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October 5, 2012

Via Email
Original via Mail

Ms. Erica Hamilton
Commission Secretary
BC Utilities Commission
Sixth Floor, 900 Howe Street, Box 250
Vancouver, BC V6Z 2N3

Dear Ms. Hamilton:

Re: FortisBC Inc. (FortisBC) Application for a Certificate of Public Convenience and Necessity (CPCN) for the Advanced Metering Infrastructure Project – BC Utilities Commission Information Request No. 1

Please find attached FortisBC's responses to Information Request No. 1 from the British Columbia Utilities Commission (BCUC or the Commission).

Sincerely,

Dennis Swanson
Director, Regulatory Affairs

cc: Registered Interveners

1.0 Reference: Application

Exhibit No. B-1, Tab 1.0, Section 1.2, p. 7

Order Requested - Revised Depreciation Rate of Five Percent

1.1 When does FortisBC plan to complete the next depreciation study and adjust the depreciation rate, if necessary?

Response:

The Company has no current plan to complete a new depreciation study. However, the Company depreciation expert Gannett Fleming estimates that rates calculated in the most recent depreciation study are reasonable for a period of three to five years. As such, FortisBC will address the matter of a new depreciation study as part of a future revenue requirements application using year-end plant in service data from the year prior to that in which the study is conducted.

1.1.1 Would FortisBC consider not revising the depreciation rate and continuing with five percent over the 20-year period?

Response:

Yes.

1.2 What does Itron guarantee the life of the meter to be?

Response:

Due to contractual sensitivities, information regarding the applicable warranties has been filed with the Commission in confidence.

Itron CENTRON OpenWay meters are designed to have a service life of 20 years. Accelerated life testing performed by Itron on CENTRON OpenWay meters suggests that the great majority of those meters will last to or beyond the 20-year design life. Please also refer to the response to BCUC IR1 Q69.1.

2.0 Reference: Application

Exhibit B-1, Executive Summary

Exhibit B-1, Tab 1.0, Section 1.1

Order G-168-08, Reasons for Decision, p. 28

Need

“FortisBC argues that "need" is not necessarily determinative of the public interest or what constitutes "public convenience and necessity", which is a flexible test. FortisBC further argues that there is "a strong regulatory and legislative basis to approve the Project."” [Ref: G-168-08, Reasons, p. 28]

“Based on both the financial and non-financial benefits, FortisBC believes the transition to advanced meters, as the standard form of metering technology, to be in the public interest.” [Ref: B-1, p. 1]

“In addition to the various non-financial benefits discussed above, financial analysis of the Project, as evaluated over a 20 year period, shows that rates will be lower than they would be without the AMI Project, due primarily to cost savings from reduced electricity theft and a reduction in manual meter reading costs. It is expected that advanced metering will provide a rate decrease of approximately 1 percent over the life of the Project, saving customers approximately $19 million on a net present value basis using an 8 percent discount rate. In summary, FortisBC believes that the Application demonstrates that the AMI Project is in the public interest and asks that a CPCN be granted to the Company for the Project.” [Ref: B-1, p. 5]

“The need for an AMI system is primarily driven by the opportunity it affords both customers and the Company to have a greater ability to efficiently manage electricity usage and the associated costs.”

[Ref: B-1, Sec. 1.1 Overview of the Project, p. 6]

2.1 Please confirm, or otherwise explain, the “need” for this project is related to changing the behaviour of the customers, in terms of consumption, and there is no Provincially mandated date for this to occur.

Response:

Although customer consumption patterns are likely to change as a result of the Project, there are benefits associated with the implementation of AMI at this time that have driven FortisBC’s decision to proceed with its application for the Project.

FortisBC believes the significant level of benefits resulting from the AMI Project clearly underscore the importance of proceeding with the project at this time. Although the province has not mandated a date for the Company to transition to advanced meters as the standard form of metering technology, a number of factors drive the timing of FortisBC's proposal, including the avoidance of significant capital costs related to the replacement of over 80,000 meters to comply with Measurement Canada requirements. As well, the Company is cognizant of the legislative requirements and timelines for BC Hydro to implement a system capable of energy balancing and detection of unmetered loads (theft) as prescribed in section 4.1 of the Smart Meters and Smart Grid Regulation 368/2010. As discussed in section 5.3.2 of the AMI Application, the Company believes that if AMI is not deployed at this time, FortisBC will experience a marked decrease in theft deterrence (and a consequent increase in theft) as a result of a perception that energy theft will be a more viable option in FortisBC's service territory as compared to BC Hydro's service territory.

Were FortisBC to delay its proposal to implement AMI, customers would be faced with the unnecessary duplication of capital expenditures related to the replacement of meters to address Measurement Canada compliance requirements (further diluting the benefits realized by the Company's current proposal), as well as the increased burden of losses due to theft as a consequence of increased marijuana production involving energy theft in FortisBC's service territory (resulting in increased rates). The response to BCUC IR1 Q53.11 indicates a $5.7 million loss of benefits if the project is delayed by two years. FortisBC submits that as a result, the timing of the Company's AMI Project proposal is appropriate, and of importance if the level of forecast benefits are to be achieved.

The FortisBC AMI system enables the utility and its customers to control costs with an enhanced ability to measure, price and manage electricity use. Thus, the need for the AMI Project is not explicitly related to changing the behaviour of customers in terms of consumption, but rather, as cited in the preamble above, is related to providing both the Company and customers the improved ability to efficiently manage electricity usage and the associated costs. AMI will allow the Company to provide customers with improved information (and potentially pricing signals in the future), enabling them to make informed decisions regarding energy use. FortisBC believes there is a fundamental need for the Company to prudently manage the operating costs of the utility, which is a key, and immediate, benefit of the AMI Project. Delay in the implementation of AMI will consequently delay the realization of this, and other, benefits.

2.2 Please confirm, or otherwise explain, there is no immediate system requirement, critical safety issue, or similar driver for this project, that requires the advanced meters to be in service by a specific date.

Response:

Although there is no immediate system requirement or critical safety issue that requires FortisBC's AMI Project to be in service by a specific date, the need to prudently manage rate increases, the impact of BC Hydro's legislated smart meter deployment, including the ability to conduct energy balancing and theft detection, as well as the avoidance of capital costs related to Measurement Canada compliance requirements does impact the timing of the need for FortisBC's AMI Project as noted in the response to BCUC IR1 Q2.1 above. A delay in the timing of the Company's proposed Project will impact the level of benefits as currently forecast in the Application. FortisBC respectfully submits that any such delay, and potential dilution of benefits attributable to AMI, would not be in the best interests of customers.

3.0 Reference: Load Forecast

Exhibit No. B-1, Tab 1.0, Section 1.3, p. 8

BCUC Decision

FortisBC stated it "…requires a BCUC decision on the proposed Project by July 20, 2013."

3.1 Provide the total consequences to costs and benefits if this date is not met.

Response:

FortisBC must decide prior to August 1, 2013 whether to proceed with the Itron contract. FortisBC may exit the contract prior to that date if it does not receive a decision or if it receives a decision with conditions that are unacceptable to the Company.

FortisBC is requesting a decision by July 20, 2013 in order to provide sufficient time for the Company to evaluate the decision prior to August 1, 2013.

The contract does not contemplate, 1) FortisBC failure to exit the contract prior to August 1, 2013 without proceeding with the contract after that date or 2) renegotiating any terms of the contract prior to August 1, 2013. The outcome in both of these circumstances is therefore uncertain.

Approximately $21 million of total project costs relate to the Itron contract for AMI – including unit costs for meters and network devices, software, and contract costs for professional services. The contract was negotiated in 2011, and prices will be held firm provided that FortisBC receives CPCN approval and agrees to any conditions contained in the BCUC decision by August 1, 2013.

Internal costs will be impacted by a delay in project start since staff continuity cannot be assured. These costs cannot easily be quantified, but relate to sourcing, obtaining, training and orienting new project personnel after a positive decision for the project is obtained.

Itron has experienced resources available in British Columbia until mid-2013 that could be quickly deployed to the FortisBC project, which would help ensure the project schedule was met and capitalize upon the synergies of implementing FortisBC's AMI project near the time of BC Hydro's Smart Metering implementation.

Project benefits will also be impacted. Beginning in 2014, FortisBC will begin incurring additional annual capital costs of $0.75 - $2.1 million related to compliance with the new Measurement Canada guidelines. Although other project benefits would likely not be impacted, the timing of realizing benefits would be delayed in a similar manner to the costs. The overall impact on the net benefits to customers would be primarily dependent on any change in costs.

As stated in more detail in the response to BCUC IR1 Q2.1, the need for the project is related to providing both the Company and customers the improved ability to efficiently manage electricity usage and the associated costs. If the project implementation is delayed customers would be faced with the unnecessary duplication of capital expenditures related to the replacement of meters to address Measurement Canada compliance, additional project implementation costs, and delayed benefits realization, all of which are counter to the need.

Please also see the response to BCUC IR1 Q53.11.

4.0 Reference: Load Forecast

Exhibit No. B-1, Tab 1.0, Section 1.4.2, p. 13

Experts

4.1 Identify the AMI Industry Experts engaged by FortisBC that help track advances in metering technologies and software products to ensure FortisBC's choices are based on relevant, affordable and secure technologies.

Response:

Util-Assist Inc. (http://www.util-assist.com) is the AMI Industry Expert engaged by FortisBC.

4.1.1 Provide a list of projects these AMI Industry Experts have been engaged in.

Response:

Util-Assist has supported over 50 utilities through the complete life-cycle of AMI integration including strategic planning, procurement, implementation and corporate change management. These utilities are identified in the table below.

1. AMI and MDM Procurement Projects

Util-Assist has helped over 50 utilities with the procurement of AMI networks and MDMs. They have assisted utilities in transforming business and technical requirements into comprehensive procurement materials and with vendor selection. Services performed include:

- Researching utility requirements across multiple utility departments;
- Providing market updates and education before procurement material is developed;
- Facilitating the procurement processes for AMI including:
    1. Procurement material and scoring package development;
    2. Response evaluation with weighted scoring criteria; and
    3. Implementing a prudent, fair selection process.

2. AMI Implementation Projects and Project Management

Util-Assist has successfully managed projects to implement and integrate AMI, WAN, WFM, MDM and CIS systems.

Util-Assist has supported over 45 utilities, representing over 2 million smart meters, through the full project life-cycle, from requirements definition through to project execution. This includes:

- Preparation and analysis of budgets and project plans;
- Identifying gaps and pitfalls to be avoided; and
- Assisting with escalation and problem solving.

3. Business Process Development Projects

Following a full gap analysis, Util-Assist has applied best practices to develop new processes for over 35 utilities such as PowerStream, Oakville Hydro, and Fortis Ontario. Services they have provided include:

- Documenting business processes to ensure daily procedures and value of asset being deployed are achieved; and
- Reviewing current business processes with utility staff to understand and analyze change management required.

4. AMI and MDM System Testing Projects

- Util-Assist has performed standardized testing on 11 leading AMI systems. Testing results have been provided to more than 50 utilities; and
- Util-Assist has facilitated AMI and MDM Systems Acceptance testing and User Acceptance testing for over 40 utilities.

1 **Table BCUC IR1 Q4.1.1 – List of Util-Assist Clients**

Utility Name	AMI & MDM Procurement	AMI Implementation & Project Mgmt	Business Process Development	AMI & MDM Testing
Algoma Power Inc.	Y	Y		Y
Atikokan Hydro Inc.	Y	Y		Y
Bluewater Power Distribution Corporation	Y	Y	Y	Y
Brant County Power Inc.	Y	Y	Y	Y
Brantford Power Inc.	Y	Y	Y	Y
Burlington Hydro Inc.		Y		Y
Cambridge and North Dumfries Hydro Inc.	Y	Y	Y	Y
Canadian Niagara Power Inc. (FortisON)	Y	Y	Y	Y
Centre Wellington Hydro Ltd.	Y	Y	Y	Y
Chapleau Public Utilities Corporation	Y	Y		Y
COLLUS Power Corp.	Y	Y	Y	Y
Cooperative Embrun Hydro Inc.				
Enersource Hydro Mississauga				Y
Espanola Regional Hydro Distribution Corp.	Y	Y		Y
Festival Hydro Inc.	Y			
FortisBC	Y			
Greater Sudbury Hydro Inc.	Y	Y	Y	Y
Grimsby Power Incorporated (FortisON)	Y	Y	Y	Y
Guelph Hydro Electric System Inc.				Y
Haldimand County Hydro Inc.	Y	Y	Y	Y
Hearst Power Distribution Co. Ltd.	Y	Y		Y
Horizon Utilities Corporation	Y			Y
Hydro 2000 Inc. (GEA)				
Hydro One				Y
Hydro Ottawa Ltd.				Y
Innisfil Hydro Distribution Systems Ltd.	Y	Y	Y	Y
Kenora H.E. Corp. Ltd.	Y	Y		Y
Kingston Electricity Distribution Inc.				Y
Kitchener-Wilmot Hydro Inc.	Y	Y	Y	Y
Lakefront Utilities Inc.	Y	Y		Y
Lakeland Power Distribution Ltd.	Y	Y		Y
Lakeland Electric (FL)		Y	Y	
Medicine Hat, The City of	Y	Y	Y	
Midland Power Utility Corporation	Y	Y	Y	Y

Utility Name	AMI & MDM Procurement	AMI Implementation & Project Mgmt	Business Process Development	AMI & MDM Testing
Milton Hydro Distribution Inc.				
Newmarket Tay Power Distribution Ltd	Y	Y	Y	Y
Niagara Peninsula Energy Inc.	Y	Y	Y	Y
Niagara-on-the-Lake Hydro Inc.	Y	Y	Y	Y
Norfolk Power Distribution Inc.	Y	Y	Y	Y
North Bay Hydro Distribution Ltd.	Y	Y	Y	Y
North Little Rock, City of	Y	Y	Y	Y
Northern Ontario Wires Inc. - Cochrane	Y	Y		Y
Oakville Hydro Corporation	Y	Y	Y	Y
Orangeville Hydro Limited / Grand Valley Energy Inc.	Y	Y	Y	Y
Orillia Power Distribution Corporation	Y	Y	Y	Y
Ottawa River Power Corp.	Y			
Parry Sound Power Corporation	Y	Y	Y	Y
Peterborough Distribution Inc.	Y	Y	Y	Y
PowerStream Inc. / Barrie Hydro Distribution Inc.	Y	Y	Y	Y
PUC Distribution Inc. (Sault Ste. Marie)	Y	Y	Y	Y
Renfrew Hydro Inc.			Y	
Rideau St. Lawrence Distribution Ltd.	Y	Y		Y
Sioux Lookout Hydro Inc.	Y	Y		Y
St. Thomas Energy Inc.	Y	Y	Y	Y
Thunder Bay Hydro Electric Distrib. Inc.	Y	Y	Y	Y
Veridian Connections Inc.	Y			Y
Wasaga Distribution Inc.	Y	Y	Y	Y
Waterloo North Hydro Inc.	Y	Y		
Welland Hydro Electric System Corp.	Y	Y	Y	Y
Wellington North Power Inc.	Y	Y	Y	Y
Westario Power Inc. (FortisON)	Y	Y	Y	Y
Whitby Hydro Electric Corp.	Y	Y	Y	Y
Woodstock Hydro Services Inc.	Y	Y	Y	Y

5.0 Reference: Description of Existing System

Exhibit B-1, Tab 3.0, Section 3.1

Failure of existing electromechanical meters

"Moreover, new regulations (S-S-06) from Measurement Canada increase the accuracy requirements for calibrating and testing meters. The approximately 80,000 electromechanical meters in the Company's metering fleet are expected to fail compliance sampling at an increased rate, and the expected lifespan of the meter population will be significantly reduced." [Ref: B-1, p.18]

"Based on the new S-S-06 regulations, FortisBC anticipates increased failures, shorter seal extensions, and an increase in compliance sampling costs. As a result, FortisBC expects an accelerated replacement of approximately 80,000 electro-mechanical meters and 8,000 digital meters over a 21 year period." [Ref: B-1, p. 93]

5.1 Please explain the anticipated failure rate for the electro-mechanical meters, and provide evidence to support the explanation. At what future date will all the existing 80,000 electromechanical meters have failed statistical testing and require replacement?

Response:

A model was created to simulate and predict the useful life of the existing FortisBC electro-mechanical meter population. This model assumed reasonable and conservative failure rates based on the recommendations of our third party meter shop. The failure rates used in the model are consistent with rates observed by the meter shop when using SS-06 guidelines in preliminary sample testing. The model assumes that as a meter ages, the likelihood of a failure increases.

For SS-06 there are 5 levels that a meter under compliance testing can attempt to achieve (target). This level corresponds to the maximum seal extension the meter is eligible for and is based on the previous extension period and the original seal length. For each decreasing level, the requirements to pass become more stringent, but the seal extensions become longer.

For its model, FortisBC determined the highest level each meter lot could target under SS-06 and then simulated compliance testing to determine pass/fail and the resulting seal extension length.

FortisBC used the following probabilities for determining which SS-06 level was obtained by each meter lot during simulated sampling activities:

Table BCUC IR1 5.1a

		Targeted level			
	Testing Outcome	**1**	**2**	**3**	**4**
Longer seal extension	Level 1	10%	-	-	-
	Level 2	20%	30%	-	-
	Level 3	40%	30%	40%	-
Shorter seal extension	Level 4	20%	20%	30%	60%
	Fail	10%	20%	30%	40%

The following describes how the model used simulates the lifespan of the meter:

- Each year a lot came up for compliance testing, a random number from 1-10 was generated. This random number was used to determine the outcome of the testing process. For example, if targeting level 3, a random number of 1-4 meant the lot was assigned to level 3, a random number of 5-7 corresponded to a level 4 and if the random number was between 8-10 then the lot was assumed to fail testing;
- Based on this predicted level, an extension period was assigned to the compliance group, and used to calculate a new seal date;
- A meter was replaced either when it was predicted to fail compliance testing by the model, or at the expiry of its seal date after reaching level 4;
- This procedure was repeated sufficiently to simulate the entire life of the meter.

Based on the model used by FortisBC, all electro-mechanical meters are expected to have failed statistical testing and therefore will need replacement by 2034. It should be noted that more than half of these replacements are predicted to occur in the first 6 years as evidenced by the following table. It outlines the number of electro-mechanical meters expected to be replaced each year due to seal expiration without an extension, and meters that are replaced because they are removed for the compliance sampling program.

Table BCUC IR1 5.1b

Year	Replacements	Exchanges	Total
2014	3,678	1,412	**5,090**
2015	3,501	1,256	**4,757**
2016	6,884	1,491	**8,375**
2017	3,884	905	**4,789**
2018	11,168	2,295	**13,463**
2019	4,407	996	**5,403**
2020	7,204	237	**7,441**
2021	4,708	268	**4,976**
2022	3,738	409	**4,147**
2023	5,567	803	**6,370**
2024	2,734	259	**2,993**
2025	5,058	136	**5,194**
2026	1,296	172	**1,468**
2027	1,327	271	**1,598**
2028	338	61	**399**
2029	372	26	**398**
2030	329	43	**372**
2031	865	29	**894**
2032	1,450	62	**1,512**
2033	0	0	**0**
2034	923	0	**923**

6.0 Reference: Project Need

Exhibit B-1, Tab 3.0, Sec. 3.1, p. 17

Project Justification

"Although electro-mechanical metering technology has remained largely unchanged since the mid-twentieth century electro-mechanical meters have been replaced by digital meters as the standard form of metering technology for the past number of years as the manufacturing and support for electro-mechanical meters has been gradually eliminated."

"For residential customers, FortisBC has installed digital meters for approximately the last six years as the standard metering technology." (p. 17)

6.1 Please confirm that electro-mechanical meters and support are no longer available on the market.

Response:

FortisBC confirms that electro-mechanical meters are no longer available to be purchased new on the market from the two main meter manufacturing venders currently being used - Itron and Elster.

FortisBC currently uses Acheson metering services located in Acheson Alberta as its third party meter shop. Support for some electro-mechanical meter forms has already been discontinued. Some of the common meter forms are still being supported but due to the Measurement Canada metering program changes currently being implemented, FortisBC is uncertain if this support will continue. This view has also been expressed by the third party meter shop.

6.2 What is the average age of the approximately 80,000 electro-mechanical meters?

Response:

FortisBC does not track original meter manufacturing dates for its meter population therefore the average age of the approximately 80,000 electro-mechanical meters is not available. However, as per the 2011 Depreciation Study, the estimated average life at December 31, 2009 was 12.7 years (includes all meters). Assuming there has not been significant replacement of these meters, the average age would be older than 12.7 years (at most 14.7 years at December 31, 2011).

6.2.1 What is the unamortized depreciation of these electro-mechanical meters?

Response:

The Company uses the pool basis of accounting for assets and thereby includes both electro-mechanical and digital meters in the same asset account and therefore cannot separate the unamortized depreciation of the two types of meters. The net book value of the unamortized meters is forecast to be approximately $9.1 million as at December 31, 2013.

6.3 What is the average age of the approximately 35,000 digital meters?

Response:

FortisBC does not track original meter manufacturing dates for its meter population therefore the average age of the approximately 35,000 digital meters is not available. Please also refer to the response to BCUC IR1 Q6.2 above.

6.3.1 What is the unamortized depreciation of these digital meters?

Response:

Please refer to the response to BCUC IR1 Q6.2.1.

6.4 Can the newer digital meters be upgraded with transmitting capability to integrate with the proposed AMI system?

Response:

No, existing digital meters are not compatible with the proposed AMI system, and cannot be upgraded to be compatible.

6.4.1 If yes, what is the cost?

Response:

Please see the response to BCUC IR1 Q6.4.

6.5 Please confirm that FortisBC plans to replace approximately 115,000 meters which includes the approximately 80,000 electro-mechanical and 35,000 digital meters.

Response:

Confirmed. FortisBC plans to replace approximately 80,000 electro-mechanical and 35,000 electronic meters during the proposed AMI project.

6.5.1 Has FortisBC considered replacing only the electromechanical meters at this time and the 35,000 digital meters closer to the end of their useful life? Please discuss this alternative.

Response:

FortisBC has considered replacing only the electro-mechanical meters with AMI meters at this time, and replacing the digital meters at the end of their useful life.

This alternative has not been pursued as it would negate much of the benefit of an AMI system. For example, the main financial benefits of an AMI system – decreasing meter reading costs and reducing theft – both require a full deployment of AMI meters in an area to be realised. Since the current digital meters are not concentrated in a geographical area, these efficiencies would not be realised across the entire FortisBC service area.

6.6 Please describe how with 162,000 customers (p.15) only approximately 115,000 are metered customers.

Response:

The 162,000 customer count referenced on page 15 of the Application refers to the total direct and indirect customer count served by FortisBC. For clarity, direct customers (approximately 115,000) are those customers served directly (metered and billed) by FortisBC within its service territory. The remaining approximately 47,000 indirect customers are those customers of the five municipalities (Kelowna, Summerland, Penticton, Grand Forks, Nelson) to which FortisBC provides wholesale service. FortisBC's proposed AMI Project will only impact the metering technology for the Company's direct customers.

6.7 Reconcile the numbers of existing and new meters in the table below:

Customer Class	Existing Meters (quantities and types)	New Meters (quantities and types)
Residential		
Commercial		
Industrial		

Response:

FortisBC will be installing new meters that will be of comparable meter types to those that are currently installed. The mapping between old and new meter types will be finalized after the project starts.

Please see the table below for preliminary meter reconciliation:

Table BCUC IR1 Q6.7 – Existing and New Meter Types

Customer Class	Existing Meters (quantities and types)	New Meters (quantities and types)
Residential	1A = 5 1S = 35 2A = 3,872 2S = 86,872 12A = 1 12S = 13,578	1A 1S C2S0 = 40 2A 2S CP2S0 = 90,744 12A 12S CP2S0 = 13,579
Commercial	3SC = 1488 9S = 936 14S = 429 16S = 3387 35S = 274 36S = 649	3SC CP2S0 = 1488 9S CP2S0 = 936 14S CP2S0 = 429 16S CP2S0 = 3387 35S CP2S0 = 274 36S CP2S0 = 649
Industrial	9S = 39	9S CP2S0 = 39

6.8 Has FortisBC submitted an application for temporary permission from Measurement Canada for verification and sealing requirements of electricity meters as BC Hydro did on May 16, 2011 for its SMI program deployment? If not, why not?

Response:

FortisBC has not applied for temporary permission from Measurement Canada pursuant to the Policy on Granting Temporary Permission to Use Electricity Meters Without Reverification for verification and sealing requirements. This is due to the timing of the expected CPCN approval and the timing of the AMI deployment which alleviates the need to apply for dispensation from Measurement Canada.

If the AMI Project is not approved, FortisBC will need to keep its compliance and retest program going through 2013, so an application now for "temporary permission" is premature.

The AMI Project, if approved, will have the first meter exchanged in mid-2014 and the last meter exchanged toward the end of 2015. FortisBC intends to keep its current retest and compliance program intact through 2013 (which tests meters with seal expiration in 2014), so there will be no exposure to overdue meters in 2014. The retest and compliance program can be discontinued in 2014 since all remaining meters will be replaced in 2015.

If FortisBC did apply for temporary permission pursuant to the Measurement Canada Policy on Granting Temporary Permission to Use Electricity Meters Without Reverification, it would not be without cost. The policy states that an electricity contractor must:

a. ensure that the integrity and accuracy of electricity meters are maintained;

b. provide objective evidence to support a decision to keep electricity meters in service without reverifying the subject meter types, models and/or groups of meters; and

c. provide a plan that will include conditions to mitigate the risk of inaccurate meters remaining in service.

FortisBC does not know why BC Hydro decided to apply for temporary permission, but assumes that it may relate to a longer deployment timeframe that increased the risk of non-conformance.

7.0 Reference: Project Need

Exhibit B-1, Tab 3.0, Sec. 3.1, p. 18 &

Exhibit B-1, Tab 5.0, Sec. 5.3.4, pp. 92-94

"For clarity, the accelerated replacement of meters to comply with Measurement Canada's new sampling requirements will have to take place either via the proposed AMI Project, or, absent approval of the AMI project, via a separate project as contemplated under the status quo and contracted meter reading alternative options ." (p.18)

7.1 Please further clarify whether the above statement refers to electro-mechanical meters only and not digital meters.

Response:

The referenced statement refers to the replacement of all electro-mechanical meters, in addition to all electronic meters belonging to compliance groups with a size less than 250 meters. The small lot size electronic meter groups are included because compliance sampling of the small lot groups will become uneconomic as minimum sampling sizes will ensure that approximately half of the meters in small lot groups will have to be removed for testing.

"FortisBC experience shows that the new sampling plan will result in an increased failure rate for electro-mechanical meters. As solid state digital meters consistently exhibit better test results than their electro-mechanical counterparts, they are typically granted longer seal extension for the installed groups of meters". (p. 93)

7.2 Please confirm whether the forecast NPV benefit of $9.8 million represented by Table 5.3.4.a, as savings to achieve Measurement Canada Compliance, is the result of the replacement of approximately 80,000 electro-mechanical meters with digital or AMI meters.

Response:

Confirmed. The forecast avoided capital cost NPV benefit of $9.8 million presented in Table 5.3.4.a from the Application results from savings to achieve Measurement Canada Compliance for approximately 80,000 electro-mechanical meters and the approximately 8,000 digital meters that are considered "small lot" at the time of sampling, as discussed in BCUC IR1 Q7.1.

8.0 Reference: Project Need

Exhibit No. B-1, Tab 3.0, Section 3.2.1, pp. 19-20

Benefits

8.1 Provide data to support FortisBC's claim that the capability afforded by the AMI system for customers to access their usage history and statistics through an online customer information portal or through an optional IHD will result in greater customer satisfaction since they will be able to get detailed information about the quantity and timing of their energy consumption.

Response:

High bill inquiries are one of the highest-volume billing inquiries that FortisBC receives in the winter months (from January-April 2012, high bill inquiries were the third most frequent billing inquiry after account balance and account updates). This is consistent with the experience of other utilities. As noted in the Application, Appendix F-1 – AMI-SEC System Security Requirements, p 105:

B.5.1.2 Customer Dispute Management

The most frequent customer dispute is a high bill. They complain about the meter reading being wrong. In truth there are enough meter reading errors that high bills are a fact of life. But the ability to check the current meter reading directly from the meter while the customer is on the phone and re-calculate the bill if the bill was high, and to end the post call investigation, by being able to directly validate the customer dispute reduces the time to clear a complaint that is nonphone time and it reduces the call handling time of the life of the dispute. It is not unusual that the initial call time goes up, since the CSR has to explain how they are getting the information and may have to have the customer walk to the meter while on the phone and verify the numbers that show on the meter. This has reduced monthly disputes with chronic callers over a period of 3 to 6 months in most utilities that have this ability.

It is difficult to predict the impact on customer satisfaction of having accurate and frequent meter readings readily available to customers. However to the extent that the availability of such information addresses customer concerns related to high bills and estimated bills, it is probable that customer satisfaction will improve. The use of bill estimates is the unavoidable result of the current manual meter reading process, and drives many of the complaints received. As well, the current high bill process also suffers from a lack of data to assist customers with identifying when their consumption increases and how increases may relate to temperature. This gap is addressed with AMI.

As suggested in the AMI-SEC report and in Exhibit B-1, Tab 5, p96, ll 11-16, over time there may be a reduction in calls associated with high bills. This benefit cannot be quantified but the Appendix F-1 from the Application indicates it is the experience of other utilities.

8.1.1 Provide the estimated amount of this benefit in dollars.

Response:

FortisBC considers this benefit non-quantifiable as detailed in the response to BCUC IR1 Q8.1.

8.1.2 Provide the cost of overlaying the ambient temperatures coinciding with the hourly meter readings in the proposed customer information portal, helping customers better understand the relationship between temperature and electricity consumption for their particular premises.

Response:

The Itron Customer Care applications, that form part of the AMI project, trend temperature delivered from a variety of weather feeds against meter data. FortisBC intends to subscribe to live hourly weather feeds at several locations throughout its service territory at a cost of less than $3,000 annually in order to provide this information to customers.

8.1.3 As all customers might not have computer access to a customer online portal, provide the cost of providing readings at regular intervals that will allow customers (through the online customer information portal) to examine electric usage in a timely and unobtrusive manner.

Response:

FortisBC considers the provision of information and services via the Internet to be a standard option that provides customers with additional communications channels and reduces overall cost. The capital cost of the customer portal (which will include a number of features including the provision of meter readings at regular intervals) is $0.25 million.

8.1.3.1 Did FortisBC assume that all AMI customers have internet access?

Response:

No. Currently, customers without Internet access (and those that prefer to deal with FortisBC representatives over the phone) can call to get information and may request additional printed data to be mailed to them. Although this is more expensive than providing the same information via the Internet, FortisBC intends to continue providing this service to customers at no additional cost.

8.2 On a scale of 1 to 10 (10 being the highest) rate customers' demand for the IHD and portal features.

Response:

FortisBC has rated customer demand for IHD and portal features on a scale of 1 to 10 based on the forecast adoption rates.

IHD/Portal Feature	Forecast Adoption Rate	Demand (1-low, 10-high)
Pre-pay	3-8%	1
In-home display (purchased by customer with PowerSense incentive)	30%	3
Use of customer portal to monitor consumption	15%	2

9.0 Reference: Project Need

Exhibit No. B-1, Tab 3.0, Section 3.2.2, pp. 19-24

Benefits

9.1 Did FortisBC's five wholesale customers sign the British Columbia Climate Action Charter?

Response:

Yes, FortisBC's five wholesale customers are signatories to the British Columbia Climate Action Charter.

9.1.1 How many customer meters lie within the boundaries of the five wholesale customers?

Response:

As noted in the response to BCUC IR1 Q6.6 above, approximately 47,000 customers are served (metered) by FortisBC's five wholesale customers.

9.1.2 Could these customers be considered indirect customers of FortisBC?

Response:

Yes, the Company considers the approximately 47,000 customers served by the five wholesale customers to be indirect customers of FortisBC.

9.2 Does the Smart Meters and Smart Grid Regulation under the CEA apply solely to BC Hydro?

Response:

Although the Smart Meters and Smart Grid Regulation under the *Clean Energy Act* (CEA) is generally applicable to BC Hydro, section 17 (6) of the CEA also states:

> If a public utility, other than the authority, makes an application under the *Utilities Commission Act* in relation to smart meters, other advanced meters or a smart grid, the commission, in considering the application, must consider the government's goal of having smart meters, other advanced meters and a smart grid in use with respect to customers other than those of the authority.

In consideration of the government's goal regarding smart meters, and as noted in section 3.2.2 of the Application, FortisBC evaluated the alignment of its proposed AMI Project with the prescribed requirements for BC Hydro as provided in the Smart Meters and Smart Grid Regulation, and determined that the proposed AMI Project is aligned with these requirements. FortisBC believes it is important for the Commission to consider this alignment, particularly since the CEA, as cited above, requires the Commission, as part of its overall assessment of the proposed Project, to consider the government's goal of having smart meters in use for customers other than those of BC Hydro.

9.2.1 Of the legislation and regulation provided by FortisBC, please advise the legislation and regulation that applies solely to FortisBC for the purposes of this Application.

Response:

Although none of the legislation and regulation provided by FortisBC as part of the Application applies solely to FortisBC, provincial energy policy as detailed in the 2007 BC Energy Plan is given effect through several pieces of legislation which impact utilities operating within the province. FortisBC has provided the relevant pieces of legislation and regulation in Appendix B of the Application which are supported by the Company's proposed Project.

10.0 Reference: Project Need

Exhibit B-1, Tab 3.0, Section 3.2.3

Smart Grid Building Blocks - FortisBC's DSAP

"The largest opportunity yet to be attributed to system improvements such as DSAP includes the measurement and confirmation of current system losses and identification of future system loss reductions. This opportunity requires the implementation of an advanced metering system in conjunction with the already implemented DSAP as an essential component of the smart grid."

[Ref: B-1, p. 28]

10.1 Please explain further the opportunity benefit attributed to DSAP that will result from the completion of the AMI project.

Response:

The opportunity benefit being referenced is the ability to identify distribution system losses on a per-feeder basis. The DSAP greatly enhanced FortisBC's visibility of its distribution substations by adding advanced substation meters at 26 of the Company's legacy substations. Together with the advanced meters already installed at new substations constructed over the last ten years, FortisBC now has advanced meters installed on almost all of its distribution feeders.

Once AMI meters are installed it would be possible to conduct energy loss measurements on a per-feeder basis. This would be done by subtracting the total energy consumed at customer end-points from the energy supplied to a distribution feeder (as measured by the substation advanced meters). Prior to completion of the DSAP, a large number of distribution feeders would not have had the advanced substation meters necessary to support this calculation.

For further information please refer to the responses to BCUC IR1 Q78.3, Q78.3.1 and Q78.3.2 for a discussion of system loss calculations.

10.2 Please identify where in this Application that cost reduction can be seen.

Response:

With respect to the cost reductions associated with reducing system losses, FortisBC is unable to quantify the expected financial benefit at this time. As discussed in the response to BCUC IR1 Q10.1, this is because FortisBC cannot accurately estimate and locate distribution system losses without AMI, and therefore cannot quantify or identify areas of opportunity until AMI is implemented. Further, FortisBC will need to conduct a cost/benefit analysis for any given loss reduction initiatives to ensure that the benefits of the associated loss reduction exceed the cost of any infrastructure upgrades. Hence, these savings have not been reflected in the project costs analysis. Any future financial benefits will be reflected in reduced power purchase costs and potentially reduced growth capital infrastructure investments.

11.0 Reference: Project Need

Exhibit B-1, Tab 3.0, Section 3.2.3

Key role of AMI in the Smart Grid

"The ability of an advanced metering system to provide comprehensive information regarding consumption at the customer endpoint, in conjunction with the information available from the advanced distribution metering already deployed at the substation level, would allow the Company to accurately measure actual losses on a near-instantaneous and annual basis." [Ref: B-1, p. 29]

11.1 Please explain further the status and capability of the "advanced distribution metering already deployed at the substation level." Specifically, is the distribution metering required to identify the theft of energy on a specific distribution lateral already installed?

Response:

At present, FortisBC has only installed metering devices at the distribution substation level (i.e. electrically at the point where the distribution feeder leaves the substation). These devices measure and record both the real-time and historical readings of power, energy, current, voltage, and harmonics. Metering at this level is not sufficient to identify or locate sites involving theft of energy. Please see the response to BCUC IR1 Q54.1 describing the downstream distribution metering proposed to be installed.

12.0 Reference: Project Need

Exhibit No. B-1, Tab 3.0, Section 3.2.3, pp. 25-29

Smart Grid Vision

12.1 Provide the actual cost of the Supervisory Control and Data Acquisition (SCADA) systems.

Response:

The FortisBC SCADA system was first installed in 1988 and underwent major upgrades in 1998 and 2007. Due to the passage of time, there is very limited cost information available for the 1988 and 1998 installations. FortisBC would estimate the total costs of the initial SCADA system installation and the upgrades since that time as being approximately $1 to $2 Million. Note that this does not include any associated infrastructure costs for the System Control Centre building (which houses the SCADA hardware and associated operating personnel). Nor does it include the costs of the field hardware and communications systems necessary needed to support the SCADA system. These latter costs have been included in the sustaining and growth capital projects completed over the years and separating out the costs would be very difficult.

12.2 Provide the actual cost of the Distribution Substation Automation Program (DSAP).

Response:

The Distribution Substation Automation Program was completed in 2012 at an actual cost of $6.747 million (inclusive of salvage).

12.3 Provide FortisBC's forecasted costs for the key components and year of the implementation of the key components for the FortisBC Smart Grid Vision. Complete the table below:

Key Components	**Forecasted Cost**	**Year Planned**
Advanced Metering Infrastructure (AMI)		
Automated Vehicle Location (AVL) - *		
Computerized Maintenance Management System (CMMS) - *		
Conservation Voltage Reduction (CVR)		
Customer information portals		
Cyber-security infrastructure - *		
Dispatch system - *		
Distributed Generation (DG) integration		
Distribution Automation (DA)		
Demand Response (DR) control		
Distribution Management System (DMS)		
Electric (EV) or plug-in hybrid (PHEV) vehicle integration		
Energy Management System (EMS)		
Fibre-optic communications networks - *		
In-Home Displays (IHD)		
Meter Data Management System (MDMS)		
Outage Management System (OMS)		
Phasor Measurement Units (PMU) - *		
Real-time transformer monitoring - *		
Real-time transmission line rating		
Supervisory Control and Data Acquisition (SCADA) - *		
Substation Automation - *		
Wide-area (wireless) communications networks		
Work Management System		
Total Forecasted Cost		

Response:

FortisBC would like to clarify that the stated "Key Components" is simply a list of available technologies that are typically classified as Smart Grid initiatives. FortisBC is not implying that it intends to deploy all of these components.

The scope of the FortisBC AMI Project already includes the following items:

- Customer information portals
- In-Home Displays (IHD)

- Meter Data Management System (MDMS)
- Wide-area (wireless) communications networks

Thus, these components are included in the AMI Project forecast of $47.7 million with an in-service date of 2015.

FortisBC would also like to reiterate that the table items marked with asterisks are either fully or partially deployed at FortisBC. Thus, the year of implementation and forecast cost is not applicable to the following projects:

- Automated Vehicle Location (AVL)
- Computerized Maintenance Management System (CMMS)
- Cyber-security infrastructure
- Dispatch system
- Fibre-optic communications networks
- Phasor Measurement Units (PMU)
- Real-time transformer monitoring
- Supervisory Control and Data Acquisition (SCADA)
- Substation Automation

For the remaining items, FortisBC would like to reiterate that the components listed in the table do not typically represent stand-alone "projects". In many cases they are actually technology sectors or initiatives and would be driven based on the uptake levels of customer-driven projects. For example, Distributed Generation and Electric Vehicle Integration will be driven by customer adoption rates. As well, these components will likely ramp up over a long period of time. Thus, there is no "Year Planned" or "Forecasted Cost" that can be provided for these components. In some cases, there is either no identified need for the project (such as for Demand Response control, Work Management System, or Real-time transmission line rating) or the technology is simply not applicable to FortisBC's operation (Energy Management System).

For all of the above reasons, there is little information at this time to provide with respect to the forecast cost and in-service date for many components. Presently, only the Outage Management System and Conservation Voltage Reduction components have been explored in some detail (and are discussed further in Section 6 - "Future Benefits"). Given all of the above, FortisBC has attempted to provide the requested data where possible.

Table BCUC IR1 Q12.3 – Smart Grid Vision

Key Components	Forecast Cost	Year Planned
Advanced Metering Infrastructure (AMI)	$47.7M	2015
Automated Vehicle Location (AVL) - *	Already deployed	
Computerized Maintenance Management System (CMMS) - *	Already deployed	
Conservation Voltage Reduction (CVR)	~ $9M	Power purchase/cost driven
Customer information portals	Included with AMI	
Cyber-security infrastructure - *	Already deployed	
Dispatch system - *	Already deployed	
Distributed Generation (DG) integration	Customer driven	
Distribution Automation (DA)	Unknown	Ongoing
Demand Response (DR) control	No identified need	
Distribution Management System (DMS)	No identified need	
Electric (EV) or plug-in hybrid (PHEV) vehicle integration	Customer driven	
Energy Management System (EMS)	Not required	
Fibre-optic communications networks - *	Already deployed	
In-Home Displays (IHD)	Included with AMI	
Meter Data Management System (MDMS)	Included with AMI	
Outage Management System (OMS)	~ $1M	~ 2016
Phasor Measurement Units (PMU) - *	Already deployed	
Real-time transformer monitoring - *	Already deployed	
Real-time transmission line rating	No identified need	
Supervisory Control and Data Acquisition (SCADA) - *	Already deployed	
Substation Automation - *	Already deployed	
Wide-area (wireless) communications networks	Included with AMI	
Work Management System	No identified need	
Total Forecast Cost	~ $57 M	

12.4 Of the key components of the FortisBC Smart Grid Vision, please identify those that FortisBC needs within the next 20 years.

Response:

Please refer to the response to BCUC IR1 Q12.3.

13.0 Reference: Project Need

Exhibit B-1, Tab 3.0, Section 3.2.3

Order C-11-07

Historical Perspective - FortisBC's Distribution Substation Automation Program (DSAP)

"FortisBC's CPCN Application for DSAP described its legacy electro-mechanical protection and metering equipment as antiquated and obsolete. The Commission ultimately concluded that replacement of this legacy technology with new electronic technology to be appropriate and of benefit to ratepayers. 7

7 Appendix A to Order C-11-07, page 13". [Ref: B-1, pp. 25-26]

13.1 Please provide the specific extract from page 13 of Appendix A to Order C-11-07 showing the Commission conclusion that replacement of legacy electro-mechanical technology with new electronic technology is appropriate and of benefit to ratepayers.

Response:

The reference to page 13 of Appendix A to Order C-11-07 is in error, and should have correctly referenced page 11 of Appendix A to Order C-11-07, which states:

"The Commission Panel therefore concludes that replacing the existing legacy technology with new electronic technology is appropriate."

14.0 Reference: Project Costs and Benefits

Exhibit B-1, Tab 3.0, Section 3.2.4

Opportunity Cost

Exhibit B-1 notes that "Although not included in the financial model, there is also an inherent opportunity cost if AMI is not pursued at this time due to the non-financial customer service and operational benefits with the Project that will not be realized should the Project not proceed."

14.1 Please describe the "non-financial customer service" and "operational benefits" that are identified.

Response:

Non-financial customer service benefits are detailed in Exhibit B-1, Tab 3.0, Section 3.2.5: Conservation Rate Structures, Enhanced Billing Information, Improved Billing Accuracy, Consolidated Billing for Multiple Customer Locations, Flexible Billing Date and Reduced Need to Access Customer Premises.

Non-financial operational benefits are detailed in Exhibit B-1, Tab 3.0, Section 3.2.5: Enhanced System Modeling, Improved Financial Reporting, Load Forecast and Cost of Service Analyses, Improved Safety, Reduced GHG Emissions, Immediate Notification of Power Outage and Restoration and Improved Power Quality Monitoring.

15.0 Reference: Project Costs and Benefits

Exhibit B-1, Tab 3.0, Section 3.2.4

Financial Benefits to Customers

15.1 Provide a ranking of customer benefits and the value of each.

Response:

Please see the table below.

Table BCUC IR1 Q15.1 – Ranking of Customer Benefits

	Benefit	**NPV $000s**
1	Theft reduction	(38,386)
2	Reduced manual meter reading	(23,785)
3	Avoided Measurement Canada compliance costs	(9,758)*
4	Remote connect/disconnect	(5,466)
5	Reduced meter exchanges	(797)
6	Reduced contact centre costs	(441)

* NPV of avoided capital costs, not NPV of revenue requirement

15.2 Provide a ranking of non-customer benefits and the value of each.

Response:

FortisBC does not know what types of benefits the Commission considers to be non-customer.

16.0 Reference: Project Need

Exhibit B-1, Tab 3.0, Section 3.2.5

Conservation Rate Structures

"As part of its 2012 Long Term Resource Plan, FortisBC has included estimated savings of 2.3 GWh beginning in 2015 and increasing to 8.9 GWh by 2025 related to the behavioural changes enabled by the FortisBC online web portal." [Ref: B-1, p.32]

16.1 Please provide the total dollar value of these estimated savings from 2015 to 2032, and the dollar value by each of the years from 2015 to 2032.

Response:

The figures provided in the application were incorrect, and the estimated customer information portal savings range from 2.2 in 2015 to 5.3 GWh in 2025.. The corrected customer information portal savings, by year, and the dollar value of each is shown in the following table. The incorrect figures do not affect the application as the customer information portal benefits were not factored in (please see the response to BCUC IR1 Q16.2 response).

Table BCUC IR1 Q16.1

Residential CIP Savings (MWh)		
Year	CIP Gross (MWh)	Value @$85 MWh
2015	2,235	$ 189,800
2016	4,557	$ 387,100
2017	4,642	$ 394,300
2018	4,727	$ 401,500
2019	4,811	$ 408,600
2020	4,895	$ 415,700
2021	4,978	$ 422,900
2022	5,062	$ 429,900
2023	5,145	$ 437,000
2024	5,228	$ 444,100
2025	5,311	$ 451,100
2026	5,393	$ 458,100
2027	5,474	$ 465,000
2028	5,555	$ 471,800
2029	5,635	$ 478,600
2030	5,714	$ 485,300
2031	5,792	$ 492,000
2032	5,870	$ 498,600
Total:		**$ 7,731,400**

16.2 Please identify where these savings can be seen in the AMI Project Benefits or explain why these savings have been included in the 2012 Long Term Resource Plan but not in the AMI project analysis.

Response:

The savings identified in the response to BCUC IR1 Q16.1 have not been included in the AMI Project Benefits. FortisBC is considering whether such savings should be included as behavioural savings as part of its DSM program, but agrees that they could be included in the AMI project analysis.

If the CIP savings were included in the AMI project analysis, there would be no change in project costs and the NPV of the project would improve to an estimated $20.9 million.

17.0 Reference: Project Need

Exhibit B-1, Tab 3.0, Section 3.2.5

Customer Benefits – Automated Outage Notification

"The AMI system will provide FortisBC with visibility down to the point of delivery at the customer's meter. This capability will provide detailed power outage information, including the time duration of the outage and the number and location of customers affected by an outage." [Ref: B-1, p. 38]

17.1 Please explain if customers have the option of signing up for automated e-mail notification of an outage of a specific meter.

<u>Response:</u>

At this time, FortisBC has not included in the project cost the design to include an email notification system that will advise a customer of an outage for a specific meter. This is a customer benefit that will be considered for implementation in the future. FortisBC intends to allow customers to select the method (if any) by which they wish to be notified of a power outage, including automated e-mail and Short Message Service (text message) notifications.

The immediate benefit of Automated Outage Notification is intended to inform FortisBC of the duration of outages, the number and location of outages. This will also aid in identifying specific meters that are still out before a crew leaves an area.

18.0 Reference: Project Need

Exhibit No. B-1, Tab 3.0, Section 3.2.5, pp. 31-32

Future Conservation Rate Structures

Meter Data Collection for TOU/CPP

The New Zealand Electricity Commission (now Electricity Authority) Guidelines on Advanced Metering Infrastructure Version 2.0 page 3 states:

" The Commission's policy is that the following should be the minimum requirements for AMI systems established in New Zealand (NZ):

(a) one metrology element complying with relevant NZ metering standards for the load served;

(b) one master accumulation (MA) register for all units consumed on site which is never reset and is read as part of a meter reading sequence;

(c) a minimum of six general accumulation (GA) registers which may start and stop their accumulation at programmable times to at least 30 minute resolution and coincident with the half hour meter data logging boundaries. This functionality may be provided within the meter's CPE or at another location (such as the back office system) within the AMI system; ...

(h) provide ability to meter both import and export power on sites where this is formally contracted between the energy retailers and their customer."

18.1 Does FortisBC consider it is a requirement of residential TOU rates that the AMI meter has half-hourly (HH) capability, compared to, for example, six GA registers?

Response:

FortisBC does consider it a requirement of TOU and CPP rates that the AMI meter has hourly interval data availability at minimum.

This data can be used to support customer service calls, load research, future time-based rates (such as TOU and CPP), and other applications. Interval data simply represents the most flexible receipt of data, allowing rate calculations to be made and easily changed within the MDMS and billing system. The meter configuration described above (multiple registers) would present FortisBC with challenges and associated costs when it comes time to adapt and reconfigure the meters or system to support new rates and programs. Interval data ensures flexibility for changing business and customer needs and future requirements.

18.1.1 Please describe the additional capital and ongoing operational cost associated with meters with HH data capability compared to six GA registers.

Response:

There is no capital cost difference solely attributable to interval data versus register data.

FortisBC has not quantified the operational costs of different measurement approaches, but expects that interval data capability would be less expensive for managing time-based rate structures since peak period changes can be managed entirely within the Company's billing software.

18.2 Does FortisBC consider that a residential meter is required to have HH capability in order to put in place CPP pricing? In your response, please explain if residential CPP could reasonably be put in place with less granular data (for example, six GA-registers).

Response:

Please refer to the response to BCUC IR1 Q18.1.

18.3 Do the residential advanced meters proposed by FortisBC have the ability to meter both import and export power? If yes, what is the incremental cost of including this functionality within each meter? If no, please explain why not.

Response:

Yes, all Itron OpenWay meters are equipped with net metering capabilities at no additional cost.

18.3.1 Could this functionality be added to the meter at a later date? Please explain why or why not and estimate the cost difference compared to the FortisBC proposal.

Response:

Please refer to the response to BCUC IR1 Q18.3.

19.0 Reference: Project Need

Exhibit No. B-1, Tab 3.0, Section 3.2.5, pp. 31-32

Enhanced Billing Information

19.1 What is the forecast cost reduction if there were a one percent reduction in the 25 percent of all calls to the FortisBC Contact Centre that are related to billing queries?

Response:

The annual cost reduction would be approximately $2,200, increasing with inflation.

20.0 Reference: Project Need

Exhibit No. B-1, Tab 3.0, Section 3.2.5, p. 33

Improved Billing Accuracy

20.1 How many billing queries per year are there for Residential customers?

Response:

For 2011, the total number of billing-related calls was approximately 45,500. Of these calls, approximately 39,500 are estimated to be related to residential inquiries.

20.1.1 What percentage of the monthly calls to the Contact Centre relate to residential billing estimated usage?

Response:

FortisBC does not track calls specifically related to estimate usage. However, calls are tracked for more general categories such as Customer Meter Read, Budget Billing, High Bill Inquiries and Bill Escalations. A proportion of calls within these categories may be attributed to estimated usage. For 2011, the calls within the above noted 4 categories totalled approximately 6,800. Of these, approximately 87% or 5,900 calls are estimated to be related to residential billing.

21.0 Reference: Project Need

Exhibit No. B-1, Tab 3.0, Section 3.2.5, pp. 33-34

Consolidated Billing for Multiple Customer Locations

21.1 How many customers have requested to receive consolidated bills?

Response:

FortisBC does not keep records of consolidated bill requests. However, FortisBC does receive requests and can occasionally accommodate them (provided that the meters for each service being consolidated are read on the same meter reading route). FortisBC contact centre personnel estimate that 20-30 customers per month inquire regarding consolidated billing and cannot be accommodated.

21.1.1 Provide an estimate of the cost or savings to provide this service.

Response:

The FortisBC Customer Information System is already configured to provide consolidated billing (see the response to BCUC IR1 Q21.1). However, the number of requests that can be accommodated is expected to increase when FortisBC informs customers of the consolidated billing option through regular customer communications. The one-time cost of implementing each consolidated bill is expected to be approximately $8 per bill consolidated, with annual printing and postage savings (for those customers not on eBilling) of approximately $6 per bill consolidated. This cost compares favourably to the cost incurred to set customers up on other billing options such as the equal payment plan and direct debit.

21.2 What is the cost proposed by FortisBC to be charged to those requesting consolidated billing?

Response:

FortisBC currently provides consolidated billing (where feasible) at no additional cost to customers and proposes to continue doing so post-AMI implementation.

22.0 Reference: Project Need

Exhibit No. B-1, Tab 3.0, Section 3.2.5, p. 34

Flexible Billing Date

22.1 How many customers have requested flexible billing dates?

Response:

FortisBC does not keep statistics specifically on calls related to customers requesting flexible billing dates but estimates that approximately 10 calls per week are received. The calls are often from fixed income customers that want to ensure their electricity bill is paid as soon as they receive their income payments. The E-Source whitepaper provided as Appendix BCUC IR1 22.1 reports results from a study showing 47% of respondents chose a flexible billing date option from a selection of five billing options.

FortisBC wishes to continue providing billing options at no additional cost to customers, provided that the utility costs are small (please refer to the response to BCUC IR1 Q22.1.1).

22.1.1 Provide an estimate of the cost to provide this service.

Response:

Based on the cost per call for billing queries, the estimated cost to set a customer up on a flexible billing date is less than $5. This amount is similar to the cost incurred to set customers up on other billing options such as the equal payment plan and direct debit.

22.2 What is the cost proposed by FortisBC to be charged to those requesting flexible billing dates?

Response:

FortisBC does not propose to charge customers to change their billing date.

23.0 Reference: Project Need

Exhibit No. B-1, Tab 3.0, Section 3.2.5, p. 34

Enhanced System Modeling

23.1 Provide the percentage incremental improvement in using AMI to assess the tens of thousands of single phase transformers.

Response:

FortisBC would like to clarify that it already uses system modelling to assess feeder loading. Further, the Company also uses these models to carry out periodic feeder rebalancing projects. This work is done to accommodate new load additions onto the distribution system and also to maintain or improve:

- Power quality – ensures that three-phase customers receive balanced voltages;
- Reliability – prevents undesirable breaker or fuse operations due to excessive imbalance current;
- Safety – prevents imbalance current from desensitizing feeder protection relays;
- System Losses – distributes load equally across phases to ensure optimal equipment utilization.

In other words, future feeder rebalancing work does not represent incremental effort that is required or results from the AMI Project. Instead, AMI meters will offer an additional source of data to be used in future modelling exercises. Until actual data is received from the AMI system, it is unknown to what extent the additional data provided by the system will improve existing system models. Thus, FortisBC is unable to provide an estimate at this time of the incremental improvement that the additional AMI data will provide to these future rebalancing projects.

23.1.1 Provide the cost of reconnecting a single phase transformer.

Response:

FortisBC interprets this question as requesting the cost of reconnecting a single phase transformer from one phase to another in order to improve the feeder load balance. In actuality, feeder rebalancing is never carried out by reconnecting individual distribution transformers. This is because the amount of load on an individual single-phase distribution transformer is far too small to have any significant impact on the overall feeder load balance. Instead, load rebalancing is conducted by reconnecting entire feeder segments (laterals) from one phase to another. This allows tens or hundreds of downstream distribution transformers to be simultaneous relocated from one phase to another. As discussed in the response to BCUC IR1 Q23.1, FortisBC already carries out periodic feeder rebalancing projects. In 2011, approximately $97,000 was expended to reconnect 74 distribution segments (representing approximately 7 MW of load transfers) in the Okanagan portion of the FortisBC service territory. Thus, the cost of reconnecting an individual distribution segment/lateral is approximately $1,300.

23.2 Provide an estimate of the number of transformers that may have to be reconnected.

Response:

As described in the responses to BCUC IR1 Q23.1 and Q23.1.1, FortisBC already conducts periodic feeder rebalancing projects. This work does not entail reconnecting individual distribution transformers, but rather entire feeder segments. The additional data provided by the AMI system will not necessarily result in additional feeder rebalancing effort. Rather, the data provided by the AMI meters will simply offer an additional source of data to be used in future modelling exercises and the resulting feeder rebalancing projects.

23.2.1 Provide the anticipated amount of improvement in percentage to thermal loading, voltage and loss of performance and include the estimated improvement in the higher degree of accuracy available from the AMI system.

Response:

Until actual data is received from the AMI system, it is unknown to what extent the additional data provided by the system will improve existing system models. Thus, FortisBC is unable to provide a quantifiable estimate at this time of the incremental improvement to system performance from the AMI system.

24.0 Reference: Project Need

Exhibit B-1, Tab 3.0, Sec. 3.2.5, p. 37

Safety - Components and Constraints

24.1 In assessing the number of safety incidents shown in Figure 3.2.5.a as fourteen to seventeen incidents per year since 2008, has Fortis included any cost reductions related to safety in its financial NPV analysis? For example, lost work days, vehicle repair costs, vehicle insurance premium savings, Worksafe BC premiums, etc. If so please indicate how much.

Response:

Within the financial NPV analysis, FortisBC has provided for cost reductions in the areas of lost work days and vehicle costs. Lost work days most often result in unplanned overtime costs which have already been accounted for in the meter reading labour cost savings.

Similarly, Worksafe BC premiums are included in labour “loading” costs. As fully loaded labour costs are reduced, so too are applicable Worksafe BC premiums.

Vehicle repair and insurance costs related to safety incidents are also included in the CPCN Application in Table 5.3.1.a which outlines vehicle costs.

FortisBC does not track costs such as overtime, Worksafe BC and vehicle repairs in such a way that it is possible to segregate what portion was related to safety incidents versus other causes. The savings though, are confirmed to be included in the NPV analysis.

24.1.1 If not, why not?

Response:

Please refer to the response to BCUC IR1 Q24.1 above.

25.0 Reference: Project Need

Exhibit No. B-1, Tab 3.0, Section 3.2.5, p. 38

Reduced GHG Emissions

25.1 Will these meter reading vehicles be permanently eliminated from the vehicle fleet?

Response:

The meter reading vehicles will be permanently eliminated from the vehicle fleet.

26.0 Reference: Project Need

Exhibit No. B-1, Tab 3.0, Section 3.2.5, pp. 38-39

Immediate Notification of Power Outages and Restoration

26.1 Provide the current duration (SAIDI), and frequency (SAIFI) values.

Response:

FortisBC reported the following statistics for the year ending 2011 (the most recent complete year for which statistics are available):

SAIDI	1.86
SAIFI	1.38

26.1.1 Have there been numerous customer complaints regarding the current SAIDI and SAIFI numbers?

Response:

The reported SAIDI and SAIFI values represent the average reliability calculated over the entire FortisBC service area. The actual reliability experienced by individual customers may be better or worse than these statistics depending on their location, and FortisBC does receive complaints from customers in areas with poor reliability statistics.

In general, Customer Satisfaction Index surveys report that most customers do not have a specific concern with their service reliability. At the same time, these surveys reveal that “Reliability and Dependability” is one area of primary importance to customers (with “Price of electricity” typically being the other area of importance).

26.1.1.1 If so, please identify the regions in the service area and the number of complaints.

Response:

Some regions of the FortisBC service area experience worse levels of reliability than the average statistics. Some examples would be customers located at the end of long distribution feeders, remote areas served by a single, radial transmission line or locations subject to adverse conditions such as frequent tree contacts, lightning, heavy snowfall or high winds. Some of the general areas that experience these reliability issues would be the Slocan Valley, the Highway 6 corridor between Nelson/Creston, and the Kootenay Lake areas.

FortisBC does not specifically track complaints related to reliability so numbers are not available.

26.2 What is the expected improvement in SAIDI and SAIFI values after AMI implementation?

Response:

FortisBC expects that AMI will reduce restoration time for customers, but any improvement will be difficult to measure. The difficulty in measuring improvements arises from the fact that AMI will provide more accurate and complete outage statistics than are available today making the cause of changes in outage statistics difficult to determine. In some circumstances, it has been found that the additional outage information provided by automated reporting systems such as

AMI and Outage Management Systems (OMS) may result in numerically worse SAIDI and SAIFI statistics (even when there is no actual change in system performance)[1].

It is anticipated, however, that the more accurate and complete data available with AMI will allow FortisBC to conduct an improved post outage analysis of time off/ time on, duration (SAIDI), and frequency (SAIFI), which may prove useful in addressing and resolving customer complaints.

27.0 Reference: Project Need

Exhibit No. B-1, Tab 3.0, Section 3.2.5, pp. 38-39

Improved Power Quality Monitoring

27.1 Explain how AMI will report electric service and wiring errors.

Response:

AMI meters can detect a variety of conditions that are indicative of electric service or wiring errors.

All AMI meters can detect inversion, removal and reverse power flow. Polyphase meters also have the ability to continuously monitor the electric service for metering installation or tampering problems through the system and installation diagnostic checks. The following programmable diagnostic checks can be enabled in the HES data collection engine:

Diagnostic 1: Cross-Phase, Polarity and Energy Flow Check – This diagnostic verifies that all meter elements are sensing and receiving the correct voltage and current angles for each phase of a specific polyphase electric service. The current tolerance is +/- 90 degrees.

Diagnostic 2: Phase Voltage Deviation Check – This diagnostic verifies that each individual phase maintains an acceptable voltage level with respect to the other phases. Problems such as shorted potential transformer windings, incorrect phase voltage, and loss of phase potential among others may be indicated. The phase voltage deviation can be set to 1% -25%.

Diagnostic 3: Inactive Phase Current Check – This diagnostic verifies that each individual current phase maintains an acceptable current level. It may indicate problems such as current

[1] M. McGranaghan, A. Maitra, C. Perry, A. Gaikwad, “Effect of Outage Management System Implementation on Reliability Indices,” in Proc. 2006 IEEE PES Transmission and Distribution Conference and Exhibition, pp. 1208-1211

diversion and open or shorted circuits, among others. The inactive phase current can be set for 0.05 amps to 200 amps.

Diagnostic 4: Phase Angle Displacement Check – Similar to Diagnostic 1, but this diagnostic allows the user to define an acceptable angle displacement between the phase voltage and current. An acceptable phase angle displacement is from 1 – 90 degrees. An acceptable current threshold is from 0.5 to 5% of class current. This diagnostic may indicate problems such as poor load power factor conditions, poor system conditions, or malfunctioning system equipment.

Further, during implementation of the proposed AMI system (and consistent with current meter exchange practices), meter deployment personnel will inspect the meter bases to observe indications of problematic service. Any potential issues discovered will be reported by the AMI system to FortisBC for appropriate action.

27.1.1 Will the AMI meter report faulty meter bases since it can detect a variety of other electrical conditions?

Response:

Itron OpenWay meters are capable of reporting temperature conditions from the meter over the network. Itron is currently making necessary enhancements to the HES to receive temperature data from the meter. If overheating is detected, the system will be able to remotely disconnect the meter and service. FortisBC expects this functionality to be enabled (at no additional cost) prior to meter deployment.

27.1.2 Would FortisBC consider changing its point of interconnection to the load side terminals of the meter base? If not, please explain why not.

Response:

Section 3.1 (“Point of Delivery”) of the FortisBC Electric Tariff states:

> “Unless otherwise specifically agreed to, the Point of Delivery is the first point of connection of the Company’s facilities to the Customer’s conductors or equipment at a location designated by or satisfactory to the Company, **without regard to the location of the Company’s metering equipment**.” [Emphasis added]

Thus, the specific point of delivery/interconnection is not related to the meter location or its connections. For example, in cases of overhead residential services the conductors from the service mast are installed and maintained by the customer; however, in cases of underground services the service conductors are installed and maintained by the Company. In larger service installations (greater than 300 volts), a disconnecting switch is required ahead of the meter; this switch is installed and maintained by the customer. Thus in all three cases, the exact location where the utility service conductors connect to the customer equipment varies. In recognition of these ongoing requirements, FortisBC does not expect to change the point of interconnection specified in its Electric Tariff.

28.0 Reference: Project Description

Exhibit No. B-1, Tab 4.0, Section 4.1.1, pp. 44-45 and Appendix C-1, p. 39

Incentives

28.1 Provide the anticipated costs of the customer incentive per device.

<u>Response:</u>

Preliminary research indicated a price range of $80-$150 per In-Home Display (IHD) device. The approved 2012-13 DSM Plan includes a nominal $50 incentive or up to half the cost, of eligible IHDs. The net Customer Portion of Cost would be $40-$100 of the price range indicated above.

28.1.1 How long does FortisBC require savings at 5.4 percent of annual energy use to fully offset the customer incentive?

<u>Response:</u>

The Total Resource Cost Benefit/Cost (B/C) ratio of an IHD measure is calculated as 1.6, based on a unit cost of $150. The Utility Cost Test B/C ratio is 4.2, with a simple payback of one year on the $50 incentive paid to a customer.

The customer's payback on their net IHD cost of $100 (after $50 DSM incentive) is approximately 1.5 years, assuming the average usage per customer (UPC).

28.1.2 When will this feature be available to the ratepayer?

Response:

The IHD devices will be piloted in 2014, with availability to customers expected in 2015.

29.0 Reference: Project Description

Exhibit No. B-1, Tab 4.0, p. 40

AMI Project's High Level Milestones

29.1 Provide the percent complete of the AMI project that corresponds with each milestone.

Response:

Please see the table below, which is based on the implementation phases shown in the graphic on p.40 of Tab 4.0 of the Application (Exhibit B-1).

Table BCUC IR1 Q29.1 – Percentage Completion of Project

	3Q2013	4Q2013	1Q2014	2Q2014	3Q2014	4Q2014	1Q2015	2Q2015	3Q2015	4Q2015	Total
HES & MDMS Implementation											
Design BSR / TAD	5.0%	5.0%									10.0%
Backoffice Build		2.3%	2.3%	2.3%	2.3%	2.3%					11.5%
Customer Web Portal						0.2%	0.2%	0.2%	0.2%		0.7%
	5.0%	7.3%	2.3%	2.3%	2.3%	2.5%	0.2%	0.2%	0.2%		22.2%
Telecom Insallation											
WAN implementation				1.9%	1.9%	1.9%					5.7%
Router deployment			1.1%	1.1%	1.1%	1.1%	1.1%				5.3%
			1.1%	2.9%	2.9%	2.9%	1.1%				10.9%
Meter Installation											
Regional Deployment				10.6%	10.6%	10.6%	10.6%	10.6%	10.6%		63.4%
Acceptance Testing							0.9%	0.9%	0.9%	0.9%	3.5%
				10.6%	10.6%	10.6%	11.4%	11.4%	11.4%	0.9%	66.9%
Total	**5.0%**	**7.3%**	**3.4%**	**15.8%**	**15.8%**	**16.0%**	**12.7%**	**11.6%**	**11.6%**	**0.9%**	**100.0%**

29.2 Provide the next lower level of milestones with corresponding percentage complete and dates.

Response:

Please refer to the response to BCUC IR1 Q29.1 above.

30.0 Reference: Project Description

Exhibit B-1, Tab 4.0, section 4.1.1, p. 43;

HAN/IHD - Home-Area Network,

Risk of Picking 'HAN technology Winner'

FortisBC states on page 43 of the Application:

"One of the benefits of an AMI solution is the capability to allow customers to take a more active role in monitoring, controlling and moderating personal electric use. Customers can easily view the amount and timing of their electric use through the HAN and/or customer information portal. One of the requirements of the procurement process was that vendors be able to meet emerging industry standards for IHDs using the Zigbee communications protocol."

A New Zealand Electricity Commission (now Electricity Authority) 2009 paper titled "Advanced Metering Infrastructure in New Zealand: Roll-out and Requirements" states on pages 33 to 35:

"The inclusion of a HAN would result in costs being incurred that would be passed on to all consumers, regardless of whether consumers ever used the HAN interface. That cost would have to be met, even though consumers would have to wait a significant period, perhaps up to 10 years, before gaining access to that benefit.

HAN communication protocols and technologies are rapidly evolving. That increases the risk of HAN technology as we know it today becoming obsolete. The risk in requiring that AMI have a HAN interface now is that the HAN technology required by regulations may not prove to be the 'winning' technology. Even if New Zealand does select what turns out to be one of the most widely-adopted technologies, by the time it is able to be used by consumers it may not be the version of that technology that has been widely adopted. The consequence of an incorrect decision on HAN-interface protocols and HAN-technologies will be the additional cost associated with changing or upgrading the technology in the future. ...

An initial high-level analysis of the costs and benefits of including a HAN interface in AMI infrastructure compared with the costs and benefits of including a HAN interface in AMI infrastructure in five years, indicates that deferring the inclusion of the HAN interface to when HAN-enabled appliances are more common in New Zealand is preferable.

For those reasons, the Commission recommends that:

(a) as a minimum requirement, AMI should have the capability to support a HAN in the future;

(b) where a HAN interface is installed, the installation of the HAN interface should not impose costs on a consumer that are greater than the benefit that consumer receives from its operation; and

(c) the standards in the voluntary Guidelines are sufficient for the current AMI roll-out, and regulating the provision of HAN functionality in AMI installations is not required."

The same report also states in Appendix 5 (Home Area Networks and In-home Display), page 69:

"A number of HAN communication protocols/technologies are competing for prominence internationally, including for example, ZigBee, WiFi and low power WiFi, Bluetooth Low Energy, Z-Wave, IPv6LoWPAN, WirelessHART, Enocean, KNX, LonWorks, X10, ONE-NET and HomePlug. To date, none of these HAN communication protocols/technologies has established itself as the dominant technology internationally, although there does seem to be some preference in Australasia for the use of Zigbee.

Internationally Nokia is introducing a "Home Control Centre" system utilising cell phone and web based control of home appliances and Google Powermeter and Microsoft Hohm both offer internet based advanced meter products.

Australia provides an insight into the difficulty of picking a 'HAN technology winner'. The Victorian Auditor-General's Report titled Towards a smart grid, November 2009 notes at section 4.4 that the home interface portion of an AMI system is the least mature of the system components and that "it will take several more years for market direction to become clear.""

30.1 Is FortisBC proposing the advanced meters include HAN, or only that they have the capability to support HAN in the future? Please explain why or why not.

Response:

FortisBC is proposing that the advanced meters include HAN functionality at implementation. This functionality is important in order to give customers near real-time access to consumption information through in-home displays and simplifies the implementation of conservation rates such as CPP and pre-pay. Please see the Application (Exhibit B-1) at Tab 4.0, Section 4.1.1.

30.1.1 Please provide the cost difference between (i) inclusion of HAN in the advanced meters and (ii) inclusion of the capability to support a HAN interface in the future (which may not be Zigbee).

Response:

FortisBC's proposed AMI meters include the HAN interface on the meter register board, and thus the interface is not optional, and comes equipped from the factory with each meter. Please also refer to the response to BCUC IR1 Q30.2.

30.2 Please describe the alternative HAN communication protocols/technologies FortisBC considered, and why Zigbee was selected.

Please include in your response a description of the following alternatives, and an explanation of why they were not selected: WiFi and low power WiFi, Bluetooth Low Energy, Z-Wave, IPv6LoWPAN, WirelessHART, Enocean, KNX, LonWorks, X10, ONE-NET, HomePlug, Nokia Home Control Centre system utilizing cell phone and web-based control of home appliances, Google Powermeter and Microsoft Hohm.

Response:

Zigbee has a dominant market share in North America, and is currently the only standards-based protocol (Smart Energy Profile) offered by the major AMI vendors. None of the alternative protocols listed in this question are available in Measurement Canada-certified meters. As well, the Zigbee protocol was chosen by BC Hydro and FortisBC believes it is in the provincial interest that home automation devices capable of connecting to electric meters in BC use the same protocol.

30.2.1 Does FortisBC consider that specifying the use of Zigbee could result in 'picking winners' and so potentially negatively impact innovation over the longer term? Please explain why or why not.

Response:

If another HAN technology/protocol becomes dominant in home automation, FortisBC expects the market to respond with protocol-bridging gateway devices capable of interfacing Zigbee to other protocols. These gateway devices already exist, for example devices that can interface

ZigBee PRO, WiFi, 6LoWPAN and JenNet, plus an interface to an INSTEON and/or X10 networks as detailed at the following links:

http://simplehomenet.com/proddetail.asp?prod=Insteon_X10_ZigBee_JenNet_6LoWPAN_Gateway_Controller

http://www.energateinc.com/index.php?page=zip-connect).

As a result of the above, FortisBC does not believe its decision to implement Zigbee – the only home automation protocol available on Measurement Canada-certified meters – will have any impact on innovation over the longer term.

30.3 When does FortisBC consider that the majority of customers would use the HAN interface (for example within the next five years, five to ten years)? Please explain.

Response:

FortisBC has not forecast customer penetration of in-home displays beyond 30 percent (not a majority of customers), and has not forecast the use of other HAN devices. 30 percent penetration of IHDs is expected to occur between 2015 and 2020 (assuming BCUC approval of the AMI Project is received by July 20, 2013).

31.0 Reference: Project Description

Exhibit No. B-1, Tab 4.0, Section 4.1.2, pp. 45-46

Risk of Future Costs

31.1 As FortisBC states "there is no capital or recurring cost to use the spectrum," is there a risk of this changing in the future as the available bandwidth or channels fill up?

Response:

FortisBC sees negligible risk in this scenario occurring for two reasons:

1. Generally, new and existing applications in the 902-928 MHz band transmit intermittently and are narrowband signals. FortisBC anticipates that this trend will continue and the chosen technology is capable of co-existing with these and other users of the band.

2. FortisBC does not anticipate any significant increases in the bandwidth required to the field devices that the proposed AMI project will service, or an increase in the number of devices of sufficient quantity to render the chosen technology unsuitable within the planning horizon (20 years).

31.2 Explain the impact of AMI meters on the 900 MHz communication band.

Response:

FortisBC anticipates very minor impacts to the 900 MHz license exempt communications band in its service area due to a wireless mesh AMI deployment. This is a function of the very small amount of data each meter will need to transmit daily, and the expected poor propagation expected from meters located near ground level within significant clutter (houses and foliage).

A realistic estimate of the expected spectrum utilization in the most dense areas is near 0.3 percent, and even worst case assumptions, would yield use of no more than 3 percent of the available spectrum in the 902-928 MHz band.

31.2.1 Do AMI meters interfere with internet services in rural communities? [http://www.valleyvoice.ca/_pdf_2012/ValleyVoice120711web.pdf].

Response:

The AMI meter technology chosen by FortisBC operates in the 902-928 MHz license exempt band. The selected meter technology uses narrowband signals that hop to multiple different frequencies in the band. In addition, when the network is functioning as designed, meters only transmit for a very small fraction of time. The meter network will only use a very small fraction of the spectrum for a very short duration of time.

On the other hand, some technologies used to deliver broadband services are wideband, and require almost the entire 902-928 MHz spectrum when transmitting. Most of these technologies are designed to be unaffected by a narrowband signal such as those being transmitted by an AMI meter.

FortisBC acknowledges that even though the two technologies have been designed to co-exist, there are situations where small amounts of interference may be experienced by both parties. The amount of this interference depends greatly on a number of factors, but in the FortisBC service territory no appreciable amount of interference is expected.

FortisBC has modified its deployment plan and started a dialogue with local Wireless Internet Service Providers (WISPs) to further reduce any potential for service impacts.

31.2.2 Do AMI meters interfere with amateur radio transmission at or near the 900 MHz ranges? [http://www.ve3ncq.ca/wordpress/?page_id=10].

Response:

The AMI technology selected by FortisBC for AMI uses similar technology to most other devices in the 902-928 MHz band. All equipment in this band is designed with the potential to interfere with other devices in the band, and this interference is expected to occur. Consequently, there are mechanisms built into the technology to limit the probability of occurrence and any impact potential interference may have on other users. This is required for all primary users in this band, including FortisBC's AMI network.

Some amateur radio transmission equipment that is allocated as secondary use in this spectrum may not have these mechanisms to deal with interference built in and therefore could be subject to interference from AMI devices. Due to the very short duration and frequency of AMI transmissions, this interference would be minimal.

31.2.3 Would the use of PLC in these areas eliminate these issues on the 900 MHz band? If not, please explain why not.

Response:

The use of PLC in the areas where rural WISPs or amateur radio operators are operating in the 900-928 MHz band would likely eliminate the specific issues alluded to in the previous questions. However, as discussed in section 7.5 of the Application, PLC would not provide all the functionality FortisBC has specified, in addition to being significantly more expensive. Furthermore, though PLC may mitigate specific issues for the frequency band in question, it can potentially cause interference in other bands where the equipment is not capable of rejecting and minimizing it.

31.2.4 Where AMI meters operate on the 900 MHz band, does it interfere with the acceptable operational performance of any of the following devices: cordless phones, crib monitors, wireless headphones, patio speakers, remote controls, wireless microphones, security systems, motion detectors, garage door openers, remote car starters, wireless computer networks or any cordless electronic equipment?

Response:

The proposed AMI meter system should not interfere with the acceptable operational performance of any of the listed devices. Most of these technologies use a narrowband frequency hopping technology, and will co-exist with the proposed AMI system without issues. As discussed in response to BCUC IR1 Q31.2.2, devices in the 902-928 MHz band are designed to operate acceptably in the presence of interference from other devices in this band. Please see the response to BCUC IR1 Q31.2.1 for a discussion on the impact the proposed AMI system could potentially have on internet services in rural communities, which also is expected to be very minimal.

31.2.5 Provide a description of the 900 MHz band and the use of the 900 MHz band by AMI meters.

Response:

The 900 MHz band being referred to is the portion of the electro-magnetic spectrum between 900-928 MHz that has been allocated in many regions worldwide to license exempt devices. In Canada, the requirements for this band fall under Industry Canada's RSS-210, which outlines parameters that equipment and users in this band must adhere to.

The band is shared amongst multiple users, and regulators have taken a hands-off approach to resolving interference complaints. Based on this "sharing" philosophy, there is an inherent need for all users in the band to consider their impact on others when deploying equipment. The implication is that equipment deployed in the band should not rely on the exclusive use of this spectrum to operate acceptably, and should have technical mechanisms to avoid causing or receiving interference from others. The resource has been available for several years, and many innovative new technologies have been designed and/or implemented to allow multiple users to co-exist and make efficient use of the spectrum.

Please see the response to BCUC IR1 Q31.2 for a description of FortisBC's use of the 900-928 MHz frequency band.

31.2.6 Does Industry Canada require all equipment operating under RSS-210 to cause no interference to other users, including licence-exempt users?

Response:

FortisBC does not interpret RSS-210 to require all equipment operating under RSS-210 to cause no interference to other users, including license-exempt users. Instead, FortisBC interprets the term "no interference, no protection" to mean that under RSS-210, a user shall not interfere (with or without purpose), with a user on another radio service (licensed frequency), or purposefully interfere with another user in the same unlicensed frequency band. Additionally, users under RSS-210 cannot claim protection from interference caused to their systems by others.

Industry Canada document SP-896 MHz section 3.7 states:

> "Low power fixed and mobile communications systems may use the 902–928 MHz band on a licence-exempt basis provided they conform to all applicable Departmental requirements. Such systems will operate on low-power only and may not claim protection from radio interference nor cause interference to licensed primary users."

Specifically in reference to the 902-928 MHz band in question, the literal interpretation of the phrase "no interference, no protection" ignores the mathematical certainty that multiple devices randomly hopping in a finite bandwidth channel, will eventually hop to the same frequency. Interference is expected by unlicensed users in this frequency band.

31.2.6.1 Do AMI Meters comply with RSS-210 Annex 8.1.b which states ""The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals."? [http://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf01320.html].

Response:

Yes, the meter technology chosen for FortisBC's AMI network comply with Annex 8.1b of Industry Canada's RSS-210.

31.3 Are there bandwidth cost risks, similar to those occurring in the United States, where the communication costs for AMI may increase?

Response:

FortisBC assumes that the question is in reference to the possibility of assessing fees on electric utility smart networks for contribution to the Universal Service Fund (USF). The USF is a fund that has been set up in the United States to ensure that advanced telecommunications are generally available to facilities such as libraries, schools and health care offices. The fee is levied against intra-state telecommunications providers.

FortisBC would like to clarify that it does not see this as a bandwidth risk but as a cost risk.

At this time FortisBC sees negligible risk of its AMI network being levied a system fee in Canada for the following reasons:

- The purpose the USF fund was created for in the US is already covered under the mandate of Industry Canada; and
- The intended target of the levy in the US is telecommunications service providers. With respect to smart meter networks, utilities are not service providers, but end users.

31.3.1 If so, please explain.

Response:

Please refer to the response to BCUC IR1 Q31.3.

32.0 Reference: Project Description

Exhibit B-1, Tab 4.0, Sec. 4.1.3, pp. 46-49

Wide Area Network

Cost Effectiveness

"In remote areas where cellular coverage is not available, third party backhaul over satellite is also a possibility. Although this solution is generally more expensive than the other options noted above from both a capital and monthly perspective, it can be the most cost-effective in certain locations." (p.47)

32.1 Please provide an assessment of cost-effectiveness for the AMI over Satellite infrastructure option compared to the Status Quo for those remote areas.

Response:

The areas in the FortisBC service territory where satellite backhaul is being considered are the most rural and sparsely populated areas. Consequently, they are the furthest driving distance from populated centres and FortisBC offices and the most costly to manually read.

The following table outlines the estimated costs to read all the meters where satellite is proposed as the backhaul technology; both using AMI meters with satellite backhaul, and continuing with the current meters using the status quo manual meter reading process. For clarification, the cost is the present day value of the total cost over the 20 year project lifetime. The following 4 scenarios are defined:

1. AMI Preliminary Design – Cost to read each meter using an AMI system based on the number of satellite backhaul sites and resulting customer meters estimated during the preliminary design in 2011. This includes the purchase, installation, operations and maintenance of all customer meters and satellite infrastructure.

2. Status Quo Compared to Preliminary Design – Cost to read the same meters referenced in the AMI Preliminary Design, but instead of using an AMI system, the current meters are not replaced and continue to be read manually.

3. AMI Probable Design – Cost to read each meter using an AMI system based on the number of satellite backhaul sites and resulting customer meters expected when an AMI system is deployed. As discussed in IR 32.2, several sites originally designated as needing satellite backhaul will likely be in cellular coverage areas based on third party cellular provider plans in 2012 and 2013. The cost includes the purchase, installation, operations and maintenance of all customer meters and satellite infrastructure.

4. Status Quo Compared to Probable Design – Cost to read the same meters referenced in the AMI Probable Design, but instead of using an AMI system, the current meters are not replaced and continue to be read manually.

Scenario	Customer Meters	Satellite Stations	Lifecycle Cost* ($ per meter)
AMI Preliminary Design	6350	35	$440.64
Status Quo Compared to Preliminary Design	6350	0	$1,530.64
AMI Probable Design	2830	20	$495.57
Status Quo Compared to Probable Design	2830	0	$1,768.40

* the lifecycle cost is the net present value of the estimated cost to read a meter over the 20 year project timeline.

In both the case of the preliminary design having 35 satellite backhaul sites, and the expected system having 20 satellite backhaul sites, an AMI system is significantly more economical than a status quo manual meter reading process.

32.2 How many of the approximately 115,000 AMI meters to be installed would need to be connected by Satellite WAN to the Head End System?

Response:

Based on a preliminary design completed in 2011, approximately 6,350 meters connected to 35 collectors would require satellite backhaul. It should be noted that third party cellular providers have planned coverage enhancements in 2012 and 2013 that would provide backhaul for 15 of these 35 collector locations servicing approximately 3,520 meters. If all of the planned coverage enhancements are completed prior to the AMI rollout, satellite backhaul will be required for only 20 collectors servicing approximately 2,830 customer meters.

32.2.1 Is this a similar proportion, based on Figure 4.1.3.a, of slightly over one third (50 out of 136) of the collectors requiring Satellite WAN connections?

Response:

Please note that the actual number of satellite collector locations identified in the preliminary design based on Figure 4.1.3.a is 35. The 50 number references the cellular collectors needed.

Satellite connected collectors comprise approximately 26 percent of all collectors in the preliminary design. In comparison, only 5.5 percent of the total meters are being backhauled by these sites.

As noted in the response to BCUC IR1 Q32.2, planned cellular converge enhancements will likely significantly decrease the number of satellite collectors and the approximate number of customer meters served by these collectors. Realization of these planned enhancements by third party providers would push the proportion of satellite collector sites down to 15 percent and the total proportion of meters served by satellite to 3 percent.

32.2.2 Does the HES or MDMS system allow for manual and/or handheld-type data collection and entry methods?

Response:

The MDMS has the capability to accept both manually and handheld-collected data.

32.2.3 If not, why not?

Response:

Please see the response to BCUC IR1 Q32.2.2.

32.2.4 What barriers or show-stoppers would exist to prevent the deployment of digital AMI meters along with digital PLC and/or digital AMR meters?

Response:

FortisBC has not identified any technical or operational barriers or showstoppers that would preclude an installation using either PLC or AMR technology, and will continue to look at alternative LAN options such as these. However the cost of satellite backhaul bandwidth that would be avoided is not sufficiently high to make either option more economical than the proposed RF mesh system in locations with sufficient population. As discussed in section 4.1.3 of the Application, FortisBC is continuing to evaluate WAN options as technology changes, and both options have been and will continue to be considered in these areas.

33.0 Reference: Project Description

Exhibit B-1, Tab 4.0, Section 4.1.3

Exhibit B-1, Appendix C-4, BC Hydro SMI Business Case

Continued Manual Meter Reads

"It is also anticipated that a small number of AMI meters (less than 1 percent) will not have an economic WAN option available (based on the technologies described above) at the time of AMI deployment. FortisBC plans to manually download data from the meters at billing period intervals. The Company expects to obtain the same information made available through the WAN technologies discussed above, but at less frequent intervals. The costs of the manual meter download have been included in the overall Project cost. FortisBC will continue to evaluate the economics of WAN options with the intent of eventually providing WAN connections for all meters." [Ref: B-1, p. 49]

BC Hydro estimated the average cost to read the five per cent of customers that would continue to be manual reads would be three times higher than pre-Smart Meter costs.

[Ref: B-1, Appendix C-4, p. 27 of 44]

33.1 Please provide the estimated FortisBC costs to read the one percent of meters that will continue to be manually read, and compare that cost to the average unit cost of all FortisBC meter reads today.

Response:

Please see the tables below.

Table BCUC IR1 Q33.1a

Status Quo	2008	2009	2010	2011
Total Meter Reading (actual) Expenses	$ 2,144,730	$ 2,107,488	$ 2,232,238	$ 2,430,213
Total Status Quo Meter Reading (forecast) Expenses	2012	2013	2014	2015
	$ 2,473,957	$ 2,518,488	$ 2,684,354	$ 2,732,672
	2016	2017	2018	2019
	$ 2,781,860	$ 2,959,094	$ 3,012,357	$ 3,066,580
	2020	2021	2022	2023
	$ 3,255,929	$ 3,314,536	$ 3,374,197	$ 3,576,459
	2024	2025	2026	2027
	$ 3,640,835	$ 3,706,370	$ 3,922,391	$ 3,992,994
	2028	2029	2030	2031
	$ 4,064,868	$ 4,295,551	$ 4,372,871	$ 4,451,583
	2032			
	$ 4,697,886			
Total AMI Meter Reading (forecast) Expenses	2016	2017	2018	2019
	$ 237,728	$ 246,279	$ 255,079	$ 263,992
	2020	2021	2022	2023
	$ 273,154	$ 282,543	$ 292,121	$ 302,016
	2024	2025	2026	2027
	$ 312,131	$ 322,468	$ 333,031	$ 343,861
	2028	2029	2030	2031
	$ 354,944	$ 366,234	$ 382,172	$ 394,081
	2032			
	$ 406,261			

Table BCUC IR1 Q33.1b

	Status Quo			Post - AMI			Post - AMI		
	Cost ($000)	100% manual reads	Cost per Customer	Cost ($000)	1% manual reads	Cost per Customer	Cost ($000)	5% manual reads	Cost per Customer
2008	$2,145	109719	$19.55						
2009	$2,107	110853	$19.01						
2010	$2,232	112249	$19.89						
2011	$2,430	111407	$21.81						
2012	$2,474	114232	$21.66						
2013	$2,518	116484	$21.62						
2014	$2,684	118809	$22.59						
2015	$2,733	121135	$22.56						
2016	$2,782	123371	$22.55	$238	1234	$192.69	$792	6169	$128.46
2017	$2,959	125581	$23.56	$246	1256	$196.11	$821	6279	$130.74
2018	$3,012	127798	$23.57	$255	1278	$199.60	$850	6390	$133.06
2019	$3,067	130024	$23.58	$264	1300	$203.03	$880	6501	$135.36
2020	$3,256	132188	$24.63	$273	1322	$206.64	$911	6609	$137.76
2021	$3,315	134357	$24.67	$283	1344	$210.29	$942	6718	$140.20
2022	$3,374	136518	$24.72	$292	1365	$213.98	$974	6826	$142.65
2023	$3,576	138650	$25.79	$302	1387	$217.83	$1,007	6933	$145.22
2024	$3,641	140812	$25.86	$312	1408	$221.67	$1,040	7041	$147.78
2025	$3,706	142955	$25.93	$322	1430	$225.57	$1,075	7148	$150.38
2026	$3,922	145078	$27.04	$333	1451	$229.55	$1,110	7254	$153.04
2027	$3,993	147181	$27.13	$344	1472	$233.63	$1,146	7359	$155.75
2028	$4,065	149280	$27.23	$355	1493	$237.77	$1,183	7464	$158.51
2029	$4,296	151367	$28.38	$366	1514	$241.95	$1,221	7568	$161.30
2030	$4,373	153420	$28.50	$382	1534	$249.10	$1,274	7671	$166.07
2031	$4,452	155448	$28.64	$394	1554	$253.51	$1,314	7772	$169.01
2032	$4,698	157481	$29.83	$406	1575	$257.97	$1,354	7874	$171.98

Annual cost per customer for manual meter reading prior to AMI implementation is approximately $23.

Post-AMI, manual meter reads for 1% of customers will be approximately $193 per customer per year. The growth in cost per customer is directly related to the fact that average travel time between reads will increase substantially from the current state.

For a more direct comparison to the BC Hydro numbers cited in the preamble, FortisBC has also included the estimated manual meter reads costs for 5% of customers. FortisBC expects the cost to be approximately 5.7 times higher compared to pre-AMI costs. This ratio may be higher than BC Hydro's due to lower customer density in the FortisBC service territory.

33.2 Please explain where these costs are included in the financial analysis spreadsheet. If they are included in a specific line item, please separate out this cost on an annual basis.

Response:

The post-AMI meter reading costs are noted starting in 2016 on line 47 (Meter Reading) on the "Gross AMI" sheet which is part of the spreadsheet in Exhibit B-3.

For further detail, please see the response to BCUC IR1 Q33.1

34.0 Reference: Project Description

Exhibit No. B-1, Tab 4.0, Section 4.1.4, pp. 49-50

Main Applications

34.1 What additional resources: hardware, software, building space, equipment and staff, will be required to implement this collection engine application?

Response:

The AMI system incorporates 18 VMS and 8 physical servers. Hardware will be supported with the current facility infrastructure and FortisBC anticipates using existing building space to house hardware and additional resources including equipment and staff. No additional hardware and software is anticipated to be required other than that already included in the project costs.

34.2 What additional resources: hardware, software, building space, equipment and staff, will be required to implement this reporting system application?

Response:

Please see the response to BCUC IR1 Q34.1.

34.3 What additional resources: hardware, software, building space, equipment and staff, will be required to implement this network management system application?

Response:

Please see response to BCUC IR1 Q34.1.

34.4 Are the costs of any of the additional resources required to support the “Main Applications” included in the CPCN Application estimate? Please explain.

Response:

Yes. Starting in 2014, forecast resources required to support the main applications are covered as part of the New Operating Costs identified on Line 46 of the Gross AMI worksheet submitted as part of Exhibit B-3.

35.0 Reference: Project Description

Exhibit No. B-1, Tab 4.0, Section 4.1.5, pp. 50-51

Data Historian

35.1 As the MDMS is a software application that maintains storage of the high volumes of data being sent from the meters in the AMI system, please explain the storage capability of the MDMS system including the duration of archiving capabilities.

Response:

The MDMS is designed to store data from 150,000 AMI metering endpoints. Three years of data will be available for immediate retrieval and four additional years will be archived. For the solution, FortisBC has estimated and accounted for 1.5TB per year of storage.

35.2 What additional resources: hardware, software, building space, equipment and staff, will be required to implement the MDMS application?

Response:

Please refer to the response to BCUC IR1 Q34.1.

35.3 Explain the security provided to protect the data.

Response:

The MDMS application is protected behind firewalls within the FortisBC corporate network. Data transmission uses SSL 128bit encryption for all communications.

Role-based security will be used which will ensure only authenticated users have access to the system. Additionally, users will be assigned to roles or security groups that will limit the functions they can perform or data they are authorized to view.

Versioning of data will also be maintained within the MDMS and audit logs kept in order to have the ability to identify changes that have been made, by which user and why.

35.4 Explain the algorithms used in the VEE process and why the backfilling of missing data is required.

Response:

Despite the robust communications network that would be established as part of the proposed AMI deployment, the transmission of some hourly data will inevitably be delayed and some data may be faulty. Validation routines flag potentially faulty data. In instances of incomplete data, estimating algorithms attempt to fill in the missing data. If automated algorithms fail, the VEE process allows for manual editing of the hourly data.

Using validation, estimation and editing (VEE), the data is quickly and accurately verified and if needed, amended, making it available for billing, operational and other uses by the utility.

Backfilling of missing data may be required:

- To ensure that clean and complete data can be delivered to utility systems;
- To ensure the data quality of assets (for example, by using the Message Sum Check algorithm to compare the sum of the intervals to the difference in register reads);
- To ensure complete data for Web presentment to customers; and
- To ensure that billing can proceed accurately.

A Message Sum Check algorithm is a critical process in the effort to provide data for billing processes that meet the needs for verification and reconciliation. Upon the receipt of the AMI

Register Reads and Interval data, the algorithm confirms that the sum of the intervals matches the register read delta for the same time period.

The Validation, Editing, and Estimation (VEE) engine within the MDM validates energy consumption according to a utility's data quality requirements and provides estimates for the inevitable missing and incorrect data that comes from meter data collection systems. The VEE engine continuously reviews and repairs problematic data. VEE fills in gaps, flags where corrections have been made, and triggers manual review where the data cannot be repaired using standardized logic.

The MDM's standard validation rules are included in validation sets. These rules use custom logic built into the MDM and will allow FortisBC to set some of the parameters needed to run the rules. An example parameter-based rule is one that checks for a high limit. For this rule, FortisBC would specify the high-end thresholds for the specific limit to check.

Some examples of validation rules include:

- Gap Check;
- Historical Max Usage Percentage Difference;
- Interval Tolerance Check;
- Load Factor High & Low Limits;
- Max & Min Zero Intervals;
- Spike Tolerance Percentage Difference;
- Overflow Check;
- Register High Limit;
- Register Low Limit;
- Rollover Check;
- Usage On Inactive Meter; and
- Zero Usage On Active Meter

35.5 Provide the additional cost of including aggregation and calculation of usage data for complex rate structures such as tier rates, TOU, CPP, and other conservation rates.

Response:

All costs related to the ability to aggregate and calculate usage data for complex rate structures are included in the CPCN Application estimate. For incremental costs related to implementing future conservation rate structures, please refer to the Application (Exhibit B-1), section 6.5, page 104.

35.5.1 Are the additional cost of including aggregation and calculation of usage data for complex rate structures such as tier rates, TOU, CPP, and other conservation rates included in the CPCN Application estimate?

Response:

Please refer to the response to BCUC IR1 Q35.5.

35.6 Provide the additional cost for supporting gas and/or water meter data streams.

Response:

There are no additional costs for supporting gas and/or water meter data streams.

36.0 Reference: Project Description

Exhibit No. B-1, Tab 4.0, Section 4.2.1, p. 53

Competitive Request For Proposal (RFP)

36.1 Why is Itron competitively tendering a RFP for meter deployment and not FortisBC?

Response:

FortisBC believes there is benefit to having the meter deployment and the meter supply contracts with the same vendor. This reduces the risk and project management effort for

FortisBC since it does not have liability for late shipments and does not have to coordinate the ordering, storage and deployment of the meters.

36.1.1 Who is responsible for meter deployment – Itron or FortisBC?

Response:

Itron is responsible meter deployment. Please also see the response to BCUC IR1 Q36.1.

36.1.2 Is there a risk of discriminatory behavior if Itron is responsible for the RFP? Please explain.

Response:

FortisBC has embedded in its contract with Itron that Itron shall submit all proposed forms of procurement documents, including forms of subcontract, to FortisBC for review. Itron is required to ensure that all competitive procurement process(es) give preference to unionized contractors whose unions are recognized by the British Columbia Federation of Labour and provide meaningful First Nations employment opportunities in connection with work to be performed on First Nations territories. FortisBC has oversight on Itron's final selection of a deployment subcontractor. As such, the risk of discrimination is minimized or avoided.

36.2 What insurance and guarantees are included in the meter deployment RFP?

Response:

Itron will determine the insurance and guarantees it requires from the deployment subcontractor in the meter deployment RFP. FortisBC has direct influence over the deployment RFP as described in the response to BCUC IR1 Q36.1.2. FortisBC ensures overall Itron performance with respect to scope, schedule, cost and quality (including deployment) as part of the Itron contract.

37.0 Reference: Project Description

Exhibit No. B-1, Tab 4.0, Section 4.2.1, p. 53

Itron

37.1 From Exhibit A2-4, it appears the value of the Itron RFP is $21 million. Please provide a listing of all planned procurement contracts, their dates, and amounts. If the contract amounts must be kept confidential, then file the response under a confidential cover.

Response:

FortisBC has one procurement contract for the proposed AMI project, with Itron, dated March, 19, 2012 for approximately $21 million.

38.0 Reference: Project Description

Exhibit B-1, Tab 4.0, Sec. 4.2.1, pp. 53-54

Procurement Process

38.1 Why did the RFP Requirements include the ability to provide meter reading service for other utilities within the same service area?

Response:

FortisBC applied the collaboration objectives outlined in Section 8.2.2 when considering adjacent utilities:

- Consistent advanced metering benefits available to customers throughout the province;
- Lowest possible cost;
- Minimized duplicate assets;
- Meet individual utility needs and objectives; and
- Consistent provincial reporting available from utilities.

These objectives resulted in additional RFP requirements (none of which would exclude a vendor if not met):

a) Back office software ability to scale for higher data throughput (i.e. from more than simply FortisBC's AMI meters) without degrading performance (consistent advanced metering benefits, consistent provincial reporting);

b) Communications network's scalability to build out into additional, non-FortisBC, service areas, with no degradation in service (consistent advanced metering benefits, consistent provincial reporting); and

c) Communication network devices able to collect data and segregate data from multiple utility meters (minimize duplicate assets).

By including the ability to provide meter reading services for adjacent utilities within the RFP process, FortisBC ensured it could evaluate the proposals received against the collaboration objectives.

38.1.1 Did this requirement limit any of the technical offers or increase the proposal costs?

Response:

All vendors offered a solution that could read different commodities (water, gas and electricity) from other utilities. This capability did not increase costs as any additional meters, network devices or IT interface costs required to extend AMI to other utilities are paid for by those utilities.

38.2 FortisBC states that the RFP did not specify the type of meter-to-collector communications technology, and that all proposals received included RF communications technology. Would the specifications in the RFP prepared by FortisBC for such things as WAN specification, AMI communication standards, collector specifications, etc., have in any way limited or constrained vendors to only offer RF communications meters?

Response:

Although FortisBC cannot say with certainty that the requirements did not eliminate non-RF communication technologies from being proposed, the Company is confident that the requirements in the RFP were reasonable, prudent and did not needlessly restrict vendor proposals. For example, FortisBC required that proposals should support hourly consumption reads to ensure that time-based rates could be supported. Although older PLC technologies might be challenged to meet this requirement, FortisBC understands that wired technologies exist that are perfectly capable of meeting the requirement.

38.3 Given the experience and selection of Fortis Alberta to use PLC communications for its program, why did FortisBC not specifically request proposals for alternative communications technology such as PLC in the RFP?

Response:

FortisBC did not specify any particular type of communications technology based on the experience of other Fortis Inc. companies (or any other utilities), including FortisAlberta (which uses PLC) and FortisOntario (which uses RF). This decision was made for two main reasons:

1. AMI communications technologies are continuously evolving, so it was prudent to test the market with business requirements, not technology requirements; and
2. FortisBC AMI requirements are unique to its operating environment.

39.0 Reference: Project Description

Exhibit B-1, Tab 4.0, Sec. 4.2.2, p. 56

Procurement Process

Meter Disposal

"Meter disposal is included in the Itron-managed deployment activities."

39.1 What incentive does Itron have to re-use or recycle the removed meters?

Response:

Itron is required to be solely responsible for the care, custody and control of all removed meters from time of removal, through transport for final disposal at a disposal facility. Throughout, the meters are to be handled in accordance with all laws, including hazardous waste and transportation laws applicable in British Columbia and in each jurisdiction through which the meters are transported.

Itron has no incentive to re-use removed electromechanical meters as they are considered obsolete and will be salvaged for scrap value. Itron is required to apply any potential value from the digital meters against the cost of recycling/disposing of the meters.

39.2 What is the cost of meter disposal?

Response:

The cost of meter disposal is included in the meter deployment cost estimate, and is assumed to be offset entirely by the scrap value of the meter.

40.0 Reference: Project Description

Exhibit No. B-1, Tab 4.0, Section 4.3, p. 56

Project Plan and Deliverables

40.1 Provide a complete copy of the Project Plan and its deliverables.

Response:

Working collaboratively with Itron, FortisBC has created a preliminary project plan that breaks out the phases described in Table 4.3.1a (page 57 of the Application) into the detailed schedule of activities from which to base the AMI CPCN proposal. The preliminary project plan is necessary in order to most accurately estimate resource requirements throughout the proposed implementation schedule.

It must be noted that finalization of the project plan is dependent upon the receipt of a positive decision from the BCUC, and will not take place until the initial Define/Design Phase of project implementation. Thereafter the project plan will be subject to change as the implementation proceeds.

The preliminary project plan is provided as Attachment BCUC IR1 40.1.

Attachment BCUC IR1 40.1

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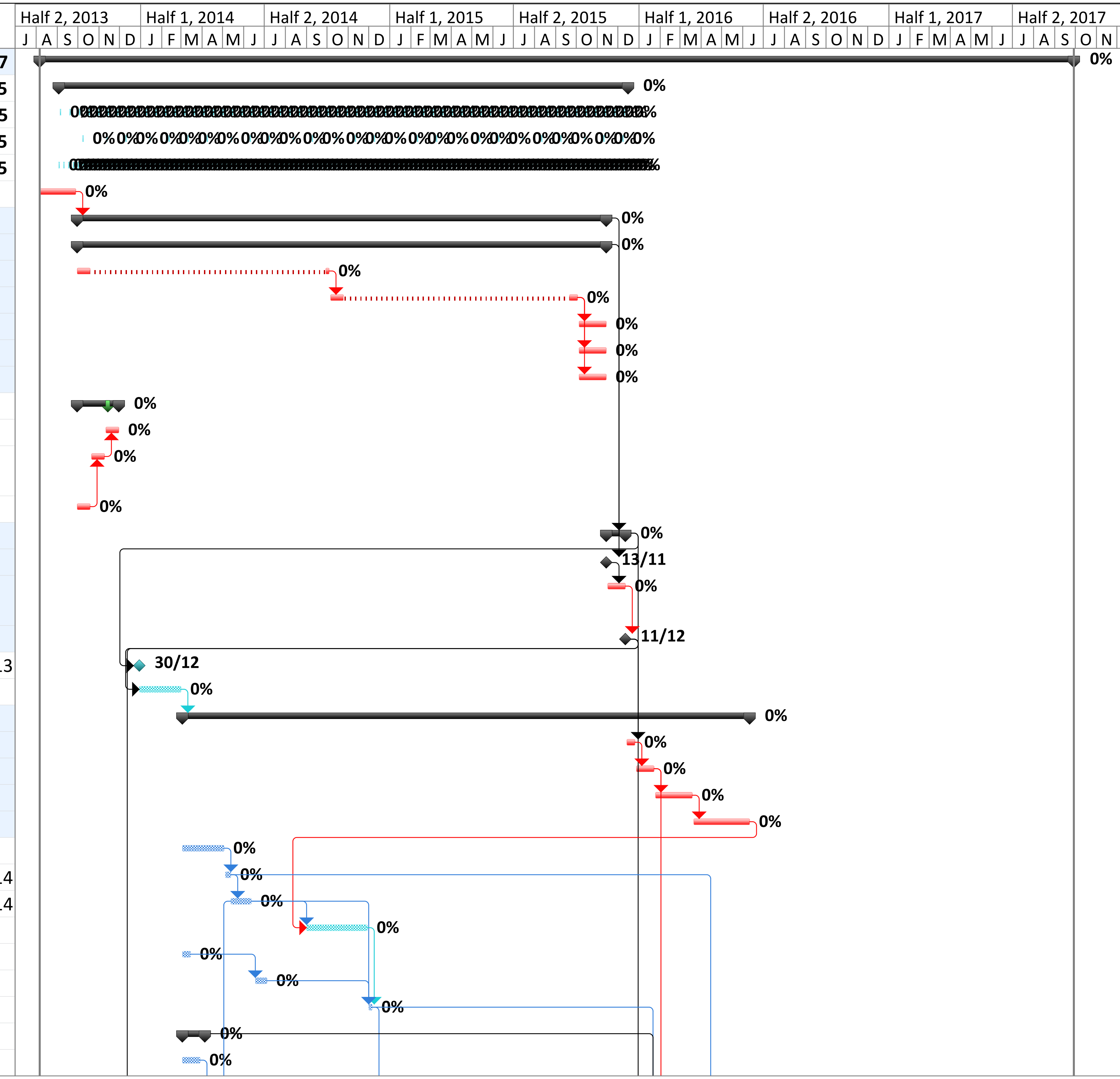
ID	Task Name	Duration	Start	Finish
1	**AMI Project Implementation**	**1083 days**	**Tue 06/08/13**	**Thu 28/09/17**
2	**Management Support**	**596 days**	**Tue 03/09/13**	**Tue 15/12/15**
3	**Sponsor Meeting**	**591 days**	**Thu 05/09/13**	**Thu 10/12/15**
64	**Steering Team Report**	**566 days**	**Tue 08/10/13**	**Tue 08/12/15**
92	**Project Team Meeting**	**596 days**	**Tue 03/09/13**	**Tue 15/12/15**
213	Project RampUP Prep	39 days	Tue 06/08/13	Fri 27/09/13
214	**Project Planning**	**555 days**	**Mon 30/09/13**	**Fri 13/11/15**
215	**Design: BSR/TAD**	**555 days**	**Mon 30/09/13**	**Fri 13/11/15**
216	Solutions Capability Training>	20 days	Mon 30/09/13	Fri 03/10/14
217	Solution Requirements Workshops & Document	25 days	Mon 06/10/14	Fri 02/10/15
218	Data Integration Design	30 days	Mon 05/10/15	Fri 13/11/15
219	System Architecture, Environments & Design	30 days	Mon 05/10/15	Fri 13/11/15
220	Test Plan Design	30 days	Mon 05/10/15	Fri 13/11/15
221	**Design: Project Plan**	**45 days**	**Mon 30/09/13**	**Fri 29/11/13**
222	WAN Design	15 days	Mon 11/11/13	Fri 29/11/13
223	RF Network Deployment Design	15 days	Mon 21/10/13	Fri 08/11/13
224	Meter Deployment Design	15 days	Mon 30/09/13	Fri 18/10/13
225	**Itron Prof Services // Notice to Proceed**	**20 days**	**Fri 13/11/15**	**Fri 11/12/15**
226	BSR/TAD: Itron quote on Prof Services	0 days	Fri 13/11/15	Fri 13/11/15
227	FortisBC review/acceptance of Itron's Prof Services quote	20 days	Mon 16/11/15	Fri 11/12/15
228	Notice to Proceed	0 days	Fri 11/12/15	Fri 11/12/15
229	Finalization of detailed project plan	0 days	Mon 30/12/13	Mon 30/12/13
230	procure/install new system server hardware	45 days	Mon 30/12/13	Fri 28/02/14
231	**BackOffice Build**	**595 days**	**Mon 03/03/14**	**Fri 10/06/16**
232	Install Hardware and Prepare Environments	10 days	Mon 14/12/15	Fri 25/12/15
233	Install & Configure Software	20 days	Mon 28/12/15	Fri 22/01/16
234	Product Configuration Design Document	40 days	Mon 25/01/16	Fri 18/03/16
235	Interfaces & Integration	60 days	Mon 21/03/16	Fri 10/06/16
236	FortisBC Test Case Design	45 days	Mon 03/03/14	Fri 02/05/14
237	Pre-FortisBC testing Training	6 days	Mon 05/05/14	Mon 12/05/14
238	Functional Testing	22 days	Tue 13/05/14	Wed 11/06/14
239	Integration Testing	65 days	Mon 01/09/14	Fri 28/11/14
240	Support Service Transition Planning	10 days	Mon 03/03/14	Fri 14/03/14
241	FortisBC Support Service Training	13 days	Wed 18/06/14	Fri 04/07/14
242	Production Cutover	5 days	Mon 01/12/14	Fri 05/12/14
243	**Field Deployment Manager**	**25 days**	**Mon 03/03/14**	**Fri 04/04/14**
244	Install and Configure	20 days	Mon 03/03/14	Fri 28/03/14



Critical		Split		Finish-only		Baseline Milestone		Manual Summary		Inactive Task	
Critical Split		Task Progress		Duration-only		Milestone		Project Summary		Inactive Milestone	
Critical Progress		Manual Task		Baseline		Summary Progress		External Tasks		Inactive Summary	
Task		Start-only		Baseline Split		Summary		External Milestone		Deadline	

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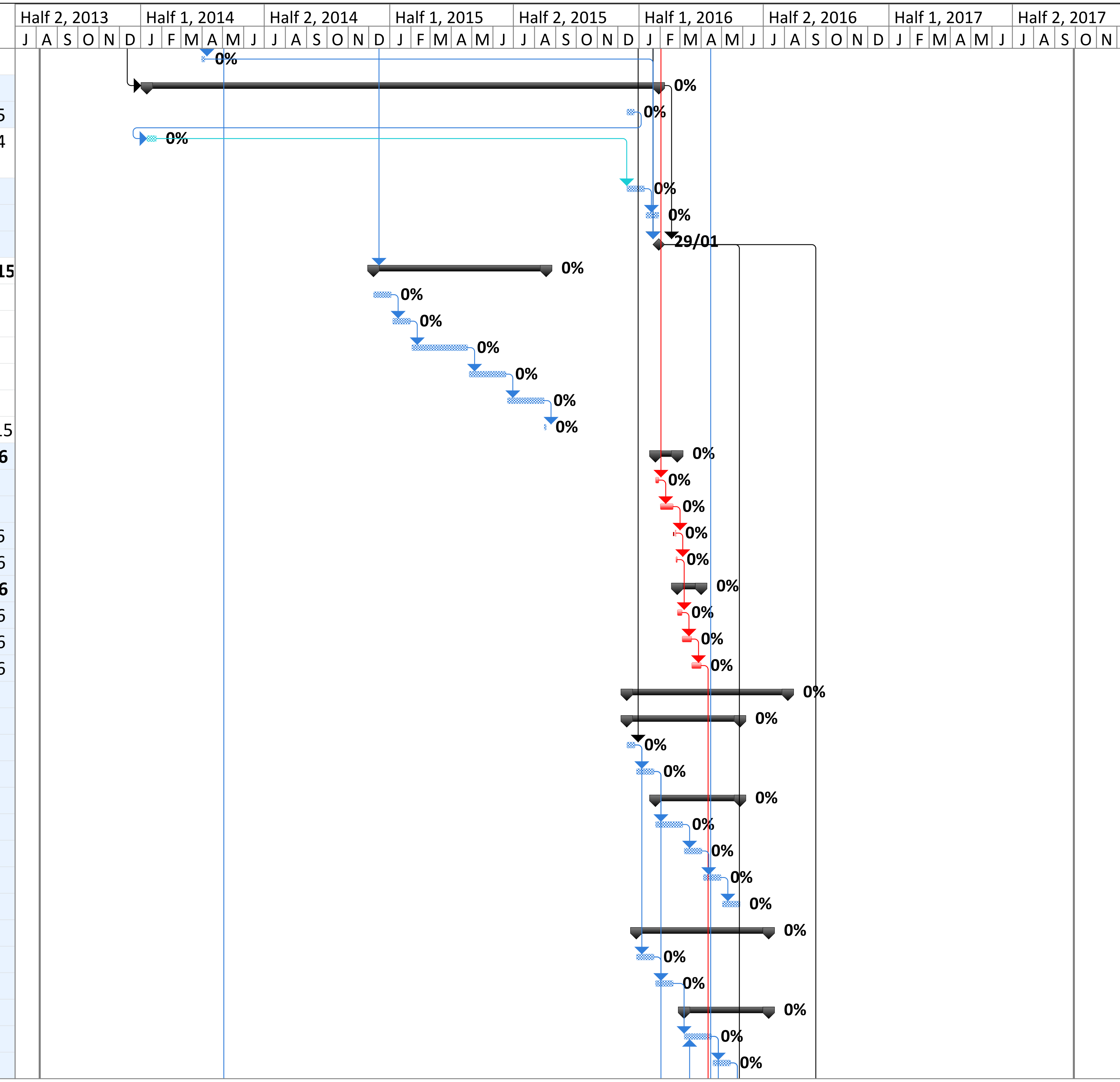
ID	Task Name	Duration	Start	Finish
245	Test	5 days	Mon 31/03/14	Fri 04/04/14
246	**Meter Deployment Subcontractor**	**536 days**	**Fri 10/01/14**	**Fri 29/01/16**
247	Prepare RFP for Meter Deployment Subcontractor	9 days	Mon 14/12/15	Thu 24/12/15
248	FortisBC to review Itron's proposed Meter Deployment RFP	10 days	Fri 10/01/14	Thu 23/01/14
249	RFP for Meter Deployment Subcontractor	20 days	Mon 14/12/15	Fri 08/01/16
250	Select Meter Deployment Subcontractor	15 days	Mon 11/01/16	Fri 29/01/16
251	Back Office Go-Live	0 days	Fri 29/01/16	Fri 29/01/16
252	**Customer Web Portal**	**181 days**	**Mon 08/12/14**	**Mon 17/08/15**
253	Request for Proposals	20 days	Mon 08/12/14	Fri 02/01/15
254	Select Vendor	20 days	Mon 05/01/15	Fri 30/01/15
255	Design	60 days	Mon 02/02/15	Fri 24/04/15
256	Integrate	40 days	Mon 27/04/15	Fri 19/06/15
257	Test	40 days	Mon 22/06/15	Fri 14/08/15
258	Customer Web Portal Go-Live	1 day	Fri 14/08/15	Mon 17/08/15
259	**First Article**	**24 days**	**Mon 25/01/16**	**Thu 25/02/16**
260	Build First Article Configuations	5 days	Mon 25/01/16	Fri 29/01/16
261	Manufacture and Validate First Article Meters	15 days	Mon 01/02/16	Fri 19/02/16
262	Factory Process Review	1 day	Fri 19/02/16	Tue 23/02/16
263	First Article Review/Acceptance	2 days	Tue 23/02/16	Thu 25/02/16
264	**Order Meters**	**25 days**	**Fri 26/02/16**	**Thu 31/03/16**
265	Order Production Meters	5 days	Fri 26/02/16	Thu 03/03/16
266	Manufacture Production Meters	10 days	Fri 04/03/16	Thu 17/03/16
267	Ship Production Meters	10 days	Fri 18/03/16	Thu 31/03/16
268	**Network Deployment**	**170 days**	**Mon 14/12/15**	**Fri 05/08/16**
269	**Site Surveys**	**120 days**	**Mon 14/12/15**	**Fri 27/05/16**
270	1000 Meter Test Site Surveys	10 days	Mon 14/12/15	Fri 25/12/15
271	Region 1 Site Surveys	20 days	Mon 28/12/15	Fri 22/01/16
272	**Other Regions Site Surveys**	**90 days**	**Mon 25/01/16**	**Fri 27/05/16**
273	Region 2	30 days	Mon 25/01/16	Fri 04/03/16
274	Region 3	20 days	Mon 07/03/16	Fri 01/04/16
275	Region 4	20 days	Mon 04/04/16	Fri 29/04/16
276	Region 5	20 days	Mon 02/05/16	Fri 27/05/16
277	**Make-ready work**	**140 days**	**Mon 28/12/15**	**Fri 08/07/16**
278	1000 Meter Test Make-ready work	20 days	Mon 28/12/15	Fri 22/01/16
279	Region 1 Make-ready	20 days	Mon 25/01/16	Fri 19/02/16
280	**Other Regions Make-ready work**	**90 days**	**Mon 07/03/16**	**Fri 08/07/16**
281	Region 2	30 days	Mon 07/03/16	Fri 15/04/16
282	Region 3	20 days	Mon 18/04/16	Fri 13/05/16



Critical	Split	Finish-only	Baseline Milestone	Manual Summary	Inactive Task
Critical Split	Task Progress	Duration-only	Milestone	Project Summary	Inactive Milestone
Critical Progress	Manual Task	Baseline	Summary Progress	External Tasks	Inactive Summary
Task	Start-only	Baseline Split	Summary	External Milestone	Deadline

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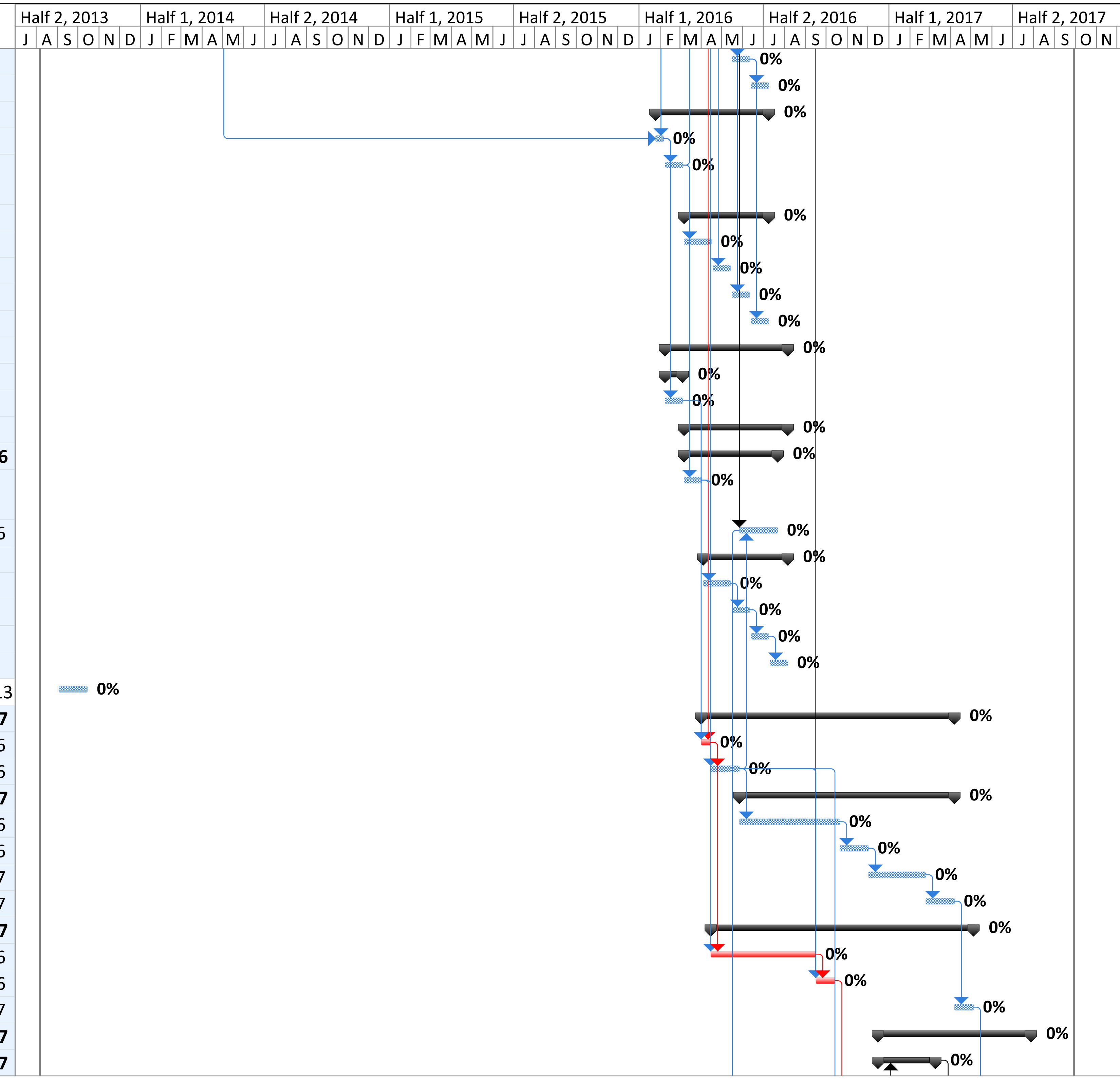
ID		Task Name	Duration	Start	Finish
283		Region 4	20 days	Mon 16/05/16	Fri 10/06/16
284		Region 5	20 days	Mon 13/06/16	Fri 08/07/16
285		**WAN implementation**	**120 days**	**Mon 25/01/16**	**Fri 08/07/16**
286		1000 Meter Test WAN implementation	10 days	Mon 25/01/16	Fri 05/02/16
287		Region 1 WAN implementation	20 days	Mon 08/02/16	Fri 04/03/16
288		**Other Regions WAN implementation**	**90 days**	**Mon 07/03/16**	**Fri 08/07/16**
289		Region 2	30 days	Mon 07/03/16	Fri 15/04/16
290		Region 3	20 days	Mon 18/04/16	Fri 13/05/16
291		Region 4	20 days	Mon 16/05/16	Fri 10/06/16
292		Region 5	20 days	Mon 13/06/16	Fri 08/07/16
293		**Network Deployment**	**130 days**	**Mon 08/02/16**	**Fri 05/08/16**
294		**1000 Meter Test**	**20 days**	**Mon 08/02/16**	**Fri 04/03/16**
295		1000 Meter Test Network Deployment	20 days	Mon 08/02/16	Fri 04/03/16
296		**Regional Network Deployment**	**110 days**	**Mon 07/03/16**	**Fri 05/08/16**
297		**Region 1**	**99 days**	**Mon 07/03/16**	**Thu 21/07/16**
298		Region 1 Network Deployment	20 days	Mon 07/03/16	Fri 01/04/16
299		Region 1 optimization	40 days	Fri 27/05/16	Thu 21/07/16
300		**Other Regions Network Deployment**	**90 days**	**Mon 04/04/16**	**Fri 05/08/16**
301		Region 2	30 days	Mon 04/04/16	Fri 13/05/16
302		Region 3	20 days	Mon 16/05/16	Fri 10/06/16
303		Region 4	20 days	Mon 13/06/16	Fri 08/07/16
304		Region 5	20 days	Mon 11/07/16	Fri 05/08/16
305		RF System optimization	30 days	Tue 03/09/13	Mon 14/10/13
306		**Meter Deployment**	**265 days**	**Fri 01/04/16**	**Thu 06/04/17**
307		1000 Meter Test Meter Deployment	10 days	Fri 01/04/16	Thu 14/04/16
308		Region 1	30 days	Fri 15/04/16	Thu 26/05/16
309		**Other Regions Meter Deployment**	**225 days**	**Fri 27/05/16**	**Thu 06/04/17**
310		Region 2	105 days	Fri 27/05/16	Thu 20/10/16
311		Region 3	30 days	Fri 21/10/16	Thu 01/12/16
312		Region 4	60 days	Fri 02/12/16	Thu 23/02/17
313		Region 5	30 days	Fri 24/02/17	Thu 06/04/17
314		**Backoffice Testing**	**275 days**	**Fri 15/04/16**	**Thu 04/05/17**
315		1000 Meter Backoffice Test	110 days	Fri 15/04/16	Thu 15/09/16
316		Region 1 (Trail, Fruitvale, Salmo) Backoffice test	20 days	Fri 16/09/16	Thu 13/10/16
317		RF System Backoffice test	20 days	Fri 07/04/17	Thu 04/05/17
318		**1.5% Network**	**160 days**	**Fri 16/12/16**	**Thu 27/07/17**
319		**1.5% Network Proposal**	**60 days**	**Fri 16/12/16**	**Thu 09/03/17**



Critical		Split		Finish-only		Baseline Milestone		Manual Summary		Inactive Task	
Critical Split		Task Progress		Duration-only		Milestone		Project Summary		Inactive Milestone	
Critical Progress		Manual Task		Baseline		Summary Progress		External Tasks		Inactive Summary	
Task		Start-only		Baseline Split		Summary		External Milestone		Deadline	

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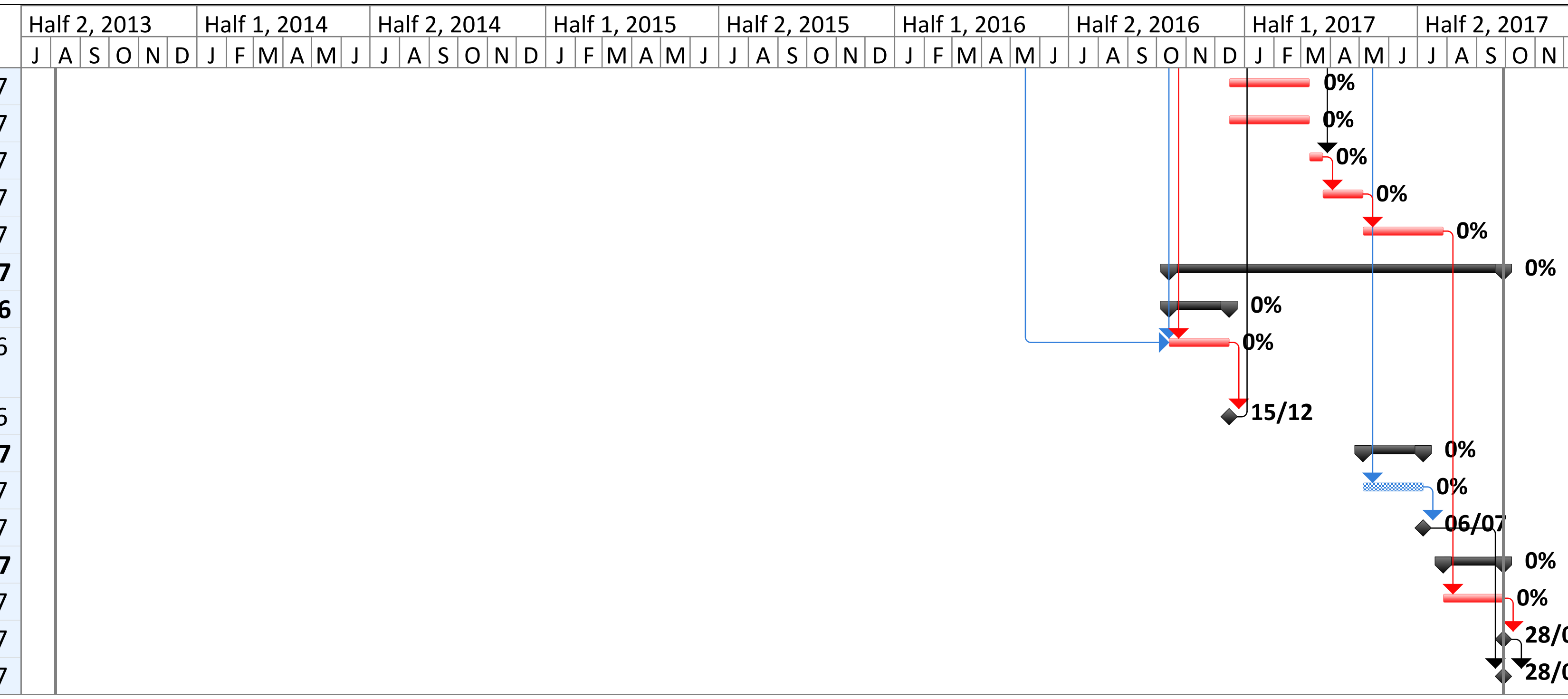
ID	Task Name	Duration	Start	Finish
320	1.5% Network site selection plan	60 days	Fri 16/12/16	Thu 09/03/17
321	1.5% Network Test Plan	60 days	Fri 16/12/16	Thu 09/03/17
322	Review/Approve 1.5% Network Proposal	10 days	Fri 10/03/17	Thu 23/03/17
323	Deploy 1.5% Network Meters and Network Devices	30 days	Fri 24/03/17	Thu 04/05/17
324	Integrate with AMI Solution	60 days	Fri 05/05/17	Thu 27/07/17
325	**Acceptance**	**250 days**	**Fri 14/10/16**	**Thu 28/09/17**
326	**Region 1**	**45 days**	**Fri 14/10/16**	**Thu 15/12/16**
327	Region 1 System Acceptance Testing (end-to-end)	45 days	Fri 14/10/16	Thu 15/12/16
328	Region 1 Acceptance	0 days	Thu 15/12/16	Thu 15/12/16
329	**RF System**	**45 days**	**Fri 05/05/17**	**Thu 06/07/17**
330	RF System Acceptance Testing	45 days	Fri 05/05/17	Thu 06/07/17
331	RF System Acceptance	0 days	Thu 06/07/17	Thu 06/07/17
332	**1.5% Network**	**45 days**	**Fri 28/07/17**	**Thu 28/09/17**
333	1.5% Network Acceptance Testing	45 days	Fri 28/07/17	Thu 28/09/17
334	1.5% Network Acceptance	0 days	Thu 28/09/17	Thu 28/09/17
335	AMI Solution	0 days	Thu 28/09/17	Thu 28/09/17



Critical		Split		Finish-only		Baseline Milestone		Manual Summary		Inactive Task	
Critical Split		Task Progress		Duration-only		Milestone		Project Summary		Inactive Milestone	
Critical Progress		Manual Task		Baseline		Summary Progress		External Tasks		Inactive Summary	
Task		Start-only		Baseline Split		Summary		External Milestone		Deadline	

40.2 Have all other necessary approvals been obtained?

Response:

Internal Company approvals necessary to move the AMI proposal to the CPCN stage have been obtained. Project implementation-related approvals will be finalized during the initial Define/Design Phase of project implementation. FortisBC is not aware at this time of any material external approvals (other than approval of the Application by the BCUC) required before proceeding with project implementation.

40.3 How does FortisBC propose to formally track AMI costs and and realize AMI benefits over the life of the project?

Response:

FortisBC proposes to track actual costs both by “type” and chronologically, against budgeted amounts, using a format similar to that provided below.

		2013	2014	2015	Total Costs
AMI Software / IT Development / Integration					
Total Budget =					
Total Contingency =					
Actual =					
	2012	2013	2014	2015	Total Costs
Meters & Deployment					
Total Budget =					
Total Contingency =					
Actual =					
	2012	2013	2014	2015	Total Costs
Communications Network					
Total Budget =					
Total Contingency =					
Actual =					
	2012	2013	2014	2015	Total Costs
Project Management					
Total Budget =					
Total Contingency =					
Actual =					
	2012	2013	2014	2015	Total Costs
Other Components					
Cap O/H =					
PST =					
AFUDC =					
Total =					
Actual =					

Benefits will be realized by actively managing and using the capabilities inherent in the proposed AMI system, and concurrently eliminating the resulting unnecessary existing costs. The proposed AMI project includes the requirement to create/change processes in all impacted facets of the Company in order to ensure that "active management" occurs. The Company's ability to realize the proposed benefits in a timely fashion is directly related to implementation of the proposed AMI system as recommended within the AMI CPCN Application.

Please refer to the response to BCUC IR1 Q56.3 for specific proposals to track benefits realization.

41.0 Reference: Project Description

Exhibit No. B-1, Tab 4.0, Section 4.3.1, p. 56

Project Phases

41.1 For each phase, provide the cost (direct and indirect) for each key activity identified in Table 4.3.1 – Project Phases.

Response:

From Table 4.3.1a, Define and Design are "concurrent action" phases happening in parallel; therefore they are costed as one in the table below. The project phases in Table 4.3.1a are all direct costs.

Phase	Total ($M)
Define/Design	$3.46
Build	$4.23
Deploy/Operate	$25.77
Transfer	$1.21

41.2 Provide the total cost for each phase.

Response:

Please see the response to BCUC IR1 Q41.1.

42.0 Reference: Project Costs and Benefits

Exhibit B-1, Tab 4.0, Table 4.3.1.a, p. 57;

Exhibit B-1, Tab 5.0, Table 5.1.a, p. 70;

Exhibit B-3, Tab “Gross AMI”, Line No. 35

Project Costs

According to Table 4.3.1.a, the final phase of the AMI project, the “Transfer” phase, is in Q4 2015.

Exhibit B-3, Tab “Gross AMI” Line No. 35 (Cumulative Construction Cost) identifies $49,530 thousand in estimated cumulative construction costs for the AMI project between 2013 and 2015.

Exhibit B-3, Tab “Gross AMI” Line No. 29 (Meter Growth and Replacement Costs) identifies $982 thousand in estimated meter growth and replacement costs for the AMI project between 2013 and 2015.

Exhibit B-3, Tab “Gross AMI” Line No. 32 (IT Hardware, Licensing and Support Costs) identifies $860 thousand in estimated costs for the AMI project between 2013 and 2015 and $12,767 thousand in estimated costs between 2013 and 2032.

Table 5.1.a identifies $47,689 thousand in estimated capital costs for the AMI project between 2013 and 2015, inclusive.

42.1 Please explain why the estimated meter growth and replacement and IT hardware, licensing and support costs of the AMI project between 2013 and 2015 are not included in the estimated capital costs in Table 5.1.a.

<u>Response:</u>

Meter growth and replacement, as well as IT hardware, licensing and support costs all represent normal sustaining capital expenditures required for the ongoing operation of the utility.

As the costs are “sustaining” in nature and will continue after the project is complete, FortisBC chose to keep these expenditures separate from the proposed AMI project capital costs on Line 27. The sustaining capital expenditures are still included in the overall AMI project financial analysis, so the overall NPV and rate impacts would not be affected if the sustaining capital expenditures were instead added to project capital expenditures.

42.2 Please separate the IT Hardware, Licensing and Support Costs per Exhibit B-3, Tab “Gross AMI” Line No. 32 into the following costs categories for each year between 2013 and 2032.

- IT Hardware
- Licensing
- Support Costs

Response:

A more descriptive separation of these sustaining capital costs would be: IT Support Costs; IT Licensing; and Equipment / Hardware / Servers. Line 32 is broken out as below.

	2013	2014	2015	2016	2017
IT Support Costs	$0.00	$ 64,986.53	$ 199,010.17	$ 202,592.36	$ 206,239.02
IT Licensing	$0.00	$ 227,096.64	$ 316,370.86	$ 322,065.53	$ 327,862.71
Equipment / Hardware / Servers	$0.00	$0.00	$52,634.03	$53,581.44	$202,126.82
Total Sustaining Capital	**$ -**	**$ 292,083**	**$ 568,015**	**$ 578,239**	**$ 736,229**
	2018	**2019**	**2020**	**2021**	**2022**
IT Support Costs	$ 209,951.32	$ 213,730.45	$ 217,577.59	$ 221,493.99	$ 225,480.88
IT Licensing	$ 333,764.24	$ 339,772.00	$ 345,887.90	$ 352,113.88	$ 358,451.93
Equipment / Hardware / Servers	$55,527.73	$56,527.23	$76,228.07	$58,580.53	$220,985.02
Total Sustaining Capital	**$ 599,243**	**$ 610,030**	**$ 639,694**	**$ 632,188**	**$ 804,918**
	2023	**2024**	**2025**	**2026**	**2027**
IT Support Costs	$ 229,539.54	$ 233,671.25	$ 237,877.33	$ 242,159.12	$ 246,517.99
IT Licensing	$ 364,904.06	$ 371,472.34	$ 378,158.84	$ 384,965.70	$ 391,895.08
Equipment / Hardware / Servers	$60,708.40	$61,801.16	$62,913.58	$64,046.02	$241,602.66
Total Sustaining Capital	**$ 655,152**	**$ 666,945**	**$ 678,950**	**$ 691,171**	**$ 880,016**
	2028	**2029**	**2030**	**2031**	**2032**
IT Support Costs	$ 250,955.31	$ 255,472.51	$ 260,071.01	$ 264,752.29	$ 269,517.83
IT Licensing	$ 398,949.19	$ 406,130.28	$ 413,440.62	$ 420,882.55	$ 428,458.44
Equipment / Hardware / Servers	$87,921.92	$67,567.13	$68,783.34	$70,021.44	$71,281.83
Total Sustaining Capital	**$ 737,826**	**$ 729,170**	**$ 742,295**	**$ 755,656**	**$ 769,258**

The larger Equipment/Hardware/Servers expenditures in 2017, 2022 and 2027 relate to adding additional capacity to the storage area network (SAN). The smaller annual expenditures in this category are for ongoing replacement of field communications and network devices.

42.2.1 Please discuss the justification for treating support costs as capital as opposed to operating and maintenance expenses.

Response:

The IT Support Costs that are referenced in Exhibit B-3 are costs invoiced to FortisBC directly from third-party vendors from whom FortisBC is purchasing the MDMS software, supporting modules, the HES and network management system.

The general policy FortisBC follows in determining capitalization of any cost is that an expenditure provides substantial benefits for a period of more than one year and the expenditure extends the useful life or increases the capacity of an asset or the quality of output efficiency (2012-2013 Revenue Requirements Application, Appendix M).

In applying this general principle, it has been FortisBC's policy to capitalize 50 percent of all annual software costs. This is based on analysis that has been conducted, including information provided by software vendors, where it has been determined that at least 25 percent of annual costs paid to vendors include service packs and enhancements that extend the life and enhance the functionality of software and at least 25 percent of annual costs paid to vendors are considered prepayments of the next software upgrade, which generally occur at no additional cost to the Company when the upgrade occurs and also extend the life and enhance the functionality of the software. The remaining 50 percent of the annual costs paid to vendors are considered purely maintenance and support and are therefore included in operating and maintenance expenses.

Based on the above, FortisBC has applied 50 percent of the forecast IT Support Costs that are referenced in Exhibit B-3 as Capital Costs, and 50 percent as Operating Expenses (as part of New Operating Costs as referenced in Exhibit B-3).

42.3 Please confirm that all estimated AMI capital costs per Exhibit B-3, tab "Gross AMI", Line No. 32 are those that would normally be capitalized under FortisBC's accounting policy for capitalization under US GAAP. If not confirmed, please explain otherwise.

Response:

Confirmed. Capital Costs included in Line No. 32 (IT Hardware, Licencing, and Support Costs) would normally be capitalized under FortisBC's accounting policy for capitalization under US GAAP. Please see the response to BCUC IR1 Q42.2.1 above, as well as Appendix M to the 2012-2013 Revenue Requirements Application for the assessment of general consistency between FortisBC's Capitalization Policy and US GAAP.

42.4 Please provide the justification for treating each of the following cost categories per Table 5.1.a as capital, as opposed to expenditures:

- System Integration
- Project Management, including resources, design, testing and training

- CPCN Development / Approval

Response:

The justification for each is provided below:

System Integration

These costs are comprised of internal IT costs required to integrate the new AMI software with existing FortisBC systems and for the creation of the Customer Information Portal. Under US GAAP, Accounting Standards Codification ("ASC") 360-10, Property, Plant & Equipment-Overall, defines the historical cost of acquiring an asset as "including the costs necessarily incurred to bring it to the condition and location necessary for its intended use". In the case of the AMI software, in order to install it in the condition required for its intended use there is compliance and other integration testing that is necessary to occur. Without the proper integration testing, the AMI system will not function as required. Therefore, System Integration costs meet the definition of eligible capital costs.

Project Management

These costs are comprised of labour resources, design, testing and training. In other words, this cost category includes all internal and contract labour involved in managing the design of the system, software installation, configuration and initial testing of the system, and ultimate rollout to the Company. Following the guidance in ASC 360-10, the Company believes these are also costs that are necessarily incurred in order to bring the AMI system to the condition necessary for its intended use, since without these dedicated resources actively managing the AMI project the AMI system would not meet its intended use.

CPCN Development / Approval

These costs include the CPCN application development cost, including procurement, and the forecast costs associated with the regulatory process. FortisBC has traditionally capitalized preliminary project costs since CPCN development and approval is a necessary requirement in the development of capital for a regulated utility. In other words, without BCUC approval to proceed, a capital project does not proceed. Therefore, these costs are necessarily incurred in order to bring the AMI system to the condition necessary for its intended use.

43.0 Reference: Project Description

Exhibit B-1, Tab 4.0, Sec. 4.3.5, p. 57

Project Risk and Mitigation

43.1 In financial terms, what is the impact on NPV and Rates of a delay in operational benefits of the AMI Project (ie., meter reading, theft reduction, etc.) of six months?

Response:

In this response, FortisBC assumes that the proposed AMI project is implemented as per the preliminary project plan, but operational benefits are delayed by six months.

Delays in operational benefits related to meter reading, remote disconnect/reconnect, contact centre, and theft reduction were included in the analysis.

The Company did not include meter exchanges or avoided cost benefits associated with Measurement Canada compliance, since those benefits are realized by the installation of the AMI meters.

See the table below for the financial impact of a six month delay in the realization of the stated operational benefits:

	NPV ($000s)	
	AMI proposal (errata 1)	**6 month delay in operational benefits**
Meter Reading	-$23,785	-$22,383
Remote Disconnect/Reconnect	-$5,466	-$5,158
Contact Centre	-$441	-$410
Theft Reduction	-$38,386	-$37,491
Project NPV	-$17,629	-$14,992

44.0 Reference: Project Description

Exhibit No. B-1, Tab 4.0, Section 4.3.2, p. 59

Schedule

44.1 Provide the PERT chart schedule for the key activities identified in Table 4.3.1.a and clearly identify the critical path.

Response:

Due to size constraints the requested PERT chart schedule is provided as an electronic Microsoft Project attachment. Please see Electronic Attachment BCUC IR1 44.1. To open and view the attachment without Microsoft Project, a free viewer program can be downloaded at the following link: http://www.moosprojectviewer.com/download.php.

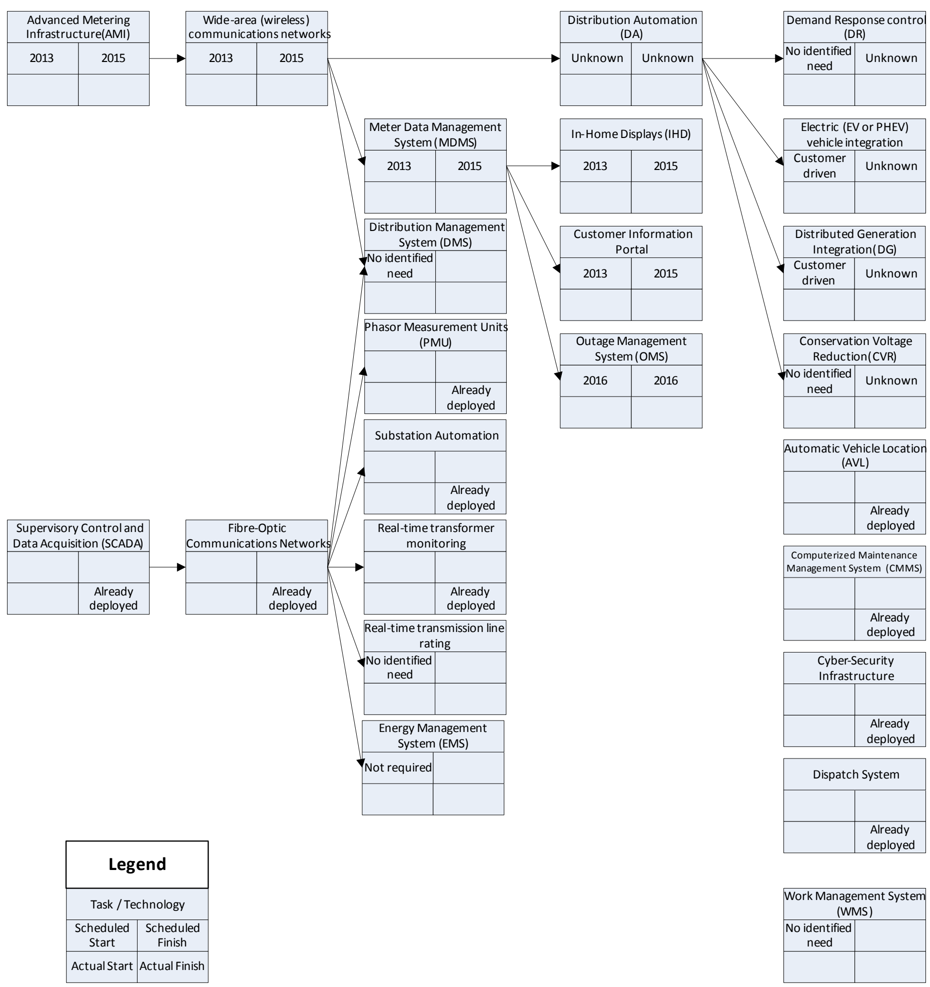
44.2 Provide the PERT chart schedule for the key components identified on pages 28 and 29 of the Application.

Response:

Please refer to BCUC IR1 Figure 44.2 below.

BCUC IR1 Figure 44.2

FortisBC Smart Grid Components - PERT Chart



45.0 Reference: Project Description

Exhibit No. B-1, Tab 4.0, Section 4.3.3, pp. 59-60

Project Manager Responsible

45.1 Who is the AMI consultant?

<u>Response:</u>

FortisBC's AMI consultant is Util-Assist Inc (http://www.util-assist.com/index.php).

45.1.1 Provide a copy of the contract for the AMI consultant, confidentially if necessary.

Response:

Due to contractual sensitivities, the attached has been filed in confidence with the Commission.

46.0 Reference: Project Description

Exhibit No. B-1, Tab 4.0, Section 4.3.5, pp. 59-60

Risks and Cost Certainty

46.1 Provide a risk evaluation in the following format for the risks already identified in Table 4.3.5.a – Overview of Risks and Solutions.

Major Risks Key: Likelihood: 5 = Almost Certain 4 = Likely 3 = Possible 2 = Unlikely 1 = Rare Consequence: 5 = Catastrophic 4 = Major 3 = Moderate 2 = Minor 1 = Insignificant			
Risk Factor *(List risk)*	***Likelihood***	***Consequence***	***Risk Response Strategy***
•			
•			
•			
•			

Response:

Please refer to the below table. Please refer to the response to BCUC IR1 Q46.2 for a discussion regarding the requested consequence levels and associated dollar impact.

BCUC IR1 Table 46.1

Major Risks Key: Likelihood: 5 = Almost Certain 4 = Likely 3 = Possible 2 = Unlikely 1 = Rare Consequence: 5 = Catastrophic 4 = Major 3 = Moderate 2 = Minor 1 = Insignificant			
Risk Factor *(List risk)*	***Likelihood***	***Consequence***	***Risk Response Strategy***
• The Project does not meet set milestones in the project schedule	3	3	Financial penalties are incorporated within the contract to incent the vendor to stay on schedule. FortisBC has selected Itron Canada as its vendor for MDMS, communications network devices and deployment, and meters and their deployment. Elimination of the need to manage multiple vendors reduces project schedule risk. Internally, the steering team ensures continued internal support and resources throughout the AMI Project thereby mitigating schedule risk from internal sources.
• Project costs increase over the planned budget.	2	3	Cost contingencies provided for: • MDMS • Meter and communication network devices • Professional services • Meter deployment Overall Project contingency is 6.4% FortisBC has selected a single vendor for MDMS, communications network devices and deployment, and meters and their deployment. All major cost elements (meters, communications devices, software applications) are provided on a fixed-price or fixed-unit-price basis. 64% of the contracted price was fixed at contract signing, with the remaining 36% to be fixed during the define/design stage of project implementation. Where estimates have been used, an appropriate contingency has been added to the project cost.
• Change requests are received.	4	2	Change requests may be denied. A detailed change control process has been implemented as an integral part of the project management process. Significant changes must be signed off by AMI steering team.
Failures in integration work OR AMI system components not performing as required during the design phase of the Project.	1	4	Warranties related to equipment, software and all aspects of system performance are included in the contract. FortisBC has set out a testing schedule at all major milestones and has also ensured that there are proper testing phases in place for the vendor such as functional testing during integration activities and factory acceptance testing of the AMI equipment

46.2 Provide a scale in dollars that converts consequence levels to dollars.

Response:

The risks identified above are too general in nature to assign a scale converting the consequence levels to dollars.

46.3 Has FortisBC identified emerging risks as well as impacts of changes in scope and underlying assumptions? Please explain.

Response:

FortisBC believes that the "Project Challenges" identified in Exhibit B-1, Tab 8.0, Section 8.4 could be considered emerging risks in that they are potentially significant but not fully understood since they are not necessarily based on actual risks. The nature of these challenges makes the development of risk response strategies difficult.

46.3.1 Will FortisBC be updating the cost-benefit analysis to reassess the economic viability of the AMI project to reflect existing and emerging risks as well as the impact of changes to scope and underlying assumptions during the life of the project?

Response:

Please see the response to BCUC IR1 Q56.5.

46.4 Discuss the risk of the home interface device's integration with the AMI system and whether suppliers of home appliances will include ZigBee compliant network devices with their household appliances.

Response:

FortisBC believes there is only a minor risk associated with the home automation communication protocol choice made by home appliance manufacturers since economic solutions are likely to be available. Please also see the response to BCUC IR1 Q30.2.1.

47.0 Reference: Project Description

Exhibit No. B-1, Tab 4.0, Section 4.3.3, p. 64

Meter Deployment and Customer Safety

47.1 Who in FortisBC has reviewed and approved the meter deployment training manual? Please provide a copy of the manual.

<u>Response:</u>

The meter deployment training document will be reviewed once it is created during the define and design stage of the project by:

- Supervisor, Meter Reading
- Director, Network Services
- Manager, Technical Trades

The following topics will be outlined in the deployment training manual:

Pre-Installation Site Inspection

1.0 Assess acceptability of site for installation by looking for:
  1.1 Generally unsafe meter conditions,
    1.1.1 Water visibly present near meter socket or,
    1.1.2 Exposed wiring
  1.2 Evidence of tampering,
    1.2.1 Missing meters,
    1.2.2 Incorrect meter in socket,
    1.2.3 Upside down meter (in conjunction with broken seal)
    1.2.4 Drilled holes in meter glass
  1.3 Compromised insulation
    1.3.1 Burn marks in and around the meter,
    1.3.2 Discoloured metal,
    1.3.3 High temperature socket

Meter Installation

2.0 Once the meter is deemed safe to exchange the following procedure will be followed,
  2.1 Cut seal and remove security ring,
  2.2 Remove meter from the socket,
  2.3 Inspect Meter Socket looking for,
    2.3.1 Jumpers/unusual Wiring,
    2.3.2 Broken or missing Government seal,
    2.3.3 Unusual lug wear combined with broken or missing seal,
      2.3.3.1 Broken or cracked meter base lugs.

2.3.4 Neutral wire is properly connected in meter base (note: this applies to network and poly phase metering only)

2.4 Verify meter compatibility with socket (voltage/current/number of elements)

2.5 Voltage check on all meter bases looking for

2.5.1 Continuity (or load side resistance),

2.5.2 Standard FBC residential voltage,

2.6 Install A-Base meter adapter if required,

2.7 Install the new meter lining up the supply lugs first,

2.8 Install security ring and meter seal,

2.9 Remove all meter related debris from the site.

47.1.1 Has the British Columbia Safety Authority (BCSA) reviewed the meter deployment training manual?

Response:

Electrical utility companies, including FortisBC, are exempt from the safety standards act administered by the BCSA. This is because electric utilities have the professional engineering expertise required to safely operate the utility infrastructure to the point of delivery via the electric meter. Therefore FortisBC has not submitted the manual for BCSA review.

47.2 Explain the risks of damaging household equipment while disconnecting a residential meter under load.

Response:

There is a risk of mechanical damage to the meter base assembly when the meter is disconnected. This mechanical damage, in rare situations, may cause arcing in the meter base should energized wires touch together or touch the metallic meter enclosure. FortisBC has not observed any household equipment damage resulting from this type of failure.

FortisBC is well aware of the potential for meter base damage during a meter exchange, and never reinstalls a meter before the meter base is repaired by a qualified electrician.

47.3 Explain if there is a risk of damaging the meter base while exchanging the residential meter and what mitigation measures FortisBC proposes to employ while performing the exchange.

Response:

There is a risk of damaging the meter base while exchanging the residential meter; however through the meter exchange process it is possible that FortisBC will also identify already damaged meter bases.

FortisBC will mitigate the risks related to damaged meter bases by making use of its meter exchange best practices outlined in the response to BCUC IR1 Q47.1. Specifically, this will include a visual inspection and meter testing of the socket base and:

- Jumpers/unusual Wiring;
- Broken or missing Government seal;
- Unusual lug wear combined with broken or missing seal;
  - Broken or cracked meter base lugs;
- Neutral wire is properly connected in meter base (note: this applies to network and poly phase metering only);
- Verify meter compatibility with socket (voltage/current/number of elements);
- Voltage check on all meter bases looking for;
  - Continuity (or load side resistance);and
  - Standard FBC residential voltage.

If any deficiencies are found, the deployment procedures will specify what measures must be taken to correct these deficiencies prior to installation completion. These measures may include the replacement of a faulty meter base by a qualified electrician at no cost to the customer.

FortisBC performed 54,640 meter installations, removals or replacements in the period from 2006 through 2011. During this period there were 13 reported meter incidents where some form of meter base damage occurred or was identified. Further, FortisBC has checked its records and has found no evidence of any damage to customer property (other than the meter base) that has occurred as a result of a meter installation, removal or replacement.

FortisBC has conservatively budgeted for over 1,000 meter base replacements as part of the AMI project budget to help ensure that any identified issues with customers' meter bases can be repaired with minimal customer inconvenience.

47.4 What is the impact on the meters when exposed to temporary over-voltages and extreme temporary over-voltages?

Response:

All meters are tested to and comply with relevant standards. With respect to over-voltage withstand capabilities, the relevant standards are:

- ANSI/NEMA C12.1-2008 (“American National Standard for Electric Meters – Code for Electricity Metering”);
- IEEE/ANSI C62.41.2-2002 (“IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits”;
- IEEE/ANSI C62.45 – 1992 (“IEEE Guide on Surge Testing for Equipment Connected to Low-Voltage AC Power Circuits”); and
- IEC 61000-4-4 – (“Electromagnetic compatibility (EMC) - Part 4-4: Testing and measurement techniques - Electrical fast transient/burst immunity test”).

These tests are used to confirm that the meters have adequate insulation to protect the public and workers from contacting any energized parts and that the meter internals are able to withstand transient overvoltage events.

Further, if a meter experiences an over-voltage situation, an appropriate event notification will be sent over the network to the HES. In the case of extreme-over voltage, self-protection devices within the meter will operate to disconnect the internal power supply and voltage sensing inputs. FortisBC will become aware that a problem has occurred as the meter will stop communicating. The device would then be non-functional until FortisBC crews are dispatched to replace the meter with a new unit. Refer also to the response to BCUC IR1 Q47.4.1.

47.4.1 Provide the AMI meter’s withstand (surge) voltage.

Response:

There is no single withstand (surge) voltage rating for the meter since the severity of overvoltage events is a factor of both the magnitude and duration of the overvoltage.

The meter vendor has provided information that the product is designed to accept twice the normal line voltage indefinitely (i.e. 480 volts for the single-phase meter); this ensures that the device is unaffected by most overvoltage events. A metal-oxide varistor (MOV) surge protector is used to protect the meter hardware (power supply and voltage sensing inputs) from transient over-voltage surges. In the event of a long-duration, extreme over-voltage situation, a current-limiting resistor is installed prior to the surge arrestor to minimize the energy dissipated during these overvoltage events (when these events are in excess of twice line voltage). In this last scenario, a fuse internal to the device will open in order to protect the meter internals from the over-voltage. The meter would then become non-functional until the fuse is repaired by the manufacturer.

48.0 Reference: Project Costs and Benefits

Exhibit B-3, Excel Document: "FortisBC – AMI Excel NPV Analysis – 17Aug12"

Costs per Meter

48.1 Please complete the attached table and provide a working Excel copy for each of the following tabs in Exhibit B-3:

- Gross AMI
- Status Quo
- Gross PLC
- Gross AMR

	Dec-12	Dec-13	Dec-14	Dec-15	Dec-16	Dec-17	Dec-18	Dec-19	Dec-20	Dec-21	Dec-22	Dec-23	Dec-24	Dec-25	Dec-26	Dec-27	Dec-28	Dec-29	Dec-30	Dec-31	Dec-32	
PROJECT CAPITAL																						
Project Capital																						Agreed to Line No. 27
AFUDC																						Agreed to Line No. 33
Total Costs (Sum of Project Capital and AFUDC)																						
Total New Meters Installed in Year																						Only include new meters installed as a result of project implementation
Cost per Meter																						

<u>Response:</u>

Please see the following table. Please also refer to Electronic Attachment BCUC IR1 48.1.

Table BCUC IR1 Q48.1 – Costs per Meter

Status Quo	Dec-12	Dec-13	Dec-14	Dec-15	Dec-16	Dec-17	Dec-18	Dec-19	Dec-20	Dec-21	Dec-22	Dec-23	Dec-24	Dec-25	Dec-26	Dec-27	Dec-28	Dec-29	Dec-30	Dec-31	Dec-32
									Project Capital												
Project Capital	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
AFUDC	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total Costs (Sum of Project Capital and AFUDC)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total New Meters installed in year (as part of Project implementation)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cost per meter	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

Gross AMI	Dec-12	Dec-13	Dec-14	Dec-15	Dec-16	Dec-17	Dec-18	Dec-19	Dec-20	Dec-21	Dec-22	Dec-23	Dec-24	Dec-25	Dec-26	Dec-27	Dec-28	Dec-29	Dec-30	Dec-31	Dec-32
									Project Capital												
Project Capital ($000)	$0	$13,562	$15,900	$17,166	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
AFUDC ($000)	$0	$168	$893	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total Costs (Sum of Project Capital and AFUDC) ($000)	$0	$13,730	$16,793	$17,166	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total New Meters installed in year (as part of Project implementation)	0	0	57,332	57,332																	
Cost per meter	$0.00	$0.00	$415.90	$415.90	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

Gross PLC	Dec-12	Dec-13	Dec-14	Dec-15	Dec-16	Dec-17	Dec-18	Dec-19	Dec-20	Dec-21	Dec-22	Dec-23	Dec-24	Dec-25	Dec-26	Dec-27	Dec-28	Dec-29	Dec-30	Dec-31	Dec-32
									Project Capital												
Project Capital ($000)	$0	$16,163	$24,513	$24,296	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
AFUDC ($000)	$0	$200	$1,179	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total Costs (Sum of Project Capital and AFUDC) ($000)	$0	$16,362	$25,692	$24,296	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total New Meters installed in year (as part of Project implementation)	0	0	56209	56209	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cost per meter	$0.00	$0.00	$590.22	$590.22	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

Gross AMR	Dec-12	Dec-13	Dec-14	Dec-15	Dec-16	Dec-17	Dec-18	Dec-19	Dec-20	Dec-21	Dec-22	Dec-23	Dec-24	Dec-25	Dec-26	Dec-27	Dec-28	Dec-29	Dec-30	Dec-31	Dec-32
									Project Capital												
Project Capital ($000)	$0	$6,807	$10,739	$10,188	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
AFUDC ($000)	$0	$84	$452	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total Costs (Sum of Project Capital and AFUDC) ($000)	$0	$6,891	$11,191	$10,188	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total New Meters installed in year (as part of Project implementation)	0	0	56209	56209	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cost per meter	$0.00	$0.00	$251.47	$251.47	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

48.2 Please complete the attached table and provide a working Excel copy for each of the following tabs in Exhibit B-3:

- Gross AMI
- Status Quo
- Gross PLC
- Gross AMR

	Dec-12	Dec-13	Dec-14	Dec-15	Dec-16	Dec-17	Dec-18	Dec-19	Dec-20	Dec-21	Dec-22	Dec-23	Dec-24	Dec-25	Dec-26	Dec-27	Dec-28	Dec-29	Dec-30	Dec-31	Dec-32	
SUSTAINING CAPITAL																						
Meter Growth																						Sum of Meter Growth and Replacement should agree to Line No. 29
Total New Meters Installed in Year																						Only include new meters installed due to meter growth
Cost per Meter																						
Meter Replacement																						Sum of Meter Growth and Replacement should agree to Line No. 29
Total Meters Replaced																						Only include new meters installed due to meter replacement
Cost per Meter																						
Measurement Canada Compliance - Testing																						Sum of Measurement Canada Compliance Testing and Meter Replacement should agree to Line No. 31
Total Meters Tested																						
Cost per Meter																						
Measurement Canada Compliance - Testing																						Sum of Measurement Canada Compliance Testing and Meter Replacement should agree to Line No. 31
Total Compliance Groups Tested																						
Cost per Compliance Group																						
Total Measurement Canada Compliance - Meter Replacement																						Sum of Measurement Canada Compliance Testing and Meter Replacement should agree to Line No. 31
Total Meters Replaced																						Only include meters replaced due to Measurement Canada compliance
Cost per Meter																						
IT Hardware, Licencing, and Support Costs																						Sum of Measurement Canada Compliance Testing and Meter Replacement agreed to Line No. 31
Total Meters Installed																						Include all applicable meters installed in the year
Cost per Meter																						

Response:

Please see the table provided below which details the status quo costs per meter. Due to contractual sensitivities, the cost per meter for AMI, PLC, and AMR have been filed with the Commission in confidence.

Table BCUC IR1 Q48.2a – Status Quo Costs per Meter

Status Quo	Dec-13	Dec-14	Dec-15	Dec-16	Dec-17	Dec-18	Dec-19	Dec-20	Dec-21	Dec-22	Dec-23	Dec-24	Dec-25	Dec-26	Dec-27	Dec-28	Dec-29	Dec-30	Dec-31	Dec-32
Sustaining Capital																				
Meter Growth ($000)	$119	$125	$122	$125	$125	$128	$131	$129	$132	$134	$135	$139	$140	$141	$142	$145	$147	$147	$148	$151
Total New Meters Installed year	2,252	2,325	2,236	2,236	2,210	2,217	2,226	2,164	2,169	2,161	2,132	2,162	2,143	2,123	2,103	2,099	2,087	2,053	2,028	2,033
Cost per Meter	$52.78	$53.73	$54.70	$55.69	$56.69	$57.71	$58.75	$59.81	$60.88	$61.98	$63.09	$64.23	$65.38	$66.56	$67.76	$68.98	$70.22	$71.49	$72.77	$74.08
Meter Replacement ($000)	$41	$67	$62	$81	$56	$110	$53	$25	$31	$41	$36	$32	$22	$19	$26	$22	$23	$32	$13	$8
Total Meters Replaced	1117	1768	1612	2059	1411	2707	1296	595	720	942	823	707	478	399	556	460	468	639	256	159
Cost per Meter	$37.09	$37.76	$38.44	$39.13	$39.83	$40.55	$41.28	$42.02	$42.78	$43.55	$44.33	$45.13	$45.94	$46.77	$47.61	$48.47	$49.34	$50.23	$51.13	$52.06
MC Compliance - Testing ($000)	$146	$909	$903	$1,478	$976	$2,310	$1,072	$1,645	$1,229	$1,070	$1,452	$820	$1,324	$486	$501	$293	$306	$302	$432	$901
Total Meters Tested	0	4295	4169	7325	4419	11592	4741	7653	5350	4429	6241	3018	5368	1296	1327	338	372	329	865	2821
Cost per Meter		$211.54	$216.60	$201.79	$220.90	$199.28	$226.08	$214.95	$229.68	$241.48	$232.70	$271.81	$246.58	$374.84	$377.71	$868.18	$823.43	$918.47	$499.48	$319.27
MC Compliance - Testing ($000)	$146	$909	$903	$1,478	$976	$2,310	$1,072	$1,645	$1,229	$1,070	$1,452	$820	$1,324	$486	$501	$293	$306	$302	$432	$901
Total Comploiance Groups Tested	0	18	17	20	9	29	11	5	6	10	15	7	2	3	8	5	4	5	2	2
Cost per Compliance Group		$50,474.84	$53,116.83	$73,906.67	$108,462.10	$79,655.25	$97,442.59	$328,998.89	$204,799.31	$106,952.51	$96,818.65	$117,189.92	$661,825.16	$161,932.63	$62,652.64	$58,688.91	$76,579.45	$60,435.32	$216,026.00	$450,333.96
Total MC Compliance plus Meter Replacement ($000)	$188	$975	$965	$1,559	$1,032	$2,420	$1,125	$1,670	$1,260	$1,111	$1,489	$852	$1,346	$504	$528	$316	$329	$334	$445	$909
Total Meters Replaced	1117	6063	5781	9384	5830	14299	6037	8248	6070	5371	7064	3725	5846	1695	1883	798	840	968	1121	2980
Cost per Meter	$168.23	$0.16	$0.17	$0.17	$0.18	$0.17	$0.19	$0.20	$0.21	$0.21	$0.21	$0.23	$0.23	$0.30	$0.28	$0.40	$0.39	$0.35	$0.40	$0.31
IT Hardware, Licencing, and Support Costs ($000).	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total Meters Installed	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cost per Meter	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

48.3 Please complete the attached table and provide a working Excel copy for each of the following tabs in Exhibit B-3:

- Gross AMI
- Status Quo
- Gross PLC
- Gross AMR

	Dec-12	Dec-13	Dec-14	Dec-15	Dec-16	Dec-17	Dec-18	Dec-19	Dec-20	Dec-21	Dec-22	Dec-23	Dec-24	Dec-25	Dec-26	Dec-27	Dec-28	Dec-29	Dec-30	Dec-31	Dec-32	
OPERATING COSTS																						
New Operating Costs																						Agreed to Line No. 46
Total Meters in Service																						Exclude Customers with MV-90 Metering System
Cost per Meter																						
Meter Reading																						Agreed to Line No. 47
Total Meters in Service that Require Manual Meter Reading																						Exclude Customers with MV-90 Metering System
Cost per Meter																						
Remote Disconnect/Reconnect																						Agreed to Line No. 48
Estimated Requests for Disconnect / Reconnect on Customer Premises																						Exclude remote disconnect and reconnect. Exclude Customers with MV-90 Metering System
Cost per Disconnect / Reconnect																						
Meter Exchanges																						Agreed to Line No. 49
Number of Meters Exchanged																						Exclude Customers with MV-90 Metering System
Cost per Meter																						
Contact Centre																						Agreed to Line No. 50
Number of Customers																						Exclude Customers with MV-90 Metering System
Cost per Customer																						
Number of Customers																						Exclude Customers with MV-90 Metering System
Number of Meters																						Exclude MV-90 Metering System

Response:

Please see the tables provided below. Please also refer to Electronic Attachment BCUC IR1 48.3.

Table BCUC IR Q48.3a –Status Quo Operating Costs

Status Quo	Dec-13	Dec-14	Dec-15	Dec-16	Dec-17	Dec-18	Dec-19	Dec-20	Dec-21	Dec-22	Dec-23	Dec-24	Dec-25	Dec-26	Dec-27	Dec-28	Dec-29	Dec-30	Dec-31	Dec-32
								Operating Costs												
New Operating Costs ($000)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total Meters in Service	116410	118734	121059	123293	125502	127718	129942	132105	134272	136432	138562	140722	142864	144985	147087	149184	151269	153320	155347	157378
Cost per Meter	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Meter Reading ($000)	$2,518	$2,684	$2,733	$2,782	$2,959	$3,012	$3,067	$3,256	$3,315	$3,374	$3,576	$3,641	$3,706	$3,922	$3,993	$4,065	$4,296	$4,373	$4,452	$4,698
Total Meters in Service that require manual meter reading	116410	118734	121059	123293	125502	127718	129942	132105	134272	136432	138562	140722	142864	144985	147087	149184	151269	153320	155347	157378
Cost per Meter	$21.63	$22.61	$22.57	$22.56	$23.58	$23.59	$23.60	$24.65	$24.69	$24.73	$25.81	$25.87	$25.94	$27.05	$27.15	$27.25	$28.40	$28.52	$28.66	$29.85
Remote Disconnect/Reconnect ($000)	$513	$532	$552	$573	$594	$615	$637	$660	$682	$706	$730	$755	$780	$806	$833	$860	$888	$916	$945	$1,410
Estimated Requests for Disconnet/Reconnect	7935	8088	8247	8405	8558	8709	8861	9010	9158	9306	9454	9600	9747	9894	10039	10183	10326	10469	10609	10747
Cost per Disconnect/Reconnect	$64.61	$65.78	$66.96	$68.17	$69.39	$70.64	$71.91	$73.21	$74.53	$75.87	$77.23	$78.62	$80.04	$81.48	$82.95	$84.44	$85.96	$87.51	$89.08	$131.19
Meter Exchanges	$242	$349	$331	$408	$310	$531	$302	$187	$212	$256	$239	$222	$183	$171	$204	$189	$194	$233	$157	$139
Number of meters Exchanged	1117	1768	1612	2059	1411	2707	1296	595	720	942	823	707	478	399	556	460	468	639	256	159
Cost per Meter	$216.64	$197.51	$205.32	$198.36	$219.89	$196.03	$233.13	$314.57	$295.00	$271.48	$290.13	$313.54	$382.14	$428.20	$367.77	$411.17	$414.87	$364.26	$612.90	$874.78
Contact Centre ($000)	$479	$497	$511	$530	$545	$565	$581	$602	$619	$641	$658	$681	$699	$723	$742	$767	$787	$813	$853	$879
Number of Customers	116410	118734	121059	123293	125502	127718	129942	132105	134272	136432	138562	140722	142864	144985	147087	149184	151269	153320	155347	157378
Cost per Customer	$4.11	$4.18	$4.22	$4.30	$4.35	$4.43	$4.47	$4.56	$4.61	$4.69	$4.75	$4.84	$4.89	$4.99	$5.05	$5.14	$5.21	$5.30	$5.49	$5.59
Number of Customers	116410	118734	121059	123293	125502	127718	129942	132105	134272	136432	138562	140722	142864	144985	147087	149184	151269	153320	155347	157378
Number of Meters	116410	118734	121059	123293	125502	127718	129942	132105	134272	136432	138562	140722	142864	144985	147087	149184	151269	153320	155347	157378

Table BCUC IR Q48.3b – AMI Operating Costs

AMI	Dec-13	Dec-14	Dec-15	Dec-16	Dec-17	Dec-18	Dec-19	Dec-20	Dec-21	Dec-22	Dec-23	Dec-24	Dec-25	Dec-26	Dec-27	Dec-28	Dec-29	Dec-30	Dec-31	Dec-32
Operating Costs																				
New Operating Costs ($000)	$0	$875	$1,529	$1,556	$1,591	$1,620	$1,611	$1,636	$1,662	$1,688	$1,715	$1,742	$1,769	$1,798	$1,826	$1,855	$1,885	$1,915	$1,946	$1,977
Total Meters in Service	116410	118734	121059	123293	125502	127718	129942	132105	134272	136432	138562	140722	142864	144985	147087	149184	151269	153320	155347	157378
Cost per Meter	$0.00	$7.37	$12.63	$12.62	$12.68	$12.68	$12.40	$12.39	$12.38	$12.37	$12.37	$12.38	$12.39	$12.40	$12.42	$12.44	$12.46	$12.49	$12.53	$12.56
Meter Reading ($000)	$2,518	$2,684	$1,734	$238	$246	$255	$264	$273	$283	$292	$302	$312	$322	$333	$344	$355	$366	$382	$394	$406
Total Meters in Service that require manual meter reading	116410.4	118734.1	60529.37	1849.401	1882.53	1915.763	1949.132	1981.57	2014.082	2046.474	2078.431	2110.837	2142.958	2174.778	2206.298	2237.758	2269.037	2299.805	2330.198	2360.666
Cost per Meter	$21.63	$22.61	$28.65	$128.54	$130.82	$133.15	$135.44	$137.85	$140.28	$142.74	$145.31	$147.87	$150.48	$153.13	$155.85	$158.62	$161.41	$166.18	$169.12	$172.10
Remote Disconnect/Reconnect ($000)	$513	$399	$138	$29	$30	$31	$32	$33	$34	$35	$37	$38	$39	$40	$42	$43	$44	$46	$47	$70
Estimated Requests for Disconnet/Reconnect	7935	6066	2062	420	428	435	443	451	458	465	473	480	487	495	502	509	516	523	530	537
Cost per Disconnect/Reconnect	$64.61	$65.78	$66.96	$68.17	$69.39	$70.64	$71.91	$73.21	$74.53	$75.87	$77.23	$78.62	$80.04	$81.48	$82.95	$84.44	$85.96	$87.51	$89.08	$131.19
Meter Exchanges	$242	$0	$0	$0	$0	$0	$0	$0	$0	$421	$429	$437	$444	$124	$127	$129	$131	$134	$136	$504
Number of meters Exchanged	1117	0	0	0	0	0	0	0	0	1872	1872	1872	1872	156	156	156	156	156	156	1872
Cost per Meter	$216.64									$225.04	$229.09	$233.21	$237.41	$797.42	$811.77	$826.39	$841.26	$856.40	$871.82	$268.99
Contact Centre ($000)	$479	$516	$518	$510	$490	$508	$522	$540	$555	$574	$589	$610	$626	$647	$664	$686	$704	$727	$764	$788
Number of Customers	116410	118734	121059	123293	125502	127718	129942	132105	134272	136432	138562	140722	142864	144985	147087	149184	151269	153320	155347	157378
Cost per Customer	$4.11	$4.35	$4.28	$4.14	$3.90	$3.97	$4.01	$4.09	$4.13	$4.21	$4.25	$4.33	$4.38	$4.46	$4.52	$4.60	$4.65	$4.74	$4.92	$5.01
Number of Customers	116410	118734	121059	123293	125502	127718	129942	132105	134272	136432	138562	140722	142864	144985	147087	149184	151269	153320	155347	157378
Number of Meters	116410	118734	121059	123293	125502	127718	129942	132105	134272	136432	138562	140722	142864	144985	147087	149184	151269	153320	155347	157378

Table BCUC IR Q48.3c – PLC Operating Costs

PLC	Dec-13	Dec-14	Dec-15	Dec-16	Dec-17	Dec-18	Dec-19	Dec-20	Dec-21	Dec-22	Dec-23	Dec-24	Dec-25	Dec-26	Dec-27	Dec-28	Dec-29	Dec-30	Dec-31	Dec-32
Operating Costs																				
New Operating Costs ($000)	$0	$768	$1,362	$1,387	$1,419	$1,445	$1,433	$1,455	$1,478	$1,501	$1,525	$1,549	$1,573	$1,598	$1,624	$1,649	$1,676	$1,702	$1,730	$1,757
Total Meters in Service	116410	118734	121059	123293	125502	127718	129942	132105	134272	136432	138562	140722	142864	144985	147087	149184	151269	153320	155347	157378
Cost per Meter	$0.00	$6.47	$11.25	$11.25	$11.31	$11.31	$11.03	$11.02	$11.01	$11.00	$11.01	$11.01	$11.01	$11.02	$11.04	$11.06	$11.08	$11.10	$11.13	$11.17
Meter Reading ($000)	$2,518	$2,684	$1,734	$238	$246	$255	$264	$273	$283	$292	$302	$312	$322	$333	$344	$355	$366	$382	$394	$406
Total Meters in Service that require manual meter reading	116410.4	118734.1	60529.37	1849.401	1882.53	1915.763	1949.132	1981.57	2014.082	2046.474	2078.431	2110.837	2142.958	2174.778	2206.298	2237.758	2269.037	2299.805	2330.198	2360.666
Cost per Meter	$21.63	$22.61	$28.65	$128.54	$130.82	$133.15	$135.44	$137.85	$140.28	$142.74	$145.31	$147.87	$150.48	$153.13	$155.85	$158.62	$161.41	$166.18	$169.12	$172.10
Remote Disconnect/Reconnect ($000)	$513	$399	$138	$29	$30	$31	$32	$33	$34	$35	$37	$38	$39	$40	$42	$43	$44	$46	$47	$70
Estimated Requests for Disconnet/Reconnect	7935	6066	2062	420	428	435	443	451	458	465	473	480	487	495	502	509	516	523	530	537
Cost per Disconnect/Reconnect	$64.61	$65.78	$66.96	$68.17	$69.39	$70.64	$71.91	$73.21	$74.53	$75.87	$77.23	$78.62	$80.04	$81.48	$82.95	$84.44	$85.96	$87.51	$89.08	$131.19
Meter Exchanges	$242	$0	$0	$0	$0	$0	$0	$0	$0	$421	$429	$437	$444	$124	$127	$129	$131	$134	$136	$504
Number of meters Exchanged	1117	0	0	0	0	0	0	0	0	1872	1872	1872	1872	156	156	156	156	156	156	1872
Cost per Meter	$216.64									$225.04	$229.09	$233.21	$237.41	$797.42	$811.77	$826.39	$841.26	$856.40	$871.82	$268.99
Contact Centre ($000)	$479	$516	$518	$510	$490	$508	$522	$540	$555	$574	$589	$610	$626	$647	$664	$686	$704	$727	$764	$788
Number of Customers	116410	118734	121059	123293	125502	127718	129942	132105	134272	136432	138562	140722	142864	144985	147087	149184	151269	153320	155347	157378
Cost per Customer	$4.11	$4.35	$4.28	$4.14	$3.90	$3.97	$4.01	$4.09	$4.13	$4.21	$4.25	$4.33	$4.38	$4.46	$4.52	$4.60	$4.65	$4.74	$4.92	$5.01
Number of Customers	116410	118734	121059	123293	125502	127718	129942	132105	134272	136432	138562	140722	142864	144985	147087	149184	151269	153320	155347	157378
Number of Meters	116410	118734	121059	123293	125502	127718	129942	132105	134272	136432	138562	140722	142864	144985	147087	149184	151269	153320	155347	157378

Table BCUC IR Q48.3d – AMR Operating Costs

AMR	Dec-13	Dec-14	Dec-15	Dec-16	Dec-17	Dec-18	Dec-19	Dec-20	Dec-21	Dec-22	Dec-23	Dec-24	Dec-25	Dec-26	Dec-27	Dec-28	Dec-29	Dec-30	Dec-31	Dec-32
Operating Costs																				
New Operating Costs ($000)	$0	$89	$162	$165	$168	$171	$174	$178	$181	$184	$187	$191	$194	$198	$202	$205	$209	$213	$217	$221
Total Meters in Service	116410	118734	121059	123293	125502	127718	129942	132105	134272	136432	138562	140722	142864	144985	147087	149184	151269	153320	155347	157378
Cost per Meter	$0.00	$0.75	$1.34	$1.34	$1.34	$1.34	$1.34	$1.34	$1.35	$1.35	$1.35	$1.36	$1.36	$1.37	$1.37	$1.38	$1.38	$1.39	$1.40	$1.40
Meter Reading ($000)	$2,518	$2,684	$1,242	$1,265	$1,288	$1,311	$1,334	$1,358	$1,383	$1,408	$1,433	$1,459	$1,485	$1,512	$1,539	$1,567	$1,595	$1,624	$1,653	$1,683
Total Meters in Service that require manual meter reading	116410	118734	121059	123293	125502	127718	129942	132105	134272	136432	138562	140722	142864	144985	147087	149184	151269	153320	155347	157378
Cost per Meter	$21.63	$22.61	$10.26	$10.26	$10.26	$10.26	$10.27	$10.28	$10.30	$10.32	$10.34	$10.37	$10.39	$10.43	$10.46	$10.50	$10.54	$10.59	$10.64	$10.69
Remote Disconnect/Reconnect ($000)	$513	$532	$552	$573	$594	$615	$637	$660	$682	$706	$730	$755	$780	$806	$833	$860	$888	$916	$945	$1,410
Estimated Requests for Disconnet/Reconnect	7935	8088	8247	8405	8558	8709	8861	9010	9158	9306	9454	9600	9747	9894	10039	10183	10326	10469	10609	10747
Cost per Disconnect/Reconnect	$64.61	$65.78	$66.96	$68.17	$69.39	$70.64	$71.91	$73.21	$74.53	$75.87	$77.23	$78.62	$80.04	$81.48	$82.95	$84.44	$85.96	$87.51	$89.08	$131.19
Meter Exchanges	$242	$0	$0	$0	$0	$0	$0	$0	$0	$421	$429	$437	$444	$124	$127	$129	$131	$134	$136	$504
Number of meters Exchanged	1117	0	0	0	0	0	0	0	0	1872	1872	1872	1872	156	156	156	156	156	156	1872
Cost per Meter	$216.64									$225.04	$229.09	$233.21	$237.41	$797.42	$811.77	$826.39	$841.26	$856.40	$871.82	$268.99
Contact Centre ($000)	$479	$529	$544	$564	$545	$565	$581	$602	$619	$641	$658	$681	$699	$723	$742	$767	$787	$813	$853	$879
Number of Customers	116410	118734	121059	123293	125502	127718	129942	132105	134272	136432	138562	140722	142864	144985	147087	149184	151269	153320	155347	157378
Cost per Customer	$4.11	$4.45	$4.49	$4.58	$4.35	$4.43	$4.47	$4.56	$4.61	$4.69	$4.75	$4.84	$4.89	$4.99	$5.05	$5.14	$5.21	$5.30	$5.49	$5.59
Number of Customers	116410	118734	121059	123293	125502	127718	129942	132105	134272	136432	138562	140722	142864	144985	147087	149184	151269	153320	155347	157378
Number of Meters	116410	118734	121059	123293	125502	127718	129942	132105	134272	136432	138562	140722	142864	144985	147087	149184	151269	153320	155347	157378

49.0 Reference: Project Costs and Benefits

Exhibit B-1, Tab 5.0, Section 5.1, Table 5.1.a, p. 70

Project Costs

49.1 Please complete the following table and provide a working Excel copy to provide further detail on the AMI project capital costs summarized in table 5.1.a.

AMI Project Capital Cost Summary					
	Item	Project Contingency	Costs Subject to Fixed-Price or Fixed-Unit price Basis	Costs Not Subject to Fixed-Price or Fixed-Unit Price Basis	Total Costs
		$ thousands			
		2013			
1	Third party software and services				4,746
2	Meters (Including deployment)				384
3	Network infrastructure				
4	System integration				1,519
5	Theft detection				
6	Project management				936
7	CPCN development / approval costs				4,915
8	Capitalized overhead, AFUDC, PST				1,230
9	**Total**				**13,730**
		2014			
10	Third party software and services				723
11	Meters (Including deployment)				10,089
12	Network infrastructure				1,677
13	System integration				511
14	Theft detection				
15	Project management				1,274
16	CPCN development / approval costs				
17	Capitalized overhead, AFUDC, PST				2,519
18	**Total**				**16,793**
		2015			
19	Third party software and services				361
20	Meters (Including deployment)				9,850
21	Network infrastructure				2,772
22	System integration				319
23	Theft detection				1,100
24	Project management				920
25	CPCN development / approval costs				
26	Capitalized overhead, AFUDC, PST				1,842
27	**Total**				**17,164**
		Total 2013 - 2015			
19	Third party software and services				5,830
20	Meters (Including deployment)				20,323
21	Network infrastructure				4,449
22	System integration				2,349
23	Theft detection				1,100
24	Project management				3,130
25	CPCN development / approval costs				4,915
26	Capitalized overhead, AFUDC, PST				5,591
27	**Total**				**47,687**

Response:

Please see the table below. Please also refer to electronic Excel attachment BCUC IR1 49.1.

Table BCUC IR1 Q49.1 - AMI Project Capital Cost Summary

	Item	Project Contingency	Costs Subject to Fixed-Price or Fixed-Unit price Basis	Costs Not Subject to Fixed-Price or Fixed-Unit Price Basis	Total Costs
			($000s)		
			2013		
1	Third Party Software and Services	$346	$4,400	$0	$ 4,746
2	Meters (Including Deployment)	$9	$339	$36	$ 384
3	Network Infrastructure	$0	$0	$0	$ -
4	System Integration	$138	$0	$1,381	$ 1,519
5	Theft Detection	$0	$0	$0	$ -
6	Project Management	$49	$0	$887	$ 936
7	CPCN Approval Costs	$0	$0	$4,915	$ 4,915
8	Capitalized OH, AFUDC, PST	$0	$0	$1,230	$ 1,230
9	**Total**	**$542**	**$4,739**	**$8,449**	$ 13,730

	Item	Project Contingency	Costs Subject to Fixed-Price or Fixed-	Costs Not Subject to Fixed-Price or Fixed-	Total Costs
			($000s)		
			2014		
1	Third Party Software and Services	$70	$652	$0	$ 723
2	Meters (Including Deployment)	$461	$9,335	$293	$ 10,089
3	Network Infrastructure	$304	$394	$980	$ 1,677
4	System Integration	$46	$0	$465	$ 511
5	Theft Detection	$0	$0	$0	$ -
6	Project Management	$66	$0	$1,208	$ 1,274
7	CPCN Approval Costs	$0	$0	$0	$ -
8	Capitalized OH, AFUDC, PST	$0	$0	$2,519	$ 2,519
9	**Total**	**$947**	**$10,381**	**$5,465**	$ 16,793

	Item	Project Contingency	Costs Subject to Fixed-Price or Fixed-	Costs Not Subject to Fixed-Price or Fixed-	Total Costs
			($000s)		
			2015		
1	Third Party Software and Services	$35	$326	$0	$ 361
2	Meters (Including Deployment)	$454	$9,138	$258	$ 9,850
3	Network Infrastructure	$356	$1,437	$980	$ 2,772
4	System Integration	$29	$0	$290	$ 319
5	Theft Detection	$100	$0	$1,000	$ 1,100
6	Project Management	$52	$0	$868	$ 920
7	CPCN Approval Costs	$0	$0	$0	$ -
8	Capitalized OH, AFUDC, PST	$0	$0	$1,842	$ 1,842
9	**Total**	**$1,027**	**$10,900**	**$5,238**	$ 17,166

AMI Project Capital Cost Summary

	Item	Project Contingency	Costs Subject to Fixed-Price or Fixed-	Costs Not Subject to Fixed-Price or Fixed-	Total Costs
			($000s)		
			Total 2013 - 2015		
1	Third Party Software and Services	$452	$5,378	$0	$ 5,830
2	Meters (Including Deployment)	$925	$18,812	$587	$ 20,323
3	Network Infrastructure	$660	$1,830	$1,959	$ 4,449
4	System Integration	$214	$0	$2,136	$ 2,349
5	Theft Detection	$100	$0	$1,000	$ 1,100
6	Project Management	$167	$0	$2,963	$ 3,130
7	CPCN Approval Costs	$0	$0	$4,915	$ 4,915
8	Capitalized OH, AFUDC, PST	$0	$0	$5,592	$ 5,592
9	**Total**	**$2,516**	**$26,021**	**$19,152**	**$ 47,689**
10	**Percentage of Total Cost**	**5.3%**	**54.6%**	**40.2%**	**100.0%**

50.0 Reference: Project Costs and Benefits

Exhibit B-1, Tab 5, Table 5.1.1.a, p. 73

Project Costs, AMI Development and Regulatory Costs

Table 5.1.1.a identifies an estimated $4,913 thousand in AMI project development and regulatory costs.

50.1 Commission staff has created the attached table as analysis of the information provided in Table 5.1.1.a. Please confirm that the table is correct. If not confirmed, please provide an updated table and explain any differences.

	($000s)	
2007 AMI Application Incurred Costs	291	*Agreed to Table 5.1.1.a*
2012 AMI Application Incurred Costs	1,687	*Agreed to Table 5.1.1.a*
Increase $	1,396	
Increase %	480%	
2012 AMI Application Incurred Costs	1,687	*Agreed to Table 5.1.1.a*
Add:		
Regulatory Process (forecast)	2,660	*Agreed to Table 5.1.1.a*
= Total Forecast 2012 AMI Application Costs	4,347	
2007 AMI Application Incurred Costs	291	*Agreed to Table 5.1.1.a*
Increase $	4,056	
Increase %	1394%	
Regulatory Process Costs as a % of Total Forecast 2012 AMI Application Costs	61%	

<u>Response:</u>

Table 5.1.1a is incorrect. A corrected version has been provided as part of Errata No. 1, and is also provided below:

	Activity	**Cost ($000s)**
1	2007 AMI Application	275
2	2012 AMI Application	2,217
3	Consultants	423
4	Regulatory Process (forecast)	2,000
5	**Total**	4,915

Based on the corrected Table 5.1.1a, the BCUC table has been updated below:

	($000s)
2007 AMI Application Incurred Costs	$275
2012 AMI Application incurred Costs (including consultants)	$2,640
Increase $	$2,365
Increase %	860%
2012 AMI Application incurred Costs	$2,640
Add:	
Regulatory Process (forecast)	$2,000
= Total Forecast 2012 AMI Application Costs	$4,640
2007 AMI Application incurred Costs	$275
Increase $	$4,365
Increase %	1687%
Regulatory Process Costs as a % of Total Forecast 2012 AMI Application Costs	43%

50.1.1 Please list and describe the factors that have resulted in 2012 AMI Application costs incurred to date that are $1,396 thousand, or 480 percent, higher than the 2007 AMI Application costs.

<u>Response:</u>

2012 AMI Application costs incurred to date are $2,365,000, or 860 percent, higher than the 2007 AMI Application costs.

Commission Order G-168-08, denying a CPCN for the 2007 AMI Application, stated, among other things, that “the Commission Panel considers that the risk of exposure to unknown costs of future elements of the program outweighs the value of any savings associated with the current AMI Project application” (page 22).

In order to address this concern FortisBC consulted experts (such as Util-Assist, Navigant, and Exponent), and employed two RFP processes to identify the AMI solution presented in this 2012 AMI CPCN Application. Ultimately, FortisBC selected Itron Canada as the vendor for the major components of the AMI Project, and negotiated a firm contract for a substantial portion of project costs. Finally, FortisBC ensured that a comprehensive consultation process was followed in order to ensure that the Company understood its Stakeholders views on AMI.

All of these activities required significantly more time, and internal resources (in addition to the external resources noted above) than did the 2007 AMI Application.

50.1.2 Please list and describe the cost categories that are included in the forecast regulatory costs of $2,660 thousand and provide the cost allocation for each category identified.

Response:

Please refer to Errata No. 1 which provides a correction to the amount of forecast regulatory costs presented in Table 5.1.1.a, which should have read $2.0 million. The cost categories (and allocations) included in the estimated regulatory costs are as follows:

Cost Category	**Allocation** ($000s)
PACA	500
Legal	800
Consultant and Expert Witnesses	200
Travel, accommodation, and miscellaneous	15
Printing and Postage	20
Advertising	50
Oral Hearing Venue	15
Commission Costs	400
Total	**2,000**

FortisBC notes that depending on the length and nature of the Commission's review process for the Company's AMI Application, the actual regulatory costs incurred could be higher or lower than currently forecast.

Details of the line items in the table:

- PACA costs are the participant costs awarded by the Commission to intervenors with a substantial interest in the proceeding;
- Legal costs are those costs incurred by Company counsel to review the application, review information request responses, and represent the Company at the oral hearing, and other participation in the regulatory process;
- Consultant and expert witness costs are required to retain consultants and expert witnesses for the regulatory review of the application (including appearance at proposed oral hearing);
- Travel, accommodation, and miscellaneous costs include those costs related to attendance at the proposed community input sessions as well as the proposed oral hearing, as well as various miscellaneous expenses;
- Printing and postage costs are related to the physical production (and mailing) of the exhibits filed by the Company in the proceeding;
- Advertising costs are incurred to publish proceeding notifications, as directed by the Commission, in print media;
- Oral hearing venue costs are related to the rental cost of the venue to be used for the proposed oral hearing; and
- Commission costs are those costs incurred by BCUC staff, consultants, and Commissioners to review the Company's application.

50.2 Please separate the "Consultant" costs of $275 thousand per Table 5.1.1.a into 2007 AMI Application and 2012 AMI Application costs.

<u>Response:</u>

Please refer to Errata No. 1 for a correction to Table 5.1.1.a from Exhibit B-1.

The $423,000 shown for consultant costs are those specific to the 2012 AMI Application. The total consultant costs for the 2007 AMI Application are $42,431 which are already included in the total of $275,000 shown for the 2007 AMI Application.

51.0 Reference: Project Costs and Benefits

Exhibit B-1, Tab 5.0, Table 5.1.a, p. 73

Project Costs, Capitalized Overhead, AFUDC, PST

51.1 Please separate the $5,592 thousand in estimated costs into the following categories for each of 2013 and 2032: capitalized overhead, AFUDC and PST. The total for each year should agree to Table 5.1.a.

Response:

The AMI Project proposal does not contemplate any of these costs beyond 2015. Please see the table below:

Table BCUC IR1 Q51.1

	2013	2014	2015
	($000s)		
Capitalized Overhead	$875	$999	$1,073
PST	$187	$627	$769
AFUDC	$168	$893	$0
Total	$1,230	$2,519	$1,842

51.2 Please confirm how the AFUDC for the AMI project was calculated, including the percentage applied and the dollar value of the project costs used.

Response:

AFUDC for the project was calculated by applying the AFUDC rate to the average work-in-progress balance in each quarter from Q3 2013 up to and including Q3 2014. The AFUDC rates and project costs used are provided below:

Year	2013	2014
AFUDC Rate	6.60%	6.70%

Year	2013	2013	2014	2014	2014
Quarter	Q3	Q4	Q1	Q2	Q3
($000s)					
Capital Spend	$3,391	$10,172	$2,475	$2,475	$5,475
AFUDC	$28	$140	$248	$289	$356

51.3 Please confirm how the Capitalized Overhead for the AMI project was calculated, including the percentage applied and the dollar value of overhead costs used.

Response:

Capitalized Overhead was calculated by applying a capitalized overhead rate of 7 percent on the average capital expenditure in the year as detailed below:

	2013	2014	2015
Capital Expenditure	$ 12,500	$ 14,274	$ 15,323
Capitalized Overhead	$ 875	$ 999	$ 1,073

52.0 Reference: Project Costs and Benefits

Exhibit B-1, Tab 5.0, Section 5.2.1, p. 75

Discount Rate

The Reasons for Decision to Commission Order G-168-08 noted the following on page 25:

"The Commission panel also considers that the selection of discount rates and evaluation periods are matters of judgment and encourages FortisBC to provide expanded justification for the base assumptions used in its analyses."

52.1 Please confirm FortisBC Inc's after-tax weighted average cost of capital.

Response:

The Company's after-tax weighted average cost of capital is forecast to be 6.7 percent for 2012 and 6.6 percent for 2013.

52.1.1 Is FortisBC Inc's after-tax weighted average cost of capital a real or nominal interest rate?

Response:

The cost of debt component of FortisBC's after-tax weighted average cost of capital is derived from nominal interest rates. The cost of equity, while approved by the BCUC, includes a component reflecting inflation embedded within the rate, thus it too is a nominal rate.

52.2 Please provide an expanded justification for using an eight percent discount rate based on FortisBC's weighted average cost of capital for the AMI Project NPV calculation. The justification provided should list and describe the factors considered in determining the appropriate discount rate for the AMI Project NPV calculation.

Response:

The analysis is meant to provide the impact on revenue requirements over a twenty year study period in accordance with the expected useful life of the meters. The Company had used a nominal discount rate of ten percent in its rate impact and economic analysis impact studies for a number of years based on the Company's 25 year weighted average cost of capital. The eight percent discount rate is meant to represent a lower long-term after-tax weighted average cost of capital based on an expected lower cost of debt over the study period. The Company is of the opinion that the current low weighted average cost of capital reflects the current anomalous economic conditions and does not reflect the average long-term cost of capital that would be expected over the study period. The reduction from the historic ten percent to an eight percent discount rate recognizes that lower rates are expected for the near term but would not be expected over a 20 year period.

52.2.1 Specifically, please confirm if consideration was given to adjusting the discount rate for any risks associated with the AMI project.

Response:

Although the discount rate was not adjusted for any risks associated with the AMI project an eight percent discount rate was used in this analysis in order to reflect a lower long-term after-tax weighted average cost of capital based on an expected lower cost of debt over the study period. In addition, the Company has provided the net present value of the revenue requirements impact assuming 10 and 6 percent discount rates.

Please also refer to the response to BCUC IR1 Q52.2.

52.2.2 Please confirm if the eight percent discount rate is an after-tax discount rate.

Response:

Confirmed.

52.3 Please provide an expanded justification for using a 20-year period for the AMI Project NPV calculation.

Response:

The 20 year study period was chosen in order to reflect the 20 year economic life of the meters (which are the most significant project expense).

52.3.1 Were alternatives to the 20-year period for the AMI Project NPV calculation considered? If yes, please list the alternatives considered and discuss why they were ultimately rejected.

Response:

No, the Company considered the economic life of the meters to be the most relevant study period so it did not consider any alternatives.

52.3.2 In 2008, FortisBC Inc. submitted an Application for a CPCN for the AMI project. The 2008 Application calculated the net present value of the project over a 25-year period. Please explain what factors have led to the decrease in the time-period from 25 to 20 years.

Response:

The 2008 Application assumed a useful life of the meters to be 25 years. As noted in Exhibit B-1, Tab 5.0, Section 5.3.3, p. 76 of the current Application, the Company has revised its estimate of the economic life to 20 years, partly based on information from the meter manufacturer that was not available in the 2008 Application, hence the decrease in the time-period.

53.0 Reference: Project Costs and Benefits

Exhibit No. B-1, Tab 5.0, pp. 70-71

Capital Cost Summary

AMI	Activity	Pre-Deployment Costs	Deployment Costs	Post Deployment Costs	Total
		($000s)	($000s)	($000s)	($000s)
AMI Project Development and Regulatory Costs					
1	2007 AMI Application	291			
2	2012 AMI Application	1,687			
3	Consultants	275			
4	Regulatory Process (forecast)	2,660			
5	Total	4,913			4,913
CAPEX					
1	Third Party Software and Services		5,830		
2	Meters (Including Deployment)		20,323		
3	Network Infrastructure		4,449		
4	System Integration		2,349		
5	Theft Detection		1,100		
6	Project Management		3,130		
7	CPCN Development/Approval Costs		4,915		
8	Capitalized Overhead, AFUDC, PST		5,591		
9	Total Capital Expenditure		47,687		47,687
Sustaining Capital					
	Meter Growth and Replacement		-352	3,611	
	Handheld Replacement		-250	-899	
	IT Hardware, Licensing, and Support Costs		860	11,907	
	Measurement Canada Compliance		-1,958	-16,597	
	Total Sustaining Capital		-1,700	-1,979	-3,679

Operating Expenses					
	New Operating Costs		2,404	29,792	
	Meter Reading		-998	-57,118	
	Disconnect/Reconnect		-547	-12,720	
	Meter Exchanges		-680	507	
	Contact Centre		27	-1,183	
	Total Operating Expenses		205	-40,723	-40,518
Theft Reduction			-3,081	-90,624	-93,705
	Total	4,913	43,111	-133,326	-85,302

53.1 Please confirm the above table is an accurate summary of all AMI gross costs and gross benefits in Table 5.1.a, 5.1.b, and 5.1.1.a, or provide the necessary changes.

Response:

Not confirmed. Changes as follows:

- In the table above CAPEX line 7 double counts AMI Project Development line 5;
- AMI Project Development and Regulatory Costs are being restated to correct Table 5.1.1a;
- Sustaining Capital items are post deployment, as are operating expenses/benefits. They cannot occur until after deployment is complete. To clarify, the proposed phased implementation completes the back office and creates sustaining capital costs prior to Project completion. Further, the proposed regional nature of network and meter deployment completes regions within the service territory prior to completion of the whole project. When a region is complete, benefits can begin to accrue.

The adjusted table is as follows:

Table BCUC IR1 Q53.1 – Cost Summary

AMI	Activity	Pre-Deployment Costs	Deployment Costs	Post Deployment Costs	Total
			($000s)		
AMI Project Development and Regulatory Costs					
1	2007 AMI Application	275			
2	2012 AMI Application	2,217			
3	Consultants	423			
4	Regulatory Process (forecast)	2,000			
5	Total	4,915			4,915
CAPEX					
1	Third Party Software and Services		5,830		
2	Meters (including Deployment)		20,323		
3	Network Infrastructure		4,449		
4	System Integration		2,349		
5	Theft Detection		1,100		
6	Project Management		3,130		
7	Capitalized Overhead, AFUDC, PST		5,592		
8	Total Capital Expenditure		42,773		42,773
Sustaining Capital					
	Meter Growth and Replacement			4,286	
	Handheld Replacement			- 1,149	
	IT Hardware, Licensing, and Support Costs			12,767	
	Measurement Canada Compliance			- 18,555	
	Total Sustaining Capital			- 2,651	- 2,651
Operating Expenses					
	New Operating Costs			32,196	
	Meter Reading			- 58,116	
	Disconnect/Reconnect			- 13,267	
	Meter Exchanges			- 1,802	
	Contact Centre			- 1,157	
	Total Operating Expenses			- 42,146	- 42,146
Theft Reduction				- 93,705	- 93,705
	Total	4,915	42,773	- 138,502	- 90,814

53.1.1 Are there any other costs or benefits that should be added to the above table?

Response:

No. The Application provides the costs and benefits associated with the AMI Application; however a change in the assumptions included in the Application could improve the benefits associated with the Project.

53.2 What is the basis of the estimate?

Response:

AMI Project Development and Regulatory Costs consist of expenditures incurred preparing the CPCN application and managing the regulatory submission/process for review of the application. Estimated costs are based primarily on expenditures incurred for similar regulatory processes.

CAPEX and Sustaining Capital are largely based upon fixed costs and unit prices negotiated with Itron, and actual costs (Meter Growth) and benefits (Handheld Replacement) inflated to the year in which they would be experienced. The IT and Project Management cost estimates are based upon FortisBC's experience in managing large scale projects.

Measurement Canada avoided costs are estimated based upon the Company's analysis of the performance of its existing fleet of meters against the new Measurement Canada SS-0-6.

Operating Costs are based upon existing experience in managing the utility, inflated through the project timeframe.

Operating Cost benefits are avoided costs based upon existing costs inflated through the project timeframe.

53.3 What is the percent accuracy of the Class 3 estimate of the costs and the benefits? Note the previous application was -10 percent/+20 percent.

Response:

For reference:

AACE Class Categories

Class 5:
Level of Project Definition - 0% - 2%
Expected Accuracy Range:
L -20% to -50%
H +30% to +100%

Class 4:
Level of Project Definition - 1% - 15%
Expected Accuracy Range:
L -15% to -30%
H +20% to +50%

Class 3:
Level of Project Definition - 10% - 40%
Expected Accuracy Range:
L -10% to -20%
H +10% to +30%

Class 2:
Level of Project Definition - 30% - 70%
Expected Accuracy Range:
L -5% to -15%
H +5% to +20%

Class 1:
Level of Project Definition - 50% - 100%
Expected Accuracy Range:
L -3% to -10%
H +3% to +15%

The Company has broken the proposed AMI project down into its major components, and made an AACE determination on each. As a result of that analysis, it was found that a substantial portion of the project warranted a Class 3 (26.5%) or Class 4 (2.6%) classification.

As a result, when discussing the project as a whole, FortisBC considers it prudent to consider it as a Class 3 classification. The aggregate contingency estimated for the project (at 6.4%) falls within the AACE guideline of -20 percent / +30 percent.

53.4 What was the methodology applied in the estimating process?

Response:

First, the Company segmented the proposed AMI project into its major components, defining them in terms of component cost and percentage of total project cost.

Each component was assessed against AACE guidelines (see the response to BCUC IR1, Q53.3 for reference) in order to determine the applicable estimate range. The proposed contingency for each component was then examined to determine if it made sense relative to the applicable AACE estimate guideline.

In order to arrive at a reasonable "full project" AACE estimate, the last step was to group the components (excluding regulatory, PST, AFUDC, Capitalized Overhead and contingency costs) into the variously applicable AACE estimate categories. See below:

	AMI Project Contingency Project Component Totals by AACE Class	Cost of Component Totals	% of Total Project Cost	Component Contingency $	Component Contingency %
1	Class 1	$1,272,977	2.67%	$15,347	1.21%
2	Class 2	$19,494,991	40.88%	$711,755	3.65%
3	Class 3	$12,647,671	26.52%	$1,664,298	13.16%
4	Class 4	$1,250,000	2.62%	$125,000	10.00%
5	not estimated (Sunk costs = pre-filing + Regulatory estimate)	$4,914,677	10.31%	$0	0.00%
6	Totals =	$39,580,316		$2,516,400	6.4%
7	CapOH/PST/AFUDC	$5,592,033			
8	AMI Project Contingency	$2,516,400			
9	AMI Project Total	$47,688,749			

As this demonstrates, while the bulk of the proposed project is AACE estimate 2 or better, there remains a material portion of the proposed project at Class 3 or 4.

53.5 What is included in the estimate?

Response:

The estimate includes:

- Capital costs covering hardware, software, and the work required to implement them, including project management costs;
- Project development and regulatory costs;
- AFUDC;
- PST;
- Capitalized Overhead; and
- An aggregate contingency for the whole project, as determined through the process

described in response to BCUC IR1 Q53.4.

53.6 What is not included in the estimate?

Response:

All known capital, sustaining and operating expenditures are included in the estimate.

53.7 What allowances have been included in the estimate?

Response:

The estimate includes:

- Inflation at 1.8 percent per year, on all aspects of the project not covered by fixed unit or fixed price contract; and
- the contingency allowance as described in response to BCUC IR1 Q53.4.

53.8 What assumptions have been included in the estimate?

Response:

High-level assumptions include:

- Positive BCUC decision by mid-July 2013, ensuring that the contract with Itron need not be renegotiated or canceled;
- Project implementation begins as per preliminary project plan, in Q3 2013;
- Implementation proceeds as per schedule in preliminary project plan, completing in Q4 2015;
- Post-AMI manual meter reading for no more than 1% of customer base;
- Customer AMI meter refusals do not exceed 0.5% of customer base; and
- Regulatory costs do not exceed $2 million.

Section 5.0 of the Application contains a number of more detailed assumptions that underlie the estimate, including discount rates, inflation rates, depreciation rates and assumptions made when calculating benefits.

53.9 What is the escalation allowance over and above CPI?

Response:

There is no cost escalation allowance included that is over and above CPI.

53.10 What exchange rate is used?

Response:

All contracted amounts were quoted and will be paid in Canadian dollars, so no exchange rate is used.

53.11 Provide a cost sensitivity analysis on the risks (costs and delay of benefits) due to the schedule slipping because of a delay in the planned implementation.

Response:

The table below replicates the table provided by the Commission for Q53, with columns added for each of the delay scenarios modeled (6 month, 1 year, and 2 year).

Table BCUC IR1 Q53.11 – Cost Sensitivity Analysis of Project Implementation Delay

Net AMI	**Errata 1**	**6 month delay**	**1 year delay**	**2 year delay**
Project Start Date	3Q2013	2Q2014	3Q2014	3Q2015
Activity	($000s)			
AMI Project Development and Regulatory Costs	2013 - 2032	2013 - 2033	2013 - 2033	2013 - 2034
Total	$4,915	$4,915	$4,915	$4,915
CAPEX				
Total Capital Expenditure	$42,773	$45,126	$45,126	$45,938
Sustaining Capital				
Meter Growth and Replacement	$4,286	$4,880	$4,880	$5,652
Handheld Replacement	-$1,149	-$1,149	-$899	-$1,257
IT Hardware, Licensing, and Support Costs	$12,767	$12,882	$12,997	$13,227
Measurement Canada Compliance	-$18,555	-$17,864	-$17,864	-$17,493
Total Sustaining Capital	-$2,651	-$1,251	-$886	$129
Operating Expenses				
New Operating Costs	$32,196	$32,486	$32,776	$33,355
Meter Reading	-$58,116	-$60,620	-$59,574	-$61,976
Disconnect/Reconnect	-$13,267	-$14,245	-$14,245	-$14,953
Meter Exchanges	-$1,802	-$1,087	-$1,087	-$883
Contact Centre	-$1,157	-$1,212	-$1,212	-$1,254
Total Operating Expenses	-$42,146	-$44,678	-$43,342	-$45,711
Theft Reduction	-$93,705	-$99,376	-$97,867	-$101,519
Total	-$90,814	-$95,264	-$92,054	-$96,248
Project NPV	-$17,629	-$16,316	-$13,162	-$11,979

53.12 As the contingency for the overall project is 6.4 percent, please provide the contingency calculation.

Response:

Please see the response to BCUC IR1 Q53.4.

53.13 Provide a breakdown of the CPCN Development/Approval costs being applied.

Response:

The CPCN Development/Approval costs of $4.915 million listed in the table above are the same as the AMI Project Development and Regulatory costs listed in the pre-deployment costs column, and include those costs related to the 2007 AMI application, the 2012 AMI application, consultants, and the regulatory process. Please refer to the response to BCUC IR1 Q50.1.2 for a breakdown of the forecast costs associated with the regulatory process.

As noted in the response to BCUC IR1 Q53.1 above, the pre-deployment costs of $4.913 million as noted in the table above, and also presented in Table 5.1.1.a from the Application are incorrect, and should read $4.915 million. Please refer to Errata No. 1.

53.14 Please identify the expenditures and benefits that are under the control of FortisBC for which they could possibly be held accountable in a future prudency review.

Response:

FortisBC respectfully submits that an application for a CPCN filed pursuant to sections 45 and 46 of the *Utilities Commission Act* should be reviewed and tested to the Commission's satisfaction prior to the Commission's issuance of a CPCN. The costs and benefits of the proposed project are forecast on the best information available at the time of application for a CPCN. If there were significant variances between forecast and actual costs then the Commission may determine whether a prudency review is required and conduct such a review pursuant to sections 59 "Discrimination in rates" and 60 "Setting of Rates" of the *Utilities Commission Act*. These sections of the Act essentially establish the rules that the Utility and the Commission must abide by in setting rates.

It is not possible to pre-determine which, if any, costs could possibly be the subject of a future prudency review. Typically, if the Commission felt that a prudency review was warranted, it would establish a phase 1 process to determine whether or not there were reasonable grounds to question the prudence of the decisions of FortisBC that led to the expenditure and whether the Commission should establish a Stage 2 proceeding to review the prudency of the expenditures prior to allowing them into rates.

53.14.1 Explain how the deployment and post-deployment benefits will be tracked and be returned to the ratepayers.

Response:

Please refer to the response BCUC IR1 Q54.14.2.

53.14.2 Does FortisBC propose accumulating the benefits in a holding account to be dealt with in subsequent revenue requirement applications before being taken in as revenue?

Response:

No. Consistent with all capital projects undertaken by the Company, the benefits would be incorporated into Revenue Requirements either as cost reductions or incremental revenue as they are forecast to be realized. Attempting to accumulate the benefits in a "holding" deferral account would be inconsistent with the treatment of other capital, would provide no incremental benefit to customers and would add additional administrative burden to the utility. The Company has forecast loss reductions of 2 GWh associated with theft reduction due to AMI in its 2012 – 2013 Revenue Requirements Application.

53.15 Please explain why theft reduction is not part of the OPEX expenditures/benefits.

Response:

Theft reduction benefits are a combination of power purchase reductions and revenue increases, and so have been separated from capital and operating expenses.

53.16 Provide a cash flow diagram of the costs and benefits for the Application.

Response:

Please refer to the response to BCUC IR1 96.1.

54.0 Reference: Project Costs and Benefits

Exhibit B-1, Tab 5.0, Section 5.1

Theft Analytics

Table 5.1.a – AMI Project Capital Cost Summary

	Item	2013	2014	2015	Total 2013-2015
		($000s)			
1	Third Party Software and Services	4,746	723	361	5,830
2	Meters (Including Deployment)	384	10,089	9,850	20,323
3	Network Infrastructure	-	1,677	2,772	4,449
4	System Integration	1,519	511	319	2,349
5	Theft Detection	-	-	1,100	1,100
6	Project Management	936	1,274	920	3,130
7	CPCN Development/Approval Costs	4,915	-	-	4,915
8	Capitalized Overhead, AFUDC, PST	1,230	2,519	1,842	5,592
9	**Total**	**13,730**	**16,793**	**17,166**	**47,689**

"Theft Detection - These costs are for additional metering required to detect losses on the distribution system." [Ref: B-1, p. 71]

Theft Analytics—A suite of software tools that support enhanced electricity network modeling methods, as well as the business rules required to analyze measurement data captured from new distribution system meters and the end-user advanced meters. [Ref: B-1, App. C-4, p. 22 of 44]

54.1 Please expand on the distribution system metering to be installed on FortisBC's system, including the number, costs, and timing.

<u>Response:</u>

The proposed distribution metering system that enables the detection of electricity theft through energy balancing consists of three types of meters:

- 300 permanent feeder meters at a unit cost of $2,500. This provides for one meter per feeder phase as well as allowances for additional meters on high load feeders. These meters will help analyse specific losses per feeder and enable the identification of feeders with a high risk of energy theft.
- 225 transformer meters at a unit cost of $800. These meters will be deployed to strategic areas of the targeted feeders to narrow the area of focus for the use of the portable

meters. They will be redeployed throughout the system depending on which feeders are being analysed.

- 50 portable meters at a unit cost of $1,000. These meters are designed for easy deployment and redeployment along targeted areas of a feeder to identify a selection of premises where energy theft is indicated.

54.2 Please expand on the theft analytics that FortisBC will use to analyze the measurement data captured from the new distribution system and advanced meters.

Response:

Beginning in 2014 FortisBC will use the new data from AMI to identify potential theft sites as outlined in Section 5.3 of the Application. Tamper flag reports, combined with the improved data quality and on-demand meter reading available from AMI, will be used to identify theft as described in Tab 5.0, pages 87-88 of the Application. In addition, energy balancing as described in Tab 5.0, pages 88-89 of the Application, will be utilized. Data from AMI will be analysed manually using Excel and existing statistical programs in conjunction with SCADA applications.

54.3 Please provide the amount included in the project financial analysis for the incremental operations and maintenance increase required due to theft detection analysis and in-field investigation. Please identify where the cost of the theft analytics software and process are included in the project financial analysis.

Response:

The project financial analysis includes as part of the New O&M identified on Line 46 of the Gross AMI spreadsheet included in Exhibit B-3 an increase of $118,000 in 2014 for the provision of one data analyst to identify potential theft sites from the additional consumption data by AMI meters. Beginning in 2015 the budget includes an additional increase of $123,000 for a Power Line Technician to support existing staff in the deployment of feeder and transformer meters. All AMI software is included in Project Capital on Line 27 of the Gross AMI spreadsheet included in Exhibit B-3.

55.0 Reference: Project Costs and Benefits

Exhibit B-1, Tab 5.0, Section 5.1

Non-Project Capital

Table 5.1.b – Summary of All Incremental Non-Project Costs and Benefits

AMI	2013	2014	2015	2016	2017 – 2032	Total
Sustaining Capital						
Meter Growth and Replacement	-	(183)	(169)	(243)	3,854	3,259
Handheld Replacement	-	(250)	-	-	(899)	(1,149)
IT Hardware, Licensing, and Support Costs	-	292	568	578	11,329	12,767
Measurement Canada Compliance	(146)	(909)	(903)	(1,478)	(15,119)	(18,555)
Total Capital	**(146)**	**(1,050)**	**(504)**	**(1,143)**	**(836)**	**(3,678)**

55.1 Please explain further the items included in the IT hardware, licensing and support costs, and separate the amounts shown into three or more discrete sets of costs, by year from 2014 to 2032, in a working spreadsheet. Please separate the IT hardware by year into categories that match the depreciation categories.

Response:

Note, as per the Company's response to BCUC IR1 Q42.2, the sub-categories are more appropriately entitled “IT Support Costs”, “IT Licensing”, and “Equipment / Hardware/ Servers”.

Please see the tables provided below:

Table BCUC IR1 Q55.1 – IT Support Costs, Licensing, and Equipment/Hardware/Servers

		2013	2014	2015	2016	2017	2018
1	**IT Support Costs**						
	Total	**$ -**	**$ 64,986.53**	**$ 199,010.17**	**$ 202,592.36**	**$ 206,239.02**	**$ 209,951.32**
2	**IT Licensing Costs**						
	Total	**$ -**	**$ 227,096.64**	**$ 316,370.86**	**$ 322,065.53**	**$ 327,862.71**	**$ 333,764.24**
3	**Equipment / Hardware / Servers**						
	Battery Changeout - CGR	$ -	$ -	$ -	$ -	$ -	$ -
	Spare AMI network Equipment	$ -	$ -	$ 52,634	$ 53,581	$ 54,546	$ 55,528
	System Hardware and Servers	$ -	$ -	$ -	$ -	$ 34,057.13	$ -
	SAN (Storage Area Network)	$ -	$ -	$ -	$ -	$ 113,523.78	$ -
	Total	**$0.00**	**$0.00**	**$52,634.03**	**$53,581.44**	**$202,126.82**	**$55,527.73**
Total Sustaining Capital Costs for AMI System		**$ -**	**$ 292,083**	**$ 568,015**	**$ 578,239**	**$ 736,229**	**$ 599,243**

		2019	2020	2021	2022	2023	2024
1	**IT Support Costs**						
	Total	**$ 213,730.45**	**$ 217,577.59**	**$ 221,493.99**	**$ 225,480.88**	**$ 229,539.54**	**$ 233,671.25**
2	**IT Licensing Costs**						
	Total	**$ 339,772.00**	**$ 345,887.90**	**$ 352,113.88**	**$ 358,451.93**	**$ 364,904.06**	**$ 371,472.34**
3	**Equipment / Hardware / Servers**						
	Battery Changeout - CGR	$ -	$18,683.35	$ -	$ -	$ -	$ -
	Spare AMI network Equipment	$ 56,527	$ 57,545	$ 58,581	$ 59,635	$ 60,708	$ 61,801
	System Hardware and Servers	$ -	$ -	$ -	$ 37,234.63	$ -	$ -
	SAN (Storage Area Network)	$ -	$ -	$ -	$ 124,115.42	$ -	$ -
	Total	**$56,527.23**	**$76,228.07**	**$58,580.53**	**$220,985.02**	**$60,708.40**	**$61,801.16**
Total Sustaining Capital Costs for AMI System		**$ 610,030**	**$ 639,694**	**$ 632,188**	**$ 804,918**	**$ 655,152**	**$ 666,945**

		2025	2026	2027	2028	2029	2030
1	**IT Support Costs**						
	Total	**$ 237,877.33**	**$ 242,159.12**	**$ 246,517.99**	**$ 250,955.31**	**$ 255,472.51**	**$ 260,071.01**
2	**IT Licensing Costs**						
	Total	**$ 378,158.84**	**$ 384,965.70**	**$ 391,895.08**	**$ 398,949.19**	**$ 406,130.28**	**$ 413,440.62**
3	**Equipment / Hardware / Servers**						
	Battery Changeout - CGR	$ -	$0.00	$0.00	$21,549.49	$0.00	$0.00
	Spare AMI network Equipment	$ 62,914	$ 64,046	$ 65,199	$ 66,372	$ 67,567	$ 68,783
	System Hardware and Servers	$ -	$ -	$ 40,708.57	$ -	$ -	$ -
	SAN (Storage Area Network)	$ -	$ -	$ 135,695.24	$ -	$ -	$ -
	Total	**$62,913.58**	**$64,046.02**	**$241,602.66**	**$87,921.92**	**$67,567.13**	**$68,783.34**
Total Sustaining Capital Costs for AMI System		**$ 678,950**	**$ 691,171**	**$ 880,016**	**$ 737,826**	**$ 729,170**	**$ 742,295**

		2031	2032
1	**IT Support Costs**		
	Total	**$ 264,752.29**	**$ 269,517.83**
2	**IT Licensing Costs**		
	Total	**$ 420,882.55**	**$ 428,458.44**
3	**Equipment / Hardware / Servers**		
	Battery Changeout - CGR	$0.00	$0.00
	Spare AMI network Equipment	$ 70,021	$ 71,282
	System Hardware and Servers	$ -	$ -
	SAN (Storage Area Network)	$ -	$ -
	Total	**$70,021.44**	**$71,281.83**
Total Sustaining Capital Costs for AMI System		**$ 755,656**	**$ 769,258**

55.2 Please explain if the licensing fees are paid on an annual basis, and if they cover maintenance and upgrades automatically provided by the vendors.

Response:

Licensing fees are paid on an annual basis. The costs in Table 5.1.b from the Application include maintenance, updates and upgrades associated with each agreement.

55.3 Please explain further the Measurement Canada compliance capital, including the impact of the change in the standards for electro-mechanical meters and why there would not be a more pronounced peak in the savings by year. Please provide the number of meters that relates to the dollar amounts in each year from 2013 to 2032.

Response:

The Measurement Canada compliance capital line item refers to the cost to replace FortisBC's electro-mechanical and small-batch digital meter fleet, based on an accelerated end of life resulting from the new Measurement Canada SS-06 regulations. These numbers do not include the cost of the compliance sampling activities. The costs in each year are directly correlated to the number of meters having their seals expire in a given year. The quantity of expirations in each year was estimated by a model that is described in the response to BCUC IR1 Q5.1. In practice, it is possible that FortisBC would have applied to replace the meters more quickly than the model indicates if customers concerns arose about the accuracy of electromechanical meters.

More pronounced peaks are due to increased meter seal expirations in a given year due to large lot sizes or several large groups expiring together.

The following table outlines the predicted number of electro-mechanical and small-batch digital meter replacements between 2014 and 2034.

Year	Replacements
2014	4,295
2015	4,169
2016	7,325
2017	4,419
2018	11,592
2019	4,741
2020	7,653
2021	5,350
2022	4,429
2023	6,241
2024	3,018
2025	5,368
2026	1,296
2027	1,327
2028	338
2029	372
2030	329
2031	865
2032	2,821

56.0 Reference: Project Costs and Benefits

Exhibit No. B-1, Tab 5.0, pp. 70-71

Table 5.1.a and Table 5.1.b

56.1 Provide the estimate of the capital expenditure (CAPEX) by the work breakdown structure (WBS) used for the project (the next level below that shown in Table 5.1.a and Table 5.1.b) and by contract for outsourced items and include sunk costs and salvage/disposal costs.

Response:

Due to contractual sensitivities, the response has been filed with the Commission in confidence.

56.1.1 Separate the CAPEX estimate provided into direct and indirect costs while showing material and labour costs.

Response:

Please refer to BCUC IR1 Q56.1.

56.2 Provide a sensitivity analysis of the NPV if the benefits are not realized within the time frames specified.

Response:

Please refer to the response to BCUC IR1 Q43.1.

56.3 Has FortisBC established a benefit realization plan?

Response:

FortisBC intends to monitor the realization of financial benefits described in Section 5.3 of the Application as shown in the following table:

Table BCUC IR1 Q56.3 – Financial Benefit Realization

Benefit Description	Monitoring Plan
Meter reading cost	Compare actual meter reading expenses to the forecast on Line 47 of the *Gross AMI* worksheet filed as part of Exhibit B-3
Theft reduction	Compare actual number of theft sites identified to the number of theft sites forecast on Row 26 of the *Theft Reduction* worksheet filed as part of Exhibit B-3 Compare actual revenue recovered from theft sites to the revenue forecast on Row 29 of the *Theft Reduction* worksheet filed as part of Exhibit B-3
Remote disconnect/reconnect	Compare cost of manual disconnects and reconnects to the forecast on Line 48 of the *Gross AMI* worksheet filed as part of Exhibit B-3
Measurement Canada compliance	Monitor whether 100% of electromechanical and small-batch digital meters are replaced with AMI meters.
Meter exchanges	Compare actual Measurement Canada-related compliance meter exchange expenses to the forecast on Line 49 of the *Gross AMI* worksheet filed as part of Exhibit B-3
Contact centre	Monitor whether the Contact Centre needs to manually enter any soft reads into the billing system once the AMI project is complete.

FortisBC proposes to report on the above items annually to the BCUC for a period of five years once the AMI project is complete.

56.3.1 How does FortisBC propose to monitor benefit realization?

Response:

Please see the response to BCUC IR1 Q56.3.

56.4 As the project may cause a transfer of economic benefits from consumers to electricity businesses, please provide a separation of the economic benefits and amounts in table format by customers and others and how these benefits could be passed on to the ratepayers.

Response:

FortisBC does not believe any economic benefits are transferred from consumers to electricity businesses.

56.5 How does FortisBC propose to review and monitor project viability and management of risks, and the potential for and impact of unintended outcomes on the ratepayers?

Response:

FortisBC plans to continuously review and monitor the AMI project and manage risks as they are identified. Please also see Exhibit B-1, Tab 4.0, Section 4.3.5, pp. 66-67 and the responses to BCUC IR1 Q46.1 - Q46.3.1.

FortisBC notes that the Project as proposed in the Application is viable. As a prudent utility operator, FortisBC will ensure project risks are managed as is done for all capital projects undertaken for the benefit of customers, however no ongoing monitoring of project viability is planned.

57.0 Reference: Project Costs and Benefits

Exhibit B-1, Tab 5.0, Section 5.1, p. 72

Meter Reading Savings

Table 5.1.b – Summary of All Incremental Non-Project Costs and Benefits

AMI	2013	2014	2015	2016	2017 – 2032	Total
Operating Expenses						
Meter Reading	-	-	(998)	(2,544)	(54,574)	(58,116)

57.1 The meter reading savings shown in the extract of Table 5.1.b above increase by 6.4 percent in 2017, and by a similar amount every three years after 2017. The meter readings increase by about 1.7 percent per year in the other years. Please explain the assumptions for these year over year inflation factors.

Response:

All meter reading expenses are inflated at 1.8 percent per year. However, in order to maintain the average annual reads per meter reader at approximately 36,000 reads per year, the

Company has forecast (in the Status Quo scenario) that an additional meter reader will be required in each of 2014, 2017, 2020, 2023, 2026, 2029, and 2032. Each of these additional meter readers are accompanied by an associated increase in non-labour support, vehicle and handheld support. As a result, savings attributed to the Company's proposed AMI Project grow disproportionally (more than the 1.8 percent inflation rate) in those years as noted in the question.

57.2 Please separate out the meter reading savings, by year, by labour, vehicles, general inflation, and any other. Detail the "other" if more than five percent of the annual savings.

Response:

Please see the following table:

Table BCUC IR1 Q57.2 – Meter Reading Savings

Meter Reading savings	2015	2016	2017	2018	2019	2020	2021	2022
Total Operating Labour (Incl. Benefits)	$ 790	$ 2,000	$ 2,112	$ 2,145	$ 2,180	$ 2,322	$ 2,358	$ 2,397
Total Non-Labour Operating	$ 58	$ 146	$ 154	$ 157	$ 159	$ 169	$ 172	$ 175
Vehicle Expenses	$ 144	$ 363	$ 384	$ 390	$ 396	$ 422	$ 428	$ 435
Handheld Support	$ 7	$ 17	$ 18	$ 19	$ 19	$ 20	$ 20	$ 21
Total Inflation		$ 18	$ 45	$ 48	$ 49	$ 50	$ 53	$ 54
Total Savings	$ 998	$ 2,544	$ 2,713	$ 2,757	$ 2,803	$ 2,983	$ 3,032	$ 3,082

Meter Reading savings	2023	2024	2025	2026	2027	2028	2029	2030
Total Operating Labour (Incl. Benefits)	$ 2,549	$ 2,589	$ 2,632	$ 2,794	$ 2,838	$ 2,886	$ 3,059	$ 3,104
Total Non-Labour Operating	$ 186	$ 189	$ 192	$ 204	$ 207	$ 211	$ 223	$ 227
Vehicle Expenses	$ 463	$ 470	$ 478	$ 507	$ 516	$ 524	$ 556	$ 564
Handheld Support	$ 22	$ 22	$ 23	$ 24	$ 25	$ 25	$ 26	$ 27
Total Inflation	$ 55	$ 58	$ 59	$ 60	$ 64	$ 65	$ 66	$ 70
Total Savings	$ 3,274	$ 3,329	$ 3,384	$ 3,589	$ 3,649	$ 3,710	$ 3,929	$ 3,991

Meter Reading savings	2030	2031	2032
Total Operating Labour (Incl. Benefits)	$ 3,104	$ 3,156	$ 3,341
Total Non-Labour Operating	$ 227	$ 230	$ 244
Vehicle Expenses	$ 564	$ 573	$ 607
Handheld Support	$ 27	$ 27	$ 29
Total Inflation	$ 70	$ 71	$ 72
Total Savings	$ 3,991	$ 4,058	$ 4,292

57.3 Please confirm, or otherwise explain why, the labour cost is increasing at three percent per year, why the vehicle costs are increasing at five percent per year, and why the general inflation is increasing at two percent per year.

Response:

FortisBC believes that the question may refer to the December 19, 2007 CPCN application for AMI, in which on page 28, the Company gave its financial assumptions, including those inflationary rates noted in the question.

However, in the current AMI proposal, the Company is using a more conservative 1.8% inflation rate for all aspects, including labour, vehicle, and general inflation.

58.0 Reference: Project Costs and Benefits

Exhibit B-1, Tab 5.0, Table 5.1.b, p. 72;

Exhibit B-3, Excel Document: "FortisBC – AMI Excel NPV Analysis – 17Aug12"

New Operating Costs

Table 5.1.b identifies $32,196 thousand in new operating costs associated with the AMI project between 2013 and 2032.

58.1 For each year between 2013 and 2032, please complete the attached table. Please include any other relevant cost categories.

New Operating Costs	Year
Category:	($000s)
Staffing	
Software Licensing and Support	
Wide Area Network (WAN)	
Hardware and and Operations	
Maintenance	
Total	
Total should agree to Exhibit B-3, Excel Document, Tab "Gross AMI", Line No. 46	

Response:

Please see the table provided below:

Table BCUC IR1 Q58.1 – New Operating Costs

		2013	2014	2015	2016	2017	2018	2019
1	STAFF				$000s			
	Total Staffing Costs	-	408	951	969	994	1,012	992
2	SOFTWARE LICENSING / SUPPORT COSTS							
	Total Licensing Costs	-	226	230	234	238	242	247
3	WAN Technologies							
	Total WAN Costs	-	242	246	250	254	258	262
4	HARDWARE							
	Total Hardware Costs	-	-	57	57	57	57	57
5	OPERATIONAL COSTS							
	Total Operational Costs	-	-	44	45	45	46	47
Total Ongoing O&M Costs for AMI System		-	**875**	**1,528**	**1,554**	**1,588**	**1,615**	**1,604**

		2020	2021	2022	2023	2024	2025	2026
1	**STAFF**				**$000s**			
	Total Staffing Costs	1,006	1,021	1,036	1,051	1,067	1,083	1,099
2	**SOFTWARE LICENSING / SUPPORT COSTS**							
	Total Licensing Costs	251	256	260	265	270	275	280
3	**WAN Technologies**							
	Total WAN Costs	266	270	275	279	283	288	293
4	**HARDWARE**							
	Total Hardware Costs	57	57	57	57	57	57	57
5	**OPERATIONAL COSTS**							
	Total Operational Costs	48	49	50	51	51	52	53
Total Ongoing O&M Costs for AMI System		**1,628**	**1,653**	**1,677**	**1,703**	**1,728**	**1,754**	**1,781**

		2027	2028	2029	2030	2031	2032
1	**STAFF**				**$000s**		
	Total Staffing Costs	1,115	1,132	1,149	1,166	1,183	1,201
2	**SOFTWARE LICENSING / SUPPORT COSTS**						
	Total Licensing Costs	285	290	295	300	306	311
3	**WAN Technologies**						
	Total WAN Costs	297	302	307	312	317	322
4	**HARDWARE**						
	Total Hardware Costs	57	57	57	57	57	57
5	**OPERATIONAL COSTS**						
	Total Operational Costs	54	55	56	57	58	59
Total Ongoing O&M Costs for AMI System		**1,808**	**1,836**	**1,864**	**1,892**	**1,921**	**1,951**

58.1.1 For each category included in the table above, please provide a description of the costs included in the category.

Response:

Staff includes the Business, Technical and Systems Analysts, the Communication Technician, Telecom Engineer and Revenue Protection personnel. These are based upon FortisBC experience and inflated at 1.8 percent per year.

Software Licensing and Support includes the Itron software (including MDMS, HES, NMS and security) plus the data management software. These are largely contracted fixed price and inflated at 1.8 percent per year.

WAN includes the estimate of WAN operating costs for the preliminary WAN, as described in Section 4.1.3 of the CPCN, and is inflated at 1.8 percent per year.

Hardware is inclusive of the system hardware and servers and the storage area network (SAN), inflated at 1.8 percent per year.

Operational costs include the annual security audits, which are based upon FortisBC experience, and inflated at 1.8 percent per year.

58.1.2 For each category identified above, please discuss the key cost assumptions made and alternatives considered in determining the new operating costs over the 20-year period.

Response:

As the cost assumptions made were based on FortisBC's experience, there were no other alternatives to be considered. Please refer to the response to BCUC IR1 Q58.1.1.

58.1.2.1 For each alternative considered, please discuss the likelihood of each occurring.

Response:

Please refer to the response to BCUC IR1 Q58.1.2.

58.1.2.2 Specifically, please address consideration given to labour escalation costs and customer growth beyond general inflation.

Response:

The Company assumed that labour escalation costs would not exceed general inflation over the study period and that customer growth would remain at a historical average of below two percent.

58.1.3 For staffing costs, please separate costs into the following categories for each year of 2013 – 2032:

- Business analysts
- Technical analysts
- System analysts
- Communications technician

- Telecom engineer
- Revenue protection analysis team
- Other

Response:

Please see the table below:

Table BCUC IR1 Q58.1.3

	2013	2014	2015	2016	2017	2018	2019
STAFF	$000s						
Business Analyst	$ -	$ -	$ 154	$ 157	$ 167	$ 170	$ 136
Technical Analyst	$ -	$ 89	$ 180	$ 184	$ 187	$ 190	$ 194
System Analyst	$ -	$ 83	$ 168	$ 171	$ 175	$ 178	$ 181
Communications Technician	$ -	$ 118	$ 120	$ 122	$ 125	$ 127	$ 129
Telecom Engineer Resource	$ -	$ -	$ 88	$ 89	$ 91	$ 92	$ 94
Revenue Protection Analyst	$ -	$ 118	$ 241	$ 245	$ 249	$ 254	$ 258
Total Staffing Costs	**$ -**	**$ 408**	**$ 951**	**$ 969**	**$ 994**	**$ 1,012**	**$ 992**

	2020	2021	2022	2023	2024	2025	2026
STAFF	$000s						
Business Analyst	$ 135	$ 134	$ 133	$ 132	$ 131	$ 130	$ 128
Technical Analyst	$ 197	$ 201	$ 204	$ 208	$ 212	$ 216	$ 220
System Analyst	$ 184	$ 187	$ 191	$ 194	$ 198	$ 201	$ 205
Communications Technician	$ 132	$ 134	$ 136	$ 139	$ 141	$ 144	$ 146
Telecom Engineer Resource	$ 96	$ 98	$ 99	$ 101	$ 103	$ 105	$ 107
Revenue Protection Analyst	$ 263	$ 268	$ 273	$ 277	$ 282	$ 288	$ 293
Total Staffing Costs	**$ 1,006**	**$ 1,021**	**$ 1,036**	**$ 1,051**	**$ 1,067**	**$ 1,083**	**$ 1,099**

	2027	2028	2029	2030	2031	2032
STAFF	$000s					
Business Analyst	$ 127	$ 126	$ 125	$ 124	$ 123	$ 121
Technical Analyst	$ 223	$ 228	$ 232	$ 236	$ 240	$ 244
System Analyst	$ 209	$ 212	$ 216	$ 220	$ 224	$ 228
Communications Technician	$ 149	$ 152	$ 154	$ 157	$ 160	$ 163
Telecom Engineer Resource	$ 109	$ 111	$ 112	$ 115	$ 117	$ 119
Revenue Protection Analyst	$ 298	$ 303	$ 309	$ 314	$ 320	$ 326
Total Staffing Costs	**$ 1,115**	**$ 1,132**	**$ 1,149**	**$ 1,166**	**$ 1,183**	**$ 1,201**

58.1.4 Please discuss if consideration was given to incremental operating costs that could be incurred during the implementation phase of the AMI project between 2013 and 2015. Commission staff note that the incremental operating costs are nil in 2013 and $875 thousand in 2014, compared to $1,529 thousand in 2015 and $1,556 thousand in 2016 (per Exhibit B-3, tab “Net AMI” Line No. 46).

Response:

New AMI-related operating costs are forecast to occur when the portions of proposed AMI system that they are supporting become functional. 2013 is largely the design phase of the project, with no portion of the proposed system becoming functional. Software systems, portions of the communications network and some meters will be installed and functional by the end of 2014, attracting a portion of the new operating costs. By the end of 2015 the entire system will be functional, attracting the full forecast operating costs.

58.2 Please recalculate the NPV of the "Net AMI" project assuming the following individual scenarios:

- New Operating Costs (Line 46) – three percent increase per year, commencing in 2016.
- New Operating Costs (Line 46) – five percent increase per year, commencing in 2016.
- New Operating Costs (Line 46) of $875 thousand in 2013 and $1,529 thousand in 2014 and 2015, increasing by five percent per year, commencing in 2016.
- New Operating Costs (Line 46) of $875 thousand in 2013 and $1,529 thousand in 2014 and 2015, increasing by three percent per year, commencing in 2016.

For this question, please provide the analysis supporting the NPV estimation, state all assumptions used, and comment on the likelihood of each event occurring.

Response:

The Company has numbered the scenarios listed above as:

- Scenario 1 New Operating Costs (Line 46) – three percent increase per year, commencing in 2016;
- Scenario 2 New Operating Costs (Line 46) – five percent increase per year, commencing in 2016;
- Scenario 3 New Operating Costs (Line 46) of $875 thousand in 2013 and $1,529 thousand in 2014 and 2015, increasing by five percent per year, commencing in 2016;
- Scenario 4 New Operating Costs (Line 46) of $875 thousand in 2013 and $1,529 thousand in 2014 and 2015, increasing by three percent per year, commencing in 2016.

Scenario	Project NPV (000s)
filed Net AMI (errata 1)	$17,629
Scenario 1	$17,258
Scenario 2	$17,011
Scenario 3	$15,641
Scenario 4	$15,888

Results:

The analysis for each scenario was identical to the Net AMI analysis in Exhibit B-3 other than the changes in the New Operating Costs line described in each scenario.

The Company considers Scenario 1 more likely than Scenario 2, but considers both less likely than the base inflation assumption of 1.8%.

The Company considers 1.8% to be a conservative scenario, and notes that if in the overall NPV analysis the inflation assumption was changed to 3.0% (for all costs in both the AMI and Status Quo cases), the NPV benefit of the AMI project would increase to $26.688 million.

Scenario 3 and 4, which provide for new operating costs starting in 2013, are unlikely since operation of the proposed AMI project will not commence in 2013.

The supporting NPV analyses are provided as Attachment BCUC IR1 58.2.

Revenue Requirements Analysis
Advanced Metering Infrastructure Project

AMI Scenario 1

Line No.		NPV @ 8.00%	0 Dec-12	1 Dec-13	2 Dec-14	3 Dec-15	4 Dec-16	5 Dec-17	6 Dec-18	7 Dec-19	8 Dec-20	9 Dec-21	10 Dec-22	11 Dec-23	12 Dec-24	13 Dec-25	14 Dec-26	15 Dec-27	16 Dec-28	17 Dec-29	18 Dec-30	19 Dec-31	20 Dec-32
	Summary																						
	Revenue Requirements																						
1	Operating Expense & Theft Reduction (Net)	**-54,867**	0	(383)	(574)	(1,919)	(4,749)	(5,615)	(6,375)	(6,650)	(7,075)	(7,376)	(7,163)	(7,426)	(7,563)	(7,710)	(8,364)	(8,600)	(8,803)	(9,226)	(9,514)	(9,735)	(10,136)
2	Depreciation Expense	**16,464**	-	-	4,006	4,528	1,401	1,335	1,313	1,190	1,137	1,068	1,025	1,017	975	958	928	941	963	992	2,634	3,063	3,012
3	Carrying Costs	**17,163**	-	-	975	2,411	2,730	2,594	2,430	2,253	2,113	1,983	1,894	1,810	1,722	1,643	1,581	1,548	1,522	1,484	1,384	1,216	1,026
4	Income Tax	**3,982**	-	5	807	123	(966)	(273)	(11)	213	398	553	672	777	868	946	1,014	1,065	1,111	1,151	1,176	1,181	1,178
5	Total Revenue Requirement for Project	**(17,258)**	0	(378)	5,214	5,143	(1,585)	(1,959)	(2,644)	(2,993)	(3,427)	(3,772)	(3,572)	(3,822)	(3,997)	(4,164)	(4,841)	(5,046)	(5,208)	(5,599)	(4,320)	(4,275)	(4,921)
6																							
7	Net Present Value of Revenue Requirements at	**6.0%**	**(23,138)**																				
8	Net Present Value of Revenue Requirements at	**8.0%**	**(17,258)**																				
9	Net Present Value of Revenue Requirements at	**10.0%**	**(12,824)**																				
10																							
11	**Rate Impact**																						
12	Forecast Revenue Requirements		287,441	310,378	327,609	365,860	383,868	390,778	397,812	404,972	412,262	419,682	427,237	434,927	442,756	450,725	458,838	467,097	475,505	484,064	492,777	501,647	510,677
13	Incremental Rate Impact		0.00%	(0.12%)	1.71%	(0.02%)	(1.75%)	(0.10%)	(0.17%)	(0.09%)	(0.11%)	(0.08%)	0.05%	(0.06%)	(0.04%)	(0.04%)	(0.15%)	(0.04%)	(0.03%)	(0.08%)	0.26%	0.01%	(0.13%)
14	Cummulative Incremental Rate Impact		0.00%	(0.12%)	1.58%	1.56%	(0.22%)	(0.31%)	(0.48%)	(0.57%)	(0.67%)	(0.76%)	(0.71%)	(0.77%)	(0.81%)	(0.84%)	(0.99%)	(1.03%)	(1.07%)	(1.15%)	(0.89%)	(0.88%)	(1.01%)
15																							
16	Cumulative Rate Impact of Entire Project		**(1.01%)**																				
17	Levelized Annual Rate Impact		**(0.05%)**																				
18	**Regulatory Assumptions**																						
19	Equity Component		40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%
20	Debt Component		60.00%	60.00%	60.00%	60.00%	60.00%	60.00%	60.00%	60.00%	60.00%	60.00%	60.00%	60.00%	60.00%	60.00%	60.00%	60.00%	60.00%	60.00%	60.00%	60.00%	60.00%
21	Equity Return		9.90%	9.90%	9.90%	9.90%	9.90%	9.90%	9.90%	9.90%	9.90%	9.90%	9.90%	9.90%	9.90%	9.90%	9.90%	9.90%	9.90%	9.90%	9.90%	9.90%	9.90%
22	Debt Return		5.92%	5.82%	5.98%	5.93%	5.73%	5.73%	5.73%	5.73%	5.73%	5.73%	5.73%	5.73%	5.73%	5.73%	5.73%	5.73%	5.73%	5.73%	5.73%	5.73%	5.73%
23	AFUDC		6.60%	6.60%	6.70%	6.60%	6.50%	6.50%	6.50%	6.50%	6.50%	6.50%	6.50%	6.50%	6.50%	6.50%	6.50%	6.50%	6.50%	6.50%	6.50%	6.50%	6.50%
24																							
25																							
26	**Capital Cost**																						
27	Project Capital		-	13,562	15,900	17,166	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
28	Sustaining Capital:		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
29	Meter Growth and Replacement		-	-	99	100	85	110	60	120	147	145	412	422	437	454	194	188	195	197	189	210	520
30	Handheld Replacement		-	-	(250)	-	-	-	-	(273)	-	-	-	-	(299)	-	-	-	-	(327)	-	-	-
31	Measurement Canada Compliance		-	(146)	(909)	(903)	(1,478)	(976)	(2,310)	(1,072)	(1,645)	(1,229)	(1,070)	(1,452)	(820)	(1,324)	(486)	(501)	(293)	(306)	(302)	(432)	(901)
32	IT Hardware, Licencing, and Support Costs		-	-	292	568	578	736	599	610	640	632	805	655	667	679	691	880	738	729	742	756	769
33	AFUDC		-	168	893	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
34	Total Construction Cost in Year		-	13,584	16,026	16,931	(815)	(130)	(1,651)	(615)	(858)	(452)	147	(375)	(15)	(190)	399	567	640	293	629	533	389
35	Cumulative Construction Cost		-	13,584	29,609	46,540	45,725	45,596	43,945	43,330	42,472	42,020	42,167	41,792	41,777	41,587	41,986	42,552	43,192	43,485	44,115	44,648	45,037
36																							
37	Net Cost of Removal		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
38	Total Capital Cost in Year		-	13,584	16,026	16,931	(815)	(130)	(1,651)	(615)	(858)	(452)	147	(375)	(15)	(190)	399	567	640	293	629	533	389
39	Cumulative Capital Cost		-	13,584	29,609	46,540	45,725	45,596	43,945	43,330	42,472	42,020	42,167	41,792	41,777	41,587	41,986	42,552	43,192	43,485	44,115	44,648	45,037
40																							
41	Additions to Plant in Service		-	(307)	29,916	16,931	(815)	(130)	(1,651)	(615)	(858)	(452)	147	(375)	(15)	(190)	399	567	640	293	629	533	389
42	Cummulative Additions to Plant		-	(307)	29,609	46,540	45,725	45,596	43,945	43,330	42,472	42,020	42,167	41,792	41,777	41,587	41,986	42,552	43,192	43,485	44,115	44,648	45,037
43	CWIP		-	13,891	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
44																							
45	**Operating Expenses**																						
46	New Operating Costs		-	-	875	1,529	1,603	1,639	1,668	1,659	1,685	1,712	1,739	1,766	1,794	1,822	1,851	1,881	1,911	1,941	1,973	2,004	2,036
47	Meter Reading		-	-	-	(998)	(2,544)	(2,713)	(2,757)	(2,803)	(2,983)	(3,032)	(3,082)	(3,274)	(3,329)	(3,384)	(3,589)	(3,649)	(3,710)	(3,929)	(3,991)	(4,058)	(4,292)
48	Remote Disconnect/Reconnect		-	-	(133)	(414)	(544)	(564)	(584)	(605)	(627)	(648)	(671)	(694)	(717)	(741)	(766)	(791)	(817)	(843)	(870)	(898)	(1,339)
49	Meter Exchanges		-	-	(349)	(331)	(408)	(310)	(531)	(302)	(187)	(212)	166	190	215	262	(46)	(78)	(60)	(63)	(99)	(21)	364
50	Contact Centre		-	-	20	7	(20)	(56)	(58)	(60)	(62)	(64)	(66)	(69)	(71)	(73)	(76)	(78)	(81)	(83)	(86)	(89)	(91)
51	**Theft Reduction**		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
52	Theft Reduction		0	(383)	(987)	(1,711)	(2,835)	(3,611)	(4,114)	(4,540)	(4,901)	(5,131)	(5,248)	(5,346)	(5,455)	(5,596)	(5,739)	(5,885)	(6,046)	(6,249)	(6,440)	(6,675)	(6,815)
53	**Total Costs / (Savings)**		0	(383)	(574)	(1,919)	(4,749)	(5,615)	(6,375)	(6,650)	(7,075)	(7,376)	(7,163)	(7,426)	(7,563)	(7,710)	(8,364)	(8,600)	(8,803)	(9,226)	(9,514)	(9,735)	(10,136)
54																							
55																							
56																							

Revenue Requirements Analysis
Advanced Metering Infrastructure Project
AMI Scenario 1

Line No.		NPV @ 8.00%	0 Dec-12	1 Dec-13	2 Dec-14	3 Dec-15	4 Dec-16	5 Dec-17	6 Dec-18	7 Dec-19	8 Dec-20	9 Dec-21	10 Dec-22	11 Dec-23	12 Dec-24	13 Dec-25	14 Dec-26	15 Dec-27	16 Dec-28	17 Dec-29	18 Dec-30	19 Dec-31	20 Dec-32
58	**Depreciation Expense**																						
59	Opening Cash Outlay		-	-	(16,353)	13,563	30,494	29,679	29,550	27,899	27,284	26,426	25,974	26,121	25,746	25,731	25,541	25,940	26,506	27,146	27,439	28,069	28,602
60	Additions in Year		-	(16,353)	29,916	16,931	(815)	(130)	(1,651)	(615)	(858)	(452)	147	(375)	(15)	(190)	399	567	640	293	629	533	389
61	Cumulative Total		-	(16,353)	13,563	30,494	29,679	29,550	27,899	27,284	26,426	25,974	26,121	25,746	25,731	25,541	25,940	26,506	27,146	27,439	28,069	28,602	28,991
62																							
63	Depreciation Expense on Incremental Capital		-	-	(1,096)	501	1,401	1,335	1,313	1,190	1,137	1,068	1,025	1,017	975	958	928	941	963	992	2,634	3,063	3,012
64	Write Off Existing Meters (Term)		-	-	4,564	4,026	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
65	Status Quo Depreciation on Existing Meters		-	-	538	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
66	**Total Depreciation Expense**		-	-	4,006	4,528	1,401	1,335	1,313	1,190	1,137	1,068	1,025	1,017	975	958	928	941	963	992	2,634	3,063	3,012
67																							
68	**Net Book Value**																						
69	Gross Book Value New Capital		-	(307)	21,586	30,494	29,679	29,550	27,899	27,284	26,426	25,974	26,121	25,746	25,731	25,541	25,940	26,506	27,146	27,439	28,069	28,602	28,991
70	Accumulated Depreciation New Capital		-	-	4,555	7,512	6,112	4,777	3,464	2,274	1,137	69	(956)	(1,972)	(2,948)	(3,905)	(4,833)	(5,775)	(6,738)	(7,729)	(10,363)	(13,426)	(16,438)
71	Gross Book Value Existing Meters		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
72	Accumulated Depreciation Existing Meters		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
73	Incremental Net Book Value		-	(307)	26,141	38,007	35,791	34,327	31,363	29,558	27,563	26,043	25,165	23,774	22,783	21,635	21,106	20,732	20,408	19,710	17,706	15,176	12,553
74					569																		
75	**Carrying Costs on Average NBV**																						
76	Return on Equity		-	-	512	1,270	1,461	1,388	1,301	1,206	1,131	1,061	1,014	969	922	879	846	828	815	794	741	651	549
77	Interest Expense		-	-	463	1,141	1,269	1,205	1,129	1,047	982	921	880	841	800	764	735	719	707	690	643	565	477
78																							
79	**Total Carrying Costs**		-	-	975	2,411	2,730	2,594	2,430	2,253	2,113	1,983	1,894	1,810	1,722	1,643	1,581	1,548	1,522	1,484	1,384	1,216	1,026
80																							
81																							
82	**Income Tax Expense**																						
83	Combined Income Tax Rate		25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%
84																							
85	**Income Tax on Equity Return**																						
86	Return on Equity		-	-	512	1,270	1,461	1,388	1,301	1,206	1,131	1,061	1,014	969	922	879	846	828	815	794	741	651	549
87	Gross up for revenue (Return / (1- tax rate)		-	-	682	1,694	1,948	1,851	1,734	1,608	1,508	1,415	1,352	1,292	1,229	1,173	1,128	1,105	1,086	1,059	988	868	732
88	Income tax on Equity Return		-	-	171	423	487	463	434	402	377	354	338	323	307	293	282	276	272	265	247	217	183
89																							
90	**Income Tax on Timing Differences**																						
91	Depreciation Expense		-	-	5,102	5,714	2,660	2,706	2,762	2,810	2,860	2,910	2,961	3,036	3,104	3,172	3,242	3,299	3,366	3,425	3,484	3,544	3,605
92	Less: Capitalized Overhead			-	(875)	(999)	(1,073)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
93	Less: Capital Cost Allowance		-	(14)	(2,316)	(5,615)	(5,946)	(4,913)	(4,095)	(3,376)	(2,797)	(2,312)	(1,959)	(1,675)	(1,422)	(1,215)	(1,046)	(931)	(848)	(765)	(697)	(652)	(621)
94	Total Timing Differences		-	14	1,910	(901)	(4,359)	(2,207)	(1,333)	(566)	63	598	1,002	1,361	1,682	1,957	2,197	2,368	2,517	2,660	2,787	2,892	2,984
95	Gross up for tax (Total Timing Differences/(1-tax rate))		-	18	2,547	(1,201)	(5,812)	(2,942)	(1,778)	(755)	84	798	1,336	1,815	2,242	2,610	2,929	3,157	3,356	3,547	3,717	3,856	3,979
96	Income tax on Timing Differences		-	5	637	(300)	(1,453)	(736)	(444)	(189)	21	199	334	454	561	652	732	789	839	887	929	964	995
97																							
98	**Total Income Tax**		-	5	807	123	(966)	(273)	(11)	213	398	553	672	777	868	946	1,014	1,065	1,111	1,151	1,176	1,181	1,178
99																							
100																							
101	**Capital Cost Allowance**																						
102	Opening Balance - UCC		-	-	(155)	25,677	35,994	28,160	23,117	17,371	13,380	9,725	6,960	5,148	3,098	1,661	255	(391)	(755)	(964)	(1,435)	(1,503)	(1,621)
103																							
104	Additions		-	-	29,916	16,931	(815)	(130)	(1,651)	(615)	(858)	(452)	147	(375)	(15)	(190)	399	567	640	293	629	533	389
105	Less: Capitalized Overhead		-	-	(875)	(999)	(1,073)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
106	Less: AFUDC		-	(168)	(893)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
107	Net Additions		-	(168)	28,148	15,932	(1,888)	(130)	(1,651)	(615)	(858)	(452)	147	(375)	(15)	(190)	399	567	640	293	629	533	389
108																							
109	CCA on Opening Balance		-	-	(25)	4,277	6,030	4,876	4,124	3,363	2,793	2,292	1,896	1,639	1,370	1,169	987	857	777	708	626	584	546
110	CCA on Capital Expenditures (1/2 yr rule)		-	(14)	2,341	1,339	(84)	37	(29)	13	4	21	63	36	52	46	59	74	71	57	71	68	75
111	Total CCA		-	(14)	2,316	5,615	5,946	4,913	4,095	3,376	2,797	2,312	1,959	1,675	1,422	1,215	1,046	931	848	765	697	652	621
112	Ending Balance UCC		-	(155)	25,677	35,994	28,160	23,117	17,371	13,380	9,725	6,960	5,148	3,098	1,661	255	(391)	(755)	(964)	(1,435)	(1,503)	(1,621)	(1,853)

Revenue Requirements Analysis
Advanced Metering Infrastructure Project

AMI Scenario 2

Line No.		NPV @ 8.00%	0 Dec-12	1 Dec-13	2 Dec-14	3 Dec-15	4 Dec-16	5 Dec-17	6 Dec-18	7 Dec-19	8 Dec-20	9 Dec-21	10 Dec-22	11 Dec-23	12 Dec-24	13 Dec-25	14 Dec-26	15 Dec-27	16 Dec-28	17 Dec-29	18 Dec-30	19 Dec-31	20 Dec-32
	Summary																						
	Revenue Requirements																						
1	Operating Expense & Theft Reduction (Net)	**-54,619**	0	(383)	(574)	(1,919)	(4,718)	(5,583)	(6,343)	(6,618)	(7,042)	(7,343)	(7,129)	(7,392)	(7,528)	(7,675)	(8,329)	(8,564)	(8,766)	(9,188)	(9,475)	(9,697)	(10,097)
2	Depreciation Expense	**16,464**	-	-	4,006	4,528	1,401	1,335	1,313	1,190	1,137	1,068	1,025	1,017	975	958	928	941	963	992	2,634	3,063	3,012
3	Carrying Costs	**17,163**	-	-	975	2,411	2,730	2,594	2,430	2,253	2,113	1,983	1,894	1,810	1,722	1,643	1,581	1,548	1,522	1,484	1,384	1,216	1,026
4	Income Tax	**3,982**	-	5	807	123	(966)	(273)	(11)	213	398	553	672	777	868	946	1,014	1,065	1,111	1,151	1,176	1,181	1,178
5	Total Revenue Requirement for Project	**(17,011)**	0	(378)	5,214	5,143	(1,554)	(1,927)	(2,611)	(2,961)	(3,394)	(3,739)	(3,538)	(3,788)	(3,963)	(4,129)	(4,805)	(5,009)	(5,171)	(5,561)	(4,281)	(4,236)	(4,881)
6																							
7	Net Present Value of Revenue Requirements at	**6.0%**	**(22,836)**																				
8	Net Present Value of Revenue Requirements at	**8.0%**	**(17,011)**																				
9	Net Present Value of Revenue Requirements at	**10.0%**	**(12,620)**																				
10																							
11	**Rate Impact**																						
12	Forecast Revenue Requirements		287,441	310,378	327,609	365,860	383,868	390,778	397,812	404,972	412,262	419,682	427,237	434,927	442,756	450,725	458,838	467,097	475,505	484,064	492,777	501,647	510,677
13	Incremental Rate Impact		0.00%	(0.12%)	1.71%	(0.02%)	(1.74%)	(0.10%)	(0.17%)	(0.09%)	(0.11%)	(0.08%)	0.05%	(0.06%)	(0.04%)	(0.04%)	(0.15%)	(0.04%)	(0.03%)	(0.08%)	0.26%	0.01%	(0.13%)
14	Cummulative Incremental Rate Impact		0.00%	(0.12%)	1.58%	1.56%	(0.21%)	(0.30%)	(0.48%)	(0.56%)	(0.67%)	(0.75%)	(0.70%)	(0.76%)	(0.80%)	(0.83%)	(0.98%)	(1.02%)	(1.06%)	(1.14%)	(0.88%)	(0.87%)	(1.00%)
15																							
16	Cumulative Rate Impact of Entire Project		**(1.00%)**																				
17	Levelized Annual Rate Impact		**(0.05%)**																				
18	**Regulatory Assumptions**																						
19	Equity Component		40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%
20	Debt Component		60.00%	60.00%	60.00%	60.00%	60.00%	60.00%	60.00%	60.00%	60.00%	60.00%	60.00%	60.00%	60.00%	60.00%	60.00%	60.00%	60.00%	60.00%	60.00%	60.00%	60.00%
21	Equity Return		9.90%	9.90%	9.90%	9.90%	9.90%	9.90%	9.90%	9.90%	9.90%	9.90%	9.90%	9.90%	9.90%	9.90%	9.90%	9.90%	9.90%	9.90%	9.90%	9.90%	9.90%
22	Debt Return		5.92%	5.82%	5.98%	5.93%	5.73%	5.73%	5.73%	5.73%	5.73%	5.73%	5.73%	5.73%	5.73%	5.73%	5.73%	5.73%	5.73%	5.73%	5.73%	5.73%	5.73%
23	AFUDC		6.60%	6.60%	6.70%	6.60%	6.50%	6.50%	6.50%	6.50%	6.50%	6.50%	6.50%	6.50%	6.50%	6.50%	6.50%	6.50%	6.50%	6.50%	6.50%	6.50%	6.50%
24																							
25																							
26	**Capital Cost**																						
27	Project Capital		-	13,562	15,900	17,166	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
28	Sustaining Capital:		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
29	Meter Growth and Replacement		-	-	99	100	85	110	60	120	147	145	412	422	437	454	194	188	195	197	189	210	520
30	Handheld Replacement		-	-	(250)	-	-	-	-	(273)	-	-	-	-	(299)	-	-	-	-	(327)	-	-	-
31	Measurement Canada Compliance		-	(146)	(909)	(903)	(1,478)	(976)	(2,310)	(1,072)	(1,645)	(1,229)	(1,070)	(1,452)	(820)	(1,324)	(486)	(501)	(293)	(306)	(302)	(432)	(901)
32	IT Hardware, Licencing, and Support Costs		-	-	292	568	578	736	599	610	640	632	805	655	667	679	691	880	738	729	742	756	769
33	AFUDC		-	168	893	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
34	Total Construction Cost in Year		-	13,584	16,026	16,931	(815)	(130)	(1,651)	(615)	(858)	(452)	147	(375)	(15)	(190)	399	567	640	293	629	533	389
35	Cumulative Construction Cost		-	13,584	29,609	46,540	45,725	45,596	43,945	43,330	42,472	42,020	42,167	41,792	41,777	41,587	41,986	42,552	43,192	43,485	44,115	44,648	45,037
36																							
37	Net Cost of Removal		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
38	Total Capital Cost in Year		-	13,584	16,026	16,931	(815)	(130)	(1,651)	(615)	(858)	(452)	147	(375)	(15)	(190)	399	567	640	293	629	533	389
39	Cumulative Capital Cost		-	13,584	29,609	46,540	45,725	45,596	43,945	43,330	42,472	42,020	42,167	41,792	41,777	41,587	41,986	42,552	43,192	43,485	44,115	44,648	45,037
40																							
41	Additions to Plant in Service		-	(307)	29,916	16,931	(815)	(130)	(1,651)	(615)	(858)	(452)	147	(375)	(15)	(190)	399	567	640	293	629	533	389
42	Cummulative Additions to Plant		-	(307)	29,609	46,540	45,725	45,596	43,945	43,330	42,472	42,020	42,167	41,792	41,777	41,587	41,986	42,552	43,192	43,485	44,115	44,648	45,037
43	CWIP		-	13,891	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
44																							
45	**Operating Expenses**																						
46	New Operating Costs		-	-	875	1,529	1,634	1,671	1,701	1,691	1,718	1,745	1,772	1,800	1,829	1,858	1,887	1,917	1,948	1,979	2,011	2,043	2,076
47	Meter Reading		-	-	-	(998)	(2,544)	(2,713)	(2,757)	(2,803)	(2,983)	(3,032)	(3,082)	(3,274)	(3,329)	(3,384)	(3,589)	(3,649)	(3,710)	(3,929)	(3,991)	(4,058)	(4,292)
48	Remote Disconnect/Reconnect		-	-	(133)	(414)	(544)	(564)	(584)	(605)	(627)	(648)	(671)	(694)	(717)	(741)	(766)	(791)	(817)	(843)	(870)	(898)	(1,339)
49	Meter Exchanges		-	-	(349)	(331)	(408)	(310)	(531)	(302)	(187)	(212)	166	190	215	262	(46)	(78)	(60)	(63)	(99)	(21)	364
50	Contact Centre		-	-	20	7	(20)	(56)	(58)	(60)	(62)	(64)	(66)	(69)	(71)	(73)	(76)	(78)	(81)	(83)	(86)	(89)	(91)
51	**Theft Reduction**		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
52	Theft Reduction		0	(383)	(987)	(1,711)	(2,835)	(3,611)	(4,114)	(4,540)	(4,901)	(5,131)	(5,248)	(5,346)	(5,455)	(5,596)	(5,739)	(5,885)	(6,046)	(6,249)	(6,440)	(6,675)	(6,815)
53	**Total Costs / (Savings)**		0	(383)	(574)	(1,919)	(4,718)	(5,583)	(6,343)	(6,618)	(7,042)	(7,343)	(7,129)	(7,392)	(7,528)	(7,675)	(8,329)	(8,564)	(8,766)	(9,188)	(9,475)	(9,697)	(10,097)
54																							
55																							
56																							

Revenue Requirements Analysis
Advanced Metering Infrastructure Project
AMI Scenario 2

Line		NPV @	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
No.		8.00%	Dec-12	Dec-13	Dec-14	Dec-15	Dec-16	Dec-17	Dec-18	Dec-19	Dec-20	Dec-21	Dec-22	Dec-23	Dec-24	Dec-25	Dec-26	Dec-27	Dec-28	Dec-29	Dec-30	Dec-31	Dec-32
57																							
58	**Depreciation Expense**																						
59	Opening Cash Outlay		-	-	(16,353)	13,563	30,494	29,679	29,550	27,899	27,284	26,426	25,974	26,121	25,746	25,731	25,541	25,940	26,506	27,146	27,439	28,069	28,602
60	Additions in Year		-	(16,353)	29,916	16,931	(815)	(130)	(1,651)	(615)	(858)	(452)	147	(375)	(15)	(190)	399	567	640	293	629	533	389
61	Cumulative Total		-	(16,353)	13,563	30,494	29,679	29,550	27,899	27,284	26,426	25,974	26,121	25,746	25,731	25,541	25,940	26,506	27,146	27,439	28,069	28,602	28,991
62																							
63	Depreciation Expense on Incremental Capital		-	-	(1,096)	501	1,401	1,335	1,313	1,190	1,137	1,068	1,025	1,017	975	958	928	941	963	992	2,634	3,063	3,012
64	Write Off Existing Meters (Term)		-	-	4,564	4,026																	
65	Status Quo Depreciation on Existing Meters		-	-	538	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
66	**Total Depreciation Expense**		-	-	4,006	4,528	1,401	1,335	1,313	1,190	1,137	1,068	1,025	1,017	975	958	928	941	963	992	2,634	3,063	3,012
67																							
68	**Net Book Value**																						
69	Gross Book Value New Capital		-	(307)	21,586	30,494	29,679	29,550	27,899	27,284	26,426	25,974	26,121	25,746	25,731	25,541	25,940	26,506	27,146	27,439	28,069	28,602	28,991
70	Accumulated Depreciation New Capital		-	-	4,555	7,512	6,112	4,777	3,464	2,274	1,137	69	(956)	(1,972)	(2,948)	(3,905)	(4,833)	(5,775)	(6,738)	(7,729)	(10,363)	(13,426)	(16,438)
71	Gross Book Value Existing Meters		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
72	Accumulated Depreciation Existing Meters		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
73	Incremental Net Book Value		-	(307)	26,141	38,007	35,791	34,327	31,363	29,558	27,563	26,043	25,165	23,774	22,783	21,635	21,106	20,732	20,408	19,710	17,706	15,176	12,553
74					569																		
75	**Carrying Costs on Average NBV**																						
76	Return on Equity		-	-	512	1,270	1,461	1,388	1,301	1,206	1,131	1,061	1,014	969	922	879	846	828	815	794	741	651	549
77	Interest Expense		-	-	463	1,141	1,269	1,205	1,129	1,047	982	921	880	841	800	764	735	719	707	690	643	565	477
78																							
79	**Total Carrying Costs**		-	-	975	2,411	2,730	2,594	2,430	2,253	2,113	1,983	1,894	1,810	1,722	1,643	1,581	1,548	1,522	1,484	1,384	1,216	1,026
80																							
81																							
82	**Income Tax Expense**																						
83	Combined Income Tax Rate		25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%
84																							
85	**Income Tax on Equity Return**																						
86	Return on Equity		-	-	512	1,270	1,461	1,388	1,301	1,206	1,131	1,061	1,014	969	922	879	846	828	815	794	741	651	549
87	Gross up for revenue (Return / (1- tax rate)		-	-	682	1,694	1,948	1,851	1,734	1,608	1,508	1,415	1,352	1,292	1,229	1,173	1,128	1,105	1,086	1,059	988	868	732
88	Income tax on Equity Return		-	-	171	423	487	463	434	402	377	354	338	323	307	293	282	276	272	265	247	217	183
89																							
90	**Income Tax on Timing Differences**																						
91	Depreciation Expense		-	-	5,102	5,714	2,660	2,706	2,762	2,810	2,860	2,910	2,961	3,036	3,104	3,172	3,242	3,299	3,366	3,425	3,484	3,544	3,605
92	Less: Capitalized Overhead			-	(875)	(999)	(1,073)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
93	Less: Capital Cost Allowance		-	(14)	(2,316)	(5,615)	(5,946)	(4,913)	(4,095)	(3,376)	(2,797)	(2,312)	(1,959)	(1,675)	(1,422)	(1,215)	(1,046)	(931)	(848)	(765)	(697)	(652)	(621)
94	Total Timing Differences		-	14	1,910	(901)	(4,359)	(2,207)	(1,333)	(566)	63	598	1,002	1,361	1,682	1,957	2,197	2,368	2,517	2,660	2,787	2,892	2,984
95	Gross up for tax (Total Timing Differences/(1-tax rate))		-	18	2,547	(1,201)	(5,812)	(2,942)	(1,778)	(755)	84	798	1,336	1,815	2,242	2,610	2,929	3,157	3,356	3,547	3,717	3,856	3,979
96	Income tax on Timing Differences		-	5	637	(300)	(1,453)	(736)	(444)	(189)	21	199	334	454	561	652	732	789	839	887	929	964	995
97																							
98	**Total Income Tax**		-	5	807	123	(966)	(273)	(11)	213	398	553	672	777	868	946	1,014	1,065	1,111	1,151	1,176	1,181	1,178
99																							
100																							
101	**Capital Cost Allowance**																						
102	Opening Balance - UCC		-	-	(155)	25,677	35,994	28,160	23,117	17,371	13,380	9,725	6,960	5,148	3,098	1,661	255	(391)	(755)	(964)	(1,435)	(1,503)	(1,621)
103																							
104	Additions		-	-	29,916	16,931	(815)	(130)	(1,651)	(615)	(858)	(452)	147	(375)	(15)	(190)	399	567	640	293	629	533	389
105	Less: Capitalized Overhead		-	-	(875)	(999)	(1,073)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
106	Less: AFUDC		-	(168)	(893)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
107	Net Additions		-	(168)	28,148	15,932	(1,888)	(130)	(1,651)	(615)	(858)	(452)	147	(375)	(15)	(190)	399	567	640	293	629	533	389
108																							
109	CCA on Opening Balance		-	-	(25)	4,277	6,030	4,876	4,124	3,363	2,793	2,292	1,896	1,639	1,370	1,169	987	857	777	708	626	584	546
110	CCA on Capital Expenditures (1/2 yr rule)		-	(14)	2,341	1,339	(84)	37	(29)	13	4	21	63	36	52	46	59	74	71	57	71	68	75
111	Total CCA		-	(14)	2,316	5,615	5,946	4,913	4,095	3,376	2,797	2,312	1,959	1,675	1,422	1,215	1,046	931	848	765	697	652	621
112	Ending Balance UCC		-	(155)	25,677	35,994	28,160	23,117	17,371	13,380	9,725	6,960	5,148	3,098	1,661	255	(391)	(755)	(964)	(1,435)	(1,503)	(1,621)	(1,853)

Revenue Requirements Analysis
Advanced Metering Infrastructure Project

AMI Scenario 3

Line No.		NPV @ 8.00%	0 Dec-12	1 Dec-13	2 Dec-14	3 Dec-15	4 Dec-16	5 Dec-17	6 Dec-18	7 Dec-19	8 Dec-20	9 Dec-21	10 Dec-22	11 Dec-23	12 Dec-24	13 Dec-25	14 Dec-26	15 Dec-27	16 Dec-28	17 Dec-29	18 Dec-30	19 Dec-31	20 Dec-32
	Summary																						
	Revenue Requirements																						
1	Operating Expense & Theft Reduction (Net)	**-53,249**	0	492	80	(1,919)	(4,718)	(5,583)	(6,343)	(6,618)	(7,042)	(7,343)	(7,129)	(7,392)	(7,528)	(7,675)	(8,329)	(8,564)	(8,766)	(9,188)	(9,475)	(9,697)	(10,097)
2	Depreciation Expense	**16,464**	-	-	4,006	4,528	1,401	1,335	1,313	1,190	1,137	1,068	1,025	1,017	975	958	928	941	963	992	2,634	3,063	3,012
3	Carrying Costs	**17,163**	-	-	975	2,411	2,730	2,594	2,430	2,253	2,113	1,983	1,894	1,810	1,722	1,643	1,581	1,548	1,522	1,484	1,384	1,216	1,026
4	Income Tax	**3,982**	-	5	807	123	(966)	(273)	(11)	213	398	553	672	777	868	946	1,014	1,065	1,111	1,151	1,176	1,181	1,178
5	Total Revenue Requirement for Project	**(15,641)**	0	497	5,868	5,143	(1,554)	(1,927)	(2,611)	(2,961)	(3,394)	(3,739)	(3,538)	(3,788)	(3,963)	(4,129)	(4,805)	(5,009)	(5,171)	(5,561)	(4,281)	(4,236)	(4,881)
6																							
7	Net Present Value of Revenue Requirements at	**6.0%**	**(21,429)**																				
8	Net Present Value of Revenue Requirements at	**8.0%**	**(15,641)**																				
9	Net Present Value of Revenue Requirements at	**10.0%**	**(11,284)**																				
10																							
11	**Rate Impact**																						
12	Forecast Revenue Requirements		287,441	310,378	327,609	365,860	383,868	390,778	397,812	404,972	412,262	419,682	427,237	434,927	442,756	450,725	458,838	467,097	475,505	484,064	492,777	501,647	510,677
13	Incremental Rate Impact		0.00%	0.16%	1.64%	(0.20%)	(1.74%)	(0.10%)	(0.17%)	(0.09%)	(0.11%)	(0.08%)	0.05%	(0.06%)	(0.04%)	(0.04%)	(0.15%)	(0.04%)	(0.03%)	(0.08%)	0.26%	0.01%	(0.13%)
14	Cummulative Incremental Rate Impact		0.00%	0.16%	1.80%	1.60%	(0.17%)	(0.27%)	(0.44%)	(0.52%)	(0.63%)	(0.71%)	(0.66%)	(0.72%)	(0.76%)	(0.80%)	(0.94%)	(0.99%)	(1.02%)	(1.10%)	(0.84%)	(0.83%)	(0.96%)
15																							
16	Cumulative Rate Impact of Entire Project		**(0.96%)**																				
17	Levelized Annual Rate Impact		**(0.05%)**																				
18	**Regulatory Assumptions**																						
19	Equity Component		40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%
20	Debt Component		60.00%	60.00%	60.00%	60.00%	60.00%	60.00%	60.00%	60.00%	60.00%	60.00%	60.00%	60.00%	60.00%	60.00%	60.00%	60.00%	60.00%	60.00%	60.00%	60.00%	60.00%
21	Equity Return		9.90%	9.90%	9.90%	9.90%	9.90%	9.90%	9.90%	9.90%	9.90%	9.90%	9.90%	9.90%	9.90%	9.90%	9.90%	9.90%	9.90%	9.90%	9.90%	9.90%	9.90%
22	Debt Return		5.92%	5.82%	5.98%	5.93%	5.73%	5.73%	5.73%	5.73%	5.73%	5.73%	5.73%	5.73%	5.73%	5.73%	5.73%	5.73%	5.73%	5.73%	5.73%	5.73%	5.73%
23	AFUDC		6.60%	6.60%	6.70%	6.60%	6.50%	6.50%	6.50%	6.50%	6.50%	6.50%	6.50%	6.50%	6.50%	6.50%	6.50%	6.50%	6.50%	6.50%	6.50%	6.50%	6.50%
24																							
25																							
26	**Capital Cost**																						
27	Project Capital		-	13,562	15,900	17,166	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
28	Sustaining Capital:		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
29	Meter Growth and Replacement		-	-	99	100	85	110	60	120	147	145	412	422	437	454	194	188	195	197	189	210	520
30	Handheld Replacement		-	-	(250)	-	-	-	-	(273)	-	-	-	-	(299)	-	-	-	-	(327)	-	-	-
31	Measurement Canada Compliance		-	(146)	(909)	(903)	(1,478)	(976)	(2,310)	(1,072)	(1,645)	(1,229)	(1,070)	(1,452)	(820)	(1,324)	(486)	(501)	(293)	(306)	(302)	(432)	(901)
32	IT Hardware, Licencing, and Support Costs		-	-	292	568	578	736	599	610	640	632	805	655	667	679	691	880	738	729	742	756	769
33	AFUDC		-	168	893	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
34	Total Construction Cost in Year		-	13,584	16,026	16,931	(815)	(130)	(1,651)	(615)	(858)	(452)	147	(375)	(15)	(190)	399	567	640	293	629	533	389
35	Cumulative Construction Cost		-	13,584	29,609	46,540	45,725	45,596	43,945	43,330	42,472	42,020	42,167	41,792	41,777	41,587	41,986	42,552	43,192	43,485	44,115	44,648	45,037
36																							
37	Net Cost of Removal		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
38	Total Capital Cost in Year		-	13,584	16,026	16,931	(815)	(130)	(1,651)	(615)	(858)	(452)	147	(375)	(15)	(190)	399	567	640	293	629	533	389
39	Cumulative Capital Cost		-	13,584	29,609	46,540	45,725	45,596	43,945	43,330	42,472	42,020	42,167	41,792	41,777	41,587	41,986	42,552	43,192	43,485	44,115	44,648	45,037
40																							
41	Additions to Plant in Service		-	(307)	29,916	16,931	(815)	(130)	(1,651)	(615)	(858)	(452)	147	(375)	(15)	(190)	399	567	640	293	629	533	389
42	Cummulative Additions to Plant		-	(307)	29,609	46,540	45,725	45,596	43,945	43,330	42,472	42,020	42,167	41,792	41,777	41,587	41,986	42,552	43,192	43,485	44,115	44,648	45,037
43	CWIP		-	13,891	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
44																							
45	**Operating Expenses**																						
46	New Operating Costs		-	875	1,529	1,529	1,634	1,671	1,701	1,691	1,718	1,745	1,772	1,800	1,829	1,858	1,887	1,917	1,948	1,979	2,011	2,043	2,076
47	Meter Reading		-	-	-	(998)	(2,544)	(2,713)	(2,757)	(2,803)	(2,983)	(3,032)	(3,082)	(3,274)	(3,329)	(3,384)	(3,589)	(3,649)	(3,710)	(3,929)	(3,991)	(4,058)	(4,292)
48	Remote Disconnect/Reconnect		-	-	(133)	(414)	(544)	(564)	(584)	(605)	(627)	(648)	(671)	(694)	(717)	(741)	(766)	(791)	(817)	(843)	(870)	(898)	(1,339)
49	Meter Exchanges		-	-	(349)	(331)	(408)	(310)	(531)	(302)	(187)	(212)	166	190	215	262	(46)	(78)	(60)	(63)	(99)	(21)	364
50	Contact Centre		-	-	20	7	(20)	(56)	(58)	(60)	(62)	(64)	(66)	(69)	(71)	(73)	(76)	(78)	(81)	(83)	(86)	(89)	(91)
51	**Theft Reduction**		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
52	Theft Reduction		0	(383)	(987)	(1,711)	(2,835)	(3,611)	(4,114)	(4,540)	(4,901)	(5,131)	(5,248)	(5,346)	(5,455)	(5,596)	(5,739)	(5,885)	(6,046)	(6,249)	(6,440)	(6,675)	(6,815)
53	**Total Costs / (Savings)**		0	492	80	(1,919)	(4,718)	(5,583)	(6,343)	(6,618)	(7,042)	(7,343)	(7,129)	(7,392)	(7,528)	(7,675)	(8,329)	(8,564)	(8,766)	(9,188)	(9,475)	(9,697)	(10,097)
54																							
55																							
56																							

Revenue Requirements Analysis
Advanced Metering Infrastructure Project
AMI Scenario 3

Line No.		NPV @ 8.00%	0 Dec-12	1 Dec-13	2 Dec-14	3 Dec-15	4 Dec-16	5 Dec-17	6 Dec-18	7 Dec-19	8 Dec-20	9 Dec-21	10 Dec-22	11 Dec-23	12 Dec-24	13 Dec-25	14 Dec-26	15 Dec-27	16 Dec-28	17 Dec-29	18 Dec-30	19 Dec-31	20 Dec-32
57																							
58	**Depreciation Expense**																						
59	Opening Cash Outlay		-	-	(16,353)	13,563	30,494	29,679	29,550	27,899	27,284	26,426	25,974	26,121	25,746	25,731	25,541	25,940	26,506	27,146	27,439	28,069	28,602
60	Additions in Year		-	(16,353)	29,916	16,931	(815)	(130)	(1,651)	(615)	(858)	(452)	147	(375)	(15)	(190)	399	567	640	293	629	533	389
61	Cumulative Total		-	(16,353)	13,563	30,494	29,679	29,550	27,899	27,284	26,426	25,974	26,121	25,746	25,731	25,541	25,940	26,506	27,146	27,439	28,069	28,602	28,991
62																							
63	Depreciation Expense on Incremental Capital		-	-	(1,096)	501	1,401	1,335	1,313	1,190	1,137	1,068	1,025	1,017	975	958	928	941	963	992	2,634	3,063	3,012
64	Write Off Existing Meters (Term)		-	-	4,564	4,026	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
65	Status Quo Depreciation on Existing Meters		-	-	538	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
66	**Total Depreciation Expense**		-	-	4,006	4,528	1,401	1,335	1,313	1,190	1,137	1,068	1,025	1,017	975	958	928	941	963	992	2,634	3,063	3,012
67																							
68	**Net Book Value**																						
69	Gross Book Value New Capital		-	(307)	21,586	30,494	29,679	29,550	27,899	27,284	26,426	25,974	26,121	25,746	25,731	25,541	25,940	26,506	27,146	27,439	28,069	28,602	28,991
70	Accumulated Depreciation New Capital		-	-	4,555	7,512	6,112	4,777	3,464	2,274	1,137	69	(956)	(1,972)	(2,948)	(3,905)	(4,833)	(5,775)	(6,738)	(7,729)	(10,363)	(13,426)	(16,438)
71	Gross Book Value Existing Meters		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
72	Accumulated Depreciation Existing Meters		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
73	Incremental Net Book Value		-	(307)	26,141	38,007	35,791	34,327	31,363	29,558	27,563	26,043	25,165	23,774	22,783	21,635	21,106	20,732	20,408	19,710	17,706	15,176	12,553
74					569																		
75	**Carrying Costs on Average NBV**																						
76	Return on Equity		-	-	512	1,270	1,461	1,388	1,301	1,206	1,131	1,061	1,014	969	922	879	846	828	815	794	741	651	549
77	Interest Expense		-	-	463	1,141	1,269	1,205	1,129	1,047	982	921	880	841	800	764	735	719	707	690	643	565	477
78																							
79	**Total Carrying Costs**		-	-	975	2,411	2,730	2,594	2,430	2,253	2,113	1,983	1,894	1,810	1,722	1,643	1,581	1,548	1,522	1,484	1,384	1,216	1,026
80																							
81																							
82	**Income Tax Expense**																						
83	Combined Income Tax Rate		25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%
84																							
85	**Income Tax on Equity Return**																						
86	Return on Equity		-	-	512	1,270	1,461	1,388	1,301	1,206	1,131	1,061	1,014	969	922	879	846	828	815	794	741	651	549
87	Gross up for revenue (Return / (1- tax rate)		-	-	682	1,694	1,948	1,851	1,734	1,608	1,508	1,415	1,352	1,292	1,229	1,173	1,128	1,105	1,086	1,059	988	868	732
88	Income tax on Equity Return		-	-	171	423	487	463	434	402	377	354	338	323	307	293	282	276	272	265	247	217	183
89																							
90	**Income Tax on Timing Differences**																						
91	Depreciation Expense		-	-	5,102	5,714	2,660	2,706	2,762	2,810	2,860	2,910	2,961	3,036	3,104	3,172	3,242	3,299	3,366	3,425	3,484	3,544	3,605
92	Less: Capitalized Overhead			-	(875)	(999)	(1,073)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
93	Less: Capital Cost Allowance		-	(14)	(2,316)	(5,615)	(5,946)	(4,913)	(4,095)	(3,376)	(2,797)	(2,312)	(1,959)	(1,675)	(1,422)	(1,215)	(1,046)	(931)	(848)	(765)	(697)	(652)	(621)
94	Total Timing Differences		-	14	1,910	(901)	(4,359)	(2,207)	(1,333)	(566)	63	598	1,002	1,361	1,682	1,957	2,197	2,368	2,517	2,660	2,787	2,892	2,984
95	Gross up for tax (Total Timing Differences/(1-tax rate))		-	18	2,547	(1,201)	(5,812)	(2,942)	(1,778)	(755)	84	798	1,336	1,815	2,242	2,610	2,929	3,157	3,356	3,547	3,717	3,856	3,979
96	Income tax on Timing Differences		-	5	637	(300)	(1,453)	(736)	(444)	(189)	21	199	334	454	561	652	732	789	839	887	929	964	995
97																							
98	**Total Income Tax**		-	5	807	123	(966)	(273)	(11)	213	398	553	672	777	868	946	1,014	1,065	1,111	1,151	1,176	1,181	1,178
99																							
100																							
101	**Capital Cost Allowance**																						
102	Opening Balance - UCC		-	-	(155)	25,677	35,994	28,160	23,117	17,371	13,380	9,725	6,960	5,148	3,098	1,661	255	(391)	(755)	(964)	(1,435)	(1,503)	(1,621)
103																							
104	Additions		-	-	29,916	16,931	(815)	(130)	(1,651)	(615)	(858)	(452)	147	(375)	(15)	(190)	399	567	640	293	629	533	389
105	Less: Capitalized Overhead		-	-	(875)	(999)	(1,073)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
106	Less: AFUDC		-	(168)	(893)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
107	Net Additions		-	(168)	28,148	15,932	(1,888)	(130)	(1,651)	(615)	(858)	(452)	147	(375)	(15)	(190)	399	567	640	293	629	533	389
108																							
109	CCA on Opening Balance		-	-	(25)	4,277	6,030	4,876	4,124	3,363	2,793	2,292	1,896	1,639	1,370	1,169	987	857	777	708	626	584	546
110	CCA on Capital Expenditures (1/2 yr rule)		-	(14)	2,341	1,339	(84)	37	(29)	13	4	21	63	36	52	46	59	74	71	57	71	68	75
111	Total CCA		-	(14)	2,316	5,615	5,946	4,913	4,095	3,376	2,797	2,312	1,959	1,675	1,422	1,215	1,046	931	848	765	697	652	621
112	Ending Balance UCC		-	(155)	25,677	35,994	28,160	23,117	17,371	13,380	9,725	6,960	5,148	3,098	1,661	255	(391)	(755)	(964)	(1,435)	(1,503)	(1,621)	(1,853)

Revenue Requirements Analysis
Advanced Metering Infrastructure Project
AMI Scenario 4

Line No.		NPV @ 8.00%	0 Dec-12	1 Dec-13	2 Dec-14	3 Dec-15	4 Dec-16	5 Dec-17	6 Dec-18	7 Dec-19	8 Dec-20	9 Dec-21	10 Dec-22	11 Dec-23	12 Dec-24	13 Dec-25	14 Dec-26	15 Dec-27	16 Dec-28	17 Dec-29	18 Dec-30	19 Dec-31	20 Dec-32
	Summary																						
	Revenue Requirements																						
1	Operating Expense & Theft Reduction (Net)	**-53,496**	0	492	80	(1,919)	(4,749)	(5,615)	(6,375)	(6,650)	(7,075)	(7,376)	(7,163)	(7,426)	(7,563)	(7,710)	(8,364)	(8,600)	(8,803)	(9,226)	(9,514)	(9,735)	(10,136)
2	Depreciation Expense	**16,464**	-	-	4,006	4,528	1,401	1,335	1,313	1,190	1,137	1,068	1,025	1,017	975	958	928	941	963	992	2,634	3,063	3,012
3	Carrying Costs	**17,163**	-	-	975	2,411	2,730	2,594	2,430	2,253	2,113	1,983	1,894	1,810	1,722	1,643	1,581	1,548	1,522	1,484	1,384	1,216	1,026
4	Income Tax	**3,982**	-	5	807	123	(966)	(273)	(11)	213	398	553	672	777	868	946	1,014	1,065	1,111	1,151	1,176	1,181	1,178
5	Total Revenue Requirement for Project	(15,888)	0	497	5,868	5,143	(1,585)	(1,959)	(2,644)	(2,993)	(3,427)	(3,772)	(3,572)	(3,822)	(3,997)	(4,164)	(4,841)	(5,046)	(5,208)	(5,599)	(4,320)	(4,275)	(4,921)
6																							
7	Net Present Value of Revenue Requirements at	**6.0%**	**(21,731)**																				
8	Net Present Value of Revenue Requirements at	**8.0%**	**(15,888)**																				
9	Net Present Value of Revenue Requirements at	**10.0%**	**(11,489)**																				
10																							
11	**Rate Impact**																						
12	Forecast Revenue Requirements		287,441	310,378	327,609	365,860	383,868	390,778	397,812	404,972	412,262	419,682	427,237	434,927	442,756	450,725	458,838	467,097	475,505	484,064	492,777	501,647	510,677
13	Incremental Rate Impact		0.00%	0.16%	1.64%	(0.20%)	(1.75%)	(0.10%)	(0.17%)	(0.09%)	(0.11%)	(0.08%)	0.05%	(0.06%)	(0.04%)	(0.04%)	(0.15%)	(0.04%)	(0.03%)	(0.08%)	0.26%	0.01%	(0.13%)
14	Cummulative Incremental Rate Impact		0.00%	0.16%	1.80%	1.60%	(0.18%)	(0.28%)	(0.45%)	(0.53%)	(0.64%)	(0.72%)	(0.67%)	(0.73%)	(0.77%)	(0.81%)	(0.95%)	(1.00%)	(1.03%)	(1.11%)	(0.85%)	(0.84%)	(0.97%)
15																							
16	Cumulative Rate Impact of Entire Project		**(0.97%)**																				
17	Levelized Annual Rate Impact		**(0.05%)**																				
18	**Regulatory Assumptions**																						
19	Equity Component		40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%
20	Debt Component		60.00%	60.00%	60.00%	60.00%	60.00%	60.00%	60.00%	60.00%	60.00%	60.00%	60.00%	60.00%	60.00%	60.00%	60.00%	60.00%	60.00%	60.00%	60.00%	60.00%	60.00%
21	Equity Return		9.90%	9.90%	9.90%	9.90%	9.90%	9.90%	9.90%	9.90%	9.90%	9.90%	9.90%	9.90%	9.90%	9.90%	9.90%	9.90%	9.90%	9.90%	9.90%	9.90%	9.90%
22	Debt Return		5.92%	5.82%	5.98%	5.93%	5.73%	5.73%	5.73%	5.73%	5.73%	5.73%	5.73%	5.73%	5.73%	5.73%	5.73%	5.73%	5.73%	5.73%	5.73%	5.73%	5.73%
23	AFUDC		6.60%	6.60%	6.70%	6.60%	6.50%	6.50%	6.50%	6.50%	6.50%	6.50%	6.50%	6.50%	6.50%	6.50%	6.50%	6.50%	6.50%	6.50%	6.50%	6.50%	6.50%
24																							
25																							
26	**Capital Cost**																						
27	Project Capital		-	13,562	15,900	17,166	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
28	Sustaining Capital:		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
29	Meter Growth and Replacement		-	-	99	100	85	110	60	120	147	145	412	422	437	454	194	188	195	197	189	210	520
30	Handheld Replacement		-	-	(250)	-	-	-	-	(273)	-	-	-	-	(299)	-	-	-	-	(327)	-	-	-
31	Measurement Canada Compliance		-	(146)	(909)	(903)	(1,478)	(976)	(2,310)	(1,072)	(1,645)	(1,229)	(1,070)	(1,452)	(820)	(1,324)	(486)	(501)	(293)	(306)	(302)	(432)	(901)
32	IT Hardware, Licencing, and Support Costs		-	-	292	568	578	736	599	610	640	632	805	655	667	679	691	880	738	729	742	756	769
33	AFUDC		-	168	893	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
34	Total Construction Cost in Year		-	13,584	16,026	16,931	(815)	(130)	(1,651)	(615)	(858)	(452)	147	(375)	(15)	(190)	399	567	640	293	629	533	389
35	Cumulative Construction Cost		-	13,584	29,609	46,540	45,725	45,596	43,945	43,330	42,472	42,020	42,167	41,792	41,777	41,587	41,986	42,552	43,192	43,485	44,115	44,648	45,037
36																							
37	Net Cost of Removal		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
38	Total Capital Cost in Year		-	13,584	16,026	16,931	(815)	(130)	(1,651)	(615)	(858)	(452)	147	(375)	(15)	(190)	399	567	640	293	629	533	389
39	Cumulative Capital Cost		-	13,584	29,609	46,540	45,725	45,596	43,945	43,330	42,472	42,020	42,167	41,792	41,777	41,587	41,986	42,552	43,192	43,485	44,115	44,648	45,037
40																							
41	Additions to Plant in Service		-	(307)	29,916	16,931	(815)	(130)	(1,651)	(615)	(858)	(452)	147	(375)	(15)	(190)	399	567	640	293	629	533	389
42	Cummulative Additions to Plant		-	(307)	29,609	46,540	45,725	45,596	43,945	43,330	42,472	42,020	42,167	41,792	41,777	41,587	41,986	42,552	43,192	43,485	44,115	44,648	45,037
43	CWIP		-	13,891	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
44																							
45	**Operating Expenses**																						
46	New Operating Costs		-	875	1,529	1,529	1,603	1,639	1,668	1,659	1,685	1,712	1,739	1,766	1,794	1,822	1,851	1,881	1,911	1,941	1,973	2,004	2,036
47	Meter Reading		-	-	-	(998)	(2,544)	(2,713)	(2,757)	(2,803)	(2,983)	(3,032)	(3,082)	(3,274)	(3,329)	(3,384)	(3,589)	(3,649)	(3,710)	(3,929)	(3,991)	(4,058)	(4,292)
48	Remote Disconnect/Reconnect		-	-	(133)	(414)	(544)	(564)	(584)	(605)	(627)	(648)	(671)	(694)	(717)	(741)	(766)	(791)	(817)	(843)	(870)	(898)	(1,339)
49	Meter Exchanges		-	-	(349)	(331)	(408)	(310)	(531)	(302)	(187)	(212)	166	190	215	262	(46)	(78)	(60)	(63)	(99)	(21)	364
50	Contact Centre		-	-	20	7	(20)	(56)	(58)	(60)	(62)	(64)	(66)	(69)	(71)	(73)	(76)	(78)	(81)	(83)	(86)	(89)	(91)
51	**Theft Reduction**		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
52	Theft Reduction		0	(383)	(987)	(1,711)	(2,835)	(3,611)	(4,114)	(4,540)	(4,901)	(5,131)	(5,248)	(5,346)	(5,455)	(5,596)	(5,739)	(5,885)	(6,046)	(6,249)	(6,440)	(6,675)	(6,815)
53	**Total Costs / (Savings)**		0	492	80	(1,919)	(4,749)	(5,615)	(6,375)	(6,650)	(7,075)	(7,376)	(7,163)	(7,426)	(7,563)	(7,710)	(8,364)	(8,600)	(8,803)	(9,226)	(9,514)	(9,735)	(10,136)
54																							
55																							
56																							

Revenue Requirements Analysis
Advanced Metering Infrastructure Project
AMI Scenario 4

Line No.		NPV @ 8.00%	0 Dec-12	1 Dec-13	2 Dec-14	3 Dec-15	4 Dec-16	5 Dec-17	6 Dec-18	7 Dec-19	8 Dec-20	9 Dec-21	10 Dec-22	11 Dec-23	12 Dec-24	13 Dec-25	14 Dec-26	15 Dec-27	16 Dec-28	17 Dec-29	18 Dec-30	19 Dec-31	20 Dec-32
57																							
58	**Depreciation Expense**																						
59	Opening Cash Outlay		-	-	(16,353)	13,563	30,494	29,679	29,550	27,899	27,284	26,426	25,974	26,121	25,746	25,731	25,541	25,940	26,506	27,146	27,439	28,069	28,602
60	Additions in Year		-	(16,353)	29,916	16,931	(815)	(130)	(1,651)	(615)	(858)	(452)	147	(375)	(15)	(190)	399	567	640	293	629	533	389
61	Cumulative Total		-	(16,353)	13,563	30,494	29,679	29,550	27,899	27,284	26,426	25,974	26,121	25,746	25,731	25,541	25,940	26,506	27,146	27,439	28,069	28,602	28,991
62																							
63	Depreciation Expense on Incremental Capital		-	-	(1,096)	501	1,401	1,335	1,313	1,190	1,137	1,068	1,025	1,017	975	958	928	941	963	992	2,634	3,063	3,012
64	Write Off Existing Meters (Term)		-	-	4,564	4,026	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
65	Status Quo Depreciation on Existing Meters		-	-	538	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
66	**Total Depreciation Expense**		-	-	4,006	4,528	1,401	1,335	1,313	1,190	1,137	1,068	1,025	1,017	975	958	928	941	963	992	2,634	3,063	3,012
67																							
68	**Net Book Value**																						
69	Gross Book Value New Capital		-	(307)	21,586	30,494	29,679	29,550	27,899	27,284	26,426	25,974	26,121	25,746	25,731	25,541	25,940	26,506	27,146	27,439	28,069	28,602	28,991
70	Accumulated Depreciation New Capital		-	-	4,555	7,512	6,112	4,777	3,464	2,274	1,137	69	(956)	(1,972)	(2,948)	(3,905)	(4,833)	(5,775)	(6,738)	(7,729)	(10,363)	(13,426)	(16,438)
71	Gross Book Value Existing Meters		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
72	Accumulated Depreciation Existing Meters		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
73	Incremental Net Book Value		-	(307)	26,141	38,007	35,791	34,327	31,363	29,558	27,563	26,043	25,165	23,774	22,783	21,635	21,106	20,732	20,408	19,710	17,706	15,176	12,553
74					569																		
75	**Carrying Costs on Average NBV**																						
76	Return on Equity		-	-	512	1,270	1,461	1,388	1,301	1,206	1,131	1,061	1,014	969	922	879	846	828	815	794	741	651	549
77	Interest Expense		-	-	463	1,141	1,269	1,205	1,129	1,047	982	921	880	841	800	764	735	719	707	690	643	565	477
78																							
79	**Total Carrying Costs**		-	-	975	2,411	2,730	2,594	2,430	2,253	2,113	1,983	1,894	1,810	1,722	1,643	1,581	1,548	1,522	1,484	1,384	1,216	1,026
80																							
81																							
82	**Income Tax Expense**																						
83	Combined Income Tax Rate		25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%
84																							
85	**Income Tax on Equity Return**																						
86	Return on Equity		-	-	512	1,270	1,461	1,388	1,301	1,206	1,131	1,061	1,014	969	922	879	846	828	815	794	741	651	549
87	Gross up for revenue (Return / (1- tax rate)		-	-	682	1,694	1,948	1,851	1,734	1,608	1,508	1,415	1,352	1,292	1,229	1,173	1,128	1,105	1,086	1,059	988	868	732
88	Income tax on Equity Return		-	-	171	423	487	463	434	402	377	354	338	323	307	293	282	276	272	265	247	217	183
89																							
90	**Income Tax on Timing Differences**																						
91	Depreciation Expense		-	-	5,102	5,714	2,660	2,706	2,762	2,810	2,860	2,910	2,961	3,036	3,104	3,172	3,242	3,299	3,366	3,425	3,484	3,544	3,605
92	Less: Capitalized Overhead			-	(875)	(999)	(1,073)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
93	Less: Capital Cost Allowance		-	(14)	(2,316)	(5,615)	(5,946)	(4,913)	(4,095)	(3,376)	(2,797)	(2,312)	(1,959)	(1,675)	(1,422)	(1,215)	(1,046)	(931)	(848)	(765)	(697)	(652)	(621)
94	Total Timing Differences		-	14	1,910	(901)	(4,359)	(2,207)	(1,333)	(566)	63	598	1,002	1,361	1,682	1,957	2,197	2,368	2,517	2,660	2,787	2,892	2,984
95	Gross up for tax (Total Timing Differences/(1-tax rate))		-	18	2,547	(1,201)	(5,812)	(2,942)	(1,778)	(755)	84	798	1,336	1,815	2,242	2,610	2,929	3,157	3,356	3,547	3,717	3,856	3,979
96	Income tax on Timing Differences		-	5	637	(300)	(1,453)	(736)	(444)	(189)	21	199	334	454	561	652	732	789	839	887	929	964	995
97																							
98	**Total Income Tax**		-	5	807	123	(966)	(273)	(11)	213	398	553	672	777	868	946	1,014	1,065	1,111	1,151	1,176	1,181	1,178
99																							
100																							
101	**Capital Cost Allowance**																						
102	Opening Balance - UCC		-	-	(155)	25,677	35,994	28,160	23,117	17,371	13,380	9,725	6,960	5,148	3,098	1,661	255	(391)	(755)	(964)	(1,435)	(1,503)	(1,621)
103																							
104	Additions		-	-	29,916	16,931	(815)	(130)	(1,651)	(615)	(858)	(452)	147	(375)	(15)	(190)	399	567	640	293	629	533	389
105	Less: Capitalized Overhead		-	-	(875)	(999)	(1,073)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
106	Less: AFUDC		-	(168)	(893)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
107	Net Additions		-	(168)	28,148	15,932	(1,888)	(130)	(1,651)	(615)	(858)	(452)	147	(375)	(15)	(190)	399	567	640	293	629	533	389
108																							
109	CCA on Opening Balance		-	-	(25)	4,277	6,030	4,876	4,124	3,363	2,793	2,292	1,896	1,639	1,370	1,169	987	857	777	708	626	584	546
110	CCA on Capital Expenditures (1/2 yr rule)		-	(14)	2,341	1,339	(84)	37	(29)	13	4	21	63	36	52	46	59	74	71	57	71	68	75
111	Total CCA		-	(14)	2,316	5,615	5,946	4,913	4,095	3,376	2,797	2,312	1,959	1,675	1,422	1,215	1,046	931	848	765	697	652	621
112	Ending Balance UCC		-	(155)	25,677	35,994	28,160	23,117	17,371	13,380	9,725	6,960	5,148	3,098	1,661	255	(391)	(755)	(964)	(1,435)	(1,503)	(1,621)	(1,853)

59.0 Reference: Project Costs and Benefits

Exhibit No. B-1, Tab 5.0, Section 5.1.1, pp. 72-73

59.1 Provide a breakdown of the consultants' costs.

Response:

The following is a breakdown of the consultant costs for Table 5.1.1 from the Application.

	Consultant Name	**Cost**
		($000s)
1	Arrow Installations Ltd	1
2	AWD	11
3	Dan Forlin Enterprises	7
4	Exponent Inc.	39
5	Navigant Consulting Inc	67
6	PCS Utilidata	22
7	Tymac Consulting Inc	5
8	Util-Assist	257
9	FortisAlberta (Acheson Meter Shop)	9
10	Neil Boyd Consulting	5
11	**Total**	**423**

59.2 As FortisBC intends to apply, as part of its next revenue requirement, for recovery of the project development costs incurred, please provide the interest rate applied to the non-rate base deferral account.

Response:

The interest rate applied to the non-rate base deferral account is forecast to be approximately six percent.

60.0 Reference: Project Costs and Benefits

Exhibit B-1, Tab 5.0, Section 5.1.2, p. 74

New staffing – Business Analysts

For staffing, FortisBC has anticipated adding an additional 9.5 FTEs to support the AMI system and new processes. The breakdown of these resources is as follows:

- Business Analyst – two additional resources to work the billing process, review reports, work queues and dashboards on a daily basis and respond to any alerts and alarms;

60.1 Please detail the number of people that currently work in the FortisBC billing process, and specifically identify the number that deal with manual and off-cycle meter reads.

Response:

FortisBC's Billing Operations group has 7 FTEs that deal with billing issues, but they do not generally enter manual off-cycle reads. In the Contact Center there is approximately 0.5 FTE manually entering off-cycle meter reads.

60.2 Please explain the types of alerts and alarms that would be handled by these two analysts, and provide copies of the vendor's documentation detailing the anticipated number of expected events and time to process/correct these events.

Response:

With the Itron system there are a variety of event types, including power loss/restore, tamper, tilt, low battery alarms, and voltage alarms, that would be handled by the two additional resources.

Itron does not have documentation detailing anticipated number of expected events and time to process/correct these events. These numbers will be dependent on many factors, notably FortisBC's decisions regarding configuration of events and alarms, automation of various processes, and the proficiency of the analysts. Configuration of the events and alarms and automation of various processes will be determined during the design phase of the project.

Based on the experience of FortisBC's industry consultant, it is expected that 2 business analysts would be required to manage the events for a utility of FortisBC's size.

61.0 Reference: Project Costs and Benefits

Exhibit B-1, Tab 5.0, Section 5.1.2, p. 74

New staffing – Technical Analysts

For staffing, FortisBC has anticipated adding an additional 9.5 FTEs to support the AMI system and new processes. The breakdown of these resources is as follows:

- Technical Analyst – two additional resources required for the day to day support of AMI-related network infrastructure including servers, security appliances, routers and firewalls. This role includes the planning and implementing of firmware and application upgrades and providing help desk support;

61.1 Please detail the number of existing FortisBC IT resources, including staff, contractors and consultants, that deal with network infrastructure including servers, security appliances, routers and firewalls.

Response:

There are 13 IT internal technical staff that support and plan desktop, infrastructure and network systems. This includes firmware and application upgrades for the overall IT environment. Standard vendor support agreements are in place for all major components.

Support Breakdown:

- WAN/LAN/Active Domain/server/ corporate security support - 3 resources;
- IP phones/SAN/UNIX/VMware support - 3 resources;
- System control center systems, including related security - 2 resources;
- Second-level tech support - 3 resources; and
- First level tech support - 2 resources

61.2 Please provide the number of existing FortisBC IT resources, including staff, contractors and consultants, that plan and implement firmware and application upgrades and provide help desk support. Please detail the number and complexity of existing IT systems at FortisBC and a relative comparison to the number and complexity being added by the AMI Project.

Response:

Please refer to BCUC IR1 Q61.1 for the IT resourcing breakdown.

Provided below are the details related to existing IT systems, and the additional systems and servers required as a result of the AMI Project.

Systems & Equipment supported:

- 745 PCs (combination of desktops & laptops)
- 152 virtual desktops
- 146 Virtual Machines -Windows servers/UNIX UNIX
- 53 physical machines - Windows/AIX/VM Host
- 218 - switches/routers/firewalls/wireless access points/
- 745 - laptops and desktops
- 152 - virtual desktops
- 655 – Active Domain users/contractors

Additional systems and servers by the AMI Project:

- 271 - new networking devices (switches, routers, security appliances, etc)
- 115,000 metering endpoints
- 18 Virtual Machines - Windows servers/UNIX
- 8 physical machines - VM Host

62.0 Reference: Project Costs and Benefits

Exhibit B-1, Tab 5.0, Section 5.1.2, p. 74

New Staffing – System Analysts

For staffing, FortisBC has anticipated adding an additional 9.5 FTEs to support the AMI system and new processes. The breakdown of these resources is as follows:

• System Analyst – two additional resources required for the day to day support of AMI software applications, including planning and implementing upgrades as well as developing and testing new enhancements for the new applications;

62.1 Please detail the number of existing FortisBC IT resources, including staff, contractors and consultants, that deal with software applications, including planning and implementing upgrades as well as developing and testing new enhancements for applications.

<u>Response:</u>

There are 11 IT internal application resources:

- Database administrators / Basis / SAP security - 3 resources.
- Customer Information System (CIS) - 2 resources.
- Geographical Information System (GIS) - 2 resources.
- SAP - 2 resources.
- Mandatory Reliability Standards - 1 resource.

- First Level application support - 1 resource.

63.0 Reference: Project Costs and Benefits

Exhibit B-1, Tab 5.0, Section 5.1.2, p. 75

New Staffing – Communications Technician

For staffing, FortisBC has anticipated adding an additional 9.5 FTEs to support the AMI system and new processes. The breakdown of these resources is as follows:

- Communications Technician – one additional field resource required to troubleshoot, fix, replace and/or install AMI-related network devices;

63.1 Please detail the number of existing FortisBC IT resources, including staff, contractors and consultants, that fix, replace and/or install network devices.

Response:

FortisBC currently has 9 FTEs troubleshooting, fixing, replacing and installing network devices.

FortisBC has interpreted this question as referring to network devices and infrastructure supporting field communications, SCADA and operations (not office IT equipment). FortisBC notes that the FTE number above also supports telecommunications devices, including data/voice multiplexers, Ethernet switches, data radios, modems, RTUs, power meters and relays that make up the operations network.

63.2 Please provide the number of network devices at FortisBC and the number that will be installed by the AMI project.

Response:

FortisBC has approximately 1,650 devices operated and maintained by Communications Technicians and expects 287 additional devices to be installed as part of an AMI deployment.

FortisBC has interpreted this question as referring to network devices and infrastructure supporting field communications, SCADA and operations (not office IT equipment). FortisBC notes that the existing number of devices identified above also includes telecommunications devices, including data/voice multiplexers, Ethernet switches, data radios, modems, RTUs, power meters and relays that make up the operations network.

64.0 Reference: Project Costs and Benefits

Exhibit B-1, Tab 5.0, Section 5.1.2, p. 75

New Staffing – Part-time Telecom Engineer

For staffing, FortisBC has anticipated adding an additional 9.5 FTEs to support the AMI system and new processes. The breakdown of these resources is as follows:

- Telecom Engineer – 0.5 additional office resources required to monitor and maintain the health of the AMI system. Work will include optimization activities, planning and coordinating all the work that has to be done on the network;

64.1 Please detail the number of existing FortisBC telecommunication resources, including staff, contractors and consultants that perform optimization activities, planning and coordinating work that has to be done on the FortisBC telecommunication network.

Response:

Currently, including planning and design staff, FortisBC has 3 FTEs supporting the planning, co-ordination and optimization of the telecommunications field network.

Please see the response to BCUC IR1 Q63.1; the Telecom Engineer supports the same equipment.

64.2 Please provide the number of telecommunication devices at FortisBC and the number that will be installed by the AMI project.

Response:

Please see the response to BCUC IR1 Q63.2. The Telecom Engineer is responsible for the optimization, planning and co-ordination of the same equipment.

65.0 Reference: Project Costs and Benefits

Exhibit B-1, Tab 5.0, Section 5.1.2, p. 75

New Staffing - Revenue Protection Analysis Team

For staffing, FortisBC has anticipated adding an additional 9.5 FTEs to support the AMI system and new processes. The breakdown of these resources is as follows:

- Revenue Protection Analysis Team – two resources required to analyze data coming from the AMI system, investigate specific alerts and alarms and strategically deploy energy balancing meters in high risk areas.

65.1 Please detail the number of existing FortisBC revenue protection resources, including staff, contractors and consultants, that investigate energy theft.

Response:

FortisBC existing revenue protection resources consist of:

- One staff manager utilized half-time;
- One full-time contracted theft investigator;
- One contracted power line technician on an as-needed basis to perform service disconnections and install check meters on primary voltage facilities; and
- One contracted private investigator on an as-needed basis to accompany the theft investigator in high risk situations and scheduled out of town investigations.

65.2 Please explain the role to be performed by these two proposed resources in deploying energy balancing meters in high risk areas, and how that integrates with the distribution metering to be installed as part of the AMI project.

Response:

The two proposed resources consist of one data analyst and one power line technician.

The installation of feeder meters in 2015 will require ongoing analysis of feeder data to identify which feeders and feeder sections require investigation. The data analyst will research system alerts, consumption anomalies and custom reports provided by the advanced metering system in conjunction with feeder data. This resource will deliver to the theft investigator a selection of potential theft sites for follow-up as well as feeder sections that present risk. The power line technician will provide ongoing field support to the theft investigator in the deployment of feeder, transformer and temporary meters in the areas suggested by the data analyst.

Please also refer to the response to BCUC IR1 Q54.3.

66.0 Reference: Project Costs and Benefits

Exhibit No. B-1, Tab 5.0, Section 5.1.2, pp. 74-75

66.1 If Kelowna becomes part of the FortisBC service area, show the impact to Table 5.1.b.

Response:

The table below shows the expected impact of the Kelowna municipal utility becoming part of the FortisBC service area, including City of Kelowna, and changes arising from Errata No. 1.

Please note, FortisBC has not completed a detailed analysis of the impact of the addition of the City of Kelowna customers. The table below is provided as a preliminary estimate of the impact of the addition of these customers.

Table BCUC IR1 Q66.1 – Impact of City of Kelowna

	Dec-13	Dec-14	Dec-15	Dec-16	Total 2017 - 2032	Total
AMI						
Capital						
Sustaining Capital					-	-
Meter Growth and Replacement	-	(198)	(179)	(262)	2,705	2,066
Handheld Replacement	-	(250)	-	-	(899)	(1,149)
IT Hardware, Licencing, and Support Costs	-	297	573	583	11,411	12,864
Measurement Canada Compliance	(146)	(1,005)	(997)	(1,652)	(16,689)	(20,490)
Total Capital	(146)	(1,155)	(604)	(1,332)	(3,472)	(6,709)
Operating Expenses						
New Operating Costs	-	884	1,538	1,565	28,412	32,400
Meter Reading	-	-	(1,151)	(2,887)	(60,711)	(64,748)
Remote Disconnect/Reconnect	-	(152)	(475)	(624)	(13,952)	(15,202)
Meter Exchanges	-	(384)	(363)	(450)	(705)	(1,902)
Contact Centre	-	18	3	(27)	(1,312)	(1,317)
Total Operating Expenses	-	366	(447)	(2,422)	(48,268)	(50,771)
Theft Reduction	(431)	(1,110)	(1,925)	(3,190)	(98,762)	(105,418)

66.1.1 If all the wholesale customers become part of the FortisBC service area, show the impact to Table 5.1.b.

Response:

FortisBC is unable to estimate impacts to Table 5.1.b without access to wholesale customer information pertaining to:

- Existing meter types and numbers of each
- Geographical location of meters
- Existing meter reading costs, and methodologies used
- Measurement Canada compliance data
- Current costs and staffing levels for contact centre, meter exchange, disconnect/reconnect processes, telecommunications and IT

67.0 Reference: Project Costs and Benefits

Exhibit B-1, Tab 5.0, Section 5.2.2, p. 75

General Inflation Rate

Page 75 of the Application notes that, "Inflation is estimated to be 1.8 percent over the 20 year analysis period. This is based on a Conference Board of Canada Provincial forecast dated April 19, 2012 of BC CPI for the period 2012 – 2016 inclusive."

67.1 For each of the exhibits listed below, please confirm if the figures included in each exhibit are presented in real or nominal dollars:

- Table 5.1.a – AMI Project Capital Cost Summary (Exhibit B-1, Tab 5, p. 70)
- Table 5.1.b – Summary of All Incremental Non-Project Costs and Benefits (Exhibit B-1, Tab 5, p. 72)
- Table 5.3.1.b – Net Meter Reading Savings (Exhibit B-1, Tab 5, p. 80)
- Table 5.3.2.e – Forecast Savings from Energy Theft Reduction (Exhibit B-1, Tab 5, p. 89)
- Table 5.3.3.a – Forecast Savings from Remote Disconnects / Reconnects (Exhibit B-1, Tab 5, p. 91)
- Table 5.3.4.a – Forecast Meter Replacement Savings (Exhibit B-1, Tab 5, p. 94)
- Table 5.3.5.a – Forecast Meter Exchange Savings (Exhibit B-1, Tab 5, p. 95)
- Table 5.3.6.a – Forecast Savings from Contact Centre (Exhibit B-1, Tab 5, p. 96)

Response:

The amounts included in each of the exhibits listed above are presented in nominal dollars.

67.2 Please discuss how the general inflation rate beyond 2016 was calculated.

Response:

Inflation beyond 2016 was held steady at the average inflation forecast for the 2012 – 2016 period based on a Conference Board of Canada Provincial forecast dated April 19, 2012 of BC CPI for the period 2012 – 2016 inclusive.

68.0 Reference: Project Costs and Benefits

Exhibit B-3, Excel Document: "FortisBC – AMI Excel NPV Analysis – 17Aug12"

Inflation and Cost Escalation

68.1 For each of the tabs listed below, please confirm if the figures presented in columns 1 through 20, inclusive, are presented in real or nominal dollars:

- Net AMI
- Gross AMI
- Net PLC
- Gross PLC
- Net AMR
- Gross AMR
- Status Quo

Response:

With the exception of figures presented as percentages, all of the figures in columns 1 through 20 inclusive are presented in nominal dollars.

69.0 Reference: Project Costs and Benefits

Exhibit No. B-1, Tab 5.0, Section 5.2.3, p. 75

69.1 Explain why the Smart Meter depreciation rate of five percent was based on a 20-year life when Toronto Hydro was based on a straight-line depreciation basis using a 15-year life and the economic useful life would be similar.

Response:

The Company's estimate of the economic useful life of the smart meters was based on the manufacturer's recommendations. CENTRON OpenWay meters are designed to have a service life of 20 years. Accelerated life testing of CENTRON OpenWay meters suggests that the great majority of those meters will last to or beyond the 20-year design life. Included as Attachment BCUC IR1 69.1, is a document from Itron provide more detail regarding accelerated life testing.

The Company also noted that BC Hydro used a 20-year life in their Smart Metering & Infrastructure Program Business Case and that FortisAlberta is using a 25 year life for their meters.

Toronto Hydro used a 15 year life as directed by the Ontario Energy Board in their "Accounting Procedures Handbook Frequently Asked Questions" of December 2010. The complete quote is below and it notes that the 15 year useful life will apply until "the distributor presents an independent depreciation study and the Board accepts a different useful life as more appropriate." As such it appears that even in the eyes of the Ontario Energy Board the question of useful life is not certain.

> *The useful life of smart meters used for regulatory purposes in the rate setting process is 15 years. For regulatory accounting purposes, 15 years useful life on a straight-line basis is used to calculate and record depreciation of in-service smart meters recorded in Account 1555, and for the smart meters recorded in Account 1860, Meters, which were transferred from Account 1555 on disposition of the account balance. This applies until such time as the distributor presents an independent depreciation study and the Board accepts a different useful life as more appropriate.*

Please also refer to the response to BCUC IR1 Q89.5.

Itron

Accelerated Life Testing

Purpose
The purpose of this document is to specify the procedures for conducting accelerated life testing at the Oconee electric meter manufacturing facility.

Meter Life Expectancy
Many meters will last beyond their 15 or 20 year life expectancy. Each stress test lasts the equivalent of the product lifespan. The tests show that the product must maintain a <= 0.5% yearly failure rate over the product life expectancy. In other words, if we have 0.5% * 20 years = 10% of the meters can fail, but 90% are still operational. From the accelerated life testing, we calculate what the yearly failure rate; we can validate that the failure rate is less than the 0.5%.

Key Stress Testing
We complete several stress tests on each meter product line. These tests include:

- Temperature Cycling Test - temperature is varied from -40°C to +85°C (5 cycles per day)
- High Temperature High Humidity Test – constant 80°C and 80% Relative Humidity
- High Temperature Test – 90°C constant

Highly Accelerated Life Testing (HALT)
These tests demonstrate a robust product, with margin beyond the specification limits:

- Employs temperature extremes to -100°C and +200°C, rapid thermal cycles at 60°C/minute, vibration up to 50 G_{rms}, and a combination of these conditions
- Tests beyond operating conditions and establish destructive limits
- Tests to failure to find weak points

Production Monitoring Program
Over 2700 OpenWay® meters have been sampled during our production testing since 2009. Two meters per day are sampled. Temperature Cycling and High Temperature/High Humidity are performed for 500 hours. Itron has two environmental chambers dedicated for continuous testing.

Corporate Headquarters

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Liberty Lake, WA 99019

www.itron.com

69.1.1 In response to BCUC IR2 22.1 in Exhibit B-3 from the 2008 CPCN Application, FortisBC stated:

> A22.1 The following estimates are based on FortisBC's experience. Please see Table A22.1 below.

Table A22.1: Expected Life (Years)

	Measurement Canada Certified Life	Technological Life	Economic Life	Useful Life
Smart Meters	10	25	25	25
Computer Hardware	N/A	5	5	5
Software	N/A	5 – 10	5	5 – 10
Communication Network Systems	N/A	5 – 10	15	15 – 20

69.1.1.1 Considering the previous response in Table A22.1, please explain why a 20-year life was selected for the current Application.

Response:

Please refer to the response to BCUC IR1 Q52.3.2.

69.2 While other regulatory bodies may use an economic useful life (EUL) of: Smart Meters, 15 years; Telecommunications (Field Area Network), 15 years; Telecommunications (Wide Area Network), 15 years; Distribution System Meters, 15 years; IT Hardware, five to seven years; and IT Software, three years, please provide the rationale for using the EUL of 20 years stated when considering the risk of technological obsolescence beyond 15 years.

Response:

Please refer to the response to BCUC IR1 Q69.1. The Company only used a EUL of 20 years for meters. Depreciation rates for the other components of the Advanced Metering Infrastructure were based on the rates recommended in the 2011 Depreciation Study filed as part of FortisBC's 2012 – 2013 Revenue Requirements Application and accepted by the Commission.

69.3 If the depreciation period is later found to be the 10 years (2008 Stimulus Bill) or 15 years, please provide the rate impact.

Response:

Please refer to the response to BCUC IR1 Q89.6.

69.3.1 Will a depreciation rate with a shorter life take into greater account the pace of advances in smart grid technology?

Response:

Depreciation estimates are meant to include estimates for loss of service value of assets due to, among other factors, wear and tear, deterioration, and technological obsolescence. A depreciation rate with a shorter life will take into greater account the pace of advances in smart grid technology.

69.3.2 Considering the rate of technological change, explain why economic life was the selected basis for depreciation rather than technological life.

Response:

Please refer to the response to BCUC IR1 Q69.1 and Q69.2.

69.4 Provide a copy of the communication equipment, software, and structures 2011 depreciation study and show how it is directly applicable to AMI software and equipment.

Response:

The 2011 Depreciation Study is attached as Appendix BCUC IR1 69.4.

The communication equipment, software, and structures in the AMI project is very similar to the communication equipment, software, and structures that the Company utilizes in its operations today. The communication equipment, software, and structures would be added to the same asset classes as are found in the depreciation study but the current depreciation rates by asset class would continue to be applied to all assets until a new depreciation study was completed.

The Company has no current plan to complete a new depreciation study. Please also refer to the response to BCUC IR1 Q1.1.

70.0 Reference: Project Costs and Benefits

Exhibit B-1, Tab 5.0, Section 5.2.6, p. 76

Carrying Costs, Debt Return

According to Exhibit B-1, "Interest expense was calculated assuming a weighted average cost of approximately 6 percent" over the life of the project between 2012 and 2032.

70.1 Please discuss the current and forecast market conditions or other factors considered in determining that the weighted average debt return will remain at approximately six percent over the life of the project.

Response:

At the time of preparing the AMI application, reference was made to the Company's 2012-2013 RRA Evidentiary Update which had forecast weighted average cost of debt (WACD) of approximately 6.0 percent for 2012 and approximately 5.9 percent for 2013. While the Company is still in the process of updating its financial schedules based on FortisBC Inc. 2012-2013 Revenue Requirements and 2012 Integrated System Plan Order G-110-12 and Decision, the Company has forecast the same WACD for 2012 and a rate of 5.8 percent for 2013. The Company believes this is appropriate for the Project as this is the period in which the project would be financed. Once the debt associated with the project is issued, and the project is funded, future debt rates do not impact the economics of the project.

70.1.1 Specifically, please discuss if consideration was given to the possibility of future interest rate increases and why no future interest rate increases are expected between 2013 and 2032.

Response:

Please refer to the response to BCUC IR1 Q70.1.

70.2 Please discuss any assumptions made and alternatives considered in determining the debt return of approximately six percent. For each alternative considered, please discuss the likelihood of each occurring.

Response:

Please refer to the response to BCUC IR1 Q70.1.

70.3 Please recalculate the NPV of the "Net AMI" project assuming the following individual scenarios:

- Debt Return (Line 22) – 100 basis points increase per year commencing in 2014, to a maximum Debt Return of eight percent.
- Debt Return (Line 22) – 100 basis points increase per year commencing in 2014, to a maximum Debt Return of 10 percent.

For this question, please provide the analysis supporting the NPV estimation, state all assumptions used, and comment on the likelihood of each event occurring.

Response:

FortisBC provides the results of the requested scenario (holding all other assumptions constant) below.

Scenario 1:

Debt Return (Line 22) – 100 basis points increase per year commencing in 2014, to a maximum Debt Return of eight percent.

In this Scenario, the only change to the model was to change the rates in Line 22 as follows:

	2012	**2013**	**2014**	**2015**	**2016 +**
Debt Return	5.92%	5.82%	6.98%	7.93%	8.00%

The NPV of the "Net AMI" project changed to the following:

	($000s)
Net Present Value of Revenue Requirements at **6.0 percent**	**(21,861)**

Net Present Value of Revenue Requirements at **8.0 percent**	**(16,046)**
Net Present Value of Revenue Requirements at **10.0 percent**	**(11,683)**

Scenario 2:

Debt Return (Line 22) – 100 basis points increase per year commencing in 2014, to a maximum Debt Return of 10 percent.

In this Scenario, the only change to the model was to change the rates in Line 22 as follows:

	2012	**2013**	**2014**	**2015**	**2016**	**2017**	**2018 +**
Debt Return	5.92%	5.82%	6.98%	7.93%	8.73%	9.73%	10.00%

The NPV of the "Net AMI" project changed to the following:

	($000s)
Net Present Value of Revenue Requirements at **6.0 percent**	**(18,609)**
Net Present Value of Revenue Requirements at **8.0 percent**	**(13,330)**
Net Present Value of Revenue Requirements at **10.0 percent**	**(9,395)**

Please also refer to the response to BCUC IR1 Q70.1.

71.0 Reference: Project Costs and Benefits

Exhibit B-1, Tab 5.0, Section 5.2.7, p. 77

Write-off Timing of Existing Meters

"Moreover, new regulations (S-S-06) from Measurement Canada increase the accuracy requirements for calibrating and testing meters. The approximately 80,000 electro-mechanical meters in the Company's metering fleet are expected to fail compliance sampling at an increased rate, and the expected lifespan of the meter population will be significantly reduced. Furthermore, due to the larger minimum sampling size mandated by S-S-06, the maintenance of small meter lots (less than 250) will become uneconomic. This represents approximately 8,000 digital meters." [Ref: B-1, p. 18]

"In the absence of the AMI Project, the Company would be writing off approximately 88,000 of its meters under Measurement Canada's new sampling plan (S-S-06) over 21 years beginning in 2014."

71.1 Please explain further the 21-year period for 88,000 of the existing meters. Does this assume that existing electro-mechanical meters are all replaced with electro-mechanical meters?

Response:

The 21-year period for the replacement of existing electro-mechanical meters is the estimated duration FortisBC expects to elapse before all electro-mechanical meters have been replaced. This assumes the meters have failed compliance testing, and are subsequently replaced with new electronic meters. FortisBC no longer installs new electro-mechanical meters.

The 21 year period was derived by modelling the useful life of the FortisBC electro-mechanical meter population as described in the response to BCUC IR1 Q5.1.

72.0 Reference: Project Costs and Benefits

Exhibit B-1, Tab 5.0, Section 5.2.7, p. 77

Accounting Treatment of Existing Meters

Exhibit B-1 notes that "FortisBC has considered three options for the accounting treatment of the existing meters to be removed from service as part of the proposed AMI project" and "…recommends option 1 which does not require an accounting variance."

72.1 Is any salvage value expected to be gained for the sale of the existing meters?

Response:

The existing meters are to be removed from service under the terms of the deployment contract for the smart meters. The Company assumed the cost of removal would be offset by any scrap value as they were disposed of.

72.1.1 Please list and describe what activities have been undertaken by FortisBC Inc. to determine the salvage value, if any, of the existing meters.

Response:

Please refer to the response to BCUC IR1 Q72.1.

72.2 Is there a cost associated with disposal of the existing meters? If yes, please confirm the estimated amount and describe the nature of the disposal costs.

Response:

Please refer to the response to BCUC IR1 Q72.1. The cost of disposal is included in the contracted deployment cost and has not been separately estimated.

72.3 Please list and discuss the factors that were considered in selecting option 1 as the most appropriate option.

Response:

Option 1 was considered the most appropriate as it is in accordance with US GAAP accounting guidance and therefore does not require the Company to apply to the Commission for an accounting variance.

72.4 For each option identified in Exhibit B-1, page 77, does FortisBC propose to recover the write-off or depreciation of the existing meters from ratepayers? Please explain why or why not.

Response:

Yes, the Company does propose to recover the accelerated depreciation of the existing meters from ratepayers.

The accelerated depreciation of the existing meters and recovery from ratepayers is an important assumption in the Company's financial analysis of the AMI project. The Company is of the opinion that recovery from ratepayers is appropriate because:

- The acquisition of the existing meters was prudent and necessary in order for the Company to provide service to customer;

- As the capital expenditures related to the Project are for the benefit of all customers, all capital should be recovered from customers; and
- The accelerated depreciation of the existing meters is due to obsolescence as a result of technological change, which includes a change in Measurement Canada compliance standards for testing and sampling meters.

72.4.1 If the answer to the preceding IR is yes, please describe the proposed method for recovering the write-down or depreciation of the existing meters from ratepayers for each option.

Response:

In all three options, the recovery of the cost of the existing meters would be included as a charge to depreciation expense in the year in which the meters are removed from service.

72.4.2 Please confirm and discuss if FortisBC would undertake the AMI project if the write-off or depreciation of the existing meters was not recoverable from the ratepayer.

Response:

The Company would not undertake the AMI project if the write-off or depreciation of the existing meters was not recoverable from the ratepayer. Depreciation of assets that are used for the benefit of customers is appropriately paid for by customers. If the write off of existing meters and the installation of new Advanced Meters is determined to be in the public interest, then the costs associated with the project, including any write offs, are appropriately borne by customers. The Company is applying to proceed with the AMI project for the purposes described in Section 3.0, page 17 of the Application and in response to BCUC IR1 Q2.1, and does not believe the shareholder should be at risk for the cost of the existing meters as a result.

Please also refer to the response to BCUC IR1 Q72.4.

72.5 Please confirm if the write-down of the existing meters of $8,590 thousand includes all property, plant and equipment, including computer equipment and software and other equipment, that will no longer be used and useful should the

AMI project proceed. If not confirmed, please identify the property, plant and equipment and provide the cost and accumulated depreciation for each asset category.

Response:

The write-down of $8.59 million only includes the existing meters. The Company will still be required to perform manual meter reads, consequently all of the related property, plant and equipment including computer equipment and software and other equipment will be retained as used and useful.

73.0 Reference: Project Costs and Benefits

Exhibit No. B-1, Tab 5.0, Section 5.2.7, p. 77

73.1 As accelerated roll-outs result in the pre-mature retirement of existing meters, should the existing meters be removed from rate base similar to a stranded asset? Please explain.

Response:

No, the accelerated retirement of existing meters should be treated as accelerated depreciation and removed from rate base as a credit to accumulated depreciation in the year of the write off. Please also refer to the response to BCUC IR1 Q72.4, Q72.4.1, and Q72.4.2.

74.0 Reference: Project Costs and Benefits

Exhibit No. B-1, Tab 5.0, Section 5.3.2 pp. 80-83

Marijuana Grow Operations and Dr. Plecas's Study

74.1 Are there any other published studies in North America that confirm Dr. Darryl Plecas's 2011 study findings?

Response:

FortisBC is aware of two publications that support Dr. Darryl Plecas' 2011 findings.

1. The Nature and Extent of Marihuana Growing Operations in Mission British Columbia : A 14 Year Review (1997-2010) by Plecas, D., Chaisson, K., and Snow, A. filed by Commission Staff as Exhibit A2-7

2. Marihuana Growth in British Columbia, Public Policy Paper Number 74 by Stephen T. Easton provided as Appendix BCUC IR1 74.1.

75.0 Reference: Project Costs and Benefits

Exhibit No. B-1, Tab 5.0, Section 5.3.2, pp. 80-83

Marijuana Grow Operations and Table 5.3.2.a – Key Assumptions

75.1 How many FortisBC residential accounts constantly consume greater than 93 kWh/day?

<u>Response:</u>

683 residential accounts have used greater than 93 kWh/day every billing period since September 2010.

75.2 As the Grow Ops are currently experimenting and using LED lighting and CFLs, please provide an updated Table 5.3.2.a – Key Assumptions, showing the impact of LEDs and CFLs on the electricity theft, cost/benefit and NPV calculations.

<u>Response:</u>

FortisBC does not contemplate a conversion to LED technology by marijuana producers during the life of the project. Please refer to BCUC IR1 Q84.3.1 for a discussion on LED lighting in marijuana production. However, should such technology become viable the potential impact on the NPV of Net Benefit is presented in the supporting analysis provided as Electronic Attachment BCUC IR1 87.2, tab 83.4.1. All assumptions remain unchanged except that LED technology at 70 percent efficiency is assumed beginning in 2017 at a rate of 2 percent in both the Status Quo and AMI Probable scenarios. This percentage increases annually by 2 percent for the remaining analysis life of the project.

76.0 Reference: Project Costs and Benefits

Exhibit B-3, Excel Document: "FortisBC – AMI Excel NPV Analysis – 17Aug12", Line No. 12;

Exhibit B-1, Tab 5.0, p. 81

Theft Reduction

Exhibit B-1 of the 2012-2013 Revenue Requirement and Review of ISP proceeding notes the following in Tab 3, page 11 :

"System losses consist of:

1. Losses in the transmission and distribution system;

2. Company use;

3. Losses due to wheeling through the BC Hydro system; and

4. Unaccounted-for energy (meter inaccuracies and theft)

Losses are calculated by using a two year rolling average. The actual gross loss rate for 2012 is the average of the 2009 rate of 9.23 percent and the 2010 rate of 8.42 percent, which is 8.82 percent. The loss rate for 2013 is further reduced to 8.76 percent due to the AMI-based loss reduction program."

Commission Order G-112-12 concerning the 2012-2013 Revenue Requirements and Review of 2012 Integrated System Plan notes the following in directive 1.c.:

"The proposed Deferral Account for Power Purchase Expense variances from forecast is approved and is to be amortized in rates in 2014."

Exhibit B-1 notes on page 81 that one of the benefits of reduced electricity theft is "increased revenues."

76.1 Please confirm if the forecast revenue requirement per Line No. 12, Exhibit B-3 includes an estimate of system losses, including system losses due to unaccounted-for energy due to theft. If not confirmed, please explain otherwise.

Response:

Not confirmed. The revenue forecast on Line 12 does not include any increased revenues from electricity theft detection and deterrence. Additional revenues (and reduced power purchase costs) related to electricity theft detection and deterrence were included on Line 52 Theft Reduction.

76.1.1 For each year between 2013 and 2032, please identify the estimated total system losses and estimated system losses due to theft included in the revenue requirement.

Response:

The estimated system losses and the portion attributed to electric theft in both the Status Quo and AMI scenarios is presented in the table below.

Table BCUC IR1 Q76.1.1

	2013	2014	2015	2016	2017	2018	2019
Reported Estimated System Losses(MWhs)	320,512	326,788	332,545	336,688	340,846	345,539	350,086
Status Quo Scenario							
Total estimated theft sites	218	231	244	257	270	276	281
Annual Estimated losses per site(kWhs)	151,200	151,200	151,200	151,200	151,200	151,200	151,200
System Losses due to Theft (MWhs)	33,032	34,939	36,884	38,869	40,893	41,710	42,545
AMI Probable Scenario							
Total estimated theft sites	206	191	177	158	137	106	82
Annual Estimated losses per site(kWhs)	151,200	151,200	151,200	151,200	151,200	151,200	151,200
System Losses due to Theft (MWhs)	31,162	28,919	26,836	23,938	20,707	16,048	12,437

	2020	2021	2022	2023	2024	2025	2026
Reported Estimated System Losses(MWhs)	354,687	359,574	364,470	369,158	374,079	378,976	383,850
Status Quo Scenario							
Total estimated theft sites	287	293	299	305	311	317	323
Annual Estimated losses per site(kWhs)	151,200	151,200	151,200	151,200	151,200	151,200	151,200
System Losses due to Theft (MWhs)	43,395	44,263	45,149	46,052	46,973	47,912	48,870
AMI Probable Scenario							
Total estimated theft sites	64	49	45	46	46	46	47
Annual Estimated losses per site(kWhs)	151,200	151,200	151,200	151,200	151,200	151,200	151,200
System Losses due to Theft (MWhs)	9,639	7,470	6,816	6,885	6,953	7,023	7,093

	2027	2028	2029	2030	2031	2032
Reported Estimated System Losses(MWhs)	388,819	393,737	398,777	403,772	408,351	413,175
Status Quo Scenario						
Total estimated theft sites	330	336	343	350	357	364
Annual Estimated losses per site(kWhs)	151,200	151,200	151,200	151,200	151,200	151,200
System Losses due to Theft (MWhs)	49,848	50,845	51,862	52,899	53,957	55,036
AMI Probable Scenario						
Total estimated theft sites	47	48	48	49	49	50
Annual Estimated losses per site(kWhs)	151,200	151,200	151,200	151,200	151,200	151,200
System Losses due to Theft (MWhs)	7,164	7,236	7,308	7,381	7,455	7,529

76.2 Please confirm that 100 percent of variances between forecast and actual power purchase costs, including system losses due to theft, will be recorded in the Deferral Account for Power Purchase Expense and amortized in rates in 2014. If not confirmed, please explain otherwise.

Response:

Confirmed.

76.2.1 If all variances between estimated and actual power purchase costs, including system losses due to theft, are included in a deferral account and amortized in rates, please discuss how reduced electricity theft will result in “increased revenues”.

Response:

To the extent that a customer is deterred from stealing electricity and begins paying for their consumption, then the amount of load on the system would not change (decrease), and there would be no variance between estimated and actual power purchase costs. Instead, losses due to theft would decrease and the power that was previously being stolen would be paid for, resulting in increased revenue.

77.0 Reference: Project Costs and Benefits

Exhibit B-1, Tab 5, Section 5.3.2, p. 80

Theft Reduction, Revenue Protection Activities

Exhibit B-1 of the 2012-2013 Revenue Requirement and Review of ISP proceeding notes the following in Tab 5, page 32:

“Forecast expenditures for 2011 are $0.17 million after tax ($0.23 million before tax) which will yield approximately $0.5 million in present value benefits”

77.1 Please provide the forecast revenue protection activities expenditures over the 20-year life of the AMI project (i.e., 2012 - 2032).

Response:

Please see the table below which includes forecast expenditures for the existing program plus the additional operations and maintenance budget required under the AMI

Table BCUC IR1 Q77.1 – Revenue Protection Expenditures

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
	$000s													
Status Quo Revenue Protection	$ 235	$ 244	$ 248	$ 253	$ 257	$ 262	$ 267	$ 272	$ 276	$ 281	$ 287	$ 292	$ 297	$ 302
AMI Incremental	0	0	0	$ 118	$ 241	$ 245	$ 249	$ 254	$ 258	$ 263	$ 268	$ 273	$ 277	$ 282
Annual Total	**$ 235**	**$ 244**	**$ 248**	**$ 371**	**$ 498**	**$ 507**	**$ 516**	**$ 526**	**$ 534**	**$ 544**	**$ 555**	**$ 565**	**$ 574**	**$ 584**

	2024	2025	2026	2027	2028	2029	2030	2031	2032
		$000s							
Status Quo Revenue Protection	$ 302	$ 308	$ 313	$ 319	$ 325	$ 330	$ 336	$ 342	$ 349
AMI Incremental	$ 282	$ 288	$ 293	$ 298	$ 303	$ 309	$ 314	$ 320	$ 326
Annual Total	**$ 584**	**$ 596**	**$ 606**	**$ 617**	**$ 628**	**$ 639**	**$ 650**	**$ 662**	**$ 675**

78.0 Reference: Project Costs and Benefits

Exhibit B-1, Tab 5.0, Section 5.3.2, p. 81;

Exhibit B-1, Tab 6.0, Section 6.1, p. 97

Energy Theft - Theft Reduction - Marijuana Assumption

FortisBC states on page 81 of the Application:

"The majority of energy theft at FortisBC is attributed to indoor marijuana grow operations. Customers engaged in indoor marijuana grow operations are motivated to steal electricity in an effort to avoid detection for two main reasons:

- *Customer billing records can be subject to production orders by law enforcement officials and used as evidence to secure search warrants; and*
- *An amendment to the provincial Safety Standards Act in 2006 obligates utilities, on request, to provide municipalities with a report identifying premises with consumption exceeding 93 kWh per day. This regulation is the basis for safety-focused initiatives in various BC municipalities whereby, based on abnormal electric consumption, municipal safety teams can inspect and shut down premises that exhibit unsafe conditions.*

As a result, marijuana grow operators often rely on energy theft to avoid scrutiny by authorities."

FortisBC states on page 97 of the Application:

"While system losses can be reasonably measured at the transmission level, the current metering system does not allow accurate measurement of distribution losses as meter readings downstream cannot be accurately synchronized with measurements at the substation."

78.1 Please explain the common approaches used by marijuana grow-operations to divert electricity.

Response:

The majority of electric diversions used by marijuana grow operations employ one of two general approaches.

1. Diversions bypassing the meter:

    - Diversions are installed from overhead or underground lines before the electric meter. The connections are made by tapping into the service mast or underground conduit from the interior wall and are not visible from the exterior of the building.

2. Diversions at the meter:

    - using a stolen meter in the socket for a portion of the billing period;
    - inverting the meter for a portion of the billing such that it records consumption in reverse;
    - Installing jumper bars between meter lugs in the meter socket to reduce metered consumption.

FortisBC has also seen rare incidents of altered meter function and diversions installed on primary voltage lines.

78.2 Does FortisBC consider that its customers receive a net benefit from paying marijuana grow operations on the FortisBC network? Please explain why or why not.

Response:

FortisBC customers financially benefit from marijuana grow operations that do not engage in the theft of service due to the increased number of billed kWh over which fixed utility costs are divided. This benefit is the same as the benefit received from any paying customer.

78.3 Please explain how FortisBC currently estimates transmission and distribution network losses (for example, for the purpose of fully allocated cost of service studies).

Response:

System losses are presently estimated by subtracting the total energy delivered to customers (as recorded by customer billing meters) from the total energy supplied into the electric system (by Company generation resources and inter-utility imports). The difference in these two quantities represents energy which has not been accounted for through customer bills. This unaccounted energy consists of:

- Technical losses (electric energy converted to heat as it passes through electrical equipment);
- Company-use load (electricity necessary to operate substation and generating facility equipment);
- Unbilled customer load (such as street lighting and cable television amplifiers);
- Meter inaccuracies; and
- Energy theft.

Since customers are on different read cycles and billing meters are read at different times over a multiple-month period, it is not possible to capture a "snap-shot" of the total system consumption. Consequently it is not currently possible to accurately determine system losses for any specific point in time. AMI deployment will enable the accurate and timely collection of more granular information on system losses. Please refer also to the responses to BCUC IR1 Q10.1 and Q78.3.2 with respect to the improved ability to measure and calculate losses.

For the purposes of fully allocated cost of service studies, losses for the total system are projected and are added to each customer class on the basis of the voltage level for the class. In FortisBC's 2009 Cost of Service Analysis and Rate Design Application, projected losses were 5.2% for transmission voltage classes, 6.2% for primary voltage classes, and 11% for secondary voltage classes[2].

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[2] http://www.fortisbc.com/About/RegulatoryAffairs/ElecUtility/Documents/FortisBC%20-%202009%20Rate%20Design%20Application%20-%20October%2030%202009.pdf

78.3.1 Would it be possible to obtain a reasonably accurate measure of network losses without the installation of AMI? Please explain why or why not.

Response:

Estimates of total system losses have been used historically in the Company's Revenue Requirements and Cost of Service Analysis Applications. While these estimates are adequate for power purchase and cost allocation purposes, they are not as granular or as detailed as the network losses which could be measured following the installation of AMI meters. These more detailed loss measurements would allow FortisBC to proactively locate and address specific loss problems. Time-synchronized customer billing meter readings are required to make more detailed loss calculations. FortisBC's proposed AMI system is capable of producing these time-synchronized meter readings.

78.3.2 Does FortisBC consider it reasonable to make an AMI investment to address electricity theft in the absence of a reliable estimation of non-technical network losses? Please explain why or why not.

Response:

As described previously in the responses to BCUC IR1 Q78.3 and Q78.3.1, the current method of estimating network losses can only determine overall losses for the entire FortisBC system. By installing AMI meters, system losses could instead be measured at the individual distribution feeder level. These much more detailed measurements would allow FortisBC to proactively locate and address specific loss concerns – whether these losses are commercial or technical in nature. Since a reduction in system losses reduces power purchase costs (and hence rates), it is in the customers' interests for FortisBC to use practical and available technologies such as AMI to identify and reduce system losses.

78.4 How many customer accounts have been subject to production orders by law enforcement officials each year since 2006?

Response:

FortisBC has received a total of thirteen production orders from law enforcement officials since 2006.

78.4.1 Have these production orders been primarily related to marijuana-related concerns?

Response:

85 percent of production orders are related to marijuana grow operations.

78.5 How often has ForticBC been obligated to provide municipalities with a report identifying premises with consumption exceeding 93 kWh per day (under the Safety Standards Act) each year since 2006?

Response:

FortisBC received one municipal consumption request in 2008, but FortisBC understands that no further action was taken.

78.5.1 Is FortisBC aware of the reason why the relevant Safety Standards Act limit was set at 93 kWh/day? If yes, please explain why.

Response:

The daily consumption threshold was set at 93 kWhs (5 lights plus estimated normal household consumption) to assist in identifying potential commercial marijuana growers in private residences. A grow using less than 6 lights is not considered commercially viable. Please also refer to the Plecas study filed as Exhibit A2-2 by the Commission.

79.0 Reference: Project Costs and Benefits

Exhibit B-1, Tab 5.0, Section 5.3.2, pp. 82-83

Theft Reduction, Indoor Marijuana Grow Premises

Concerning the "Plecas Study", Exhibit B-1, page 82 notes the following:

"A 2011 study prepared by Dr. Darryl Plecas, RCMP University Research Chart at the University of the Fraser Valley, estimates that 13,206 indoor marijuana grow premises

existed province wide in 2010. As FortisBC serves approximately 6 percent of residential electric customers in BC, 792 sites were calculated to exist in the Company's service area. This figure is assumed to increase at 2 percent annually in the status quo model, resulting in an overall figure of 824 grow sites in FortisBC's service territory in 2012. "

Concerning the "Probable Status Quo Forecast", Exhibit B-1, page 83 notes that "FortisBC projects that the number of marijuana grow sites will continue to increase at 2 percent annually…"

79.1 Please discuss the factors considered in determining that the number of indoor marijuana grow operations is expected to grow by two percent annually from 2010 through to 2032. Please provide the evidence considered, specifically the information used and the source from which the information was obtained.

Response:

Two percent is the forecast customer growth between 2011 and 2013 as filed in the FortisBC 2012-2013 Revenue Requirements Application, Table 3C. FortisBC chose to use this figure for inflating marijuana grow operation numbers through 2032 since it is based on current forecasts.

If FortisBC instead used the P.E.O.P.L.E. 36[3] estimate of 1.2 percent average annual population growth between 2011 and 2036 for the Status Quo marijuana operation growth, the NPV of the theft benefit would increase to $42.1 million.

79.1.1 Please confirm if the 2011 study by Dr. Plecas assesses the expected growth rate of indoor marijuana grow sites in BC. If confirmed, please discuss the assessment performed and the conclusions drawn in the study.

Response:

The 2011 study by Dr. Plecas does not assess the expected growth rate of indoor marijuana grow sites in BC. The 2010 provincial figure of 13,206 used in the study is calculated using the economic model proposed by Easton in the Easton Policy Paper (please see the response to BCUC IR1 Q74.1). The inputs in the formula are the number of grows founded by police, the risks of operating and the ratio of product value to cost. The formula does not contemplate potential growth rates in the number of provincial sites.

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[3] (http://www.bcstats.gov.bc.ca/Files/48b3eee9-248f-49c2-94a5-b9422efb6e8/BritishColumbiain2036PEOPLE36.pdf)

79.2 According to Table 5.3.2.a, the average number of 1000W lights per site is 30 with the source of this information stated as "FortisBC." Please discuss how this information was obtained by FortisBC and provide any internal data compiled as support.

Response:

The number and size of lights at each theft site are reported to FortisBC by either the attending RCMP officer or an electrician in attendance. While this information is not consistently available, FortisBC has compiled the available data provided from 2005-2011 and calculated an estimate of thirty 1000 watt lights per theft site. Please see the table provided below detailing the number of lights reported to FortisBC.

Table BCUC IR1 Q79.2 – Number of Lights

	Number of Lights 2005-2006	Number of Lights 2007-2011
	30	28
	26	21
	38	24
	26	24
	31	20
	21	26
	24	24
	54	24
	10	42
	24	30
	14	25
	24	40
	46	25
	26	67
	15	24
	41	20
	20	36
	20	36
	24	33
	30	38
	53	33
	24	32
	11	14
	14	28
	12	25
	28	32
	27	21
	24	18
	16	36
	34	24
	20	15
	100	40
	30	38
	45	16
	30	31
	45	42
	30	21
	12	19
	32	21
	30	10
	32	8
	46	20
	28	24
	6	63
	21	12
	2	37
	51	33
	56	42
		10
		10
		36
		32
		27
		19
		24
		34
		16
		114
Average	**29.23**	**29.03**

79.2.1 What is the size of residential service required to support a 30kW grow op?

Response:

A residential application with a 30kW load would be sized at 200 amps.

80.0 Reference: Project Costs and Benefits

Exhibit B-1, Tab 5.0, Section 5.3.2, pp. 81-84;

Exhibit B-3, Excel Document: "FortisBC – AMI Excel NPV Analysis – 17Aug12"

Deterrence Benefit

Concerning the "Probable AMI Forecast", Exhibit B-1 notes:

"It is expected that with an AMI-enabled theft detection program, marijuana grow operators may choose to switch to alternate energy sources rather than pay for electricity. This reduction in gross load is accounted for by assuming a 1 percent growth in grow sites in the probable AMI forecast as opposed to the 2 percent assumed in the status quo model."

"AMI enabled revenue protection is expected to increase theft detection from 8 to 25 percent by 2016, and gradually increase deterrence from 75 to 95 percent by 2021."

Exhibit B-1 also notes the following as the two main reasons for those engaged in marijuana grow operations to divert electricity:

"Customer billing records can be subject to production orders by law enforcement officials and used as evidence to secure search warrants;

An amendment to the provincial Safety Standards Act in 2006 obligates utilities, on request, to provide municipalities with a report identifying premises with consumption exceeding 93 kwh per day. "

80.1 Commission staff has prepared the following table. The table is based on the following:

- The reduction in growth load due to marijuana grow operators moving to alternative energy sources due to the AMI project is factored into the FortisBC analysis per Exhibit B-3 by assuming a two percent growth in sites per the Status Quo versus a one percent growth in sites in the AMI – Probable scenario. Therefore, the incremental difference in total sites between the Status Quo and the AMI – Probable scenario represents the number of sites moving to alternative energy sources each year.

Total Sites per Status Quo	824	841	858	875	892	910	928	947	966	985	1,005	1,025	1,046	1,066	1,088	1,110	1,132	1,154	1,177	1,201	1,225	Agreed to Exhibit B-3, Tab "Theft Reduction"
Total Sites per AMI Program	824	833	841	849	858	866	875	884	893	902	911	920	929	938	948	957	967	976	986	996	1,006	Agreed to Exhibit B-3, Tab "Theft Reduction"
Difference	-	8	17	25	34	44	53	63	73	84	94	105	117	128	140	152	165	178	191	205	219	
Sites Moving to Alternative Energy Sources Each Year (a)		**8**	**8**	**9**	**9**	**9**	**10**	**10**	**10**	**10**	**11**	**11**	**11**	**12**	**12**	**12**	**13**	**13**	**13**	**14**	**14**	
Total Paying Sites - AMI Probable	618	641	663	691	721	760	793	820	843	857	865	874	883	891	900	909	918	928	937	946	956	Agreed to Exhibit B-3, Tab "Theft Reduction"
Increase in Total Paying Sites - AMI Probable Each Year (b)		**23**	**22**	**28**	**30**	**39**	**33**	**27**	**23**	**13**	**9**	**9**	**9**	**9**	**9**	**9**	**9**	**9**	**9**	**9**	**9**	
Difference between (a) and (b)	**-**	**15**	**14**	**19**	**21**	**30**	**23**	**17**	**13**	**3**	**(2)**	**(2)**	**(3)**	**(3)**	**(3)**	**(3)**	**(4)**	**(4)**	**(4)**	**(4)**	**(5)**	
Total Sites Moving to Alternative Energy Sources	**219**																					
Total Increase in Paying Sites - AMI Probable	337																					

Please confirm that the table is correct. If not confirmed, please provide an updated table and explain the differences.

Response:

Confirmed.

80.1.1 According to the table prepared by Commission staff above, the number of marijuana grow operation sites that will commence paying for electricity due to the AMI project exceeds those that will move to alternative energy sources. Please explain the rationale for this, given that the two main reasons for energy theft are indicated as those to evade detection by both law enforcement and municipal authorities.

Response:

The detection risks to illegal marijuana grow operations from production orders and the amended *Safety Standard Act* cited in the preamble to this question are known and stable risks, particularly in FortisBC service territory where no municipalities have taken action to date. All other risks being equal, FortisBC would expect the number of paying sites and alternate energy sites to remain constant.

However, other detection risk factors are not equal in the status quo and AMI scenarios. In the status quo scenario, the increased risk of detection due to electricity theft in BC Hydro service territory would be considered by marijuana growers. In the AMI scenario, the increasing risk of detection due to theft in both BC Hydro and FortisBC service territories would be considered.

In light of these evolving detection risk considerations, FortisBC considers it reasonable that there would be both an increase in paying sites and an increase in the use of alternative energy sources. Both of these responses by illegal marijuana grow sites are logical given the increased risk of the theft detection and the stable risk of paid consumption detection.

81.0 Reference: Project Costs and Benefits

Exhibit B-3, Excel Document: "FortisBC – AMI Excel NPV Analysis – 17Aug12"

Tab: Theft Reduction

81.1 For tab "Theft Reduction," please confirm if the figures presented for 2012 through 2032, inclusive, are presented in real or nominal dollars.

<u>Response:</u>

The figures for 2012 through 2032 are presented in nominal dollars.

81.2 For tab "Theft Reduction," please define each term listed below:

- Marginal Revenue
- Marginal Cost
- Marginal Revenue Margin

<u>Response:</u>

Marginal Revenue is incremental revenue received per MWh at the residential tariff rate which is billed to FortisBC customers ($120.04 per MWh in 2012).

Marginal Cost is the incremental power purchase expense per MWh based on the BC Wholesale Market Energy Price Forecast ($54.68 per MWh for 2012).

Marginal Revenue Margin is the difference between Marginal Revenue and Marginal Cost ($120.04-$54.68=$63.35 per MWh for 2012).

81.3 For tab "Theft Reduction," please discuss the key cost assumptions made and alternatives considered in determining the marginal cost for each year of the 20-

year period. For each alternative considered, please discuss the likelihood of each occurring.

Response:

All revenue calculations are based on the forecast Tier 2 residential conservation rate to 2016, escalated at 2 percent thereafter. All power purchase costs are based on the BC Wholesale Market Energy Price Forecast.

FortisBC considers these revenue and cost rate forecasts to be reasonable and as such did not consider other alternatives.

81.4 For tab "Theft Reduction," please discuss the key assumptions made and alternatives considered in determining the marginal revenue for each year of the 20-year period. For each alternative considered, please discuss the likelihood of each occurring.

Response:

Please see the response to BCUC IR1 Q81.3. FortisBC did not consider other alternatives.

82.0 Reference: Project Costs and Benefits

Exhibit B-1, Tab 5.0, Section 5.3.2, pp. 88-89, 127

Exhibit B-1, Appendix C-4, BC Hydro Smart Meter Business Case, p. 9;

Energy Theft - Feeder Meters

FortisBC states on pages 88 and 89 of the Application:

"Feeder meters, as distinct from those to be installed at customer homes or businesses, will be installed at key points on FortisBC distribution feeders. These meters monitor cumulative electricity loads on an hourly or more frequent basis and will measure the total electricity supplied to a specific area. Based on the data supplied by the feeder meters, AMI connected transformer meters can be strategically deployed downstream to effectively balance the energy inventory in targeted areas of the feeder. ...

Energy balancing will require the purchase of feeder, transformer and portable wireless meters plus the associated annual operational expense. The Company proposes a capital investment of $1.1 million for a selection of energy balancing meters. This capital *cost is based on preliminary unit costs quoted from vendors who are active in product development, and has been included in the capital expenditure request for the AMI Project. The AMI Project includes a strategic deployment of these meters beginning in 2015. The accompanying operational expense is forecast at $0.24 million in 2015.*

This AMI feature is expected to increase theft detection to 25 percent by 2016 and gradually increase deterrence from 75 to 84 percent by 2016. Results from this initial approach will be reviewed to determine if additional capital investment will generate satisfactory incremental returns and if warranted, FortisBC will seek approval of new capital and operational investment in a separate filing."

FortisBC states on page 127 of the Application:

"As part of the Company's AMI Project, FortisBC, FortisBC Energy (FEI) and BC Hydro initiated a process to review the opportunities and benefits of collaboration and coordination on Smart Meter (AMI) projects.

BC Hydro's Smart Meter Business Case (Appendix C-4 of the Application) states on page 9:

"Legitimate customers bear the cost of electricity theft, which has grown significantly from approximately 500 GWh in 2006 to an estimate of at least 850 GWh today—that's enough power to supply 77,000 homes for a year and amounts to approximately $100 million a year in energy cost.

Although BC Hydro has identified over 2,600 electricity thefts over the past five years, identifying and confirming theft is a time-consuming, inefficient and expensive manual process. While BC Hydro cannot reasonably expect to eliminate all electricity theft, augmenting the current manual process with new technology will substantially reduce current levels of theft by:

- *Theft detection—New distribution system meters (different from those to be installed at customer homes or businesses) located at key points on BC Hydro's system will measure electricity supplied to specific areas. Combined with software tools to enable electricity balancing analysis, distribution system meters will help BC Hydro identify electricity theft more accurately and address it more quickly.*

- *Tamper detection—Smart meters have a tamper detection feature that automatically notifies BC Hydro if they have been removed from the wall or otherwise manipulated.*

Reducing electricity theft delivers tangible financial benefits through increased revenue, revenue recovery (e.g. back-billing), and reduced cost of energy."

A July 2010 VaasaETT GETT Report titled "Evaluation of residential smart meter policies" states on page 69:

"The high levels of theft [in Brazil] however do mean that a simple and low functionality smart metering system could pay for itself, as it has in Italy, assuming the logistical difficulties of such a large rollout, 54 million customers, and the effects of the moist climate are not too costly. In most smart meter rollouts, it is not the actual meters which cost; it is the communication and data-handling infrastructure put into place. However if tampering and accurate readings are the main goals, this infrastructure is less expensive – again as can be seen from the example of the Italian rollout which cost only €70 per household as compared to over €200 in most other markets. This will again mean however that the number of environmentally beneficial programmes enabled by the system may be lowered depending on the system design."

82.1 Are FortisBC assumptions regarding the cost to customers of electricity theft consistent with those used by BC Hydro in its Smart Metering and Infrastructure Program Business Case? If no, please explain.

Response:

The assumptions regarding the cost to customers of electric theft are not detailed in the referenced BC Hydro Business Case. The document reports $100 million annually in lost revenues due to electric theft but does not specifically cite the associated cost to customers.

The theft benefit per customer of FortisBC AMI deployment is estimated at $330 ($38 million NPV benefit divided by 115,000 customers) which compares favourably with the BC Hydro theft benefit of $406 ($732 million NPV benefit divided by 1,800,000 customer) as estimated from data in the published Business Case, which suggests similar assumptions are used.

82.2 Is FortisBC aware of BC Hydro's approach to identifying electricity theft, and their successes/ challenges to date? If yes, please describe. If no, please explain if FortisBC's collaboration and coordination with BC Hydro could be considered adequate without this information.

Response:

The detailed methodology used in identifying electric theft and the subsequent results is necessarily sensitive in nature. FortisBC confirms that it has discussed with BC Hydro their approach to identifying electricity theft and their successes/challenges to date under a Non - Disclosure Agreement. The benefit of this discussion is reflected in FortisBC's approach to theft reduction in Tab 5.3.2 of the Application and it is expected that collaboration will continue as more experience is gained by both parties.

82.2.1 Does FortisBC consider it would be reasonable to further delay AMI deployment until lessons could be learned from BC Hydro regarding the extent of theft on its network and the cost-effectiveness of AMI as a tool to address it? Please explain why or why not.

Response:

The customer benefit of AMI deployment is not limited to the benefit of theft reduction. There are additional financial and non-financial considerations as well as regulatory and legislative environments that support the proposed timing of AMI installation at FortisBC. To delay AMI implementation will generally delay these benefits for FortisBC customers and will specifically increase losses due to electric theft. Please refer to Tab 5.3.2, page 83 and Table 5.0, page 69 from the Application, and the responses to BCUC IR1 Q53.11 and Q82.2.

82.3 Are the distribution feeder meters referred to by FortisBC above the same as the ‘new distribution system meters (different from those to be installed at customer homes or businesses) located at key points on BC Hydro’s system’ referred to in BC Hydro’s AMI business case? If no, please explain any differences.

Response:

The distribution meters referred to in the FortisBC AMI Application are expected to be similar in function to those contemplated in the BC Hydro Smart Metering & Infrastructure Business Case. FortisBC understands that BC Hydro has issued a RFP for distribution feeder meters but has not yet made a final decision on the specific model to be used. It is the intent of FortisBC to follow closely the BC Hydro experience and employ similar technology as appropriate for FortisBC customers.

82.4 Did FortisBC undertake a cost/benefit analysis of only installing advanced distribution feeder meters (rather than advanced meters at customer homes or businesses) as an option to detect electricity theft? Please explain why or why not.

Response:

As indicated in Tabs 5 and 6 of the Application the customer benefit of advanced meter deployment is not limited to the detection of electricity theft. For this reason FortisBC did not undertake a cost/benefit analysis of installing only distribution feeder meters. FortisBC has previously tested a manual approach to energy balancing at the feeder level as a means of theft detection and has concluded that the installation of feeder meters without the accompanying advanced meters as an effective tool to identify electric theft is not practical for the following reasons.

- It is not possible to accurately synchronize the meter readings on the feeder meters with the cumulative consumption recorded by the current meter system as the readings cannot be collected simultaneously, (it takes a meter reader several hours to read a route and each feeder may have several routes which are read on different days depending on the geography and customer population).
- If one accepts inaccuracies introduced by a manual meter reading approach to energy balancing at the feeder level, specific theft identification would still require repeated manual re-reading of meters downstream of primary metering to begin locating the source of unusual losses.

The repeated and non-standard nature of the manual meter readings required for this type of energy balancing would alert electricity thieves to the theft detection activities of the Company.

82.4.1 Please provide the results (or undertake and provide the results) of the analysis referred to above. Please state all assumptions used.

Response:

Please refer to the responses to BCUC IR1 Q82.4, Q82.4.2 and Q87.2.9.

82.4.2 Does FortisBC consider it would be prudent to install the feeder meters for theft detection first, and only include any additional electricity theft related benefits in a subsequent AMI business plan? Please explain why or why not.

Response:

The installation of feeder meters without the concurrent installation of advanced meters at customer premises is not an effective tool in identifying electric theft. The thefts benefits require the deployment of both types of meters. Please also see the response to BCUC IR1 Q78.3.1.

82.5 Please estimate the average infrastructure cost per residential household of (i) the AMI proposal and (ii) an alternative where the advanced meters are only installed on the feeder level (rather than at customer homes or businesses).

Response:

The AMI capital cost per customer is approximately $425. The installation of feeder meters only would not be effective in detecting energy theft (please see the response to BCUC IR1 Q82.4), but if deployed would cost approximately $10 in capital per customer. Please also see response to BCUC IR1 Q84.1.1.

82.6 Please describe the differences in IT costs if HH load data at individual customer sites is used as the investigative starting point to identify electricity theft, rather than the load data from feeder meters.

Response:

FortisBC assumes that HH load data refers to interval load data, which in the case of the proposed AMI system is expected to be hourly.

Hourly interval data consumption data without synchronized load data from feeder meters does not allow energy balancing. Energy balancing is performed by comparing hourly consumption measured on a feeder meter to the synchronized hourly total of all customer meters downstream. This is a simple and highly effective method of detecting theft and other non-technical losses.

FortisBC does not contemplate additional IT costs specific to theft detection. The project budget provides for the addition of one data analyst to extract leads from AMI data on potential theft sites using existing software tools.

82.6.1 Is ‘off-the-shelf’ IT software available to identify electricity theft using (i) HH load data at individual customer sites and (ii) load data from feeder meters?

Response:

FortisBC is aware of “off-the-shelf” software that purports to identify electricity theft. Commercially available software is primarily based on heuristic algorithms that attempt to detect theft using load data rather than energy balancing. Software-based heuristic algorithms attempt to identify sites based on suspicious consumption patterns. It is challenging to identify theft by consumption patterns since there is no consumption to be detected. This software is most useful for detecting suspicious paid consumption patterns, which is not the purpose of the FortisBC revenue protection program.

FortisBC continues to monitor commercial theft detection software, but believes that energy balancing is the most cost-effective approach.

82.7 Why does FortisBC consider that hourly consumption data may be sufficient for feeder meters, and yet requires half-hourly consumption data for advanced meters at customer homes or businesses?

Response:

The Application states in several sections the intent to collect hourly consumption data from advanced meters installed at customer premises (please refer to pages 3,19, 46, 51 and 55 from the Application). There is no intent at this time to collect consumption data at half-hourly intervals.

83.0 Reference: Project Costs and Benefits

Exhibit B-1, Tab 5.0, Section 5.3.2, pp. 82-84;

Energy Theft - Annual Marijuana Energy Use Assumptions

FortisBC states on pages 82 to 84 of the Application:

"A 2011 study prepared by Dr. Darryl Plecas, RCMP University Research Chair at the University of the Fraser Valley, estimates that 13,206 indoor marijuana grow premises existed province wide in 2010. As FortisBC serves approximately 6 percent of residential electric customers in BC, 792 sites were calculated to exist in the Company's service area. This figure is assumed to increase at 2 percent annually in the status quo model, resulting in an overall figure of 824 grow sites in FortisBC's service territory in 2012.

Dr. Plecas reports an average of 36 lights per site; however, FortisBC historical data indicates 30 lights per site. Although FortisBC data indicates the number is trending upward, the more conservative 30 has been used in the theft benefit calculation. Each light consumes an average 14 kWhs per day based on a combination of 18 and 12 hours *cycles which translates into 151,200 kWhs annually per site. Therefore these 824 sites will consume approximately 125,000 MWhs in 2012. ...*

There is considerable uncertainty in predicting long term customer behaviour related to marijuana production in an environment of political debate on the topic and evolving legislative response. ... It is expected that with an AMI-enabled theft detection program, marijuana grow operators may choose to switch to alternate energy sources rather than pay for electricity. This reduction in gross load is accounted for by assuming a 1 percent growth in grow sites in the probable AMI forecast as opposed to the 2 percent assumed in the status quo model. ...

AMI-enabled revenue protection is expected to increase theft detection from 8 to 25 percent by 2016, and gradually increase deterrence from 75 to 95 percent by 2021."

A 2011 study titled "The Nature and Extent of Marihuana Growing Operations in Mission British Columbia: A 14 Year Review (1997-2010) by the University of the Fraser Valley" states on page 6:

"Further, it is worth noting that those growing operations involving electricity theft have been consistently larger than operations that do not involve electricity theft."

83.1 Confirm the study filed as Exhibit A2-1 is the 2011 study prepared by Dr. Darryl Plecas, RCMP University Research Chair at the University of the Fraser Valley referred to on page 87 of the Application. If not, please file the 2011 study prepared by Dr. Darryl Plecas, RCMP University Research Chair at the University of the Fraser Valley referred to on page 87 of the Application.

<u>Response:</u>

The Plecas study filed by Commission staff as Exhibit A2-1 is the study referred to on pages 82-86 of the Application.

83.2 Please explain the rationale behind the following assumptions made by FortisBC:

- That the number of marijuana grow premises in FortisBC territory compared to the BC total is proportional to the number of residential electric customers.
- Under the status quo, the number of marijuana grow operations in FortisBC territory is assumed to increase by two percent per year. In your response, please discuss the ability of the FortisBC theft detection program and the 2006 Safety Standards Act to place downward pressure on the number of marijuana grow operations.

Response

The assumption that the number of marijuana production sites at FortisBC is proportional to the provincial number of residential electric customers is based on the following:

- The majority of confirmed paying and non-paying marijuana sites are located in privately owned residences or out buildings versus commercial establishments.
- The rationale is endorsed in Professor Neil Boyd's Opinion (Please BCUC IR1 Q86.1).
- The 2004 Public Policy Paper by Stephen T Easton calculates an implied number of grow houses by region from the number of RCMP busts. Based on Table 5 in the paper, the proportionate share of the provincial estimate in the FortisBC service territory ranges from 5-8% when allowances are made for municipal utilities and geographical overlap with BC Hydro. Please see BCUC IR1 Q74.1.

The research article, "The Marihuana Indoor Production Calculator" filed by Commission staff as Exhibit A2-2 estimates 10,000 marijuana grow sites existed in BC in 2003. The 2011 Plecas report filed as Exhibit A2-1 calculates the number of sites at 13,206 in 2010. The growth in the estimated number of sites from 2003 to 2010 does not seem to indicate downward pressure from the 2006 Amendment on the number of marijuana grow operations in BC. This is not surprising given the lucrative nature of this illegal business.

83.3 Is it FortisBC's experience that the marijuana grow operations involving electricity theft are generally the same size as marijuana grow operations that do not involve electricity theft? Please explain why or why not.

Response:

FortisBC does not have information that would allow it to compare the size of paying and stealing marijuana grow operations.

FortisBC has limited experience with paying marijuana grow operations since it is interested primarily in detecting and deterring theft. FortisBC does not request information from the RCMP for marijuana sites that have been busted and are paying for electricity.

FortisBC does ask the RCMP for the number, size and timer settings of the lights at busted grow operations stealing electricity in order to invoice for losses.

83.4 What type of lamp and wattage has been assumed to be used in the marijuana grow operation?

Response:

The theft detection benefit calculation assumes the use of 1000 Watt High Pressure Sodium or Metal Halide lamps in marijuana grow operations.

83.4.1 How likely is it that, over the next 20 years, marijuana grow-operations would switch to more efficient light bulbs, such as LED's? Please explain and describe the potential impact on the number and electricity consumption of paying and non-paying marijuana grow operations on FortisBC's network.

Response:

Several factors need to be considered in analysing the future use of LED lights in marijuana grow operations over the 20 year life of the project.

Current LED Use

- FortisBC has queried local and provincial RCMP drug squads for the use of LEDs at sites shut down for illegal production. Both groups report no findings of LED lights to date;
- To date, FortisBC has not discovered the use of LED technology in any of the approximately 160 grow operations it has identified as diverting electricity;
- FortisBC has consulted the BC Growers Association and the Institute for Sustainable Horticulture at the Kwantlan Polytechnic University in Langley to inquire on the use and results of LED lights in commercial applications. Both parties report that they do not use LEDs in commercial applications as the technology is still in development and the results unproven for commercial applications; and
- FortisBC has polled seven hydroponic suppliers in the service area and none were stocking LED lights for indoor growing. Without exception, the reasons cited were lack of market demand, high cost and poor results.

It appears that there is considerable information available (much of it from LED suppliers) to suggest that LED lighting has a great deal of "future potential", but there is little credible evidence to support a current trend towards LED use by marijuana grow operations.

Current LED Technology

Non-industry studies on LED lighting in greenhouse applications, while often hopeful about the future of LED lighting, do not generally advocate a switch from HPS lighting in practical applications.

The October 2011 publication of Greenhouse Canada contains an article by Dr. Elly Nederhof, a guest scientist at Wageningen University and Research Centre in the Netherlands. The report equates the LED to HPS in terms of efficiency. She further points out that increases in efficiency, a reduction in price as well as additional knowledge is required to better apply LED technology for plant growing. The report is attached as Appendix BCUC IR1 83.4.1.

Another academic study abstract comparing the growth of tomatoes under hybrid LED and HPS lighting (http://www.actahort.org/books/952/952_42.htm) concluded that “The use of LEDs can be promising for greenhouse horticulture, but before it can be put into practice on a large scale more knowledge must be acquired on effects of LED lighting on crops. Furthermore, the growers will have to learn to grow their crops under LEDs and the efficiency of LEDs must increase even more.”

From Wikipedia http://en.wikipedia.org/wiki/Cannabis_cultivation:

> Recent advancements in LED technology have allowed for diodes that emit enough energy for cannabis cultivation. These diodes can emit light in a specific nanometer range, allowing for total control over the spectrum of the light. LEDs are able to produce all of their light in the PAR range. One major short coming of LED’s remains their lack of intensity. Due to this lack of intensity LED is only able to excel at growing plants in the vegetative stage of growth, or when flowering with extremely small canopies (micro grows).
>
> LED grow lights are still considered an experimental technology in cannabis cultivation. Due to their high cost and low light output they remain unused by the commercial grower. The market remains flooded with cheap quality LED lights that do not produce yields comparable to what growers are accustomed to. Many companies are using single watt LED chips, which have notoriously produced low yields and wispy results. When considering purchasing any grow light, one should carefully examine both the spectrum and the intensity of the light, and try to find results from similar grows using that light.

Future LED Use

Commercial marijuana growers who are faced with a choice between proven and unproven technology that costs approximately 10 times more will consider several factors:

- New technology in its current stage of development will dramatically increase the start-up costs of a risky illegal operation with uncertain crop results. Easton's estimate of operating cost would increase approximately 50% and yield a negative return for the investor. (Please see Easton Policy Paper filed as Appendix BCUC IR1 74.1).
- Easton cites electric costs for paying sites using existing technology at less than 10% of operating cost. If energy is being paid for and the new technology presents a 70% reduction in electric costs then the investor would not likely recover the initial investment during the project life or the expected life of the apparatus.
- If the marijuana grower is stealing electricity, there is no reasonable motivation to reduce energy consumption.
- A reduction of 70 percent in electric consumption (assuming a 300W LED light replaces a 1000W HPS) will result in annual energy consumption of 45,360 kWhs for a 30 light operation (126 kWhs per day). This level of consumption exceeds the 93 kWh daily average reportable under the *Safety Standards Act*. Therefore if municipal engagement occurs at FortisBC under the Act, paying operators will not be able to avoid detection by using current LED technology.

<u>Impact on the NPV of Net Benefit</u>

FortisBC has considered the potential impact of emerging LED technology on the AMI Application and observes the following.

- Considerable dialogue and testing from 2007-2011 have not yet produced a satisfactory prototype and it does not seem reasonable to contemplate the use of LEDs for illegal marijuana production during the life of the project.
- Sites that have chosen to steal energy will have no motivation to embrace this technology.
- Sites that have chosen to pay will not use LEDs unless cost and efficiency align such that the capital investment can be quickly recovered in reduced electric costs and/or the use of LEDs will eliminate detection under the obligations of the Safety Standards Act.

In analyzing a potential impact of LED use in marijuana production FortisBC has calculated the NPV of Net Benefit at $32.9 million as presented in the supporting analysis provided as Electronic Attachment BCUC IR1 87.2. All assumptions remain unchanged except that the LED energy requirements are assumed to be 30 percent of the energy requirements for HPS lights. LED adoption is assumed to begin in 2017 at an annual growth rate of 2 percent per year in both scenarios for the remaining analysis period of the project.

84.0 Reference: Project Costs and Benefits

Exhibit B-1, Tab 5.0, Section 5.3.2, p. 89

Energy Theft Reduction - Phase 1 / Phase 2 Savings

FortisBC states on page 89:

"The savings from energy theft reduction will be realized in accordance with the two phases discussed above. The Company expects to increase detection of energy theft from 8 to 15 percent in 2014 -2015 due to the productivity gains and improved data analysis associated with initial deployment. The introduction of energy balancing beginning in 2015 is expected to increase the deterrent impact to 84 percent by 2016, and improve detection capabilities to 25 percent by 2016. The progression of recoveries for the life of the Project is detailed in the table below."

Table 5.3.2.e - Forecast Savings from Energy Theft Reduction

Forecast Savings ($000s)							
Theft Reduction	Phase 1	2013	2014				
		(383)	(987)				
	Phase 2	2015	2016	2017	2018	2019	2020
		(1,711)	(2,835)	(3,611)	(4,114)	(4,540)	(4,901)
		2021	2022	2023	2024	2025	2026
		(5,131)	(5,248)	(5,346)	(5,455)	(5,596)	(5,739)
		2027	2028	2029	2030	2031	2032
		(5,885)	(6,046)	(6,249)	(6,440)	(6,675)	(6,815)

84.1 Would it be correct to infer that Phase 1 reflects the energy theft reduction benefits from AMI, while Phase 2 reflects the energy theft reduction benefits related to energy balancing (purchase of feeder, transformer and portable wireless meters plus the associated annual operational expense)? Please explain why or why not.

Response;

The theft reduction benefits contemplated in Phase 1 are related to the deployment of advanced meters at customer premises. These benefits are further enhanced in Phase 2 by the addition of energy balancing. FortisBC has not estimated the benefit of each phase separately. Please also see the responses to BCUC IR1 Q78.3.1 and Q82.4.2.

84.1.1 Is it possible to put in place Phase 2 without Phase 1? If no, please explain why not, and describe the minimum requirements of Phase 1 in order to proceed with Phase 2.

Response:

It is possible to install Phase 2 without Phase 1 however the data collected would not be meaningful in determining system losses or identifying electric theft at customer premises. Phase 1 requires the deployment of advanced meters at each customer premise in order to realize the benefits associated with energy balancing in Phase 2. Please see the responses to BCUC IR1 Q84.1 and Q82.4.1.

84.1.2 Are there other jurisdictions that have put in place a similar energy balancing initiative without advanced meters being installed at each customer's premises? If yes, please describe.

Response:

FortisBC is not aware of any energy balancing initiatives in the absence of advanced meter deployment.

85.0 Reference: Project Costs and Benefits

Exhibit B-1, Tab 5.0, Section 5.3.2, p. 83;

Energy Theft Reduction - FortisBC Revenue Protection Plan

FortisBC states on page 83 of the Application:

"FortisBC has had a revenue protection program in place since 2006. Based on a three year average for the period 2009 – 2011, the program has identified an average 25 percent of known or suspected marijuana sites as diverting energy, which equates to a 75 percent deterrence factor as a result of FortisBC's current revenue protection activities. ...

Revenue protection investigations have discovered an average of 8 percent of the total estimated theft sites annually. This implies that in 2012, 16 of the estimated 206 sites *engaged in theft will be identified and the remaining 190 sites will be undetected representing an annual revenue loss of $3.7 million in 2012. ...*

However, it is anticipated that after it becomes clear that FortisBC will not have an AMI-enabled theft detection program (as would be the case with the status quo), the current deterrence benefit will drop from 75 percent in 2012 to 70 percent by 2017."

A 2011 study titled "The Nature and Extent of Marihuana Growing Operations in Mission British Columbia: A 14 Year Review (1997-2010) by the University of the Fraser Valley" (Exhibit A2-7) states on page 6:

"In terms of electrical theft, this too has increased three fold in terms of the percentage of operations since the late 1990's that installed a bypass to steal power. Specifically, as demonstrated in Table 8, a majority (57 per cent) of [Mission marijuana grow] operations were stealing electricity."

85.1 Please describe the FortisBC Revenue Protection Program. Please include in your description the program's objective, staffing and budget (from 2009 to 2011).

Response:

The primary objective of the FortisBC Revenue Protection Program is to identify, recover and deter electricity theft. The program staff consists of one manager who is responsible both for the administration of electric theft investigations as well as the administration of third party contracts (leasing of pole space to telecommunication companies). The theft investigation activity is supported by one contracted theft investigator responsible for investigating leads on potential theft sites, invoicing and collecting losses, and attending court as required. The budget also includes support from a contracted power line technician to assist in after-hours and underground service investigations. The budget for the years 2009-2011 appears in the following table.

2009	2010	2011
$225,000	$230,000	$234,600

85.2 Please describe any expected changes in the Revenue Protection Program and budget over the next 20 years, under the status quo scenario and under the AMI scenario.

Response:

No changes to staffing or methodology are assumed in the Status Quo scenario, with costs escalating by inflation.

Staffing changes in the AMI scenario are discussed in the response to BCUC IR1 Q85.2.1, and the budget impacts in BCUC IR1 Q77.1.

85.2.1 Please describe and identify under both scenarios any programs/costs related to Phase 1 and Phase 2 theft reduction initiatives.

Response:

There are no program/costs in the status quo scenario related to Phase 1 and Phase 2 theft reduction initiatives as both are possible only with AMI deployment.

The program changes under Phase 1 of the AMI scenario involve a shift from reliance on external tips to leads generated by tamper detection and improved data quality as well as the operational efficiencies offered by on demand meter readings. Phase 1 requires the addition of 1 full time data analyst in 2014 estimated at $0.118 million to extract potential sites for investigation. Phase 2 program changes involve energy balancing in strategic areas of feeders to provide additional leads and will require the further addition of 1 full time power line technician valued at $0.120 million. Please see response to BCUC IR1 Q77.1.

85.3 Please describe how FortisBC becomes aware of 'known or suspected marijuana sites'.

Response:

FortisBC becomes aware of confirmed marijuana sites as a result of the execution of RCMP search warrants where FortisBC crews are requested to disconnect the electric service due to safety concerns. Suspected sites are those where a tip or field investigation suggests the possibility of a marijuana operation but there is no conclusive evidence to confirm this.

85.3.1 Does FortisBC have any explanation as to why 57 percent of marijuana grow operations in Mission were estimated in the University of Fraser Valley Mission study as diverting electricity, and yet in FortisBC territory it is estimated at 25 percent?

Response:

The FortisBC estimate of a 25 percent theft rate in marijuana grow operations within the service territory is based on FortisBC internal data from 2009-2011. The Company has no explanation for the figure quoted in the Mission study, however FortisBC does note that it has had a robust Revenue Protection program in place since 2006 which factors into the estimated 25 percent theft rate. To the extent that the estimated theft rate is higher, the proposed AMI Project would provide a greater net benefit. The Company submits that its decision to assume an estimate of a 25 percent theft rate reflects the conservative approach used to model the potential benefit of AMI for theft detection and deterrence.

85.3.2 Please describe the approach taken by FortisBC in investigating known or suspected marijuana sites.

Response:

When a lead is obtained pertaining to known or suspected electricity theft or a marijuana grow operation, the account is reviewed for changes in billed consumption or links to other identified theft sites. If warranted, a field investigation ensues to measure instantaneous load before the meter and compare it with the consumption currently being recorded on the meter. If there is a discrepancy, theft is confirmed.

85.3.3 How does FortisBC ensure the safety of its employees investigating marijuana grow operations?

Response:

FortisBC employees are not engaged in the field investigation of marijuana grow operations. FortisBC hires contractors that have experience in this type of investigation to minimize the risk. The investigator employed by FortisBC at this time is a licensed Private Investigator and a former RCMP officer with 30 years of drug related experience has been contracted to investigate sites where theft is potentially occurring. The majority of confirmed theft to date has been associated with marijuana grow operations. The safety of this contractor is ensured in the following ways:

- The installation of an Automated Vehicle Locator in the vehicle used to visit sites.
- Adherence to a working alone policy that complies with Work Safe BC requirements.

FortisBC field staff are sometimes required to perform electrical service disconnections for safety reasons at RCMP request during the execution of search warrants. These employees attend only with the RCMP on site.

85.4 What actions does FortisBC take when it discovers a marijuana grow operation has been diverting electricity?

Response:

If electricity theft is discovered, it is reported to police with the detail of the daily losses calculated during the field investigation. If the RCMP executes a search warrant, FortisBC will request a report from the attending constable or electrician on the details of the diversion (i.e. parties at the scene, actual load, timer settings and estimated duration of the theft). An invoice will be issued to the perpetrators of the theft, which will be provided to the RCMP along with a request for restitution in any court proceedings. FortisBC will use customary collection strategies to facilitate invoice payment.

85.4.1 How successful has FortisBC been in back-billing marijuana grow operators who have been diverting electricity? Please quantify.

Response:

FortisBC back-billed $0.714 million from 2006 – 2011 for the costs associated with theft of electricity and collected $0.355 million for the same period. Approximately 98 percent of this amount is related to marijuana grow operations. Details are provided in the table which follows.

Year	Invoiced	Collected
2006	$ 145,168	$ 79,982
2007	$ 111,867	$ 100,003
2008	$ 168,720	$ 64,602
2009	$ 78,164	$ 45,836
2010	$ 124,357	$ 32,617
2011	$ 86,135	$ 32,045
Total	**$ 714,411**	**$ 355,086**

85.5 Has FortisBC considered as an alternative option to address electricity theft an expansion of the role of the Revenue Protection Program (which could be coupled with advanced meters at the feeder level)? If not, please explain why not. If yes, please describe the results.

Response:

The alternative option as described has not been considered by FortisBC since the deployment of advanced meters at the feeder level in the absence of advanced meters at customer premises is not an effective tool in identifying electric theft. An expansion in the existing department in conjunction with advanced feeder meters would not increase the number of leads nor improve the quality of tips; both of which are possible with AMI deployment. Please see the responses to BCUC IR1 Q82.4 and Q84.1.1.

86.0 Reference: Project Costs and Benefits

Exhibit No. B-1, Tab 5.0, Section 5.3.2, pp. 80-83

Potential AMI Forecast

86.1 Provide a copy of information from Professor Neil Boyd, professor of criminology at Simon Fraser University, that allowed FortisBC to prepare the two additional calculations based on its interpretation of their data: a low range (“Low Range“) and a high range (“High Range”) estimate.

Response:

Please refer to Appendix BCUC IR1 86.1 entitled Professor Neil Boyd Opinion which supports a Low Range calculation. The High Range calculation was based on the 2011 report issued by Dr. Darryl Plecas and Jordan Diplock titled “The Increasing Problem of Electrical Consumption in Indoor Marihuana Grow Operations in British Columbia”. The latter report was filed by Commission staff on August 14, 2012 as Exhibit A2-1.

86.2 What would the low/high range forecast be if grow ops switch to LED lighting systems?

Response:

As current information suggests that this technology is not yet proven for marijuana production, FortisBC does not contemplate the conversion to LED Lighting systems by producers during the life of the project. Further, the information FortisBC used to estimate the probable theft benefit related to AMI did not contemplate the adoption of LEDs by growers, as such a discussion of possible ranges for low/high forecasts is not possible. However, if it were possible that a marketable prototype were in use by up to two percent of growers beginning in 2017, the NPV of the Net Benefit presented in the Application declines to $32.9 million. Please see the responses to BCUC IR1 Q83.4.1 and Q87.2.4 for a detailed discussion on LED use in marijuana production. The supporting analysis is provided in the Electronic Attachment BCUC IR1 87.2.

87.0 Reference: Project Costs and Benefits

Exhibit B-1, Tab 5.0, Section 5.3.2, p. 84

Energy Theft Reduction - Probable AMI Forecast

FortisBC includes the following table on page 84 of the Application:

Table 5.3.2.b – Probable AMI Forecast

Probable AMI Forecast

		2012	2013	2014	2015	2016
Marginal Revenue	per MWh	$ 120.03	$ 125.98	$ 136.78	$ 148.32	$ 160.63
Marginal Cost	per MWh	$ 54.68	$ 57.30	$ 61.18	$ 64.49	$ 68.47
Marginal Revenue Margin	per MWh	$ 65.35	$ 68.68	$ 75.60	$ 83.83	$ 92.16
Status Quo - Probable						
Deterrence (% paying grow-ops)		75%	74%	73%	72%	71%
Investigation success		8.0%	8.0%	8.0%	8.0%	8.0%
Total sites		824	841	858	875	892
Total paying sites		618	622	627	631	635
Total theft sites		206	218	231	244	257
Identified theft sites		16	17	18	20	21
Revenue margin from paying sites		6,109,373	6,463,489	7,162,791	7,996,908	8,852,497
Power purchase cost from theft sites		(1,703,956)	(1,892,737)	(2,137,580)	(2,378,679)	(2,661,337)
Recovered revenue from theft identification		359,080	399,492	458,782	525,188	599,373
Total benefit/(cost) from Status Quo - Probable		**4,764,497**	**4,970,244**	**5,483,994**	**6,143,416**	**6,790,533**
AMI Program - Probable						
Deterrence (% paying grow-ops)		75%	77%	79%	81%	84%
Investigation success		8.0%	8.0%	12.0%	15.0%	25.0%
Total sites		824	833	841	849	858
Total paying sites		618	641	663	691	721
Total theft sites		206	191	177	158	137
Identified theft sites		16	15	21	24	34
Revenue margin from paying sites		6,109,373	6,660,390	7,584,059	8,759,240	10,045,812
Power purchase cost from theft sites		(1,703,956)	(1,657,038)	(1,641,857)	(1,543,771)	(1,417,774)
Recovered revenue from theft identification		359,080	349,744	528,580	639,091	997,826
Total benefit/(cost) from AMI - Probable		**4,764,497**	**5,353,097**	**6,470,782**	**7,854,560**	**9,625,864**
Total probable net benefit/(cost) from AMI		**-**	**382,852**	**986,789**	**1,711,144**	**2,835,330**
		NPV of Net Benefit				
		$ 38,386,403				

87.1 Please state all assumptions used in this calculation of the NPV of Net Benefit of $38 million in Table 5.3.2.b/

Response:

The assumptions used in the calculation are detailed in the tables which follow.

Table BCUC IR1 Q87.1a - Status Quo-Probable

Line	Input	Assumption
A	Marginal Revenue	FortisBC Residential Tariff Forecast (Tier 2)
B	Marginal Cost	BC Wholesale Energy Market Forecast
C	Marginal Revenue Margin	(A-C)
D	Deterrence (% paying sites)	Deterrence ratio will decline from current 75% to 70% by 2017 without AMI and remain at 70% thereafter.
E	Investigation success	The investigation success rate will remain at 8% as leads will not increase.
F	Total sites	Total sites are 6 % of the total estimated provincially. This number is inflated by 2% per year to reflect estimated customer growth.
G	Total paying sites	Total paying sites are the net of theft sites and total sites 2013- 2017 and 70% of the total sites thereafter.
H	Total theft sites	Total theft sites increase by 75% of the growth in total sites 2013-2017 and 30% of total sites thereafter.
I	Identified theft sites	Identified theft sites are calculated as ((E*F*(1-D)) from 2012-2032.
J	Revenue Margin paying sites	Revenue Margin from paying sites is calculated for each year as (C*G*151,200kWh)/1000)
H	Power purchase cost of theft sites	Power purchase costs of theft sites is calculated for each year as (B*H*151,200kWhs/1000)
I	Recovered revenue from theft identification	Recovered revenue for theft sites is calculated each year as (I*A*151,200kWhs/1000)+20% This assumes that each theft site is billed for an average 1 year loss and collection success is 20% likely.
J	Total Benefit/(cost) of Status Quo Scenario	The benefit(cost) is calculated for each year as J-H+I
K	NPV of the Total Benefit for the Status Quo-Probable	The NPV is calculated as the sum of J for 2012-2032 discounted at 8%

1 **Table BCUC IR1 Q87.1b - AMI Program-Probable**

Line	Input	Assumption
A	Deterrence (% paying sites)	Deterrence ratio will increase from the current 75% to 95% by 2021 with AMI and remain at 95% thereafter.
B	Investigation success	The investigation success rate will increase from 8% to 25% by 2016 and remain at 25% thereafter.
C	Total sites	Total sites are 6 % of the total estimated provincially. This number is inflated by 1% per year to reflect the net of estimated customer growth at 2% and growers who may move to alternate energy sources or leave FortisBC altogether with AMI.
D	Total paying sites	Total paying sites are the net of theft sites and total sites 2013- 2020 and 95% of the total sites thereafter.
E	Total theft sites	Total theft sites are the previous year's total less 90% of the sites which were detected in for 2013-2020 and 5% of total sites thereafter. The assumption is that 90% of detected sites will become paying customers.
F	Identified theft sites	Identified theft sites are calculated as ((B*C*(1-A)) from 2012-2032.
G	Revenue Margin paying sites	Revenue Margin from paying sites is calculated for each year as(Marginal Revenue *D*151,200kWh)/1000)
H	Power purchase cost of theft sites	Power purchase costs of theft sites is calculated for each year as (Marginal Cost*E*B8151,200kWhs/1000)
I	Recovered revenue from theft identification	Recovered revenue for theft sites is calculated each year as (F*Marginal Revenue*151,200kWhs/1000)+20% This assumes that each theft site is billed for an average 1 year loss and collection success is 20% likely.
J	Total Benefit/(cost) of AMI -Probable	The benefit(cost) is calculated for each year as G-H+I
K	NPV of the Total Benefit for the AMI Program-Probable	The NPV is calculated as the sum of J for 2012-2032 discounted at 8%
L	NPV of Net Benefit	The sum of the annual differences between the NPV Total Benefit for AMI-Probable and Status Quo-Probable for 2012-2032 discounted at 8%.

2
3

87.1.1 Please explain how the power purchase cost from theft sites has been determined. Specifically, does this reflect the incremental generation and network costs associated with the power supplied to theft sites, or the lost revenue margin?

Response:

The power purchase cost for theft sites has been derived from the BC Wholesale Energy Market Price forecast. It is the marginal power purchase expense incurred to supply theft sites not the revenue margin.

87.1.2 Please explain how the recovered revenue from theft identification has been estimated for both scenarios and provide supporting evidence.

Response:

Recovered revenue from theft identification has been estimated in the same manner in both scenarios. The following assumptions are made:

- The detected sites are assumed to become paying sites in the current year;
- The associated consumption is priced at the marginal revenue rate (residential conservation block 2);
- The detected sites are back billed on average for 1 year with a 20% estimate of collection success; and
- The sum of payment for the current year plus the associated back billing collection is recovered revenue.

This estimate is based on FortisBC experience in billing and collections. Please also see the response to BCUC IR1 Q85.4.1.

87.1.3 What rate schedule is the paying marijuana grow operation site assumed to be charged under and why?

Response:

99 percent of marijuana grow operations identified by FortisBC to date are in residential premises which are billed under the residential tariff rates. This assumption is used in the financial analysis.

87.1.4 Please explain why the theft detection rate related to AMI only increases from eight percent to 25 percent by 2016.

Response:

FortisBC has used a conservative approach to estimating savings throughout this Application. The theft detection strategy proposed by the Company will see strategic deployment of downstream primary feeder meters. The location of the feeder meters will be guided by total feeder loss measurements calculated using the Distribution Substation Automation equipment already in place with the proposed AMI meters. This means that FortisBC will not be able to immediately pinpoint the source of theft, but will segment feeders with downstream primary feeder meters over time. For this reason FortisBC chose to conservatively predict a 25% detection rate.

87.2 Please recalculate the 'NPV of net benefit' assuming implementation of AMI results in a five percent per year decline in the number of total marijuana sites under the AMI scenario (rather than a one percent per year increase).

For this question and the following sub-questions, please provide the analysis supporting the NPV estimation; state all assumptions used; use FortisBC incremental costs to supply theft sites to determine 'power purchase cost from theft sites'; and comment on the likelihood of each senario occurring and the resultant impact on marijuana grow operations assumed in the question. Where appropriate, please also provide a FortisBC estimate (or range of estimates) of the expected impact of the marijuana grow operations resulting from each scenario.

Response:

This scenario and the ones which follow in the sub-questions below demonstrate a range of benefits from theft detection (each with a corresponding likelihood). This highlights the difficulty of accurate prediction in an evolving technological, social and legal environment.

Considerably more certain is the continued public safety risk and financial cost to FortisBC paying customers in the absence of AMI deployment.

FortisBC has carefully considered many scenarios in arriving at the NPV of Net Benefit for Theft Reduction and is of the view that the $38.4 million proposed in the Application is a conservative and reasonable figure in light of these uncertainties.

In the scenario proposed in this question, the NPV of Net Benefit declines to ($662,263) as presented in the supporting analysis provided as electronic Attachment BCUC IR1 87.2. All other assumptions in the model remain unchanged including the power purchase cost for theft sites.

The likelihood of this scenario requires analysis of the reasons why both non-paying and paying marijuana growers might leave the FortisBC service area if AMI is deployed.

FortisBC believes that the rate of marijuana production will continue to rise to meet increasing demand from population growth. This is because the incentive to commercially grow marijuana has not diminished; export demand (estimated at 90% of production), market price and the return on the investment for marijuana growers have all remain relatively unchanged.

The risk versus reward model proposed by Easton suggests that growers will operate in a manner and location that best minimizes risk. (Please see the Easton Policy Paper filed in response to BCUC IR1 Q74.1 and Exhibit A2-1). Growers will therefore leave the FortisBC service territory if they perceive lower risk elsewhere.

Non-paying operators will face an increased risk of detection if AMI is implemented at FortisBC and therefore they must consider the following:

- The deployment of AMI in conjunction with full-scale energy balancing at BC Hydro will not encourage relocation to BC Hydro.
- The surrounding jurisdictions to which provincial growers may consider moving have considerably more punitive criminal penalties for illegal marijuana production than in BC. (Easton reports that 13 percent of operators detected by the police in BC faced criminal charges compared to 60 percent in the rest of the country).
- Illegal growers who are paying customers at FortisBC do not presently face a risk of detection under the Safety Standards Act as there has been no municipal engagement to date.

It seems reasonable to predict that the least risky option for non-paying growers is to remain in FortisBC as paying sites.

The risk to paying operators with AMI deployment is limited to possible detection under the Safety Standards Act. As municipal engagement has not occurred to date there is no motivation to leave. Therefore a 5 percent reduction in marijuana sites with AMI deployment does not seem a likely scenario as remaining within the FortisBC service territory presents the least risk option for existing marijuana producers.

The supporting analysis for this question and the following sub-questions is provided as Electronic Attachment BCUC IR1 87.2.

87.2.1 Please recalculate the 'NPV of net benefit' assuming a five percent per year increase in total grow-ops in the status quo scenario (rather than a two percent per year increase).

Response:

The likelihood of the scenario presented in the question requires consideration of the potential reasons why the number of growers might escalate in the absence of AMI and the possible impact this might have on the Status Quo.

The risk of detection for paying sites at BC Hydro is unchanged as a result of AMI deployment. It is higher in regions of municipal engagement under the Safety Standards Act and lower in regions who have not engaged. The risk of detection in FortisBC in the Status Quo scenario also does not change, so all else being equal a paying producer is therefore not motivated to move their business to FortisBC.

The risk of detection for producers who engage in stealing electricity will increase in BC Hydro territory as a result of AMI deployment. All else being equal, the stealing producer may choose the lower risk FortisBC alternative. It is reasonable to expect that a stealing producer coming to FortisBC will continue to steal versus start paying since they have the same option to pay in BC Hydro. If this were to occur the current paying ratio cannot be assumed to remain constant.

FortisBC believes it is possible that the number of producers will increase by five percent in the absence of AMI. However, the probability of this occurring without degrading the current deterrence ratio is unlikely. FortisBC believes that if the number of sites in the Status Quo increases by five percent, 75 percent of those will steal. The Company has assumed that this influx of stealing growers produces a decline in the deterrence rate from 75 percent in 2012 to 60 percent by 2019.

In this more plausible refinement of the scenario outlined in this question, the NPV of the Net Benefit related to the AMI Project increases to $47.3 million as presented in the supporting analysis provided as Electronic Attachment BCUC IR1 87.2. Please also refer to the response to BCUC IR1 Q87.2.

In the less likely scenario specifically outlined in the question, the NPV of the Net Benefit declines to $21.5 million as presented in the supporting analysis provided as Electronic Attachment BCUC IR1 87.2.

87.2.2 Please recalculate the 'NPV of net benefit' assuming both events described above occur (status quo has a five percent per year increase in total sites, AMI has a five percent per year decline in total sites).

Response:

The occurrence of each scenario independently does not seem reasonable for the reasons detailed in the responses to BCUC IR1 Q87.2 and Q87.2.1 and this probability does not increase when contemplating that they occur together. FortisBC considers this scenario to be very unlikely.

The NPV of the Net Benefit declines to ($17.5) million as presented in the supporting analysis provided as Electronic Attachment BCUC IR1 87.2.

87.2.3 Please recalculate the 'NPV of net benefit' assuming Safety Standard Act obligations result in a five percent per year decline in the number of total marijuana sites from current levels under both the AMI and the status quo scenario.

Response:

FortisBC does not consider this a likely scenario as municipal engagement under the Act is not anticipated at FortisBC. In addition, market forces support the continued production of marijuana and there are limited geographic options for producers outside of BC. Please also see the response to BCUC IR1 Q87.2.

Should municipal engagement occur province-wide under the *Safety Standards Act,* FortisBC contemplates that the Status Quo theft ratio will return to the 50% level as producers will remain at FortisBC and seek to avoid detection. (This is a similar outcome to the results of the 14 year Mission study filed as Exhibit A2-7). The AMI scenario will also deteriorate in that the paying ratio will only improve to 85% as more producers may attempt to steal. An additional 2 percent may also be forced to consider alternate energy sources to reduce risk.

In this more probable scenario, the resulting NPV of Net Benefit increases to $48.5 million as presented in the supporting analysis provided as Electronic Attachment BCUC IR1 87.2.

In the scenario specifically requested, the NPV of the Net Benefit is $23.4 million as presented in the supporting analysis provided as Electronic Attachment BCUC IR1 87.2. All other assumptions remain unchanged including price of electric theft at power purchase price.

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87.2.4 Please recalculate the 'NPV of net benefit' assuming advances in lighting technology result in five percent per year of all marijuana grow operations converting to LED lighting in both the AMI and the status quo scenario.

Response:

FortisBC submits that the five percent level of LED conversion in marijuana production is not likely for the reasons detailed in BCUC IR1 Q84.3.1. FortisBC believes that based on the reasons detailed in the response to BCUC IR1 Q83.4.1, an annual conversion rate of two percent per year beginning in 2017 is more reasonable. This more likely adoption rate results in an NPV of the Net Benefit of $32.9 million. Please also refer to the response to BCUC IR1 Q83.4.1.

In the scenario specifically outlined in the question, the NPV of the Net Benefit is $21.4 million as presented in the supporting analysis provided as Electronic Attachment BCUC IR1 87.2.

87.2.5 Please recalculate the 'NPV of net benefit' assuming advances in alternative energy result in five percent per year of all marijuana grow operations converting to alternative energy sources in both the AMI and the status quo scenario.

Response:

FortisBC has no visibility on the number of illegal marijuana producers shut down by the RCMP who are using commercial size generators since electricity theft is the focus of the utility.

However, the Company believes the use of alternative energy source in five percent of illegal marijuana sites is unlikely for several reasons:

- Commercial generators are visible, noisy and readily observed during surveillance by law officials;

- Commercial generators require considerable maintenance and the associated expertise; and
- The capital and operating costs for a commercial sized generator are much higher than paying for electricity from FortisBC.

In light of Easton's risk versus reward model presented in the response to BCUC IR1 Q83.4.1 it does not seem likely that five percent of marijuana producers will adopt alternative energy sources. If municipalities engage under the *Safety Standards Act,* it is possible that up to two percent of marijuana producers will be forced to consider alternative energy sources in the AMI Probable scenario rather than cease production. In this alternative scenario presented in the response to BCUC IR1 Q87.2.3 the NPV of Net Benefit increases to $48.5 million.

In the scenario specifically outlined in the question, the NPV of Net Benefit declines to $23.4 million as presented in supporting analysis provided as Electronic Attachment BCUC IR1 87.2.

87.2.6 Please recalculate the 'NPV of net benefit' using a starting assumption that 50 percent of marijuana grow operations are diverting electricity.

<u>Response:</u>

This scenario does not seem likely in light of FortisBC internal data from 2006-2011. FortisBC has used the average theft ratio from 2008-2011 to arrive at the 25% estimate used in the Application.

The NPV of Net Benefit increases to $83.1 million as presented in the supporting analysis provided as Electronic Attachment BCUC IR1 Q87.2

87.2.7 Please recalculate the 'NPV of net benefit' assuming marijuana grow operations diverting electricity are 50 percent larger on average than grow operations not diverting electricity.

<u>Response:</u>

FortisBC considers this scenario possible since the 50% size differential between paying and theft sites is supported by the findings reported in the Mission 14 year review filed by Commission staff as Exhibit A2-7. The Company has observed that five paying licensed producers in FortisBC shut down by the RCMP in 2012 for illegal production averaged 54 lights per site versus the 30 light averages for theft sites.

The NPV of the Net Benefit increases to $50.4 million as presented in the supporting analysis provided as Electronic Attachment BCUC IR1 87.2.

87.2.8 Please recalculate the 'NPV of net benefit' assuming both the above two scenarios occur (50 percent of marijuana grow operations diverting electricity and being on average 50 percent larger than paying grow operations).

Response:

FortisBC considers this scenario unlikely since FortisBC data does not currently support a 50% theft ratio as further described in the response to BCUC IR1 Q87.2.6.

The NPV of the Net Benefit increases to $106 million as presented in the supporting analysis provided as Electronic Attachment BCUC IR1 87.2.

87.2.9 Please recalculate the 'NPV of net benefit' for an alternative option where only Phase 2 of the theft detection program is undertaken (purchase of feeder, transformer and portable wireless meters plus the associated annual operational expense), together with the minimum requirements of Phase 1 required to enable Phase 2. Please specify Phase 1 minimum requirements.

Response:

The minimum phase 1 requirement to enable phase 2 is the full implementation of AMI. As such, the net benefit related to theft detection in this scenario is the same as presented in the Application. Please also refer to the responses to BCUC IR1 Q82.4.2 and Q78.3.1.

87.3 Please describe how FortisBC is proposing to measure, evaluate and report the actual versus forecast results of the AMI program as it relates to theft reduction and revenue margin from paying marijuana grow operations.

Response:

Please see the response to BCUC IR1 Q56.3.

88.0 Reference: Project Costs and Benefits

Exhibit B-1, Tab 5.0, Section 5.3.2, pp. 87-88

Energy Theft Reduction

Phase 1 – Theft Detection Improvements

FortisBC states on page 87 and 88 of the Application that Phase 1 Theft Detection Improvements comprise:

"Tamper Detection - Advanced meters have a tamper detection feature that will automatically notify FortisBC if they have been removed from the meter socket, inverted or otherwise manipulated. The tamper flags from the AMI system will begin to provide additional leads for FortisBC investigators as soon as deployment begins in 2014.

Improved Data Quality - Advanced meters are capable of recording energy consumption, instantaneous load, and voltage at frequent intervals whereas electro-mechanical meters collect only peak load and the total energy used every 60 days. A review of these consumption files using existing data analysis tools will increase both the quality 1 and the number of leads on potential theft sites.

On-Demand Meter Readings - On-demand meter reading enhances field investigator productivity by eliminating the need to physically read meters to verify theft. This feature eliminates return trips to premises under investigation and improves the safety of the investigator by reducing the need to access premises potentially engaged in illegal activities."

88.1 Based on FortisBC experience to date, what proportion of electricity theft by marijuana grow operations results from meter tampering which could be identified by the advanced meter tamper detection feature?

Response:

FortisBC estimates that 5 percent of electricity theft involves meter tampering.

Meter tampering to facilitate electricity theft consists in any given case of one or more of several activities, all of which can be detected by the proposed AMI system:

a) removing the meter and installing bypass in the meter socket;

b) placing the meter in an up-side down position between meter reads to reduce recorded readings; and

c) replacing the legitimate meter with another meter in between meter reader visits.

88.1.1 To what extent could meter tampering be detected by the meter reader? Please explain.

Response:

The meter tampering related to marijuana grow operations occurs between meter reader visits and is generally difficult for meter readers to detect. On occasion a reader or other field employee may be dispatched to the premise in between reads to exchange a meter or to confirm the reading is correct and will report meter tampering. Please refer to the response to BCUC IR1 Q88.1.

88.2 Would FortisBC obtain sufficient data quality improvement for theft detection through installation of advanced meters at the distribution feeder level, rather than at individual customer sites? Please explain why or why not.

Response:

Please see responses to BCUC IR1 Q78.3.1, Q82.4, and Q84.1.

88.2.1 Please confirm that FortisBC has existing data analysis tools to review consumption files from HH meters at individual customer sites in order to identify potential theft.

Response:

Confirmed. Please refer to the response to BCUC IR1 Q54.2.

88.3 Please explain how FortisBC would be able to determine electricity theft is occurring without a visit to the site.

Response:

Confirmation of electricity theft is currently determined by measuring load at the transformer and concurrently measuring consumption on the meter. Transformer measurements can usually be done at the edge of the property while meter readings require a presence on the customer property. Theft sites often present access issues for the investigator (i.e. threatening dogs, locked gates or customer presence) and require return visits. The On-Demand Meter Reading feature offered by AMI will enable the investigator to poll the meter wirelessly at the road rather than enter the customer property. This feature will reduce safety risks for the investigator at potential theft sites, preserve the integrity of discreet investigation and improve productivity by eliminating the need for repeat visits.

88.3.1 Do meter readers physically visiting sites act as a deterrent to electricity theft? Please explain why or why not.

Response:

The bills issued to FortisBC customers indicate the approximate date of the next meter reading, meaning that customers who are engaged in tampering have a good idea of when they need to conceal any visible evidence. Similarly, many off-cycle reads (i.e. for move-outs or check readings) are performed at customer request, again giving the customer an opportunity to present a normal meter installation. Physical visits may nevertheless deter some visually obvious theft such as inverted or switched meters. However, the more common methods of electric theft cannot be detected with a cursory visual inspection. The Tamper Detection feature enabled by AMI will improve the reporting on tampered meters as all sites where meter tampering has occurred will be identified.

89.0 Reference: Project Costs and Benefits

Exhibit B-1, Tab 5.0, Section 5.3.3, p. 76;

Exhibit B-3, Excel Document: “FortisBC – AMI Excel NPV Analysis – 17Aug12”

Composite Depreciation Rate, Meters

Exhibit B-1, page 76 notes the following:

“Meters – Assumptions regarding depreciation rates for the AMI meters have been determined based on the observed useful lives as established through industry experience, as well as through the manufacturer’s recommendations. This has resulted in a 5 percent depreciation rate based on an estimated economic life of 20 years;”

On December 23, 2010, the Ontario Energy Board issued the “Accounting Procedures Handbook Frequently Asked Questions” which notes:

"The useful life of smart meters used for regulatory purposes in the rate setting process is 15 years."

89.1 Please list the "assumptions" referenced above that were used to determine the estimated useful life of 20 years for the meters and provide the information that was used to make each assumption.

Response:

Please refer to the response to BCUC IR1 Q69.1.

89.2 Please provide evidence to support the "manufacturer's recommendations" referenced above that were used to determine the useful life of 20 years.

Response:

Please refer to the response to BCUC IR1 Q89.1.

89.3 Please provide the source from which the "industry experience" as referenced above was gained. Specifically, include the following information for each instance of industry experience:

- Utility or jurisdiction
- Type of product
- Manufacturer of the product
- If the industry experience is based on actual or estimated economic life

Response:

Please refer to the responses to BCUC IR1 Q69.1 and BCUC IR1 Q89.5.

89.3.1 Specifically, please discuss if consideration was given to the recommendations of the Ontario Energy Board concerning the useful life of smart meters for regulatory purposes.

Response:

Please refer to the response to BCUC IR1 Q69.1.

89.4 Were alternatives to the 20-year economic life for meters considered? If yes, please list the alternatives considered and comment on why they were ultimately rejected.

Response:

The Company considered 15, 20 and 25 year useful life assumptions. However as discussed in the responses to BCUC IR1 Q69.1, a 20 year life was assumed.

89.5 Is FortisBC Inc. aware of other jurisdictions with AMI systems that are using an economic life other than 20 years? If so, please provide the name of each jurisdiction.

Response:

Currently the only other jurisdictions known to FortisBC using an economic life other than 20 years are FortisAlberta (at 25 years) and Ontario (at 15 years).

89.6 Please recalculate the NPV of the "Net AMI" project assuming the following individual scenarios:

- Useful life of new meters of 10 years
- Useful life of new meters of 15 years
- Useful life of new meters of 25 years

For this question, please provide the analysis supporting the NPV estimation, state all assumptions used, and comment on the likelihood of each event occurring.

Response:

If the depreciation period was set at 10 years for the new AMI meters, the NPV of the Net AMI benefit is approximately $13.5 million (assuming an 8 percent discount rate) and the cumulative incremental benefit to rates in year 2025 is approximately 0.58 percent.

If the depreciation period was set at 15 years for the new AMI meters, the NPV of the Net AMI benefit is approximately $14.5 million (assuming an 8 percent discount rate) and the cumulative incremental benefit to rates in year 2030 is approximately 0.87 percent.

If the depreciation period was set at 25 years for the new AMI meters, the NPV of the Net AMI benefit increases to approximately $19.9 million (assuming an 8 percent discount rate) and the cumulative incremental benefit to rates in year 2032 decreases to approximately 0.87 percent.

90.0 Reference: Project Costs and Benefits

Exhibit B-1, Tab 5.0, Section 5.3.3, p. 76

Composite Depreciation Rate

90.1 Please provide the calculation of the composite depreciation rate of 5.22 percent using the attached table as a guideline. Please include additional cost categories, if required.

	Item	Total 2013 - 2015	% of Total	Depreciation Category	Depreciation Rate	Portion of Total Composite Depreciation Rate
		($000s)				
1	Third Party Software and Services	5,830	12%			0.00%
2	Meters (Including Deployment)	20,323	43%			0.00%
3	Network Infrastructure	4,449	9%			0.00%
4	System Integration	2,349	5%			0.00%
5	Theft Detection	1,100	2%			0.00%
6	Project Management	3,130	7%			0.00%
7	CPCN Development / Approval Costs	4,915	10%			0.00%
8	Capitalized Overhead, AFUDC, PST	5,592	12%			0.00%
9	**Total**	**47,688**	**100%**			**0.00%**

<u>Response:</u>

The Company has determined that the calculation of the composite depreciation rate did not include an allocation for the PST component. The composite depreciation rate was therefore understated by 0.18 percent. Please also see Errata 1. The revised composite depreciation rate should be 5.4 percent as presented in Table BCUC IR1 90.1 below:

Table BCUC IR1 90.1 – Composite Depreciation Rate

	Item	Total 2013-2015	% of Total	Depreciation Category	Depreciation Rate	Portion of Total Composite Depreciation Rate
		($000s)				
1	Third Party Software and Services	5,830	12.2%	Software	5.01%	0.6%
2	Meters (Including Deployment)	20,323	42.6%	Meters	5.00%	2.1%
3	Network Infrastructure	4,402	9.2%	Comm Structure & Equip	8.05%	0.7%
4	Network Infrastructure	48	0.1%	Software	5.01%	0.0%
5	System Integration	2,349	4.9%	Software	5.01%	0.2%
6	Theft Detection	1,100	2.3%	Meters	5.00%	0.1%
7	Project Management	3,130	6.6%	Average	5.40%	0.4%
8	CPCN Development/Approval Costs	4,915	10.3%	Average	5.40%	0.6%
9	Capitalized Overhead, AFUDC, PST	5,592	11.7%	Average	5.40%	0.6%
10	**Total**	**47,689**	**100.0%**			**5.40%**

90.2 Exhibit B-1 notes that the Computer Hardware and Software depreciation rate is 5.01 percent, based on the 2011 Depreciation Study. Please discuss the factors that were considered in determining that the rate according to the 2011 Depreciation Study was appropriate, including:

- Similarities and differences between the existing Computer Hardware and Software and that associated with the AMI project.
- The useful life of the existing Computer Hardware and Software compared to that associated with the AMI project.
- Industry experience and manufacturers recommendations considered in determining the useful life of Computer Hardware and Software associated with AMI projects.

Response:

The Computer Hardware and Software in the AMI project is very similar to the Computer Hardware and Software that the Company uses in its operations today. The Computer Hardware and Software would be added to the same asset classes as are found in the depreciation study but the current depreciation rates by asset class would continue to be applied to all assets until a new depreciation study was completed.

The Company has no current plan to complete a new depreciation study. Please also refer to the response to BCUC IR1 Q1.1.

90.3 Exhibit B-1 notes that the Communication Structures and Equipment depreciation rate is 8.05 percent, based on the 2011 Depreciation Study. Please discuss the factors that were considered in determining that the rate according to the 2011 Depreciation Study was appropriate, including:

- Similarities and differences between the existing Communication Structures and Equipment and that associated with the AMI project.
- The useful life of the existing Communication Structures and Equipment compared to that associated with the AMI project.
- Industry experience and manufacturers recommendations that were considered in determining the useful life of Communication Structures and Equipment associated with AMI projects.

Response:

Please refer to the response to BCUC IR1 Q69.4.

90.4 Please confirm when FortisBC expects to commence depreciating any new AMI meters.

Response:

The Company expects to begin depreciating a portion of the new Advanced Metering Infrastructure including AMI meters in 2015 based on the 2014 year-end AMI plant in service.

90.5 Please confirm the useful life for depreciation purposes of the existing a) electro-mechanical meters and b) digital meters that have been installed in the past five years. (Note: this should be the estimated useful life of an individual meter upon installation, as opposed to the composite useful life of the Meter asset group per the 2011 Depreciation Study.)

Response:

The 2011 Depreciation Study recommended a 20 year Survivor Curve or average service life for all of FortisBC's meters including electro-mechanical meters and digital meters.

91.0 Reference: Project Costs and Benefits

Exhibit B-1, Tab 5.0, Section 5.3.3

Disconnect/Reconnect

Table 5.1.b – Summary of All Incremental Non-Project Costs and Benefits

AMI	2013	2014	2015	2016	2017 – 2032	Total
Operating Expenses						
Disconnect/Reconnect	-	(133)	(414)	(544)	(12,176)	(13,267)

"The management of vacant premises can involve multiple vehicle trips to each identified vacant site. An initial trip is required to confirm vacant site status or to leave notification for the occupants of the requirement to contact the Company to establish an account. A second trip is often required to either disconnect the premises, or to leave another tag advising the occupant to contact the Company to avoid any interruption in service. The process is time consuming, labour intensive, and thus expensive, particularly as multiple vehicle trips are required before resolution occurs (1 - 2 for disconnect and 1 for reconnect)." [Ref: B-1, p. 90]

"FortisBC assumed that a CSP will still require one visit to 50 percent of vacant premises and 100 percent of premises scheduled for disconnection due to non-payment." [Ref: B-1, p. 91]

91.1 Please confirm, or otherwise explain, that the bulk of the savings related to a disconnect/ reconnect are related to the reconnection process.

Response:

Not confirmed. Site visits will continue to be performed in advanced of disconnections in many cases (to assess the premise for risks and to hang a door tag), as referenced in the preamble to this question, so there will continue to be costs related to disconnections. Savings related to the actual disconnection and reconnection of service are expected to be roughly equal.

91.2 Please confirm the number of expected instances of disconnections and the expected number of reconnections for each year between 2013 and 2032 for both the Status Quo and the AMI Project.

Response:

FortisBC does not expect the total number of disconnects and reconnects to be materially different in the Status Quo and AMI scenarios. The forecast numbers are shown in the following table:

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Disconnects	2535	2583	2604	2655	2675	2725	2746	2796	2816	2865
Reconnects	2460	2506	2526	2575	2594	2643	2662	2711	2729	2777
	2023	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**
Disconnects	2885	2933	2953	3001	3020	3068	3087	3134	3153	3200
Reconnects	2795	2842	2860	2907	2925	2972	2990	3035	3053	3098

FortisBC expects a significant decline in the total number of on-site disconnects and reconnects that FortisBC employees will have to physically attend - less than 300 annually.

92.0 Reference: Project Costs and Benefits

Exhibit No. B-1, Tab 5.0, Section 5.3.3, pp. 89-91

Non-Payment

92.1 Provide a copy of the FortisBC policy for disconnection of service for non-payment of service.

Response:

FortisBC's policy for disconnection of service for non-payment is detailed in the Terms and Conditions of its Electric Tariff, Section 6.5 - Payment of Accounts. Please see below.

Figure 92.1 – Non-Pay Disconnect Policy

TERMS AND CONDITIONS

Electric Tariff
B.C.U.C. No. 2
Sheet TC17

6. METER READING AND BILLING (Cont'd)

6.2 Proration of Billing

Bills will be prorated as appropriate under the following conditions:

(1) For meters normally read every one month where the billing period is less than 21 days or greater than 39 days.
(2) For meters normally read every two months where the billing period is less than 51 days or greater than 69 days.

6.3 Rates for Electricity

The Customer shall pay for Electricity in accordance with these Terms and Conditions and the Customer's applicable rate schedule, as amended from time to time and accepted for filing by the British Columbia Utilities Commission. If it is found that the Customer has been overcharged, the appropriate refund shall be with interest as calculated in Clause 11.3.

6.4 Sales Tax and Assessments

In addition to payments for Services provided, the Customer shall pay to the Company the amount of any taxes or assessments imposed by any competent taxing authority on any Services provided to the Customer.

6.5 Payment of Accounts

Bills for electric Service are due and payable when rendered. Payments may be made to the Company's collection office, electronically or to authorized collectors.

Customers' accounts not paid by the due date printed on the bill shall be in arrears. Late payment charges may be applied to overdue accounts at the rate specified on the bill and as set out on the applicable rate schedule.

Customers will be advised that their account is in arrears by way of notification on the next billing. If payment is not received, a letter will be mailed to the Customer advising that if payment is not received within ten days of the date of mailing, Service may be suspended without further notice. The Company will make every reasonable effort to contact the Customer by telephone or in person to advise the Customer of the consequences of non-payment, but the account may be disconnected if payment is not received.

Issued December 20, 2010
FORTISBC INC.

By: Dennis Swanson
Director, Regulatory Affairs

Accepted for filing ______
BRITISH COLUMBIA UTILITIES COMMISSION

By: ______
Commission Secretary

EFFECTIVE (applicable to consumption on and after) January 1, 2011 G-156-10

92.2 Provide the current reconnection charge.

Response:

There are three different reconnection charges depending on the time of day a customer is reconnected.

The charge for Normal working hours is $100.00. The charge for Overtime hours is $132.00 and the charge for Callout hours is $339.00.

92.2.1 Will FortisBC be reducing the reconnection charge considering the ability of the AMI reconnect feature? If not, please explain why not.

Response:

Once the AMI project is completed, the marginal cost of a remote reconnection is likely to be less than $10, meaning that in theory the reconnection fee could be dropped substantially. However, FortisBC proposes to maintain the current reconnection charge until the next COSA in order to better understand all costs associated with the new processes.

The reconnection charge also deters disconnections, the costs of which are borne by all customers. Although disconnection process costs would go down with the AMI project, there are still related costs such as site visits for 50% of vacant sites and 100% of non-pay sites (Exhibit B-1, Section 5.3.3, p60) and the contact centre processes related to non-pay disconnects.

93.0 Reference: Project Costs and Benefits

Exhibit B-1, Tab 5.0, Section 5.3.5

Meter Exchange Costs Post-AMI

"The AMI Project will result in the replacement of nearly all existing meters with new AMI enabled meters. This will avoid operating costs that would have been incurred sampling and retesting meters for six years after meter deployment. After year six, the cost of meter exchanges is expected to begin returning to the pre-AMI deployment levels."

93.1 Since the enhanced meters have a very different sampling and replacement profile from the existing electro-mechanical meters, why would the meter exchange cost ever return to pre-AMI levels?

Response:

FortisBC submits that new meters, whether enhanced or not, will require increased sampling frequency and compliance groups will require more samples to be removed from the population under SS-06 than under the current regulations. As well, FortisBC's current meter population is composed of many small groups; and therefore has many more compliance groups than would be optimal.

Under a full meter population replacement scenario, compliance group size would be optimized and group size would increase accordingly. Though each compliance group would have more samples pulled, more often; there would be fewer sample groups.

94.0 Reference: Project Costs and Benefits

Exhibit B-1, Tab 5.0, Section 5.3.4, p. 5.2.4

Composite CCA Rate

94.1 Please provide the calculation of the composite CCA rate of 5.22 percent using the following table as a guideline.

	Item	Total 2013 - 2015	% of Total	CCA Class	CCA Rate	Portion of Total Composite CCA Rate
		($000s)				
1	Third Party Software and Services	5,830	12%			0.00%
2	Meters (Including Deployment)	20,323	43%			0.00%
3	Network Infrastructure	4,449	9%			0.00%
4	System Integration	2,349	5%			0.00%
5	Theft Detection	1,100	2%			0.00%
6	Project Management	3,130	7%			0.00%
7	CPCN Development / Approval Costs	4,915	10%			0.00%
8	Capitalized Overhead, AFUDC, PST	5,592	12%			0.00%
9	**Total**	**47,688**	**100%**			**0.00%**

Response:

The Company has determined that the calculation of the composite CCA rate did not include an allocation for the PST component. The composite CCA rate was therefore understated by 0.52

percent. The revised composite CCA rate should be 16.24 percent as presented in Table BCUC IR1 94.1 below:

Table BCUC IR1 94.1 – Composite CCA Rate

	Item	Total 2013-2015	% of Total	CC Class	CCA Rate	Portion of Total Composite CCA Rate
		($000s)				
1	Third Party Software and Services	5,830	12%	Class 46	30.0%	3.7%
2	Meters (Including Deployment)	20,187	42%	Class 46	8.0%	3.4%
3	Meters (Including Deployment)	137	0%	Class 50	30.0%	0.1%
4	Network Infrastructure	4,449	9%	Class 46	30.0%	2.8%
5	System Integration	2,349	5%	Class 46	30.0%	1.5%
6	Theft Detection	1,100	2%	Class 50	8.0%	0.2%
7	Project Management	3,130	7%	Average	16.2%	1.1%
8	CPCN Development/Approval Costs	4,915	10%	Average	16.2%	1.7%
9	Capitalized Overhead, AFUDC, PST	5,592	12%	Average	16.2%	1.9%
10	**Total**	**47,689**	**100%**			**16.24%**

94.2 Please confirm what CCA Class the existing meters and existing network infrastructure and systems software are included in.

Response:

Existing meters have been included in Class 47. Existing network infrastructure and the systems software for that network infrastructure has been included in Class 46.

95.0 Reference: Project Costs and Benefits

Exhibit B-3, Excel Document: "FortisBC – AMI Excel NPV Analysis – 17Aug12", Tab "Gross AMI", Line No. 92

Income Taxes, Total Timing Differences

95.1 Please confirm that all applicable additions and deductions to arrive at taxable income are included in Line No. 92. If not confirmed, please explain otherwise.

Response:

Confirmed.

96.0 Reference: Project Costs and Benefits

Exhibit B-3, Excel Document: "FortisBC – AMI Excel NPV Analysis – 17Aug12"

Economic-Impact Analysis

The Commission's Decision concerning BC Hydro's 2006 IEP/LTAP states at pages 200-201:

"Typically the end result of a project evaluation is the expression of a PV or a levelized cost of energy or capacity. Both calculations require the use of a discount rate, and both calculations require a stream of cash flows to apply the discount rate to. The Commission Panel accepts BC Hydro's argument that two tests may be considered for use in project evaluation. The first, and the more important, is an economic analysis of a project, which should only use the incremental cash flows disbursed by BC Hydro as its key input. The second, and less material test is a ratepayer impact analysis which examines how BC Hydro will recover a project's costs from its ratepayers and which may include items typically not found in a conventional economic analysis such as sunk costs, interest during construction and costs allocated from other departments of BC Hydro."

96.1 Please prepare and file an economic impact analysis in a working Excel workbook, with active links and cells, of the net benefits for each of the following alternatives:

- Gross AMI
- Gross PLC
- Gross AMR
- Gross Status Quo
- Net AMI
- Net PLC
- Net AMR

The economic impact analysis should include only the expected annual cash inflows and outflows over the life of the project and should be prepared in accordance with the following guidelines:

a) Categories:

At a minimum, the economic impact analysis should be disaggregated into the following categories:

Project Capital Costs

- Third Party Software and Services
- Meters (including deployment)
- Network Infrastructure
- System Integration
- Theft Detection
- Project Management
- CPCN Development / Approval Costs
- Capitalized Overhead
- AFUDC
- PST

Sustaining Capital Costs

- Meter Growth
- Meter Replacement
- Handheld Replacement
- Measurement Canada Compliance
- IT Hardware
- Licensing
- Support Costs

Operating Costs

- Meter Reading
  - Labour
  - Non-Labour

- New Operating Costs
  - Staffing
  - Software Licensing and Support
  - Wide Area Network
  - Hardware and Operations
  - Maintenance

- Remote Disconnect/Reconnect
- Meter Exchanges
- Contact Centre

Theft Reduction

Income Taxes

- Income Tax on Equity Return
- Income Tax on Timing Differences, including CCA

Any other relevant cost categories should be included.

b) Project and sustaining capital costs should be included in the year in which they are expected to be incurred.

c) No financing or depreciation expense should be included.

d) The analysis should not include sunk costs.

e) All figures should be presented in nominal dollars.

f) For each economic analysis provided, please state the assumptions used and comment on the likelihood of each occurring.

g) For each economic analysis provided, please list and discuss all key cost uncertainties.

<u>Response:</u>

Please see electronic attachment BCUC IR1 Q96.1 for the working Excel model.

Please note the following assumptions were incorporated:

- Project and sustaining capital costs were included in the year in which they are expected to be incurred.
- No financing or depreciation expense was included.
- The analysis did not include sunk costs.
- All figures are presented in nominal dollars.

96.2 For the economic analysis prepared above, please recalculate the NPV of the "Net AMI" project assuming the New Operating Costs (Line 46) increase by three percent per year, commencing in 2016. For this question, and the following sub-questions, provide the analysis supporting the NPV estimation, state all assumptions used, and comment on the likelihood of each event occurring.

Response:

In this analysis the only change was that it was assumed that New Operating Costs (Line 46) were escalated by 3 percent per year commencing in 2016 instead of 1.8 percent. Please see the results below.

New Operating Costs escalated at 3% starting in 2016

	($000s)
Net Present Value of Revenue Requirements at 6.0 percent	**(22,087)**
Net Present Value of Revenue Requirements at 8.0 percent	**(16,468)**
Net Present Value of Revenue Requirements at 10.0 percent	**(12,224)**

FortisBC believes it is highly unlikely that only New Operating Costs would increase by three percent per year. A more likely scenario is that all costs (in both the Status Quo and AMI) would rise at three percent starting in 2016. If that were the case, the following table would result:

All Model Costs previously escalated at 1.8% increased to 3% starting in 2016

	($000s)
Net Present Value of Revenue Requirements at 6.0 percent	**(27,607)**
Net Present Value of Revenue Requirements at 8.0 percent	**(20,697)**
Net Present Value of Revenue Requirements at 10.0 percent	**(15,501)**

96.2.1 Please recalculate the NPV of the "Net AMI" project assuming the New Operating Costs (Line 46) increase by five percent per year, commencing in 2016.

Response:

In this analysis the only change was that it was assumed that New Operating Costs (Line 46) were escalated by 5 percent per year commencing in 2016 instead of 1.8 percent. Please see the results below.

New Operating Costs escalated at 5% starting in 2016

	($000s)
Net Present Value of Revenue Requirements at 6.0 percent	**(19,149)**
Net Present Value of Revenue Requirements at 8.0 percent	**(14,212)**
Net Present Value of Revenue Requirements at 10.0 percent	**(10,473)**

FortisBC believes it is highly unlikely that only New Operating Costs would increase by five percent per year. A more likely scenario is that all costs (in both the Status Quo and AMI) would rise at five percent starting in 2016. If that were the case, the following table would result:

All Model Costs previously escalated at 1.8% increased to 5% starting in 2016

	($000s)
Net Present Value of Revenue Requirements at 6.0 percent	**(35,448)**
Net Present Value of Revenue Requirements at 8.0 percent	**(26,660)**
Net Present Value of Revenue Requirements at 10.0 percent	**(20,085)**

96.2.2 Please recalculate the NPV of the "Net AMI" project assuming the New Operating Costs (Line 46) of $875 thousand in 2013 and $1,529 thousand in 2014 and 2015, increase by five percent per year, commencing in 2016.

Response:

Please refer to the response to BCUC IR1 Q96.2.1.

96.2.3 Please recalculate the NPV of the "Net AMI" project assuming the New Operating Costs (Line 46) of $875 thousand in 2013 and $1,529 thousand in 2014 and 2015, increase by three percent per year, commencing in 2016.

Response:

Please refer to the response to BCUC IR1 Q58.2, Scenario 4.

96.2.4 Please recalculate the NPV of the "Net AMI" project assuming that the implementation of the AMI meters, and the related costs and benefits, is delayed by two years.

Response:

Please refer to the response to BCUC IR1 Q53.11

96.2.5 Please recalculate the NPV of the "Net AMI" project assuming that the AMI Project Capital costs exceed the expected costs of $47,689 thousand by five percent.

Response:

In this analysis the only change was that it was assumed that the AMI Project Capital costs exceed the expected costs of $47,689 thousand by five percent. This is unlikely given the contingency allowance and the accuracy of the estimate. Please see the results below.

	($000s)
Net Present Value of Revenue Requirements at 6.0 percent	**(21,227)**
Net Present Value of Revenue Requirements at 8.0 percent	**(15,645)**
Net Present Value of Revenue Requirements at 10.0 percent	**(11,449)**

96.2.6 Please recalculate the NPV of the "Net AMI" project assuming that the AMI Project Capital costs exceed the expected costs of $47,689 thousand by 10 percent.

Response:

In this analysis the only change was that it was assumed that the AMI Project Capital costs exceed the expected costs of $47,689 thousand by 10 percent. This is unlikely given the contingency allowance and accuracy of the estimate. Please see the results below.

	($000s)
Net Present Value of Revenue Requirements at 6.0 percent	**(18,863)**
Net Present Value of Revenue Requirements at 8.0 percent	**(13,662)**
Net Present Value of Revenue Requirements at 10.0 percent	**(9,766)**

96.2.7 Please recalculate the NPV of the "Net AMI" project assuming that the AMI Project Capital costs exceed the expected costs of $47,689 thousand by 15 percent.

Response:

In this analysis the only change was that it was assumed that the AMI Project Capital costs exceed the expected costs of $47,689 thousand by 15 percent. This is unlikely given the contingency allowance and accuracy of the estimate. Please see the results below.

	($000s)
Net Present Value of Revenue Requirements at 6.0 percent	**(16,499)**
Net Present Value of Revenue Requirements at 8.0 percent	**(11,678)**
Net Present Value of Revenue Requirements at 10.0 percent	**(8,084)**

97.0 Reference: Project Costs and Benefits

Exhibit B-1, Tab 3.0, p. 19;

Exhibit B-3, Excel Document: "FortisBC – AMI Excel NPV Analysis – 17Aug12"

Revenue Requirement

Exhibit B-1, page 19 notes the following as a benefit of the AMI project:

"Approximately $19 million in savings (on a net present value basis) as evaluated over a 20 year period (associated rate reduction of approximately 1 percent)."

Exhibit B-3, Line No. 5 "Total Revenue Requirement for the Project" includes Line No. 1 "Operating Expenses and Theft Reduction (Net)". The Theft Reduction is calculated in Tab "Theft Reduction" and includes the following three factors in the calculation of the total benefit / cost: revenue margin from paying sites, power purchase costs from theft sites, and recovered revenue from theft identification.

97.1 Please confirm that the one percent "rate reduction" referenced above refers to the cumulative percentage decrease in the revenue requirement over 20 years, as opposed to a one percent reduction in rates. If not confirmed, please explain otherwise.

<u>Response:</u>

Confirmed. This means that customer rates will be lower if AMI is implemented than they will be otherwise.

97.2 Please confirm that "Total Revenue Requirement for the Project" per Line No. 5 of Exhibit B-3 is intended to represent the net increase / decrease in the revenue requirement over the 20-year life of the project. If not confirmed, please explain otherwise.

Response:

The “Total Revenue Requirement for the Project” per Line No. 5 of Exhibit B-3 is the present value of the net increase / decrease in the revenue requirement over the 20-year life of the project, discounted at 8 percent.

97.2.1 In tab “Theft Benefit” of Exhibit B-3, please discuss how the following items included in the net benefit / cost calculation change FortisBC’s overall revenue requirement:

- Revenue margin from paying sites
- Recovered revenue from theft identification.

Response:

Recovered revenue from theft identification (back-billing) is recorded as sales revenue from customers, which increases the total annual revenue collected in a given year. As the annual revenue margin from paying sites increases (either through increased load or an increased number of paying sites), the total annual revenue to be collected at approved rates will be affected accordingly.

97.3 Please confirm the maximum incremental increase in revenue requirement (and the relevant year) and maximum incremental decrease in revenue requirement (and the relevant year) based on the figures presented in Exhibit B-3, tab “Net AMI”, Line No. 13.

Response:

The maximum incremental increase in the revenue requirement is 1.71% and occurs in 2014.

The maximum incremental decrease in the revenue requirement is 1.76% and occurs in 2016.

98.0 Reference: Project Costs and Benefits

Exhibit B-3, Excel Document: "FortisBC – AMI Excel NPV Analysis – 17Aug12"

Sensitivity Analysis

98.1 Outside of those already provided, please provide copies of any sensitivity analyses prepared by FortisBC in assessing the AMI project.

<u>Response:</u>

All sensitivity analyses have been provided.

98.2 Other than those already provided, please list and discuss the key assumptions that were made in preparing the financial analysis of the AMI project in Exhibit B-3. For each assumption identified, please discuss the alternatives considered and likelihood of each alternative occurring.

<u>Response:</u>

Please refer to the response to BCUC IR1 Q53.8. Any variances to these assumptions that have been considered (such as the depreciation rate) have already been provided. FortisBC has not considered the likelihood of different assumptions from those provided.

99.0 Reference: Project Costs and Benefits

Exhibit B-1, Tab 5.0, Section 5.3.6

Exhibit B-2, FortisBC 2008 AMI CPCN

Contact Centre Savings

"A2.4 Readings will be more accurate than the manual process as there is no chance for human data entry errors. Readings will be transmitted as data directly from the meter to the billing system virtually eliminating the possibility of misreads and keying errors. With the more accurate readings and reduced need for billing estimates that will be provided by AMI, it is estimated that billing related calls to FortisBC's contact center will decrease by approximately 25 percent resulting in a reduction of costs associated with these calls. The cost savings associated with the reduction in calls are expected to be $169,000 in the first year after implementation. In addition, billing corrections due to inaccurate readings will be almost completely eliminated. This will result in an additional cost savings of $96,000 per year for a total of $265,000 per year following Project completion." [Ref: 2008 CPCN, B-2, A2.4]

Table 5.3.6.a - Forecast Savings from Contact Centre

	Forecast Savings ($000s)						
Contact Centre	2013	2014	2015	2016	2017	2018	2019
	-	20	7	(20)	(56)	(58)	(6)
	2020	2021	2022	2023	2024	2025	2026
	(62)	(64)	(66)	(69)	(71)	(73)	(76)
	2027	2028	2029	2030	2031	2032	
	(78)	(81)	(83)	(86)	(89)	(91)	

"The forecast savings in Contact Centre operating costs represents a benefit to FortisBC customers of $0.4 million as evaluated on a net present value basis." [Ref: B-1, p. 96]

99.1 Please explain why the Contact Centre savings appear to be significantly lower than as presented in the FortisBC 2008 AMI CPCN Application process.

Response:

The savings for the Contact Centre and Billing are confirmed to be lower in the 2012 AMI Application than in the 2008 AMI Application.

FortisBC has chosen in this Application to focus on the most certain contact centre savings, which are those that relate to increased call volume during meter deployment and reduced soft read data entry. FortisBC continues to believe (as asserted in the 2008 Application) that there will be fewer calls and billing corrections resulting from inaccurate reads and estimates. However, the Company is concerned that those savings may be offset by increased call volume related to the new, more detailed consumption information that will be available to customers after the implementation of AMI. It is important to FortisBC that it has sufficient contact centre resources available to support customers throughout the life of the AMI project.

If call volumes and billing corrections are lower than forecast, those savings will be reflected in future revenue requirements.

100.0 Reference: Project Costs and Benefits

Exhibit No. B-1, Tab 5.0, Section 6.1, pp. 89-91

Residential Power Factor

100.1 Does FortisBC believe the overall residential power factor (PF) to be below 0.9?

Response:

No, FortisBC expects the power factor for the majority of FortisBC's residential customers to be between 0.9 and unity.

For clarity, the discussion in Section 6.1 of the Application refers to the ability of the AMI system to determine power factor at all customer end-points. While this does include residential customers, FortisBC's expectation is that low power factor concerns are more likely with other customer classes such as commercial and irrigation customers. This is because the latter often have large electric motor loads as compared to residential customer loads which are primarily resistive (lighting and heating).

100.1.1 Provide the estimated incremental benefit amount of billing on detecting residential power factor.

Response:

FortisBC is unable to provide an estimate of the financial benefit at this time. Since existing residential energy meters record only kWh consumption, FortisBC has effectively no information related to residential power factor. Only once residential AMI meters are installed will FortisBC be able to collect data on the power factor of individual residential customers and thus determine the potential impact of power factor improvements on the FortisBC system.

However, as discussed in the response to BCUC IR1 Q100.1, it is expected that low power factor issues will be more probable with other customer classes, and that residential power factor is not expected to be a significant concern.

101.0 Reference: Project Costs and Benefits

Exhibit No. B-1, Tab 5.0, Section 6.2, pp. 98-101

Losses

101.1 Provide a copy of the Smart Grid VVO system study that shows a saving of 50 GWh or more per year.

Response:

The requested study ("Conservation Voltage Regulation Optimization Report") was included in the AMI Project CPCN Application as Appendix C-2. FortisBC notes that it was inadvertently referred to as Appendix C-3 in Section 6.2 of the Application.

101.2 Please explain why the transmission losses are higher than the distribution losses.

Response:

Transmission losses are not higher than distribution losses. As stated in Assumption 2 on page 100 of the Application, FortisBC's total system losses are estimated to be 8.8 percent of total energy available for sale. In Assumption 3 on the same page, distribution losses are estimated to be approximately 6.3 percent. As a result, transmission losses are estimated to be approximately (8.8 – 6.3) = 2.5 percent.

102.0 Reference: Future Benefits

Exhibit B-1, Tab 6.0, Section 6.3

Outage Management

"Due to the limited visibility currently available to the System Control Center on the status of the distribution network downstream from distribution substations … Crews must be dispatched to patrol feeders and identify the specific sections affected by the outage … The time-consuming nature of this process can be further impacted by the occurrence of multiple outage events due to weather conditions … Outage data from the AMI system can be used to map outages and determine location and number of customers without service. Disruptions in power delivery can be detected at specific transformers, down to individual metering endpoints with full visibility provided back to the System Control Center. … Armed with this information, field crews' response and repair times will be reduced. … By implementing an Outage Management System (OMS), FortisBC expects to reduce the vehicle time spent by power line technicians locating specific outage causes, resulting in a reduction in outage times for customers, and improved safety and reliability for both the Company and customers." [Ref: B-1, pp. 101-102]

Table 6.3.a – Potential Savings from Outage Management System Deployed in 2014

Forecast Savings ($000s)							
Outage Management System	2013	2014	2015	2016	2017	2018	2019
	-	830	(68)	(138)	(141)	(143)	(146)
	2020	2021	2022	2023	2024	2025	2026
	(148)	(151)	(154)	(157)	(159)	(162)	(165)
	2027	2028	2029	2030	2031	2032	
	(168)	(171)	(174)	(177)	(181)	(184)	

102.1 Please confirm the system control centre, or other group, will receive instant notification from the advanced meters when the power goes off. Please confirm the exact geographic location will be known for each advanced meter.

Response:

The operator will receive outage information via a separate software application shortly after the event occurs (within a minute or two under normal operating conditions), subject to the filtering described in the response to BCUC IR1 Q102.2. Meter location data is stored in the FortisBC GIS system, so the operator will have the ability to display the exact geographic location for advanced meters.

102.2 Since the outage information, by end use meter, will be known by the system control centre as soon as the advanced meters are installed, why will field crew response and repair times not be reduced until after a proposed Outage Management System is deployed at additional cost?

Response:

Please also see the response to BCUC IR1 Q102.3.

Until FortisBC implements an outage management system the AMI outage information will be of limited value at the onset of an outage on the system.

Without the OMS, the control room operator will be able to view individual outages graphically on a screen. However, that data will have to be filtered to ensure that the operator is not overwhelmed with short duration, isolated outage information or high volume information from large outages better reported by SCADA. The necessary outage data filtering is likely to result in a short delay before information is presented to the operator, which may in fact result in FortisBC receiving customer calls first.

A key benefit achieved once AMI is implemented is the ability to view “nested” outages following power restoration. The ability to view any customer outages post restoration can reduce or eliminate the number of crew call backs to areas where they believed power had already been restored.

The benefit here will be limited and will form part of the Outage Management System business case.

102.3 Please explain in detail what is installed/implemented in 2014 for $830 thousand.

Response:

FortisBC is considering the acquisition, in 2014/2015 of an Outage Management software System (OMS) that will leverage the information from the AMI meter, CIS (Customer Information System) and GIS that will provide additional efficiencies in outage restoration and reporting as well as enhancing customer service. With an OMS information from each of these systems will be automated and managed through one tool.

The OMS will compile AMI meter outage information and using the connectivity model of the distribution system from GIS will predict the individual outage groups and provide information on the customers involved in each outage area. The OMS will also predict which device in the distribution system has most likely operated to cause the outage which will allow the System Control System to dispatch field personnel to the appropriate location. This is in addition to the AMI-enabled notification of power being off at individual meters. In addition the OMS will allow for the single point management of the outage and restoration information to allow for distribution and corporate outage reporting.

Overall benefits in an OMS system include:

- Provide better visibility of the scope and scale of the outage;
- Centralize the outage management process into one tool, from call/AMI data handling, providing information to the System Control Centre to efficiently respond and report outage data;
- Enhance the Company's ability to perform triage during system wide outage and provide companywide visibility;
- Enhance customer service by providing information to SCC when responding to customer calls and by providing real time information on outages to the web; and
- Full use of the capabilities of the AMI system by managing and analyzing outage data from the meters, mapping the outage area, providing "pinging" functionality and automatically checking to ensure all customers are back on once the power is

restored.

103.0 Reference: Project Costs and Benefits

Exhibit No. B-1, Tab 5.0, Section 6.4, pp. 102-103

Pre-Pay

103.1 Will FortisBC be filing an application related to Pre-Pay in 2016? If not, will it be within the twenty-year window? If so, when?

Response:

As indicated in the Application at Tab 6.0, Section 6.4, p 103, "If AMI is approved, FortisBC intends to fully investigate the potential development costs and potential savings associated with a pre-pay system. If warranted, a proposal for a prepay system will be included in a future application filing for possible submission in 2015 or later."

FortisBC is interested in offering an optional pre-pay after AMI is implemented for several reasons:

- Customers have the convenience and control of paying as much as they want, whenever they want;
- Experience from utilities offering pre-pay programs shows that participating customers tend to be highly satisfied with their utilities (http://www.elp.com/index/display/article-display/4104517685/articles/utility-automation-engineering-td/volume-16/issue-10/departments/perspectives/pre-paid-metering-amis-killer-app.html);
- Pre-pay programs help consumers reduce their bills by raising awareness of energy consumption;
- Customers would not need a credit check or deposit; and
- The risk of write-offs from pre-pay customers is reduced.

103.2 Will the current in-home devices on the market accommodate pre-payment or will the customer have to purchase a new in-home device?

Response:

Zigbee Smart Energy Profile supports pre-payment, but not all in-home display devices will necessarily support pre-payment. It is possible that a dedicated IHD device may be required to support pre-payment. The cost of a dedicated device, if required, and how it is paid for will be considered in a pre-payment rate application if one is submitted.

104.0 Reference: Future Benefits

Exhibit B-1, Tab 6.0, Section 6.5

Future Conservation Rate Structures

Table 6.5.a - Conservation Rate Structures - Indicative Avoided Power Purchase Costs

	Participation Rate	Per Participant Savings (Capacity) Incremental to RIB	Per Participant Savings (Energy) Incremental to RIB	2016 Power Purchase Savings	2020 Power Purchase Savings	2030 Power Purchase Savings
					($000s)	
TOU	20%	10.50%	3.60%	$881	$959	$1,216
CPP	20%	9.50%	0.00%	$117	$158	$308
Pre-pay	8%	5.30%	9.80%	$667	$705	$818

"If, after sufficient further investigation, it is determined that one or more innovative rate structures would enable a cost-effective means of allowing the utility to reduce the load it serves and helping customers exert control over their electricity bill, then the Company will enter into appropriate stakeholder consultation and regulatory processes, with consideration for the submission of a regulatory application in 2016 or later." [Ref: B-1, p. 104]

104.1 Please expand on the potential timing of an enhanced Time of Use (TOU) or Critical Peak Pricing (CPP) rate structure. For example, if the earliest submission of a regulatory application was in 2016, when would the rate structure actually be available for customers, and when would the power purchase savings start?

<u>Response:</u>

Assuming that an application for some suite of innovative rate structures, (including some or all of TOU, CPP, and pre-pay) was submitted to the Commission in early 2016, it is possible that the resulting new rates could be in place at the beginning of 2017. The Company assumes that the associated regulatory process would conclude in 6 months and that implementation and customer communication would require a further 6 months to complete.

FortisBC suggests in Section 6.0 of the Application that it may apply for a pre-pay rate structure in 2015. If the rates were to come into effect in 2017, Table 6.5a would be updated as follows:

Table BCUC IR1 104.1 – 2017 Conservation Rate Structures

	Participation Rate	Per Participant Savings (Capacity) Incremental to RIB	Per Participant Savings (Energy) Incremental to RIB	2017 Power Purchase Savings ($000)s	2020 Power Purchase Savings ($000)s	2030 Power Purchase Savings ($000)s
TOU	20%	10.50%	3.60%	$901	$959	$1,216
CPP	20%	9.50%	0.00%	$127	$158	$308
Pre-Pay	8%	5.30%	9.80%	$677	$705	$818

105.0 Reference: Project Alternatives Considered

Exhibit B-1, Tab 7

Exhibit B-2, FortisBC 2008 AMI CPCN, Q17.3.5, p.53

New Alternative – Phased Implementation of Advanced Meters

"Changes to National Policy (E-26), "Reverification Periods for Electricity Meters and Metering Installations", issued September 15, 2004 by Measurement Canada, will result in increased frequency of mechanical demand meter exchanges. The proposed regulation will require that 100 percent of mechanical demand meters be exchanged every four years."

[Ref: B-2, FortisBC 2008 AMI, Q17.3.5, p.53]

105.1 Please confirm the replacement rate for the existing electro-mechanical meters used by FortisBC. Specifically, if FortisBC was to replace the existing electro-mechanical meters with advanced meters, by what date would the system be essentially advanced metering?

<u>Response:</u>

Please refer to the response to BCUC IR1 Q55.3 for a table detailing the replacement rate for electro-mechanical meters due to the new SS-06 regulations. The total exchange would take a maximum of 21 years if the Company chose to manage the electro-mechanical population until the end of life, though compliance testing would become more expensive and difficult as time goes on.

Since FortisBC has a significant population of electronic meters without an advanced feature set, the system would not be considered a complete advanced metering system even at the conclusion of replacement of all electro-mechanical meters.

105.2 Please provide the unit cost for a digital meter and for an advanced meter, as currently in use and proposed by FortisBC. Please identify all the cost differences between [1] replacing an existing electro-mechanical meter with a new digital meter, and [2] replacing an existing meter with a new advanced meter.

Response:

Please see the table below which provides the unit cost for digital and electro-mechanical meters currently in use by FortisBC. Due to contractual sensitivities, the unit cost of the proposed AMI meter has been filed with the Commission in confidence.

Meter Type	Unit Cost
Single phase electromechanical meter	$36.84
Single phase digital meter	$30.11

The difference in cost between replacing one meter type with another is the cost of the meter itself.

105.3 Please provide a new phased implementation scenario, and compare it to the FortisBC AMI solution as detailed in Tab 7. For the phased implementation scenario, assume:

- replacement of the existing meters with advanced meters would start in Q3 of 2013 using FortisBC's existing process for meter replacement (minimal incremental capital and operations costs);
- the HES, MDMS, telcom and all other pieces of the proposed AMI project are installed at appropriate timing to be working together by the time the existing meters are replaced with advanced meters (deferred capital);
- new meters on the distribution feeders will provide the benefits of theft detection, and;

- savings on meter reading will shift out into the future by the appropriate number of years.

<u>Response:</u>

FortisBC made the following assumptions in preparing this response:

1. Meters are replaced with AMI meters at the rate of the yearly sum of Measurement Canada SS-O6 + normal meter exchanges + new customer growth.
    a. Meter fleet is converted to AMI:
        i. 25% by 2016
        ii. 50% by 2019
        iii. 75% by 2024, and
        iv. 88% by 2032
    b. Unit price of AMI meters are inflated by 1.8 percent per year
2. HES, MDMS, telecom are installed in 2013 / 2014 as per existing proposed preliminary project plan. The back office software (including integration) and communication network is required immediately in order to realize benefits as soon as AMI meters are installed.
3. Measurement Canada compliance, Meter Growth and Replacement are adjusted for the cost of the AMI meters.
4. The cost related to the meter exchange program remains the same as in Status Quo.
5. Meters are written off over the 20 year study period as they are replaced by AMI meters.
6. Benefits adjusted:
    a. While not an exact forecast, benefits are generally adjusted relative to the percentage of the meter fleet that has been converted to AMI.
    b. Theft reduction
        i. The gain in theft reduction benefits as per the proposed AMI project is reduced annually to equate to the percentage of the meter fleet that has been converted to AMI. Feeder meters do not, by themselves, provide the proposed gain over the Status Quo.
    c. Manual Meter Reading

i. As an approximation, manual meter reading costs are reduced by the percentage of the meter fleet that has been converted to AMI.

ii. In reality, the reductions would most likely be "stepped" over time as meter reading routes become predominantly AMI.

iii. Conversely, manual meter reading unit costs would, in reality, likely rise over time from existing unit costs to those more appropriately required to service geographically distant meters.

d. Disconnect / Reconnect

i. Reduced as a percentage of the meter fleet that has been converted to AMI.

e. Contact Centre

i. Contact centre costs in "new AMI" have been equated to "Status Quo", negating any benefit claim.

ii. While there will be contact centre benefits associated with the reduction in soft reads as AMI goes in, there will also likely be an increase in call volume related to the extended (20yr+) meter replacement program – however this would be difficult to quantify. To ease the modeling of this scenario, the relative costs and benefits have been considered to cancel each other out.

f. Results:

i. NPV of net customer benefit becomes a cost of $10.830 million.

105.3.1 Please integrate this new scenario into the financial model and provide in a working spreadsheet and detail assumptions used.

Response:

The requested spreadsheet is provided as electronic Excel attachment BCUC IR1 105.3.

106.0 Reference: Project Alternatives

Exhibit B-1, Tab 7.0, Section 7.5, pp. 105-118

Project Alternatives Considered

106.1 The analysis of alternatives in the Application considered only discrete alternatives. Were any hybrid alternatives considered to optimize the solution? (i.e. maximize NPV by utilizing a mix of the alternatives)

Response:

FortisBC assumed that vendors would propose hybrid alternatives in optimizing their responses to the RFP. In fact, the negotiated AMI contract allows Itron to propose and/or substitute alternative, functionally-similar LAN solutions (such as PLC or direct cellular connection) where they are more economic than the main RF solution.

FortisBC also has the contractual right to request or impose changes to the LAN technology where it may reduce WAN costs (although in this case FortisBC will be responsible for any increases in vendor-related costs, so each instance will be evaluated on its economic merits).

In either case, the economics of the AMI project will be preserved or enhanced if alternative LAN technology is selected.

The alternative analysis prepared by FortisBC presents only single-technology LAN alternatives for simplicity and clarity.

106.1.1 If not, why not?

Response:

Please see the response to BCUC IR1 Q106.1.

106.2 Please discuss why a hybrid solution such as the following could not, was not, or should not be considered.

- AMI deployed to replace bulk of electro-mechanical meters where satellite WAN connection not required
- Existing digital meters re-deployed to remote areas with replacement by either AMR, PLC or AMI as technology develops and economics permit.

Response:

Please see the response to BCUC IR1 Q106.1. Hybrid technologies are specifically contemplated in the main AMI contract.

"No PLC proposals were received from any vendors during the RFP process. However, Itron was able to provide an estimate of PLC capital costs of approximately $66 million for a system with nearly equivalent functionality to their RF technology."

106.3 Please provide a breakdown of this estimate with line items comparing the AMI quote provided with the PLC alternative.

Response:

Itron provided a written estimate for a 100% OpenWay PLC solution. The Itron OpenWay system upon which the proposed AMI system is based is designed to consist primarily of RF-equipped meters. Alternative meter communications options include direct-cellular and PLC-equipped meters to address situations that cannot economically be accommodated by RF. PLC-equipped OpenWay meters are currently not commercially available from Itron, but are expected to provide similar capabilities to the RF and cellular-equipped meters. These enhanced capabilities require a more expensive PLC infrastructure than typical PLC-equipped meters generally available on the market.

Line Item	**Difference between PLC and RF (positive numbers indicate higher PLC cost) ($000s)**
Meters	$4,861
Network Infrastructure and Installation	$16,258
Head End System	$216
Security Appliances	$0
Professional Services	$698
Total	**$22,032**

106.4 How was the estimate of $66 million provided to FortisBC? Was this a verbal or written estimate?

Response:

The estimate was provided to FortisBC as a written estimate.

106.5 How does this estimate compare on a unit cost basis with the actual costs experienced by Fortis Alberta in its roll-out of PLC based meters?

Response:

The $126 million dollar FortisAlberta AMI expenditure that covers 470,000 customers results in a cost of approximately $268 per customer.

This compares to the $47.7 million expense proposed by FortisBC covering 115,000 customers, or approximately $415 per customer.

This cost is not directly comparable to the FortisBC expenditure for several reasons, including the fact that no costs related to HES or MDMS servers or software, provincial sales tax, regulatory process, contingency allowance, remote disconnects, theft detection metering or customer portal were incurred by FortisAlberta. These costs total approximately $11.4 million in the FortisBC AMI project.

If FortisBC excludes those costs from its AMI project, the capital cost drops to approximately $36.3 million or $316 per customer. The bandwidth available with the FortisBC RF system at this expenditure level exceeds that available with the FortisAlberta PLC system. This allows hourly consumption data to be collected system-wide, for example, which challenges the FortisAlberta PLC system as described in the response to BCUC IR1 Q113.1.1.

107.0 Reference: Future Benefits

Exhibit B-1, Tab 6.0, Section 6.5, p. 103;

Future Conservation Rate Structures -

TOU Customer Response Assumptions

FortisBC states on page 103 of the Application:

"AMI allows FortisBC to remotely and economically apply time-varying rate structures to selected meters dispersed throughout the Company's service territory. ... FortisBC has estimated, using data from its Future Program Study (by Navigant) and the BC Wholesale Market costs for energy an capacity (as presented in the Company's 2012

Long Term Resource Plan – Midgard Consulting 2011 FortisBC Energy & Capacity Market Assessment), the effect of possible conservation rate structures enabled by AMI."

The May 2011 Midgard Consulting Inc. 2011 FortisBC Energy and Capacity Market Assessment Report states on pages 2, 3 and 21:

"The wholesale electricity market in British Columbia has a limited number of buyers and sellers and as a consequence wholesale pricing in the province essentially amounts to the wholesale prices for the Mid- Columbia ("Mid-C") market adjusted to take into account the costs of moving electricity into BC." (page 2)

"FortisBC's continued reliance upon the wholesale electricity market to meet current and future needs is not an unreasonable strategy - especially in light of the modest sizes of FortisBC's energy and capacity deficits." (page 3)

"Midgard calculated the British Columbia Wholesale Market Energy Forecast Curve by taking the Mid-C Forecast Price Curve as the starting point, adding the cost of transmitting power from Mid-C to FortisBC territory, and then converting the resulting price into Canadian dollars." (page 21)

The Midgard Consulting report also includes the following table on page 23:

Table 5.1.3.3-A: British Columbia Wholesale Market Energy Curve (CAD)

Year	Expected	HLH	LLH	Year	Expected	HLH	LLH
2011	$51.79	$54.24	$49.26	2026	$104.73	$109.73	$99.56
2012	$54.68	$57.27	$52.00	2027	$108.45	$113.63	$103.09
2013	$57.30	$60.01	$54.49	2028	$112.55	$117.93	$106.99
2014	$61.18	$64.08	$58.17	2029	$117.90	$123.53	$112.07
2015	$64.49	$67.55	$61.32	2030	$122.45	$128.31	$116.40
2016	$68.47	$71.73	$65.11	2031	$128.10	$134.23	$121.77
2017	$72.36	$75.81	$68.80	2032	$130.48	$136.72	$124.03
2018	$76.15	$79.77	$72.40	2033	$134.80	$141.25	$128.13
2019	$79.67	$83.46	$75.74	2034	$139.16	$145.82	$132.28
2020	$82.59	$86.52	$78.52	2035	$143.58	$150.45	$136.47
2021	$88.77	$93.00	$84.39	2036	$148.04	$155.12	$140.72
2022	$92.27	$96.68	$87.72	2037	$152.55	$159.85	$145.00
2023	$94.19	$98.68	$89.54	2038	$157.11	$164.63	$149.34
2024	$96.78	$101.40	$92.00	2039	$161.73	$169.47	$153.72
2025	$100.90	$105.72	$95.92	2040	$167.50	$175.52	$159.22

The Australian Victorian Auditor-General's November 2009 Report "Towards a 'smart grid' – the roll-out of Advanced Metering Infrastructure" states:

"The cost-benefit study behind the AMI decision was flawed and failed to offer a comprehensive view of the economic case for the project." (page ix)

"... the approach used to identify the benefits from demand management relied on two significant assumptions that appear to be optimistic:

- *The assumed difference in the peak price of electricity and the pre-existing 'any time' average price of electricity, known as the peak-to-average price ratio, was much higher than could have reasonably been expected to eventuate in the retail market*
- *It was assumed that all consumers would respond to price signals as soon as the new meters were installed." (page 26)*

"The IMRO 2004 study's tariff assumptions were inappropriate because they were based on wholesale price data that reflected extreme conditions. This assumption translated into a peak-to-average price ratio of three (i.e., in that month, peak prices were three times the average) that in turn led to a substantially higher than reasonable estimate of demand benefits." (page 27)

"... the AIMRO 2005 study used the same tariff assumption from the IMRO 2004 study to estimate demand reduction benefits, which by then would have been demonstrated as clearly not realistic, based on the available historical data." (page 28)

107.1 Please describe the drivers which are leading FortisBC to consider time-varying rate structures for residential customers as a future AMI benefit (for example, avoid the need for new generating/network capacity, reduce the use of fossil fuel peaking plants, address generation/network reliability concerns etc).

Response:

The Company considers that the implementation of time-varying rate structures provides direct customer benefits and resulting operational/cost advantages to the utility.

Customer benefits resulting from the implementation of time-based rate structures are discussed under the Conservation Rate Structures heading in Section 3.2.5 of the Application. These customer benefits are in and of themselves of considerable value as justification for AMI-enabled innovative rate structures.

The types of utility operational and cost benefits noted in the information request *(avoid the need for new generating/network capacity, reduce the use of fossil fuel peaking plants, address generation/network reliability concerns etc.),* are a result of the changes in customer consumption behaviour and timing that the new rate structures are designed to elicit.

Given that the electric system is designed and built to accommodate the peak aggregate load of the Company's customers, FortisBC considers that successfully reducing customers' total demand and shifting usage to off-peak hours will provide such benefits as:

- Delaying requirement for new generating facilities and transmission and distribution infrastructure, lowering costs for all customers;
- Reducing future power purchase expense (as shown in Table 6.5a);
- Inasmuch as some market-based power supply alternatives may be fossil fuel based, a reduction in any reliance on such resources provides an environmental benefit.

These drivers are relevant to FortisBC now, which is why the Company has contemplated the implementation of time-varying rates in the AMI CPCN.

107.1.1 If the driver(s) identified above are not relevant to FortisBC now, but could be in the future, please estimate how many years it could be before the driver becomes relevant to FortisBC residential customers.

Response:

Please see the response to BCUC IR1 Q107.1.

107.2 Please define the Mid-C High Load Hours (HLH) and Low Load Hours (LLH) time periods.

Response:

High Load Hours (HLH or On-peak Hours) - Hours ending 0700 - 2200 (6 a.m. - 10 p.m.) Pacific Time at Mid-Columbia, seven (7) days a week including NERC holidays.

Low Load Hours (LLH or Off-peak Hours) - Hours ending 2300 - 0600 (10 p.m. - 6 a.m.) Pacific Time at Mid-Columbia, seven (7) days a week including NERC holidays.[4]

[4] http://www.djindexes.com/mdsidx/?event=energyMidColumbiaD

107.2.1 Are these time periods reasonably similar to that used in the Future Program Study by Navigant to estimate participant response to TOU rates? Please explain why or why not.

Response:

At page 38 of the Navigant report, the authors note,

We recommend using the BC Hydro CRI results as the impact from participating customers. BC Hydro is most similar to FortisBC in terms of climate, prices and demographics. As discussed below, these need to be adjusted for number of participation rates. We recommend assuming that 20% to 30% response rate is consistent with analyses that show that 20% to 30% provide most of the response to mandatory TOU programs, and make the voluntary programs (e.g. BC Hydro, Hydro One) consistent with the mandatory programs (Newmarket Hydro).

The recommendation is based not on a specific set of time periods as an input to the analysis, but rather on the outcomes produced in the referenced studies. The BC Hydro CRI used peak time periods reflective of actual high use periods on its system rather than the long HLH time frames of the Mid-C index.

The BC Hydro CRI used a single peak period defined for non-holiday weekdays from 4pm to 9pm for the Lower Mainland and Fort St. John, November through February and a two peak period defined for non-holiday weekdays from 7am to 11am and from 4pm to 9pm for Campbell River on Vancouver Island, November through February. [5]

107.2.2 Are these differences between the Mid-C based HLH prices and LLH prices similar to the peak/off-peak generation prices typically seen in other jurisdictions with residential TOU rates? Please explain why or why not.

Response:

A comparison of prices is not possible because neither the FortisBC AMI Application not the Navigant report use a set of TOU prices as a basis for estimating the customer participation rate or capacity and energy savings attributable to the introduction of the conservation rate. Rather than developing a set of rates and then determining an estimated customer response to those rates, recommendations were provided by Navigant based upon the experience in other jurisdictions.

[5] Conservation Research Initiative Residential Time of Use Rate Application August, 2006

107.3 Please provide the peak: off-peak residential energy price ratio assumed in the Future Program Study by Navigant (for example, 2:1, 3:1) for the purposes of estimating customer response to FortisBC TOU rates.

Response:

Please see the response to BCUC IR1 Q107.2.2 and Q109.1.1. No on-peak/off-peak pricing was developed or assumed by Navigant for the purposes of the study. Assumptions on the TOU impact on conservation and response were drawn from the BC Hydro Conservation Research Initiative.

107.3.1 Are these assumptions reasonably consistent with the peak: off-peak differences expected in the Midgard BC Wholesale Market Energy Curve? Please explain why or why not.

Response:

This comparison cannot be made for the reason stated in the response to BCUC 107.3.

107.4 Please estimate how much money a residential customer with average consumption volume would save in one month if they shifted 10 percent of their consumption from peak (HLH) to off-peak periods (LLH) in 2012.

In undertaking this analysis, please assume the customer is on a FortisBC residential TOU tariff where the peak: off-peak ¢ /kWh difference is set equal to the peak: off-peak ¢ /kWh difference forecast in the Midgard BC Wholesale Market Energy Curve. Please state all assumptions made.

Response:

In order to respond to the question, FortisBC has made the following assumptions:

- Based on load and customer count forecasts contained in its 2012 – 2013 Revenue Requirements Application, the average residential customer will use 1,040 kwh each month;
- Residential customers will consume 40% of their power in dual peak (morning and evening) on-peak periods; and

- Beginning rates are set assuming 100% of residential consumption is subject to TOU rates.

From the referenced Midgard Report, data for 2012 is as follows:

Year	HLH	LLH	Difference $/MWh	Difference $/kWh
2012	57.27	52.00	5.27	0.00527

A set of on-peak/ off-peak rates that provides revenue neutrality to the January 1, 2012 flat rate, given forecast 2012 residential load, 40% on-peak consumption and a $0.00527 on-peak/off-peak differential is,

- On-peak $0.09763 per kWh; and
- Off-peak $0.09236 per kWh.

The effect of a shift of 10% of consumption from the on-peak to off-peak time periods is summarized in the table below. The savings in the scenario provided by the Commission is 22 cents per month.

	Before Shifting Consumption			**After Shifting Consumption**		
	Usage (kWh)	Rate	Cost	Usage (kWh)	Rate	Cost
On-Peak	416	0.09763	$ 40.61	374.4	0.09763	$ 36.55
Off-Peak	624	0.09236	$ 57.63	665.6	0.09236	$ 61.47
Total	**1040**		**$ 98.25**	**1040**		**$ 98.03**

107.4.1 Please redo the above analysis for each year up to 2030.

Response:

The difference between the HLH and LLH prices to 2030 can be found in the table below.

Table BCUC IR1 Q107.4.1a – HLH and LLH Difference

Year	HLH	LLH	Difference $/MWh	Difference $/kWh
2013	60.01	54.49	5.52	0.00552
2014	64.08	58.17	5.91	0.00591
2015	67.55	61.32	6.23	0.00623
2016	71.73	65.11	6.62	0.00662
2017	75.81	68.80	7.01	0.00701
2018	79.77	72.40	7.37	0.00737
2019	83.46	75.74	7.72	0.00772
2020	86.52	78.52	8.00	0.008
2021	93.00	84.39	8.61	0.00861
2022	96.68	87.72	8.96	0.00896
2023	98.68	89.54	9.14	0.00914
2024	101.40	92.00	9.40	0.0094
2025	105.72	95.92	9.80	0.0098
2026	109.73	99.56	10.17	0.01017
2027	113.63	103.09	10.54	0.01054
2028	117.93	106.99	10.94	0.01094
2029	123.53	112.07	11.46	0.01146
2030	128.31	116.40	11.91	0.01191

FortisBC does not have rate projections out to 2030, however, it is the difference between the on-peak and off-peak price that most affects potential bill impacts. For illustrative purposes, an on-peak rate of $0.11 / kWh is used in all years, as the rate used does not impact the savings.

Using the *Annual Energy Sales for Residential Customers* found at page 45 of the Navigant report and residential load growth projections out to 2030, yields the following results.

Table BCUC IR1 Q107.4.1b – Potential Bill Impacts due to Consumption Shifting

		Before Shifting Consumption					After Shifting Consumption					
Year	Monthly Average/Customer (kWh)	On-Peak Use (kWh)	Off-Peak Use (kWh)	On-Peak Rate ($/kWh)	Off-Peak Rate ($/kWh)	Consumption Charge ($)	On-Peak Use (kWh)	Off-Peak Use (kWh)	On-Peak Rate ($/kWh)	Off-Peak Rate ($/kWh)	Consumption Charge ($)	Saving
2013	1030	412	618	0.1100	0.1045	109.84	371	659	0.1100	0.1045	109.62	0.23
2014	1031	412	619	0.1100	0.1041	109.74	371	660	0.1100	0.1041	109.50	0.24
2015	1027	411	616	0.1100	0.1038	109.14	370	657	0.1100	0.1038	108.88	0.26
2016	1023	409	614	0.1100	0.1034	108.49	368	655	0.1100	0.1034	108.22	0.27
2017	1020	408	612	0.1100	0.1030	107.95	367	653	0.1100	0.1030	107.66	0.29
2018	1018	407	611	0.1100	0.1026	107.45	366	651	0.1100	0.1026	107.15	0.30
2019	1015	406	609	0.1100	0.1023	106.98	366	650	0.1100	0.1023	106.67	0.31
2020	1012	405	607	0.1100	0.1020	106.49	364	648	0.1100	0.1020	106.17	0.32
2021	1009	404	606	0.1100	0.1014	105.82	363	646	0.1100	0.1014	105.47	0.35
2022	1007	403	604	0.1100	0.1010	105.39	363	645	0.1100	0.1010	105.03	0.36
2023	1005	402	603	0.1100	0.1009	105.01	362	643	0.1100	0.1009	104.64	0.37
2024	1001	401	601	0.1100	0.1006	104.51	361	641	0.1100	0.1006	104.13	0.38
2025	999	400	599	0.1100	0.1002	104.02	360	639	0.1100	0.1002	103.63	0.39
2026	996	399	598	0.1100	0.0998	103.51	359	638	0.1100	0.0998	103.10	0.41
2027	993	397	596	0.1100	0.0995	102.97	358	636	0.1100	0.0995	102.55	0.42
2028	990	396	594	0.1100	0.0991	102.41	356	634	0.1100	0.0991	101.98	0.43
2029	987	395	592	0.1100	0.0985	101.82	355	632	0.1100	0.0985	101.37	0.45
2030	984	394	591	0.1100	0.0981	101.24	354	630	0.1100	0.0981	100.77	0.47

107.4.2 Based on the above analysis, please estimate how long it would likely be before the residential customer bill savings would reflect those assumed in the Navigant study.

Response:

The Navigant study contains assumptions on customer response rates and capacity/energy savings that did not rely on any set of specific rate assumptions. No bill savings were assumed or presented by Navigant directly. The per-participant energy savings presented in Table 6.5a of the Application were derived by the Company from the overall energy savings and participation rates provided by Navigant. The participant per-participant energy savings are assumed to occur in year one following implementation. Using the constraints regarding pricing provided in the above information requests would not yield these bill savings in any year. Please also refer to the response to BCUC IR1 Q110.4.

107.4.3 Does FortisBC consider that the Navigant assumptions regarding customer response to a FortisBC TOU rate are optimistic? Please explain why or why not.

Response:

FortisBC considers that the response rates recommended by Navigant, (in the 20%-30% range) are reasonable given that it is based on the BC Hydro CRI experience and represents results produced by a voluntary group of participants. Should FortisBC choose and be permitted to implement a TOU rate in the future, it would most likely be as an alternative to the existing Residential Conservation Rate. Customers who opt in to such a rate are assumed to be responsive and as such the Company does not view the assumptions used by Navigant to be optimistic.

107.5 Please explain how FortisBC can offer optional TOU rates to residential customers on stepped rates without resulting in a significant number of 'free-riders'. For example, customers who consume more energy than average at the higher Tier-2 price may see significant bill savings from a switch to a TOU rate without making any changes to their consumption pattern.

Response:

The Company considers that a certain amount of free-ridership is going to occur on any conservation rate that it may implement. There are currently customers who benefit financially from the inclining block rate without changing behaviour, and a certain amount would be expected under a TOU rate as well.

The Company does not expect however that bill savings would be “significant”. Using the assumptions provided in the responses to BCUC IR1 Q107.4, and the current RCR rate, (also revenue neutral to the 2012 flat rate), the savings attributed to a customer moving from RCR to TOU with no change in behaviour (assumed 40 percent consumption is on-peak) is shown in the table below.

In order to minimize free-ridership, eligibility for the TOU rate could be contingent upon customers using a certain percentage of power during off-peak hours, however, the Company views this as administratively burdensome and a disincentive to enrollment on the rate.

Table BCUC IR1 Q107.5 – RCR and TOU Bill Comparisons

	Residential Conservation Rate						Time of Use Rate (@40% on peak)							
Monthly Consumption	Threshold	Tier 1 rate	Tier 2 rate	Customer Charge	Energy Charges	Total	On-Peak Rate	Off-Peak Rate	On-Peak Usage	Off-Peak Usage	Customer Charge	Energy Charges	Total	Difference
1300	800	0.08136	0.11769	$ 29.65	$ 123.93	$ 153.58	0.09763	0.09236	520	780	$ 30.07	122.81	$ 152.88	$ 0.70
1350	800	0.08136	0.11769	$ 29.65	$ 129.82	$ 159.47	0.09763	0.09236	540	810	$ 30.07	127.53	$ 157.60	$ 1.87
1400	800	0.08136	0.11769	$ 29.65	$ 135.70	$ 165.35	0.09763	0.09236	560	840	$ 30.07	132.26	$ 162.33	$ 3.03
1450	800	0.08136	0.11769	$ 29.65	$ 141.59	$ 171.24	0.09763	0.09236	580	870	$ 30.07	136.98	$ 167.05	$ 4.19
1500	800	0.08136	0.11769	$ 29.65	$ 147.47	$ 177.12	0.09763	0.09236	600	900	$ 30.07	141.70	$ 171.77	$ 5.35
1550	800	0.08136	0.11769	$ 29.65	$ 153.36	$ 183.01	0.09763	0.09236	620	930	$ 30.07	146.43	$ 176.50	$ 6.51
1600	800	0.08136	0.11769	$ 29.65	$ 159.24	$ 188.89	0.09763	0.09236	640	960	$ 30.07	151.15	$ 181.22	$ 7.67
1650	800	0.08136	0.11769	$ 29.65	$ 165.12	$ 194.77	0.09763	0.09236	660	990	$ 30.07	155.87	$ 185.94	$ 8.83
1700	800	0.08136	0.11769	$ 29.65	$ 171.01	$ 200.66	0.09763	0.09236	680	1020	$ 30.07	160.60	$ 190.67	$ 9.99
1750	800	0.08136	0.11769	$ 29.65	$ 176.89	$ 206.54	0.09763	0.09236	700	1050	$ 30.07	165.32	$ 195.39	$ 11.15
1800	800	0.08136	0.11769	$ 29.65	$ 182.78	$ 212.43	0.09763	0.09236	720	1080	$ 30.07	170.04	$ 200.11	$ 12.32
1850	800	0.08136	0.11769	$ 29.65	$ 188.66	$ 218.31	0.09763	0.09236	740	1110	$ 30.07	174.77	$ 204.84	$ 13.48

108.0 Reference: Future Benefits

Exhibit B-1, Tab 6.0, Section 6.5, p. 104;

Future Conservation Rate Structures -

Fortis Capacity Outlook

FortisBC states on page 104 of the Application:

"If, after sufficient further investigation, it is determined that one or more innovative rate structures would enable a cost-effective means of allowing the utility to reduce the load it serves and helping customer exert control over their electricity bill, then the Company will enter into appropriate stakeholder consultation and regulatory processes, with consideration for the submission of a regulatory application in 2016 or later."

The May 2011 Midgard Consulting Inc. 2011 FortisBC Energy and Capacity Market Assessment Report includes the following on pages 8 and 9:

3.3 FortisBC Capacity Outlook

Similar to energy, FortisBC faces capacity shortfalls over the next three decades. Until 2014 FortisBC faces expected capacity gaps of up to 107 MW in the summer (July 2014) and 125 MW in the winter (March 2014) (see Table 3.3-A).

After the Waneta Expansion Capacity Purchase Agreement comes into effect in 2015, FortisBC's expected peak summer and winter capacity gaps essentially fall to zero. The summer gap grows from 4 MW in 2015 to 112 MW in 2040. The winter gap remains at zero until 2017, but then expands at approximately 10 MW per year, reaching 223 MW in 2040. It is important to note that these forecasts take into account both the effects of DSM as well as FortisBC's planning reserve margin requirements.

Table 3.3-A: Forecast FortisBC Capacity Gaps By Month and Year (MW)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2011	4	39	101	0	0	34	84	36	0	29	40	74
2012	14	47	108	4	0	40	91	43	0	35	48	85
2013	24	56	117	11	0	47	100	50	0	43	58	96
2014	34	64	125	17	0	53	107	57	0	49	66	106
2015	0	0	1	0	0	4	0	0	0	0	0	0
2016	0	0	0	0	0	6	0	0	0	0	0	0
2017	0	0	0	0	0	9	0	0	0	0	0	2
2018	0	0	0	0	0	12	0	0	0	0	0	13
2019	0	0	0	0	0	16	0	0	0	0	0	23
2020	0	0	0	0	0	20	0	0	0	0	0	34
2021	0	0	0	0	0	24	0	0	0	0	0	45
2022	0	0	0	0	0	28	0	0	0	0	0	56

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2023	0	0	0	0	0	32	0	0	0	0	0	67
2024	6	0	0	0	0	36	3	0	0	0	0	79
2025	17	0	0	0	0	41	11	0	0	0	0	90
2026	27	0	0	0	0	45	18	0	0	0	0	101
2027	37	0	0	0	0	49	26	0	0	0	0	113
2028	48	0	0	0	0	54	34	0	0	0	0	125
2029	59	0	0	0	0	58	42	0	0	0	0	136
2030	69	0	0	0	0	62	50	0	0	0	0	147
2031	78	0	0	0	0	66	57	0	0	0	0	156
2032	89	0	0	0	0	70	65	0	0	0	0	164
2033	99	0	0	0	0	74	72	0	0	0	0	171
2034	109	7	0	0	0	78	80	0	0	0	0	179
2035	118	15	3	0	0	82	87	0	0	0	0	186
2036	128	23	11	0	0	86	92	0	0	0	0	194
2037	138	31	19	0	1	90	97	0	0	0	0	201
2038	148	39	27	0	4	94	102	0	0	0	0	208
2039	155	47	34	0	8	98	107	0	0	0	7	216
2040	161	55	42	0	11	102	112	0	0	0	16	223

108.1 Does FortisBC expect to have a generation capacity gap in 2016 that could be economically addressed through the introduction of residential TOU rates? Please explain why or why not.

Response:

Table 3.3-A in Midgard's report for FortisBC's 2012 Resource Plan indicated a small capacity gap in June 2016 based on system requirements to meet expected customer demand after taking into account the effects of DSM. FortisBC is currently reviewing its system requirements planning assumptions, including the determination of planning reserve margin, and based on preliminary assessment expects that the future capacity gaps indicated in the table will not emerge until later in the planning cycle, all else being equal. In any case, the ability to economically address future capacity gaps on a planning basis through the introduction of residential TOU rates is uncertain. The introduction of residential TOU rates would be expected to change overall customer use patterns, however the determination of the impact on the few hours in a year that sets the peak demand system requirements would only be known with any certainty once greater experience with TOU rates has been gained. However, although the impact on peak hour system requirement is uncertain, TOU rates would be expected to incent customers to shift their use patterns generally, which could have the potential to reduce the overall power purchase expense through active management of the power supply portfolio.

108.1.1 By what year does FortisBC consider that the generation capacity gap could be economically addressed through the introduction of residential TOU rates?

Response:

Please see the response to BCUC IR1 Q108.1.

108.1.2 Is the generation capacity gap primarily seasonal (i.e., between months) rather than within day? Please explain why or why not.

Response:

Overall capacity requirements change with the season, but within the season they change by the day in response to the weather and unplanned outages. Likewise, they change within the day by the time of day in response to general customer load patterns. For planning purposes like the 2012 ISP or the AMI application, the capacity gaps are calculated based on monthly expected generation capacity and forecast demands. However, even if a gap is shown, that will most likely only be for a few hours of the month it is shown for. The actual size of the gap will depend on the weather and any generation outages the Company may be experiencing and therefore any actual gaps may be larger or smaller than expected.

108.1.2.1 Please confirm that seasonal rates do not require AMI.

Response:

Seasonal rates do not “require” AMI, although a seasonal rate could be challenging to implement with manual meter reading. If all customers were on the rate, it would require significant additional resources to read all the meters in a short duration at the time of a seasonal rate change. (Currently, the manual meter reading capacity is approximately 13,500 meters per week, so it would require roughly nine times more meter readers to obtain a seasonal read from 115,000 customers in a week.)

Proration of bills would be required for approximately 80 percent of customers even if the seasonal reads occurred over five days (since presumably only one day of the five would be the date of the seasonal change). In the experience of FortisBC, particularly with respect to the Residential Conservation Rate, customers prefer not to have pro-rated bills.

109.0 Reference: Future Benefits

Exhibit B-1, Tab 6.0, Section 6.5, p. 103

Future Conservation Rate Structures -

CPP Customer Response Assumptions

FortisBC states on page 103 of the Application:

"FortisBC has estimated ... the effect of possible conservation rate structures enabled by AMI. TOU, Critical Peak Pricing (CPP) and pre-pay rate structures have been assessed at this high level with potential impacts stated as incremental to those achieved via the Company's default RIB rate."

109.1 What estimates did the Navigant study make regarding the difference between (i) the CPP residential price and (ii) the average price charged to residential customers when estimating customer response to CPP pricing?

Response:

Navigant did not attempt to estimate the difference between existing residential rates and CPP rates when estimating customer response to CPP pricing. Navigant does note that the results with respect to conservation rates are relatively consistent, however, which could imply that, 1) the response to conservation rate structures is relatively independent of the difference between existing and CPP residential rates, or 2) that the difference between existing and CPP rates is relatively similar at the utilities studied.

Navigant developed estimates of the energy and peak load savings for various future conservation rates and load control programs that would be enabled by AMI per participating customer. There are multiple pilots and studies with relatively consistent estimates of energy and capacity savings per participating customer (when expressed as a percent of their peak demand or annual energy use)[6].

109.1.1 Are these assumptions reasonably consistent with FortisBC expectations of the additional value of energy at these critical peak periods? Please explain why or why not.

Response:

[6] Exhibit B-1, Appendix C-1, p12

It is not clear from the Navigant study how the CPP rates were set at the utilities studied, nor is it clear what those rates were. It is therefore not possible to compare those rates with the FortisBC forecast of the additional value of energy at critical peak periods. The Navigant study does note that under CPP rates customers "are charged (pricing) or provided and [sic] incentive (rebate) for usage during critical peak periods as defined by both reliability and economic considerations"[7] so presumably CPP rates would not necessarily be set based only on the additional value of energy at peak times.

109.1.2 Does FortisBC consider that it will face a risk of customer outages as a result of lack of generation or network capacity which could viably be addressed through a residential CPP product? Please explain why or why not.

Response:

FortisBC attempts to ensure that generation and network capacity is sufficient to meet a wide variety of (but not necessarily all) contingencies. The availability of CPP rates as an additional resource to help alleviate load during contingency events could be beneficial.

109.1.2.1 If CPP is not a viable option for residential customers in this situation now, but could be in the future, please estimate when it could become a viable option.

Response:

The availability of a CPP option could be beneficial today in unusual contingency events.

109.1.3 Does FortisBC consider that it will face a risk of very high critical peak period prices in the wholesale energy market which could viably be addressed through a residential CPP product? Please explain why or why not.

Response:

[7] Exhibit B-1, Appendix C-1, p. 6

FortisBC is not forecasting very high critical peak period prices in its resource plan, but in the event that they occurred, the effect could be viably mitigated through a residential CPP rate structure.

109.1.3.1 If CPP is not a viable option in the current situation now, but could be for residential customers in the future; please estimate when it could become a viable option for residential customers in the future.

Response:

FortisBC is not forecasting "very high critical peak prices" in its resource plan, so it cannot estimate when CPP could become a viable option on this basis. However, if the cost of implementing CPP were sufficiently low, it may be prudent to have the option available as a contingency measure.

110.0 Reference: Future Benefits

Exhibit B-1, Tab 6.0, Section 6.5, p. 104

Future Conservation Rate Structures - Avoided Power Purchase Costs

FortisBC includes the following table on page 104 of the Application:

Table 6.5.a - Conservation Rate Structures - Indicative Avoided Power Purchase Costs

	Participation Rate	Per Participant Savings (Capacity) Incremental to RIB	Per Participant Savings (Energy) Incremental to RIB	2016 Power Purchase Savings	2020 Power Purchase Savings	2030 Power Purchase Savings
					($000s)	
TOU	20%	10.50%	3.60%	$881	$959	$1,216
CPP	20%	9.50%	0.00%	$117	$158	$308
Pre-pay	8%	5.30%	9.80%	$667	$705	$818

Note: Source for take up and participation rates is Navigant AMI Future Program Study - November 2010, provided as Appendix C-1. Power purchase savings are based upon BC Wholesale Market cost of Energy and Capacity (Midgard Consulting - 2011 FortisBC Energy & Capacity Market Assessment).

110.1 Please provide the supporting analysis for the estimated power purchase savings for 2016, 2020 and 2030 calculated for TOU, CPP and Pre-Pay. Please state all assumptions used in the analysis.

Response:

The savings calculations in the referenced table sum together for each conservation rate type in each year:

- forecast residential load x participation rate x energy savings rate x 2011 BC Wholesale Market Energy rate; and
- forecast capacity x participation rate x capacity savings rate x forecast BC Wholesale Market Capacity rate

110.2 Does the estimate of avoided power purchase costs as a result of conservation rate structures relate to residential customers only? If not, please provide a breakdown of the results by the main customer classes.

Response:

The estimated savings in Table 6.5a result from Residential customers only. The following tables show the savings from Commercial, Industrial and Wholesale customers calculated on the same basis as Residential.

Table BCUC IR1 Q110.2a - Commercial

	Participation Rate	**Per Participant Savings (Capacity) Incremental to RIB**	**Per Participant Savings (Energy) Incremental to RIB**	**2016 Power Purchase Savings** ($000s)	**2020 Power Purchase Savings** ($000s)	**2030 Power Purchase Savings** ($000s)
TOU	20%	10.50%	3.60%	486	523	643
CPP	20%	9.50%	0.00%	63	84	164
PrePay	8%	5.30%	9.80%	369	386	431

Table BCUC IR1 Q110.2b - Industrial

	Participation Rate	Per Participant Savings (Capacity) Incremental to RIB	Per Participant Savings (Energy) Incremental to RIB	2016 Power Purchase Savings ($000s)	2020 Power Purchase Savings ($000s)	2030 Power Purchase Savings ($000s)
TOU	20%	10.50%	3.60%	168	164	200
CPP	20%	9.50%	0.00%	26	35	68
PrePay	8%	5.30%	9.80%	125	115	122

Table BCUC IR1 Q110.2c - Wholesale

	Participation Rate	Per Participant Savings (Capacity) Incremental to RIB	Per Participant Savings (Energy) Incremental to RIB	2016 Power Purchase Savings ($000s)	2020 Power Purchase Savings ($000s)	2030 Power Purchase Savings ($000s)
TOU	20%	10.50%	3.60%	635	676	817
CPP	20%	9.50%	0.00%	85	114	224
PrePay	8%	5.30%	9.80%	481	495	538

110.3 Using the analysis above, please calculate the expected net present value for the introduction of each of the residential TOU, CPP and Pre-pay rates from 2016 to 2030. Please state all assumptions used in the analysis, and include set-up costs.

Response:

Assuming start-up costs in 2015 of $250,000 for TOU and CPP and $500,000 for pre-pay, and beginning the programs in 2016, the following 2012 NPV values (at an 8% discount rate and using the calculations provided in the response to BCUC IR1 Q110.1) are calculated:

Conservation Rate	NPV Savings ($000s)
TOU	$7,710
CPP	$1,219
PrePay	$5,273

110.3.1 Please redo this analysis assuming the introduction of these rates is delayed by five years.

Response:

Assuming start-up costs in 2020 of $250,000 for TOU and CPP and $500,000 for Pre-pay, and beginning the programs in 2021, the following 2012 NPV values (at an 8% discount rate and using the calculations provided in the response to BCUC IR1 Q110.1) are calculated:

Conservation Rate	NPV Savings ($000s)
TOU	$6,454
CPP	$1,162
PrePay	$4,245

110.4 Please recalculate table 6.5.a, assuming, for the purpose of estimating residential customer response to each conservation rate, that customer compensation for shifting load to off-peak periods is set equal to the generation value that FortisBC derives from the shifting (e.g., difference in the Mid-C based HLH, LLH).

Response:

FortisBC does not have information that would allow it to calculate the effect of pricing the on-peak/ off-peak differential at the difference between forecast Mid-C HLH and LLH prices. However, based on the forecast difference in Mid-C HLH and LLH prices in 2016, 2020 and 2030, the resulting differential between on-peak and off-peak rates would be less than $0.011 per kWh (2011 FortisBC Energy & Capacity Market Assessment). Current FortisBC residential TOU on-peak and off-peak rates (available to grandfathered customers only) differ by more than $0.100 per kWh. Since the response to time-based rates will depend to some extent on the rate differential, the savings in this scenario would be expected to be substantially less than shown in Table 6.5.a.

FortisBC notes that the savings from pre-pay would be less impacted since the savings are not directly related to time-based pricing differentials.

110.4.1 Please calculate the expected net present value for the introduction of each of the residential TOU, CPP and Pre-pay rates from 2016 to 2030 based on the analysis above. Please state all assumptions used in the analysis, and include set-up costs.

Response:

FortisBC cannot complete this analysis. Please see the response to BCUC IR1 Q110.4.

110.4.2 Please redo this analysis assuming the introduction of these rates is delayed by five years.

Response:

FortisBC cannot complete this analysis. Please see the response to BCUC IR1 Q110.4.

110.5 Please confirm it is possible to have pre-pay meters without AMI infrastructure in place.

Response:

Confirmed. There are utilities that have implemented pre-pay without an AMI infrastructure, such as the Salt River Project M-Power Price Plan (http://www.srpnet.com/payment/mpower/Default.aspx). However, these implementations still require significant infrastructure investments including a communications infrastructure to each participating home, in-home displays and service disconnect switches.

110.5.1 Please explain why pre-pay rates are considered a 'future benefit' of AMI.

Response:

Pre-pay rates are considered a future benefit since they require further analysis and are not proposed as part of the AMI project.

110.6 Does FortisBC consider that, for the purpose of determining if conservation rates provide a net benefit to FortisBC customers, the cost to the customer of responding to the conservation rate (for example, investment in smarter appliances and health issues associated with under-heating homes during winter peak periods) should be included in the evaluation? Please explain why or why not.

Response:

FortisBC believes that all costs to customers should be considered (and quantified where it is possible to do so with reasonable accuracy) when evaluating whether conservation rates provide a net benefit to customers.

110.7 Please describe the further investigation that FortisBC intends to undertake in order to determine if residential TOU, CPP or Pre-pay could be cost-effective. Please include in this description the estimated annual budget for these activities over each of the next five years.

Response:

FortisBC intends to do the following to further assess the implementation of conservation rates:

- Estimate utility costs, including (as applicable) IT, regulatory, in-home displays and contact centre costs;
- Estimate customer costs, including (as applicable) appliances, in-home displays and set-up fees;
- Estimate customer participation rates;
- Consider non-quantifiable utility costs and benefits;
- Consider non-quantifiable customer costs and benefits; and
- Estimate utility savings and benefit/cost ratios.

FortisBC does not intend to create a separate budget to develop the business case for conservation rates, and will incorporate the analyses into existing budgets. The Company estimates approximately $25,000 in labour costs to obtain the information listed above and build an internal business case. Should FortisBC decide to submit a regulatory application for the implementation of a particular rate, a budget for implementation will be included as part of that application. The Company has estimated set-up costs of $250,000 for CPP and TOU rates (and possibly higher for pre-pay).

111.0 Reference: Future Benefits

Exhibit B-1, Tab 6.0, Section 6.5, p. 103;

Exhibit B-1, Appendix C-1, p. 10

Future Conservation Rate Structures -

Network Benefits

FortisBC states on page 103 of the Application:

"FortisBC has estimated, using data from its Future Program Study (by Navigant) and the BC Wholesale Market costs for energy and capacity (as presented in the Company's 2012 Long Term Resource Plan – Midgard Consulting 2011 FortisBC Energy & Capacity Market Assessment), the effect of possible conservation rate structures enabled by AMI."

Appendix C-1 of the Application (Navigant Future AMI program study) states on page 10:

"Load control (LC) programs are designed to reduce electric loads during capacity constrained periods by sending signals to customers and/or their equipment to either cease operation or reduce power usage. ... The most common load control programs in the residential sector control water heaters and air-conditioners. These programs typically allow the utility to switch the appliance(s) off for a defined period of time during load control events."

111.1 Does the Midgard Consulting 2011 FortisBC Energy and Capacity Market Assessment also include any network (transmission/distribution) incremental capacity costs associated with load growth? Please explain why or why not.

<u>Response:</u>

No, the Midgard report does not provide any information on the network (transmission/distribution) incremental capacity costs associated with load growth. It discusses the impacts of regional transmission capacity constraints on the electricity market and gives overall forecasts of the BC wholesale market capacity and the BC new resource market capacity.

111.2 Please provide FortisBC's forecast network investment costs (transmission and distribution) from 2012 to 2030 related to load growth (i.e., which could be avoided if peak load was lower than forecast).

Response:

Please refer to BCUC IR1 Table 111.2 below (summarized from Appendix J of the FortisBC 2012 Long-Term Capital Plan). These costs are related to projects which could potentially be deferred or avoided if peak load was lower than forecast.

BCUC IR1 Table Q111.2

Year	2012	2013	2014	2015	2016	2017-31
	($000s)					
Total Transmission Growth	11,832	8,847	17,287	27,537	15,265	348,873
Total Distribution Growth	13,646	13,759	16,300	14,320	19,172	267,293
Total	**25,478**	**22,606**	**33,588**	**41,857**	**34,437**	**616,166**

111.2.1 Are avoidable network investments specific to certain regions only? If yes, please describe.

Response:

The avoidable network investment costs listed in BCUC IR1 Table Q111.1 represent growth investments required throughout the FortisBC service territory. The total costs are composed of many individual projects that may cover an area as small as a portion of distribution feeder or an area as large as the north or south Okanagan. Thus, to have any impact on future projects that support growth in an area, any load reductions would need to be specific to the area covered by those individual projects.

111.2.2 Does FortisBC consider that any of these investments could reasonably be avoided through the use of residential TOU or CPP rates? Please explain why or why not.

Response:

In general, it is plausible that customer demand reductions resulting from TOU or CPP rates could result in the deferral of some load-growth driven projects. However, the potential impact is highly dependent on the magnitude and "firmness" of the customer response to those new rate signals. Given the timing of the AMI Project deployment and the implementation of new rate designs beyond that, there would not be any impact on the timing of growth capital projects earlier than approximately 2017.

111.2.3 Does FortisBC consider that any of these investments could reasonably be avoided through other residential demand side mechanisms, such as ripple control/load control programs or distributed generation? Please explain why or why not.

Response:

In general, it is plausible that customer demand reductions resulting from load control (demand response) or distributed generation could result in the deferral of some load-growth driven projects. However, the potential impact is highly dependent on the customer uptake of these new technologies. FortisBC would have to determine the amount and "firmness" of the load available for shedding before it could be dependably considered as a method to reduce customer peak load. Given the timing of the AMI Project deployment (which is necessary to support wide-scale implementation of these technologies), there would not be any impact on the timing of growth capital projects earlier than approximately 2016.

111.3 Does FortisBC consider that a residential TOU/CPP rate which recovers a disproportionate share of sunk network costs (for example, 100 percent or 75 percent) during peak periods could be a viable option to encourage residential customers to shift consumption to off-peak periods and so reduce incremental network costs? Please explain why or why not.

Response:

A reduction in peak period energy use could result in a drop in peak demand. TOU rates designed such that the price differential is sufficient to cause customers to shift consumption into non-peak periods would result in a drop in peak energy use. Collecting demand-related costs predominantly or entirely during the peak periods would be one such method of creating the differential.

111.3.1 If yes, please describe the network savings that could result from such an approach and the potential impacts on low income and vulnerable customers.

Response:

As a method to reduce system peak demand, Direct Load Control (DLC) could result in the system impacts and savings discussed in the responses to BCUC IR1 Q111.2 – Q111.2.3.

CPP/TOU rates with higher pricing differentials will benefit or disadvantage all customers depending on their consumption patterns and their ability/willingness to change those consumption patterns. This would include low income and vulnerable customers.

Without analyzing AMI interval usage data in conjunction with an appropriately designed end-use survey, it is not possible to know how low income and vulnerable customers that do not change their consumption patterns will benefit or be disadvantaged by higher CPP/TOU pricing differentials.

More difficult to assess is which customer groups may be best able to adjust consumption patterns in response to a CPP/TOU rate.

111.4 Does FortisBC consider that customer investment in electric cars could result in a significant increase in network investment costs resulting from load growth compared to that forecasted under the status quo?

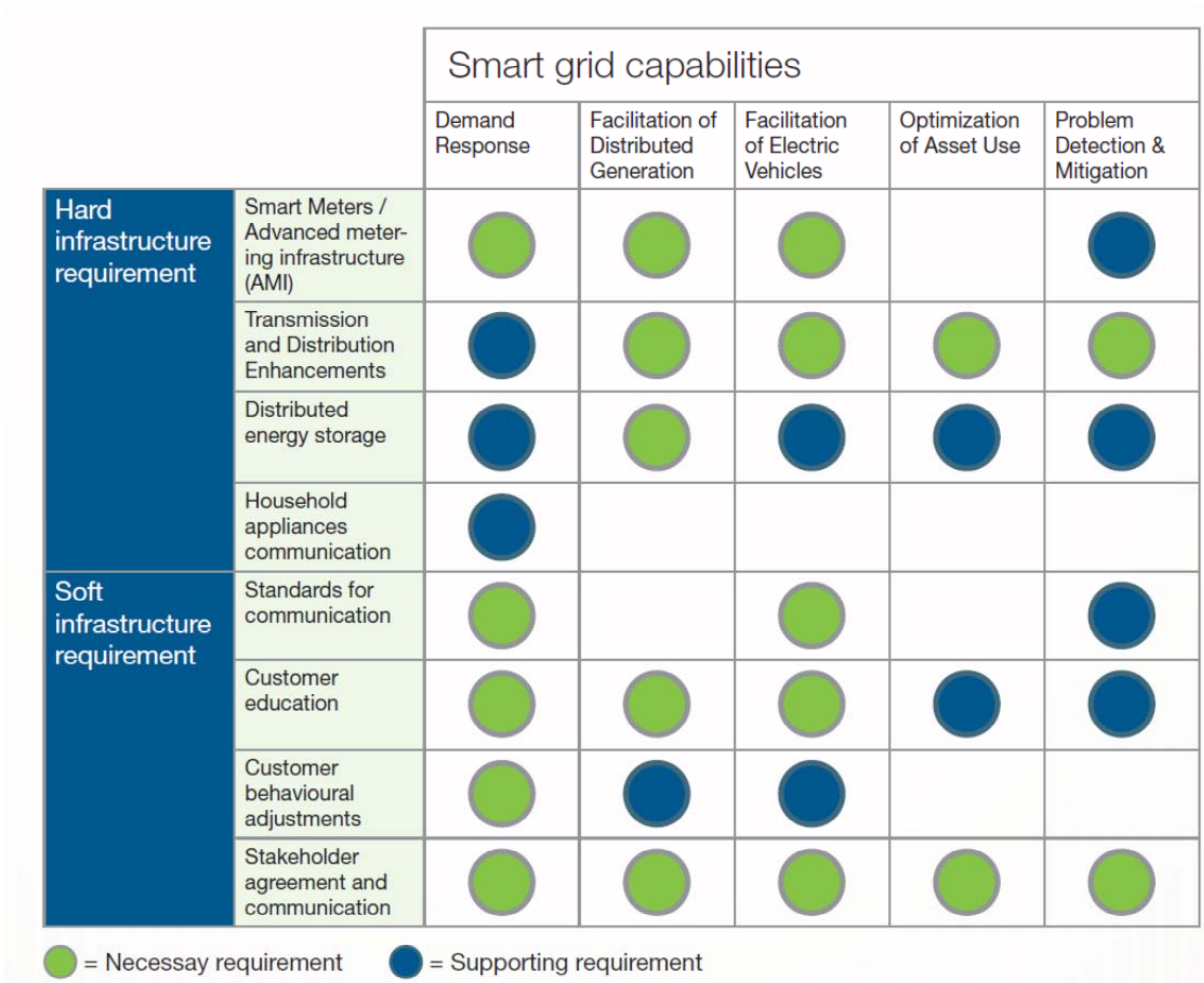
Response:

Yes, FortisBC considers that a significant uptake of electric vehicles could result in additional supply infrastructure necessary to support this un-forecast load growth. The potential impact is highly dependent on a number of factors:

- The rate of customer uptake of electric vehicles;
- The geographic distribution of customer adoption (i.e. are the vehicles clustered in specific areas of the FortisBC service area); and
- Whether the vehicles are charged during on-peak or off-peak times.

While FortisBC has little control over the first two unknowns, it does have potential influence as to when the charging of electric vehicles takes place. The installation of an AMI system is generally considered a fundamental building block that would support the wide-scale integration of electric vehicles. For example, the following graphic excerpted from the Canadian Electricity

Association (CEA) paper entitled "The Smart Grid – A Pragmatic Approach"[8] shows how AMI is considered a necessary infrastructure requirement that facilitates the integration of electric vehicles.



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[8] www.electricity.ca/media/**SmartGrid**/**SmartGrid**paperEN.pdf

111.4.1 If yes, are there approaches to promote recharging of vehicles during off-peak periods that do not require AMI infrastructure? Please describe.

Response:

Technology available in today's electric vehicle charging stations allows for "economy charging" without the assistance of AMI networks. If customers purchase charging stations with Time-of-Use metering installed on the EV circuit, the charging station can be configured to charge only when the power rates are at their lowest. Economy charging requires no action, other than plugging in the electric vehicle. At least two vendors offer charging equipment with this functionality.

112.0 Reference: Project Environment

Exhibit No. B-1, Tab 8.0, Section 8.1, p. 125

Market Penetration in North America

"According to a new report from Pike Research, unit shipments of smart meters in North America were 12.4 million in 2011 and will decline to 7.2 million by 2013, a 42% drop over just 2 years. After 2014, they will begin a gradual rise through the end of the decade."

112.1 Provide the current market penetration of smart meters in North America.

Response:

According to Berg Insights (http://www.berginsight.com/ReportPDF/ProductSheet/bi-smseries2-ps.pdf), "North America has the world's highest penetration of automatic meter reading, exceeding 50 percent".

IDC Energy Insights (http://www.idc-ei.com/getdoc.jsp?containerId=prUS22778411) forecasts that by 2015, North American smart meter deployments will reach 88 million, representing a penetration rate of 51.4%.

113.0 Reference: Project Environment

Exhibit B-1, Tab 8.0, Sec. 8.1.1, pp. 125-126

Other AMI Projects

113.1 In Alberta, Fortis Alberta selected a digital PLC system for its deployment covering more than 470,000 customers, completed in 2011. Has FortisBC had discussions with or been provided with reports of the analysis, selection and post-implementation reviews to share the experiences of Fortis Alberta?

Response:

FortisBC has not seen internal FortisAlberta procurement documents related to their AMI implementation but has reviewed relevant regulatory filings and has engaged in related discussions in person, over the phone and by email.

113.1.1 Specifically, FortisBC raises concerns of possible data transmitted by PLC (p. 112). What were the experiences of Fortis Alberta with regards to this potential concern and what can FortisBC learn from Fortis Alberta in this regard?

Response:

FortisAlberta implemented their solution for daily reads from each meter to support two monthly billing reads. The FortisAlberta system uses hourly reads for engineering studies and based on that experience FortisBC understands that the current generation of PLC technology has restraints on the total number of hourly customers that can be supported off each substation.

113.1.2 Please explain how and why Fortis Alberta would have received proposals for a PLC type system while FortisBC notes that no PLC type proposals were received in its RFP process (p. 112).

Response:

FortisBC cannot definitively say why FortisAlberta received PLC system proposals. However two factors likely contributed: 1) PLC technology is best suited for utilities with low meter density per square kilometer, and 2) FortisAlberta required daily (rather than hourly) reads.

Lower meter density negatively impacts the economics of an RF mesh solution relative to a PLC solution since RF mesh technologies rely on meter-to-meter communication. FortisAlberta customer density is approximately 11.2 meters per square kilometre vs FortisBC density of 38.6 meters per square kilometre.

113.1.3 What factors would have favoured Fortis Alberta's selection of a PLC system over a RF system as selected by FortisBC?

Response:

The PLC AMI system selected by FortisAlberta represented the lowest total cost for the functionality required and the relatively low meter density. Please also see the response to BCUC IR1 Q113.1.2.

113.1.4 What communication technology(ies) were deployed in the Ontario roll-out of 4.7 million meters?

Response:

FortisBC understands that all Ontario utilities use RF-based LAN solutions, the only exception being for Suite Metering projects (where a landlord chooses to install sub-metering).

According to IT research firm IDC (https://idc-insights-community.com/energy/smart-grid/smart-metering-in-canada), RF-Mesh based solutions have captured approximately 90 percent of the Canadian Smart Meter communications market.

113.1.4.1 Are any implementation reports / lessons-learned documents available from Ontario? If so, please provide.

Response:

FortisBC found the following report from the IESO that summarizes lessons learned: http://esr.degroote.mcmaster.ca/documents/1A-1.pdf.

114.0 Reference: Project Environment

Exhibit B-1, Tab 8.0, Section 8.2.3, pp. 128-129

Use of BC Hydro's MDMS (Meter Data Management System)

"Lowest Possible Cost

All three utilities recognized that there were potential cost benefits attributable to collaboration. Potential cost benefits can be generally categorized in two ways:

Shared Infrastructure: Cost savings and reduced infrastructure requirements may be achieved when two or more utilities share all or part of the advanced metering infrastructure. Any shared infrastructure may also result in some increased cost related to the need to separate the customer data required by each utility and to customize the shared infrastructure to each utility's requirements.

Software systems, particularly the MDMS, could potentially be shared. However, an initial cost analysis showed that any savings that might be achieved with a joint software license would be offset by complexities related to 1) integrating the MDMS with two different HESs and two different Customer Information Systems (which is where the bulk of software costs will be spent) and 2) segregating customer data in a manner that would ensure customer privacy."

HES: means Head End System and is the AMI System component that manages the customer meters and other endpoint devices.

MDMS: means Meter Data Management System and is the component with the AMI System that manages data transmitted from the meter.

114.1 Please explain further the integration of the MDMS and the HES. Specifically, explain how the proposed FortisBC HES differs from the existing BC Hydro HES, including the supplier of the two HES systems and the costs to integrate it with a MDMS.

<u>Response:</u>

FortisBC utilizes enterprise application integration software as the integration platform for integrating and exchanging service-oriented and message-oriented data between IT systems, including the HES , MDMS and billing system. FortisBC is not familiar with BC Hydro's enterprise service bus, enterprise application integration software, infrastructure and software configurations and versions. This makes it very difficult to estimate the difference in integration costs between the FortisBC and BC Hydro IT environments.

As stated in Exhibit B-1, Tab 8.0, Section 8.2.3, "… an initial cost analysis showed that any savings that might be achieved with a joint software license would be offset by complexities related to 1) integrating the MDMS with two different HESs and two different Customer

Information Systems (which is where the bulk of software costs will be spent) and 2) segregating customer data in a manner that would ensure customer privacy."

For the purposes of analyzing the value of sharing an MDMS, FortisBC assumed that basic integration costs would be similar. However, there are additional complexities and costs involved with sharing the MDMS:

- Procuring or constructing secure communications links with sufficient bandwidth between BC Hydro and FortisBC data centres, including backup data centres;
- Additional configuration costs for the MDMS to ensure that data is appropriately secured and segregated;
- Additional setup costs and ongoing administration costs related to creating appropriate role-based MDMS security for BC Hydro and FortisBC employees;
- Negotiating and administering a MDMS sharing agreement between FortisBC and BC Hydro; and
- Coordinating upgrades and enhancements of the MDMS, HES and billing systems at FortisBC and BC Hydro.

FortisBC believes the costs of sharing the MDMS arising from the activities above to be in significantly in excess of $500,000 one-time and $100,000 on an annual basis. These costs would be in addition to the integration costs identified in the responses to BCUC IR1 Q114.2 and 114.5.

Savings from a sharing arrangement could arise from lower licensing and maintenance fees. FortisBC is contractually required to keep contract details confidential, but can confirm that one-time licensing and ongoing maintenance fees related to the MDMS are less than the minimum estimated costs of sharing above.

114.2 Please provide the anticipated costs for connecting the proposed FortisBC MDMS to the proposed FortisBC MDMS.

Response:

FortisBC assumes the question should have read "Please provide the anticipated costs for connecting the proposed FortisBC HES to the proposed FortisBC MDMS" and has answered on that basis.

The cost of integrating the proposed FortisBC HES to the FortisBC MDMS is estimated to be $2.0 million.

114.3 Please explain the difference, in cost, between connecting to the existing BC Hydro MDMS and the existing FortisBC HES as compared to connecting the proposed FortisBC MDMS to the proposed FortisBC HES.

Response:

Please refer to the response to BCUC IR1 Q114.1.

114.4 Please explain further the integration of the MDMS and the billing system. Specifically, explain how the existing FortisBC billing system differs from the existing BC Hydro billing system, in terms of the difference in the data to be provided by the MDMS to the billing system.

Response:

Please refer to the response to BCUC IR1 Q114.1.

114.5 Please provide the anticipated costs for connecting the proposed FortisBC MDMS to the FortisBC billing system.

Response:

The cost of integrating the proposed FortisBC MDMS to the FortisBC billing system is estimated to be $2.1 million.

114.6 Please explain the difference, in cost, between connecting to the existing BC Hydro MDMS and the existing FortisBC billing system as compared to connecting the proposed FortisBC MDMS to the existing FortisBC billing system.

Response:

Please refer to the response to BCUC IR1 Q114.1.

115.0 Reference: Project Environment

Exhibit No. B-1, Tab 8.0, Section 8.2.3, pp. 128-130

Service Territory Restriction

115.1 Explain why FEI would be considering AMR.

<u>Response:</u>

FEI would be considering AMR as a way to lower customer costs and improve customer service.

115.2 Provide the list of reporting options available to the Commission.

<u>Response:</u>

Provincial utilities that have deployed AMI will be able to provide more granular hourly load data for regulatory processes. This will allow consistently accurate reporting from utilities for load-related data such as:

- Load profiles by customer class;
- Unbilled consumption;
- Load data for cost-of-service and rate design; and
- System loss reporting.

115.3 What is the cost of “scaling” to accommodate other utilities within the FortisBC service territory?

<u>Response:</u>

As stated at Exhibit B-1, Tab 8.0 Section 8.3, p. 130, lines 22-25, “The Company expects that participating utilities would purchase meters and pay a contribution toward the communications network devices and any necessary IT work to connect their meters to the AMI system.”

These categories listed above represent the cost of "scaling" to accommodate other utilities. It is the intent of FortisBC that costs related to scaling are borne by the utilities being accommodated.

115.3.1 Is this cost included in the CPCN estimated cost?

Response:

Costs related to scaling to accommodate other utilities are not included in the CPCN estimated cost.

115.4 Why have Nelson, Grand Forks, and Penticton chosen AMR while FortisBC selected AMI?

Response:

FortisBC does not have knowledge of why Nelson, Grand Forks and Penticton have chosen AMR rather than AMI.

115.5 Are any provisions included in the costs to facilitate the other utilities connecting their meters to AMI in the future? Please explain what is included and the costs.

Response:

There are no provisions in the costs to facilitate other utilities connecting their meters to AMI in the future. Please also see the response to BCUC IR1 Q115.3.1.

116.0 Reference: Project Environment

Exhibit No. B-1, Tab 8.0, Section 8.4.5, pp. 139-140

Non-Payment and Figure 8.4.5.a

116.1 Explain why the flowchart does not require direct contact via a premises visit with the account holder.

Response:

Although the flowchart does not show direct contact via the customer premise, the notes at the bottom of the flowchart under "Non-Pay Disconnection Eligibility Criteria" more clearly outline the FortisBC policy.

Direct contact with customers via a site visit to the premises is the most frequently-used form of contact for an account being disconnected for non-payment. The FortisBC process is to contact a customer either by hanging a 48-hour door tag at the premise or speaking to them via phone. FortisBC believes that these notifications, and the internal policy that requires at least two points of contact with the customer, provide adequate notification for making payments or arrangements. This policy is also compliant FortisBC Electric Tariff guidelines.

It is important to note that in rare cases it is not always possible to access a customer's premises due to safety reasons or access issues and the other forms of contact must be used.

116.2 Explain why the flowchart does not address temperature extremes as a limitation on disconnection.

Response:

The flow chart was intended to provide a general overview of the collections process. As a result it doesn't list all the numerous factors considered by FortisBC before disconnecting a customer, including overdue balance, payment history, temperature extremes, holiday seasons, economic hardship and other extenuating circumstances. FortisBC does not believe that a written process can adequately address all of these factors. As well, FortisBC never loses sight of the fact that overdue balances are funded by all FortisBC ratepayers.

FortisBC will avoid disconnections when the temperatures reach a daytime high of -5 within any area of the service territory.

116.3 Explain why the inability to make a payment is not shown.

Response:

As discussed in the response to BCUC IR1 Q116.2, the flow chart was intended to provide a general overview of the collections process. As a result it doesn't list all the numerous factors considered by FortisBC before disconnecting a customer, including steps taken when customers are challenged to make a payment. Upon contacting a customer that is scheduled for disconnection for non-payment, it is current practice for FortisBC to work with the customer to set up payment arrangements and identify potential alternative resources to help address the challenge. Some of the resources a customer can potentially use to help address a payment challenge are through the use of a credit card or to set up an Equal Payment Plan.

116.4 Is FortisBC planning to submit a revised "ELECTRIC TARIFF B.C.U.C. NO. 2 FOR SERVICE IN THE WEST KOOTENAY AND OKANAGAN AREAS TERMS AND CONDITIONS AND RATE SCHEDULES" that updates the process proposed and related charges for disconnect/reconnect as part of this Application?

Response:

The Company believes the existing language in section 6.5 of the Terms and Condition of FortisBC's Electric Tariff sufficiently supports the proposed internal process for assessing whether a customer will be disconnected (remotely or otherwise) for non-payment. As such, the Company does not believe an update to its electric tariff updating the proposed process for disconnection for non-payment is required.

With regard to the existing charges for meter disconnection/reconnection as detailed in Schedule 80 of FortisBC's Electric Tariff, please refer to the response to BCUC IR1 92.2.1.

117.0 Reference: Project Environment

Exhibit No. B-1, Tab 8.0, Section 8.5, pp. 142-143

Opt-Out

117.1 How many states or provinces have permitted electric utility customers to opt-out of a smart meter program either at no-cost or for a fee? Please provide a listing.

Response:

FortisBC is not aware of any states or provinces that allow opt-out for no fee.

FortisBC understands that the following states and provinces permit electric utility customers to opt-out of a "smart meter" program for a fee:

- Quebec;

- Maine;
- Naperville, Illinois (municipal, not state);
- California (Pacific Gas and Electric);
- Vermont (Green Mountain Power and Central Vermont Public Service); and
- Nevada (NV Energy).

117.2 Explain why an opt-out clause is not consistent with existing BC provincial policy or legislation.

Response:

The provincial smart meter implementation as prescribed in the *Clean Energy Act* and the associated Smart Meters and Smart Grid Regulation (the Regulation) requires BC Hydro to install a smart meter for each eligible premises by the end of the 2012 calendar year. The Regulation defines "eligible premises" as "a building, structure or equipment of a customer of the authority if the building, structure or equipment is connected to the electric distribution system and has an electricity meter".

Based on the above, it is evident that the applicable provincial legislation currently in force contains no provision for customers of BC Hydro to opt-out of having a smart meter installed to measure electricity supplied to their premises. Although this legislation applies only to customers of BC Hydro, the Company submits that current provincial policy, as enacted by this legislation, does not support the inclusion of an opt-out clause for FortisBC customers at this time.

117.3 Can the existing tariff accommodate an opt-out clause?

Response:

In order to accommodate an opt-out clause, FortisBC's existing Electric Tariff would have to be updated to include the terms applicable to a customer's decision to opt-out of having an advanced meter installed at their premises, as well as detail on the fees to be charged to recover the costs associated with opting-out of AMI.

117.4 Is FortisBC applying to the Commission for approval to suspend a customer's service until the AMI meter is installed as part of this Application?

Response:

No. As detailed in section 8.2 of the Terms and Conditions of FortisBC's Electric Tariff, the Company may demand the suspension of service whenever necessary, including for the purpose of making repairs on or improvements to any of its apparatus, equipment or work. As FortisBC has proposed the improvement of its metering system by way of the replacement of existing meters with AMI meters (as the standard metering technology), the Company submits that the existing Terms and Conditions of the Electric Tariff already support the right to suspend service for those customers refusing installation of an AMI meter until such time that an AMI meter is installed.

118.0 Reference: Project Environment

Exhibit No. B-1, Tab 9.0, Section 9.4, pp. 147-148

No Cost Impact

118.1 Why is there an expectation from the BCMEU that there should be no cost impact to the wholesale customers of FortisBC?

Response:

FortisBC does not know why the BCMEU expects that there should be no cost impacts to their members.

Consistent with all capital expenditures undertaken by the utility, the costs and benefits are included in the Company's Revenue Requirements and therefore are incorporated into all customer rates. In addition, the proposed FortisBC AMI project results in a net benefit to all customers as is evidenced by the financial analysis included as part of this Application.

118.1.1 Would not the other wholesale customers share the cost of the ancillary equipment such as software, MDMS, etc.?

Response:

FortisBC assumes this question refers to the fact that a majority of BCMEU members were not interested in sharing the proposed FortisBC AMI infrastructure at this time.

FortisBC understands that many of the BCMEU members have already invested in wireless drive-by metering systems (Nelson, Grand Forks and Penticton). This is a significant investment that would be stranded if these municipal utilities decided to share the proposed FortisBC infrastructure.

Please also see the response to BCUC IR Q118.1

118.2 Please clarify the AMI situation with FortisBC considering a future purchase of the City of Kelowna utility.

Response:

The proposed City of Kelowna utility purchase is still in the initial stages and is yet to be approved by the Kelowna electorate, Kelowna city council, and the BCUC. As the proposed acquisition progresses the Company will consider how best to address the impact to the AMI Project which may include an update to the AMI application currently under review.

118.3 What would be the cost and benefit impacts if the wholesale customers were to become part of the AMI system at a later date?

Response:

FortisBC has not yet completed its analysis of cost and benefit impacts to the AMI project if the City of Kelowna customers were to become part of the proposed AMI system. Please also see the response to BCUC IR1 Q118.2.

119.0 Reference: Illumina Supergroup Findings

Exhibit B-1, Tab E, Appendix E-2,

Public Consultation and Support -

AMI Openhouse Findings

119.1 Does FortisBC consider these open houses were well attended? If not, to what would FortisBC attribute this?

Response:

In total, 93 individuals attended the five open houses held in Kelowna, Osoyoos, Creston, Trail, and Princeton in June of 2011 for the AMI project. In comparison for open houses held on the Company's recently filed "Guidelines for Establishing Entitlement to Non-PPA Embedded Cost Power and Matching Methodology" there were five attendees in Kelowna and a single participant in Castlegar. Those open houses were held on March 6 and March 8, 2012 respectfully.

FortisBC received 54 participants in four open houses held in Kelowna; Osoyoos; Creston and Castlegar in February of 2011 during the Company's consultation on the Integrated System Plan.

Consultation on the Okanagan Transmission Reinforcement (OTR) included three open houses in Oliver, Okanagan Falls, and Penticton in March 2007. A total of 110 participants participated in those sessions. FortisBC also held three open houses in May 2007 for OTR with 128 participants participating.

Using these prior consultation attendance records as guidelines, FortisBC submits that the AMI open houses were well attended.

119.2 Please confirm that FortisBC received approximately 22 feedback forms from this open house and that approximately one third of those either Disagreed or Strongly Disagreed that the material presented was useful and helped to understand AMI.

Response:

FortisBC received 22 feedback forms from the open houses held in June 2011. For the statement on the feedback form, "The open house material presented to me tonight was useful and helped me understand the AMI better", 4 participants marked "strongly disagree" and 1 marked "disagree" for a total of 5 or 22.7 per cent.

119.2.1 Please also confirm that approximately one-third either Disagreed or Strongly Disagreed that the material presented was a balanced perspective on the AMI.

Response:

FortisBC received 22 feedback forms from the open houses held in June 2011. For the statement on the feedback form, "The open house material presented to me tonight was a balanced perspective on AMI", 6 participants marked "strongly disagree" and 2 marked "disagree" for a total of 8 or 36.3 per cent.

119.2.2 What would FortisBC do differently to improve the balanced perspective of the information it provides to its customers?

Response:

FortisBC believes that the information it provided to customers (and continues to provide through www.fortisbc.com/ami) presents a factual, balanced perspective that included discussion of EMF concerns. However, FortisBC cannot control how the information it provides is perceived.

As is the case with open houses on potentially controversial subjects (whether at FortisBC or elsewhere), many people that take the time to attend have strong negative opinions related to the topic of discussion. FortisBC submits that the AMI open houses understandably attracted customers with strong negative opinions regarding the project.

119.3 Does FortisBC consider it has the support of the majority of its customers to proceed with the project? Please provide additional evidence in support.

Response:

FortisBC does not believe that the majority of its customers are opposed to advanced metering.

As written at Exhibit B-3, Tab 9.0, Section 9.1, p 144, of the 159 randomly chosen customers participating in ISP consultation, "46 per cent of participants had positive comments on AMI; 27 per cent had neutral comments; 15 per cent had negative comments."

As of September 28, 2012, FortisBC has been contacted by 324 individuals indicating their disapproval of the AMI project and/or refusal to accept an AMI meter. This is less than 0.3 per cent of the approximately 115,000 electricity customers served by FortisBC. Given the very negative media portrayal of "smart metering", this small percentage would indicate that a significant majority of FortisBC customers either do not have a negative opinion of the AMI project or are in favour of the project.

119.4 Has FortisBC communicated a cost savings or rate benefit to its customers in any of its public workshops, open-houses or mailings associated with the AMI project?

Response:

In its customer collateral, FortisBC consistently provides the cost savings benefit along with other customer benefits of the AMI project. FortisBC developed a website dedicated to the project at www.fortisbc.com/ami which lists the benefits of the project, including the cost savings. This site also houses FAQ's which speak to the most common concerns of the project.

As of September 1, 2012 FortisBC sent approximately 317 letters to individuals who contacted the company. The responses were separated into categories, depending if the customer requested more information about particularly aspects of the proposed project, such as perceived health concerns or privacy. All letters indicated several benefits, including mentioning significant financial savings over the life of the project. The letter concluded by asking customers to visit fortisbc.com/ami for the most recent developments in the project.

The company also sent out a news release on July 26, 2012 that included the benefits of the project. Additionally during media interviews, FortisBC spokespeople make every effort to communicate the benefits and cost savings.

In the open houses held in June 2011, FortisBC spoke to the benefits of the project on three separate slides. Re: FortisBC open house presentation slide 7,8,9. The company also discussed the cost and stated that the financial benefits of the project would pay for itself.

120.0 Reference: Other Proposed Rate Recovery Options

120.1 Has FortisBC considered other methods of rate recovery for the AMI program such as:

- Reconcilable tariff riders,
- Customer surcharge mechanisms,
- Base-rate recovery opportunities,
- Reconcilable balancing account mechanisms (cost/benefits are tracked and net amount is consolidated into rates periodically),
- Deferred cost recovery,
- Rate-basing of some capital investment,
- Linking rate proceedings to smart grid projects that have stimulus funding.

Response:

FortisBC did consider a rate smoothing option which would have resulted in some deferred cost recovery of the Project, however when the Company considered that the Project reduces rates in 19 of 20 the years in the financial analysis, the rate smoothing option was rejected. Further, the use of a rate smoothing mechanism associated with the addition of new plant in service could cause the utility to have earning volatility issues associated with US GAAP reporting.

Although FortisBC has not considered other methods of rate recovery, the following discussion is provided regarding the alternative rate recovery options as identified in the question above.

- Reconcilable tariff riders – FortisBC acknowledges that although the use of a tariff rider mechanism to recover costs related to the AMI Project is feasible, such riders have not been employed by utilities operating in BC to effect rate recovery of specific capital expenditures. Attempting to recover the project expenditures by way of a tariff rider would be inconsistent with the treatment of other capital expenditures made by the Company, would provide no incremental benefit to customers and would add additional administrative burden (costs) to the utility.

- Customer surcharge mechanisms – A customer surcharge mechanism effects recovery of the project costs on a per-customer charge basis as opposed to a per-kwh charge basis as provided by a tariff rider. As noted for the option above, such a mechanism has not been employed by utilities in BC for recovery of capital project expenditures, and would only serve to add additional administrative burden (costs) to the utility with no resultant benefit provided to customers.

- Base-rate recovery opportunities – This is the existing rate-recovery mechanism applied to all of FortisBC's capital projects, and is the proposed mechanism for recovering the costs associated with the AMI Project.

- Reconcilable balancing account mechanisms – This approach involves tracking the project costs and forecast benefits in a separate account to be periodically trued-up for recovery in rates. Like tariff riders and customer surcharge mechanisms, this type of mechanism for recovery of capital expenditures has not been employed by utilities operating in BC. As noted in the response to BCUC IR1 Q53.14.2, the benefits of the Project would be incorporated into Revenue Requirements either as cost reductions or incremental revenue as they are forecast to be realized. FortisBC notes that this approach is consistent with all capital projects undertaken by the Company. Attempting to accumulate the benefits in a "holding" deferral account would be inconsistent with the treatment of other capital expenditures made by the Company, would provide no incremental benefit to customers and would add additional administrative burden (costs) to the utility.

- Rate-basing of some capital investment – This is the same approach as considered above for base-rate recovery opportunities, and is consistent with FortisBC's proposal relating to the AMI Project. As components of the AMI system are installed and become used and useful during the approximate 2 year project period, the relevant expenditures will be included in the Company's rate base for rate making purposes.
- Linking rate proceedings to smart grid projects that have stimulus funding – This approach to rate recovery has been used for some AMI projects in the United States where stimulus funding has been made available for smart grid projects, however as no such incentives currently exist for FortisBC consideration of such an approach is not applicable.

121.0 Reference: IT Costs

Data Growth

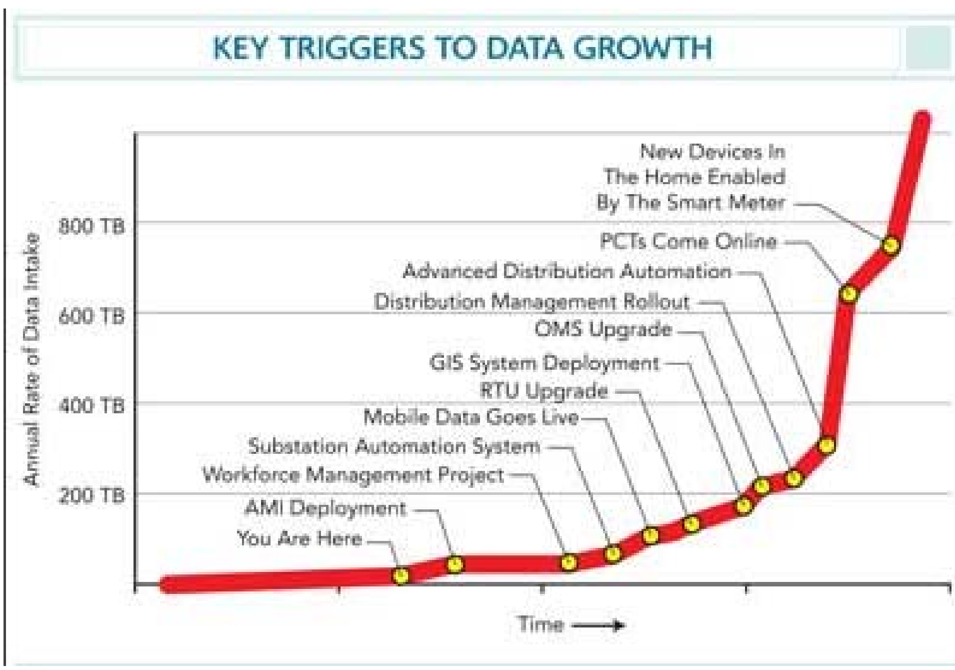


Figure 1- Data Growth Key Triggers

"One of the largest drivers of data volumes for a utility is the meter reads from all of the smart meters in its territory. Prior to the implementation of a smart meter, utilities would conduct one meter read a month per meter. With the new smart meters that capture usage data in 15-minute intervals, utilities will collect more than 3,000 meter readings a month for each meter. This translates to terabytes (TB) of data being collected and stored at the customer level. We can expect 300 TB per year of meter data by 2012, according to the FPL Group. The diagram from the Electric Power Research Institute via Pike Research illustrates this exponential growth in data and the triggers driving key inflection points.

As the Figure 1 illustrates, a broad array of drivers and sources for this data exists. Utilities will be forced to grapple with many types of data in format and content."

121.1 Explain how FortisBC proposes to deal with terabytes (TB) of data being collected and stored at the customer level.

Response:

FortisBC has provided for the storage, retrieval and archiving of customer metering data for seven years using the most cost effective storage available while preserving reliability and security. Please also refer to the response to BCUC IR1 Q35.1.

121.2 What are the requirements for data retention in years?

Response:

Please refer to the response to BCUC IR1 Q121.1.

121.3 If Austin Energy's data storage for 500,000 meters went from 20TB to 200TB or 400MB/meter/year, what is the expectation for the estimated increase in FortisBC's data storage requirements and its associated costs?

Response:

FortisBC currently has 21 GB (0.021 TB) of meter read data storage. Refer to response to BCUC IR1 Q35.1 for storage requirements for the AMI solution (1.5 TB per year). The costs for storage requirements for the AMI solution have been included in the overall project costs.

121.3.1 Are these costs for data storage included in the AMI CPCN costs and are they adequate?

Response:

Yes.

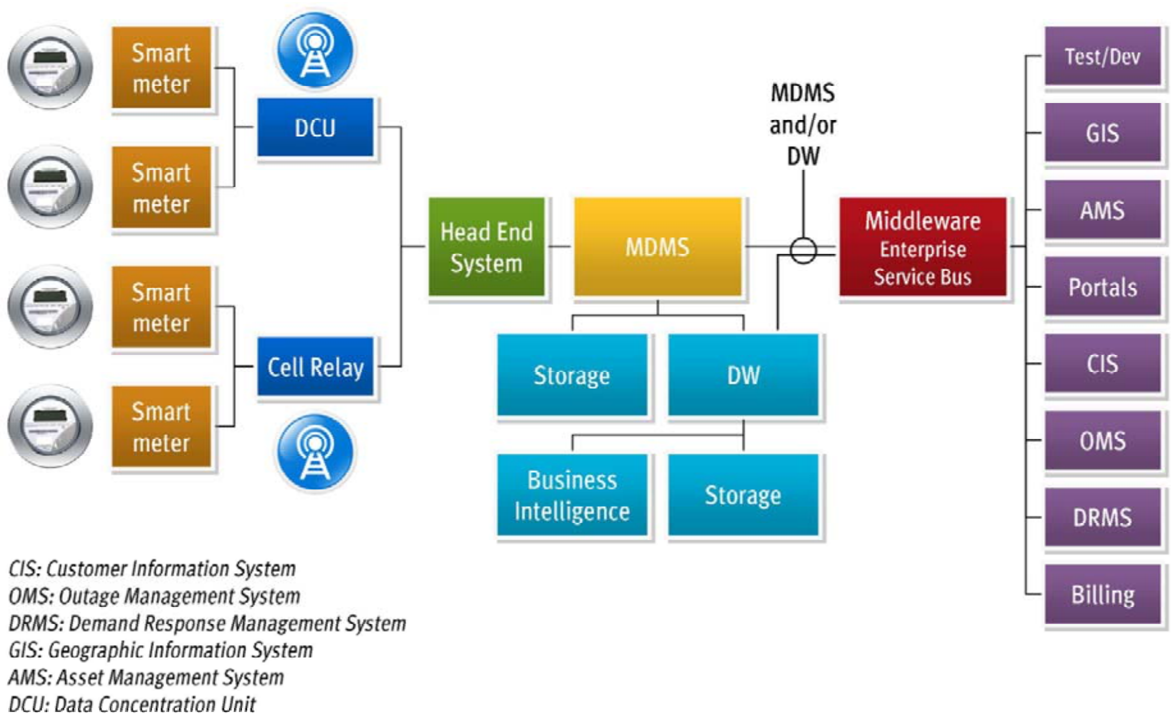


Figure 2

121.4 Please provide FortisBC's AMI IT/OT block diagram similar to the above and provide the capex and opex costs for what is referred to as Middleware Enterprise and the application elements on the right-hand side that may be included in the FortisBC vision.

<u>Response:</u>

The block diagram does not reflect the AMI solution architecture being proposed by FortisBC. Please refer to the CPCN Application, Appendix B-3, Figure 10, which more closely reflects the AMI solution architecture being proposed by FortisBC.

The capital costs relating to the enterprise application integration middleware are identified in the responses to BCUC IR1 Q114.2 and Q114.5.

Operating costs are included in the New Operating Costs shown on Line 46 of the Gross AMI spreadsheet that is part of Exhibit B-3.

Sustaining capital costs are included in the IT Hardware, Licencing, and Support Costs shown on Line 32 of the Gross AMI spreadsheet that is part of Exhibit B-3.

ASK E SOURCE | UCC-ASKES-53 | PUBLISHED: MARCH 21, 2012

Pick a Date, Any Date

Insights into Utility Custom Due-Date Programs

By Stephanie Spalding

Q: I'm looking for information and best practices around customer-selected or "pick a due date" programs. What utilities offer these types of programs, how interested are customers, and what are the cash-flow implications?

A: Customer-selected due-date programs are popular because they give customers control and flexibility over their energy-bill expenditures and personal cash flow. Customers can choose their preferred due date to align with fixed-income paychecks or their household budgeting structure. For utilities, offering programs that leave more decisions in the hands of customers, instead of forcing them to do business on your terms, allows for an improved overall customer experience. Custom due-date programs can give utilities a boost in customer satisfaction, keep customers off payment-arrangement programs, and help shorten the cash-flow cycle.

Utilities Offering Custom Due-Date Programs

We are aware of the following utilities that offer custom due-date programs:

- Baltimore Gas and Electric Co. The Bill Extender Plan allows customers on fixed incomes to change their due date to align with their benefit checks.
- City of Mesa, Arizona. Customers can sign up online and select up to three choices of due dates.
- Colorado Springs Utilities. Due dates are available on a first-come basis and are subject to operating needs. Customers must be enrolled in autopay and paperless billing to qualify for the program.
- Entergy Corp. Customers can enroll online through the My Account section of the website.
- Gainesville Regional Utilities (GRU). Available dates are based on the meter-reading schedule for the service location.
- KCP&L. This program is only for qualified customers who receive Supplemental Security Income or Social Security income.
- NV Energy. Customers must call to enroll.
- Otter Tail Power. Customers must be enrolled in autopay and can select the date their account will be charged. This is not a true custom due-date program, but it has the same effect because the customer has a 20-day range to choose from.
- Portland General Electric. Customers can e-mail the utility to enroll and select the date they prefer. The program is offered as a benefit of the advanced metering infrastructure (AMI) implementation, as described in the Metering.com article Portland General Electric—AMI is only the beginning.
- Pulaski Electric System (PES). Customers can select from the 7th, 14th, 21st, or 28th days of the month, but the chosen date must be within 14 days of the original due date.
- Rocky Mountain Power. Customers can call to move their due date a few days earlier or later depending on the meter-reading schedule.
- Salt River Project. Residential and business customers can choose any date between the 1st and the 28th.

- Tacoma Public Utilities. Customers can choose the 10th, 20th, or 30th days of each month.
- Wisconsin Public Service. Customers can choose any calendar day (the 1st through the 31st), any business day (1 through 22), or a specific number of days after the bill is mailed.
- Xcel Energy. Residential customers in Colorado and residential plus small or midsize business customers in the rest of the utility's service territory can change their due date once per year.

Several other service industries also offer this feature, including Discover, the cable company Sky, AT&T (listed in the benefits box on the right), and Chase (as shown in the demo). Many credit card companies also offer the ability for customers to change their due date, but those companies don't explicitly market the program.

Customer Interest in Custom Due-Date Programs

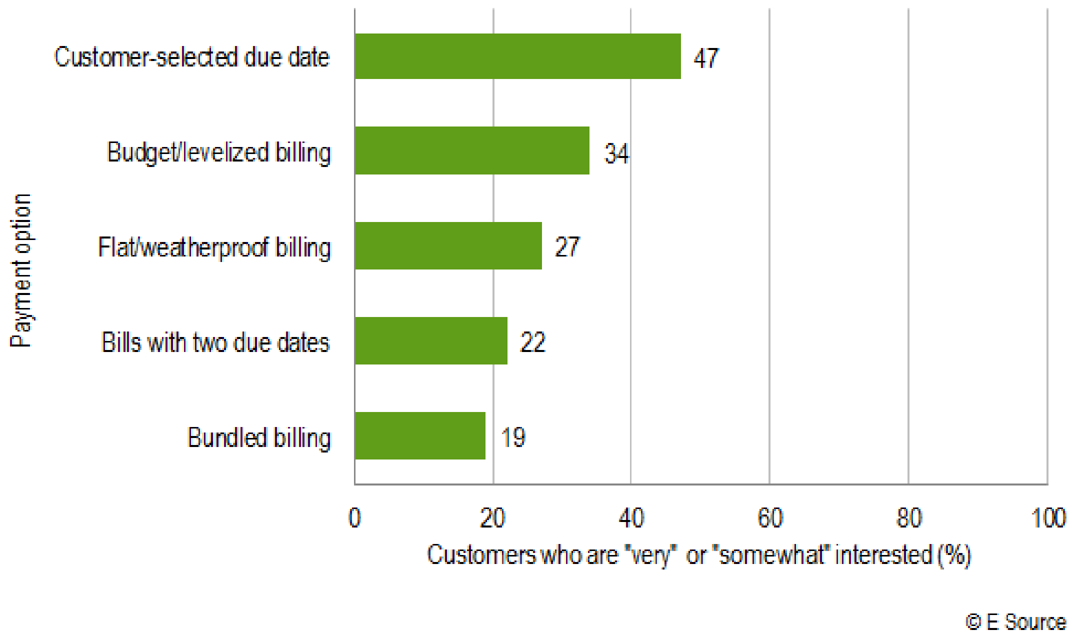
Regarding the issue of customer interest in a custom due date, our multi-client study Utility Billing and Payment Options for Residential End Users (PDF) suggests that this option is very popular with customers. For this study, we asked customers what they thought about five billing options:

- *Bills with two due dates*, where you pay half your bill on each due date so the due dates better meet your income timeline.
- *Budget, or "levelized," billing*, which smooths out the highs and lows of your monthly energy bill and is based on your average monthly usage. Your bill is adjusted periodically, based on your actual usage.
- *Bundled billing*, where monthly bills from several companies such as telephone, water, newspaper, or Internet service are placed together on one bill.
- *Customer-selected due date*, where you select your preferred monthly billing date.
- *Flat, or weatherproof, billing*, where you lock in an amount to pay each month for a year and that amount doesn't change, even if you use more or less energy than expected.

A customer-selected due date was the clear favorite among these options, with 47 percent of respondents saying they were "somewhat interested" or "very interested" in participating (**Figure 1**). The popularity of this program indicates that it may be another weapon in the utility arsenal against low customer satisfaction scores.

FIGURE 1: Interest in billing options

Customer-selected due date was the clear favorite among billing options.



Potential Cash-Flow Implications and Benefits to Utilities

The potential cash-flow implications of allowing customers to choose when they pay their bill may be obvious: No business wants all of its receivables to come in the door on the same day or even the same week—they want a nice, even cash flow throughout the billing period. However, another school of thought is that customer-selected due-date programs may help customers pay on time and reduce write-offs, which serves to increase cash flow. But the true impact on arrearage reduction seems to be small.

One of our best sources on credit issues and payment-troubled customers is Roger Colton from the law and economics consulting firm Fisher Sheehan & Colton. His report *Understanding Why Customers Don't Pay: The Need for Flexible Collection Practices* states:

> Roughly half (47%) of all payment troubled customers experienced some "unusual condition" that prevented the timely payment of their utility bill. . . . the presence of a conflict between the billing date and the due date (5%).

This didn't seem to be a sizeable class, but, Colton explains, "It's a small but politically popular subset of customers who benefit from pick-a-date programs. They tend to be seniors on fixed incomes who work really hard at budgeting." Given the small size of this group, however, there doesn't seem to be a lot of arrearage reduction from these programs.

Rather than offer the program to reduce arrears, several utilities offer it for the customer satisfaction benefits. Renee Castillo, senior director of Customer Services at SRP, explains the utility's custom due-date program:

> SRP does experience fairly spiky billing runs and somewhat higher call volume with the billing spikes, but we plan for it and tolerate that challenge for the sake of the customer satisfaction benefit. Customer satisfaction with choosing due dates is very high, and we've offered the option for many years. Customers don't have to be on autopay or paperless billing to enroll.

Before smart meters, SRP would simply hold the bill until the customer's chosen due date, but now that the utility has automated metering, it can forecast when there will be a spike in billing.

According to Cindy Andrade, customer operations director at GRU, the Preferred Due Date program is used as a vehicle for customer satisfaction and reductions in payment extensions. "We do not find a significant impact to our operations by offering the custom due date," says Andrade. "Our expectation is that if a customer can choose their due date, then perhaps they will request fewer (hopefully no) payment extensions. It is also an offering that increases customer satisfaction. Our payment extensions, which are three times higher during the recession than before, are having more of an impact on our efficiencies than this program."

Matt Bucher, customer care supervisor at Otter Tail Power, also weighed in on the discussion: "In our case, the pick-a-due-date program is tied with automatic payments." He adds:

> From a workload perspective, this has the potential for great operational savings if these customers were paying in a more labor-intensive process, such as a walk-in payment location, prior to signing up for the program. However, most customers who enroll were likely paying via check by mail, in which case we're moving from processing their payment with a remittance center machine to processing by Automated Clearing House (ACH). There are still some savings to be had, but not as substantial, if they were a walk-in customer prior.

> In terms of cash flow, customers have the option of selecting any day between the day of billing and the due date. That period is roughly 20 days for our customers. If customers sign up for autopay, but do not select a date, we will pull the money from their account the day after the account bills. Most customers will pick a date for the funds to be withdrawn and it's usually the due date for their account. Since customers typically paid on or near the due date when they were paying by check, the program allows us to get funds faster. Although the majority of customers select the due date, a surprising number of customers do not select a date and just want their payment to be automatic, so we receive those funds immediately after billing.

If cash-flow concerns are a deterrent to this type of program offering, you might consider the boost in customer satisfaction as an acceptable trade-off to the minute operational impacts, if any exist at all.

Resources

Renee Castillo, Senior Director of Customer Services, SRP, 602-236-2175 (2011)

Cindy Andrade, Customer Operations Director, GRU, 352-393-1412 (2011)

Matt Bucher, Customer Care Supervisor, Otter Tail Power, 218-739-8443 (2011)

Roger Colton, Partner, Fisher Sheehan & Colton, 617-484-0597 (2009)

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FortisBC, Inc.

KELOWNA, BRITISH COLUMBIA

DEPRECIATION STUDY

CALCULATED ANNUAL DEPRECIATION ACCRUAL RATES APPLICABLE TO PLANT IN SERVICE AT DECEMBER 31, 2009

Gannett Fleming
Valuation and Rate Division

Harrisburg, Pennsylvania **Calgary, Alberta** **Valley Forge, Pennsylvania**

Gannett Fleming
Valuation and Rate Division

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June 6, 2011

FortisBC, Inc.
Suite 100, 1975 Springfield Road
Kelowna, BC
V1Y 7P7

Attention: Ms. Michele Leeners
Vice President of Finance and Chief Financial Officer

Dear Ms. Leeners:

Pursuant to your request, we have conducted a depreciation study related to the electric generation, transmission and distribution system of FortisBC, Inc. as of December 31, 2009. Our report presents a description of the methods used in the estimation of depreciation and net salvage, the statistical analyses of service life and the summary and detailed tabulations of annual and accrued depreciation.

The calculated annual depreciation accrual rates presented in the report are applicable to plant in service as of December 31, 2009. The depreciation rates are based on the straight-line method, the remaining life basis, using the average service life group procedure. An annual review of the depreciation rates using the same estimates and methods is recommended.

Respectfully submitted,
GANNETT FLEMING, INC.

LARRY E. KENNEDY
Director, Canadian Services
Valuation and Rate Division

LEK/hac
Project: 053630

A Tradition of Excellence

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PART I. INTRODUCTION

FORTISBC, INC.
DEPRECIATION STUDY

CALCULATED ANNUAL DEPRECIATION ACCRUAL RATES
APPLICABLE TO PLANT IN SERVICE
AT DECEMBER 31, 2009

PART I. INTRODUCTION

SCOPE

This report sets forth the results of the depreciation study conducted for the electric generation, transmission and distribution assets of FortisBC, Inc. (“Fortis”) to determine the annual depreciation accrual rates and amounts for ratemaking purposes applicable to the original cost of plant at December 31, 2009.

The depreciation accrual rates presented herein are based on generally-accepted methods and procedures for calculating depreciation. The estimated survivor curves and estimated net salvage percents used in this report are based on studies incorporating data through 2009.

Part I, Introduction, contains statements with respect to the scope of the report and the basis of the study. Part II, Methods Used in the Estimation of Depreciation, presents the methods used in the estimation of average service lives, survivor curves and net salvage and in the calculation of depreciation. Part III, Results of Study, presents a summary of annual depreciation. Parts IV through VI, present the statistical analyses of service lives, net salvage estimates, and the detailed tabulations of annual depreciation, respectively.

BASIS OF THE STUDY

Depreciation. The annual depreciation accrual, and cost of removal rates and the related calculated requirement for accumulated depreciation and cost of removal were calculated using the straight line method, the remaining life basis and the average service life (ASL) procedure. The calculation was based on the attained ages and estimated service life and net salvage characteristics for each depreciable group of assets.

Service Life and Net Salvage Estimates. The method of estimating service life consisted of compiling the service life history of the plant accounts and subaccounts, reducing this history to trends through the use of analytical techniques that have been generally accepted in various regulatory jurisdictions, and forecasting the trend of survivors for each depreciable group on the basis of interpretations of past trends and consideration of Company plans for the future. The combination of the historical trend and the estimated future trend yielded a complete pattern of life characteristics from which the average service life was derived. The service life estimates used in the depreciation calculation incorporated historical data compiled through December 31, 2009. Such data included plant additions, retirements, transfers and other plant activity.

A general understanding of the function of the plant and information with respect to the reasons for past retirements and the expected future causes of retirement was obtained through discussions with operating and management personnel in this study, and previous site tours of the generation, transmission and distribution facilities of the company. Throughout these interviews and site tours, an analysis of the accounting procedures and policies was also undertaken by Gannett Fleming in order to determine the reasonableness of the historic retirement transactions.

The estimates of net salvage were based in part on historical data compiled through 2009, and in part through knowledge gained in the operational staff interviews and site tours. Additionally, Gannett Fleming has significant experience in the development of net salvage percentage estimates, and included this background and experience in the development of recommended net salvage percentages as well.

RECOMMENDATIONS

The calculated annual depreciation accrual and cost of removal rates set forth herein apply specifically to plant in service as of December 31, 2009. Continued surveillance and periodic revisions are normally required to maintain continued use of appropriate depreciation rates.

The depreciation rates should be reviewed periodically if there are indications that plant and accumulated depreciation account activity may result in materially different depreciation rates. The survivor curves, net salvage percents, and amortization periods used in this study should be the basis for periodic recalculations. Complete depreciation studies, which reevaluate these parameters, should be performed every three to five years.

PART II. METHODS USED IN THE ESTIMATION OF DEPRECIATION

PART II. METHODS USED IN THE ESTIMATION OF DEPRECIATION

DEPRECIATION

Depreciation, in public utility regulation, is the loss in service value not restored by current maintenance, incurred in connection with the consumption or prospective retirement of utility plant in the course of service from causes which are known to be in current operation and against which the utility is not protected by insurance. Among causes to be given consideration are wear and tear, deterioration, action of the elements, inadequacy, obsolescence, changes in the art, changes in demand, and the requirements of public authorities.

Depreciation, as used in accounting, is a method of distributing fixed capital costs, less net salvage, over a period of time by allocating annual amounts to expense. Each annual amount of such depreciation expense is part of that year's total cost of providing electric utility service. Normally, the period of time over which the fixed capital cost is allocated to the cost of service is equal to the period of time over which an item renders service, that is, the item's service life. The most prevalent method of allocation is to distribute an equal amount of cost to each year of service life. This method is known as the straight-line method of depreciation.

The calculation of annual and accrued depreciation based on the straight line method requires the estimation of survivor curves and the selection of group depreciation procedures. These subjects are discussed in the sections that follow.

ESTIMATION OF SURVIVOR CURVES

Survivor Curves. The use of an average service life for a property group implies that the various units in the group have different lives. Thus, the average life may be obtained by determining the separate lives of each of the units, or by constructing a survivor curve by plotting the number of units which survive at successive ages. A discussion of the general concept of survivor curves is presented. Also, the Iowa type survivor curves are reviewed.

The survivor curve graphically depicts the amount of property existing at each age throughout the life of an original group. From the survivor curve, the average life of the group, the remaining life expectancy, the probable life, and the frequency curve can be calculated. In Figure 1, a typical smooth survivor curve and the derived curves are illustrated. The average life is obtained by calculating the area under the survivor curve, from age zero to the maximum age, and dividing this area by the ordinate at age zero. The remaining life expectancy at any age can be calculated by obtaining the area under the curve, from the observation age to the maximum age, and dividing this area by the percent surviving at the observation age. For example, in Figure 1, the remaining life at age 30 is equal to the crosshatched area under the survivor curve divided by 29.5 percent surviving at age 30. The probable life at any age is developed by adding the age and remaining life. If the probable life of the property is calculated for each year of age, the probable life curve shown in the chart can be developed. The frequency curve presents the number of units retired in each age interval and is derived by obtaining the differences between the amount of property surviving at the beginning and at the end of each interval.

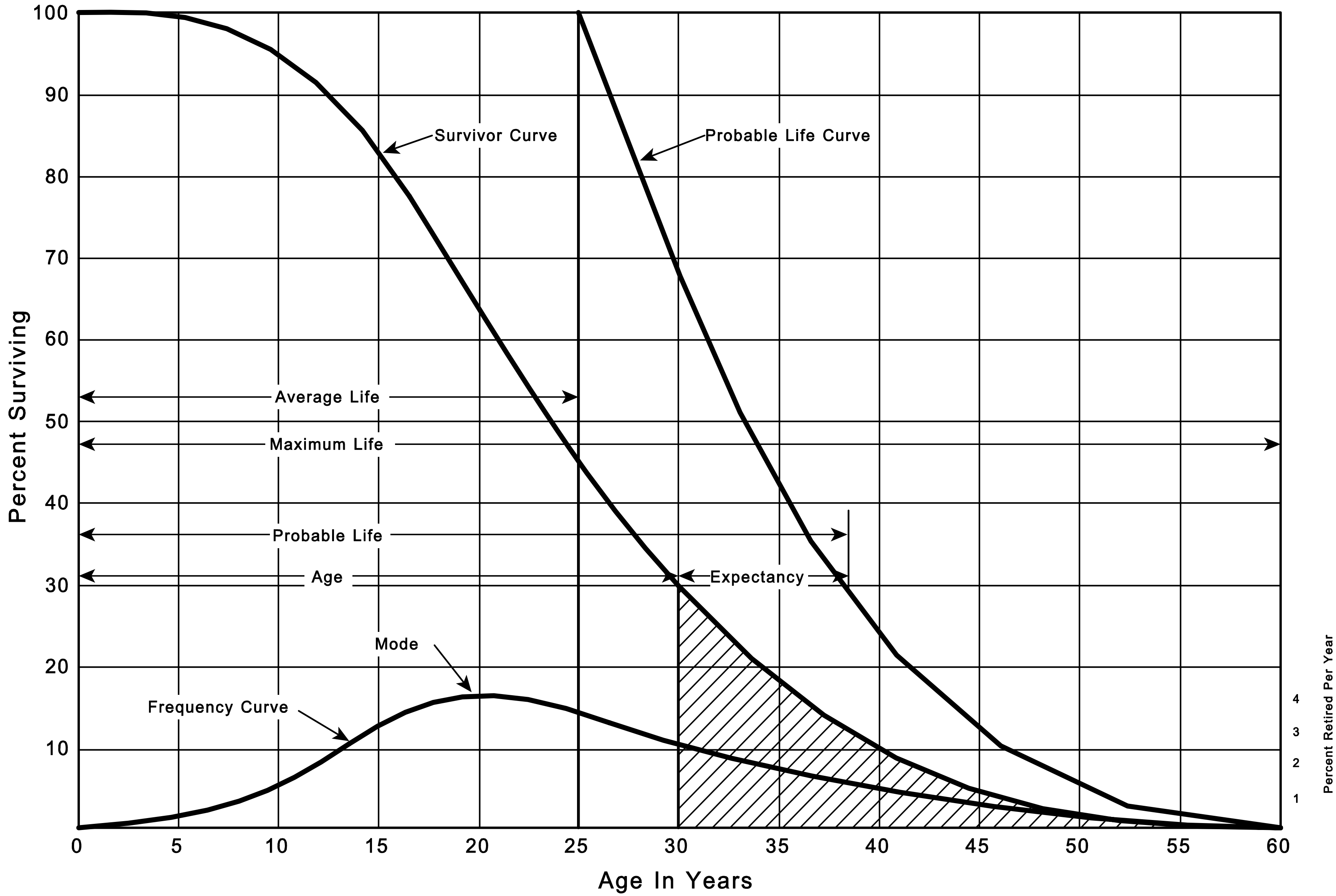


Figure 1. A Typical Survivor Curve and Derived Curves

Iowa Type Curves The range of survivor characteristics usually experienced by utility and industrial properties is encompassed by a system of generalized survivor curves known as the Iowa type curves. There are four families in the Iowa system, labeled in accordance with the location of the modes of the retirements in relationship to the average life and the relative height of the modes. The left moded curves, presented in Figure 2, are those in which the greatest frequency of retirement occurs to the left of, or prior to, average service life. The symmetrical moded curves, presented in Figure 3, are those in which the greatest frequency of retirement occurs at average service life. The right moded curves, presented in Figure 4, are those in which the greatest frequency occurs to the right of, or after, average service life. The origin moded curves, presented in Figure 5, are those in which the greatest frequency of retirement occurs at the origin, or immediately after age zero. The letter designation of each family of curves (L, S, R or O) represents the location of the mode of the associated frequency curve with respect to the average service life. The numbers represent the relative heights of the modes of the frequency curves within each family.

The Iowa curves were developed at the Iowa State College Engineering Experiment Station through an extensive process of observation and classification of the ages at which industrial property had been retired. A report of the study which resulted in the classification of property survivor characteristics into 18 type curves, which constitute three subsequent Experiment Station bulletins and in the text, "Engineering Valuation and Depreciation."[1] In 1957, Frank V. B. Couch, Jr., an Iowa State College graduate student

[1]Marston, Anson, Robley Winfrey and Jean C. Hempstead. Engineering Valuation and Depreciation, 2nd Edition. New York, McGraw-Hill Book Company. 1953.

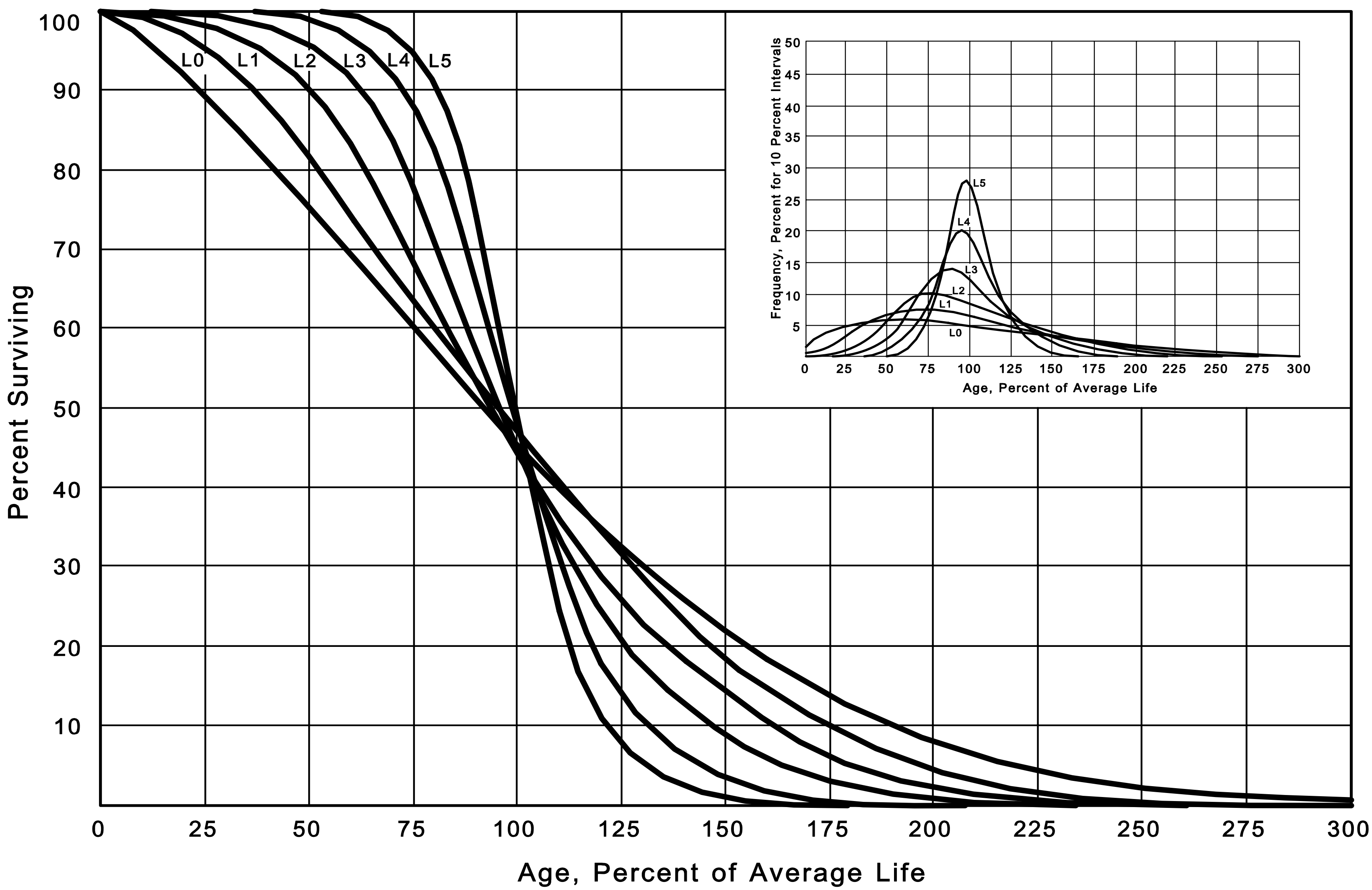


Figure 2. Left Modal or "L" Iowa Type Survivor Curves

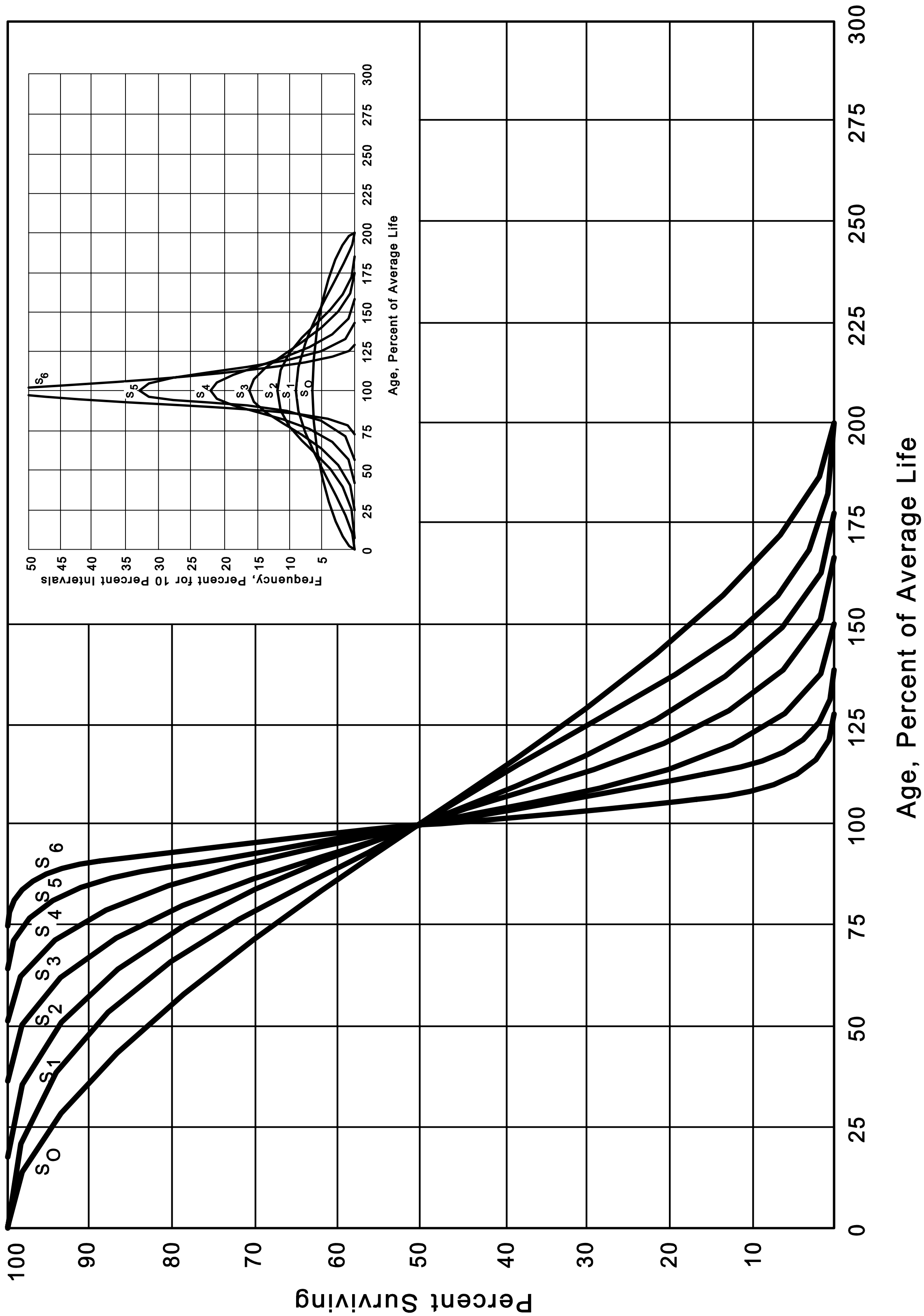


Figure 3. Symmetrical or "S" Iowa Type Survivor Curves

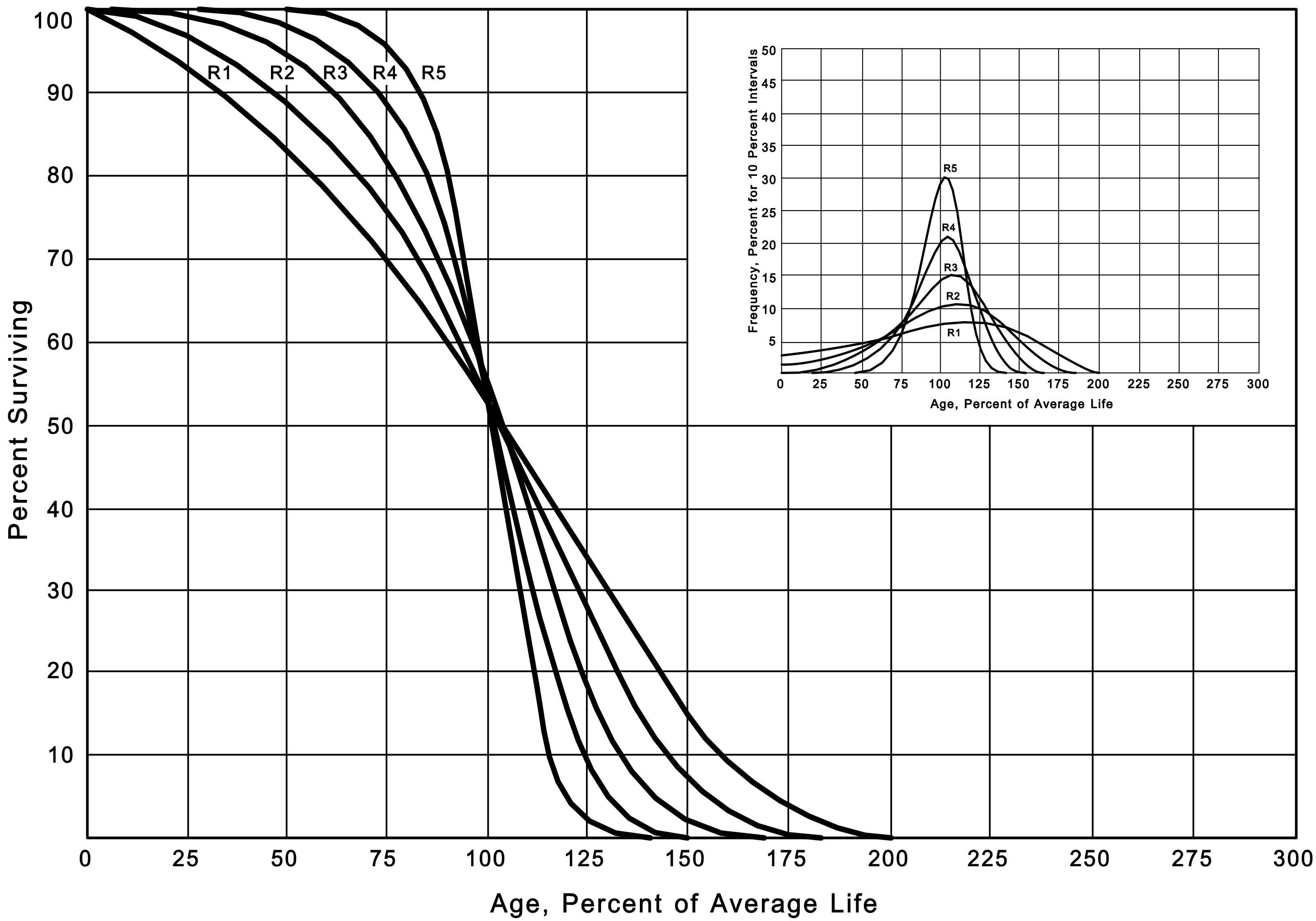


Figure 4. Right Modal or "R" Iowa Type Survivor Curves

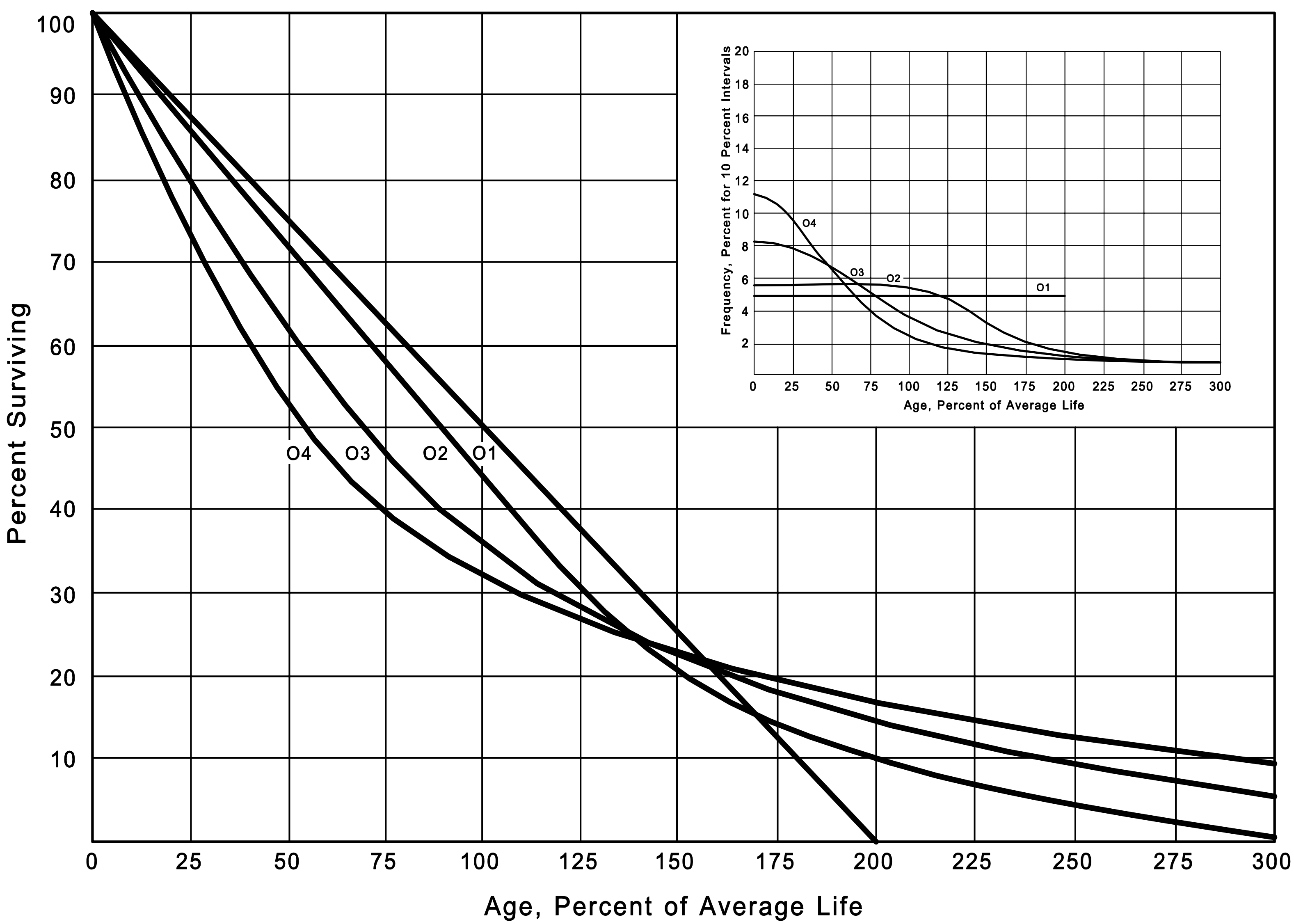


Figure 5. Origin Modal or "O" Iowa Type Survivor Curves

submitted a thesis[2] presenting his development of the fourth family consisting of the four O type survivor curves.

Retirement Rate Method of Analysis. The retirement rate method is an actuarial method of deriving survivor curves using the average rates at which property of each age group is retired. The method relates to property groups for which aged accounting experience is available or for which aged accounting experience is developed by statistically aging un-aged amounts and is the method used to develop the original stub survivor curves in this study. The method (also known as the annual rate method) is illustrated through the use of an example in the following text, and is also explained in several publications, including "Statistical Analyses of Industrial Property Retirements,"[3] "Engineering Valuation and Depreciation,"[4] and "Depreciation Systems."[5]

The average rate of retirement used in the calculation of the percent surviving for the survivor curve (life table) requires two sets of data: first, the property retired during a period of observation, identified by the property's age at retirement; and second, the property exposed to retirement at the beginnings of the age intervals during the same period. The period of observation is referred to as the experience band, and the band of years which represent the installation dates of the property exposed to retirement during the experience band is referred to as the placement band. An example of the calculations used in the development of a life table follows. The example includes schedules of annual

[2]Couch, Frank V. B., Jr. "Classification of Type O Retirement Characteristics of Industrial Property." Unpublished M.S. thesis (Engineering Valuation). Library, Iowa State College, Ames, Iowa. 1957.

[3]Winfrey, Robley, Supra Note 1.

[4]Marston, Anson, Robley Winfrey, and Jean C. Hempstead, Supra Note 2.

[5]Wolf, Frank K. and W. Chester Fitch. Depreciation Systems. Iowa State University Press. 1994

aged property transactions, a schedule of plant exposed to retirement, a life table and illustrations of smoothing the stub survivor curve.

Schedules of Annual Transactions in Plant Records. The property group used to illustrate the retirement rate method is observed for the experience band 2001-2009 during which there were placements during the years 1996-2009. In order to illustrate the summation of the aged data by age interval, the data were compiled in the manner presented in Tables 1 and 2 on the following pages. In Table 1, the year of installation (year placed) and the year of retirement are shown. The age interval during which a retirement occurred is determined from this information. In the example which follows, $10,000 of the dollars invested in 1996 were retired in 2001. The $10,000 retirement occurred during the age interval between 4½ and 5½ years on the basis that approximately one-half of the amount of property was installed prior to and subsequent to July 1 of each year. That is, on the average, property installed during a year is placed in service at the midpoint of the year for the purpose of the analysis. All retirements also are stated as occurring at the midpoint of a one-year age interval of time, except the first age interval which encompasses only one-half year.

The total retirements occurring in each age interval in a band are determined by summing the amounts for each transaction year-installation year combination for that age interval. For example, the total of $143,000 retired for age interval 4½-5½ is the sum of the retirements entered on Table 1 immediately above the stairstep line drawn on the table beginning with the 2001 retirements of 1996 installations and ending with the 2009 retirements of the 2005 installations. Thus, the total amount of 143 for age interval 4½-5½ equals the sum of:

$$10 + 12 + 13 + 11 + 13 + 13 + 15 + 17 + 19 + 20.$$

TABLE 1. RETIREMENTS FOR EACH YEAR 2000-2009 SUMMARIZED BY AGE INTERVAL

Experience Band 2000-2009 | Placement Band 1995-2009

Year Placed	Retirements, Thousands of Dollars During Year										Total During Age Interval	Age Interval
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1995	10	11	12	13	14	16	23	24	25	26	26	13½-14½
1996	11	12	13	15	16	18	20	21	22	19	44	12½-13½
1997	11	12	13	14	16	17	19	21	22	18	64	11½-12½
1998	8	9	10	11	11	13	14	15	16	17	83	10½-11½
1999	9	10	11	12	13	14	16	17	19	20	93	9½-10½
2000	4	9	10	11	12	13	14	15	16	20	105	8½-9½
2001		5	11	12	13	14	15	16	18	20	113	7½-8½
2002			6	12	13	15	16	17	19	19	124	6½-7½
2003				6	13	15	16	17	19	19	131	5½-6½
2004					7	14	16	17	19	20	143	4½-5½
2005						8	18	20	22	23	146	3½-4½
2006							9	20	22	25	150	2½-3½
2007								11	23	25	151	1½-2½
2008									11	24	153	½-1½
2009	—	—	—	—	—	—	—	—	—	13	80	0-½
Total	53	68	86	106	128	157	196	231	273	308	1,606	

TABLE 2. OTHER TRANSACTIONS FOR EACH YEAR 2000-2009
SUMMARIZED BY AGE INTERVAL

Experience Band 2000-2009 | Placement Band 1995-2009

	Acquisitions, Transfers and Sales, Thousands of Dollars During Year											
Placed (1)	2000 (2)	2001 (3)	2002 (4)	2003 (5)	2004 (6)	2005 (7)	2006 (8)	2007 (9)	2008 (10)	2009 (11)	Total During Age Interval (12)	Age Interval (13)
1995	-	-	-	-	-	-	60[a]	-	-	-	-	13½-14½
1996	-	-	-	-	-	-	-	-	-	-	-	12½-13½
1997	-	-	-	-	-	-	-	-	-	-	-	11½-12½
1998	-	-	-	-	-	-	-	(5)[b]	-	-	60	10½-11½
1999	-	-	-	-	-	-	-	6[a]	-	-	-	9½-10½
2000		-	-	-	-	-	-	-	-	-	(5)	8½-9½
2001			-	-	-	-	-	-	-	-	-	7½-8½
2002			-	-	-	-	-	-	-	-	-	6½-7½
2003				-	-	-	-	(12)[b]	-	-	-	5½-6½
2004					-	-	-	-	22[a]	-	-	4½-5½
2005						-	-	(19)[b]	-	-	10	3½-4½
2006							-	-	-	-	-	2½-3½
2007								-	-	(102)[c]	(121)	1½-2½
2008									-	-	-	½-1½
2009											-	0-½
Total	-	-	-	-	-	-	60	(30)	22	(102)	(50)	

[a] Transfer Affecting Exposures at Beginning of Year
[b] Transfer Affecting Exposures at End of Year
[c] Sale with Continued Use
Parentheses denote Credit amount.

In Table 2, other transactions which affect the group are recorded in a similar manner. The entries illustrated include transfers and sales. The entries which are credits to the plant account are shown in parentheses. The items recorded on this schedule are not totaled with the retirements, but are used in developing the exposures at the beginning of each age interval.

Schedule of Plant Exposed to Retirement. The development of the amount of plant exposed to retirement at the beginning of each age interval is illustrated in Table 3 on page II-16. The surviving plant at the beginning of each year from 2001 through 2009 is recorded by year in the portion of the table headed "Annual Survivors at the Beginning of the Year." The last amount entered in each column is the amount of new plant added to the group during the year. The amounts entered in Table 3 for each successive year following the beginning balance or addition are obtained by adding or subtracting the net entries shown on Tables 1 and 2. For the purpose of determining the plant exposed to retirement, transfers-in are considered as being exposed to retirement in this group at the beginning of the year in which they occurred, and the sales and transfers-out are considered to be removed from the plant exposed to retirement at the beginning of the following year. Thus, the amounts of plant shown at the beginning of each year are the amounts of plant from each placement year considered to be exposed to retirement at the beginning of each successive transaction year. For example, the exposures for the installation year 2006 are calculated in the following manner:

Exposures at age 0	= amount of addition	= $750,000
Exposures at age ½	= $750,000 - $ 8,000	= $742,000
Exposures at age 1½	= $742,000 - $18,000	= $724,000
Exposures at age 2½	= $724,000 - $20,000 - $19,000	= $685,000
Exposures at age 3½	= $685,000 - $22,000	= $663,000

For the entire experience band 2001-2009, the total exposures at the beginning of an age interval are obtained by summing diagonally in a manner similar to the summing of the retirements during an age interval (Table 1). For example, the figure of 3,789, shown as the total exposures at the beginning of age interval 4½-5½, is obtained by summing:

255 + 268 + 284 + 311 + 334 + 374 + 405 + 448 + 501 + 609.

Original Life Table. The original life table, illustrated in Table 4 on page ll-19, is developed from the totals shown on the schedules of retirements and exposures, Tables 1 and 3, respectively. The exposures at the beginning of the age interval are obtained from the corresponding age interval of the exposure schedule, and the retirements during the age interval are obtained from the corresponding age interval of the retirement schedule. The retirement ratio is the result of dividing the retirements during the age interval by the exposures at the beginning of the age interval. The percent surviving at the beginning of each age interval is derived from survivor ratios, each of which equals one minus the retirement ratio. The percent surviving is developed by starting with 100% at age zero and successively multiplying the percent surviving at the beginning of each interval by the survivor ratio, i.e., one minus the retirement ratio for that age interval. The calculations necessary to determine the percent surviving at age 5½ are as follows:

Percent surviving at age 4½	=	88.15				
Exposures at age 4½	=	3,789,000				
Retirements from age 4½ to 5½	=	143,000				
Retirement Ratio	=	143,000	÷	3,789,000	=	0.0377
Survivor Ratio	=	1.000	-	0.0377	=	0.9623
Percent surviving at age 5½	=	(88.15)	x	(0.9623)	=	84.83

The totals of the exposures and retirements (columns 2 and 3) are shown for the purpose of checking with the respective totals in Tables 1 and 3. The ratio of the total retirements to the total exposures, other than for each age interval, is meaningless.

TABLE 3. PLANT EXPOSED TO RETIREMENT JANUARY 1 OF EACH YEAR 2001-2009 SUMMARIZED BY AGE INTERVAL

Experience Band 2001-2009 — Placement Band 1996-2009

Exposures, Thousands of Dollars — Annual Survivors at the Beginning of the Year

Year Placed (1)	2001 (2)	2002 (3)	2003 (4)	2004 (5)	2005 (6)	2006 (7)	2007 (8)	2008 (9)	2009 (10)	2009 (11)	Total at Beginning of Age Interval (12)	Age Interval (13)
1996	255	245	234	222	209	195	239	216	192	167	167	13½-14½
1997	279	268	256	243	228	212	194	174	153	131	323	12½-13½
1998	307	296	284	271	257	241	224	205	184	162	531	11½-12½
1999	338	330	321	311	300	289	276	262	242	226	823	10½-11½
2000	376	367	357	346	334	321	307	297	280	261	1,097	9½-10½
2001	420[a]	416	407	397	386	374	361	347	332	316	1,503	8½-9½
2002		460[a]	455	444	432	419	405	390	374	356	1,952	7½-8½
2003			510[a]	504	492	479	464	448	431	412	2,463	6½-7½
2004				580[a]	574	561	546	530	501	482	3,057	5½-6½
2005					660[a]	653	639	623	628	609	3,789	4½-5½
2006						750[a]	742	724	685	663	4,332	3½-4½
2007							850[a]	841	821	799	4,955	2½-3½
2008								960[a]	949	926	5,719	1½-2½
2009									1,080[a]	1,069	6,579	½-1½
2009											7,490	0-½
Total	1,975	2,382	2,824	3,318	3,872	4,494	5,247	6,017	6,852	7,799	44,780	

[a] Additions during the year.

The original survivor curve is plotted from the original life table (column 6, Table 4). When the curve terminates at a percent surviving greater than zero, it is called a stub survivor curve. Survivor curves developed from retirement rate studies generally are stub curves.

Smoothing the Original Survivor Curve. The smoothing of the original survivor curve eliminates any irregularities and serves as the basis for the preliminary extrapolation to zero percent surviving of the original stub curve. Even if the original survivor curve is complete from 100% to zero percent, it is desirable to eliminate any irregularities, as there is still an extrapolation for the vintages which have not yet lived to the age at which the curve reaches zero percent. In this study, the smoothing of the original curve with established type curves was used to eliminate irregularities in the original curve.

The Iowa type curves are used in this study to smooth those original stub curves which are expressed as percents surviving at ages in years. Each original survivor curve was compared to the Iowa curves using visual and mathematical matching in order to determine the better fitting smooth curves. In Figures 6, 7, and 8, the original curve developed in Table 4 is compared with the L, S, and R Iowa type curves which most nearly fit the original survivor curve. In Figure 6, the L1 curve with an average life between 12 and 13 years appears to be the best fit. In Figure 7, the S0 type curve with a 12-year average life appears to be the best fit and appears to be better than the L1 fitting. In Figure 8, the R1 type curve with a 12-year average life appears to be the best fit and appears to be better than either the L1 or the S0.

TABLE 4. ORIGINAL LIFE TABLE
CALCULATED BY THE RETIREMENT RATE METHOD

Experience Band 2001-2009 Placement Band 1996-2009

(Exposure and Retirement Amounts are in Thousands of Dollars)

Age at Beginning of Interval (1)	Exposures at Beginning of Age Interval (2)	Retirements During Age Interval (3)	Retirement Ratio (4)	Survivor Ratio (5)	Percent Surviving at Beginning of Age Interval (6)
0.0	7,490	80	0.0107	0.9893	100.00
0.5	6,579	153	0.0233	0.9767	98.93
1.5	5,719	151	0.0264	0.9736	96.62
2.5	4,955	150	0.0303	0.9697	94.07
3.5	4,332	146	0.0337	0.9663	91.22
4.5	3,789	143	0.0377	0.9623	88.15
5.5	3,057	131	0.0429	0.9571	84.83
6.5	2,463	124	0.0503	0.9497	81.19
7.5	1,952	113	0.0579	0.9421	77.11
8.5	1,503	105	0.0699	0.9301	72.65
9.5	1,097	93	0.0848	0.9152	67.57
10.5	823	83	0.1009	0.8991	61.84
11.5	531	64	0.1205	0.8795	55.60
12.5	323	44	0.1362	0.8638	48.90
13.5	167	26	0.1557	0.8443	42.24
					35.66
Total	44,780	1,606			

Column 2 from Table 3, Column 12, Plant Exposed to Retirement.
Column 3 from Table 1, Column 12, Retirements for Each Year.
Column 4 = Column 3 divided by Column 2.
Column 5 = 1.0000 minus Column 4.
Column 6 = Column 5 multiplied by Column 6 as of the Preceding Age Interval.

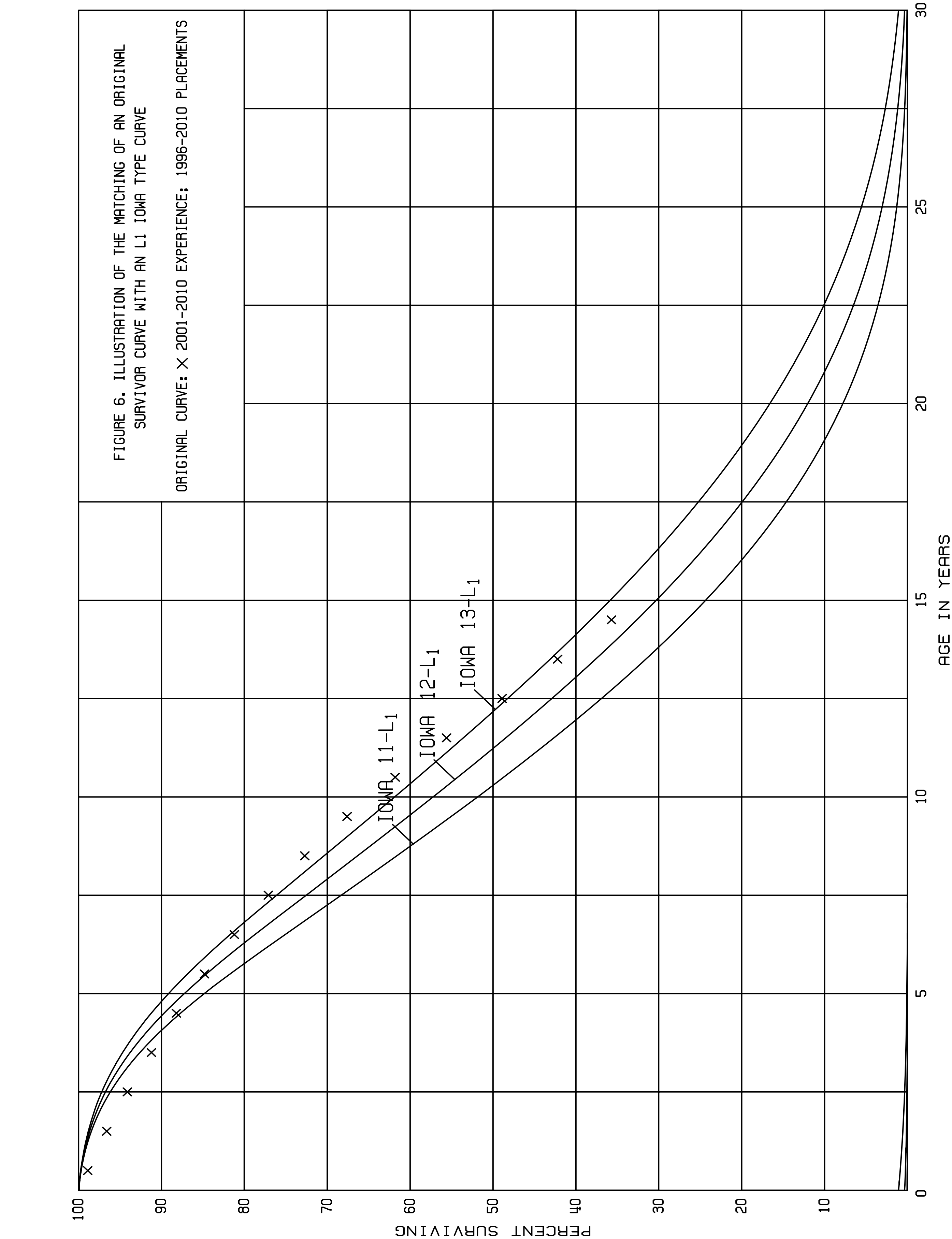


FIGURE 6. ILLUSTRATION OF THE MATCHING OF AN ORIGINAL SURVIVOR CURVE WITH AN L1 IOWA TYPE CURVE

ORIGINAL CURVE: × 2001-2010 EXPERIENCE; 1996-2010 PLACEMENTS

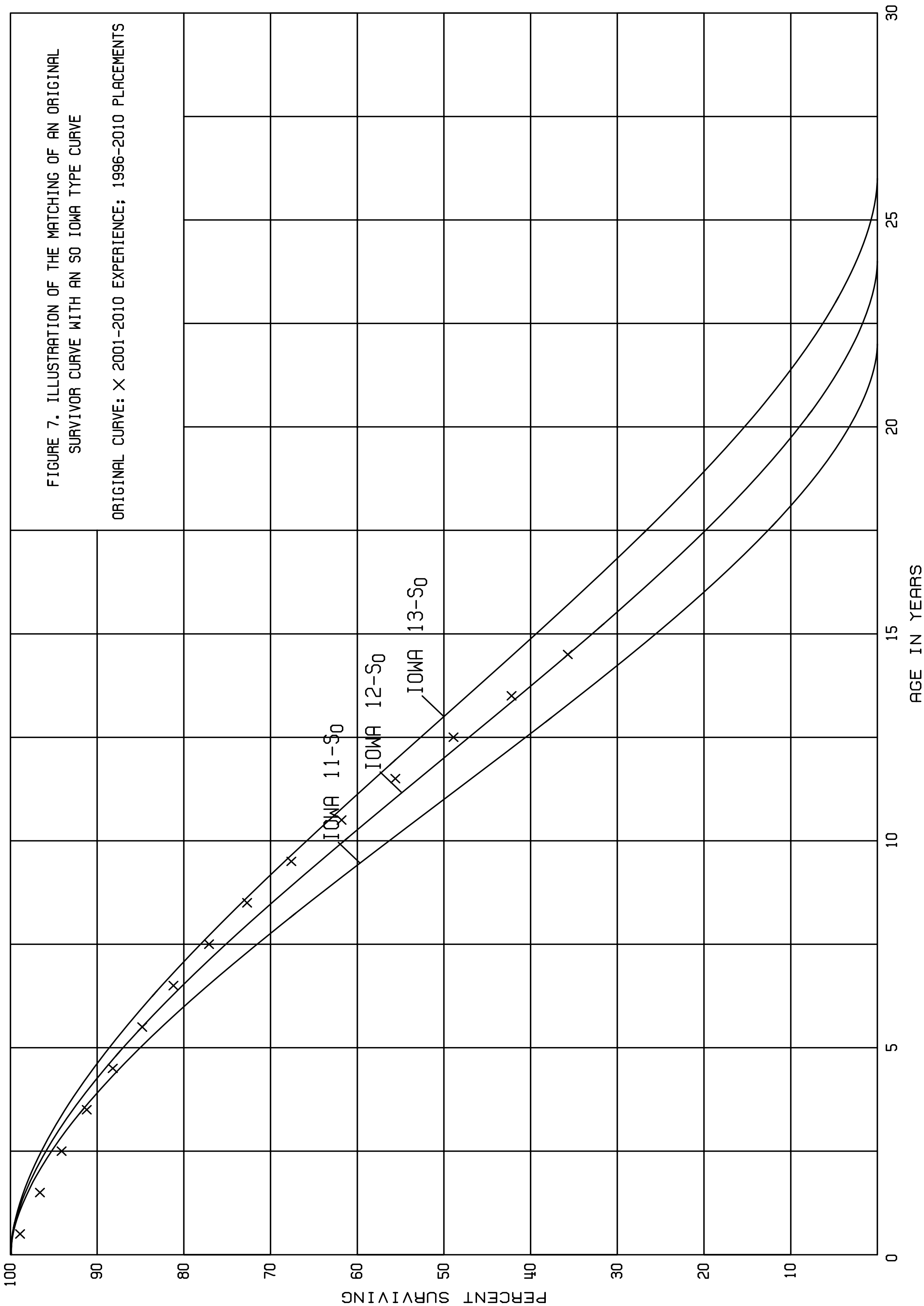


FIGURE 7. ILLUSTRATION OF THE MATCHING OF AN ORIGINAL
SURVIVOR CURVE WITH AN SO IOWA TYPE CURVE
ORIGINAL CURVE: × 2001-2010 EXPERIENCE; 1996-2010 PLACEMENTS
IOWA 11-S0
IOWA 12-S0
IOWA 13-S0
PERCENT SURVIVING
AGE IN YEARS
100
90
80
70
60
50
40
30
20
10
0
5
10
15
20
25
30

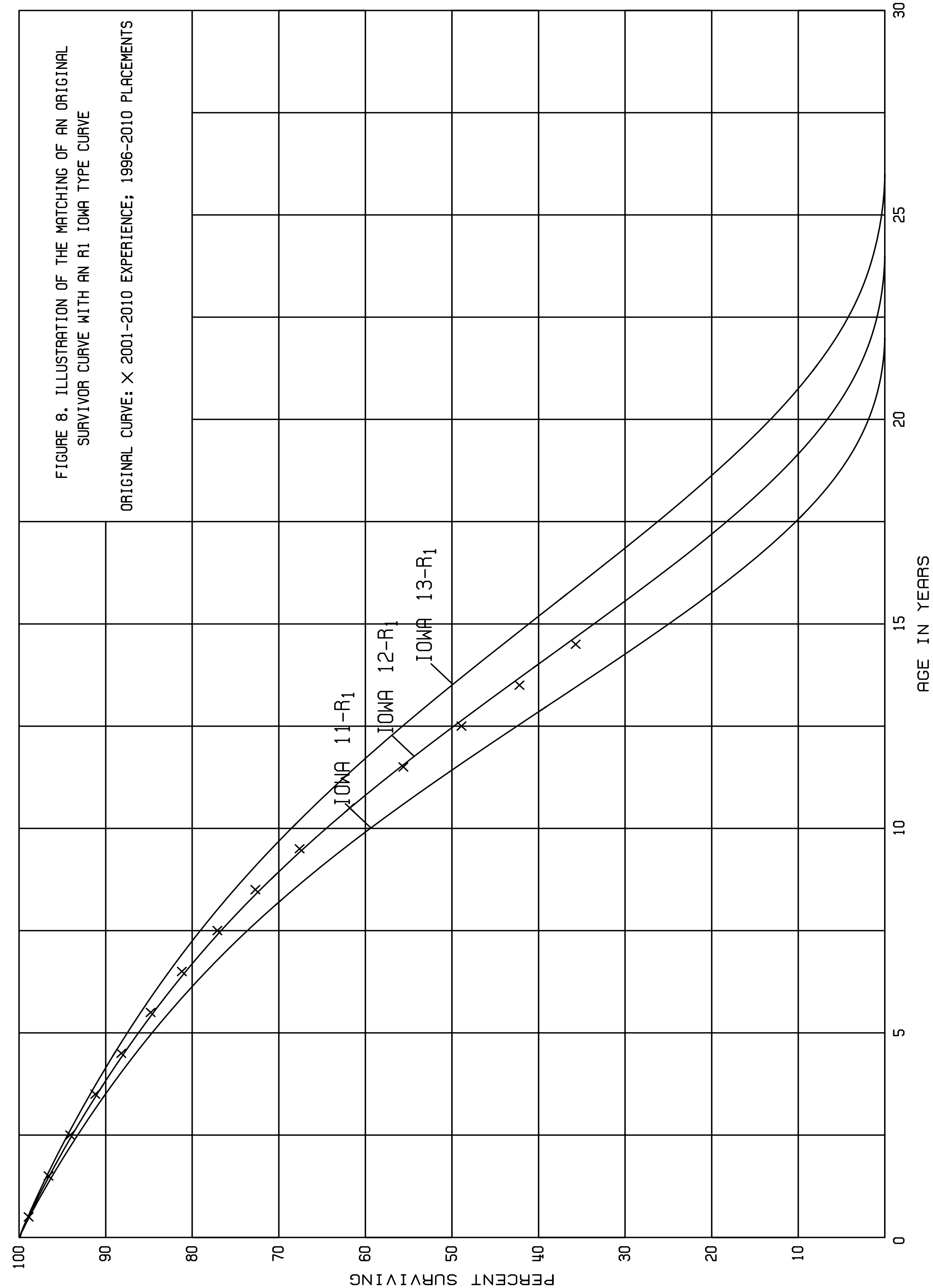


FIGURE 8. ILLUSTRATION OF THE MATCHING OF AN ORIGINAL SURVIVOR CURVE WITH AN R1 IOWA TYPE CURVE
ORIGINAL CURVE: × 2001-2010 EXPERIENCE; 1996-2010 PLACEMENTS
IOWA 11-R1
IOWA 12-R1
IOWA 13-R1
PERCENT SURVIVING
AGE IN YEARS
100
90
80
70
60
50
40
30
20
10
0
5
10
15
20
25
30

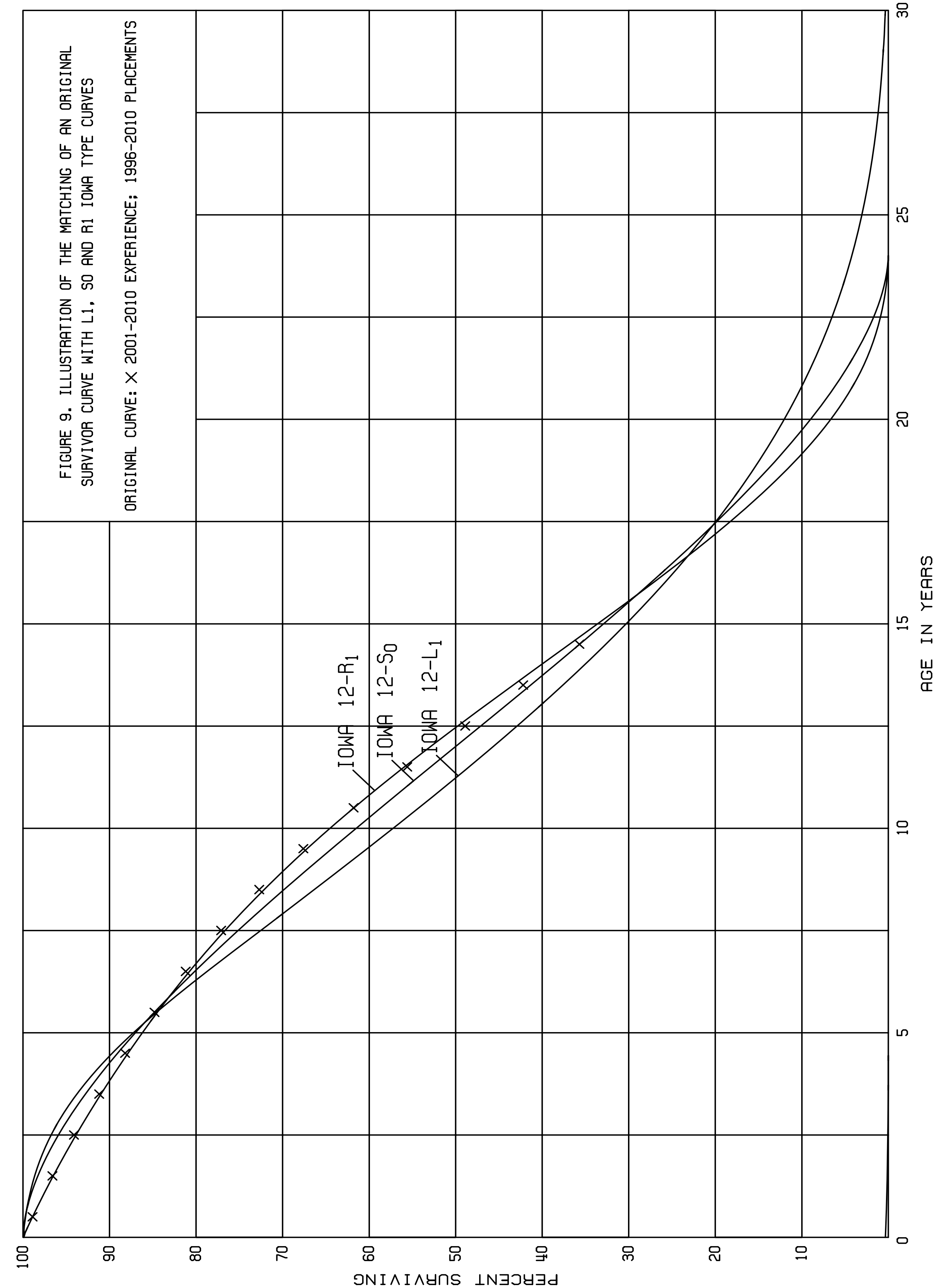


FIGURE 9. ILLUSTRATION OF THE MATCHING OF AN ORIGINAL SURVIVOR CURVE WITH L1, S0 AND R1 IOWA TYPE CURVES

In Figure 9, the three fittings, 12-L1, 12-S0 and 12-R1 are drawn for comparison purposes. It is probable that the 12-R1 Iowa curve would be selected as the most representative of the plotted survivor characteristics of the group.

Survivor Curve Judgments. The survivor curve estimates were based on judgment which considered a number of factors. The primary factors were the statistical analysis of data; current policies and outlook as determined through conversations conducted as part of this study with operations and management personnel; incorporating the knowledge that Gannett Fleming has gained through the completion of a number of Fortis assignments over a number of years; and survivor curve estimates from previous studies of this Company and other electric distribution companies.

Account 365.00 - Distribution Conductors and Devices, represents 17% of the depreciable plant studied. The retirements, additions and other plant transactions for the period 1960-2009 were analyzed by the retirement rate method. The original survivor curve as plotted on page IV-46, indicates retirement ratios that begin to increase at age 13 and continue with high retirement ratios thereafter. Staff interviews did not indicate any significant reason that the future retirement patterns will vary from those experienced in the past. While it is considered that this account will experience growth over the next few years, given expected growth in the distribution service areas, the historic retirement trends are expected to continue into the future. The life of this account has been increased from 40 to 45. As such, the Iowa 45-R3 selected for this account fits well to the historic retirement patterns and is expected to be indicative of the future retirement patterns.

Account 362.00 - Distribution Station Equipment, represents 15% of the depreciable plant studied. The retirements, additions and other plant transactions for the period 1960 through 2009 were analyzed by the retirement rate method. The original survivor curve as plotted on page IV-40, indicates small retirement ratios early in the assets life and increase in frequency at approximately ages 13, 26 and 36. The company has recently finished upgrading a number of the older distribution substation facilities. It is not anticipated that the new assets which were installed will have different retirement patterns than the ones they have replaced. The Iowa 55-S3 was selected and is a better match for the historical data then the current Iowa 45-R2.5. The Iowa 55-S3, provides a reasonable interpretation of the historical retirement experience and recognizes the expectation that future retirements will most likely follow the same trends as the past.

Account 353.00 - Transmission Substation Equipment, represents 11% of the depreciable plant studied. The retirements, additions and other plant transactions for the period 1960 through 2009 were analyzed by the retirement rate method. This account consists primarily of the investment in transmission substations. As indicated in the original survivor curve as plotted at page IV-26, this account has historically been subjected to only very modest retirement activity. Recently Fortis has constructed a number of new terminal stations as well as rebuilt some of the existing substations. The company does not expect to continue building with the same frequency in the future and does not believe these new builds with have a different retirement pattern than the historic indications. The movement from an Iowa 50-S3 to a 50-S4, provides a more reasonable interpretation of the historical retirement experience and recognizes the expectation that future retirements will most likely follow the same trends as the past.

Account 368.00 - Distribution Line Transformers, represents 8% of the depreciable plant studied. The retirements, additions and other plant transactions for the period 1960 through 2009 were analyzed by the retirement rate method. This account consists mainly of the lower voltage overhead and pad mounted line transformers used in the distribution of electric power within the company's service area. The original survivor curve as plotted on page IV-49, indicates retirement ratios that begin early in the accounts life and continue with relatively consistent retirement ratios through age 43, with remaining plant retiring quickly thereafter. Operational and management staff interviews did not indicate any significant reason that the future historic retirement patterns will vary from those experienced in the past. While it is considered that this account will experience growth over the next few years, given expected growth in the distribution service areas, to better fit the historical data a movement from the Iowa 45-L2.5 to 45-R4 was selected for this account. The 45-R4 curve is a good fit to the historic retirement patterns and is expected to be indicative of the future retirement patterns.

Account 364.00 – Distribution Poles, Towers and Fixtures, represents 10% of the depreciable plant studied. The retirements, additions and other plant transactions for the period 1960 through 2009 were analyzed by the retirement rate method. This account consists of the distribution power poles, the insulators and attachments to the power poles such as cross -arms and guy wires. As indicated in the original survivor curve as plotted on page IV-43 this account has witnessed a significant amount of retirement activity within the experience band analyzed, with the pace of retirement ratios increasing at approximately age 27. While it is expected that this account will continue to experience growth over the next number of years, it is also expected that the retirement activity in this account in the future will follow a similar dispersion as that witnessed over the last number of years. As such the Iowa 50-R3 selected for this account provides a good fit to the historical retirement patterns and is considered to be reflective of the future retirements in this account.

Account 355.00 – Transmission Poles, Towers and Fixtures, represents 6% of the depreciable plant studied. The retirements, additions and other plant transactions for the period 1960 through 2009 were analyzed by the retirement rate method. This account consists of the transmission, towers, poles, insulators and attachments, such as guy wires and anchors. In 2004, 380 km of 60Kv transmission lines was removed. Discussions with operating staff indicate that the account did experience a significant level of plant retirements over past few years due to required system improvements and upgrades of aging plant. Management has indicated future builds and retirements will occur as needed but are not expected to be similar in number or significance as the past 3 years. Therefore, the Iowa curve has shifted from 45-S2 to 50-R3 and is considered to be reflective of the estimated future retirement patterns.

Account 356.00 - Transmission Conductors and Devices, represents 6% of the depreciable plant studied. The retirements, additions and other plant transactions for the period 1960 through 2009 were analyzed by the retirement rate method. This account consists mainly of the Transmission conductor, and related material required for the electric transmission of electricity. As indicated in the original survivor curve as plotted at page IV-32, this account has witnessed a significant amount of retirement activity within the experience band analyzed. Retirements in this account have begun at a relatively early age and significantly increased in frequency at age 30 and continued at a high frequency through to age 50. Discussions with management and company staff indicate that further retirement activity will likely be similar to the historic levels. As such, the currently approved Iowa 50-R3 has been modified to 60-R3 for this account which provides a reasonable interpretation of the historical retirement experience and recognizes the expectation that future retirements will occur in a similar pattern as the historic retirement activity.

Account 335.00 - Generation Plant - Other Power Plant Equipment, represents 3% of the depreciable plant studied. The retirements, additions and other plant transactions for the period 1960 through 2009 were analyzed by the retirement rate method. This account consists mainly of the Transmission conductor, and related material required for the electric transmission of electricity. As indicated in the original survivor curve as plotted at page IV-26, this account has witnessed only limited amounts of retirement activity within the experience band analyzed. Discussions with management and company staff indicate that further retirement activity will likely be similar to the historic levels. As such, the Iowa curve 45-R4 is recommended for this account as it provides a reasonable interpretation of the historical retirement experience and recognizes the expectation that future retirements will occur in a similar pattern as the historic retirement activity.

Account 334.00 - Generation Plant - Accessory Electrical Equipment, represents 2% of the depreciable plant studied. The retirements, additions and other plant transactions for the period 1960 through 2009 were analyzed by the retirement rate method. As indicated in the original survivor curve as plotted at page IV-14, this account has witnessed some retirement activity within the experience band analyzed. Retirements in this account have begun at a relatively early age with more significant amount of retirements from ages 12 to 24. Discussions with management and company staff indicate that further retirement activity will likely be similar to the historic levels. The currently approved Iowa 45-R2.5 has been modified to the Iowa curve 50-R3 for this account which provides a reasonable interpretation of the historical retirement experience and recognizes the expectation that future retirements will occur in a similar pattern as the historic retirement activity.

All other accounts, which individually represent less than 2% of the depreciable plant studied were analyzed using similar methods and considered similar factors.

ESTIMATION OF NET SALVAGE

The estimates of net salvage were based, in part on historical data for the years 1995 through 2009 and in part on the professional judgment of Gannett Fleming. Gross salvage and cost of removal as recorded to the depreciation reserve account and related to experienced retirements were used. Percentages of the cost of plant retired were calculated for each component of net salvage on both annual and five-year moving average bases. Additionally, the historic trends of the net salvage percentages were compared to other electric utilities, and were modified based on the judgment and experience of Gannett Fleming.

When a utility retires plant, the plant may be: sold to a third party; reused by the utility for additional service; abandoned in place; or physically removed. In the circumstances where the plant is sold or re-used a salvage proceed (or positive salvage amount) is normally recognized. In circumstances where the plant is abandoned in place or physically removed, a cost of removal expenditure (or negative salvage) is incurred. The net of these estimated gross salvage proceeds and the estimated costs of removal are expressed as a percentage of the accounts original cost to determine a net salvage percentage. In the circumstances where the salvage proceeds exceed the costs of retirement a net positive salvage percentage exists. In the circumstances where the costs of removal exceed the salvage proceeds, a net negative salvage percentage results.

The estimation of the net salvage percentages developed using the traditional approach, included the following steps:

1. The annual retirement, gross salvage and cost of removal transactions for the period January 1, 1995 through December 31, 2009 were extracted from the plant accounting systems.

2. A net salvage amount (gross salvage proceeds less cost of retirement) was calculated for each historic year. Additionally, a net salvage amount was also calculated for each historic 3-year rolling band.

3. The net salvage amount determined above was compared to the original booked costs retired for each period in the manner described, which resulted in a net salvage percentage of original costs retired for each year, in addition to 3-year rolling bands.

4. The annual, and 3-year rolling average net salvage percentages were analyzed to determine a reasonable estimated net salvage percentage. At this point the net salvage percentage was based purely upon statistical analysis.

5. Each account was then analyzed based on the statistical analyses, the information provided by the operations groups regarding the current projects, and with the professional judgment of Gannett Fleming. Based on this analysis, a net salvage percentage for each account was determined.

6. The net salvage percentage was then used in the depreciation rate calculations in the technical update.

The annual, five-year and three-year net salvage percentage calculations are presented in account order in Part IV of this report.

CALCULATION OF ANNUAL AND ACCRUED DEPRECIATION

Group Depreciation Procedures. When more than a single item of property is under consideration, a group procedure for depreciation is appropriate because normally all of the items within a group do not have identical service lives, but have lives that are dispersed over a range of time. There are two primary group procedures, namely, average service life and equal life group.

In the average service life procedure, the rate of annual depreciation is based on the average life or average service life of the group, and this rate is applied to the surviving balances of the group's cost. A characteristic of this procedure is that the cost of plant retired prior to average life is not fully recouped at the time of retirement, whereas the cost of plant retired subsequent to average life is more than fully recouped. Over the entire life cycle, the portion of cost not recouped prior to average life is balanced by the cost recouped subsequent to average life. In this procedure, the accrued depreciation is based on the average service life of the group and the average remaining life of each vintage within the group derived from the area under the survivor curve between the attained age of the vintage and the maximum age.

In the equal life group procedure, the property group is subdivided according to service life. That is, each equal life group includes that portion of the property which experiences the life of that specific group. The relative size of each equal life group is determined from the property's life dispersion curve. The calculated depreciation for the property group is the summation of the calculated depreciation based on the service life of each equal life group.

The deprecation rates calculated in this study incorporated the use of the ASL procedure.

CALCULATION OF ANNUAL AND ACCRUED AMORTIZATION

Amortization is the gradual extinguishment of an amount in an account by distributing such amount over a fixed period, over the life of the asset or liability to which it applies, or over the period during which it is anticipated the benefit will be realized. Normally, the distribution of the amount is in equal amounts to each year of the amortization period.

The calculation of annual and accrued amortization requires the selection of an amortization period. The amortization periods used in this report were based on judgment which incorporated a consideration of the period during which the assets will render most of their service, the amortization period and service lives used by other utilities, and the service life estimates previously used for the asset under depreciation accounting.

Amortization accounting is proposed for certain General Plant accounts that represent numerous units of property, but a very small portion of depreciable plant in service. The general plant accounts and their amortization periods are as follows:

	Account	Amortization Period, Years
391.0	Office Furniture and Equipment	15
391.1	Computer Equipment and Software	10
391.2	PC Computer Equipment and Software	5
394.0	Tools and Work equipment	15
397.0	Communications Structures and Equipment	15

For the purpose of calculating annual amortization amounts as of December 31, 2009, the book depreciation reserve for each plant account is assigned or allocated to vintages. The book reserve assigned to vintages with an age greater than the amortization period is equal to the vintage's original cost. The remaining book reserve is allocated among vintages with an age less than the amortization period in proportion to the calculated accrued amortization. The calculated accrued amortization is equal to the original cost multiplied by the ratio of the vintage's age to its amortization period. The annual amortization amount is determined by dividing the future amortizations (original cost less allocated book reserve) by the remaining period of amortization for the vintage.

PART III. RESULTS OF STUDY

PART III. RESULTS OF STUDY

QUALIFICATION OF RESULTS

The calculation of the composite remaining lives, and the determination of the annual and accrued depreciation related to investment (and separately for cost of removal) are the principal results of the study. Continued surveillance and periodic revisions are normally required to maintain continued use of appropriate annual depreciation accrual rates. An assumption that accrual rates can remain unchanged over a long period of time implies a disregard for the inherent variability in service lives and salvage and for the change of the composition of property in service. The annual accrual rates and the accrued depreciation were calculated in accordance with the straight line method, using the average service life procedure, applied on a remaining life basis, based on estimates which reflect considerations of current historical evidence and expected future conditions.

DESCRIPTION OF DETAILED TABULATIONS

The service life and net salvage estimates were based on judgment that incorporated statistical analysis of retirement data, discussions with management and consideration of estimates made for other electric utilities. The results of the statistical analysis of service life are presented in the section beginning on page IV-2.

For each depreciable group analyzed by the retirement rate method, a chart depicting the original and estimated survivor curves followed by a tabular presentation of the original life table plotted on the chart is presented. The survivor curves estimated for the depreciable groups are shown as dark smooth curves on the charts. Each smooth survivor curve is denoted by a numeral followed by the curve type designation. The numeral used is the average life derived from the entire curve from 100 percent to zero percent surviving. The titles of the charts indicate the group, the symbol used to plot the points of the original life table, and the experience and placement bands of the life tables which where plotted. The experience band indicates the range of years for which retirements were used to develop the stub survivor curve. The placements indicate, for the related experience band, the range of years of installations which appear in the experience.

Detailed calculations of the net salvage percentage are presented in account sequence for each account where a historic analysis of net salvage was available in the section beginning at page V-2. The detailed analysis provides the annual net salvage calculations for each year from 1995 through 2009 inclusive, as well as the moving three-year average and the most recent five-year average.

The tables of the calculated annual depreciation applicable to plant as of December 31, 2009 are presented in account sequence starting at page VI-2. The tables indicate the estimated average survivor curves and net salvage percents used in the calculations. The tables set forth, for each installation year, the original cost, calculated accrued depreciation, and the calculated annual accrual.

FORTISBC, INC.

SCHEDULE 1. ESTIMATED SURVIVOR CURVE, ORIGINAL COST, BOOK DEPRECIATION RESERVE AND CALCULATED ANNUAL DEPRECIATION ACCRUALS RELATED TO UTILITY PLANT AS OF DECEMBER 31, 2009
DEPRECIATION RELATED TO RECOVERY OF ORIGINAL COST OF INVESTMENT

	DEPRECIABLE WORK	SURVIVOR CURVE	NET SALVAGE (%)	ORIGINAL COST AT DECEMBER 31, 2009	BOOK DEPRECIATION RESERVE	FUTURE ACCRUALS	CALCULATED ANNUAL ACCRUAL AMOUNT	CALCULATED ANNUAL ACCRUAL RATE	COMPOSITE REMAINING LIFE
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)=(7)/(4)	(9)=(6)/(7)
	GENERATION PLANT								
330.10	LAND RIGHTS	75-R4	0	961,358	(709,439)	1,670,797	36,531	3.80	45.7
331.00	STRUCTURES AND IMPROVEMENTS	60-L3	0	12,015,310	4,714,257	7,301,053	154,738	1.29	47.2
332.00	RESERVOIRS, DAMS, AND WATERWAYS	70-R4	0	24,443,427	3,290,720	21,152,707	492,446	2.01	42.9
333.00	WATER WHEELS, TURBINES, AND GENERATORS	75-R3	0	61,382,405	4,165,975	57,216,430	1,197,917	1.95	47.8
334.00	ACCESSORY ELECTRICAL EQUIPMENT	50-R3	0	27,493,467	7,725,117	19,768,350	648,832	2.36	30.4
335.00	OTHER POWER PLANT EQUIPMENT	45-R4	0	40,893,990	8,029,184	32,864,806	947,694	2.32	34.7
336.00	ROADS, RAILROADS AND BRIDGES	75-S4	0	1,287,435	233,134	1,054,301	19,214	1.49	54.9
	TOTAL GENERATION PLANT			**168,477,392**	**27,448,948**	**141,028,444**	**3,497,372**	**2.08**	
	TRANSMISSION PLANT								
350.10	LAND RIGHTS	75-R3	0	5,798,520	1,103,235	4,695,285	85,106	1.47	55.2
353.00	SUBSTATION EQUIPMENT	50-S4	0	138,236,257	29,775,810	108,460,447	4,758,609	3.44	22.8
355.00	POLES, TOWERS AND FIXTURES	50-R3	0	72,712,210	17,470,103	55,242,107	1,922,254	2.64	28.8
356.00	CONDUCTORS AND DEVICES	60-R3	0	70,447,452	14,363,421	56,084,031	1,442,900	2.05	38.9
359.00	ROADS AND TRAILS	40-R0.5	0	1,121,930	55,044	1,066,886	30,050	2.68	35.5
	TOTAL TRANSMISSION PLANT			**288,316,368**	**62,767,613**	**225,548,755**	**8,238,919**	**2.86**	
	DISTRIBUTION PLANT								
360.10	LAND RIGHTS	75-R3	0	8,477,101	472,271	8,004,830	225,551	2.66	35.5
362.00	SUBSTATION EQUIPMENT	55-S3	0	181,230,662	32,248,509	148,982,153	3,986,601	2.20	37.4
364.00	POLES, TOWERS AND FIXTURES	50-R3	0	126,978,444	34,246,501	92,731,943	2,706,149	2.13	34.2
365.00	CONDUCTORS AND DEVICES	45-R3	0	208,986,680	49,392,215	159,594,465	5,366,420	2.57	29.7
368.00	LINE TRANSFORMERS	45-R4	0	98,456,668	15,995,063	82,461,605	3,360,316	3.41	24.6
369.00	SERVICES	75-R4	0	7,292,398	6,475,852	816,546	11,420	0.16	71.5
370.00	METERS	20-R1	0	13,276,592	6,809,246	6,467,346	887,446	6.68	7.3
371.00	INSTALLATIONS ON CUSTOMERS PREMISES	20-R1	0	937,832	937,832	-	-	-	0.0
373.00	STREET LIGHTING AND SIGNAL SYSTEMS	40-R4	0	10,274,609	1,482,786	8,791,823	2,361,225	22.98	3.7
	TOTAL DISTRIBUTION PLANT			**655,910,986**	**148,060,275**	**507,850,711**	**18,905,128**	**2.88**	
	GENERAL PLANT								
390.00	STRUCTURES - FRAME AND IRON	40-R3	0	337,364	266,696	70,668	2,384	0.71	29.6
390.10	STRUCTURES- MASONRY	35-R3	0	8,931,826	1,729,033	7,202,793	557,504	6.24	12.9
390.20	OPERATIONS BUILDINGS	35-R3	0	12,750,128	2,405,273	10,344,855	767,587	6.02	13.5
391.00	OFFICE FURNITURE AND EQUIPMENT	15-SQ	0	5,475,178	3,811,035	1,664,143	199,244	3.64	8.4
391.10	COMPUTER EQUIPMENT & SOFTWARE	10-SQ	0	31,957,542	20,400,688	11,556,854	1,599,848	5.01	7.2
391.20	PC COMPUTER EQUIPMENT & SOFTWARE	5-SQ	0	24,929,022	14,475,255	10,453,767	2,613,442	10.48	4.0
392.10	LIGHT DUTY VEHICLES	8-L3	20	6,766,552	186,391	5,226,851	1,266,432	18.72	4.1
392.20	HEAVY DUTY VEHICLES	20-L3	20	10,785,689	2,413,034	6,215,518	415,905	3.86	14.9
394.00	TOOLS AND WORK EQUIPMENT	15-SQ	0	10,869,029	6,546,629	4,322,400	438,361	4.03	9.9
397.00	COMMUNICATIONS STRUCTURES AND EQUIPMENT	15-SQ	0	22,698,403	7,165,405	15,532,998	1,827,007	8.05	8.5
	TOTAL GENERAL PLANT.			**135,500,733**	**59,399,439**	**72,590,846**	**9,687,714**	**7.15**	
	TOTAL DEPRECIABLE PLANT			**1,248,205,480**	**297,676,275**	**947,018,757**	**40,329,132**	**3.23**	
	PLANT NOT STUDIED								
114.00	UTILITY PLANT ACQUISITION ADJUSTMENT			11,912,000	4,839,225				
350.00	LAND RIGHTS			7,204,996					
360.00	LAND RIGHTS			2,456,724					
389.00	LAND			11,297,255	34,055				
390.90	LEASEHOLD IMPROVEMENTS			4,401,334	2,054,075				
	TOTAL NON - DEPRECIABLE PLANT			**37,272,309**	**6,927,355**				
	TOTAL PLANT			**1,285,477,789**	**304,603,630**	**947,018,757**	**40,329,132**		

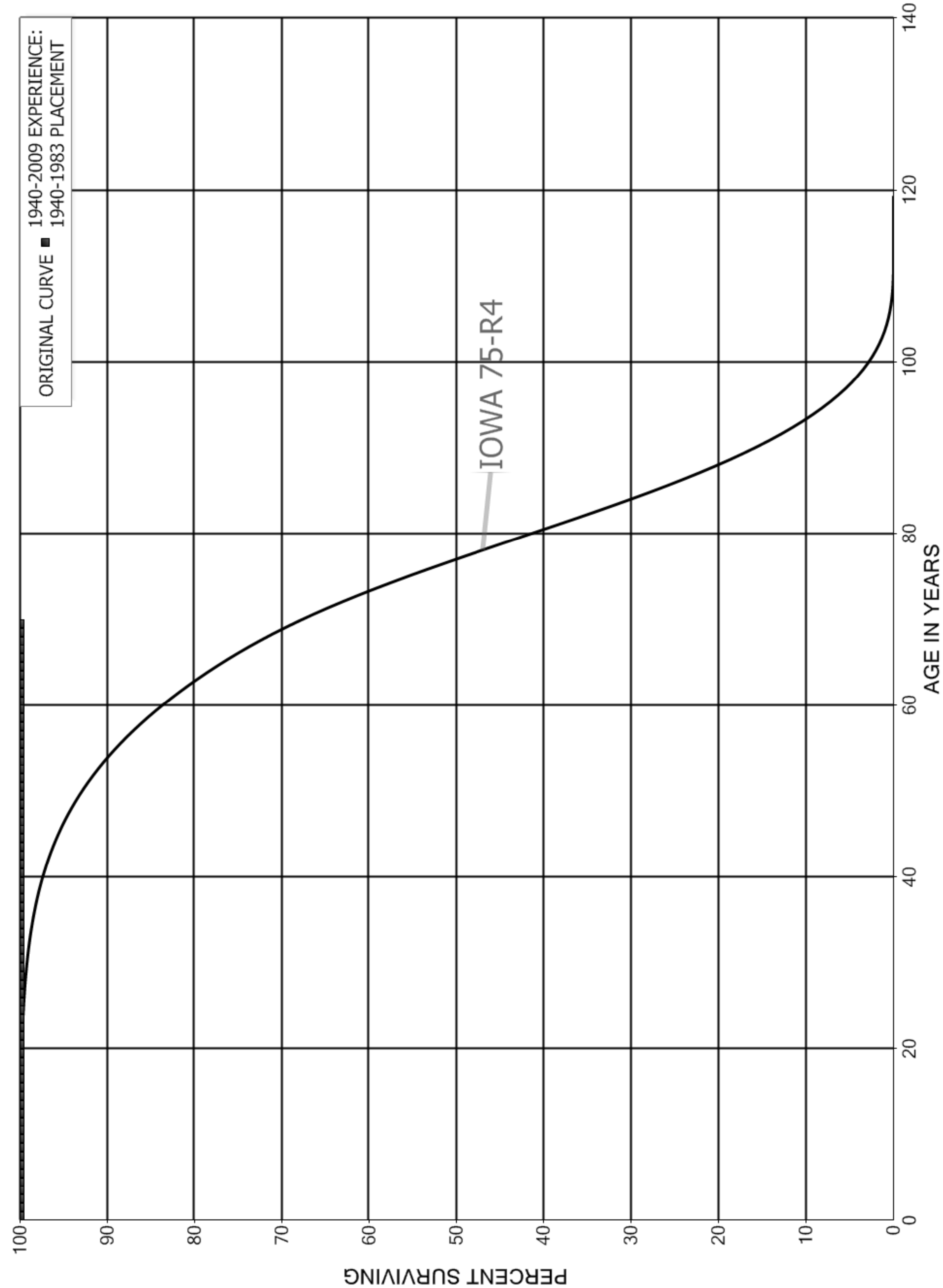
FORTISBC, INC.

SCHEDULE 2. ESTIMATED SURVIVOR CURVE, ORIGINAL COST, BOOK DEPRECIATION RESERVE AND CALCULATED ANNUAL DEPRECIATION ACCRUALS RELATED TO UTILITY PLANT AS OF DECEMBER 31, 2009
DEPRECIATION RELATED TO RECOVERY OF COST OF REMOVAL

	DEPRECIABLE WORK	SURVIVOR CURVE	NET SALVAGE (%)	ORIGINAL COST AT DECEMBER 31, 2009	BOOK DEPRECIATION RESERVE	FUTURE ACCRUALS	CALCULATED ANNUAL ACCRUAL AMOUNT	CALCULATED ANNUAL ACCRUAL RATE	COMPOSITE REMAINING LIFE
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)=(7)/(4)	(9)=(6)/(7)
	GENERATION PLANT								
330.10	LAND RIGHTS	75-R4		961,358					
331.00	STRUCTURES AND IMPROVEMENTS	60-L3	(15)	12,015,310		1,802,297	38,184	0.32	47.2
332.00	RESERVOIRS, DAMS, AND WATERWAYS	70-R4	(15)	24,443,427		3,666,514	85,467	0.35	42.9
333.00	WATER WHEELS, TURBINES, AND GENERATORS	75-R3	(50)	61,382,405		30,691,202	642,075	1.05	47.8
334.00	ACCESSORY ELECTRICAL EQUIPMENT	50-R3	(30)	27,493,467		8,248,040	271,317	0.99	30.4
335.00	OTHER POWER PLANT EQUIPMENT	45-R4	(5)	40,893,990		2,044,700	58,925	0.14	34.7
336.00	ROADS, RAILROADS AND BRIDGES	75-S4		1,287,435					
	TOTAL GENERATION PLANT			**168,477,392**		**46,452,753**	**1,095,968**	**0.65**	
	TRANSMISSION PLANT								
350.10	LAND RIGHTS	75-R3		5,798,520					
353.00	SUBSTATION EQUIPMENT	50-S4	(30)	138,236,257		41,470,877	1,818,898	1.32	22.8
355.00	POLES, TOWERS AND FIXTURES	50-R3	(50)	72,712,210		36,356,105	1,262,365	1.74	28.8
356.00	CONDUCTORS AND DEVICES	60-R3	(50)	70,447,452		35,223,726	905,494	1.29	38.9
359.00	ROADS AND TRAILS	40-R0.5		1,121,930					
	TOTAL TRANSMISSION PLANT			**288,316,368**		**113,050,708**	**3,986,757**	**1.38**	
	DISTRIBUTION PLANT								
360.10	LAND RIGHTS	75-R3		8,477,101					
362.00	SUBSTATION EQUIPMENT	55-S3	(20)	181,230,662		36,246,132	969,148	0.53	37.4
364.00	POLES, TOWERS AND FIXTURES	50-R3	(40)	126,978,444		50,791,378	1,485,128	1.17	34.2
365.00	CONDUCTORS AND DEVICES	45-R3	(25)	208,986,680		52,246,670	1,759,147	0.84	29.7
368.00	LINE TRANSFORMERS	45-R4	(25)	98,456,668		24,614,167	1,000,576	1.02	24.6
369.00	SERVICES	75-R4		7,292,398					
370.00	METERS	20-R1		13,276,592					
371.00	INSTALLATIONS ON CUSTOMERS PREMISES	20-R1		937,832					
373.00	STREET LIGHTING AND SIGNAL SYSTEMS	40-R4	(5)	10,274,609		513,730	138,846	1.35	3.7
	TOTAL DISTRIBUTION PLANT			**655,910,986**		**164,412,078**	**5,352,845**	**0.82**	
	GENERAL PLANT								
390.00	STRUCTURES - FRAME AND IRON	40-R3		337,364					
390.10	STRUCUTRES- MASONRY	35-R3		8,931,826					
390.20	OPERATIONS BUILDINGS	35-R3		12,750,128					
391.00	OFFICE FURNITURE AND EQUIPMENT	15-SQ		5,475,178					
391.10	COMPUTER EQUIPMENT & SOFTWARE	10-SQ		31,957,542					
391.20	PC COMPUTER EQUIPMENT & SOFTWARE	5-SQ		24,929,022					
392.10	LIGHT DUTY VEHICLES	8-L3	20	6,766,552					
392.20	HEAVY DUTY VEHICLES	20-L3	20	10,785,689					
394.00	TOOLS AND WORK EQUIPMENT	15-SQ		10,869,029					
397.00	COMMUNICATIONS STRUCTURES AND EQUIPMENT	15-SQ		22,698,403					
	TOTAL GENERAL PLANT.			**135,500,733**					
	TOTAL DEPRECIABLE PLANT			**1,248,205,480**		**323,915,538**	**10,435,570**	**0.84**	
	PLANT NOT STUDIED								
114.00	UTILITY PLANT ACQUISITION ADJUSTMENT			11,912,000					
350.00	LAND RIGHTS			7,204,996					
360.00	LAND RIGHTS			2,456,724					
389.00	LAND			11,297,255					
390.90	LEASEHOLD IMPROVEMENTS			4,401,334					
	TOTAL NON - DEPRECIABLE PLANT			**37,272,309**					
	TOTAL PLANT			**1,285,477,789**		**323,915,538**	**10,442,253**		

PART IV. SERVICE LIFE STATISTICS

FORTISBC, INC.
ACCOUNT 330.10 - LAND RIGHTS
ORIGINAL AND SMOOTH SURVIVOR CURVES



FORTISBC, INC.

ACCOUNT 330.10 - LAND RIGHTS

ORIGINAL LIFE TABLE

PLACEMENT BAND 1940-1983 EXPERIENCE BAND 1940-2009

AGE AT BEGIN OF INTERVAL	EXPOSURES AT BEGINNING OF AGE INTERVAL	RETIREMENTS DURING AGE INTERVAL	RETMT RATIO	SURV RATIO	PCT SURV BEGIN OF INTERVAL
0.0	961,358		0.0000	1.0000	100.00
0.5	961,358		0.0000	1.0000	100.00
1.5	961,358		0.0000	1.0000	100.00
2.5	961,358		0.0000	1.0000	100.00
3.5	961,358		0.0000	1.0000	100.00
4.5	961,358		0.0000	1.0000	100.00
5.5	961,358		0.0000	1.0000	100.00
6.5	961,358		0.0000	1.0000	100.00
7.5	961,358		0.0000	1.0000	100.00
8.5	961,358		0.0000	1.0000	100.00
9.5	961,358		0.0000	1.0000	100.00
10.5	961,358		0.0000	1.0000	100.00
11.5	961,358		0.0000	1.0000	100.00
12.5	961,358		0.0000	1.0000	100.00
13.5	961,358		0.0000	1.0000	100.00
14.5	961,358		0.0000	1.0000	100.00
15.5	961,358		0.0000	1.0000	100.00
16.5	961,358		0.0000	1.0000	100.00
17.5	961,358		0.0000	1.0000	100.00
18.5	961,358		0.0000	1.0000	100.00
19.5	961,358		0.0000	1.0000	100.00
20.5	961,358		0.0000	1.0000	100.00
21.5	961,358		0.0000	1.0000	100.00
22.5	961,358		0.0000	1.0000	100.00
23.5	961,358		0.0000	1.0000	100.00
24.5	961,358		0.0000	1.0000	100.00
25.5	961,358		0.0000	1.0000	100.00
26.5	98,939		0.0000	1.0000	100.00
27.5	15,998		0.0000	1.0000	100.00
28.5	15,998		0.0000	1.0000	100.00
29.5	15,998		0.0000	1.0000	100.00
30.5	15,998		0.0000	1.0000	100.00
31.5	15,998		0.0000	1.0000	100.00
32.5	15,998		0.0000	1.0000	100.00
33.5	15,998		0.0000	1.0000	100.00
34.5	15,998		0.0000	1.0000	100.00
35.5	15,998		0.0000	1.0000	100.00
36.5	15,998		0.0000	1.0000	100.00
37.5	15,998		0.0000	1.0000	100.00
38.5	15,998		0.0000	1.0000	100.00

FORTISBC, INC.

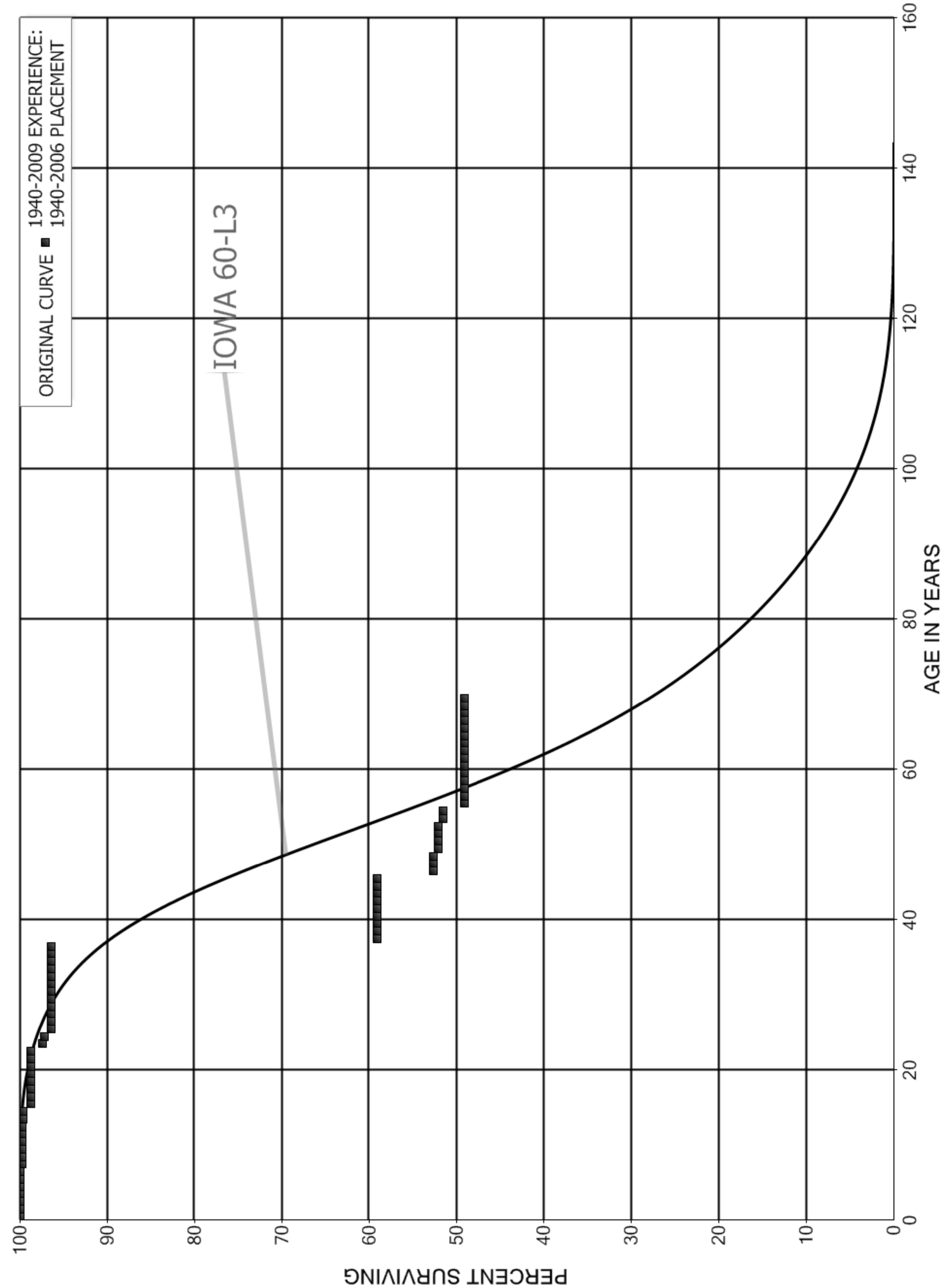
ACCOUNT 330.10 - LAND RIGHTS

ORIGINAL LIFE TABLE, CONT.

PLACEMENT BAND 1940-1983 EXPERIENCE BAND 1940-2009

AGE AT BEGIN OF INTERVAL	EXPOSURES AT BEGINNING OF AGE INTERVAL	RETIREMENTS DURING AGE INTERVAL	RETMT RATIO	SURV RATIO	PCT SURV BEGIN OF INTERVAL
39.5	15,998		0.0000	1.0000	100.00
40.5	15,998		0.0000	1.0000	100.00
41.5	15,998		0.0000	1.0000	100.00
42.5	15,998		0.0000	1.0000	100.00
43.5	15,998		0.0000	1.0000	100.00
44.5	15,998		0.0000	1.0000	100.00
45.5	15,998		0.0000	1.0000	100.00
46.5	15,998		0.0000	1.0000	100.00
47.5	15,998		0.0000	1.0000	100.00
48.5	15,998		0.0000	1.0000	100.00
49.5	15,998		0.0000	1.0000	100.00
50.5	15,998		0.0000	1.0000	100.00
51.5	15,998		0.0000	1.0000	100.00
52.5	15,998		0.0000	1.0000	100.00
53.5	15,998		0.0000	1.0000	100.00
54.5	15,998		0.0000	1.0000	100.00
55.5	15,998		0.0000	1.0000	100.00
56.5	15,998		0.0000	1.0000	100.00
57.5	15,998		0.0000	1.0000	100.00
58.5	15,998		0.0000	1.0000	100.00
59.5	15,998		0.0000	1.0000	100.00
60.5	15,998		0.0000	1.0000	100.00
61.5	15,998		0.0000	1.0000	100.00
62.5	15,998		0.0000	1.0000	100.00
63.5	15,998		0.0000	1.0000	100.00
64.5	15,998		0.0000	1.0000	100.00
65.5	15,998		0.0000	1.0000	100.00
66.5	15,998		0.0000	1.0000	100.00
67.5	15,998		0.0000	1.0000	100.00
68.5	15,998		0.0000	1.0000	100.00
69.5					100.00

FORTISBC, INC.
ACCOUNT 331.00 - STRUCTURES AND IMPROVEMENTS
ORIGINAL AND SMOOTH SURVIVOR CURVES



FORTISBC, INC.

ACCOUNT 331.00 - STRUCTURES AND IMPROVEMENTS

ORIGINAL LIFE TABLE

PLACEMENT BAND 1940-2006 EXPERIENCE BAND 1940-2009

AGE AT BEGIN OF INTERVAL	EXPOSURES AT BEGINNING OF AGE INTERVAL	RETIREMENTS DURING AGE INTERVAL	RETMT RATIO	SURV RATIO	PCT SURV BEGIN OF INTERVAL
0.0	12,410,509	22	0.0000	1.0000	100.00
0.5	12,410,487	3	0.0000	1.0000	100.00
1.5	12,410,483	24	0.0000	1.0000	100.00
2.5	12,410,459	2	0.0000	1.0000	100.00
3.5	12,410,456	13	0.0000	1.0000	100.00
4.5	12,410,442	2	0.0000	1.0000	100.00
5.5	12,235,746	12,150	0.0010	0.9990	100.00
6.5	11,647,414	24,726	0.0021	0.9979	99.90
7.5	11,237,542	2	0.0000	1.0000	99.69
8.5	10,254,541	6	0.0000	1.0000	99.69
9.5	9,084,961	6	0.0000	1.0000	99.69
10.5	8,999,993	16	0.0000	1.0000	99.69
11.5	6,029,362		0.0000	1.0000	99.69
12.5	5,935,161	4,122	0.0007	0.9993	99.69
13.5	5,783,643		0.0000	1.0000	99.62
14.5	3,595,240	31,200	0.0087	0.9913	99.62
15.5	3,390,404		0.0000	1.0000	98.75
16.5	2,254,094		0.0000	1.0000	98.75
17.5	2,254,094		0.0000	1.0000	98.75
18.5	2,254,094		0.0000	1.0000	98.75
19.5	1,491,541		0.0000	1.0000	98.75
20.5	1,491,541		0.0000	1.0000	98.75
21.5	1,491,541		0.0000	1.0000	98.75
22.5	1,491,541	20,654	0.0138	0.9862	98.75
23.5	1,417,548	3,832	0.0027	0.9973	97.39
24.5	1,364,476	10,530	0.0077	0.9923	97.12
25.5	1,350,311		0.0000	1.0000	96.37
26.5	1,350,311		0.0000	1.0000	96.37
27.5	586,555		0.0000	1.0000	96.37
28.5	586,555		0.0000	1.0000	96.37
29.5	586,555		0.0000	1.0000	96.37
30.5	586,555		0.0000	1.0000	96.37
31.5	586,555		0.0000	1.0000	96.37
32.5	586,555		0.0000	1.0000	96.37
33.5	586,555		0.0000	1.0000	96.37
34.5	586,555		0.0000	1.0000	96.37
35.5	586,555		0.0000	1.0000	96.37
36.5	586,555	227,314	0.3875	0.6125	96.37
37.5	359,241		0.0000	1.0000	59.02
38.5	359,241		0.0000	1.0000	59.02

FORTISBC, INC.

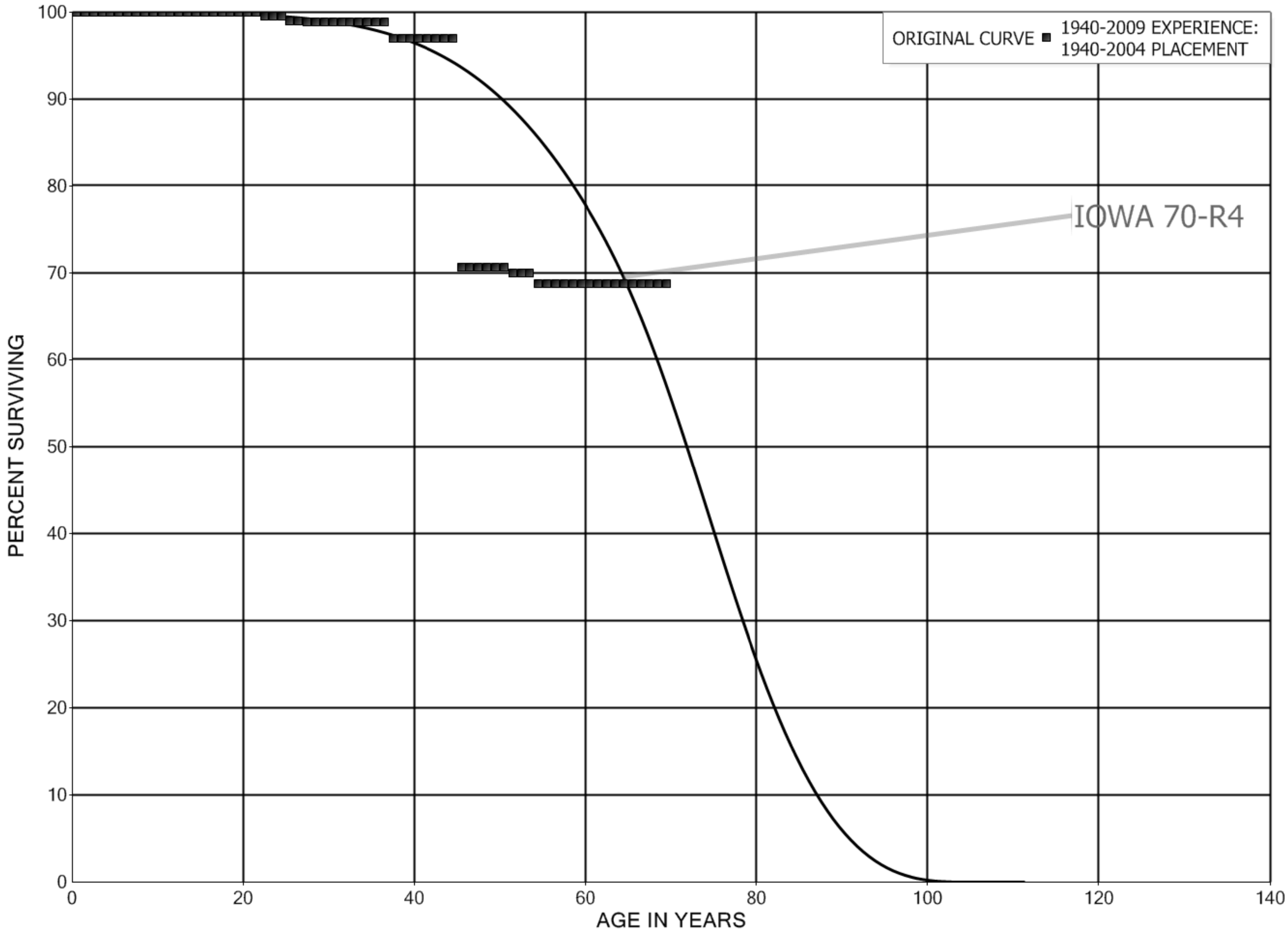
ACCOUNT 331.00 - STRUCTURES AND IMPROVEMENTS

ORIGINAL LIFE TABLE, CONT.

PLACEMENT BAND 1940-2006 EXPERIENCE BAND 1940-2009

AGE AT BEGIN OF INTERVAL	EXPOSURES AT BEGINNING OF AGE INTERVAL	RETIREMENTS DURING AGE INTERVAL	RETMT RATIO	SURV RATIO	PCT SURV BEGIN OF INTERVAL
39.5	359,241		0.0000	1.0000	59.02
40.5	359,241		0.0000	1.0000	59.02
41.5	359,241		0.0000	1.0000	59.02
42.5	359,241		0.0000	1.0000	59.02
43.5	359,241		0.0000	1.0000	59.02
44.5	359,241		0.0000	1.0000	59.02
45.5	359,241	39,309	0.1094	0.8906	59.02
46.5	319,932		0.0000	1.0000	52.57
47.5	319,932		0.0000	1.0000	52.57
48.5	319,932	2,935	0.0092	0.9908	52.57
49.5	316,997		0.0000	1.0000	52.08
50.5	316,997		0.0000	1.0000	52.08
51.5	316,997		0.0000	1.0000	52.08
52.5	316,997	3,653	0.0115	0.9885	52.08
53.5	313,344		0.0000	1.0000	51.48
54.5	313,344	14,675	0.0468	0.9532	51.48
55.5	298,669		0.0000	1.0000	49.07
56.5	298,669		0.0000	1.0000	49.07
57.5	298,669		0.0000	1.0000	49.07
58.5	298,669		0.0000	1.0000	49.07
59.5	298,669		0.0000	1.0000	49.07
60.5	298,669		0.0000	1.0000	49.07
61.5	298,669		0.0000	1.0000	49.07
62.5	298,669		0.0000	1.0000	49.07
63.5	298,669		0.0000	1.0000	49.07
64.5	298,669		0.0000	1.0000	49.07
65.5	298,669		0.0000	1.0000	49.07
66.5	298,669		0.0000	1.0000	49.07
67.5	298,669		0.0000	1.0000	49.07
68.5	298,669		0.0000	1.0000	49.07
69.5					49.07

FORTISBC, INC.
ACCOUNT 332.00 - RESERVOIRS, DAMS, AND WATERWAYS
ORIGINAL AND SMOOTH SURVIVOR CURVES



FORTISBC, INC.

ACCOUNT 332.00 - RESERVOIRS, DAMS, AND WATERWAYS

ORIGINAL LIFE TABLE

PLACEMENT BAND 1940-2004 EXPERIENCE BAND 1940-2009

AGE AT BEGIN OF INTERVAL	EXPOSURES AT BEGINNING OF AGE INTERVAL	RETIREMENTS DURING AGE INTERVAL	RETMT RATIO	SURV RATIO	PCT SURV BEGIN OF INTERVAL
0.0	25,040,208	235	0.0000	1.0000	100.00
0.5	25,039,973	218	0.0000	1.0000	100.00
1.5	25,039,755	215	0.0000	1.0000	100.00
2.5	25,039,540	333	0.0000	1.0000	100.00
3.5	25,039,207	116	0.0000	1.0000	100.00
4.5	25,039,090	124	0.0000	1.0000	100.00
5.5	23,934,727	93	0.0000	1.0000	100.00
6.5	23,087,090	111	0.0000	1.0000	99.99
7.5	23,086,979	752	0.0000	1.0000	99.99
8.5	23,086,227	2,827	0.0001	0.9999	99.99
9.5	22,383,650	5	0.0000	1.0000	99.98
10.5	22,383,645		0.0000	1.0000	99.98
11.5	22,383,645	4,752	0.0002	0.9998	99.98
12.5	22,357,216		0.0000	1.0000	99.96
13.5	22,344,138	2	0.0000	1.0000	99.96
14.5	22,344,136		0.0000	1.0000	99.96
15.5	21,108,273		0.0000	1.0000	99.96
16.5	18,124,124	4	0.0000	1.0000	99.96
17.5	17,651,789		0.0000	1.0000	99.96
18.5	16,694,527		0.0000	1.0000	99.96
19.5	16,536,952		0.0000	1.0000	99.96
20.5	16,211,071		0.0000	1.0000	99.96
21.5	15,975,684	68,452	0.0043	0.9957	99.96
22.5	15,661,023	2,102	0.0001	0.9999	99.53
23.5	15,637,547	3,015	0.0002	0.9998	99.52
24.5	15,634,532	83,507	0.0053	0.9947	99.50
25.5	15,542,728		0.0000	1.0000	98.97
26.5	15,542,728	19,693	0.0013	0.9987	98.97
27.5	1,356,312		0.0000	1.0000	98.84
28.5	1,356,312		0.0000	1.0000	98.84
29.5	1,356,312		0.0000	1.0000	98.84
30.5	1,356,312		0.0000	1.0000	98.84
31.5	1,356,312		0.0000	1.0000	98.84
32.5	1,352,574		0.0000	1.0000	98.84
33.5	1,352,574		0.0000	1.0000	98.84
34.5	1,352,574		0.0000	1.0000	98.84
35.5	1,352,574		0.0000	1.0000	98.84
36.5	1,352,574	26,222	0.0194	0.9806	98.84
37.5	1,326,352		0.0000	1.0000	96.92
38.5	1,326,352		0.0000	1.0000	96.92

FORTISBC, INC.

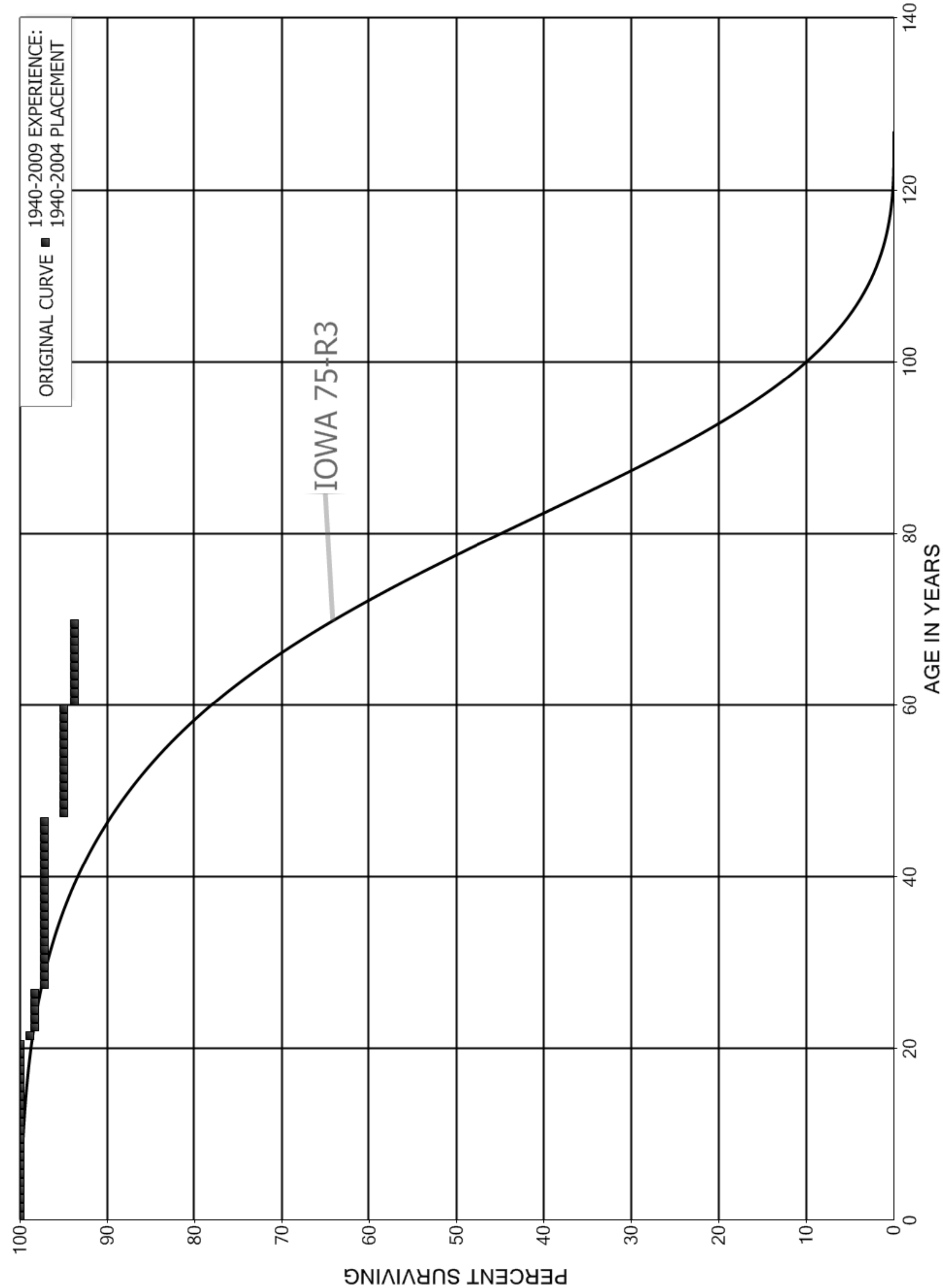
ACCOUNT 332.00 - RESERVOIRS, DAMS, AND WATERWAYS

ORIGINAL LIFE TABLE, CONT.

PLACEMENT BAND 1940-2004 EXPERIENCE BAND 1940-2009

AGE AT BEGIN OF INTERVAL	EXPOSURES AT BEGINNING OF AGE INTERVAL	RETIREMENTS DURING AGE INTERVAL	RETMT RATIO	SURV RATIO	PCT SURV BEGIN OF INTERVAL
39.5	1,326,352		0.0000	1.0000	96.92
40.5	1,326,352		0.0000	1.0000	96.92
41.5	1,326,352		0.0000	1.0000	96.92
42.5	1,326,352		0.0000	1.0000	96.92
43.5	1,326,352		0.0000	1.0000	96.92
44.5	1,326,352	359,807	0.2713	0.7287	96.92
45.5	966,545		0.0000	1.0000	70.63
46.5	966,545		0.0000	1.0000	70.63
47.5	966,545		0.0000	1.0000	70.63
48.5	966,545	698	0.0007	0.9993	70.63
49.5	881,443		0.0000	1.0000	70.58
50.5	881,443	8,068	0.0092	0.9908	70.58
51.5	873,375		0.0000	1.0000	69.93
52.5	873,375		0.0000	1.0000	69.93
53.5	873,375	15,430	0.0177	0.9823	69.93
54.5	857,945		0.0000	1.0000	68.70
55.5	857,945		0.0000	1.0000	68.70
56.5	857,945		0.0000	1.0000	68.70
57.5	857,945		0.0000	1.0000	68.70
58.5	857,945		0.0000	1.0000	68.70
59.5	857,945		0.0000	1.0000	68.70
60.5	857,945		0.0000	1.0000	68.70
61.5	857,945		0.0000	1.0000	68.70
62.5	857,945		0.0000	1.0000	68.70
63.5	857,945		0.0000	1.0000	68.70
64.5	857,945		0.0000	1.0000	68.70
65.5	857,945		0.0000	1.0000	68.70
66.5	857,945		0.0000	1.0000	68.70
67.5	857,945		0.0000	1.0000	68.70
68.5	857,945		0.0000	1.0000	68.70
69.5					68.70

FORTISBC, INC.
ACCOUNT 333.00 - WATER WHEELS, TURBINES, AND GENERATORS
ORIGINAL AND SMOOTH SURVIVOR CURVES



FORTISBC, INC.

ACCOUNT 333.00 - WATER WHEELS, TURBINES, AND GENERATORS

ORIGINAL LIFE TABLE

PLACEMENT BAND 1940-2004 EXPERIENCE BAND 1940-2009

AGE AT BEGIN OF INTERVAL	EXPOSURES AT BEGINNING OF AGE INTERVAL	RETIREMENTS DURING AGE INTERVAL	RETMT RATIO	SURV RATIO	PCT SURV BEGIN OF INTERVAL
0.0	62,697,338	1,847	0.0000	1.0000	100.00
0.5	62,695,491	146	0.0000	1.0000	100.00
1.5	62,695,345	5,712	0.0001	0.9999	100.00
2.5	62,689,633	215	0.0000	1.0000	99.99
3.5	62,689,417	564	0.0000	1.0000	99.99
4.5	62,688,853	350	0.0000	1.0000	99.99
5.5	48,891,933	202	0.0000	1.0000	99.99
6.5	48,780,544	78	0.0000	1.0000	99.99
7.5	48,613,305		0.0000	1.0000	99.99
8.5	41,830,187		0.0000	1.0000	99.99
9.5	38,537,495	77	0.0000	1.0000	99.99
10.5	38,412,481		0.0000	1.0000	99.99
11.5	33,637,372		0.0000	1.0000	99.99
12.5	33,465,021	16	0.0000	1.0000	99.99
13.5	33,031,807	84	0.0000	1.0000	99.99
14.5	32,773,765	34	0.0000	1.0000	99.98
15.5	32,630,160	112	0.0000	1.0000	99.98
16.5	32,576,869		0.0000	1.0000	99.98
17.5	32,576,869	12,573	0.0004	0.9996	99.98
18.5	32,564,297		0.0000	1.0000	99.95
19.5	32,517,792		0.0000	1.0000	99.95
20.5	32,517,792	362,137	0.0111	0.9889	99.95
21.5	32,155,654	166,625	0.0052	0.9948	98.83
22.5	31,980,348		0.0000	1.0000	98.32
23.5	31,936,684	729	0.0000	1.0000	98.32
24.5	31,918,854		0.0000	1.0000	98.32
25.5	31,865,135		0.0000	1.0000	98.32
26.5	31,865,135	355,334	0.0112	0.9888	98.32
27.5	16,605,071		0.0000	1.0000	97.22
28.5	16,605,071		0.0000	1.0000	97.22
29.5	16,605,071		0.0000	1.0000	97.22
30.5	16,603,448		0.0000	1.0000	97.22
31.5	16,603,448		0.0000	1.0000	97.22
32.5	16,603,448		0.0000	1.0000	97.22
33.5	16,603,448		0.0000	1.0000	97.22
34.5	16,603,448		0.0000	1.0000	97.22
35.5	16,603,448		0.0000	1.0000	97.22
36.5	16,603,448		0.0000	1.0000	97.22
37.5	16,603,448		0.0000	1.0000	97.22
38.5	16,603,448	4,196	0.0003	0.9997	97.22

FORTISBC, INC.

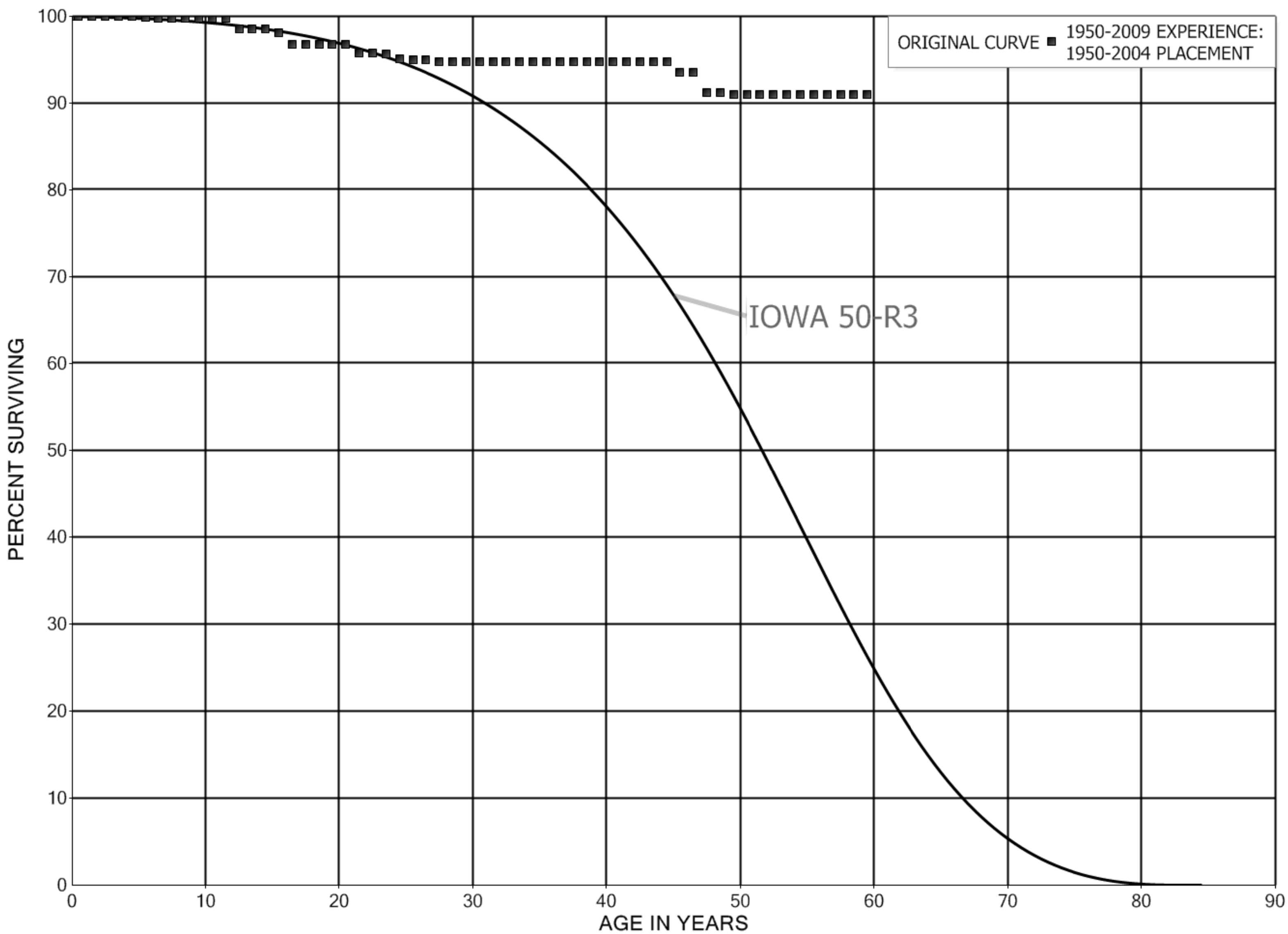
ACCOUNT 333.00 - WATER WHEELS, TURBINES, AND GENERATORS

ORIGINAL LIFE TABLE, CONT.

PLACEMENT BAND 1940-2004 EXPERIENCE BAND 1940-2009

AGE AT BEGIN OF INTERVAL	EXPOSURES AT BEGINNING OF AGE INTERVAL	RETIREMENTS DURING AGE INTERVAL	RETMT RATIO	SURV RATIO	PCT SURV BEGIN OF INTERVAL
39.5	16,599,252	11,818	0.0007	0.9993	97.20
40.5	16,587,435		0.0000	1.0000	97.13
41.5	16,587,435		0.0000	1.0000	97.13
42.5	16,587,435		0.0000	1.0000	97.13
43.5	16,587,435		0.0000	1.0000	97.13
44.5	16,587,435		0.0000	1.0000	97.13
45.5	16,587,435	355	0.0000	1.0000	97.13
46.5	16,587,080	367,027	0.0221	0.9779	97.13
47.5	16,220,053		0.0000	1.0000	94.98
48.5	16,220,053	13,147	0.0008	0.9992	94.98
49.5	904,696		0.0000	1.0000	94.90
50.5	904,696		0.0000	1.0000	94.90
51.5	904,696		0.0000	1.0000	94.90
52.5	904,696		0.0000	1.0000	94.90
53.5	904,696		0.0000	1.0000	94.90
54.5	904,696		0.0000	1.0000	94.90
55.5	904,696		0.0000	1.0000	94.90
56.5	904,696		0.0000	1.0000	94.90
57.5	904,696		0.0000	1.0000	94.90
58.5	904,696		0.0000	1.0000	94.90
59.5	904,696	11,555	0.0128	0.9872	94.90
60.5	893,140		0.0000	1.0000	93.69
61.5	893,140		0.0000	1.0000	93.69
62.5	893,140		0.0000	1.0000	93.69
63.5	893,140		0.0000	1.0000	93.69
64.5	893,140		0.0000	1.0000	93.69
65.5	893,140		0.0000	1.0000	93.69
66.5	893,140		0.0000	1.0000	93.69
67.5	893,140		0.0000	1.0000	93.69
68.5	893,140		0.0000	1.0000	93.69
69.5					93.69

FORTISBC, INC.
ACCOUNT 334.00 - ACCESSORY ELECTRICAL EQUIPMENT
ORIGINAL AND SMOOTH SURVIVOR CURVES



FORTISBC, INC.

ACCOUNT 334.00 - ACCESSORY ELECTRICAL EQUIPMENT

ORIGINAL LIFE TABLE

PLACEMENT BAND 1950-2004 EXPERIENCE BAND 1950-2009

AGE AT BEGIN OF INTERVAL	EXPOSURES AT BEGINNING OF AGE INTERVAL	RETIREMENTS DURING AGE INTERVAL	RETMT RATIO	SURV RATIO	PCT SURV BEGIN OF INTERVAL
0.0	28,194,492	1	0.0000	1.0000	100.00
0.5	28,194,492	2	0.0000	1.0000	100.00
1.5	28,194,489		0.0000	1.0000	100.00
2.5	28,194,489	28,650	0.0010	0.9990	100.00
3.5	28,165,839		0.0000	1.0000	99.90
4.5	28,165,839	21,670	0.0008	0.9992	99.90
5.5	22,885,086	16,800	0.0007	0.9993	99.82
6.5	22,671,969	300	0.0000	1.0000	99.75
7.5	21,662,594	6	0.0000	1.0000	99.75
8.5	18,258,959		0.0000	1.0000	99.75
9.5	13,865,266	4	0.0000	1.0000	99.75
10.5	13,658,103		0.0000	1.0000	99.75
11.5	13,102,112	170,267	0.0130	0.9870	99.75
12.5	7,823,139		0.0000	1.0000	98.45
13.5	7,352,756		0.0000	1.0000	98.45
14.5	6,943,660	27,435	0.0040	0.9960	98.45
15.5	6,813,239	94,037	0.0138	0.9862	98.06
16.5	6,505,918	1	0.0000	1.0000	96.71
17.5	6,505,918	2	0.0000	1.0000	96.71
18.5	6,505,916	1	0.0000	1.0000	96.71
19.5	6,505,915		0.0000	1.0000	96.71
20.5	6,505,915	69,044	0.0106	0.9894	96.71
21.5	6,436,871		0.0000	1.0000	95.68
22.5	6,436,871	5,469	0.0008	0.9992	95.68
23.5	6,280,675	37,818	0.0060	0.9940	95.60
24.5	6,242,856	5,865	0.0009	0.9991	95.02
25.5	6,157,103		0.0000	1.0000	94.94
26.5	6,157,103	11,866	0.0019	0.9981	94.94
27.5	5,285,547		0.0000	1.0000	94.75
28.5	5,285,547		0.0000	1.0000	94.75
29.5	5,285,547		0.0000	1.0000	94.75
30.5	5,285,547		0.0000	1.0000	94.75
31.5	5,273,364		0.0000	1.0000	94.75
32.5	5,268,983		0.0000	1.0000	94.75
33.5	5,259,200		0.0000	1.0000	94.75
34.5	5,252,965		0.0000	1.0000	94.75
35.5	5,252,965		0.0000	1.0000	94.75
36.5	5,252,965		0.0000	1.0000	94.75
37.5	5,252,965		0.0000	1.0000	94.75
38.5	5,252,965		0.0000	1.0000	94.75

FORTISBC, INC.

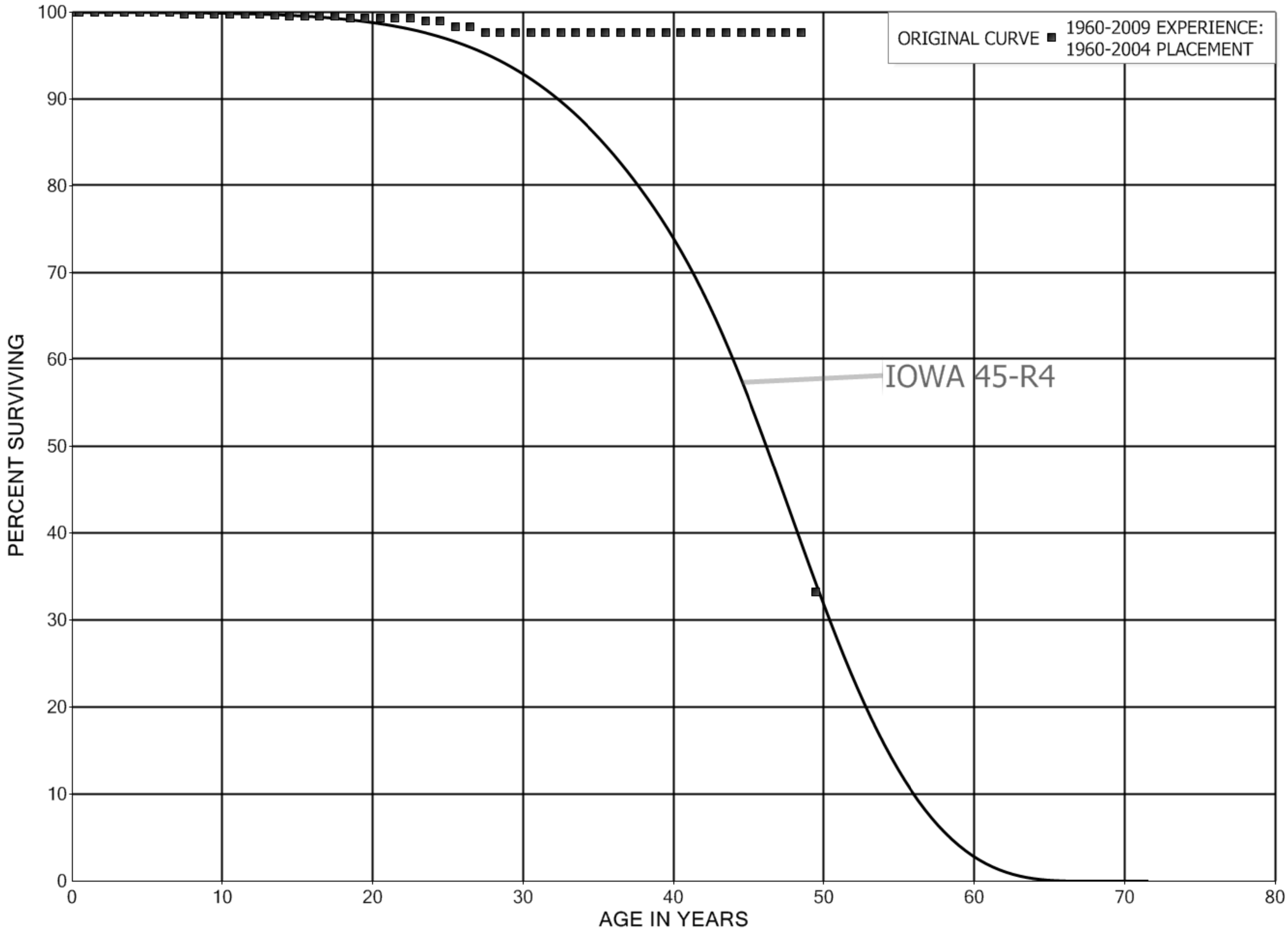
ACCOUNT 334.00 - ACCESSORY ELECTRICAL EQUIPMENT

ORIGINAL LIFE TABLE, CONT.

PLACEMENT BAND 1950-2004 EXPERIENCE BAND 1950-2009

AGE AT BEGIN OF INTERVAL	EXPOSURES AT BEGINNING OF AGE INTERVAL	RETIREMENTS DURING AGE INTERVAL	RETMT RATIO	SURV RATIO	PCT SURV BEGIN OF INTERVAL
39.5	5,252,965		0.0000	1.0000	94.75
40.5	5,252,965		0.0000	1.0000	94.75
41.5	5,252,965		0.0000	1.0000	94.75
42.5	5,252,965		0.0000	1.0000	94.75
43.5	5,252,965	1,947	0.0004	0.9996	94.75
44.5	5,251,017	64,694	0.0123	0.9877	94.72
45.5	5,186,323		0.0000	1.0000	93.55
46.5	5,186,323	132,922	0.0256	0.9744	93.55
47.5	5,053,401		0.0000	1.0000	91.15
48.5	5,053,401	12,223	0.0024	0.9976	91.15
49.5	493,652		0.0000	1.0000	90.93
50.5	493,652		0.0000	1.0000	90.93
51.5	493,652		0.0000	1.0000	90.93
52.5	493,652		0.0000	1.0000	90.93
53.5	493,652		0.0000	1.0000	90.93
54.5	493,652		0.0000	1.0000	90.93
55.5	493,652		0.0000	1.0000	90.93
56.5	493,652		0.0000	1.0000	90.93
57.5	493,652		0.0000	1.0000	90.93
58.5	493,652		0.0000	1.0000	90.93
59.5					90.93

FORTISBC, INC.
ACCOUNT 335.00 - OTHER POWER PLANT EQUIPMENT
ORIGINAL AND SMOOTH SURVIVOR CURVES



FORTISBC, INC.

ACCOUNT 335.00 - OTHER POWER PLANT EQUIPMENT

ORIGINAL LIFE TABLE

PLACEMENT BAND 1960-2004 EXPERIENCE BAND 1960-2009

AGE AT BEGIN OF INTERVAL	EXPOSURES AT BEGINNING OF AGE INTERVAL	RETIREMENTS DURING AGE INTERVAL	RETMT RATIO	SURV RATIO	PCT SURV BEGIN OF INTERVAL
0.0	41,127,153	3,037	0.0001	0.9999	100.00
0.5	41,124,116	3,192	0.0001	0.9999	99.99
1.5	41,120,924	6,995	0.0002	0.9998	99.98
2.5	41,113,929	8,763	0.0002	0.9998	99.97
3.5	41,105,166	5,976	0.0001	0.9999	99.95
4.5	41,099,191	1,783	0.0000	1.0000	99.93
5.5	30,694,070	2,528	0.0001	0.9999	99.93
6.5	12,452,934	20,037	0.0016	0.9984	99.92
7.5	11,937,787	273	0.0000	1.0000	99.76
8.5	11,227,427	1,313	0.0001	0.9999	99.76
9.5	10,288,278	3,603	0.0004	0.9996	99.74
10.5	9,576,469	3,149	0.0003	0.9997	99.71
11.5	8,294,057		0.0000	1.0000	99.68
12.5	7,942,693	1,020	0.0001	0.9999	99.68
13.5	7,558,975	9,472	0.0013	0.9987	99.66
14.5	7,470,216	2,257	0.0003	0.9997	99.54
15.5	7,159,045	1,520	0.0002	0.9998	99.51
16.5	6,777,934		0.0000	1.0000	99.49
17.5	6,499,640	15,786	0.0024	0.9976	99.49
18.5	6,380,526		0.0000	1.0000	99.25
19.5	6,089,354		0.0000	1.0000	99.25
20.5	5,978,682		0.0000	1.0000	99.25
21.5	5,978,682		0.0000	1.0000	99.25
22.5	5,920,043	20,946	0.0035	0.9965	99.25
23.5	5,412,859		0.0000	1.0000	98.90
24.5	5,309,444	30,528	0.0057	0.9943	98.90
25.5	5,216,700		0.0000	1.0000	98.33
26.5	5,216,700	35,514	0.0068	0.9932	98.33
27.5	84,069		0.0000	1.0000	97.66
28.5	84,069		0.0000	1.0000	97.66
29.5	84,069		0.0000	1.0000	97.66
30.5	84,069		0.0000	1.0000	97.66
31.5	84,069		0.0000	1.0000	97.66
32.5	84,069		0.0000	1.0000	97.66
33.5	84,069		0.0000	1.0000	97.66
34.5	84,069		0.0000	1.0000	97.66
35.5	84,069		0.0000	1.0000	97.66
36.5	84,069		0.0000	1.0000	97.66
37.5	84,069		0.0000	1.0000	97.66
38.5	84,069		0.0000	1.0000	97.66

FORTISBC, INC.

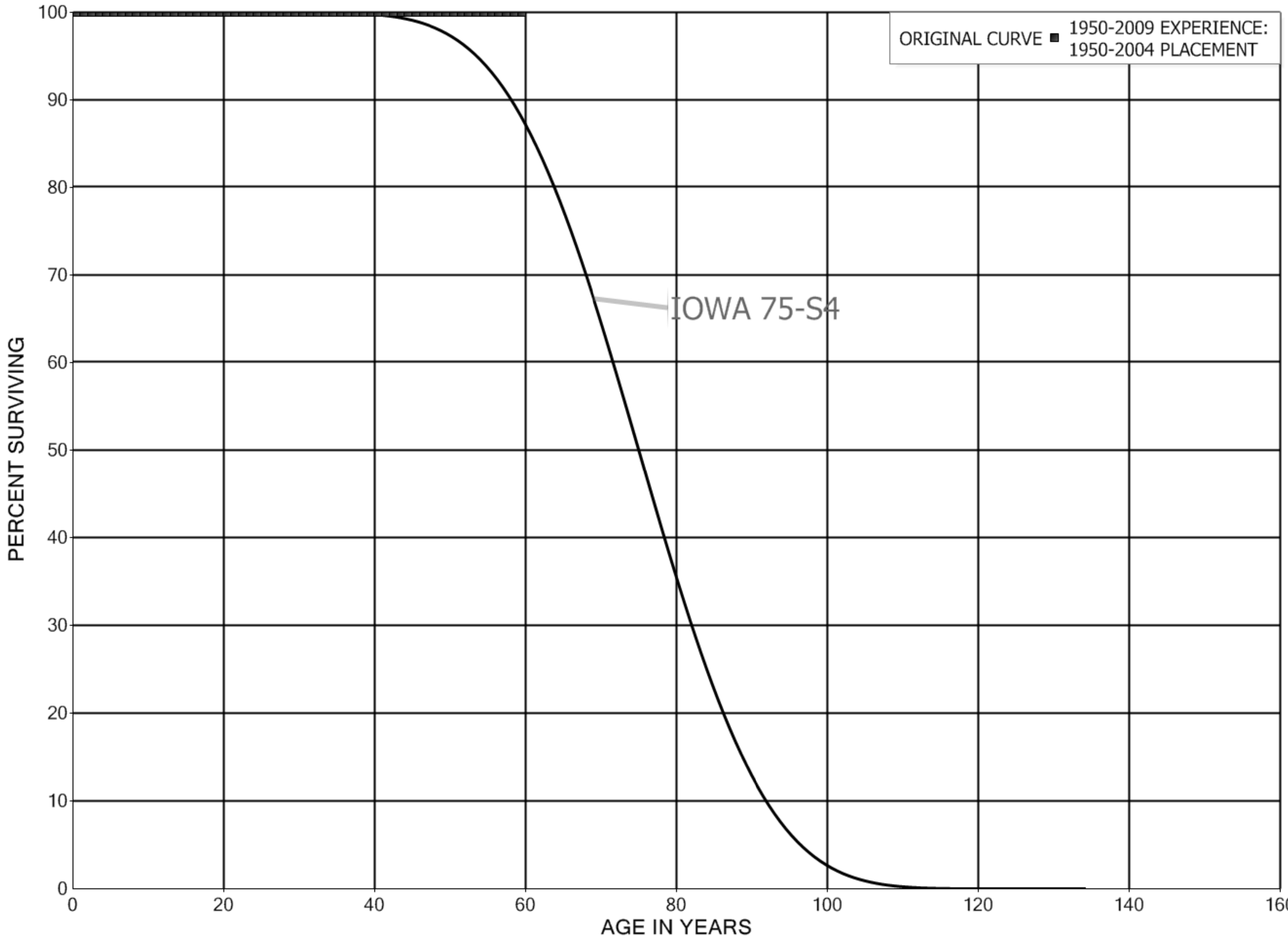
ACCOUNT 335.00 - OTHER POWER PLANT EQUIPMENT

ORIGINAL LIFE TABLE, CONT.

PLACEMENT BAND 1960-2004 EXPERIENCE BAND 1960-2009

AGE AT BEGIN OF INTERVAL	EXPOSURES AT BEGINNING OF AGE INTERVAL	RETIREMENTS DURING AGE INTERVAL	RETMT RATIO	SURV RATIO	PCT SURV BEGIN OF INTERVAL
39.5	84,069		0.0000	1.0000	97.66
40.5	84,069		0.0000	1.0000	97.66
41.5	84,069		0.0000	1.0000	97.66
42.5	84,069		0.0000	1.0000	97.66
43.5	84,069		0.0000	1.0000	97.66
44.5	84,069		0.0000	1.0000	97.66
45.5	84,069		0.0000	1.0000	97.66
46.5	84,069		0.0000	1.0000	97.66
47.5	84,069		0.0000	1.0000	97.66
48.5	84,069	55,471	0.6598	0.3402	97.66
49.5					33.22

FORTISBC, INC.
ACCOUNT 336.00 - ROADS, RAILROADS AND BRIDGES
ORIGINAL AND SMOOTH SURVIVOR CURVES



FORTISBC, INC.

ACCOUNT 336.00 - ROADS, RAILROADS AND BRIDGES

ORIGINAL LIFE TABLE

PLACEMENT BAND 1950-2004 EXPERIENCE BAND 1950-2009

AGE AT BEGIN OF INTERVAL	EXPOSURES AT BEGINNING OF AGE INTERVAL	RETIREMENTS DURING AGE INTERVAL	RETMT RATIO	SURV RATIO	PCT SURV BEGIN OF INTERVAL
0.0	1,287,435		0.0000	1.0000	100.00
0.5	1,287,435		0.0000	1.0000	100.00
1.5	1,287,435		0.0000	1.0000	100.00
2.5	1,287,435		0.0000	1.0000	100.00
3.5	1,287,435		0.0000	1.0000	100.00
4.5	1,287,435		0.0000	1.0000	100.00
5.5	1,286,516		0.0000	1.0000	100.00
6.5	1,272,082		0.0000	1.0000	100.00
7.5	1,259,996		0.0000	1.0000	100.00
8.5	1,258,598		0.0000	1.0000	100.00
9.5	1,227,140		0.0000	1.0000	100.00
10.5	693,082		0.0000	1.0000	100.00
11.5	693,082		0.0000	1.0000	100.00
12.5	693,082		0.0000	1.0000	100.00
13.5	693,082		0.0000	1.0000	100.00
14.5	693,082		0.0000	1.0000	100.00
15.5	693,082		0.0000	1.0000	100.00
16.5	693,082		0.0000	1.0000	100.00
17.5	693,082		0.0000	1.0000	100.00
18.5	693,082		0.0000	1.0000	100.00
19.5	693,082		0.0000	1.0000	100.00
20.5	693,082		0.0000	1.0000	100.00
21.5	693,082		0.0000	1.0000	100.00
22.5	693,082		0.0000	1.0000	100.00
23.5	693,082		0.0000	1.0000	100.00
24.5	693,082		0.0000	1.0000	100.00
25.5	675,244		0.0000	1.0000	100.00
26.5	675,244		0.0000	1.0000	100.00
27.5	2,712		0.0000	1.0000	100.00
28.5	2,712		0.0000	1.0000	100.00
29.5	2,712		0.0000	1.0000	100.00
30.5	2,712		0.0000	1.0000	100.00
31.5	2,712		0.0000	1.0000	100.00
32.5	2,712		0.0000	1.0000	100.00
33.5	2,712		0.0000	1.0000	100.00
34.5	2,712		0.0000	1.0000	100.00
35.5	2,712		0.0000	1.0000	100.00
36.5	2,712		0.0000	1.0000	100.00
37.5	2,712		0.0000	1.0000	100.00
38.5	2,712		0.0000	1.0000	100.00

FORTISBC, INC.

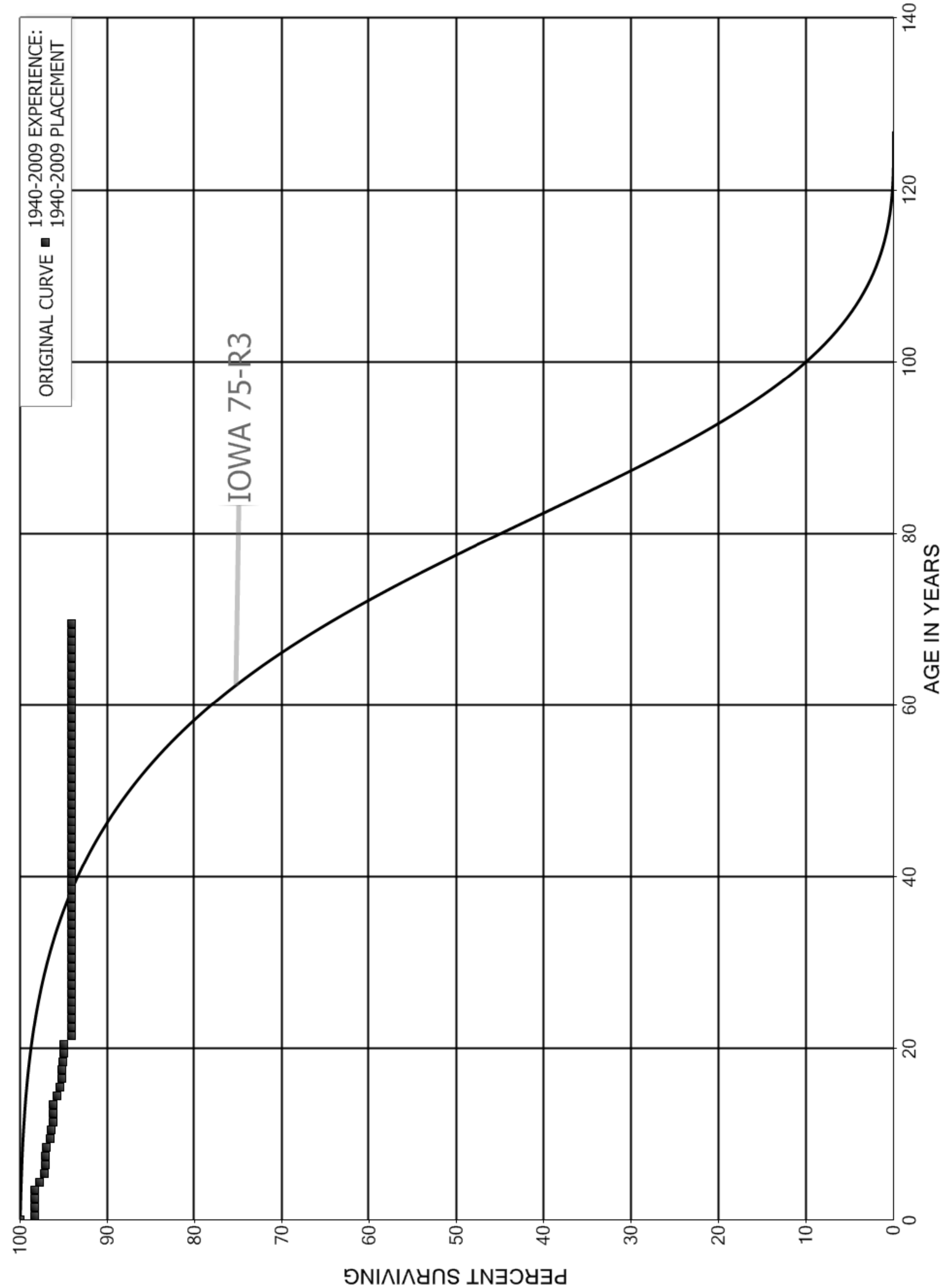
ACCOUNT 336.00 - ROADS, RAILROADS AND BRIDGES

ORIGINAL LIFE TABLE, CONT.

PLACEMENT BAND 1950-2004 EXPERIENCE BAND 1950-2009

AGE AT BEGIN OF INTERVAL	EXPOSURES AT BEGINNING OF AGE INTERVAL	RETIREMENTS DURING AGE INTERVAL	RETMT RATIO	SURV RATIO	PCT SURV BEGIN OF INTERVAL
39.5	2,712		0.0000	1.0000	100.00
40.5	2,712		0.0000	1.0000	100.00
41.5	2,712		0.0000	1.0000	100.00
42.5	2,712		0.0000	1.0000	100.00
43.5	2,712		0.0000	1.0000	100.00
44.5	2,712		0.0000	1.0000	100.00
45.5	2,712		0.0000	1.0000	100.00
46.5	2,712		0.0000	1.0000	100.00
47.5	2,712		0.0000	1.0000	100.00
48.5	2,712		0.0000	1.0000	100.00
49.5	2,712		0.0000	1.0000	100.00
50.5	2,712		0.0000	1.0000	100.00
51.5	2,712		0.0000	1.0000	100.00
52.5	2,712		0.0000	1.0000	100.00
53.5	2,712		0.0000	1.0000	100.00
54.5	2,712		0.0000	1.0000	100.00
55.5	2,712		0.0000	1.0000	100.00
56.5	2,712		0.0000	1.0000	100.00
57.5	2,712		0.0000	1.0000	100.00
58.5	2,712		0.0000	1.0000	100.00
59.5					100.00

FORTISBC, INC.
ACCOUNT 350.10 - LAND RIGHTS
ORIGINAL AND SMOOTH SURVIVOR CURVES



FORTISBC, INC.

ACCOUNT 350.10 - LAND RIGHTS

ORIGINAL LIFE TABLE

PLACEMENT BAND 1940-2009 EXPERIENCE BAND 1940-2009

AGE AT BEGIN OF INTERVAL	EXPOSURES AT BEGINNING OF AGE INTERVAL	RETIREMENTS DURING AGE INTERVAL	RETMT RATIO	SURV RATIO	PCT SURV BEGIN OF INTERVAL
0.0	6,026,388	102,681	0.0170	0.9830	100.00
0.5	5,822,654	53	0.0000	1.0000	98.30
1.5	5,023,648	170	0.0000	1.0000	98.30
2.5	5,023,478	2,332	0.0005	0.9995	98.29
3.5	5,021,147	28,385	0.0057	0.9943	98.25
4.5	4,992,762	26,836	0.0054	0.9946	97.69
5.5	3,610,809	5,134	0.0014	0.9986	97.17
6.5	2,875,754	83	0.0000	1.0000	97.03
7.5	2,827,403	3,371	0.0012	0.9988	97.02
8.5	2,800,366	10,221	0.0037	0.9963	96.91
9.5	2,398,546	5,319	0.0022	0.9978	96.56
10.5	2,393,228	3,830	0.0016	0.9984	96.34
11.5	2,115,701	1,038	0.0005	0.9995	96.19
12.5	2,056,909	253	0.0001	0.9999	96.14
13.5	2,037,103	8,272	0.0041	0.9959	96.13
14.5	2,028,831	8,187	0.0040	0.9960	95.74
15.5	2,020,644	3,370	0.0017	0.9983	95.35
16.5	2,017,274	1,283	0.0006	0.9994	95.19
17.5	1,503,424	1,891	0.0013	0.9987	95.13
18.5	1,499,522	1,156	0.0008	0.9992	95.01
19.5	1,482,339	261	0.0002	0.9998	94.94
20.5	1,464,624	13,171	0.0090	0.9910	94.92
21.5	1,451,278	573	0.0004	0.9996	94.07
22.5	1,445,176		0.0000	1.0000	94.03
23.5	1,239,666		0.0000	1.0000	94.03
24.5	1,198,342		0.0000	1.0000	94.03
25.5	1,115,038		0.0000	1.0000	94.03
26.5	1,114,597		0.0000	1.0000	94.03
27.5	1,108,002		0.0000	1.0000	94.03
28.5	1,059,485		0.0000	1.0000	94.03
29.5	1,053,016		0.0000	1.0000	94.03
30.5	1,049,480		0.0000	1.0000	94.03
31.5	1,042,958		0.0000	1.0000	94.03
32.5	1,035,122		0.0000	1.0000	94.03
33.5	1,028,385		0.0000	1.0000	94.03
34.5	1,028,385		0.0000	1.0000	94.03
35.5	1,028,385		0.0000	1.0000	94.03
36.5	1,028,385	0	0.0000	1.0000	94.03
37.5	1,028,385		0.0000	1.0000	94.03
38.5	1,028,385		0.0000	1.0000	94.03

FORTISBC, INC.

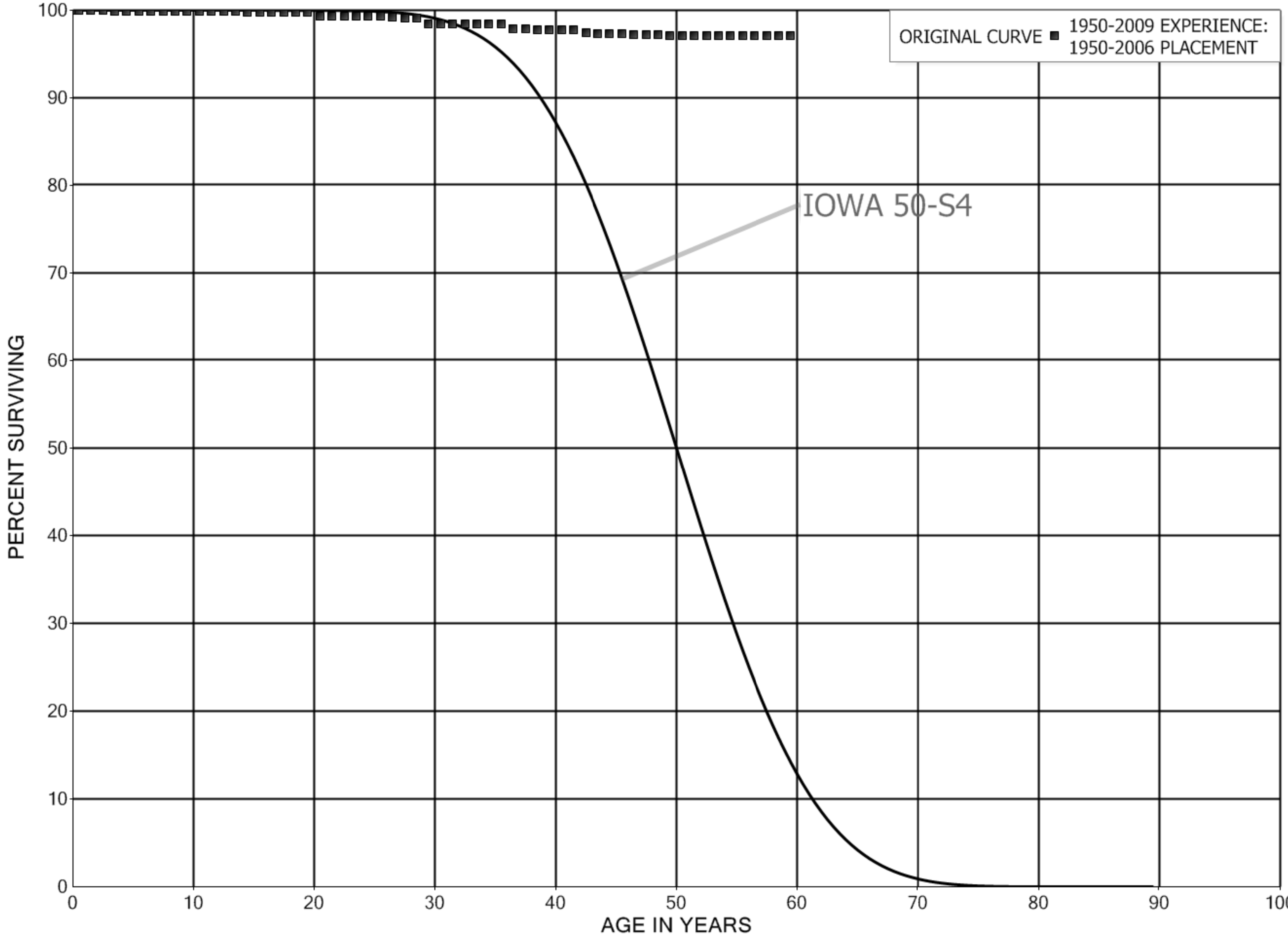
ACCOUNT 350.10 - LAND RIGHTS

ORIGINAL LIFE TABLE, CONT.

PLACEMENT BAND 1940-2009 EXPERIENCE BAND 1940-2009

AGE AT BEGIN OF INTERVAL	EXPOSURES AT BEGINNING OF AGE INTERVAL	RETIREMENTS DURING AGE INTERVAL	RETMT RATIO	SURV RATIO	PCT SURV BEGIN OF INTERVAL
39.5	1,028,385		0.0000	1.0000	94.03
40.5	1,028,385		0.0000	1.0000	94.03
41.5	1,028,385	0	0.0000	1.0000	94.03
42.5	1,028,385		0.0000	1.0000	94.03
43.5	1,028,385	0	0.0000	1.0000	94.03
44.5	1,028,385		0.0000	1.0000	94.03
45.5	1,028,385		0.0000	1.0000	94.03
46.5	1,013,338		0.0000	1.0000	94.03
47.5	1,000,449		0.0000	1.0000	94.03
48.5	991,221		0.0000	1.0000	94.03
49.5	991,221		0.0000	1.0000	94.03
50.5	991,221		0.0000	1.0000	94.03
51.5	989,498	0	0.0000	1.0000	94.03
52.5	901,044		0.0000	1.0000	94.03
53.5	901,044		0.0000	1.0000	94.03
54.5	901,044		0.0000	1.0000	94.03
55.5	901,044		0.0000	1.0000	94.03
56.5	901,044		0.0000	1.0000	94.03
57.5	901,044		0.0000	1.0000	94.03
58.5	901,044		0.0000	1.0000	94.03
59.5	901,044		0.0000	1.0000	94.03
60.5	901,044		0.0000	1.0000	94.03
61.5	901,044		0.0000	1.0000	94.03
62.5	901,044		0.0000	1.0000	94.03
63.5	901,044		0.0000	1.0000	94.03
64.5	901,044		0.0000	1.0000	94.03
65.5	901,044		0.0000	1.0000	94.03
66.5	901,044		0.0000	1.0000	94.03
67.5	901,044		0.0000	1.0000	94.03
68.5	901,044		0.0000	1.0000	94.03
69.5					94.03

FORTISBC, INC.
ACCOUNT 353.00 - SUBSTATION EQUIPMENT
ORIGINAL AND SMOOTH SURVIVOR CURVES



FORTISBC, INC.

ACCOUNT 353.00 - SUBSTATION EQUIPMENT

ORIGINAL LIFE TABLE

PLACEMENT BAND 1950-2006 EXPERIENCE BAND 1950-2009

AGE AT BEGIN OF INTERVAL	EXPOSURES AT BEGINNING OF AGE INTERVAL	RETIREMENTS DURING AGE INTERVAL	RETMT RATIO	SURV RATIO	PCT SURV BEGIN OF INTERVAL
0.0	139,386,344	3,248	0.0000	1.0000	100.00
0.5	139,383,096	110,537	0.0008	0.9992	100.00
1.5	139,272,558	11,686	0.0001	0.9999	99.92
2.5	139,260,872	42,242	0.0003	0.9997	99.91
3.5	130,020,020	25,553	0.0002	0.9998	99.88
4.5	110,584,196	1,618	0.0000	1.0000	99.86
5.5	104,255,694	9,061	0.0001	0.9999	99.86
6.5	93,796,553	16,657	0.0002	0.9998	99.85
7.5	93,741,114	2,488	0.0000	1.0000	99.83
8.5	90,859,492	1,725	0.0000	1.0000	99.83
9.5	89,737,911	18,413	0.0002	0.9998	99.83
10.5	89,064,104	17,802	0.0002	0.9998	99.81
11.5	86,329,604	668	0.0000	1.0000	99.79
12.5	86,328,936	4,668	0.0001	0.9999	99.79
13.5	82,214,707	6,919	0.0001	0.9999	99.78
14.5	80,319,947	1,297	0.0000	1.0000	99.77
15.5	57,635,104	1,452	0.0000	1.0000	99.77
16.5	55,799,064	14,449	0.0003	0.9997	99.77
17.5	55,344,135		0.0000	1.0000	99.74
18.5	55,344,135		0.0000	1.0000	99.74
19.5	55,135,520	241,940	0.0044	0.9956	99.74
20.5	52,760,428	311	0.0000	1.0000	99.30
21.5	51,832,707	309	0.0000	1.0000	99.30
22.5	51,832,398	496	0.0000	1.0000	99.30
23.5	48,524,118	3,299	0.0001	0.9999	99.30
24.5	44,155,360		0.0000	1.0000	99.30
25.5	43,870,521	39,757	0.0009	0.9991	99.30
26.5	43,830,764	59,683	0.0014	0.9986	99.21
27.5	40,492,042		0.0000	1.0000	99.07
28.5	40,492,042	254,310	0.0063	0.9937	99.07
29.5	35,075,046		0.0000	1.0000	98.45
30.5	35,075,046		0.0000	1.0000	98.45
31.5	26,385,873		0.0000	1.0000	98.45
32.5	25,469,588		0.0000	1.0000	98.45
33.5	25,135,733		0.0000	1.0000	98.45
34.5	22,923,512	6,246	0.0003	0.9997	98.45
35.5	22,917,266	136,555	0.0060	0.9940	98.42
36.5	16,187,761		0.0000	1.0000	97.84
37.5	16,187,761	21,315	0.0013	0.9987	97.84
38.5	16,166,446		0.0000	1.0000	97.71

FORTISBC, INC.

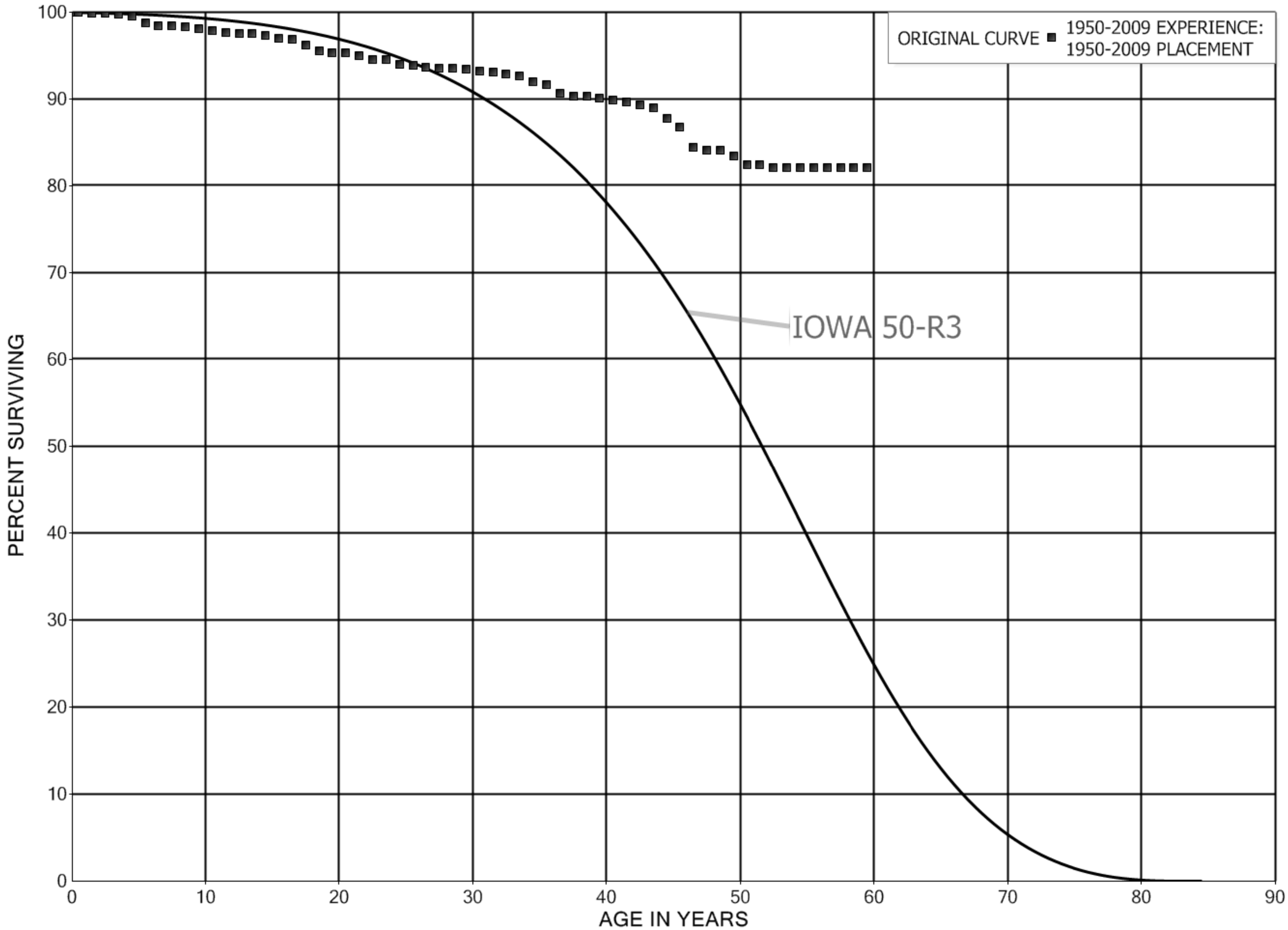
ACCOUNT 353.00 - SUBSTATION EQUIPMENT

ORIGINAL LIFE TABLE, CONT.

PLACEMENT BAND 1950-2006 EXPERIENCE BAND 1950-2009

AGE AT BEGIN OF INTERVAL	EXPOSURES AT BEGINNING OF AGE INTERVAL	RETIREMENTS DURING AGE INTERVAL	RETMT RATIO	SURV RATIO	PCT SURV BEGIN OF INTERVAL
39.5	16,166,446		0.0000	1.0000	97.71
40.5	16,166,446		0.0000	1.0000	97.71
41.5	16,166,446	57,620	0.0036	0.9964	97.71
42.5	16,108,827	15,405	0.0010	0.9990	97.36
43.5	11,774,723		0.0000	1.0000	97.27
44.5	11,774,723		0.0000	1.0000	97.27
45.5	11,774,723	7,794	0.0007	0.9993	97.27
46.5	11,766,929		0.0000	1.0000	97.20
47.5	11,766,929		0.0000	1.0000	97.20
48.5	11,766,929	14,565	0.0012	0.9988	97.20
49.5	8,203,136		0.0000	1.0000	97.08
50.5	8,203,136		0.0000	1.0000	97.08
51.5	8,203,136		0.0000	1.0000	97.08
52.5	8,203,136		0.0000	1.0000	97.08
53.5	8,203,136		0.0000	1.0000	97.08
54.5	8,203,136		0.0000	1.0000	97.08
55.5	8,203,136		0.0000	1.0000	97.08
56.5	8,203,136		0.0000	1.0000	97.08
57.5	8,203,136		0.0000	1.0000	97.08
58.5	8,203,136		0.0000	1.0000	97.08
59.5					97.08

FORTISBC, INC.
ACCOUNT 355.00 - POLES, TOWERS AND FIXTURES
ORIGINAL AND SMOOTH SURVIVOR CURVES



FORTISBC, INC.

ACCOUNT 355.00 - POLES, TOWERS AND FIXTURES

ORIGINAL LIFE TABLE

PLACEMENT BAND 1950-2009 EXPERIENCE BAND 1950-2009

AGE AT BEGIN OF INTERVAL	EXPOSURES AT BEGINNING OF AGE INTERVAL	RETIREMENTS DURING AGE INTERVAL	RETMT RATIO	SURV RATIO	PCT SURV BEGIN OF INTERVAL
0.0	76,558,352	51,071	0.0007	0.9993	100.00
0.5	75,637,606	60,862	0.0008	0.9992	99.93
1.5	75,576,745	47,178	0.0006	0.9994	99.85
2.5	67,194,156	25,216	0.0004	0.9996	99.79
3.5	67,168,940	180,666	0.0027	0.9973	99.75
4.5	65,009,915	479,288	0.0074	0.9926	99.48
5.5	57,183,152	177,826	0.0031	0.9969	98.75
6.5	48,272,028	47,597	0.0010	0.9990	98.44
7.5	47,303,184	32,455	0.0007	0.9993	98.35
8.5	46,063,520	95,768	0.0021	0.9979	98.28
9.5	43,315,999	108,718	0.0025	0.9975	98.08
10.5	42,390,562	105,198	0.0025	0.9975	97.83
11.5	39,165,461	41,365	0.0011	0.9989	97.59
12.5	37,533,638	11,305	0.0003	0.9997	97.48
13.5	33,109,847	67,102	0.0020	0.9980	97.45
14.5	32,554,747	118,492	0.0036	0.9964	97.26
15.5	28,539,483	26,247	0.0009	0.9991	96.90
16.5	27,646,791	194,261	0.0070	0.9930	96.81
17.5	26,855,069	169,683	0.0063	0.9937	96.13
18.5	25,799,697	56,567	0.0022	0.9978	95.53
19.5	24,990,548	19,008	0.0008	0.9992	95.32
20.5	24,335,469	78,238	0.0032	0.9968	95.24
21.5	24,004,329	105,466	0.0044	0.9956	94.94
22.5	22,434,116	1,013	0.0000	1.0000	94.52
23.5	21,719,304	142,414	0.0066	0.9934	94.52
24.5	19,014,000	3,194	0.0002	0.9998	93.90
25.5	17,385,191	51,721	0.0030	0.9970	93.88
26.5	16,509,262	11,031	0.0007	0.9993	93.60
27.5	15,879,442	5,816	0.0004	0.9996	93.54
28.5	15,557,683	15,561	0.0010	0.9990	93.50
29.5	14,789,859	41,806	0.0028	0.9972	93.41
30.5	14,532,366	16,191	0.0011	0.9989	93.15
31.5	14,455,867	36,920	0.0026	0.9974	93.04
32.5	13,867,033	20,858	0.0015	0.9985	92.81
33.5	12,720,005	97,354	0.0077	0.9923	92.67
34.5	12,446,202	45,679	0.0037	0.9963	91.96
35.5	12,400,523	142,308	0.0115	0.9885	91.62
36.5	12,258,214	31,234	0.0025	0.9975	90.57
37.5	12,226,980	521	0.0000	1.0000	90.34
38.5	12,226,459	34,086	0.0028	0.9972	90.33

FORTISBC, INC.

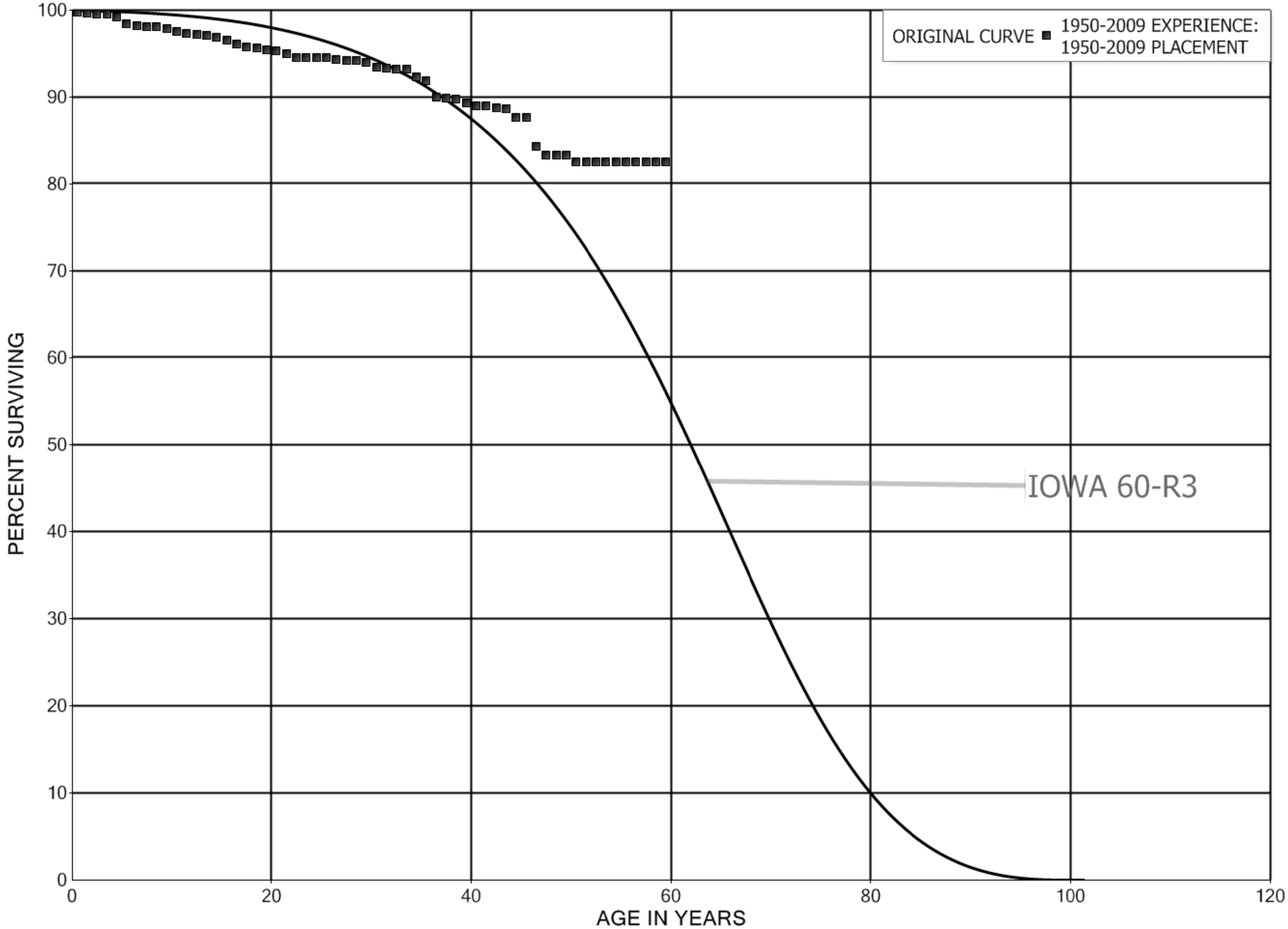
ACCOUNT 355.00 - POLES, TOWERS AND FIXTURES

ORIGINAL LIFE TABLE, CONT.

PLACEMENT BAND 1950-2009 EXPERIENCE BAND 1950-2009

AGE AT BEGIN OF INTERVAL	EXPOSURES AT BEGINNING OF AGE INTERVAL	RETIREMENTS DURING AGE INTERVAL	RETMT RATIO	SURV RATIO	PCT SURV BEGIN OF INTERVAL
39.5	12,192,373	29,437	0.0024	0.9976	90.08
40.5	12,162,936	27,146	0.0022	0.9978	89.86
41.5	12,135,790	44,216	0.0036	0.9964	89.66
42.5	12,091,574	57,923	0.0048	0.9952	89.34
43.5	12,033,651	165,812	0.0138	0.9862	88.91
44.5	8,768,577	95,096	0.0108	0.9892	87.68
45.5	8,315,508	228,877	0.0275	0.9725	86.73
46.5	8,024,906	23,694	0.0030	0.9970	84.35
47.5	7,558,160	4,490	0.0006	0.9994	84.10
48.5	7,302,738	54,821	0.0075	0.9925	84.05
49.5	7,247,917	89,942	0.0124	0.9876	83.42
50.5	7,152,005	2,512	0.0004	0.9996	82.38
51.5	7,002,902	24,891	0.0036	0.9964	82.35
52.5	632,199		0.0000	1.0000	82.06
53.5	632,199		0.0000	1.0000	82.06
54.5	632,199		0.0000	1.0000	82.06
55.5	632,199		0.0000	1.0000	82.06
56.5	632,199		0.0000	1.0000	82.06
57.5	632,199		0.0000	1.0000	82.06
58.5	632,199		0.0000	1.0000	82.06
59.5					82.06

FORTISBC, INC.
ACCOUNT 356.00 - CONDUCTORS AND DEVICES
ORIGINAL AND SMOOTH SURVIVOR CURVES



FORTISBC, INC.

ACCOUNT 356.00 - CONDUCTORS AND DEVICES

ORIGINAL LIFE TABLE

PLACEMENT BAND 1950-2009 EXPERIENCE BAND 1950-2009

AGE AT BEGIN OF INTERVAL	EXPOSURES AT BEGINNING OF AGE INTERVAL	RETIREMENTS DURING AGE INTERVAL	RETMT RATIO	SURV RATIO	PCT SURV BEGIN OF INTERVAL
0.0	74,382,693	192,002	0.0026	0.9974	100.00
0.5	73,284,855	82,388	0.0011	0.9989	99.74
1.5	73,202,467	55,017	0.0008	0.9992	99.63
2.5	64,811,729	33,102	0.0005	0.9995	99.55
3.5	64,778,627	193,903	0.0030	0.9970	99.50
4.5	64,040,872	490,980	0.0077	0.9923	99.21
5.5	56,889,230	187,446	0.0033	0.9967	98.45
6.5	49,012,825	12,183	0.0002	0.9998	98.12
7.5	48,090,867	30,494	0.0006	0.9994	98.10
8.5	45,681,494	106,526	0.0023	0.9977	98.03
9.5	42,845,483	119,036	0.0028	0.9972	97.81
10.5	42,726,447	112,540	0.0026	0.9974	97.53
11.5	39,283,146	52,852	0.0013	0.9987	97.28
12.5	37,611,371	19,196	0.0005	0.9995	97.15
13.5	32,922,852	74,645	0.0023	0.9977	97.10
14.5	32,511,741	124,624	0.0038	0.9962	96.88
15.5	28,177,687	141,085	0.0050	0.9950	96.51
16.5	27,214,244	88,306	0.0032	0.9968	96.02
17.5	26,425,603	28,209	0.0011	0.9989	95.71
18.5	25,560,918	58,848	0.0023	0.9977	95.61
19.5	24,620,068	26,066	0.0011	0.9989	95.39
20.5	23,892,235	86,444	0.0036	0.9964	95.29
21.5	22,338,985	106,461	0.0048	0.9952	94.94
22.5	21,469,224	1,463	0.0001	0.9999	94.49
23.5	20,792,814	3,890	0.0002	0.9998	94.48
24.5	18,781,765	2,421	0.0001	0.9999	94.47
25.5	17,130,033	30,163	0.0018	0.9982	94.45
26.5	16,648,335	11,838	0.0007	0.9993	94.29
27.5	15,985,263	5,668	0.0004	0.9996	94.22
28.5	15,752,575	47,347	0.0030	0.9970	94.19
29.5	15,163,966	79,874	0.0053	0.9947	93.90
30.5	14,740,811	22,505	0.0015	0.9985	93.41
31.5	14,640,555	15,643	0.0011	0.9989	93.27
32.5	14,054,057	3,672	0.0003	0.9997	93.17
33.5	13,153,047	126,187	0.0096	0.9904	93.14
34.5	12,831,416	59,515	0.0046	0.9954	92.25
35.5	12,771,901	255,213	0.0200	0.9800	91.82
36.5	12,516,688	14,928	0.0012	0.9988	89.99
37.5	12,501,760	19,078	0.0015	0.9985	89.88
38.5	12,482,682	66,662	0.0053	0.9947	89.74

FORTISBC, INC.

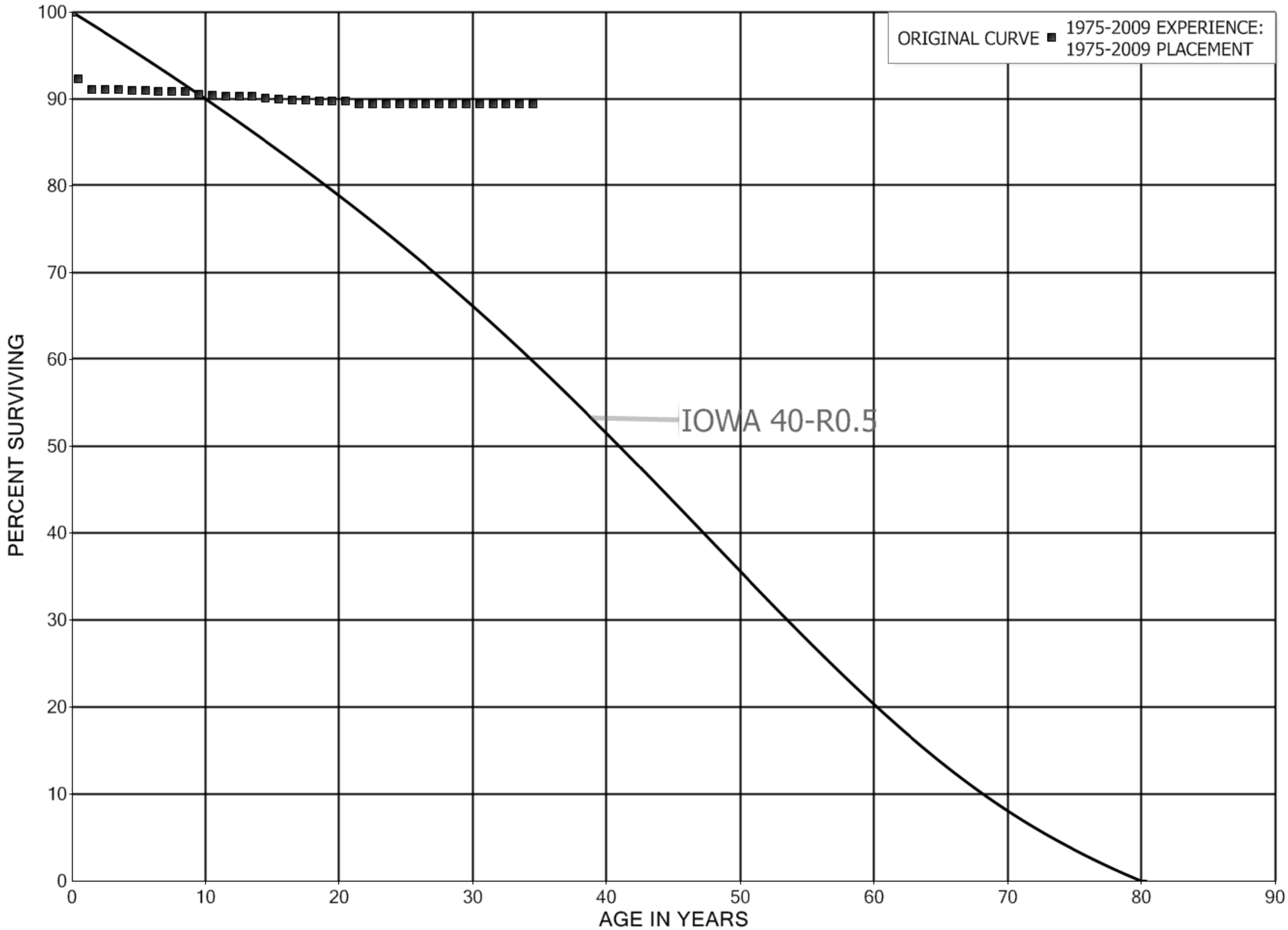
ACCOUNT 356.00 - CONDUCTORS AND DEVICES

ORIGINAL LIFE TABLE, CONT.

PLACEMENT BAND 1950-2009 EXPERIENCE BAND 1950-2009

AGE AT BEGIN OF INTERVAL	EXPOSURES AT BEGINNING OF AGE INTERVAL	RETIREMENTS DURING AGE INTERVAL	RETMT RATIO	SURV RATIO	PCT SURV BEGIN OF INTERVAL
39.5	12,416,020	47,767	0.0038	0.9962	89.26
40.5	12,368,253		0.0000	1.0000	88.92
41.5	12,368,253	27,135	0.0022	0.9978	88.92
42.5	12,341,118	17,126	0.0014	0.9986	88.72
43.5	12,323,992	130,039	0.0106	0.9894	88.60
44.5	9,099,316	7,673	0.0008	0.9992	87.67
45.5	9,091,643	347,847	0.0383	0.9617	87.59
46.5	8,682,070	96,267	0.0111	0.9889	84.24
47.5	8,144,049	0	0.0000	1.0000	83.31
48.5	7,481,782		0.0000	1.0000	83.31
49.5	7,481,782	70,991	0.0095	0.9905	83.31
50.5	7,388,823	1,972	0.0003	0.9997	82.52
51.5	7,270,795		0.0000	1.0000	82.49
52.5	1,447,409		0.0000	1.0000	82.49
53.5	1,447,409		0.0000	1.0000	82.49
54.5	1,447,409		0.0000	1.0000	82.49
55.5	1,447,409		0.0000	1.0000	82.49
56.5	1,447,409		0.0000	1.0000	82.49
57.5	1,447,409		0.0000	1.0000	82.49
58.5	1,447,409		0.0000	1.0000	82.49
59.5					82.49

FORTISBC, INC.
ACCOUNT 359.00 - ROADS AND TRAILS
ORIGINAL AND SMOOTH SURVIVOR CURVES



FORTISBC, INC.

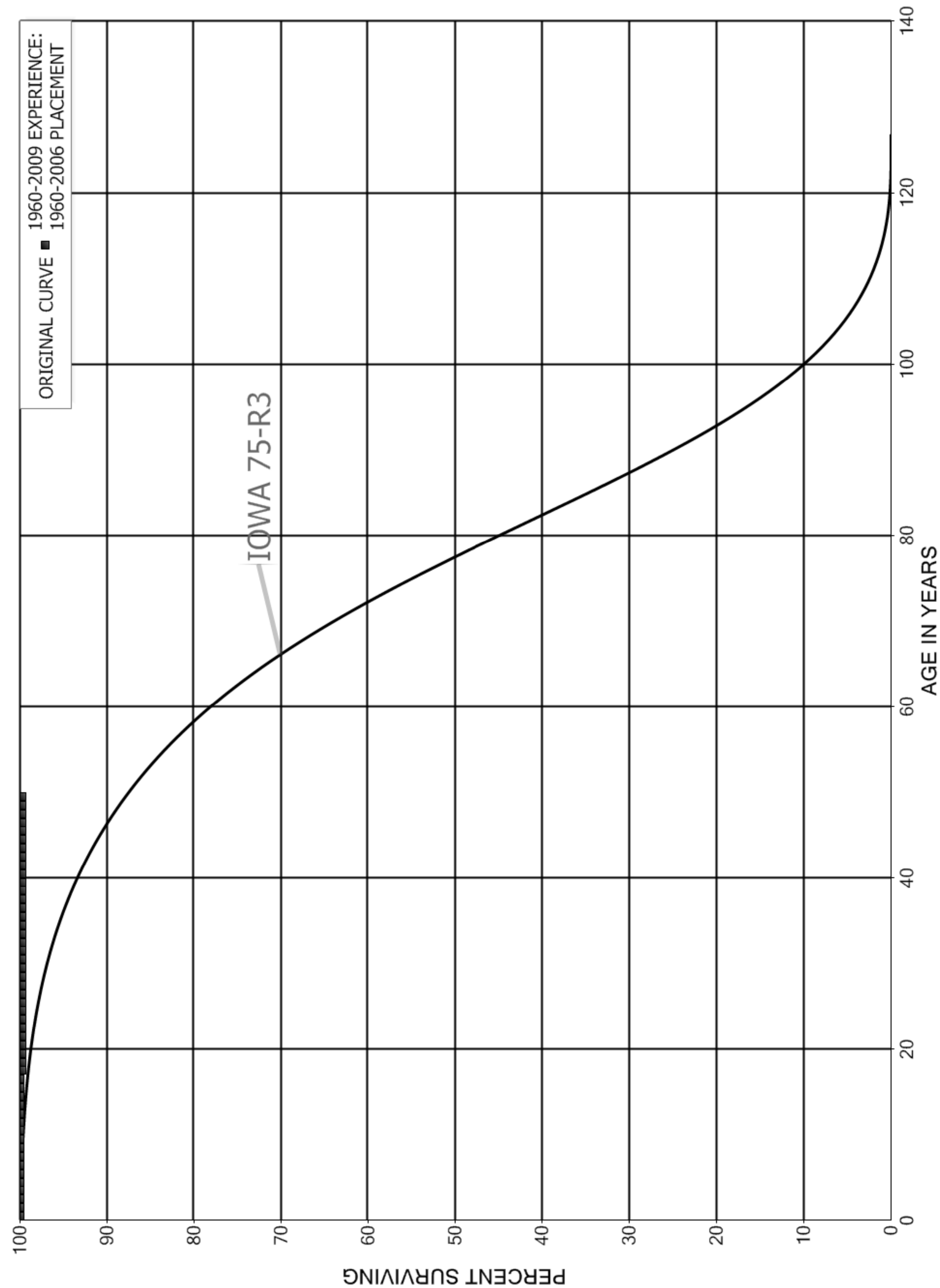
ACCOUNT 359.00 - ROADS AND TRAILS

ORIGINAL LIFE TABLE

PLACEMENT BAND 1975-2009 EXPERIENCE BAND 1975-2009

AGE AT BEGIN OF INTERVAL	EXPOSURES AT BEGINNING OF AGE INTERVAL	RETIREMENTS DURING AGE INTERVAL	RETMT RATIO	SURV RATIO	PCT SURV BEGIN OF INTERVAL
0.0	1,231,354	95,119	0.0772	0.9228	100.00
0.5	831,986	10,735	0.0129	0.9871	92.28
1.5	821,250	5	0.0000	1.0000	91.08
2.5	821,245	67	0.0001	0.9999	91.08
3.5	821,179	810	0.0010	0.9990	91.08
4.5	820,369	766	0.0009	0.9991	90.99
5.5	418,826	146	0.0003	0.9997	90.90
6.5	109,056	2	0.0000	1.0000	90.87
7.5	109,054	96	0.0009	0.9991	90.87
8.5	108,957	292	0.0027	0.9973	90.79
9.5	108,666	152	0.0014	0.9986	90.55
10.5	108,514	109	0.0010	0.9990	90.42
11.5	108,405	30	0.0003	0.9997	90.33
12.5	108,375	7	0.0001	0.9999	90.30
13.5	108,368	236	0.0022	0.9978	90.30
14.5	108,132	234	0.0022	0.9978	90.10
15.5	107,898	96	0.0009	0.9991	89.91
16.5	107,802	37	0.0003	0.9997	89.83
17.5	107,765	54	0.0005	0.9995	89.79
18.5	107,711	33	0.0003	0.9997	89.75
19.5	107,679	7	0.0001	0.9999	89.72
20.5	107,671	376	0.0035	0.9965	89.72
21.5	107,295	16	0.0002	0.9998	89.40
22.5	107,279		0.0000	1.0000	89.39
23.5	107,279		0.0000	1.0000	89.39
24.5	107,279		0.0000	1.0000	89.39
25.5	107,279		0.0000	1.0000	89.39
26.5	107,279		0.0000	1.0000	89.39
27.5	49,792		0.0000	1.0000	89.39
28.5	49,792		0.0000	1.0000	89.39
29.5	23,498		0.0000	1.0000	89.39
30.5	21,121		0.0000	1.0000	89.39
31.5	20,481		0.0000	1.0000	89.39
32.5	17,902		0.0000	1.0000	89.39
33.5	4,416		0.0000	1.0000	89.39
34.5					89.39

FORTISBC, INC.
ACCOUNT 360.10 - LAND RIGHTS
ORIGINAL AND SMOOTH SURVIVOR CURVES



FORTISBC, INC.

ACCOUNT 360.10 - LAND RIGHTS

ORIGINAL LIFE TABLE

PLACEMENT BAND 1960-2006 EXPERIENCE BAND 1960-2009

AGE AT BEGIN OF INTERVAL	EXPOSURES AT BEGINNING OF AGE INTERVAL	RETIREMENTS DURING AGE INTERVAL	RETMT RATIO	SURV RATIO	PCT SURV BEGIN OF INTERVAL
0.0	8,495,621	0	0.0000	1.0000	100.00
0.5	8,495,620	6	0.0000	1.0000	100.00
1.5	8,495,615	3	0.0000	1.0000	100.00
2.5	8,495,612		0.0000	1.0000	100.00
3.5	7,842,657		0.0000	1.0000	100.00
4.5	7,842,657		0.0000	1.0000	100.00
5.5	7,842,655		0.0000	1.0000	100.00
6.5	7,842,655		0.0000	1.0000	100.00
7.5	7,842,655		0.0000	1.0000	100.00
8.5	7,824,523		0.0000	1.0000	100.00
9.5	7,743,417		0.0000	1.0000	100.00
10.5	7,555,541		0.0000	1.0000	100.00
11.5	7,425,549		0.0000	1.0000	100.00
12.5	7,425,549		0.0000	1.0000	100.00
13.5	7,425,549		0.0000	1.0000	100.00
14.5	7,425,549		0.0000	1.0000	100.00
15.5	7,425,549		0.0000	1.0000	100.00
16.5	7,425,549	18,511	0.0025	0.9975	100.00
17.5	7,407,038		0.0000	1.0000	99.75
18.5	7,307,557		0.0000	1.0000	99.75
19.5	7,270,691		0.0000	1.0000	99.75
20.5	7,270,428		0.0000	1.0000	99.75
21.5	7,246,515		0.0000	1.0000	99.75
22.5	7,197,987		0.0000	1.0000	99.75
23.5	7,089,257		0.0000	1.0000	99.75
24.5	6,959,628		0.0000	1.0000	99.75
25.5	6,933,806		0.0000	1.0000	99.75
26.5	6,762,251		0.0000	1.0000	99.75
27.5	6,675,070		0.0000	1.0000	99.75
28.5	6,605,547		0.0000	1.0000	99.75
29.5	6,484,551		0.0000	1.0000	99.75
30.5	6,390,265		0.0000	1.0000	99.75
31.5	6,312,448		0.0000	1.0000	99.75
32.5	6,283,515		0.0000	1.0000	99.75
33.5	6,171,836		0.0000	1.0000	99.75
34.5	6,137,907		0.0000	1.0000	99.75
35.5	6,137,907		0.0000	1.0000	99.75
36.5	6,137,907		0.0000	1.0000	99.75
37.5	6,137,907		0.0000	1.0000	99.75
38.5	6,137,907		0.0000	1.0000	99.75

FORTISBC, INC.

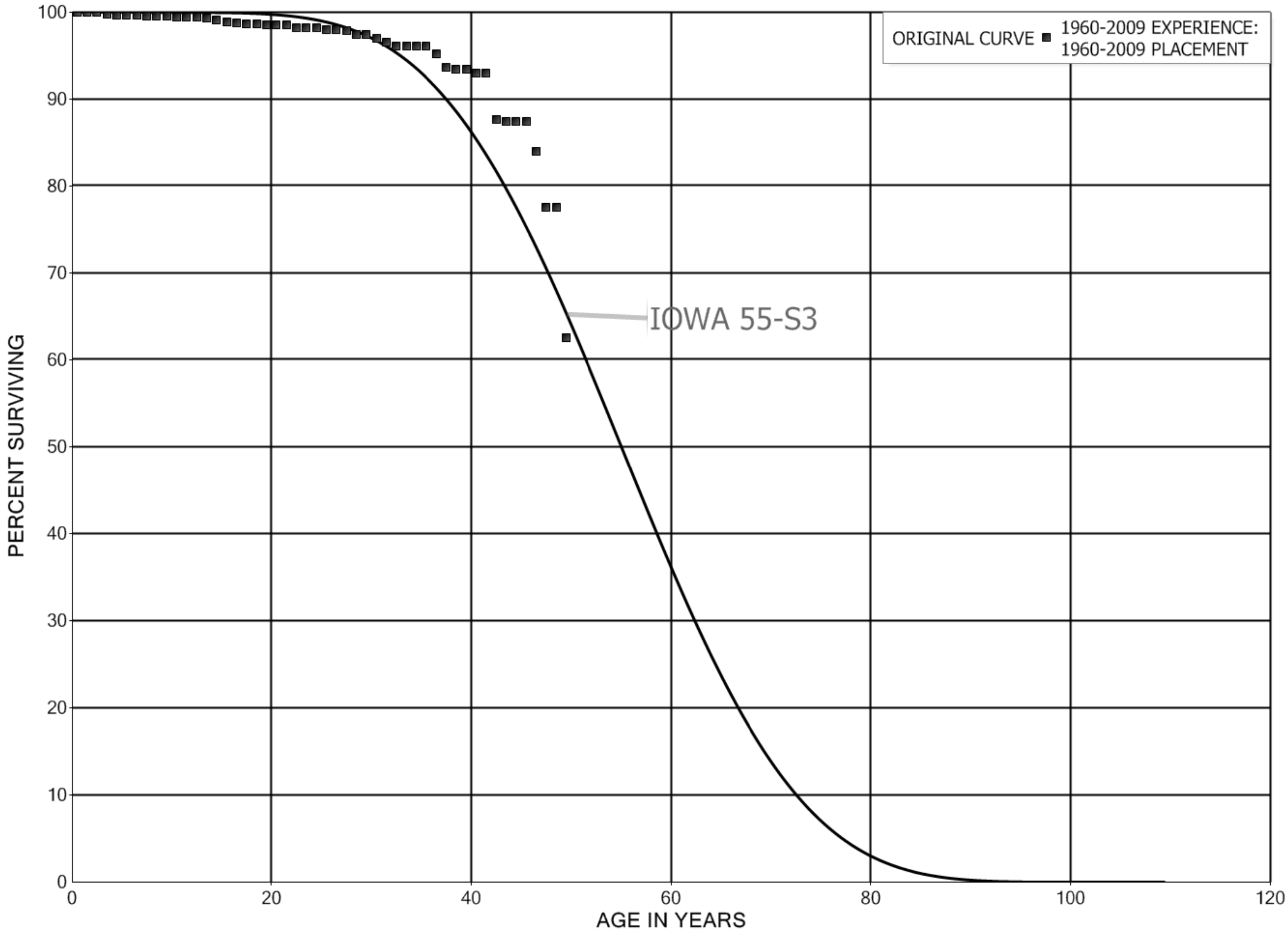
ACCOUNT 360.10 - LAND RIGHTS

ORIGINAL LIFE TABLE, CONT.

PLACEMENT BAND 1960-2006 EXPERIENCE BAND 1960-2009

AGE AT BEGIN OF INTERVAL	EXPOSURES AT BEGINNING OF AGE INTERVAL	RETIREMENTS DURING AGE INTERVAL	RETMT RATIO	SURV RATIO	PCT SURV BEGIN OF INTERVAL
39.5	6,137,907		0.0000	1.0000	99.75
40.5	6,137,907		0.0000	1.0000	99.75
41.5	6,137,907		0.0000	1.0000	99.75
42.5	6,137,907		0.0000	1.0000	99.75
43.5	6,137,907		0.0000	1.0000	99.75
44.5	6,137,907		0.0000	1.0000	99.75
45.5	6,137,907		0.0000	1.0000	99.75
46.5	6,137,907		0.0000	1.0000	99.75
47.5	6,137,907		0.0000	1.0000	99.75
48.5	6,137,907		0.0000	1.0000	99.75
49.5					99.75

FORTISBC, INC.
ACCOUNT 362.00 - SUBSTATION EQUIPMENT
ORIGINAL AND SMOOTH SURVIVOR CURVES



FORTISBC, INC.

ACCOUNT 362.00 - SUBSTATION EQUIPMENT

ORIGINAL LIFE TABLE

PLACEMENT BAND 1960-2009 EXPERIENCE BAND 1960-2009

AGE AT BEGIN OF INTERVAL	EXPOSURES AT BEGINNING OF AGE INTERVAL	RETIREMENTS DURING AGE INTERVAL	RETMT RATIO	SURV RATIO	PCT SURV BEGIN OF INTERVAL
0.0	185,888,879	25,565	0.0001	0.9999	100.00
0.5	168,188,500	36,039	0.0002	0.9998	99.99
1.5	138,990,044	46,718	0.0003	0.9997	99.96
2.5	128,394,037	319,592	0.0025	0.9975	99.93
3.5	127,778,237	44,615	0.0003	0.9997	99.68
4.5	127,733,623	39,838	0.0003	0.9997	99.65
5.5	126,120,669	30,700	0.0002	0.9998	99.62
6.5	98,037,950	41,318	0.0004	0.9996	99.59
7.5	97,161,167	33,161	0.0003	0.9997	99.55
8.5	95,464,846	39,967	0.0004	0.9996	99.52
9.5	92,216,863	34,528	0.0004	0.9996	99.47
10.5	89,134,698	25,855	0.0003	0.9997	99.44
11.5	88,766,208	40,591	0.0005	0.9995	99.41
12.5	86,294,150	36,562	0.0004	0.9996	99.36
13.5	83,164,063	213,998	0.0026	0.9974	99.32
14.5	79,056,144	154,813	0.0020	0.9980	99.07
15.5	75,634,837	129,891	0.0017	0.9983	98.87
16.5	73,937,353	61,220	0.0008	0.9992	98.70
17.5	73,031,911	16,124	0.0002	0.9998	98.62
18.5	65,923,902	42,746	0.0006	0.9994	98.60
19.5	63,302,279	8,860	0.0001	0.9999	98.53
20.5	62,733,443	37,013	0.0006	0.9994	98.52
21.5	61,466,369	154,059	0.0025	0.9975	98.46
22.5	55,928,038	11,021	0.0002	0.9998	98.22
23.5	55,358,156	20,787	0.0004	0.9996	98.20
24.5	55,026,689	84,535	0.0015	0.9985	98.16
25.5	50,674,608	116	0.0000	1.0000	98.01
26.5	47,089,854	107,027	0.0023	0.9977	98.01
27.5	45,183,111	168,895	0.0037	0.9963	97.79
28.5	43,762,137	1,184	0.0000	1.0000	97.42
29.5	39,381,283	177,189	0.0045	0.9955	97.42
30.5	38,036,209	168,473	0.0044	0.9956	96.98
31.5	29,122,723	131,156	0.0045	0.9955	96.55
32.5	26,487,098	930	0.0000	1.0000	96.11
33.5	25,223,682		0.0000	1.0000	96.11
34.5	23,202,899		0.0000	1.0000	96.11
35.5	22,912,748	231,421	0.0101	0.9899	96.11
36.5	22,217,902	344,643	0.0155	0.9845	95.14
37.5	20,977,092	56,159	0.0027	0.9973	93.66
38.5	20,711,174		0.0000	1.0000	93.41

FORTISBC, INC.

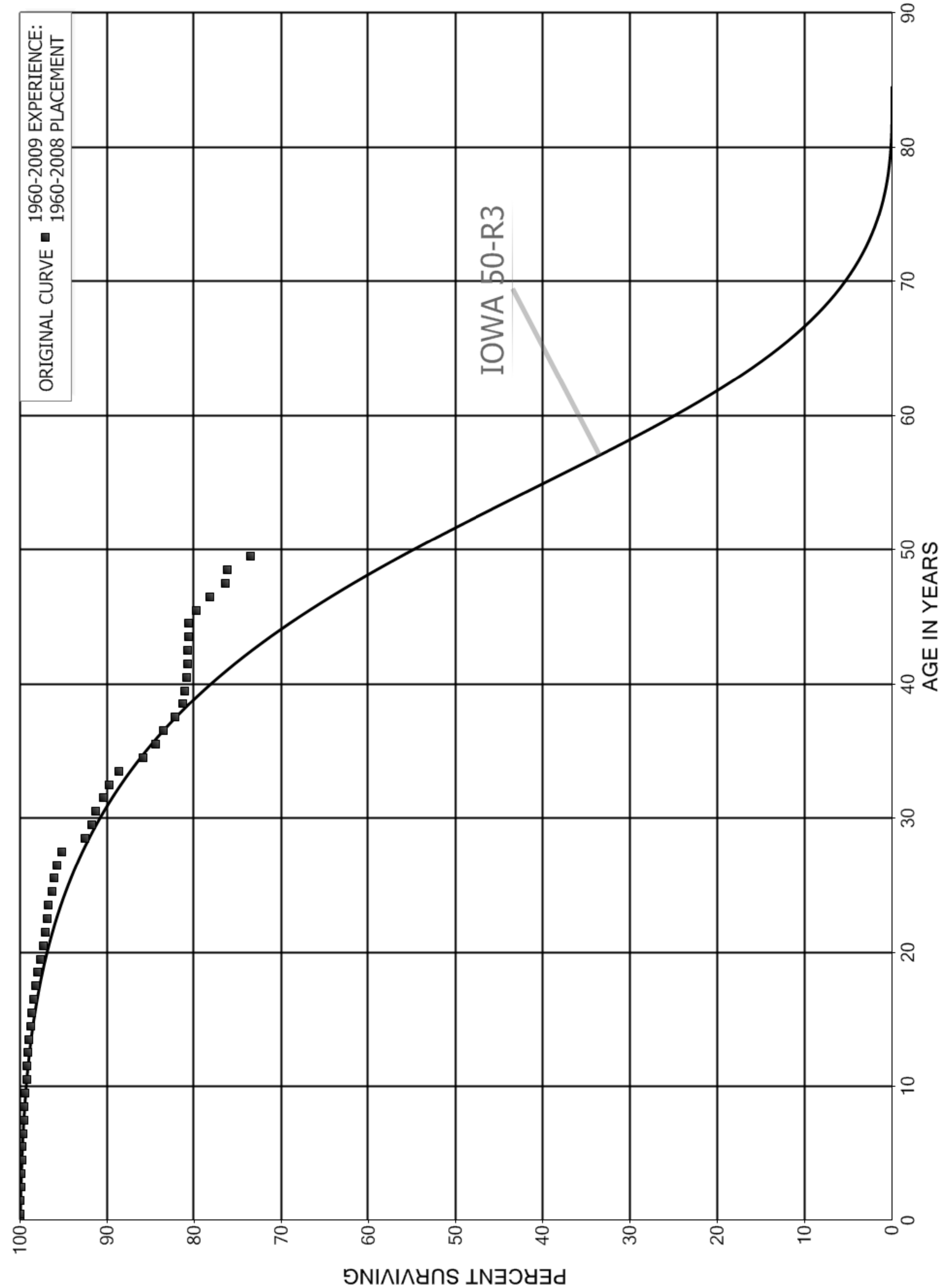
ACCOUNT 362.00 - SUBSTATION EQUIPMENT

ORIGINAL LIFE TABLE, CONT.

PLACEMENT BAND 1960-2009 EXPERIENCE BAND 1960-2009

AGE AT BEGIN OF INTERVAL	EXPOSURES AT BEGINNING OF AGE INTERVAL	RETIREMENTS DURING AGE INTERVAL	RETMT RATIO	SURV RATIO	PCT SURV BEGIN OF INTERVAL
39.5	19,754,539	89,743	0.0045	0.9955	93.41
40.5	12,484,087	1,459	0.0001	0.9999	92.99
41.5	9,245,594	532,227	0.0576	0.9424	92.98
42.5	8,713,367	28,362	0.0033	0.9967	87.63
43.5	3,575,635		0.0000	1.0000	87.34
44.5	3,575,635		0.0000	1.0000	87.34
45.5	3,575,635	138,565	0.0388	0.9612	87.34
46.5	3,437,070	266,032	0.0774	0.9226	83.96
47.5	3,070,277		0.0000	1.0000	77.46
48.5	2,505,610	484,519	0.1934	0.8066	77.46
49.5					62.48

FORTISBC, INC.
ACCOUNT 364.00 - POLES, TOWERS AND FIXTURES
ORIGINAL AND SMOOTH SURVIVOR CURVES



FORTISBC, INC.

ACCOUNT 364.00 - POLES, TOWERS AND FIXTURES

ORIGINAL LIFE TABLE

PLACEMENT BAND 1960-2008 EXPERIENCE BAND 1960-2009

AGE AT BEGIN OF INTERVAL	EXPOSURES AT BEGINNING OF AGE INTERVAL	RETIREMENTS DURING AGE INTERVAL	RETMT RATIO	SURV RATIO	PCT SURV BEGIN OF INTERVAL
0.0	133,055,033	35,031	0.0003	0.9997	100.00
0.5	133,020,002	53,737	0.0004	0.9996	99.97
1.5	121,185,595	63,068	0.0005	0.9995	99.93
2.5	111,619,702	80,906	0.0007	0.9993	99.88
3.5	95,915,567	53,877	0.0006	0.9994	99.81
4.5	88,171,066	63,098	0.0007	0.9993	99.75
5.5	82,701,945	74,570	0.0009	0.9991	99.68
6.5	82,627,375	57,085	0.0007	0.9993	99.59
7.5	82,570,290	59,802	0.0007	0.9993	99.52
8.5	77,894,308	84,083	0.0011	0.9989	99.45
9.5	73,861,849	93,669	0.0013	0.9987	99.34
10.5	69,910,992	62,341	0.0009	0.9991	99.22
11.5	66,132,678	74,537	0.0011	0.9989	99.13
12.5	61,916,470	79,268	0.0013	0.9987	99.02
13.5	58,556,647	83,223	0.0014	0.9986	98.89
14.5	53,517,045	93,613	0.0017	0.9983	98.75
15.5	49,095,515	103,042	0.0021	0.9979	98.58
16.5	46,230,799	90,245	0.0020	0.9980	98.37
17.5	36,362,505	82,435	0.0023	0.9977	98.18
18.5	34,746,350	116,226	0.0033	0.9967	97.96
19.5	33,407,582	99,150	0.0030	0.9970	97.63
20.5	31,881,130	76,745	0.0024	0.9976	97.34
21.5	30,510,949	79,568	0.0026	0.9974	97.10
22.5	29,701,308	50,381	0.0017	0.9983	96.85
23.5	28,275,024	111,418	0.0039	0.9961	96.69
24.5	26,855,443	55,186	0.0021	0.9979	96.31
25.5	25,865,896	107,634	0.0042	0.9958	96.11
26.5	24,755,386	144,916	0.0059	0.9941	95.71
27.5	23,672,170	666,337	0.0281	0.9719	95.15
28.5	21,031,339	177,076	0.0084	0.9916	92.47
29.5	19,449,029	95,817	0.0049	0.9951	91.69
30.5	18,169,004	174,039	0.0096	0.9904	91.24
31.5	16,935,989	117,284	0.0069	0.9931	90.36
32.5	15,800,215	199,960	0.0127	0.9873	89.74
33.5	14,710,097	454,270	0.0309	0.9691	88.60
34.5	13,608,839	235,410	0.0173	0.9827	85.87
35.5	13,373,429	143,697	0.0107	0.9893	84.38
36.5	13,229,733	209,959	0.0159	0.9841	83.48
37.5	13,019,773	134,251	0.0103	0.9897	82.15
38.5	12,885,522	40,232	0.0031	0.9969	81.30

FORTISBC, INC.

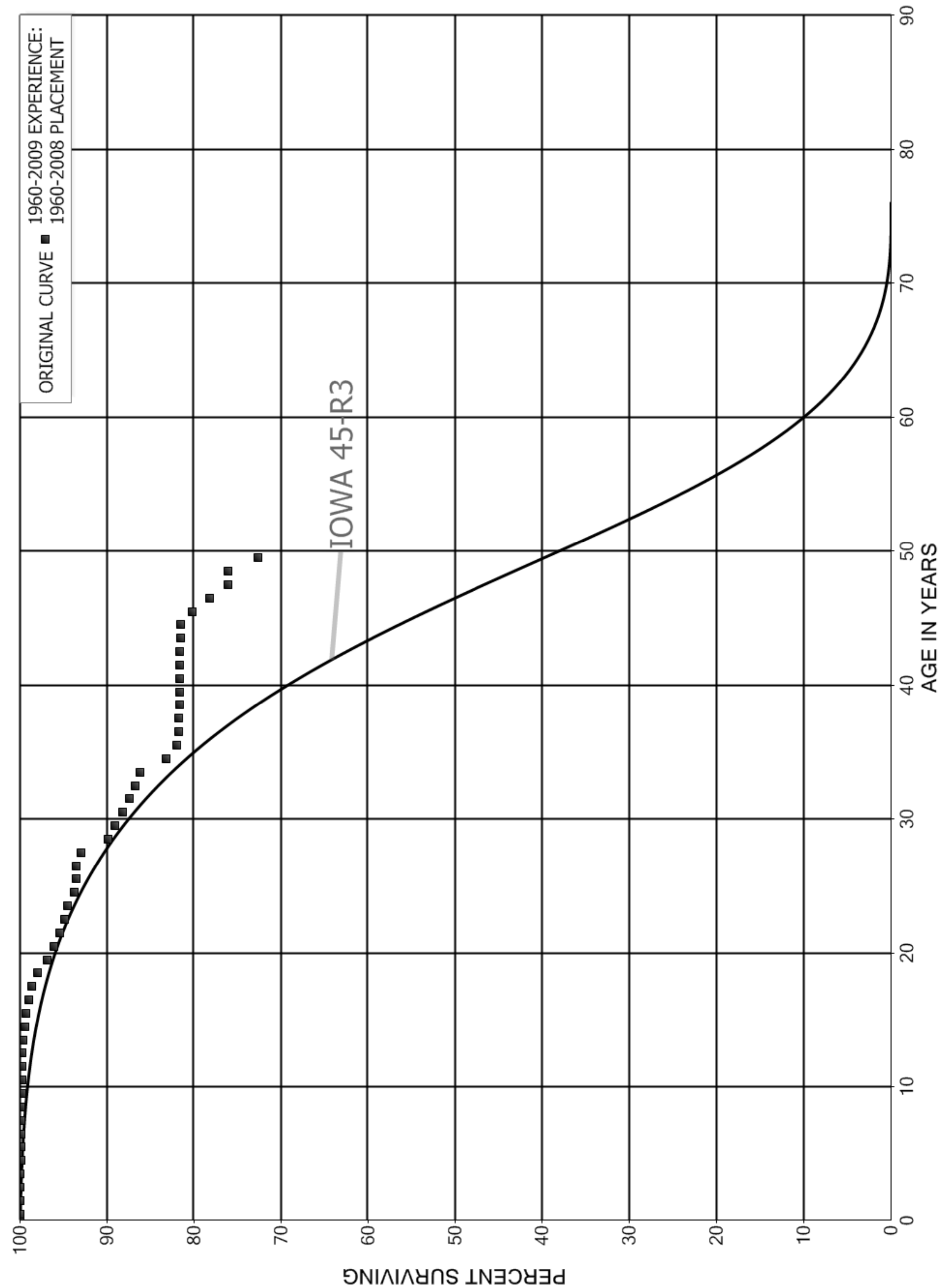
ACCOUNT 364.00 - POLES, TOWERS AND FIXTURES

ORIGINAL LIFE TABLE, CONT.

PLACEMENT BAND 1960-2008 EXPERIENCE BAND 1960-2009

AGE AT BEGIN OF INTERVAL	EXPOSURES AT BEGINNING OF AGE INTERVAL	RETIREMENTS DURING AGE INTERVAL	RETMT RATIO	SURV RATIO	PCT SURV BEGIN OF INTERVAL
39.5	12,845,290	33,943	0.0026	0.9974	81.05
40.5	12,811,348	23,489	0.0018	0.9982	80.84
41.5	12,787,859	2,570	0.0002	0.9998	80.69
42.5	12,785,289	10,634	0.0008	0.9992	80.67
43.5	12,774,656	6,018	0.0005	0.9995	80.60
44.5	12,768,637	130,474	0.0102	0.9898	80.57
45.5	12,638,163	250,732	0.0198	0.9802	79.74
46.5	12,387,431	288,090	0.0233	0.9767	78.16
47.5	12,099,341	19,628	0.0016	0.9984	76.34
48.5	12,079,714	433,826	0.0359	0.9641	76.22
49.5					73.48

FORTISBC, INC.
ACCOUNT 365.00 - CONDUCTORS AND DEVICES
ORIGINAL AND SMOOTH SURVIVOR CURVES



FORTISBC, INC.

ACCOUNT 365.00 - CONDUCTORS AND DEVICES

ORIGINAL LIFE TABLE

PLACEMENT BAND 1960-2008 EXPERIENCE BAND 1960-2009

AGE AT BEGIN OF INTERVAL	EXPOSURES AT BEGINNING OF AGE INTERVAL	RETIREMENTS DURING AGE INTERVAL	RETMT RATIO	SURV RATIO	PCT SURV BEGIN OF INTERVAL
0.0	217,822,975	34,575	0.0002	0.9998	100.00
0.5	217,788,400	37,436	0.0002	0.9998	99.98
1.5	199,731,622	45,312	0.0002	0.9998	99.97
2.5	183,151,610	40,825	0.0002	0.9998	99.94
3.5	161,526,747	99,486	0.0006	0.9994	99.92
4.5	150,337,962	11,293	0.0001	0.9999	99.86
5.5	142,358,079	42,664	0.0003	0.9997	99.85
6.5	133,246,625	5,718	0.0000	1.0000	99.82
7.5	128,318,161	18,541	0.0001	0.9999	99.82
8.5	120,744,780	49,446	0.0004	0.9996	99.80
9.5	115,447,684	63,297	0.0005	0.9995	99.76
10.5	110,400,123	6,378	0.0001	0.9999	99.71
11.5	105,147,653	19,086	0.0002	0.9998	99.70
12.5	95,652,229	48,767	0.0005	0.9995	99.68
13.5	90,158,924	188,621	0.0021	0.9979	99.63
14.5	84,856,657	134,128	0.0016	0.9984	99.43
15.5	75,955,435	238,275	0.0031	0.9969	99.27
16.5	69,458,261	277,433	0.0040	0.9960	98.96
17.5	59,262,960	333,685	0.0056	0.9944	98.56
18.5	54,513,858	645,375	0.0118	0.9882	98.01
19.5	49,292,649	418,079	0.0085	0.9915	96.85
20.5	46,274,006	321,745	0.0070	0.9930	96.03
21.5	43,754,839	222,133	0.0051	0.9949	95.36
22.5	41,501,832	184,575	0.0044	0.9956	94.87
23.5	38,989,295	277,278	0.0071	0.9929	94.45
24.5	36,731,221	106,387	0.0029	0.9971	93.78
25.5	34,633,375	10,351	0.0003	0.9997	93.51
26.5	33,024,233	193,734	0.0059	0.9941	93.48
27.5	30,053,941	1,005,374	0.0335	0.9665	92.93
28.5	26,257,937	221,898	0.0085	0.9915	89.82
29.5	23,775,973	223,086	0.0094	0.9906	89.06
30.5	21,799,425	203,575	0.0093	0.9907	88.23
31.5	20,435,926	169,027	0.0083	0.9917	87.40
32.5	19,242,921	111,137	0.0058	0.9942	86.68
33.5	18,381,469	639,368	0.0348	0.9652	86.18
34.5	17,174,179	262,315	0.0153	0.9847	83.18
35.5	16,911,864	28,682	0.0017	0.9983	81.91
36.5	16,883,182	19,695	0.0012	0.9988	81.77
37.5	16,863,487	10,175	0.0006	0.9994	81.68
38.5	16,853,311	3,419	0.0002	0.9998	81.63

FORTISBC, INC.

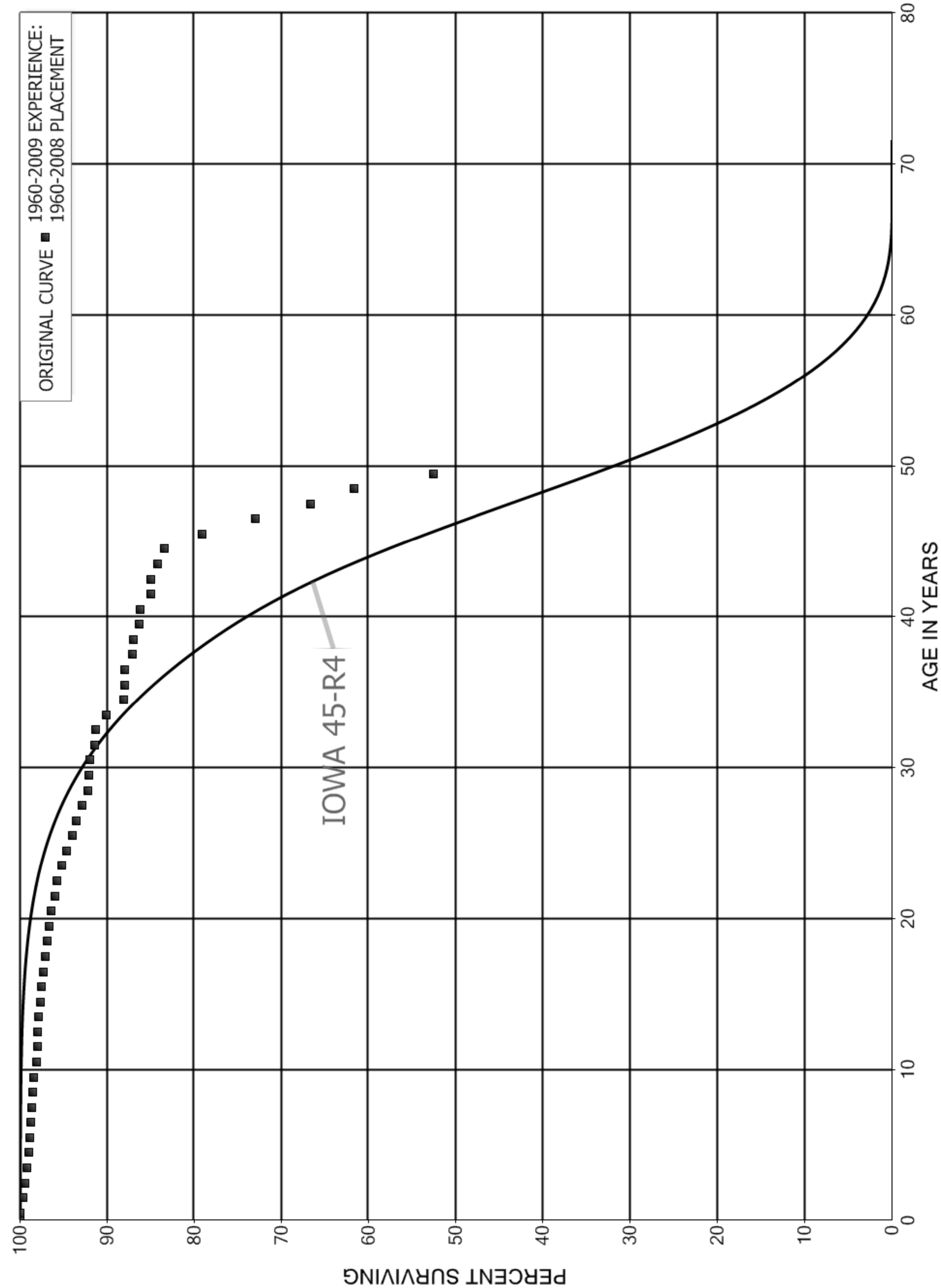
ACCOUNT 365.00 - CONDUCTORS AND DEVICES

ORIGINAL LIFE TABLE, CONT.

PLACEMENT BAND 1960-2008 EXPERIENCE BAND 1960-2009

AGE AT BEGIN OF INTERVAL	EXPOSURES AT BEGINNING OF AGE INTERVAL	RETIREMENTS DURING AGE INTERVAL	RETMT RATIO	SURV RATIO	PCT SURV BEGIN OF INTERVAL
39.5	16,849,892	3,402	0.0002	0.9998	81.61
40.5	16,846,491	1,554	0.0001	0.9999	81.60
41.5	16,844,936	1,265	0.0001	0.9999	81.59
42.5	16,843,671	9,713	0.0006	0.9994	81.58
43.5	16,833,959	3,170	0.0002	0.9998	81.54
44.5	16,830,789	276,717	0.0164	0.9836	81.52
45.5	16,554,072	418,402	0.0253	0.9747	80.18
46.5	16,135,669	430,270	0.0267	0.9733	78.15
47.5	15,705,399	10,615	0.0007	0.9993	76.07
48.5	15,694,785	708,815	0.0452	0.9548	76.02
49.5					72.58

FORTISBC, INC.
ACCOUNT 368.00 - LINE TRANSFORMERS
ORIGINAL AND SMOOTH SURVIVOR CURVES



FORTISBC, INC.

ACCOUNT 368.00 - LINE TRANSFORMERS

ORIGINAL LIFE TABLE

PLACEMENT BAND 1960-2008 EXPERIENCE BAND 1960-2009

AGE AT BEGIN OF INTERVAL	EXPOSURES AT BEGINNING OF AGE INTERVAL	RETIREMENTS DURING AGE INTERVAL	RETMT RATIO	SURV RATIO	PCT SURV BEGIN OF INTERVAL
0.0	108,867,573	87,451	0.0008	0.9992	100.00
0.5	108,780,123	332,537	0.0031	0.9969	99.92
1.5	101,035,435	200,215	0.0020	0.9980	99.61
2.5	88,577,480	172,483	0.0019	0.9981	99.42
3.5	73,151,037	167,980	0.0023	0.9977	99.22
4.5	67,457,881	92,322	0.0014	0.9986	99.00
5.5	62,451,129	89,860	0.0014	0.9986	98.86
6.5	57,273,576	40,688	0.0007	0.9993	98.72
7.5	53,367,571	58,000	0.0011	0.9989	98.65
8.5	50,051,124	90,790	0.0018	0.9982	98.54
9.5	47,087,854	167,996	0.0036	0.9964	98.36
10.5	44,710,110	7,176	0.0002	0.9998	98.01
11.5	43,405,951	36,099	0.0008	0.9992	97.99
12.5	42,321,226	34,574	0.0008	0.9992	97.91
13.5	41,271,015	84,579	0.0020	0.9980	97.83
14.5	40,049,095	37,217	0.0009	0.9991	97.63
15.5	38,131,874	89,135	0.0023	0.9977	97.54
16.5	36,719,687	78,992	0.0022	0.9978	97.31
17.5	29,761,066	70,232	0.0024	0.9976	97.10
18.5	29,342,763	72,599	0.0025	0.9975	96.88
19.5	28,927,525	63,309	0.0022	0.9978	96.64
20.5	28,366,615	134,747	0.0048	0.9952	96.42
21.5	27,829,485	76,418	0.0027	0.9973	95.97
22.5	27,420,211	141,617	0.0052	0.9948	95.70
23.5	26,785,360	172,283	0.0064	0.9936	95.21
24.5	25,884,930	190,061	0.0073	0.9927	94.60
25.5	25,299,340	114,909	0.0045	0.9955	93.90
26.5	24,611,232	179,723	0.0073	0.9927	93.48
27.5	23,659,469	163,506	0.0069	0.9931	92.79
28.5	21,883,987	31,147	0.0014	0.9986	92.15
29.5	20,795,812	28,039	0.0013	0.9987	92.02
30.5	19,840,206	109,647	0.0055	0.9945	91.90
31.5	18,628,550	16,392	0.0009	0.9991	91.39
32.5	17,771,256	251,784	0.0142	0.9858	91.31
33.5	16,705,057	363,920	0.0218	0.9782	90.01
34.5	15,781,832	11,251	0.0007	0.9993	88.05
35.5	15,770,581	6,856	0.0004	0.9996	87.99
36.5	15,763,725	150,251	0.0095	0.9905	87.95
37.5	15,613,474	19,612	0.0013	0.9987	87.11
38.5	15,593,863	137,997	0.0088	0.9912	87.00

FORTISBC, INC.

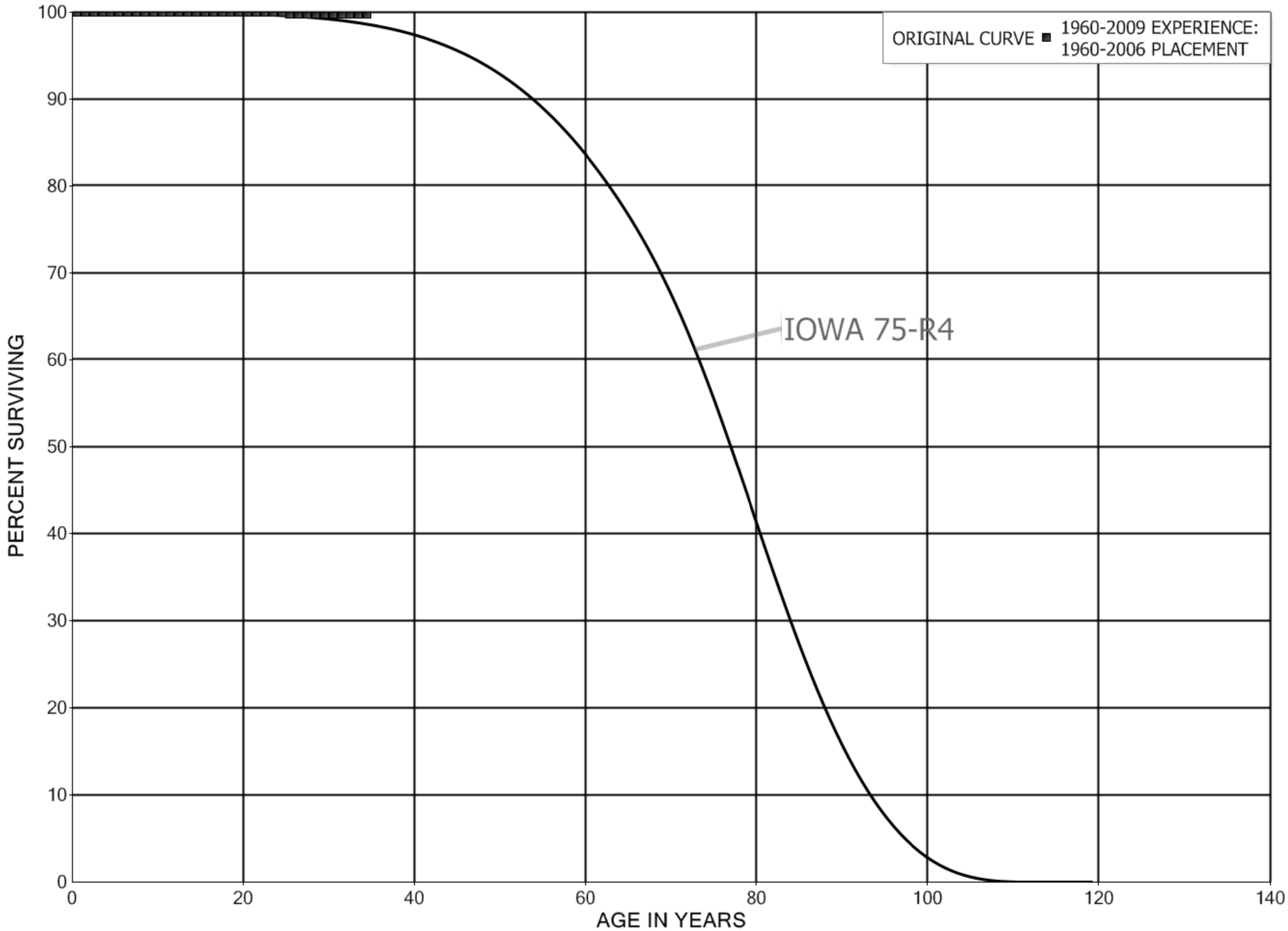
ACCOUNT 368.00 - LINE TRANSFORMERS

ORIGINAL LIFE TABLE, CONT.

PLACEMENT BAND 1960-2008 EXPERIENCE BAND 1960-2009

AGE AT BEGIN OF INTERVAL	EXPOSURES AT BEGINNING OF AGE INTERVAL	RETIREMENTS DURING AGE INTERVAL	RETMT RATIO	SURV RATIO	PCT SURV BEGIN OF INTERVAL
39.5	15,455,865	4,979	0.0003	0.9997	86.23
40.5	15,450,886	224,718	0.0145	0.9855	86.21
41.5	15,226,168	3,660	0.0002	0.9998	84.95
42.5	15,222,508	127,889	0.0084	0.9916	84.93
43.5	15,094,620	156,943	0.0104	0.9896	84.22
44.5	14,937,677	769,187	0.0515	0.9485	83.34
45.5	14,168,490	1,097,501	0.0775	0.9225	79.05
46.5	13,070,989	1,133,967	0.0868	0.9132	72.93
47.5	11,937,022	885,653	0.0742	0.9258	66.60
48.5	11,051,369	1,632,016	0.1477	0.8523	61.66
49.5					52.55

FORTISBC, INC.
ACCOUNT 369.00 - SERVICES
ORIGINAL AND SMOOTH SURVIVOR CURVES



FORTISBC, INC.

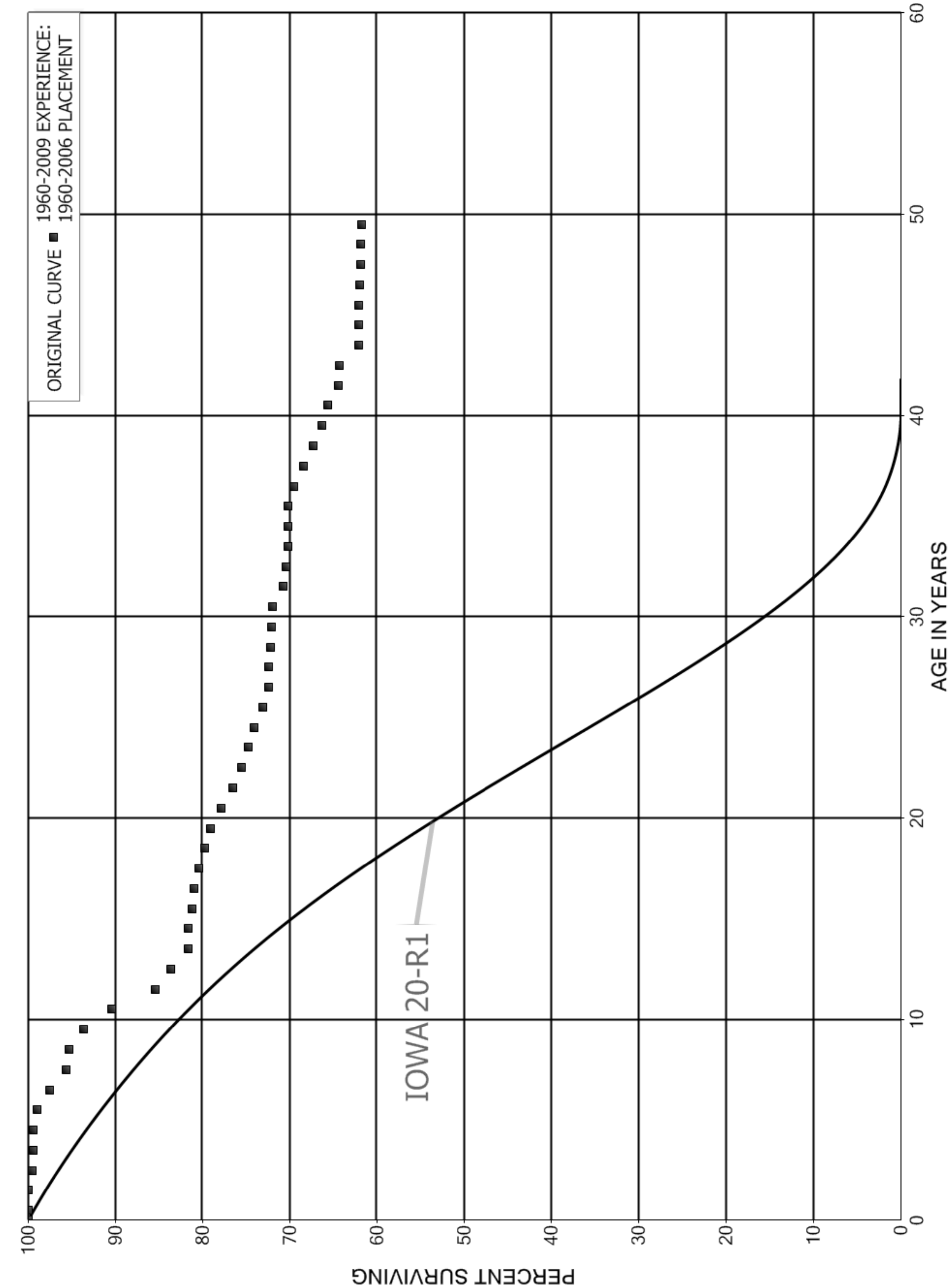
ACCOUNT 369.00 - SERVICES

ORIGINAL LIFE TABLE

PLACEMENT BAND 1960-2006 EXPERIENCE BAND 1960-2009

AGE AT BEGIN OF INTERVAL	EXPOSURES AT BEGINNING OF AGE INTERVAL	RETIREMENTS DURING AGE INTERVAL	RETMT RATIO	SURV RATIO	PCT SURV BEGIN OF INTERVAL
0.0	7,347,500		0.0000	1.0000	100.00
0.5	7,347,500		0.0000	1.0000	100.00
1.5	7,347,500		0.0000	1.0000	100.00
2.5	7,347,500		0.0000	1.0000	100.00
3.5	6,145,474		0.0000	1.0000	100.00
4.5	6,145,474		0.0000	1.0000	100.00
5.5	6,145,474		0.0000	1.0000	100.00
6.5	6,145,474		0.0000	1.0000	100.00
7.5	6,145,474		0.0000	1.0000	100.00
8.5	6,145,474		0.0000	1.0000	100.00
9.5	6,145,474		0.0000	1.0000	100.00
10.5	6,145,474		0.0000	1.0000	100.00
11.5	6,145,474	2	0.0000	1.0000	100.00
12.5	6,145,472	14	0.0000	1.0000	100.00
13.5	6,145,457	16	0.0000	1.0000	100.00
14.5	6,145,441	30	0.0000	1.0000	100.00
15.5	6,145,411	28	0.0000	1.0000	100.00
16.5	6,145,383	94	0.0000	1.0000	100.00
17.5	6,145,289	186	0.0000	1.0000	100.00
18.5	3,988,053	224	0.0001	0.9999	99.99
19.5	2,526,260	313	0.0001	0.9999	99.99
20.5	2,525,948	2,000	0.0008	0.9992	99.98
21.5	2,523,948	0	0.0000	1.0000	99.90
22.5	2,523,948		0.0000	1.0000	99.90
23.5	2,523,948		0.0000	1.0000	99.90
24.5	2,523,948	3,892	0.0015	0.9985	99.90
25.5	2,520,056	0	0.0000	1.0000	99.74
26.5	2,520,056		0.0000	1.0000	99.74
27.5	2,520,056		0.0000	1.0000	99.74
28.5	1,991,453		0.0000	1.0000	99.74
29.5	1,605,726		0.0000	1.0000	99.74
30.5	1,425,318		0.0000	1.0000	99.74
31.5	1,090,279		0.0000	1.0000	99.74
32.5	684,040		0.0000	1.0000	99.74
33.5	361,390		0.0000	1.0000	99.74
34.5	48,302	48,302	1.0000		99.74
35.5					

FORTISBC, INC.
ACCOUNT 370.00 - METERS
ORIGINAL AND SMOOTH SURVIVOR CURVES



FORTISBC, INC.

ACCOUNT 370.00 - METERS

ORIGINAL LIFE TABLE

PLACEMENT BAND 1960-2006 EXPERIENCE BAND 1960-2009

AGE AT BEGIN OF INTERVAL	EXPOSURES AT BEGINNING OF AGE INTERVAL	RETIREMENTS DURING AGE INTERVAL	RETMT RATIO	SURV RATIO	PCT SURV BEGIN OF INTERVAL
0.0	16,782,808	1,323	0.0001	0.9999	100.00
0.5	16,781,485	3,903	0.0002	0.9998	99.99
1.5	16,777,582	77,689	0.0046	0.9954	99.97
2.5	16,699,892	15,234	0.0009	0.9991	99.51
3.5	16,253,046	7,659	0.0005	0.9995	99.42
4.5	15,940,806	63,247	0.0040	0.9960	99.37
5.5	15,379,782	220,705	0.0144	0.9856	98.97
6.5	14,426,146	281,231	0.0195	0.9805	97.55
7.5	14,060,676	51,658	0.0037	0.9963	95.65
8.5	13,593,443	242,076	0.0178	0.9822	95.30
9.5	12,424,288	422,546	0.0340	0.9660	93.60
10.5	11,528,776	644,210	0.0559	0.9441	90.42
11.5	10,291,112	217,624	0.0211	0.9789	85.37
12.5	9,515,823	222,793	0.0234	0.9766	83.56
13.5	8,758,934	4,475	0.0005	0.9995	81.61
14.5	8,461,375	35,547	0.0042	0.9958	81.56
15.5	7,959,393	26,734	0.0034	0.9966	81.22
16.5	7,298,367	49,079	0.0067	0.9933	80.95
17.5	6,382,018	57,201	0.0090	0.9910	80.40
18.5	5,899,001	42,216	0.0072	0.9928	79.68
19.5	5,324,763	84,312	0.0158	0.9842	79.11
20.5	4,927,902	87,503	0.0178	0.9822	77.86
21.5	4,626,458	58,862	0.0127	0.9873	76.48
22.5	4,292,231	43,759	0.0102	0.9898	75.51
23.5	4,143,634	35,101	0.0085	0.9915	74.74
24.5	3,945,511	57,571	0.0146	0.9854	74.10
25.5	3,759,672	30,945	0.0082	0.9918	73.02
26.5	3,596,076	2,776	0.0008	0.9992	72.42
27.5	3,391,433	7,586	0.0022	0.9978	72.36
28.5	3,164,644	6,038	0.0019	0.9981	72.20
29.5	2,989,552	5,304	0.0018	0.9982	72.06
30.5	2,921,824	48,347	0.0165	0.9835	71.94
31.5	2,799,823	15,050	0.0054	0.9946	70.75
32.5	2,752,907	6,687	0.0024	0.9976	70.37
33.5	2,746,012		0.0000	1.0000	70.20
34.5	2,746,012		0.0000	1.0000	70.20
35.5	2,746,012	24,948	0.0091	0.9909	70.20
36.5	2,721,064	47,556	0.0175	0.9825	69.56
37.5	2,673,508	40,011	0.0150	0.9850	68.34
38.5	2,633,497	38,580	0.0146	0.9854	67.32

FORTISBC, INC.

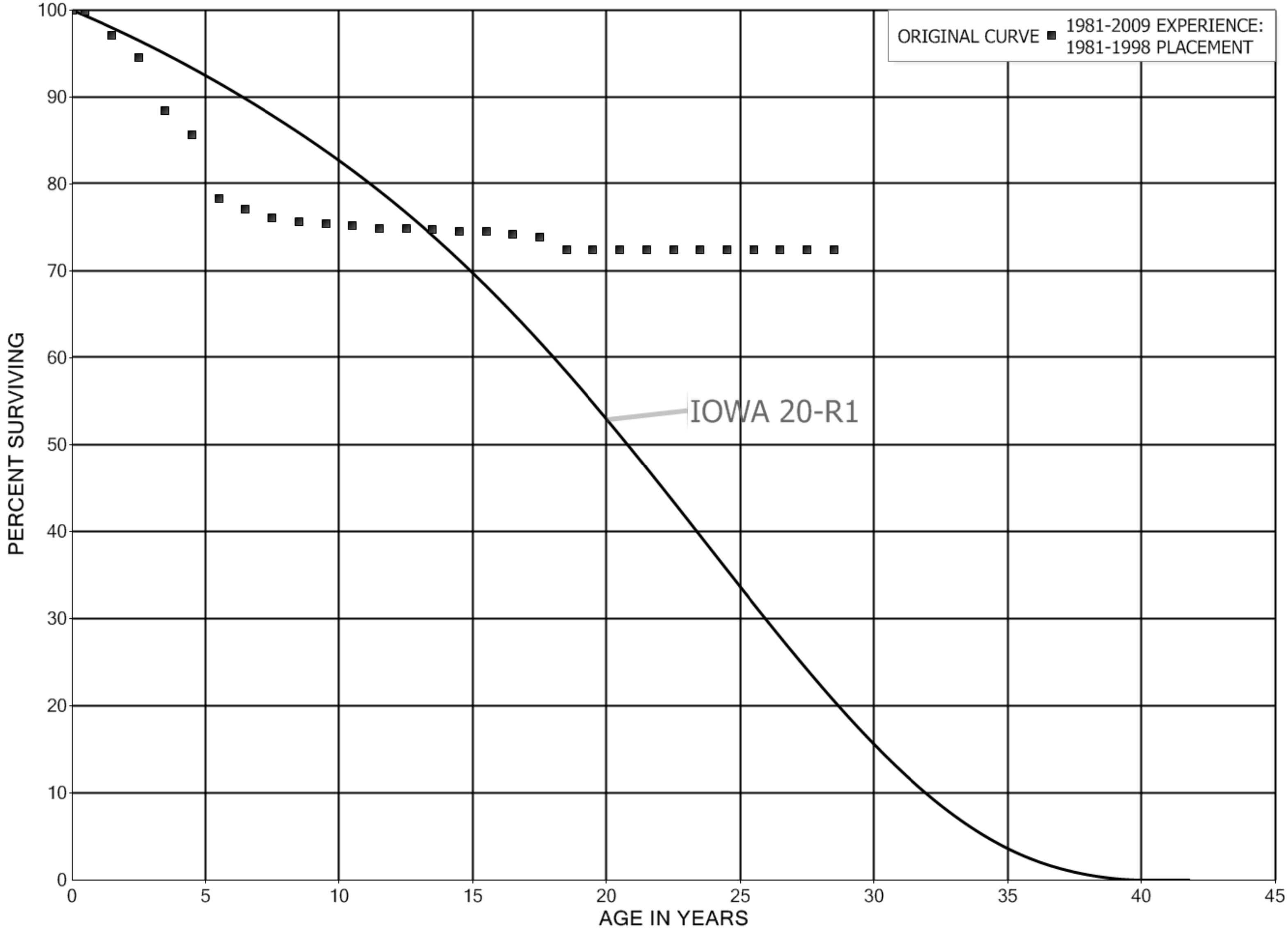
ACCOUNT 370.00 - METERS

ORIGINAL LIFE TABLE, CONT.

PLACEMENT BAND 1960-2006 EXPERIENCE BAND 1960-2009

AGE AT BEGIN OF INTERVAL	EXPOSURES AT BEGINNING OF AGE INTERVAL	RETIREMENTS DURING AGE INTERVAL	RETMT RATIO	SURV RATIO	PCT SURV BEGIN OF INTERVAL
39.5	2,594,917	27,049	0.0104	0.9896	66.33
40.5	2,567,868	49,457	0.0193	0.9807	65.64
41.5	2,518,411	3,190	0.0013	0.9987	64.38
42.5	2,515,222	87,933	0.0350	0.9650	64.30
43.5	2,427,288		0.0000	1.0000	62.05
44.5	2,427,288	1,399	0.0006	0.9994	62.05
45.5	2,425,889	1,455	0.0006	0.9994	62.01
46.5	2,424,434	3,548	0.0015	0.9985	61.97
47.5	2,420,886		0.0000	1.0000	61.88
48.5	2,420,886	4,100	0.0017	0.9983	61.88
49.5					61.78

FORTISBC, INC.
ACCOUNT 371.00 - INSTALLATIONS ON CUSTOMERS' PREMISES
ORIGINAL AND SMOOTH SURVIVOR CURVES



FORTISBC, INC.

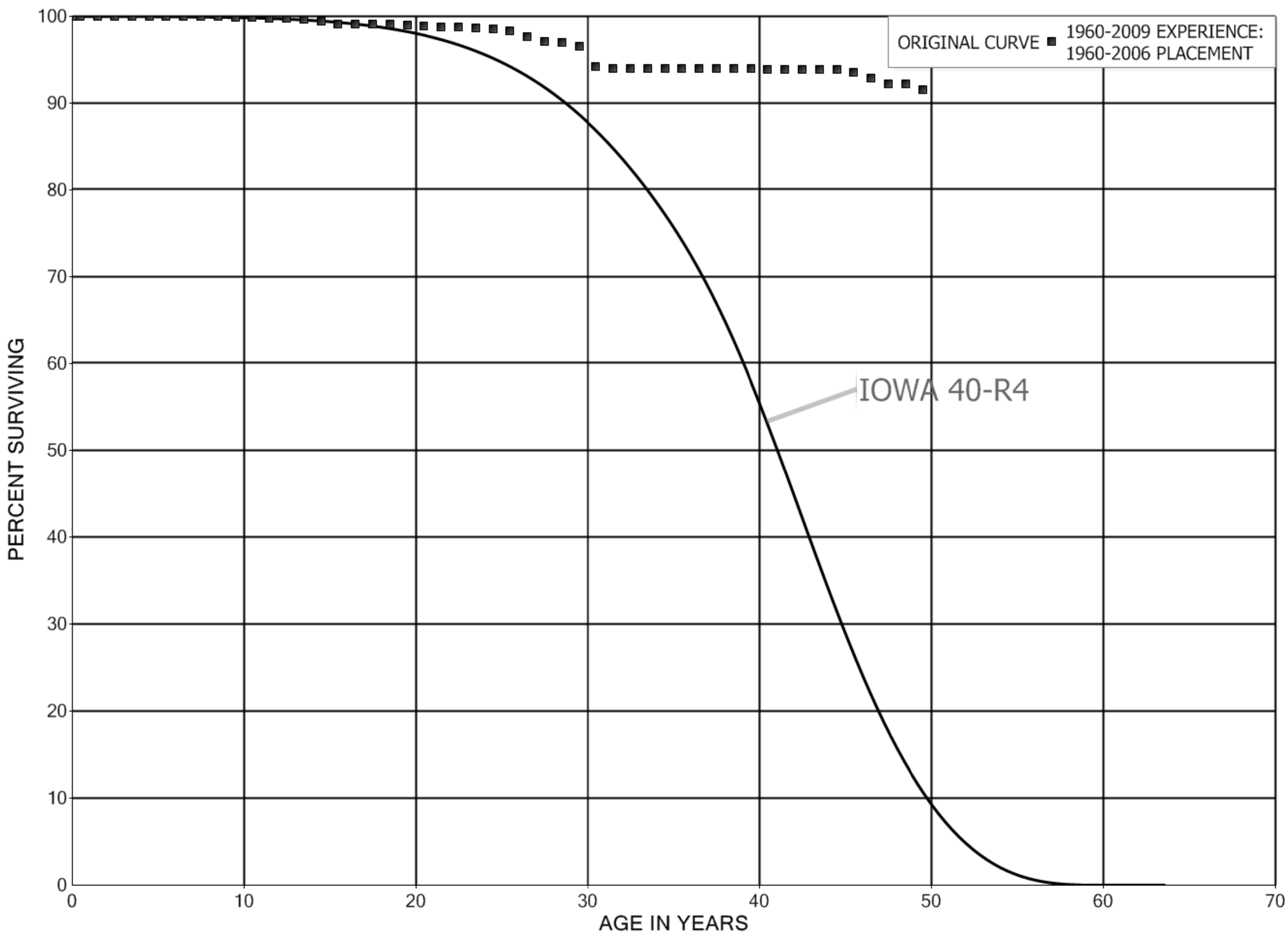
ACCOUNT 371.00 - INSTALLATIONS ON CUSTOMERS' PREMISES

ORIGINAL LIFE TABLE

PLACEMENT BAND 1981-1998 EXPERIENCE BAND 1981-2009

AGE AT BEGIN OF INTERVAL	EXPOSURES AT BEGINNING OF AGE INTERVAL	RETIREMENTS DURING AGE INTERVAL	RETMT RATIO	SURV RATIO	PCT SURV BEGIN OF INTERVAL
0.0	1,275,829	1,571	0.0012	0.9988	100.00
0.5	1,274,258	36,028	0.0283	0.9717	99.88
1.5	1,238,230	33,205	0.0268	0.9732	97.05
2.5	1,205,025	77,568	0.0644	0.9356	94.45
3.5	1,127,457	34,597	0.0307	0.9693	88.37
4.5	1,092,860	93,991	0.0860	0.9140	85.66
5.5	998,869	15,003	0.0150	0.9850	78.29
6.5	983,866	14,006	0.0142	0.9858	77.12
7.5	969,860	5,413	0.0056	0.9944	76.02
8.5	964,447	2,301	0.0024	0.9976	75.59
9.5	962,146	2,661	0.0028	0.9972	75.41
10.5	959,484	4,339	0.0045	0.9955	75.20
11.5	920,192	812	0.0009	0.9991	74.86
12.5	919,379	364	0.0004	0.9996	74.80
13.5	919,016	2,688	0.0029	0.9971	74.77
14.5	913,223	1,037	0.0011	0.9989	74.55
15.5	905,507	3,482	0.0038	0.9962	74.47
16.5	894,233	3,781	0.0042	0.9958	74.18
17.5	263,972	5,150	0.0195	0.9805	73.87
18.5	253,612		0.0000	1.0000	72.42
19.5	248,412		0.0000	1.0000	72.42
20.5	248,412		0.0000	1.0000	72.42
21.5	216,060		0.0000	1.0000	72.42
22.5	190,912		0.0000	1.0000	72.42
23.5	181,931		0.0000	1.0000	72.42
24.5	129,211		0.0000	1.0000	72.42
25.5	113,132		0.0000	1.0000	72.42
26.5	70,614		0.0000	1.0000	72.42
27.5	34,384		0.0000	1.0000	72.42
28.5					72.42

FORTISBC, INC.
ACCOUNT 373.00 - STREET LIGHTING AND SIGNAL SYSTEMS
ORIGINAL AND SMOOTH SURVIVOR CURVES



FORTISBC, INC.

ACCOUNT 373.00 - STREET LIGHTING AND SIGNAL SYSTEMS

ORIGINAL LIFE TABLE

PLACEMENT BAND 1960-2006 EXPERIENCE BAND 1960-2009

AGE AT BEGIN OF INTERVAL	EXPOSURES AT BEGINNING OF AGE INTERVAL	RETIREMENTS DURING AGE INTERVAL	RETMT RATIO	SURV RATIO	PCT SURV BEGIN OF INTERVAL
0.0	10,981,489		0.0000	1.0000	100.00
0.5	10,981,489	889	0.0001	0.9999	100.00
1.5	10,980,600	80	0.0000	1.0000	99.99
2.5	10,980,520	240	0.0000	1.0000	99.99
3.5	10,834,507	468	0.0000	1.0000	99.99
4.5	10,834,039	1,820	0.0002	0.9998	99.98
5.5	9,945,802	128	0.0000	1.0000	99.97
6.5	8,980,140	1,086	0.0001	0.9999	99.97
7.5	8,979,054	3,797	0.0004	0.9996	99.95
8.5	8,895,297	2,833	0.0003	0.9997	99.91
9.5	8,873,390	5,976	0.0007	0.9993	99.88
10.5	8,821,726	3,337	0.0004	0.9996	99.81
11.5	8,809,472	7,583	0.0009	0.9991	99.78
12.5	8,801,889	9,788	0.0011	0.9989	99.69
13.5	8,770,133	19,554	0.0022	0.9978	99.58
14.5	8,728,328	23,256	0.0027	0.9973	99.36
15.5	8,704,652	2,636	0.0003	0.9997	99.09
16.5	8,698,655	2,354	0.0003	0.9997	99.06
17.5	8,600,595	1,846	0.0002	0.9998	99.04
18.5	8,598,750	5,158	0.0006	0.9994	99.01
19.5	8,593,592	14,433	0.0017	0.9983	98.95
20.5	8,572,321	5,423	0.0006	0.9994	98.79
21.5	8,566,898	4,515	0.0005	0.9995	98.73
22.5	8,562,383	3,046	0.0004	0.9996	98.67
23.5	8,550,677	10,192	0.0012	0.9988	98.64
24.5	8,503,221	22,229	0.0026	0.9974	98.52
25.5	8,445,914	54,935	0.0065	0.9935	98.26
26.5	8,363,390	44,606	0.0053	0.9947	97.62
27.5	8,268,004	13,879	0.0017	0.9983	97.10
28.5	8,194,453	39,132	0.0048	0.9952	96.94
29.5	8,088,224	192,783	0.0238	0.9762	96.48
30.5	7,830,141	18,913	0.0024	0.9976	94.18
31.5	7,704,514	969	0.0001	0.9999	93.95
32.5	7,631,774	1,839	0.0002	0.9998	93.94
33.5	7,524,948	381	0.0001	0.9999	93.92
34.5	7,445,190	127	0.0000	1.0000	93.91
35.5	7,445,063	42	0.0000	1.0000	93.91
36.5	7,445,021		0.0000	1.0000	93.91
37.5	7,445,021	104	0.0000	1.0000	93.91
38.5	7,444,917	1,186	0.0002	0.9998	93.91

FORTISBC, INC.

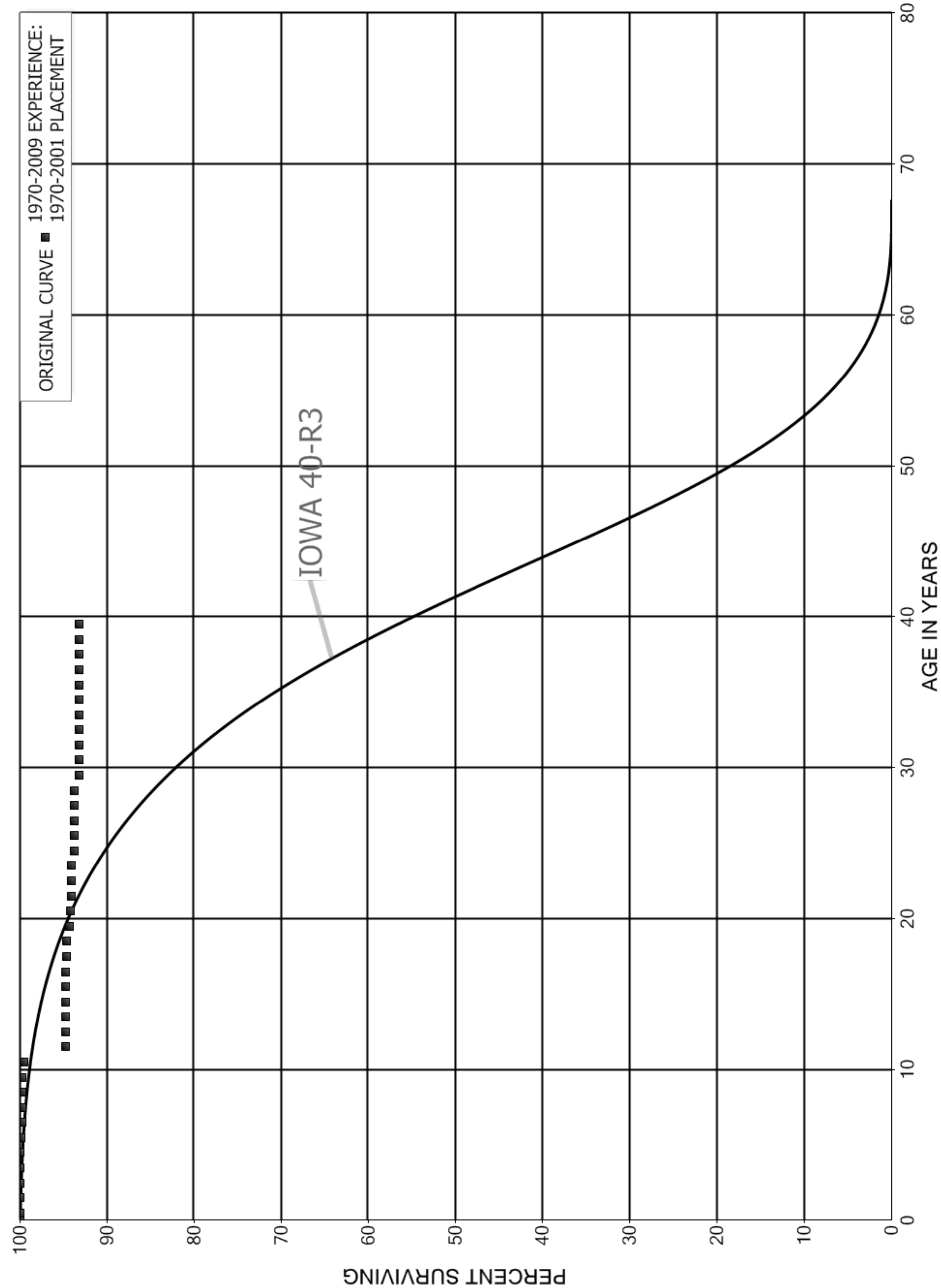
ACCOUNT 373.00 - STREET LIGHTING AND SIGNAL SYSTEMS

ORIGINAL LIFE TABLE, CONT.

PLACEMENT BAND 1960-2006 EXPERIENCE BAND 1960-2009

AGE AT BEGIN OF INTERVAL	EXPOSURES AT BEGINNING OF AGE INTERVAL	RETIREMENTS DURING AGE INTERVAL	RETMT RATIO	SURV RATIO	PCT SURV BEGIN OF INTERVAL
39.5	7,443,731	2,843	0.0004	0.9996	93.89
40.5	7,440,888	37	0.0000	1.0000	93.86
41.5	7,440,850	12	0.0000	1.0000	93.86
42.5	7,440,838	608	0.0001	0.9999	93.86
43.5	7,440,230	3,539	0.0005	0.9995	93.85
44.5	7,436,691	23,390	0.0031	0.9969	93.80
45.5	7,413,301	49,475	0.0067	0.9933	93.51
46.5	7,363,827	52,676	0.0072	0.9928	92.89
47.5	7,311,151		0.0000	1.0000	92.22
48.5	7,311,151	52,739	0.0072	0.9928	92.22
49.5					91.56

FORTISBC, INC.
ACCOUNT 390.00 - STRUCTURES - FRAME AND IRON
ORIGINAL AND SMOOTH SURVIVOR CURVES



FORTISBC, INC.

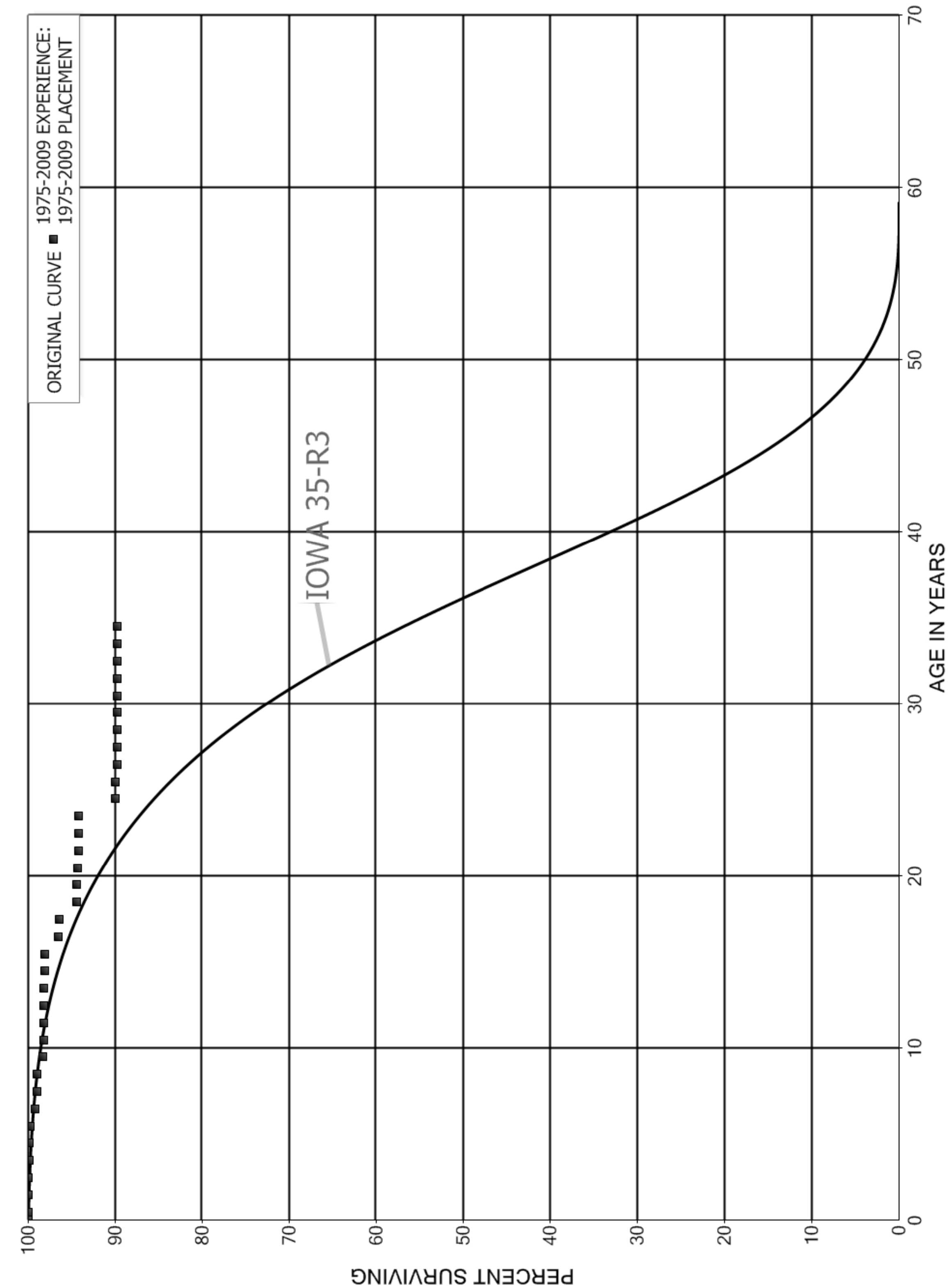
ACCOUNT 390.00 - STRUCTURES - FRAME AND IRON

ORIGINAL LIFE TABLE

PLACEMENT BAND 1970-2001 EXPERIENCE BAND 1970-2009

AGE AT BEGIN OF INTERVAL	EXPOSURES AT BEGINNING OF AGE INTERVAL	RETIREMENTS DURING AGE INTERVAL	RETMT RATIO	SURV RATIO	PCT SURV BEGIN OF INTERVAL
0.0	353,468		0.0000	1.0000	100.00
0.5	353,468		0.0000	1.0000	100.00
1.5	353,468		0.0000	1.0000	100.00
2.5	353,468	1	0.0000	1.0000	100.00
3.5	353,468	1	0.0000	1.0000	100.00
4.5	353,467	437	0.0012	0.9988	100.00
5.5	353,030	440	0.0012	0.9988	99.88
6.5	352,590	12	0.0000	1.0000	99.75
7.5	352,578	0	0.0000	1.0000	99.75
8.5	286,715	4	0.0000	1.0000	99.75
9.5	279,678	608	0.0022	0.9978	99.75
10.5	260,474	12,476	0.0479	0.9521	99.53
11.5	245,793	7	0.0000	1.0000	94.76
12.5	234,081	10	0.0000	1.0000	94.76
13.5	225,742	85	0.0004	0.9996	94.76
14.5	218,763	36	0.0002	0.9998	94.72
15.5	191,373	61	0.0003	0.9997	94.70
16.5	184,216	15	0.0001	0.9999	94.67
17.5	179,233	9	0.0001	0.9999	94.67
18.5	179,224	672	0.0038	0.9962	94.66
19.5	173,267	235	0.0014	0.9986	94.31
20.5	153,101	189	0.0012	0.9988	94.18
21.5	120,336	9	0.0001	0.9999	94.06
22.5	112,256	48	0.0004	0.9996	94.06
23.5	106,688	289	0.0027	0.9973	94.02
24.5	91,263		0.0000	1.0000	93.76
25.5	89,084		0.0000	1.0000	93.76
26.5	84,633	0	0.0000	1.0000	93.76
27.5	83,775		0.0000	1.0000	93.76
28.5	81,133	461	0.0057	0.9943	93.76
29.5	34,576		0.0000	1.0000	93.23
30.5	29,812		0.0000	1.0000	93.23
31.5	15,309		0.0000	1.0000	93.23
32.5	14,804		0.0000	1.0000	93.23
33.5	12,919		0.0000	1.0000	93.23
34.5	4,441		0.0000	1.0000	93.23
35.5	4,441		0.0000	1.0000	93.23
36.5	4,441		0.0000	1.0000	93.23
37.5	4,441		0.0000	1.0000	93.23
38.5	4,441		0.0000	1.0000	93.23
39.5					93.23

FORTISBC, INC.
ACCOUNT 390.10 - STRUCTURES - MASONRY
ORIGINAL AND SMOOTH SURVIVOR CURVES



FORTISBC, INC.

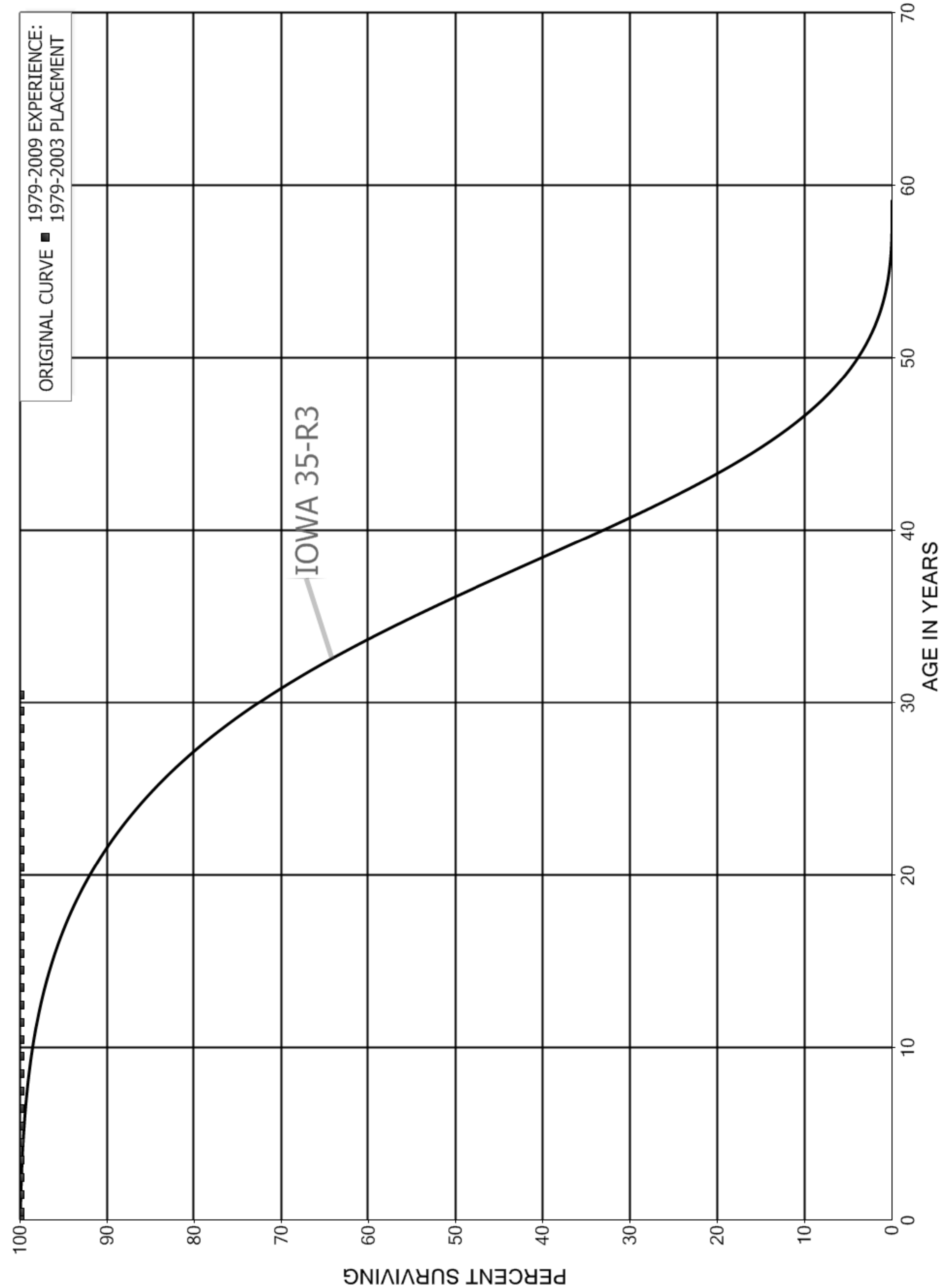
ACCOUNT 390.10 - STRUCTURES - MASONRY

ORIGINAL LIFE TABLE

PLACEMENT BAND 1975-2007 EXPERIENCE BAND 1975-2009

AGE AT BEGIN OF INTERVAL	EXPOSURES AT BEGINNING OF AGE INTERVAL	RETIREMENTS DURING AGE INTERVAL	RETMT RATIO	SURV RATIO	PCT SURV BEGIN OF INTERVAL
0.0	9,687,622		0.0000	1.0000	100.00
0.5	9,687,622		0.0000	1.0000	100.00
1.5	9,687,622	7,600	0.0008	0.9992	100.00
2.5	9,419,740	5,685	0.0006	0.9994	99.92
3.5	9,414,055	7,040	0.0007	0.9993	99.86
4.5	9,407,015	1,319	0.0001	0.9999	99.79
5.5	9,405,696	55,676	0.0059	0.9941	99.77
6.5	9,153,220	24,675	0.0027	0.9973	99.18
7.5	9,128,545		0.0000	1.0000	98.91
8.5	8,895,729	52,773	0.0059	0.9941	98.91
9.5	8,837,689	9,654	0.0011	0.9989	98.33
10.5	8,760,231		0.0000	1.0000	98.22
11.5	8,760,231	1,625	0.0002	0.9998	98.22
12.5	8,758,606	5,595	0.0006	0.9994	98.20
13.5	8,753,011	2,231	0.0003	0.9997	98.14
14.5	8,750,780	735	0.0001	0.9999	98.11
15.5	8,656,917	139,958	0.0162	0.9838	98.11
16.5	8,224,094	8,181	0.0010	0.9990	96.52
17.5	8,064,781	170,388	0.0211	0.9789	96.42
18.5	7,754,518	3,804	0.0005	0.9995	94.39
19.5	7,750,714	4,316	0.0006	0.9994	94.34
20.5	7,367,140	6,650	0.0009	0.9991	94.29
21.5	6,613,987	4,393	0.0007	0.9993	94.20
22.5	5,347,460		0.0000	1.0000	94.14
23.5	5,270,903	232,497	0.0441	0.9559	94.14
24.5	3,327,871		0.0000	1.0000	89.99
25.5	3,327,871	11,000	0.0033	0.9967	89.99
26.5	2,654,218		0.0000	1.0000	89.69
27.5	2,654,218		0.0000	1.0000	89.69
28.5	2,654,218		0.0000	1.0000	89.69
29.5	2,654,218		0.0000	1.0000	89.69
30.5	594,921		0.0000	1.0000	89.69
31.5	594,921		0.0000	1.0000	89.69
32.5	594,921		0.0000	1.0000	89.69
33.5	496,561		0.0000	1.0000	89.69
34.5					89.69

FORTISBC, INC.
ACCOUNT 390.20 - OPERATIONS BUILDINGS
ORIGINAL AND SMOOTH SURVIVOR CURVES



FORTISBC, INC.

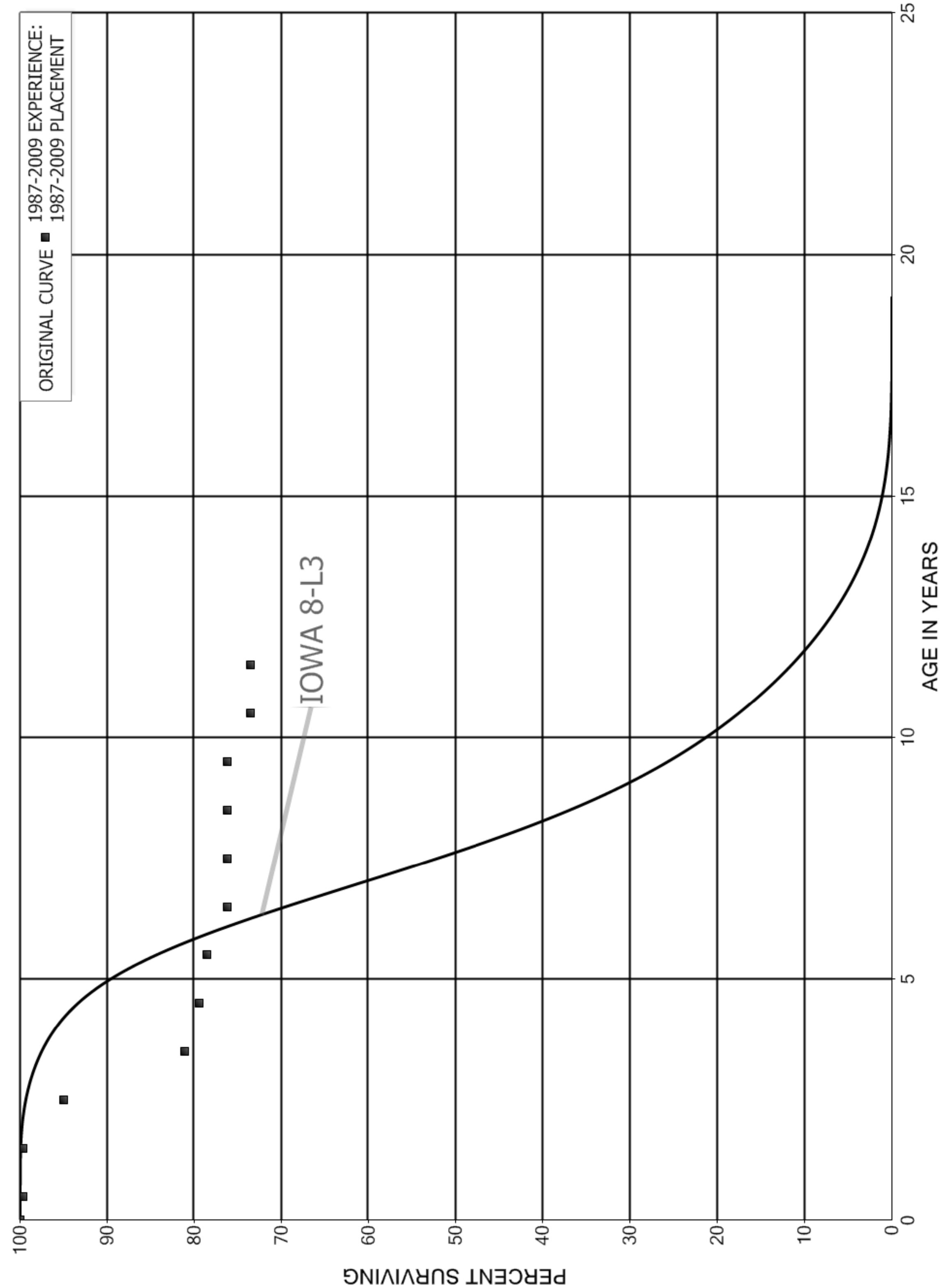
ACCOUNT 390.20 - OPERATIONS BUILDINGS

ORIGINAL LIFE TABLE

PLACEMENT BAND 1979-2003 EXPERIENCE BAND 1979-2009

AGE AT BEGIN OF INTERVAL	EXPOSURES AT BEGINNING OF AGE INTERVAL	RETIREMENTS DURING AGE INTERVAL	RETMT RATIO	SURV RATIO	PCT SURV BEGIN OF INTERVAL
0.0	12,750,128		0.0000	1.0000	100.00
0.5	12,750,128		0.0000	1.0000	100.00
1.5	12,750,128		0.0000	1.0000	100.00
2.5	12,750,128		0.0000	1.0000	100.00
3.5	12,750,128		0.0000	1.0000	100.00
4.5	12,750,128		0.0000	1.0000	100.00
5.5	12,750,128		0.0000	1.0000	100.00
6.5	7,816,293		0.0000	1.0000	100.00
7.5	7,816,293		0.0000	1.0000	100.00
8.5	7,816,293		0.0000	1.0000	100.00
9.5	7,816,293		0.0000	1.0000	100.00
10.5	7,816,293		0.0000	1.0000	100.00
11.5	7,816,293		0.0000	1.0000	100.00
12.5	7,816,293		0.0000	1.0000	100.00
13.5	7,816,293		0.0000	1.0000	100.00
14.5	7,816,293		0.0000	1.0000	100.00
15.5	7,816,293		0.0000	1.0000	100.00
16.5	7,816,293		0.0000	1.0000	100.00
17.5	7,816,293		0.0000	1.0000	100.00
18.5	7,816,293		0.0000	1.0000	100.00
19.5	7,816,293		0.0000	1.0000	100.00
20.5	7,816,293		0.0000	1.0000	100.00
21.5	7,816,293		0.0000	1.0000	100.00
22.5	7,816,293		0.0000	1.0000	100.00
23.5	7,816,293		0.0000	1.0000	100.00
24.5	7,816,293		0.0000	1.0000	100.00
25.5	7,816,293		0.0000	1.0000	100.00
26.5	7,816,293		0.0000	1.0000	100.00
27.5	7,816,293		0.0000	1.0000	100.00
28.5	7,816,293		0.0000	1.0000	100.00
29.5	7,816,293		0.0000	1.0000	100.00
30.5					100.00

FORTISBC, INC.
ACCOUNT 392.10 - LIGHT DUTY VEHICLES
ORIGINAL AND SMOOTH SURVIVOR CURVES



FORTISBC, INC.

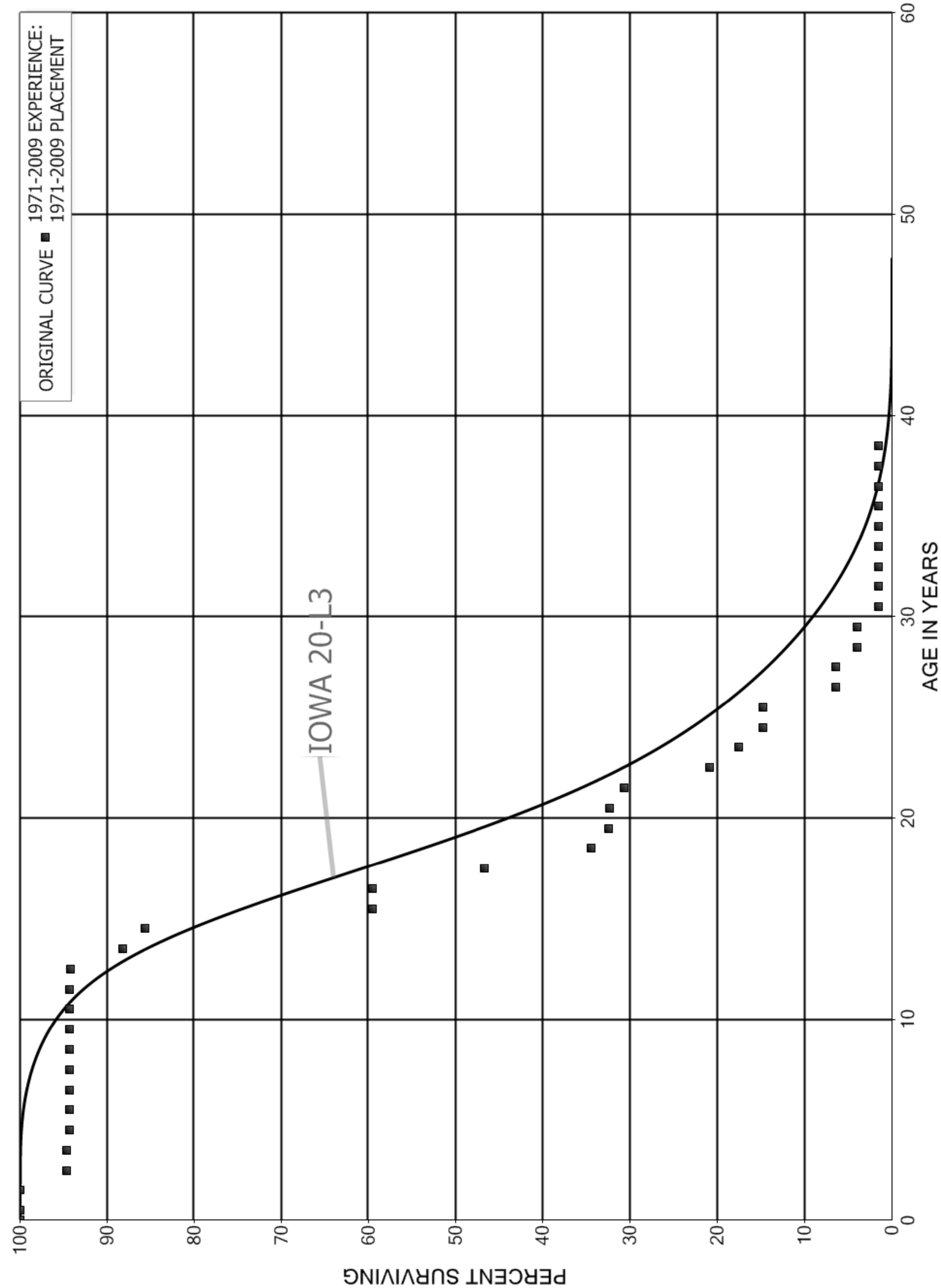
ACCOUNT 392.10 - LIGHT DUTY VEHICLES

ORIGINAL LIFE TABLE

PLACEMENT BAND 1987-2009 EXPERIENCE BAND 1987-2009

AGE AT BEGIN OF INTERVAL	EXPOSURES AT BEGINNING OF AGE INTERVAL	RETIREMENTS DURING AGE INTERVAL	RETMT RATIO	SURV RATIO	PCT SURV BEGIN OF INTERVAL
0.0	18,109,498	60,011	0.0033	0.9967	100.00
0.5	17,791,780		0.0000	1.0000	99.67
1.5	16,756,168	798,400	0.0476	0.9524	99.67
2.5	14,758,096	2,152,260	0.1458	0.8542	94.92
3.5	10,401,683	217,571	0.0209	0.9791	81.08
4.5	8,516,831	93,530	0.0110	0.9890	79.38
5.5	8,336,194	249,695	0.0300	0.9700	78.51
6.5	8,071,011		0.0000	1.0000	76.16
7.5	8,071,011		0.0000	1.0000	76.16
8.5	8,071,011		0.0000	1.0000	76.16
9.5	8,071,011	280,820	0.0348	0.9652	76.16
10.5	7,790,191		0.0000	1.0000	73.51
11.5	7,790,191	1,403,820	0.1802	0.8198	73.51
12.5	6,386,371	3,384,920	0.5300	0.4700	60.26
13.5	2,978,261	185,250	0.0622	0.9378	28.32
14.5	2,591,216	586,030	0.2262	0.7738	26.56
15.5	1,981,644	797,129	0.4023	0.5977	20.55
16.5	1,184,515	369,100	0.3116	0.6884	12.29
17.5	815,415	392,090	0.4808	0.5192	8.46
18.5	423,325	187,890	0.4438	0.5562	4.39
19.5	207,220	1,290	0.0062	0.9938	2.44
20.5	183,140	183,140	1.0000		2.43
21.5					

FORTISBC, INC.
ACCOUNT 392.20 - HEAVY DUTY VEHICLES
ORIGINAL AND SMOOTH SURVIVOR CURVES



FORTISBC, INC.

ACCOUNT 392.20 - HEAVY DUTY VEHICLES

ORIGINAL LIFE TABLE

PLACEMENT BAND 1971-2009 EXPERIENCE BAND 1971-2009

AGE AT BEGIN OF INTERVAL	EXPOSURES AT BEGINNING OF AGE INTERVAL	RETIREMENTS DURING AGE INTERVAL	RETMT RATIO	SURV RATIO	PCT SURV BEGIN OF INTERVAL
0.0	26,443,918		0.0000	1.0000	100.00
0.5	24,636,909		0.0000	1.0000	100.00
1.5	23,967,842	1,295,930	0.0541	0.9459	100.00
2.5	19,485,777		0.0000	1.0000	94.59
3.5	18,410,382	59,440	0.0032	0.9968	94.59
4.5	17,592,744		0.0000	1.0000	94.29
5.5	17,418,199		0.0000	1.0000	94.29
6.5	17,294,400		0.0000	1.0000	94.29
7.5	16,989,571		0.0000	1.0000	94.29
8.5	16,989,571		0.0000	1.0000	94.29
9.5	16,911,216	9,809	0.0006	0.9994	94.29
10.5	16,853,911		0.0000	1.0000	94.23
11.5	16,853,911	11,340	0.0007	0.9993	94.23
12.5	16,842,571	1,078,584	0.0640	0.9360	94.17
13.5	15,700,921	452,470	0.0288	0.9712	88.14
14.5	14,856,974	4,537,200	0.3054	0.6946	85.60
15.5	9,799,168		0.0000	1.0000	59.46
16.5	9,749,781	2,109,361	0.2163	0.7837	59.46
17.5	7,301,630	1,905,740	0.2610	0.7390	46.59
18.5	5,371,697	319,589	0.0595	0.9405	34.43
19.5	4,568,118	20,392	0.0045	0.9955	32.38
20.5	4,519,164	224,969	0.0498	0.9502	32.24
21.5	4,294,195	1,380,280	0.3214	0.6786	30.63
22.5	2,705,693	427,170	0.1579	0.8421	20.79
23.5	2,278,523	361,340	0.1586	0.8414	17.51
24.5	1,797,029	7,000	0.0039	0.9961	14.73
25.5	1,753,311	991,018	0.5652	0.4348	14.67
26.5	727,595		0.0000	1.0000	6.38
27.5	675,254	252,426	0.3738	0.6262	6.38
28.5	422,825		0.0000	1.0000	3.99
29.5	344,155	214,170	0.6223	0.3777	3.99
30.5	118,280		0.0000	1.0000	1.51
31.5	61,170		0.0000	1.0000	1.51
32.5	61,170		0.0000	1.0000	1.51
33.5	61,170		0.0000	1.0000	1.51
34.5	61,170		0.0000	1.0000	1.51
35.5	61,170		0.0000	1.0000	1.51
36.5	61,170		0.0000	1.0000	1.51
37.5	17,435		0.0000	1.0000	1.51
38.5					1.51

PART V. NET SALVAGE STATISTICS

FORTISBC, INC.

ACCOUNT 331.00 - STRUCTURES AND IMPROVEMENTS

SUMMARY OF BOOK SALVAGE

YEAR	REGULAR RETIREMENTS	COST OF REMOVAL AMOUNT	PCT	GROSS SALVAGE AMOUNT	PCT	NET SALVAGE AMOUNT	PCT
1995	14,776		0		0		0
1996							
1997							
1998							
1999							
2000		10				10-	
2001							
2002							
2003							
2004	40,943	409	1		0	409-	1-
2005	51,854	455	1		0	455-	1-
2006	3,832	45	1		0	45-	1-
2007	10,530	73	1		0	73-	1-
2008		372				372-	
2009		34,323				34,323-	
TOTAL	121,935	35,689	29		0	35,689-	29-
THREE-YEAR MOVING AVERAGES							
95-97	4,925		0		0		0
96-98							
97-99							
98-00		3				3-	
99-01		3				3-	
00-02		3				3-	
01-03							
02-04	13,648	136	1		0	136-	1-
03-05	30,932	288	1		0	288-	1-
04-06	32,210	303	1		0	303-	1-
05-07	22,072	191	1		0	191-	1-
06-08	4,787	164	3		0	164-	3-
07-09	3,510	11,589	330		0	11,589-	330-
FIVE-YEAR AVERAGE							
05-09	13,243	7,054	53		0	7,054-	53-

FORTISBC, INC.

ACCOUNT 332.00 - RESERVOIRS, DAMS, AND WATERWAYS

SUMMARY OF BOOK SALVAGE

YEAR	REGULAR RETIREMENTS	COST OF REMOVAL AMOUNT	PCT	GROSS SALVAGE AMOUNT	PCT	NET SALVAGE AMOUNT	PCT
2003							
2004	68,452	685	1		0	685-	1-
2005	369,177	655	0		0	655-	0
2006	3,015	806	27		0	806-	27-
2007	76,239	1,474	2		0	1,474-	2-
2008	4,551	47	1		0	47-	1-
2009	19,693	213,012			0	213,012-	
TOTAL	541,127	216,680	40		0	216,680-	40-
THREE-YEAR MOVING AVERAGES							
03-05	145,876	446	0		0	446-	0
04-06	146,881	715	0		0	715-	0
05-07	149,477	978	1		0	978-	1-
06-08	27,935	776	3		0	776-	3-
07-09	33,494	71,511	214		0	71,511-	214-
FIVE-YEAR AVERAGE							
05-09	94,535	43,199	46		0	43,199-	46-

FORTISBC, INC.

ACCOUNT 333.00 - WATER WHEELS, TURBINES, AND GENERATORS

SUMMARY OF BOOK SALVAGE

YEAR	REGULAR RETIREMENTS	COST OF REMOVAL AMOUNT	PCT	GROSS SALVAGE AMOUNT	PCT	NET SALVAGE AMOUNT	PCT
1995		149				149-	
1996							
1997							
1998							
1999		433			0	433-	
2000	33,568	563	2		0	563-	2-
2001		17				17-	
2002							
2003	362,133	5	0		0	5-	0
2004	170,821	4,290	3		0	4,290-	3-
2005		3,442				3,442-	
2006	1,083	138	13		0	138-	13-
2007	367,027	3,509	1		0	3,509-	1-
2008	181,067	4,722	3		0	4,722-	3-
2009	368,480	491,636	133		0	491,636-	133-
TOTAL	1,484,179	508,904	34		0	508,904-	34-

THREE-YEAR MOVING AVERAGES

YEAR	REGULAR RETIREMENTS	COST OF REMOVAL AMOUNT	PCT	GROSS SALVAGE AMOUNT	PCT	NET SALVAGE AMOUNT	PCT
95-97		50				50-	
96-98							
97-99		144				144-	
98-00	11,189	332	3		0	332-	3-
99-01	11,189	338	3		0	338-	3-
00-02	11,189	193	2		0	193-	2-
01-03	120,711	7	0		0	7-	0
02-04	177,651	1,432	1		0	1,432-	1-
03-05	177,651	2,579	1		0	2,579-	1-
04-06	57,301	2,623	5		0	2,623-	5-
05-07	122,703	2,363	2		0	2,363-	2-
06-08	183,059	2,790	2		0	2,790-	2-
07-09	305,525	166,623	55		0	166,623-	55-

FIVE-YEAR AVERAGE

YEAR	REGULAR RETIREMENTS	COST OF REMOVAL AMOUNT	PCT	GROSS SALVAGE AMOUNT	PCT	NET SALVAGE AMOUNT	PCT
05-09	183,531	100,689	55		0	100,689-	55-

FORTISBC, INC.

ACCOUNT 334.00 - ACCESSORY ELECTRICAL EQUIPMENT

SUMMARY OF BOOK SALVAGE

YEAR	REGULAR RETIREMENTS	COST OF REMOVAL AMOUNT	PCT	GROSS SALVAGE AMOUNT	PCT	NET SALVAGE AMOUNT	PCT
1999		440				440-	
2000		653				653-	
2001							
2002		473				473-	
2003	188,915	2	0		0	2-	0
2004	69,020	690	1		0	690-	1-
2005	70,164	2,527	4		0	2,527-	4-
2006	37,818	247	1		0	247-	1-
2007	132,922	1,073	1		0	1,073-	1-
2008	93,009	1,160	1		0	1,160-	1-
2009	194,348	209,855	108		0	209,855-	108-
TOTAL	786,198	217,120	28		0	217,120-	28-
THREE-YEAR MOVING AVERAGES							
99-01		364				364-	
00-02		375				375-	
01-03	62,972	158	0		0	158-	0
02-04	85,979	388	0		0	388-	0
03-05	109,366	1,073	1		0	1,073-	1-
04-06	59,001	1,155	2		0	1,155-	2-
05-07	80,302	1,283	2		0	1,283-	2-
06-08	87,917	827	1		0	827-	1-
07-09	140,093	70,696	50		0	70,696-	50-
FIVE-YEAR AVERAGE							
05-09	105,652	42,972	41		0	42,972-	41-

FORTISBC, INC.

ACCOUNT 335.00 - OTHER POWER PLANT EQUIPMENT

SUMMARY OF BOOK SALVAGE

YEAR	REGULAR RETIREMENTS	COST OF REMOVAL AMOUNT	PCT	GROSS SALVAGE AMOUNT	PCT	NET SALVAGE AMOUNT	PCT
2000	57,465	598	1		0	598-	1-
2001							
2002							
2003							
2004							
2005	76,417	84	0		0	84-	0
2006							
2007	30,528	227	1		0	227-	1-
2008	30,120	137	0		0	137-	0
2009	90,985		0		0		0
TOTAL	285,515	1,046	0		0	1,046-	0
THREE-YEAR MOVING AVERAGES							
00-02	19,155	199	1		0	199-	1-
01-03							
02-04							
03-05	25,472	28	0		0	28-	0
04-06	25,472	28	0		0	28-	0
05-07	35,648	104	0		0	104-	0
06-08	20,216	121	1		0	121-	1-
07-09	50,544	121	0		0	121-	0
FIVE-YEAR AVERAGE							
05-09	45,610	90	0		0	90-	0

FORTISBC, INC.

ACCOUNT 350.10 - LAND RIGHTS

SUMMARY OF BOOK SALVAGE

YEAR	REGULAR RETIREMENTS	COST OF REMOVAL AMOUNT	PCT	GROSS SALVAGE AMOUNT	PCT	NET SALVAGE AMOUNT	PCT
2003	202,938	2	0		0	2-	0
2004	24,931	258	1		0	258-	1-
2005							
2006							
2007							
2008							
2009							
TOTAL	227,869	260	0		0	260-	0
THREE-YEAR MOVING AVERAGES							
03-05	75,956	87	0		0	87-	0
04-06	8,310	86	1		0	86-	1-
05-07							
06-08							
07-09							
FIVE-YEAR AVERAGE							
05-09							

FORTISBC, INC.

ACCOUNT 353.00 - SUBSTATION EQUIPMENT

SUMMARY OF BOOK SALVAGE

YEAR	REGULAR RETIREMENTS	COST OF REMOVAL AMOUNT	PCT	GROSS SALVAGE AMOUNT	PCT	NET SALVAGE AMOUNT	PCT
1996	7,794		0		0		0
1997							
1998		1,886				1,886-	
1999	50,703	68	0		0	68-	0
2000		382				382-	
2001		173				173-	
2002							
2003							
2004		901				901-	
2005		795				795-	
2006	496,251	2,350	0		0	2,350-	0
2007	75,512	3,370	4		0	3,370-	4-
2008	49,236	5,005	10		0	5,005-	10-
2009	21,849	242,754			0	242,754-	
TOTAL	701,345	257,684	37		0	257,684-	37-

THREE-YEAR MOVING AVERAGES

YEAR	REGULAR RETIREMENTS	COST OF REMOVAL AMOUNT	PCT	GROSS SALVAGE AMOUNT	PCT	NET SALVAGE AMOUNT	PCT
96-98	2,598	629	24		0	629-	24-
97-99	16,901	651	4		0	651-	4-
98-00	16,901	779	5		0	779-	5-
99-01	16,901	208	1		0	208-	1-
00-02		185				185-	
01-03		58				58-	
02-04		300				300-	
03-05		565				565-	
04-06	165,417	1,349	1		0	1,349-	1-
05-07	190,587	2,172	1		0	2,172-	1-
06-08	207,000	3,575	2		0	3,575-	2-
07-09	48,866	83,710	171		0	83,710-	171-

FIVE-YEAR AVERAGE

YEAR	REGULAR RETIREMENTS	COST OF REMOVAL AMOUNT	PCT	GROSS SALVAGE AMOUNT	PCT	NET SALVAGE AMOUNT	PCT
05-09	128,570	50,855	40		0	50,855-	40-

FORTISBC, INC.

ACCOUNT 355.00 - POLES, TOWERS AND FIXTURES

SUMMARY OF BOOK SALVAGE

YEAR	REGULAR RETIREMENTS	COST OF REMOVAL AMOUNT	PCT	GROSS SALVAGE AMOUNT	PCT	NET SALVAGE AMOUNT	PCT
1995	99,949	974	1		0	974-	1-
1996	213,287	2,079	1		0	2,079-	1-
1997		883-				883	
1998							
1999	6,579	3,462	53		0	3,462-	53-
2000	100,351	1,251	1		0	1,251-	1-
2001	2,512	25	1		0	25-	1-
2002		454				454-	
2003	1,091,033	20	0		0	20-	0
2004	223,141	15,852	7		0	15,852-	7-
2005	64,253	3,428-	5-		0	3,428	5
2006	49,637	3,571	7		0	3,571-	7-
2007	2,154	2,282	106		0	2,282-	106-
2008	15,154	2,508	17		0	2,508-	17-
2009	24,891	330,850			0	330,850-	
TOTAL	1,892,939	359,016	19		0	359,016-	19-

THREE-YEAR MOVING AVERAGES

YEAR	REGULAR RETIREMENTS	COST OF REMOVAL AMOUNT	PCT	GROSS SALVAGE AMOUNT	PCT	NET SALVAGE AMOUNT	PCT
95-97	104,412	723	1		0	723-	1-
96-98	71,096	399	1		0	399-	1-
97-99	2,193	860	39		0	860-	39-
98-00	35,643	1,571	4		0	1,571-	4-
99-01	36,480	1,579	4		0	1,579-	4-
00-02	34,288	577	2		0	577-	2-
01-03	364,515	166	0		0	166-	0
02-04	438,058	5,442	1		0	5,442-	1-
03-05	459,475	4,148	1		0	4,148-	1-
04-06	112,343	5,332	5		0	5,332-	5-
05-07	38,681	808	2		0	808-	2-
06-08	22,315	2,787	12		0	2,787-	12-
07-09	14,066	111,880	795		0	111,880-	795-

FIVE-YEAR AVERAGE

YEAR	REGULAR RETIREMENTS	COST OF REMOVAL AMOUNT	PCT	GROSS SALVAGE AMOUNT	PCT	NET SALVAGE AMOUNT	PCT
05-09	31,218	67,156	215		0	67,156-	215-

FORTISBC, INC.

ACCOUNT 356.00 - CONDUCTORS AND DEVICES

SUMMARY OF BOOK SALVAGE

YEAR	REGULAR RETIREMENTS	COST OF REMOVAL AMOUNT	PCT	GROSS SALVAGE AMOUNT	PCT	NET SALVAGE AMOUNT	PCT
1995	13,192	125	1		0	125-	1-
1996	393,558	3,731	1		0	3,731-	1-
1997	124,398-	122-	0		0	122	0
1998			0		0		0
1999		3,619				3,619-	
2000	103,152	1,250	1		0	1,250-	1-
2001	6,887	69	1		0	69-	1-
2002							
2003	855,508	9	0		0	9-	0
2004	211,195	4,055	2		0	4,055-	2-
2005		4,976				4,976-	
2006		3,571				3,571-	
2007		2,069				2,069-	
2008		2,508				2,508-	
2009		419,432				419,432-	
TOTAL	1,459,096	445,291	31		0	445,291-	31-
THREE-YEAR MOVING AVERAGES							
95-97	94,118	1,245	1		0	1,245-	1-
96-98	89,720	1,203	1		0	1,203-	1-
97-99	41,466-	1,166	3-		0	1,166-	3
98-00	34,384	1,623	5		0	1,623-	5-
99-01	36,680	1,646	4		0	1,646-	4-
00-02	36,680	440	1		0	440-	1-
01-03	287,465	26	0		0	26-	0
02-04	355,568	1,355	0		0	1,355-	0
03-05	355,568	3,013	1		0	3,013-	1-
04-06	70,398	4,201	6		0	4,201-	6-
05-07		3,538				3,538-	
06-08		2,716				2,716-	
07-09		141,336				141,336-	
FIVE-YEAR AVERAGE							
05-09		86,511				86,511-	

FORTISBC, INC.

ACCOUNT 362.00 - SUBSTATION EQUIPMENT

SUMMARY OF BOOK SALVAGE

YEAR	REGULAR RETIREMENTS	COST OF REMOVAL AMOUNT	PCT	GROSS SALVAGE AMOUNT	PCT	NET SALVAGE AMOUNT	PCT
1995		3,074			0	3,074-	
1996	330,483	3,403	1		0	3,403-	1-
1997			0		0		0
1998	146,294		0		0		0
1999			0		0		0
2000	15,208	115	1		0	115-	1-
2001	17,841	307	2		0	307-	2-
2002		83				83-	
2003	383,051	4	0		0	4-	0
2004	161,630	1,877	1		0	1,877-	1-
2005		328				328-	
2006	780,412	768	0		0	768-	0
2007	233,118	2,769	1		0	2,769-	1-
2008	73,108	1,302	2		0	1,302-	2-
2009	2,018,319	77,851	4		0	77,851-	4-
TOTAL	4,159,465	91,883	2		0	91,883-	2-
THREE-YEAR MOVING AVERAGES							
95-97	110,161	2,159	2		0	2,159-	2-
96-98	158,926	1,134	1		0	1,134-	1-
97-99	48,765		0		0		0
98-00	53,834	38	0		0	38-	0
99-01	11,016	141	1		0	141-	1-
00-02	11,016	169	2		0	169-	2-
01-03	133,631	132	0		0	132-	0
02-04	181,560	655	0		0	655-	0
03-05	181,560	737	0		0	737-	0
04-06	314,014	991	0		0	991-	0
05-07	337,844	1,288	0		0	1,288-	0
06-08	362,213	1,613	0		0	1,613-	0
07-09	774,849	27,307	4		0	27,307-	4-
FIVE-YEAR AVERAGE							
05-09	620,992	16,604	3		0	16,604-	3-

FORTISBC, INC.

ACCOUNT 364.00 - POLES, TOWERS AND FIXTURES

SUMMARY OF BOOK SALVAGE

YEAR	REGULAR RETIREMENTS	COST OF REMOVAL AMOUNT	PCT	GROSS SALVAGE AMOUNT	PCT	NET SALVAGE AMOUNT	PCT
1995	358,733	4,178	1		0	4,178-	1-
1996	249,180	83	0		0	83-	0
1997	361,979	865	0		0	865-	0
1998	261,380	1,154	0		0	1,154-	0
1999	102,575	2,893	3		0	2,893-	3-
2000	105,334	3,773	4		0	3,773-	4-
2001	87,504	3,368	4		0	3,368-	4-
2002		5,836				5,836-	
2003		2				2-	
2004	152,450	4,070	3		0	4,070-	3-
2005	124,134	12	0		0	12-	0
2006	249,103	4	0		0	4-	0
2007	285,089	70-	0		0	70	0
2008	354,093	56-	0		0	56	0
2009	433,826	899,583	207		0	899,583-	207-
TOTAL	3,125,379	925,695	30		0	925,695-	30-

THREE-YEAR MOVING AVERAGES

YEAR	REGULAR RETIREMENTS	COST OF REMOVAL AMOUNT	PCT	GROSS SALVAGE AMOUNT	PCT	NET SALVAGE AMOUNT	PCT
95-97	323,297	1,709	1		0	1,709-	1-
96-98	290,846	701	0		0	701-	0
97-99	241,978	1,637	1		0	1,637-	1-
98-00	156,430	2,607	2		0	2,607-	2-
99-01	98,471	3,345	3		0	3,345-	3-
00-02	64,279	4,326	7		0	4,326-	7-
01-03	29,168	3,068	11		0	3,068-	11-
02-04	50,817	3,302	6		0	3,302-	6-
03-05	92,194	1,361	1		0	1,361-	1-
04-06	175,229	1,362	1		0	1,362-	1-
05-07	219,442	18-	0		0	18	0
06-08	296,095	40-	0		0	40	0
07-09	357,669	299,819	84		0	299,819-	84-

FIVE-YEAR AVERAGE

YEAR	REGULAR RETIREMENTS	COST OF REMOVAL AMOUNT	PCT	GROSS SALVAGE AMOUNT	PCT	NET SALVAGE AMOUNT	PCT
05-09	289,249	179,895	62		0	179,895-	62-

FORTISBC, INC.

ACCOUNT 365.00 - CONDUCTORS AND DEVICES

SUMMARY OF BOOK SALVAGE

YEAR	REGULAR RETIREMENTS	COST OF REMOVAL AMOUNT	PCT	GROSS SALVAGE AMOUNT	PCT	NET SALVAGE AMOUNT	PCT
1995	825,623	1,670	0		0	1,670-	0
1996	193,306	3,212-	2-		0	3,212	2
1997	336,433	5,100	2		0	5,100-	2-
1998	216,234	1,261	1		0	1,261-	1-
1999		2,090				2,090-	
2000	93,238	3,744	4		0	3,744-	4-
2001	44,968	3,034	7		0	3,034-	7-
2002		368-				368	
2003	75,543	1	0		0	1-	0
2004	113,231	5,802	5		0	5,802-	5-
2005	273,643	296-	0		0	296	0
2006	417,711	1,269-	0		0	1,269	0
2007	428,815	274-	0		0	274	0
2008	587,763		0		0		0
2009	708,815	1,393,766	197		0	1,393,766-	197-
TOTAL	4,315,324	1,411,048	33		0	1,411,048-	33-

THREE-YEAR MOVING AVERAGES

95-97	451,787	1,186	0		0	1,186-	0
96-98	248,658	1,050	0		0	1,050-	0
97-99	184,222	2,817	2		0	2,817-	2-
98-00	103,157	2,365	2		0	2,365-	2-
99-01	46,069	2,956	6		0	2,956-	6-
00-02	46,069	2,136	5		0	2,136-	5-
01-03	40,170	889	2		0	889-	2-
02-04	62,925	1,812	3		0	1,812-	3-
03-05	154,139	1,836	1		0	1,836-	1-
04-06	268,195	1,412	1		0	1,412-	1-
05-07	373,390	613-	0		0	613	0
06-08	478,097	514-	0		0	514	0
07-09	575,131	464,497	81		0	464,497-	81-

FIVE-YEAR AVERAGE

05-09	483,350	278,385	58		0	278,385-	58-

FORTISBC, INC.

ACCOUNT 368.00 - LINE TRANSFORMERS

SUMMARY OF BOOK SALVAGE

YEAR	REGULAR RETIREMENTS	COST OF REMOVAL AMOUNT	PCT	GROSS SALVAGE AMOUNT	PCT	NET SALVAGE AMOUNT	PCT
1995	5,468	492	9		0	492-	9-
1996		85-				85	
1997	146,975		0		0		0
1998							
1999	127,125	2,340	2		0	2,340-	2-
2000		308				308-	
2001	227,756	2,407	1		0	2,407-	1-
2002		2,017				2,017-	
2003	234,683	3	0		0	3-	0
2004	481,295	7,569	2		0	7,569-	2-
2005	577,784	277	0		0	277-	0
2006	942,950	1,308	0		0	1,308-	0
2007	1,026,299	3,020	0		0	3,020-	0
2008	1,461,654	2,048	0		0	2,048-	0
2009	1,632,016	737,628	45		0	737,628-	45-
TOTAL	6,864,004	759,330	11		0	759,330-	11-

THREE-YEAR MOVING AVERAGES

95-97	50,815	136	0		0	136-	0
96-98	48,992	28-	0		0	28	0
97-99	91,367	780	1		0	780-	1-
98-00	42,375	883	2		0	883-	2-
99-01	118,294	1,685	1		0	1,685-	1-
00-02	75,919	1,577	2		0	1,577-	2-
01-03	154,146	1,476	1		0	1,476-	1-
02-04	238,659	3,196	1		0	3,196-	1-
03-05	431,254	2,616	1		0	2,616-	1-
04-06	667,343	3,051	0		0	3,051-	0
05-07	849,011	1,535	0		0	1,535-	0
06-08	1,143,634	2,125	0		0	2,125-	0
07-09	1,373,323	247,565	18		0	247,565-	18-

FIVE-YEAR AVERAGE

05-09	1,128,140	148,856	13		0	148,856-	13-

FORTISBC, INC.

ACCOUNT 370.00 - METERS

SUMMARY OF BOOK SALVAGE

YEAR	REGULAR RETIREMENTS	COST OF REMOVAL AMOUNT	PCT	GROSS SALVAGE AMOUNT	PCT	NET SALVAGE AMOUNT	PCT
2003	2,804,975	29	0		0	29-	0
2004	59	105-	178-		0	105	178
2005	1,399	1,234-	88-		0	1,234	88
2006	1,455	769	53		0	769-	53-
2007	3,548	610-	17-		0	610	17
2008	3,831-	1,635-	43		0	1,635	43-
2009	4,100	295,044-			0	295,044	
TOTAL	2,811,705	297,829-	11-		0	297,829	11
THREE-YEAR MOVING AVERAGES							
03-05	935,478	436-	0		0	436	0
04-06	971	190-	20-		0	190	20
05-07	2,134	358-	17-		0	358	17
06-08	391	492-	126-		0	492	126
07-09	1,273	99,096-			0	99,096	
FIVE-YEAR AVERAGE							
05-09	1,334	59,551-			0	59,551	

FORTISBC, INC.

ACCOUNT 373.00 - STREET LIGHTING AND SIGNAL SYSTEMS

SUMMARY OF BOOK SALVAGE

YEAR	REGULAR RETIREMENTS	COST OF REMOVAL AMOUNT	PCT	GROSS SALVAGE AMOUNT	PCT	NET SALVAGE AMOUNT	PCT
1995		157				157-	
1996							
1997							
1998							
1999	1,622	27	2		0	27-	2-
2000	417,141	113	0		0	113-	0
2001							
2002							
2003	8,100		0		0		0
2004	26,253	660	3		0	660-	3-
2005	23,390	2	0		0	2-	0
2006	49,475		0		0		0
2007	52,676	1-	0		0	1	0
2008	46,051	1	0		0	1-	0
2009	52,739	124,577	236		0	124,577-	236-
TOTAL	677,445	125,536	19		0	125,536-	19-
THREE-YEAR MOVING AVERAGES							
95-97		52				52-	
96-98							
97-99	541	9	2		0	9-	2-
98-00	139,588	47	0		0	47-	0
99-01	139,588	47	0		0	47-	0
00-02	139,047	38	0		0	38-	0
01-03	2,700		0		0		0
02-04	11,451	220	2		0	220-	2-
03-05	19,247	221	1		0	221-	1-
04-06	33,039	220	1		0	220-	1-
05-07	41,847		0		0		0
06-08	49,400		0		0		0
07-09	50,488	41,525	82		0	41,525-	82-
FIVE-YEAR AVERAGE							
05-09	44,866	24,916	56		0	24,916-	56-

FORTISBC, INC.

ACCOUNT 390.10 - STRUCTURES - MASONRY

SUMMARY OF BOOK SALVAGE

YEAR	REGULAR RETIREMENTS	COST OF REMOVAL AMOUNT	PCT	GROSS SALVAGE AMOUNT	PCT	NET SALVAGE AMOUNT	PCT
2002	132,286	127-	0		0	127	0
2003	572,749	6	0		0	6-	0
2004	20,325	204	1		0	204-	1-
2005	18,600	4	0		0	4-	0
2006	11,835	489	4		0	489-	4-
2007		2,547				2,547-	
2008		723				723-	
2009		525				525-	
TOTAL	755,795	4,371	1		0	4,371-	1-
THREE-YEAR MOVING AVERAGES							
02-04	241,787	27	0		0	27-	0
03-05	203,891	71	0		0	71-	0
04-06	16,920	232	1		0	232-	1-
05-07	10,145	1,013	10		0	1,013-	10-
06-08	3,945	1,253	32		0	1,253-	32-
07-09		1,265				1,265-	
FIVE-YEAR AVERAGE							
05-09	6,087	858	14		0	858-	14-

FORTISBC, INC.

ACCOUNT 397.00 - COMMUNICATIONS STRUCTURES AND EQUIPMENT

SUMMARY OF BOOK SALVAGE

YEAR	REGULAR RETIREMENTS	COST OF REMOVAL AMOUNT	PCT	GROSS SALVAGE AMOUNT	PCT	NET SALVAGE AMOUNT	PCT
1995	60,914-		0		0		0
1996	99,252		0		0		0
1997	58,157-		0		0		0
1998	1,052,266		0		0		0
1999	765,028-	73	0		0	73-	0
2000	673,866-	14	0		0	14-	0
2001							
2002							
2003							
2004							
2005							
2006	129,725	53	0		0	53-	0
2007		74				74-	
2008		461				461-	
2009	54,750	16,118	29		0	16,118-	29-
TOTAL	221,970-	16,793	8-		0	16,793-	8

THREE-YEAR MOVING AVERAGES

YEAR	REGULAR RETIREMENTS	COST OF REMOVAL AMOUNT	PCT	GROSS SALVAGE AMOUNT	PCT	NET SALVAGE AMOUNT	PCT
95-97	6,606-		0		0		0
96-98	364,454		0		0		0
97-99	76,360	24	0		0	24-	0
98-00	128,876-	29	0		0	29-	0
99-01	479,631-	29	0		0	29-	0
00-02	224,622-	5	0		0	5-	0
01-03							
02-04							
03-05							
04-06	43,242	17	0		0	17-	0
05-07	43,242	42	0		0	42-	0
06-08	43,242	196	0		0	196-	0
07-09	18,250	5,551	30		0	5,551-	30-

FIVE-YEAR AVERAGE

YEAR	REGULAR RETIREMENTS	COST OF REMOVAL AMOUNT	PCT	GROSS SALVAGE AMOUNT	PCT	NET SALVAGE AMOUNT	PCT
05-09	36,895	3,341	9		0	3,341-	9-

PART VI. DETAILED DEPRECIATION CALCULATIONS

FORTISBC, INC.

ACCOUNT 330.10 - LAND RIGHTS

CALCULATED REMAINING LIFE DEPRECIATION ACCRUAL
RELATED TO ORIGINAL COST OF INVESTMENT AS OF DECEMBER 31, 2009

YEAR (1)	ORIGINAL COST (2)	CALCULATED ACCRUED (3)	ALLOC. BOOK RESERVE (4)	FUTURE BOOK ACCRUALS (5)	REM. LIFE (6)	ANNUAL ACCRUAL (7)
SURVIVOR CURVE.. IOWA 75-R4						
NET SALVAGE PERCENT.. 0						
1940	15,997.99	13,042	26,839-	42,837	13.86	3,091
1982	82,941.01	30,080	61,902-	144,843	47.80	3,030
1983	862,419.15	301,614	620,698-	1,483,117	48.77	30,410
	961,358.15	344,736	709,439-	1,670,797		36,531

COMPOSITE REMAINING LIFE AND ANNUAL ACCRUAL RATE, PERCENT.. 45.7 3.80

FORTISBC, INC.

ACCOUNT 331.00 - STRUCTURES AND IMPROVEMENTS

CALCULATED REMAINING LIFE DEPRECIATION ACCRUAL
RELATED TO ORIGINAL COST OF INVESTMENT AS OF DECEMBER 31, 2009

YEAR (1)	ORIGINAL COST (2)	CALCULATED ACCRUED (3)	ALLOC. BOOK RESERVE (4)	FUTURE BOOK ACCRUALS (5)	REM. LIFE (6)	ANNUAL ACCRUAL (7)
SURVIVOR CURVE.. IOWA 60-L3						
NET SALVAGE PERCENT.. -15						
1940	298,669.34	249,988	343,470			
1982	763,756.14	385,433	566,746	311,574	33.67	9,254
1984	3,635.15	1,714	2,520	1,660	35.40	47
1985	49,239.74	22,377	32,903	23,723	36.29	654
1986	53,338.48	23,329	34,303	27,036	37.18	727
1990	762,553.66	280,032	411,763	465,174	40.84	11,390
1993	1,136,310.02	355,438	522,641	784,116	43.68	17,951
1994	173,635.56	51,152	75,215	124,466	44.63	2,789
1995	2,188,403.51	603,999	888,129	1,628,535	45.60	35,713
1996	147,395.52	37,940	55,788	113,717	46.57	2,442
1997	94,201.20	22,479	33,053	75,278	47.55	1,583
1998	2,970,614.06	653,076	960,293	2,455,913	48.53	50,606
1999	84,961.99	17,066	25,094	72,612	49.52	1,466
2000	1,169,574.11	212,740	312,816	1,032,194	50.51	20,435
2001	982,999.38	160,151	235,488	894,961	51.50	17,378
2002	385,145.41	55,365	81,409	361,508	52.50	6,886
2003	576,182.13	71,780	105,547	557,062	53.50	10,412
2004	174,693.70	18,416	27,079	173,819	54.50	3,189
2006	1.00	0	0	1		
	12,015,310.10	3,222,475	4,714,257	9,103,350		192,922

COMPOSITE REMAINING LIFE AND ANNUAL ACCRUAL RATE, PERCENT.. 47.2 1.61

FORTISBC, INC.

ACCOUNT 332.00 - RESERVOIRS, DAMS, AND WATERWAYS

CALCULATED REMAINING LIFE DEPRECIATION ACCRUAL
RELATED TO ORIGINAL COST OF INVESTMENT AS OF DECEMBER 31, 2009

YEAR (1)	ORIGINAL COST (2)	CALCULATED ACCRUED (3)	ALLOC. BOOK RESERVE (4)	FUTURE BOOK ACCRUALS (5)	REM. LIFE (6)	ANNUAL ACCRUAL (7)
SURVIVOR CURVE.. IOWA 70-R4						
NET SALVAGE PERCENT.. -15						
1940	857,944.73	838,927	293,219	693,417	10.48	66,166
1960	84,404.59	64,410	22,512	74,553	23.55	3,166
1977	3,738.80	1,957	684	3,616	38.14	95
1982	14,166,722.36	6,316,467	2,207,714	14,084,017	42.86	328,605
1984	8,296.59	3,438	1,202	8,339	44.78	186
1986	21,374.06	8,178	2,858	21,722	46.71	465
1987	246,209.31	90,282	31,555	251,586	47.68	5,277
1988	235,387.67	82,524	28,844	241,852	48.66	4,970
1989	325,880.80	109,004	38,099	336,664	49.64	6,782
1990	157,574.30	50,170	17,535	163,675	50.62	3,233
1991	957,262.28	289,370	101,140	999,712	51.60	19,374
1992	472,331.33	135,095	47,218	495,963	52.59	9,431
1993	2,984,148.79	805,471	281,526	3,150,245	53.57	58,806
1994	1,235,862.59	313,483	109,568	1,311,674	54.56	24,041
1996	13,077.52	2,892	1,011	14,028	56.54	248
1997	21,677.48	4,437	1,551	23,378	57.54	406
2000	699,749.87	108,982	38,091	766,621	60.52	12,667
2003	847,544.28	90,362	31,583	943,093	63.51	14,850
2004	1,104,239.69	99,596	34,810	1,235,066	64.51	19,145
	24,443,427.04	9,415,045	3,290,720	24,819,221		577,913

COMPOSITE REMAINING LIFE AND ANNUAL ACCRUAL RATE, PERCENT.. 42.9 2.36

FORTISBC, INC.

ACCOUNT 333.00 - WATER WHEELS, TURBINES, AND GENERATORS

CALCULATED REMAINING LIFE DEPRECIATION ACCRUAL
RELATED TO ORIGINAL COST OF INVESTMENT AS OF DECEMBER 31, 2009

YEAR (1)	ORIGINAL COST (2)	CALCULATED ACCRUED (3)	ALLOC. BOOK RESERVE (4)	FUTURE BOOK ACCRUALS (5)	REM. LIFE (6)	ANNUAL ACCRUAL (7)
SURVIVOR CURVE.. IOWA 75-R3						
NET SALVAGE PERCENT.. -50						
1940	893,140.36	1,019,788	157,305	1,182,406	17.91	66,019
1960	15,302,210.91	13,499,534	2,082,335	20,870,981	30.89	675,655
1979	1,623.26	931	144	2,291	46.31	49
1982	14,904,729.96	7,765,290	1,197,814	21,159,281	48.95	432,263
1984	53,718.78	26,065	4,021	76,557	50.74	1,509
1985	17,101.05	7,986	1,232	24,420	51.65	473
1986	43,664.51	19,597	3,023	62,474	52.56	1,189
1987	8,681.26	3,738	577	12,445	53.47	233
1990	46,504.95	17,448	2,691	67,066	56.24	1,192
1993	53,178.73	16,964	2,617	77,151	59.05	1,307
1994	143,570.42	43,099	6,648	208,708	59.99	3,479
1995	257,957.45	72,539	11,189	375,747	60.94	6,166
1996	433,197.92	113,584	17,521	632,276	61.89	10,216
1997	172,351.74	41,915	6,465	252,063	62.84	4,011
1998	4,775,108.54	1,069,600	164,988	6,997,675	63.80	109,681
1999	124,936.62	25,586	3,947	183,458	64.76	2,833
2000	3,292,692.10	610,465	94,166	4,844,872	65.73	73,709
2001	6,783,118.10	1,127,354	173,897	10,000,780	66.69	149,959
2002	167,160.90	24,540	3,785	246,956	67.66	3,650
2003	111,187.29	14,165	2,185	164,596	68.63	2,398
2004	13,796,570.11	1,487,339	229,425	20,465,430	69.61	294,001
	61,382,404.96	27,007,527	4,165,975	87,907,632		1,839,992

COMPOSITE REMAINING LIFE AND ANNUAL ACCRUAL RATE, PERCENT.. 47.8 3.00

FORTISBC, INC.

ACCOUNT 334.00 - ACCESSORY ELECTRICAL EQUIPMENT

CALCULATED REMAINING LIFE DEPRECIATION ACCRUAL
RELATED TO ORIGINAL COST OF INVESTMENT AS OF DECEMBER 31, 2009

SURVIVOR CURVE.. IOWA 50-R3
NET SALVAGE PERCENT.. -30

YEAR (1)	ORIGINAL COST (2)	CALCULATED ACCRUED (3)	ALLOC. BOOK RESERVE (4)	FUTURE BOOK ACCRUALS (5)	REM. LIFE (6)	ANNUAL ACCRUAL (7)
1950	493,651.95	559,219	394,020	247,728	6.43	38,527
1960	4,547,525.89	4,691,592	3,305,650	2,606,134	10.32	252,532
1975	6,235.54	4,946	3,485	4,621	19.49	237
1976	9,782.54	7,574	5,337	7,380	20.22	365
1977	4,381.24	3,307	2,330	3,366	20.97	161
1978	12,182.69	8,958	6,312	9,525	21.72	439
1982	859,690.07	562,151	396,086	721,511	24.85	29,035
1984	79,888.05	48,853	34,421	69,433	26.48	2,622
1986	150,727.11	85,628	60,333	135,612	28.15	4,817
1993	213,283.18	87,173	61,421	215,847	34.28	6,297
1994	102,985.32	39,656	27,941	105,940	35.19	3,011
1995	409,096.00	147,741	104,097	427,728	36.11	11,845
1996	470,383.76	158,623	111,764	499,735	37.03	13,495
1997	5,108,706.16	1,599,229	1,126,801	5,514,517	37.96	145,272
1998	555,990.89	160,604	113,160	609,628	38.89	15,676
1999	207,158.75	54,723	38,557	230,749	39.84	5,792
2000	4,393,692.76	1,053,256	742,114	4,969,687	40.78	121,866
2001	3,403,629.72	730,964	515,031	3,909,688	41.74	93,668
2002	1,009,074.92	191,785	135,130	1,176,667	42.69	27,563
2003	196,317.30	32,361	22,801	232,411	43.66	5,323
2004	5,259,082.96	735,641	518,326	6,318,482	44.62	141,606
	27,493,466.80	10,963,984	7,725,117	28,016,390		920,149

COMPOSITE REMAINING LIFE AND ANNUAL ACCRUAL RATE, PERCENT.. 30.4 3.35

FORTISBC, INC.

ACCOUNT 335.00 - OTHER POWER PLANT EQUIPMENT

CALCULATED REMAINING LIFE DEPRECIATION ACCRUAL
RELATED TO ORIGINAL COST OF INVESTMENT AS OF DECEMBER 31, 2009

SURVIVOR CURVE.. IOWA 45-R4
NET SALVAGE PERCENT.. -5

YEAR (1)	ORIGINAL COST (2)	CALCULATED ACCRUED (3)	ALLOC. BOOK RESERVE (4)	FUTURE BOOK ACCRUALS (5)	REM. LIFE (6)	ANNUAL ACCRUAL (7)
1960	28,598.82	26,819	22,838	7,191	4.81	1,495
1982	5,097,116.40	3,135,078	2,669,749	2,682,223	18.64	143,896
1984	62,215.73	35,770	30,461	34,866	20.36	1,712
1985	103,415.43	57,334	48,824	59,762	21.24	2,814
1986	486,237.40	259,359	220,863	289,686	22.14	13,084
1987	58,639.16	30,047	25,587	35,984	23.04	1,562
1989	110,671.56	51,931	44,223	71,982	24.89	2,892
1990	291,172.03	130,309	110,968	194,763	25.82	7,543
1991	103,328.50	43,952	37,428	71,067	26.77	2,655
1992	278,293.24	112,208	95,553	196,655	27.72	7,094
1993	379,591.18	144,550	123,095	275,476	28.68	9,605
1994	308,914.78	110,643	94,221	230,140	29.65	7,762
1995	79,286.41	26,604	22,655	60,596	30.62	1,979
1996	382,697.82	119,746	101,972	299,861	31.59	9,492
1997	351,364.26	101,825	86,711	282,221	32.58	8,662
1998	1,279,263.40	341,475	290,791	1,052,436	33.56	31,360
1999	708,205.87	172,683	147,052	596,564	34.55	17,267
2000	937,835.73	207,009	176,283	808,445	35.54	22,747
2001	710,087.00	140,335	119,506	626,085	36.53	17,139
2002	495,110.01	86,412	73,586	446,280	37.52	11,894
2003	18,238,607.57	2,761,891	2,351,953	16,798,585	38.51	436,214
2004	10,403,338.19	1,332,668	1,134,865	9,788,640	39.51	247,751
	40,893,990.49	9,428,648	8,029,184	34,909,506		1,006,619

COMPOSITE REMAINING LIFE AND ANNUAL ACCRUAL RATE, PERCENT.. 34.7   2.46

FORTISBC, INC.

ACCOUNT 336.00 - ROADS, RAILROADS AND BRIDGES

CALCULATED REMAINING LIFE DEPRECIATION ACCRUAL
RELATED TO ORIGINAL COST OF INVESTMENT AS OF DECEMBER 31, 2009

YEAR (1)	ORIGINAL COST (2)	CALCULATED ACCRUED (3)	ALLOC. BOOK RESERVE (4)	FUTURE BOOK ACCRUALS (5)	REM. LIFE (6)	ANNUAL ACCRUAL (7)
SURVIVOR CURVE.. IOWA 75-S4						
NET SALVAGE PERCENT.. 0						
1950	2,711.76	2,044	1,418	1,294	18.46	70
1982	672,532.49	246,597	171,028	501,504	47.50	10,558
1984	17,837.70	6,065	4,206	13,632	49.50	275
1999	534,057.85	74,768	51,856	482,202	64.50	7,476
2000	31,457.91	3,985	2,764	28,694	65.50	438
2001	1,398.00	158	110	1,288	66.50	19
2002	12,086.49	1,209	838	11,248	67.50	167
2003	14,433.54	1,251	868	13,566	68.50	198
2004	919.03	67	46	873	69.50	13
	1,287,434.77	336,144	233,134	1,054,301		19,214

COMPOSITE REMAINING LIFE AND ANNUAL ACCRUAL RATE, PERCENT.. 54.9 1.49

FORTISBC, INC.

ACCOUNT 350.10 - LAND RIGHTS

CALCULATED REMAINING LIFE DEPRECIATION ACCRUAL
RELATED TO ORIGINAL COST OF INVESTMENT AS OF DECEMBER 31, 2009

YEAR (1)	ORIGINAL COST (2)	CALCULATED ACCRUED (3)	ALLOC. BOOK RESERVE (4)	FUTURE BOOK ACCRUALS (5)	REM. LIFE (6)	ANNUAL ACCRUAL (7)
SURVIVOR CURVE.. IOWA 75-R3						
NET SALVAGE PERCENT.. 0						
1940	901,044.23	685,875	578,770	322,274	17.91	17,994
1957	88,454.10	54,605	46,078	42,376	28.70	1,477
1958	1,723.12	1,047	884	839	29.42	29
1961	9,227.20	5,335	4,502	4,725	31.64	149
1962	12,889.30	7,323	6,179	6,710	32.39	207
1963	15,046.65	8,396	7,085	7,962	33.15	240
1976	6,737.64	2,810	2,371	4,367	43.72	100
1977	7,836.21	3,179	2,683	5,153	44.57	116
1978	6,522.00	2,571	2,170	4,352	45.44	96
1979	3,535.15	1,352	1,141	2,394	46.31	52
1980	6,469.42	2,400	2,025	4,444	47.18	94
1981	48,516.60	17,421	14,701	33,816	48.07	703
1982	6,595.29	2,291	1,933	4,662	48.95	95
1983	440.75	148	125	316	49.85	6
1984	83,304.12	26,946	22,738	60,566	50.74	1,194
1985	41,323.87	12,865	10,856	30,468	51.65	590
1986	205,509.88	61,489	51,887	153,623	52.56	2,923
1987	5,529.07	1,587	1,339	4,190	53.47	78
1988	174.61	48	41	134	54.39	2
1989	17,453.89	4,582	3,866	13,588	55.31	246
1990	16,027.30	4,009	3,383	12,644	56.24	225
1991	2,011.69	478	403	1,609	57.17	28
1992	512,566.64	115,430	97,405	415,162	58.11	7,144
1996	19,552.08	3,418	2,884	16,668	61.89	269
1997	57,754.66	9,364	7,902	49,853	62.84	793
1998	273,697.23	40,871	34,489	239,208	63.80	3,749
2000	391,598.57	48,402	40,843	350,756	65.73	5,336
2001	23,665.44	2,622	2,213	21,452	66.69	322
2002	48,268.24	4,724	3,986	44,282	67.66	654
2003	729,921.45	61,992	52,311	677,610	68.63	9,873
2004	1,355,117.11	97,392	82,184	1,272,933	69.61	18,287
2008	798,952.60	15,763	13,301	785,652	73.52	10,686
2009	101,053.58	660	557	100,497	74.51	1,349
	5,798,519.69	1,307,395	1,103,235	4,695,285		85,106

COMPOSITE REMAINING LIFE AND ANNUAL ACCRUAL RATE, PERCENT.. 55.2 1.47

FORTISBC, INC.

ACCOUNT 353.00 - SUBSTATION EQUIPMENT

CALCULATED REMAINING LIFE DEPRECIATION ACCRUAL
RELATED TO ORIGINAL COST OF INVESTMENT AS OF DECEMBER 31, 2009

YEAR (1)	ORIGINAL COST (2)	CALCULATED ACCRUED (3)	ALLOC. BOOK RESERVE (4)	FUTURE BOOK ACCRUALS (5)	REM. LIFE (6)	ANNUAL ACCRUAL (7)
SURVIVOR CURVE.. IOWA 50-S4						
NET SALVAGE PERCENT.. -30						
1950	8,203,136.45	9,759,764	4,317,506	6,346,571	4.24	1,496,833
1960	3,549,228.16	3,951,427	1,748,025	2,865,972	7.18	399,160
1966	4,318,698.21	4,494,815	1,988,408	3,625,900	9.97	363,681
1973	6,592,949.01	6,068,150	2,684,417	5,886,417	14.60	403,179
1975	2,212,221.52	1,943,525	859,773	2,016,115	16.21	124,375
1976	333,854.77	285,927	126,488	307,523	17.06	18,026
1977	916,285.13	764,017	337,984	853,187	17.93	47,584
1978	8,689,173.28	7,044,139	3,116,173	8,179,752	18.82	434,631
1980	5,162,685.13	3,936,960	1,741,625	4,969,866	20.67	240,439
1982	3,279,039.15	2,337,693	1,034,144	3,228,607	22.58	142,985
1984	284,838.93	188,552	83,411	286,880	24.54	11,690
1985	4,365,459.60	2,778,528	1,229,160	4,445,937	25.52	174,214
1986	3,307,784.57	2,020,196	893,690	3,406,430	26.51	128,496
1988	927,410.58	518,423	229,339	976,295	28.50	34,256
1989	2,133,151.05	1,136,970	502,971	2,270,125	29.50	76,953
1990	208,615.23	105,768	46,789	224,411	30.50	7,358
1992	440,480.31	200,419	88,661	483,963	32.50	14,891
1993	1,834,587.26	787,038	348,168	2,036,795	33.50	60,800
1994	22,683,546.22	9,141,469	4,043,986	25,444,624	34.50	737,525
1995	1,887,840.82	711,716	314,848	2,139,345	35.50	60,263
1996	4,109,560.99	1,442,456	638,111	4,704,318	36.50	128,885
1998	2,716,697.46	812,293	359,341	3,172,366	38.50	82,399
1999	655,393.83	178,923	79,152	772,860	39.50	19,566
2000	1,119,856.46	276,605	122,364	1,333,449	40.50	32,925
2001	2,879,134.00	636,289	281,480	3,461,394	41.50	83,407
2002	38,782.97	7,563	3,346	47,072	42.50	1,108
2003	10,450,079.42	1,766,063	781,267	12,803,836	43.50	294,341
2004	6,326,885.21	904,745	400,239	7,824,712	44.50	175,836
2005	19,410,270.27	2,271,002	1,004,641	24,228,710	45.50	532,499
2006	9,198,610.72	837,074	370,303	11,587,891	46.50	249,202
	138,236,256.71	67,308,509	29,775,810	149,931,324		6,577,507

COMPOSITE REMAINING LIFE AND ANNUAL ACCRUAL RATE, PERCENT.. 22.8   4.76

FORTISBC, INC.

ACCOUNT 355.00 - POLES, TOWERS AND FIXTURES

CALCULATED REMAINING LIFE DEPRECIATION ACCRUAL
RELATED TO ORIGINAL COST OF INVESTMENT AS OF DECEMBER 31, 2009

YEAR (1)	ORIGINAL COST (2)	CALCULATED ACCRUED (3)	ALLOC. BOOK RESERVE (4)	FUTURE BOOK ACCRUALS (5)	REM. LIFE (6)	ANNUAL ACCRUAL (7)
SURVIVOR CURVE.. IOWA 50-R3						
NET SALVAGE PERCENT.. -50						
1950	632,198.52	826,347	421,839	526,459	6.43	81,875
1957	6,345,812.44	7,811,061	3,987,443	5,531,276	8.97	616,642
1958	146,591.03	178,548	91,146	128,741	9.40	13,696
1959	5,970.45	7,191	3,671	5,285	9.85	537
1961	250,931.41	295,020	150,604	225,793	10.81	20,887
1962	443,051.96	514,117	262,450	402,128	11.32	35,524
1963	61,725.69	70,645	36,063	56,526	11.85	4,770
1964	357,972.37	403,900	206,186	330,773	12.39	26,697
1965	3,099,262.64	3,443,901	1,758,066	2,890,828	12.96	223,058
1975	176,448.95	161,504	82,446	182,227	19.49	9,350
1976	1,126,169.76	1,006,120	513,611	1,175,644	20.22	58,143
1977	551,913.86	480,662	245,372	582,499	20.97	27,778
1978	60,308.09	51,165	26,119	64,343	21.72	2,962
1979	215,686.87	178,006	90,870	232,660	22.49	10,345
1980	752,262.50	603,465	308,061	820,333	23.26	35,268
1981	315,943.26	245,962	125,560	348,355	24.05	14,485
1982	618,789.79	466,877	238,334	689,851	24.85	27,761
1983	824,207.49	601,836	307,229	929,082	25.66	36,207
1984	1,625,614.62	1,147,034	585,546	1,852,876	26.48	69,973
1985	2,562,889.55	1,744,559	890,574	2,953,760	27.31	108,157
1986	713,798.72	467,895	238,854	831,844	28.15	29,550
1987	1,464,747.28	922,791	471,072	1,726,049	29.00	59,519
1988	252,902.00	152,803	78,004	301,349	29.86	10,092
1989	636,070.79	367,713	187,713	766,393	30.73	24,940
1990	752,583.06	415,426	212,069	916,806	31.60	29,013
1991	885,688.37	465,252	237,505	1,091,028	32.49	33,580
1992	597,460.56	297,894	152,071	744,120	33.38	22,292
1993	866,444.93	408,615	208,592	1,091,075	34.28	31,828
1994	3,896,772.62	1,731,336	883,824	4,961,335	35.19	140,987
1995	487,997.81	203,349	103,807	628,190	36.11	17,397
1996	4,412,486.84	1,716,899	876,454	5,742,276	37.03	155,071
1997	1,590,457.89	574,473	293,261	2,092,426	37.96	55,122
1998	3,119,903.36	1,039,864	530,837	4,149,018	38.89	106,686
1999	816,718.46	248,936	127,078	1,098,000	39.84	27,560
2000	2,651,753.37	733,475	374,429	3,603,201	40.78	88,357
2001	1,207,209.50	299,147	152,711	1,658,103	41.74	39,725
2002	921,246.30	202,029	103,133	1,278,736	42.69	29,954
2003	8,733,298.36	1,661,073	847,955	12,251,993	43.66	280,623
2004	7,347,474.81	1,185,882	605,377	10,415,835	44.62	233,434
2005	1,978,358.44	261,737	133,613	2,833,925	45.59	62,161
2007	8,335,410.26	615,153	314,028	12,189,087	47.54	256,396
2009	869,674.90	12,784	6,526	1,297,986	49.51	26,217
	72,712,209.88	34,222,446	17,470,103	91,598,212		3,184,619

COMPOSITE REMAINING LIFE AND ANNUAL ACCRUAL RATE, PERCENT.. 28.8 4.38

FORTISBC, INC.

ACCOUNT 356.00 - CONDUCTORS AND DEVICES

CALCULATED REMAINING LIFE DEPRECIATION ACCRUAL
RELATED TO ORIGINAL COST OF INVESTMENT AS OF DECEMBER 31, 2009

YEAR (1)	ORIGINAL COST (2)	CALCULATED ACCRUED (3)	ALLOC. BOOK RESERVE (4)	FUTURE BOOK ACCRUALS (5)	REM. LIFE (6)	ANNUAL ACCRUAL (7)
SURVIVOR CURVE.. IOWA 60-R3						
NET SALVAGE PERCENT.. -50						
1950	1,447,408.55	1,724,580	845,969	1,325,144	12.34	107,386
1957	5,823,386.78	6,395,564	3,137,257	5,597,823	16.07	348,340
1958	116,054.92	125,745	61,682	112,400	16.66	6,747
1959	21,968.60	23,468	11,512	21,441	17.27	1,242
1961	662,266.88	686,608	336,806	656,594	18.53	35,434
1962	441,754.31	450,808	221,138	441,493	19.18	23,018
1963	61,725.24	61,972	30,400	62,188	19.84	3,134
1965	3,094,636.30	3,002,555	1,472,862	3,169,092	21.19	149,556
1975	195,443.41	153,276	75,187	217,978	28.63	7,614
1976	897,338.27	686,020	336,518	1,009,489	29.42	34,313
1977	570,854.88	424,862	208,410	647,872	30.23	21,431
1978	77,751.02	56,292	27,613	89,014	31.04	2,868
1979	343,281.46	241,499	118,464	396,458	31.86	12,444
1980	541,261.30	369,549	181,277	630,615	32.69	19,291
1981	227,020.16	150,232	73,694	266,836	33.53	7,958
1982	651,233.22	417,115	204,610	772,240	34.38	22,462
1983	451,534.70	279,611	137,159	540,143	35.23	15,332
1984	1,649,310.96	985,876	483,608	1,990,358	36.09	55,150
1985	2,007,159.74	1,156,124	567,121	2,443,619	36.96	66,115
1986	674,946.60	373,917	183,420	829,000	37.84	21,908
1987	763,300.21	406,080	199,197	945,753	38.72	24,425
1988	1,466,806.22	747,697	366,773	1,833,436	39.61	46,287
1989	701,767.35	341,933	167,731	884,920	40.51	21,844
1990	882,002.13	409,906	201,074	1,121,929	41.41	27,093
1991	836,475.65	369,726	181,364	1,073,349	42.32	25,363
1992	700,334.08	293,436	143,941	906,560	43.24	20,966
1993	822,358.90	325,654	159,745	1,073,793	44.16	24,316
1994	4,209,430.04	1,570,138	770,210	5,543,935	45.08	122,980
1995	336,465.29	117,595	57,685	447,013	46.02	9,713
1996	4,669,323.99	1,522,176	746,683	6,257,303	46.96	133,248
1997	1,618,922.79	489,732	240,231	2,188,153	47.90	45,682
1998	3,330,760.07	928,433	455,430	4,540,710	48.85	92,952
2000	2,729,484.54	631,207	309,630	3,784,597	50.75	74,573
2001	2,378,878.74	493,035	241,852	3,326,466	51.71	64,329
2002	909,775.71	166,489	81,669	1,282,995	52.68	24,354
2003	7,688,957.81	1,222,544	599,702	10,933,735	53.64	203,835
2004	6,660,662.69	895,892	439,467	9,551,527	54.62	174,872
2005	543,851.95	59,960	29,413	786,365	55.59	14,146
2007	8,335,721.98	512,647	251,472	12,252,111	57.54	212,932
2009	905,834.78	11,101	5,445	1,353,307	59.51	22,741
	70,447,452.22	29,281,054	14,363,421	91,307,757		2,348,394

COMPOSITE REMAINING LIFE AND ANNUAL ACCRUAL RATE, PERCENT.. 38.9 3.33

FORTISBC, INC.

ACCOUNT 359.00 - ROADS AND TRAILS

CALCULATED REMAINING LIFE DEPRECIATION ACCRUAL
RELATED TO ORIGINAL COST OF INVESTMENT AS OF DECEMBER 31, 2009

SURVIVOR CURVE.. IOWA 40-R0.5
NET SALVAGE PERCENT.. 0

YEAR (1)	ORIGINAL COST (2)	CALCULATED ACCRUED (3)	ALLOC. BOOK RESERVE (4)	FUTURE BOOK ACCRUALS (5)	REM. LIFE (6)	ANNUAL ACCRUAL (7)
1975	4,415.60	2,208	1,071	3,345	20.00	167
1976	13,486.84	6,571	3,187	10,300	20.51	502
1977	2,578.63	1,223	593	1,986	21.03	94
1978	640.35	295	143	497	21.56	23
1979	2,376.35	1,064	516	1,860	22.09	84
1980	26,294.36	11,425	5,542	20,752	22.62	917
1982	57,486.72	23,411	11,355	46,132	23.71	1,946
2003	309,623.31	30,962	15,018	294,605	36.00	8,183
2004	400,777.56	33,966	16,475	384,303	36.61	10,497
2009	304,250.00	2,358	1,144	303,106	39.69	7,637
	1,121,929.72	113,483	55,044	1,066,886		30,050

COMPOSITE REMAINING LIFE AND ANNUAL ACCRUAL RATE, PERCENT.. 35.5   2.68

FORTISBC, INC.

ACCOUNT 360.10 - LAND RIGHTS

CALCULATED REMAINING LIFE DEPRECIATION ACCRUAL
RELATED TO ORIGINAL COST OF INVESTMENT AS OF DECEMBER 31, 2009

YEAR (1)	ORIGINAL COST (2)	CALCULATED ACCRUED (3)	ALLOC. BOOK RESERVE (4)	FUTURE BOOK ACCRUALS (5)	REM. LIFE (6)	ANNUAL ACCRUAL (7)
SURVIVOR CURVE.. IOWA 75-R3						
NET SALVAGE PERCENT.. 0						
1960	6,137,906.93	3,609,887	412,909	5,724,998	30.89	185,335
1975	33,928.61	14,539	1,663	32,266	42.86	753
1976	111,679.90	46,578	5,328	106,352	43.72	2,433
1977	28,932.60	11,739	1,343	27,590	44.57	619
1978	77,816.84	30,670	3,508	74,309	45.44	1,635
1979	94,286.61	36,067	4,125	90,162	46.31	1,947
1980	120,995.42	44,881	5,134	115,861	47.18	2,456
1981	69,523.20	24,964	2,855	66,668	48.07	1,387
1982	87,180.85	30,281	3,464	83,717	48.95	1,710
1983	171,554.97	57,528	6,580	164,975	49.85	3,309
1984	25,822.03	8,353	955	24,867	50.74	490
1985	129,629.49	40,358	4,616	125,013	51.65	2,420
1986	108,729.76	32,532	3,721	105,009	52.56	1,998
1987	48,528.00	13,931	1,594	46,934	53.47	878
1988	23,912.68	6,571	752	23,161	54.39	426
1989	263.49	69	8	255	55.31	5
1990	36,865.70	9,221	1,055	35,811	56.24	637
1991	99,480.88	23,650	2,705	96,776	57.17	1,693
1998	129,992.26	19,412	2,220	127,772	63.80	2,003
1999	187,876.08	25,651	2,934	184,942	64.76	2,856
2000	81,105.31	10,025	1,147	79,958	65.73	1,216
2001	18,132.00	2,009	230	17,902	66.69	268
2004	2.00	0	0	2		
2006	652,955.00	29,951	3,425	649,530	71.56	9,077
	8,477,100.61	4,128,867	472,271	8,004,830		225,551

COMPOSITE REMAINING LIFE AND ANNUAL ACCRUAL RATE, PERCENT.. 35.5 2.66

FORTISBC, INC.

ACCOUNT 362.00 - SUBSTATION EQUIPMENT

CALCULATED REMAINING LIFE DEPRECIATION ACCRUAL
RELATED TO ORIGINAL COST OF INVESTMENT AS OF DECEMBER 31, 2009

YEAR (1)	ORIGINAL COST (2)	CALCULATED ACCRUED (3)	ALLOC. BOOK RESERVE (4)	FUTURE BOOK ACCRUALS (5)	REM. LIFE (6)	ANNUAL ACCRUAL (7)
SURVIVOR CURVE.. IOWA 55-S3						
NET SALVAGE PERCENT.. -20						
1960	2,021,091.22	1,843,672	1,037,930	1,387,379	13.19	105,184
1961	564,667.59	509,312	286,727	390,874	13.66	28,614
1962	100,760.88	89,806	50,558	70,355	14.15	4,972
1966	5,109,370.15	4,314,189	2,428,754	3,702,490	16.30	227,147
1968	3,237,033.69	2,649,888	1,491,804	2,392,636	17.48	136,878
1969	7,180,709.11	5,779,580	3,253,724	5,363,127	18.11	296,142
1970	956,634.91	756,610	425,948	722,014	18.75	38,507
1971	209,758.39	162,879	91,696	160,014	19.41	8,244
1972	896,167.27	682,396	384,168	691,233	20.10	34,390
1973	463,424.62	345,700	194,618	361,492	20.81	17,371
1974	290,150.38	211,885	119,285	228,895	21.53	10,631
1975	2,020,783.16	1,442,621	812,151	1,612,789	22.28	72,387
1976	1,262,486.06	880,069	495,451	1,019,532	23.05	44,231
1977	2,504,469.02	1,702,688	958,560	2,046,803	23.84	85,856
1978	8,745,014.17	5,790,808	3,260,045	7,233,972	24.65	293,467
1979	1,167,884.38	752,206	423,469	977,992	25.48	38,383
1980	4,379,670.53	2,739,589	1,542,303	3,713,302	26.33	141,029
1981	1,252,078.95	759,721	427,699	1,074,796	27.19	39,529
1982	1,799,715.59	1,057,455	595,314	1,564,345	28.07	55,730
1983	3,584,638.10	2,035,802	1,146,093	3,155,473	28.97	108,922
1984	4,267,545.92	2,338,939	1,316,750	3,804,305	29.88	127,319
1985	310,679.51	164,039	92,349	280,466	30.80	9,106
1986	558,860.65	283,617	159,668	510,965	31.74	16,098
1987	5,384,271.66	2,622,054	1,476,135	4,984,991	32.68	152,540
1988	1,230,061.44	573,248	322,721	1,153,353	33.64	34,285
1989	559,975.74	249,120	140,247	531,724	34.61	15,363
1990	2,578,877.30	1,092,691	615,151	2,479,502	35.58	69,688
1991	7,091,885.28	2,853,236	1,606,283	6,903,979	36.56	188,840
1992	844,221.31	321,598	181,050	832,016	37.54	22,163
1993	1,567,592.49	563,299	317,120	1,563,991	38.53	40,592
1994	3,266,494.96	1,103,226	621,082	3,298,712	39.52	83,469
1995	3,893,920.44	1,231,024	693,028	3,979,677	40.51	98,239
1996	3,093,525.89	910,499	512,583	3,199,648	41.51	77,081
1997	2,431,466.25	663,119	373,315	2,544,444	42.50	59,869
1998	342,635.30	85,970	48,398	362,764	43.50	8,339
1999	3,047,637.55	698,189	393,059	3,264,106	44.50	73,351
2000	3,208,016.19	664,945	374,343	3,475,276	45.50	76,380
2001	1,663,158.87	308,449	173,647	1,822,144	46.50	39,186
2002	835,465.09	136,709	76,963	925,595	47.50	19,486
2003	28,052,019.53	3,978,225	2,239,617	31,422,806	48.50	647,893
2004	1,573,115.97	188,774	106,274	1,781,465	49.50	35,989

FORTISBC, INC.

ACCOUNT 362.00 - SUBSTATION EQUIPMENT

CALCULATED REMAINING LIFE DEPRECIATION ACCRUAL
RELATED TO ORIGINAL COST OF INVESTMENT AS OF DECEMBER 31, 2009

YEAR (1)	ORIGINAL COST (2)	CALCULATED ACCRUED (3)	ALLOC. BOOK RESERVE (4)	FUTURE BOOK ACCRUALS (5)	REM. LIFE (6)	ANNUAL ACCRUAL (7)
SURVIVOR CURVE.. IOWA 55-S3						
NET SALVAGE PERCENT.. -20						
2006	296,208.00	22,621	12,735	342,715	51.50	6,655
2007	10,549,287.92	575,358	323,908	12,335,238	52.50	234,957
2008	29,162,417.31	954,311	537,247	34,457,654	53.50	644,068
2009	17,674,813.42	192,797	108,539	21,101,237	54.50	387,179
	181,230,662.16	57,282,933	32,248,509	185,228,286		4,955,749

COMPOSITE REMAINING LIFE AND ANNUAL ACCRUAL RATE, PERCENT.. 37.4 2.73

FORTISBC, INC.

ACCOUNT 364.00 - POLES, TOWERS AND FIXTURES

CALCULATED REMAINING LIFE DEPRECIATION ACCRUAL
RELATED TO ORIGINAL COST OF INVESTMENT AS OF DECEMBER 31, 2009

YEAR (1)	ORIGINAL COST (2)	CALCULATED ACCRUED (3)	ALLOC. BOOK RESERVE (4)	FUTURE BOOK ACCRUALS (5)	REM. LIFE (6)	ANNUAL ACCRUAL (7)
SURVIVOR CURVE.. IOWA 50-R3						
NET SALVAGE PERCENT.. -40						
1960	11,645,887.24	12,939,047	9,414,870	6,889,372	10.32	667,575
1975	646,987.85	552,709	402,169	503,614	19.49	25,840
1976	890,158.39	742,250	540,085	706,137	20.22	34,923
1977	1,018,489.39	827,869	602,384	823,501	20.97	39,270
1978	1,058,976.27	838,540	610,149	872,418	21.72	40,167
1979	1,184,208.27	912,172	663,726	994,166	22.49	44,205
1980	1,405,233.93	1,052,127	765,562	1,201,766	23.26	51,667
1981	1,974,494.38	1,434,668	1,043,911	1,720,381	24.05	71,534
1982	938,300.03	660,751	480,784	832,836	24.85	33,515
1983	1,002,875.21	683,480	497,322	906,703	25.66	35,335
1984	934,361.96	615,333	447,736	860,371	26.48	32,491
1985	1,308,163.32	831,102	604,737	1,226,692	27.31	44,917
1986	1,375,902.49	841,777	612,504	1,313,759	28.15	46,670
1987	730,072.78	429,283	312,360	709,742	29.00	24,474
1988	1,293,436.00	729,394	530,731	1,280,079	29.86	42,869
1989	1,427,302.41	770,115	560,361	1,437,862	30.73	46,790
1990	1,222,541.78	629,854	458,302	1,253,256	31.60	39,660
1991	1,533,719.27	751,952	547,145	1,600,062	32.49	49,248
1992	9,778,049.03	4,550,313	3,310,955	10,378,314	33.38	310,914
1993	2,761,673.57	1,215,578	884,494	2,981,849	34.28	86,985
1994	4,327,917.51	1,794,701	1,305,883	4,753,202	35.19	135,073
1995	4,956,378.54	1,927,635	1,402,610	5,536,320	36.11	153,318
1996	3,280,555.63	1,191,367	866,877	3,725,901	37.03	100,618
1997	4,141,671.04	1,396,240	1,015,950	4,782,389	37.96	125,985
1998	3,715,973.81	1,155,965	841,118	4,361,245	38.89	112,143
1999	3,857,187.17	1,097,293	798,426	4,601,636	39.84	115,503
2000	3,948,376.86	1,019,313	741,685	4,786,043	40.78	117,363
2001	4,616,180.04	1,067,630	776,842	5,685,810	41.74	136,220
2004	5,406,022.29	814,363	592,557	6,975,874	44.62	156,340
2005	7,690,623.65	949,638	690,987	10,075,886	45.59	221,011
2006	15,623,229.38	1,500,455	1,091,780	20,780,741	46.57	446,226
2007	9,502,824.92	654,555	476,275	12,827,680	47.54	269,829
2008	11,780,670.01	488,191	355,224	16,137,714	48.52	332,599
	126,978,444.42	47,065,660	34,246,501	143,523,321		4,191,277

COMPOSITE REMAINING LIFE AND ANNUAL ACCRUAL RATE, PERCENT.. 34.2   3.30

FORTISBC, INC.

ACCOUNT 365.00 - CONDUCTORS AND DEVICES

CALCULATED REMAINING LIFE DEPRECIATION ACCRUAL
RELATED TO ORIGINAL COST OF INVESTMENT AS OF DECEMBER 31, 2009

YEAR (1)	ORIGINAL COST (2)	CALCULATED ACCRUED (3)	ALLOC. BOOK RESERVE (4)	FUTURE BOOK ACCRUALS (5)	REM. LIFE (6)	ANNUAL ACCRUAL (7)
SURVIVOR CURVE.. IOWA 45-R3						
NET SALVAGE PERCENT.. -25						
1960	14,985,969.77	15,743,511	10,849,269	7,883,193	7.18	1,097,938
1975	567,922.97	471,220	324,730	385,174	15.13	25,458
1976	750,314.64	608,383	419,253	518,640	15.81	32,805
1977	1,023,977.70	810,363	558,443	721,529	16.51	43,703
1978	1,159,924.53	895,070	616,816	833,090	17.22	48,379
1979	1,753,461.59	1,318,011	908,276	1,283,551	17.94	71,547
1980	2,260,066.04	1,652,363	1,138,687	1,686,396	18.68	90,278
1981	2,790,629.88	1,981,347	1,365,398	2,122,889	19.44	109,202
1982	2,776,557.77	1,912,736	1,318,117	2,152,580	20.20	106,563
1983	1,598,791.69	1,066,754	735,128	1,263,362	20.98	60,217
1984	1,991,458.69	1,285,039	885,554	1,603,769	21.77	73,669
1985	1,980,796.47	1,234,135	850,475	1,625,521	22.57	72,021
1986	2,327,962.72	1,398,058	963,439	1,946,514	23.38	83,256
1987	2,030,873.81	1,172,830	808,228	1,730,364	24.21	71,473
1988	2,197,422.00	1,218,361	839,605	1,907,172	25.04	76,165
1989	2,600,564.10	1,380,477	951,323	2,299,382	25.89	88,814
1990	4,575,834.09	2,320,977	1,599,446	4,120,347	26.74	154,089
1991	4,415,416.72	2,132,867	1,469,815	4,049,456	27.61	146,666
1992	9,917,867.80	4,548,458	3,134,462	9,262,873	28.49	325,127
1993	6,258,899.15	2,717,379	1,872,618	5,951,006	29.37	202,622
1994	8,767,093.14	3,587,166	2,472,011	8,486,855	30.27	280,372
1995	5,113,646.29	1,964,471	1,353,769	5,038,289	31.17	161,639
1996	5,444,537.11	1,953,976	1,346,536	5,459,135	32.08	170,173
1997	9,476,339.05	3,158,819	2,176,825	9,668,599	33.00	292,988
1998	5,246,091.44	1,613,173	1,111,680	5,445,934	33.93	160,505
1999	4,984,264.50	1,403,880	967,451	5,262,880	34.86	150,972
2000	5,247,651.01	1,339,594	923,150	5,636,414	35.81	157,398
2001	7,554,840.35	1,731,286	1,193,075	8,250,475	36.75	224,503
2002	4,922,746.16	996,856	686,960	5,466,473	37.71	144,961
2003	9,068,790.58	1,594,633	1,098,904	10,237,084	38.67	264,729
2004	7,968,589.07	1,188,615	819,106	9,141,630	39.63	230,674
2005	11,089,298.70	1,355,390	934,035	12,927,588	40.60	318,413
2006	21,584,038.33	2,056,419	1,417,132	25,562,916	41.57	614,937
2007	16,534,700.14	1,125,186	775,395	19,892,980	42.55	467,520
2008	18,019,342.48	735,865	507,104	22,017,074	43.53	505,791
	208,986,680.48	71,673,668	49,392,215	211,841,136		7,125,567

COMPOSITE REMAINING LIFE AND ANNUAL ACCRUAL RATE, PERCENT.. 29.7   3.41

FORTISBC, INC.

ACCOUNT 368.00 - LINE TRANSFORMERS

CALCULATED REMAINING LIFE DEPRECIATION ACCRUAL
RELATED TO ORIGINAL COST OF INVESTMENT AS OF DECEMBER 31, 2009

SURVIVOR CURVE.. IOWA 45-R4
NET SALVAGE PERCENT.. -25

YEAR (1)	ORIGINAL COST (2)	CALCULATED ACCRUED (3)	ALLOC. BOOK RESERVE (4)	FUTURE BOOK ACCRUALS (5)	REM. LIFE (6)	ANNUAL ACCRUAL (7)
1960	9,419,353.20	10,515,648	5,020,827	6,753,364	4.81	1,404,026
1975	559,304.79	495,139	236,410	462,721	13.13	35,242
1976	814,416.07	704,470	336,358	681,662	13.86	49,182
1977	840,901.54	709,626	338,820	712,307	14.62	48,721
1978	1,102,007.88	906,401	432,772	944,738	15.39	61,386
1979	927,567.35	742,564	354,546	804,913	16.18	49,747
1980	1,057,028.61	822,725	392,820	928,466	16.98	54,680
1981	1,611,974.89	1,217,484	581,303	1,433,666	17.81	80,498
1982	772,040.35	565,307	269,913	695,137	18.64	37,293
1983	573,198.06	406,175	193,933	522,565	19.49	26,812
1984	395,528.93	270,720	129,259	365,152	20.36	17,935
1985	728,146.98	480,577	229,458	680,726	21.24	32,049
1986	493,234.82	313,204	149,543	467,001	22.14	21,093
1987	332,855.14	203,042	96,945	319,124	23.04	13,851
1988	402,383.22	235,173	112,286	390,693	23.96	16,306
1989	497,600.57	277,966	132,718	489,283	24.89	19,658
1990	342,639.46	182,550	87,161	341,138	25.82	13,212
1991	348,071.21	176,259	84,157	350,932	26.77	13,109
1992	6,879,629.06	3,302,222	1,576,687	7,022,849	27.72	253,350
1993	1,323,051.96	599,789	286,377	1,367,438	28.68	47,679
1994	1,880,004.11	801,610	382,739	1,967,266	29.65	66,350
1995	1,137,341.23	454,311	216,916	1,204,761	30.62	39,346
1996	1,015,636.35	378,325	180,636	1,088,909	31.59	34,470
1997	1,048,625.88	361,776	172,735	1,138,047	32.58	34,931
1998	1,296,983.81	412,149	196,786	1,424,444	33.56	42,445
1999	2,209,747.79	641,435	306,261	2,455,924	34.55	71,083
2000	2,872,479.88	754,816	360,396	3,230,204	35.54	90,889
2001	3,258,447.00	766,631	366,038	3,707,021	36.53	101,479
2002	3,865,316.89	803,116	383,458	4,448,188	37.52	118,555
2003	5,087,693.18	917,184	437,921	5,921,695	38.51	153,770
2004	4,914,429.78	749,451	357,835	5,785,202	39.51	146,424
2005	5,525,175.28	689,127	329,032	6,577,437	40.51	162,366
2006	15,253,960.90	1,483,066	708,108	18,359,343	41.50	442,394
2007	12,257,740.35	851,300	406,464	14,915,711	42.50	350,958
2008	7,412,151.29	308,809	147,445	9,117,744	43.50	209,603
	98,456,667.81	33,500,147	15,995,063	107,075,772		4,360,892

COMPOSITE REMAINING LIFE AND ANNUAL ACCRUAL RATE, PERCENT.. 24.6   4.43

FORTISBC, INC.

ACCOUNT 369.00 - SERVICES

CALCULATED REMAINING LIFE DEPRECIATION ACCRUAL
RELATED TO ORIGINAL COST OF INVESTMENT AS OF DECEMBER 31, 2009

YEAR (1)	ORIGINAL COST (2)	CALCULATED ACCRUED (3)	ALLOC. BOOK RESERVE (4)	FUTURE BOOK ACCRUALS (5)	REM. LIFE (6)	ANNUAL ACCRUAL (7)
SURVIVOR CURVE.. IOWA 75-R4						
NET SALVAGE PERCENT.. 0						
1975	313,088.38	141,265	313,088			
1976	322,649.96	141,537	322,650			
1977	406,239.51	173,111	406,240			
1978	335,038.66	138,572	335,039			
1979	180,407.47	72,331	180,407			
1980	385,727.31	149,766	385,727			
1981	528,602.68	198,474	528,603			
1990	1,461,568.98	378,064	1,461,569			
1991	2,157,049.05	529,491	2,157,049			
2006	1,202,026.00	56,099	385,480	816,546	71.50	11,420
	7,292,398.00	1,978,710	6,475,852	816,546		11,420

COMPOSITE REMAINING LIFE AND ANNUAL ACCRUAL RATE, PERCENT.. 71.5 0.16

FORTISBC, INC.

ACCOUNT 370.00 - METERS

CALCULATED REMAINING LIFE DEPRECIATION ACCRUAL
RELATED TO ORIGINAL COST OF INVESTMENT AS OF DECEMBER 31, 2009

YEAR (1)	ORIGINAL COST (2)	CALCULATED ACCRUED (3)	ALLOC. BOOK RESERVE (4)	FUTURE BOOK ACCRUALS (5)	REM. LIFE (6)	ANNUAL ACCRUAL (7)
SURVIVOR CURVE.. IOWA 20-R1						
NET SALVAGE PERCENT.. 0						
1960	2,416,785.74	2,295,946	2,123,318	293,468	1.00	293,468
1976	208.19	186	172	36	2.12	17
1977	31,865.46	27,994	25,889	5,976	2.43	2,459
1978	73,654.76	63,527	58,751	14,904	2.75	5,420
1979	62,424.10	52,811	48,840	13,584	3.08	4,410
1980	169,053.48	140,145	129,608	39,445	3.42	11,534
1981	219,202.68	177,883	164,508	54,695	3.77	14,508
1982	201,867.31	160,081	148,045	53,822	4.14	13,000
1983	132,651.28	102,672	94,952	37,699	4.52	8,340
1984	128,267.37	96,778	89,501	38,766	4.91	7,895
1985	163,022.00	119,658	110,661	52,361	5.32	9,842
1986	104,837.32	74,749	69,129	35,708	5.74	6,221
1987	275,366.00	190,278	175,971	99,395	6.18	16,083
1988	213,940.64	143,019	132,266	81,675	6.63	12,319
1989	312,549.79	201,595	186,437	126,113	7.10	17,762
1990	532,021.91	330,120	305,299	226,723	7.59	29,871
1991	425,815.70	253,573	234,507	191,309	8.09	23,648
1992	867,270.86	493,911	456,775	410,496	8.61	47,677
1993	634,291.97	344,103	318,231	316,061	9.15	34,542
1994	466,436.05	239,981	221,937	244,499	9.71	25,180
1995	293,083.77	142,439	131,729	161,355	10.28	15,696
1996	534,096.16	243,815	225,483	308,613	10.87	28,391
1997	557,665.23	237,565	219,703	337,962	11.48	29,439
1998	593,454.32	234,414	216,789	376,665	12.10	31,129
1999	472,965.89	171,923	158,997	313,969	12.73	24,664
2000	927,078.22	306,863	283,791	643,287	13.38	48,078
2001	415,575.04	123,841	114,529	301,046	14.04	21,442
2002	84,239.28	22,281	20,606	63,633	14.71	4,326
2003	732,930.18	168,940	156,238	576,692	15.39	37,472
2004	497,777.04	97,813	90,458	407,319	16.07	25,347
2005	304,581.00	49,342	45,632	258,949	16.76	15,450
2006	431,612.94	54,599	50,494	381,119	17.47	21,816
	13,276,591.68	7,362,845	6,809,246	6,467,346		887,446

COMPOSITE REMAINING LIFE AND ANNUAL ACCRUAL RATE, PERCENT.. 7.3   6.68

FORTISBC, INC.

ACCOUNT 371.00 - INSTALLATIONS ON CUSTOMERS' PREMISES

CALCULATED REMAINING LIFE DEPRECIATION ACCRUAL
RELATED TO ORIGINAL COST OF INVESTMENT AS OF DECEMBER 31, 2009

YEAR (1)	ORIGINAL COST (2)	CALCULATED ACCRUED (3)	ALLOC. BOOK RESERVE (4)	FUTURE BOOK ACCRUALS (5)	REM. LIFE (6)	ANNUAL ACCRUAL (7)
SURVIVOR CURVE.. IOWA 20-R1						
NET SALVAGE PERCENT.. 0						
1981	34,384.33	27,903	34,384			
1982	36,229.42	28,730	36,229			
1983	42,518.49	32,909	42,518			
1984	16,078.90	12,132	16,079			
1985	52,719.75	38,696	52,720			
1986	8,980.84	6,403	8,981			
1987	25,148.56	17,378	25,149			
1988	32,351.82	21,627	32,352			
1990	5,199.58	3,226	5,200			
1991	5,210.15	3,103	5,210			
1992	626,480.82	356,781	626,481			
1993	7,791.55	4,227	7,792			
1994	6,679.42	3,437	6,679			
1995	3,104.62	1,509	3,105			
1998	34,953.75	13,807	34,953	1		
	937,832.00	571,868	937,832			

COMPOSITE REMAINING LIFE AND ANNUAL ACCRUAL RATE, PERCENT.. 0.0 0.00

FORTISBC, INC.

ACCOUNT 373.00 - STREET LIGHTING AND SIGNAL SYSTEMS

CALCULATED REMAINING LIFE DEPRECIATION ACCRUAL
RELATED TO ORIGINAL COST OF INVESTMENT AS OF DECEMBER 31, 2009

YEAR (1)	ORIGINAL COST (2)	CALCULATED ACCRUED (3)	ALLOC. BOOK RESERVE (4)	FUTURE BOOK ACCRUALS (5)	REM. LIFE (6)	ANNUAL ACCRUAL (7)
SURVIVOR CURVE.. IOWA 40-R4						
NET SALVAGE PERCENT.. -5						
1960	7,258,412.32	7,114,514	1,310,643	6,310,690	2.66	2,372,440
1975	79,376.92	64,593	11,899	71,447	9.00	7,939
1976	104,987.34	83,587	15,398	94,839	9.67	9,808
1977	71,770.38	55,841	10,287	65,072	10.36	6,281
1978	106,714.55	81,040	14,929	97,121	11.07	8,773
1979	65,300.16	48,356	8,908	59,657	11.79	5,060
1980	67,097.78	48,383	8,913	61,540	12.53	4,911
1981	59,671.66	41,838	7,708	54,947	13.29	4,134
1982	50,779.95	34,564	6,367	46,952	14.07	3,337
1983	27,588.35	18,199	3,353	25,615	14.87	1,723
1984	35,077.35	22,384	4,124	32,707	15.69	2,085
1985	37,265.08	22,968	4,231	34,897	16.52	2,112
1986	8,659.78	5,142	947	8,146	17.38	469
1989	6,838.17	3,585	660	6,520	20.03	326
1992	95,705.52	43,211	7,961	92,530	22.80	4,058
1993	3,360.78	1,434	264	3,265	23.74	138
1994	419.62	169	31	410	24.69	17
1995	22,251.58	8,382	1,544	21,820	25.65	851
1996	21,967.77	7,716	1,421	21,645	26.62	813
1998	8,917.15	2,675	493	8,870	28.57	310
1999	45,688.16	12,521	2,307	45,666	29.56	1,545
2000	19,074.22	4,737	873	19,155	30.54	627
2001	79,960.00	17,778	3,275	80,683	31.53	2,559
2003	965,533.24	164,237	30,256	983,554	33.52	29,342
2004	886,418.00	127,744	23,534	907,205	34.51	26,288
2006	145,773.00	13,355	2,460	150,602	36.51	4,125
	10,274,608.83	8,048,953	1,482,786	9,305,553		2,500,071

COMPOSITE REMAINING LIFE AND ANNUAL ACCRUAL RATE, PERCENT.. 3.7   24.33

FORTISBC, INC.

ACCOUNT 390.00 - STRUCTURES - FRAME AND IRON

CALCULATED REMAINING LIFE DEPRECIATION ACCRUAL
RELATED TO ORIGINAL COST OF INVESTMENT AS OF DECEMBER 31, 2009

YEAR (1)	ORIGINAL COST (2)	CALCULATED ACCRUED (3)	ALLOC. BOOK RESERVE (4)	FUTURE BOOK ACCRUALS (5)	REM. LIFE (6)	ANNUAL ACCRUAL (7)
SURVIVOR CURVE.. IOWA 40-R3						
NET SALVAGE PERCENT.. 0						
1970	4,441.25	3,519	4,441			
1975	8,477.77	6,144	8,478			
1976	1,884.54	1,337	1,885			
1977	505.63	351	506			
1978	14,502.63	9,829	14,503			
1979	4,764.19	3,149	4,764			
1980	46,096.68	29,675	46,097			
1981	2,642.09	1,655	2,642			
1982	857.56	522	858			
1983	4,450.46	2,626	4,450			
1984	2,179.00	1,245	2,179			
1985	15,136.67	8,359	15,137			
1986	5,520.20	2,941	5,520			
1987	8,070.07	4,140	8,070			
1988	32,576.54	16,052	32,577			
1989	19,930.71	9,417	19,409	522	21.10	25
1990	5,285.55	2,388	4,922	364	21.93	17
1992	4,967.87	2,033	4,190	778	23.63	33
1993	7,095.84	2,751	5,670	1,426	24.49	58
1994	27,354.25	10,005	20,620	6,734	25.37	265
1995	6,893.99	2,368	4,881	2,013	26.26	77
1996	8,329.76	2,676	5,515	2,815	27.15	104
1997	11,704.28	3,494	7,201	4,503	28.06	160
1998	2,204.69	607	1,251	954	28.98	33
1999	18,596.12	4,696	9,679	8,917	29.90	298
2000	7,032.66	1,612	3,322	3,711	30.83	120
2001	65,863.00	13,551	27,929	37,934	31.77	1,194
	337,364.00	147,142	266,696	70,668		2,384

COMPOSITE REMAINING LIFE AND ANNUAL ACCRUAL RATE, PERCENT.. 29.6   0.71

FORTISBC, INC.

ACCOUNT 390.10 - STRUCTURES - MASONRY

CALCULATED REMAINING LIFE DEPRECIATION ACCRUAL
RELATED TO ORIGINAL COST OF INVESTMENT AS OF DECEMBER 31, 2009

YEAR (1)	ORIGINAL COST (2)	CALCULATED ACCRUED (3)	ALLOC. BOOK RESERVE (4)	FUTURE BOOK ACCRUALS (5)	REM. LIFE (6)	ANNUAL ACCRUAL (7)
SURVIVOR CURVE.. IOWA 35-R3						
NET SALVAGE PERCENT.. 0						
1975	496,561.44	392,994	128,574	367,987	7.30	50,409
1976	98,360.00	76,439	25,008	73,352	7.80	9,404
1979	2,059,296.91	1,503,287	491,823	1,567,474	9.45	165,870
1980	0.06	0	0			
1983	662,652.46	435,648	142,529	520,123	11.99	43,380
1985	1,710,535.48	1,056,136	345,530	1,365,005	13.39	101,942
1986	76,557.00	45,672	14,942	61,615	14.12	4,364
1987	1,262,134.00	726,270	237,610	1,024,524	14.86	68,945
1988	746,503.00	413,137	135,164	611,339	15.63	39,113
1989	379,258.00	201,549	65,940	313,318	16.40	19,105
1991	139,875.00	67,939	22,227	117,648	18.00	6,536
1992	151,132.00	69,823	22,844	128,288	18.83	6,813
1993	292,864.00	128,359	41,995	250,869	19.66	12,760
1994	93,128.00	38,555	12,614	80,514	20.51	3,926
1999	67,804.00	19,469	6,369	61,435	24.95	2,462
2000	5,267.00	1,374	450	4,817	25.87	186
2001	232,816.00	54,546	17,845	214,971	26.80	8,021
2003	196,800.04	35,481	11,608	185,192	28.69	6,455
2007	260,282.00	18,220	5,961	254,321	32.55	7,813
	8,931,826.39	5,284,898	1,729,033	7,202,793		557,504

COMPOSITE REMAINING LIFE AND ANNUAL ACCRUAL RATE, PERCENT.. 12.9 6.24

FORTISBC, INC.

ACCOUNT 390.20 - OPERATIONS BUILDINGS

CALCULATED REMAINING LIFE DEPRECIATION ACCRUAL
RELATED TO ORIGINAL COST OF INVESTMENT AS OF DECEMBER 31, 2009

YEAR (1)	ORIGINAL COST (2)	CALCULATED ACCRUED (3)	ALLOC. BOOK RESERVE (4)	FUTURE BOOK ACCRUALS (5)	REM. LIFE (6)	ANNUAL ACCRUAL (7)
SURVIVOR CURVE.. IOWA 35-R3						
NET SALVAGE PERCENT.. 0						
1979	7,816,292.74	5,705,894	2,080,875	5,735,418	9.45	606,923
2003	4,933,835.51	889,521	324,398	4,609,438	28.69	160,664
	12,750,128.25	6,595,415	2,405,273	10,344,855		767,587

COMPOSITE REMAINING LIFE AND ANNUAL ACCRUAL RATE, PERCENT.. 13.5 6.02

FORTISBC, INC.

ACCOUNT 391.00 - OFFICE FURNITURE AND EQUIPMENT

CALCULATED REMAINING LIFE DEPRECIATION ACCRUAL
RELATED TO ORIGINAL COST OF INVESTMENT AS OF DECEMBER 31, 2009

YEAR (1)	ORIGINAL COST (2)	CALCULATED ACCRUED (3)	ALLOC. BOOK RESERVE (4)	FUTURE BOOK ACCRUALS (5)	REM. LIFE (6)	ANNUAL ACCRUAL (7)
SURVIVOR CURVE.. 15-SQUARE						
NET SALVAGE PERCENT.. 0						
1985	54,039.39	50,437	54,039			
1998	2,561,379.01	1,963,732	2,411,360	150,019	3.50	42,863
1999	284,447.00	199,113	244,500	39,947	4.50	8,877
2000	128,875.00	81,620	100,225	28,650	5.50	5,209
2001	144,211.00	81,720	100,348	43,863	6.50	6,748
2002	202,331.03	101,166	124,227	78,104	7.50	10,414
2003	451,130.69	195,488	240,049	211,082	8.50	24,833
2004	601,075.73	220,396	270,634	330,442	9.50	34,783
2005	314,887.27	94,466	115,999	198,888	10.50	18,942
2006	242,960.20	56,690	69,613	173,347	11.50	15,074
2007	248,080.29	41,348	50,773	197,307	12.50	15,785
2008	236,641.24	23,664	29,058	207,583	13.50	15,377
2009	5,119.92	171	210	4,910	14.50	339
	5,475,177.77	3,110,011	3,811,035	1,664,143		199,244

COMPOSITE REMAINING LIFE AND ANNUAL ACCRUAL RATE, PERCENT.. 8.4   3.64

FORTISBC, INC.

ACCOUNT 391.10 - COMPUTER EQUIPMENT AND SOFTWARE

CALCULATED REMAINING LIFE DEPRECIATION ACCRUAL
RELATED TO ORIGINAL COST OF INVESTMENT AS OF DECEMBER 31, 2009

SURVIVOR CURVE.. 10-SQUARE
NET SALVAGE PERCENT.. 0

YEAR (1)	ORIGINAL COST (2)	CALCULATED ACCRUED (3)	ALLOC. BOOK RESERVE (4)	FUTURE BOOK ACCRUALS (5)	REM. LIFE (6)	ANNUAL ACCRUAL (7)
1994	218,967.68	197,071	218,968			
1995	424,200.51	381,780	424,201			
1996	395,202.00	355,682	395,202			
1997	363,002.00	326,702	363,002			
1998	5,442,637.00	4,898,373	5,442,637			
1999	394,191.00	354,772	394,191			
2000	206,947.22	186,252	206,947			
2002	8,742,268.96	6,556,702	8,254,409	487,860	2.50	195,144
2003	1,284,447.63	834,891	1,051,067	233,381	3.50	66,680
2004	356,899.97	196,295	247,121	109,779	4.50	24,395
2005	1,496,275.23	673,324	847,666	648,609	5.50	117,929
2006	1,382,866.62	484,003	609,324	773,543	6.50	119,007
2007	1,650,874.70	412,719	519,583	1,131,292	7.50	150,839
2008	6,530,657.12	979,599	1,233,244	5,297,413	8.50	623,225
2009	3,068,103.93	153,405	193,126	2,874,978	9.50	302,629
	31,957,541.57	16,991,570	20,400,688	11,556,854		1,599,848

COMPOSITE REMAINING LIFE AND ANNUAL ACCRUAL RATE, PERCENT.. 7.2 5.01

FORTISBC, INC.

ACCOUNT 391.20 - PC COMPUTER EQUIPMENT AND SOFTWARE

CALCULATED REMAINING LIFE DEPRECIATION ACCRUAL
RELATED TO ORIGINAL COST OF INVESTMENT AS OF DECEMBER 31, 2009

YEAR (1)	ORIGINAL COST (2)	CALCULATED ACCRUED (3)	ALLOC. BOOK RESERVE (4)	FUTURE BOOK ACCRUALS (5)	REM. LIFE (6)	ANNUAL ACCRUAL (7)
SURVIVOR CURVE.. 5-SQUARE						
NET SALVAGE PERCENT.. 0						
1994	56,834.00	45,467	41,209	15,625	1.00	15,625
1995	114,958.00	91,966	83,353	31,605	1.00	31,605
1996	580,755.35	464,604	421,090	159,665	1.00	159,665
1997	243,398.00	194,718	176,481	66,917	1.00	66,917
1998	2,933,838.00	2,347,070	2,127,246	806,592	1.00	806,592
1999	416,862.00	333,490	302,256	114,606	1.00	114,606
2000	4,169,357.20	3,335,486	3,023,088	1,146,269	1.00	1,146,269
2001	2,113,030.00	1,690,424	1,532,101	580,929	1.00	580,929
2002	669,968.26	535,975	485,776	184,192	1.00	184,192
2003	861,086.83	688,869	624,350	236,737	1.00	236,737
2004	725,775.97	580,621	526,241	199,535	1.00	199,535
2005	1,405,882.45	1,124,706	1,019,367	386,515	1.00	386,515
2006	4,222,324.07	2,955,627	2,678,806	1,543,518	1.50	1,029,012
2007	1,056,865.25	528,433	478,940	577,925	2.50	231,170
2008	2,589,121.76	776,737	703,989	1,885,133	3.50	538,609
2009	2,768,964.77	276,896	250,962	2,518,003	4.50	559,556
	24,929,021.91	15,971,089	14,475,255	10,453,767		6,287,534

COMPOSITE REMAINING LIFE AND ANNUAL ACCRUAL RATE, PERCENT.. 1.7 25.22

FORTISBC, INC.

ACCOUNT 392.10 - LIGHT DUTY VEHICLES

CALCULATED REMAINING LIFE DEPRECIATION ACCRUAL
RELATED TO ORIGINAL COST OF INVESTMENT AS OF DECEMBER 31, 2009

SURVIVOR CURVE.. IOWA 8-L3
NET SALVAGE PERCENT.. +20

YEAR (1)	ORIGINAL COST (2)	CALCULATED ACCRUED (3)	ALLOC. BOOK RESERVE (4)	FUTURE BOOK ACCRUALS (5)	REM. LIFE (6)	ANNUAL ACCRUAL (7)
1989	22,790.00	15,953	1,375	16,857	1.00	16,857
1990	28,215.00	19,750	1,702	20,870	1.00	20,870
1994	23,542.00	16,479	1,420	17,414	1.00	17,414
1995	201,795.00	141,256	12,174	149,262	1.00	149,262
1996	23,190.00	15,908	1,371	17,181	1.14	15,071
2003	15,488.00	8,147	702	11,688	2.74	4,266
2004	87,107.00	42,073	3,626	66,060	3.17	20,839
2005	1,667,280.93	696,923	60,066	1,273,759	3.82	333,445
2006	2,204,153.00	742,800	64,020	1,699,302	4.63	367,020
2007	1,199,672.00	295,119	25,436	934,302	5.54	168,647
2008	1,035,611.85	155,342	13,388	815,101	6.50	125,400
2009	257,707.22	12,885	1,111	205,055	7.50	27,341
	6,766,552.00	2,162,635	186,391	5,226,851		1,266,432

COMPOSITE REMAINING LIFE AND ANNUAL ACCRUAL RATE, PERCENT.. 4.1 18.72

FORTISBC, INC.

ACCOUNT 392.20 - HEAVY DUTY VEHICLES

CALCULATED REMAINING LIFE DEPRECIATION ACCRUAL
RELATED TO ORIGINAL COST OF INVESTMENT AS OF DECEMBER 31, 2009

YEAR (1)	ORIGINAL COST (2)	CALCULATED ACCRUED (3)	ALLOC. BOOK RESERVE (4)	FUTURE BOOK ACCRUALS (5)	REM. LIFE (6)	ANNUAL ACCRUAL (7)
SURVIVOR CURVE.. IOWA 20-L3						
NET SALVAGE PERCENT.. +20						
1971	17,435.00	12,686	13,330	618	1.81	341
1972	43,735.00	31,454	33,050	1,938	2.02	959
1978	57,110.00	37,967	39,893	5,795	3.38	1,714
1979	11,705.00	7,664	8,053	1,311	3.63	361
1980	78,670.00	50,726	53,299	9,637	3.88	2,484
1981	2.87	2	2			
1982	52,341.00	32,661	34,318	7,555	4.40	1,717
1983	34,698.00	21,291	22,371	5,387	4.66	1,156
1984	36,718.00	22,163	23,287	6,087	4.91	1,240
1985	120,154.00	71,371	74,992	21,131	5.15	4,103
1987	208,222.00	120,186	126,283	40,295	5.57	7,234
1988	0.03	0	0			
1989	28,561.96	16,086	16,902	5,948	5.92	1,005
1990	483,990.00	269,292	282,954	104,238	6.09	17,116
1991	24,193.00	13,287	13,961	5,393	6.27	860
1992	338,790.00	183,082	192,370	78,662	6.49	12,120
1993	49,387.00	26,136	27,462	12,048	6.77	1,780
1994	520,606.23	268,425	282,043	134,442	7.11	18,909
1995	391,477.00	195,112	205,011	108,171	7.54	14,346
1996	63,066.00	30,120	31,648	18,805	8.06	2,333
1999	47,496.00	18,770	19,722	18,275	10.12	1,806
2000	78,355.00	28,396	29,837	32,847	10.94	3,002
2002	304,829.00	89,132	93,654	150,209	12.69	11,837
2003	123,799.00	31,643	33,248	65,791	13.61	4,834
2004	174,545.00	37,981	39,908	99,728	14.56	6,849
2005	758,198.02	135,869	142,762	463,796	15.52	29,884
2006	1,075,395.00	150,125	157,742	702,574	16.51	42,554
2007	3,186,134.99	318,613	334,778	2,214,130	17.50	126,522
2008	669,066.61	40,144	42,181	493,072	18.50	26,653
2009	1,807,008.78	36,140	37,973	1,407,634	19.50	72,186
	10,785,689.49	2,296,524	2,413,034	6,215,518		415,905

COMPOSITE REMAINING LIFE AND ANNUAL ACCRUAL RATE, PERCENT.. 14.9 3.86

FORTISBC, INC.

ACCOUNT 394.00 - TOOLS AND WORK EQUIPMENT

CALCULATED REMAINING LIFE DEPRECIATION ACCRUAL
RELATED TO ORIGINAL COST OF INVESTMENT AS OF DECEMBER 31, 2009

YEAR (1)	ORIGINAL COST (2)	CALCULATED ACCRUED (3)	ALLOC. BOOK RESERVE (4)	FUTURE BOOK ACCRUALS (5)	REM. LIFE (6)	ANNUAL ACCRUAL (7)
SURVIVOR CURVE.. 15-SQUARE						
NET SALVAGE PERCENT.. 0						
1978	30,528.52	28,493	30,529			
1979	67,863.00	63,339	67,863			
1980	80,643.00	75,267	80,643			
1981	72,218.00	67,403	72,218			
1982	77,142.00	71,999	77,142			
1983	65,245.00	60,895	65,245			
1984	115,409.00	107,715	115,409			
1985	473,348.43	441,790	473,348			
1986	198,825.00	185,569	198,825			
1987	120,168.00	112,156	120,168			
1988	175,882.00	164,156	175,882			
1989	404,733.00	377,749	404,733			
1990	206,564.00	192,792	206,564			
1991	223,808.00	208,887	223,808			
1992	160,370.00	149,678	160,370			
1993	288,316.00	269,094	288,316			
1995	215,015.00	200,680	215,015			
1996	88,890.00	80,001	88,890			
1997	461,604.00	384,668	438,983	22,621	2.50	9,048
1998	498,925.00	382,511	436,521	62,404	3.50	17,830
1999	545,506.00	381,854	435,772	109,734	4.50	24,385
2000	351,604.00	222,681	254,123	97,481	5.50	17,724
2001	664,907.00	376,783	429,985	234,922	6.50	36,142
2002	449,257.79	224,629	256,347	192,911	7.50	25,721
2003	514,101.97	222,776	254,232	259,870	8.50	30,573
2004	518,418.44	190,088	216,928	301,490	9.50	31,736
2005	758,607.61	227,582	259,717	498,891	10.50	47,513
2006	859,648.67	200,582	228,904	630,745	11.50	54,847
2007	936,499.18	156,086	178,125	758,374	12.50	60,670
2008	587,124.42	58,712	67,002	520,122	13.50	38,528
2009	657,856.91	21,926	25,022	632,835	14.50	43,644
	10,869,028.94	5,908,541	6,546,629	4,322,400		438,361

COMPOSITE REMAINING LIFE AND ANNUAL ACCRUAL RATE, PERCENT.. 9.9   4.03

FORTISBC, INC.

ACCOUNT 397.00 - COMMUNICATIONS STRUCTURES AND EQUIPMENT

CALCULATED REMAINING LIFE DEPRECIATION ACCRUAL
RELATED TO ORIGINAL COST OF INVESTMENT AS OF DECEMBER 31, 2009

SURVIVOR CURVE.. 15-SQUARE
NET SALVAGE PERCENT.. 0

YEAR (1)	ORIGINAL COST (2)	CALCULATED ACCRUED (3)	ALLOC. BOOK RESERVE (4)	FUTURE BOOK ACCRUALS (5)	REM. LIFE (6)	ANNUAL ACCRUAL (7)
1977	15,726.00	14,678	13,059	2,667	1.00	2,667
1978	42,197.00	39,384	35,039	7,158	1.00	7,158
1979	48,433.00	45,204	40,217	8,216	1.00	8,216
1980	66,469.00	62,038	55,193	11,276	1.00	11,276
1982	39,708.00	37,061	32,972	6,736	1.00	6,736
1983	97,820.00	91,298	81,225	16,595	1.00	16,595
1984	166,808.00	155,687	138,510	28,298	1.00	28,298
1985	52,071.00	48,599	43,237	8,834	1.00	8,834
1986	33,009.00	30,808	27,409	5,600	1.00	5,600
1987	28,033.00	26,164	23,277	4,756	1.00	4,756
1988	168,129.52	156,920	139,607	28,523	1.00	28,523
1989	3,077.00	2,872	2,555	522	1.00	522
1990	115,099.00	107,425	95,573	19,526	1.00	19,526
1991	135,481.00	126,448	112,497	22,984	1.00	22,984
1992	221,699.00	206,918	184,088	37,611	1.00	37,611
1993	61,008.00	56,941	50,659	10,349	1.00	10,349
1994	105,674.00	98,629	87,747	17,927	1.00	17,927
1995	193,317.00	180,429	160,522	32,795	1.00	32,795
1996	916,634.00	824,971	733,950	182,684	1.50	121,789
1997	591,987.00	493,321	438,891	153,096	2.50	61,238
1998	264,756.00	202,980	180,585	84,171	3.50	24,049
1999	569,024.00	398,317	354,370	214,654	4.50	47,701
2000	114,826.00	72,723	64,699	50,127	5.50	9,114
2001	212,907.00	120,648	107,337	105,570	6.50	16,242
2002	29,998.55	14,999	13,344	16,655	7.50	2,221
2003	2,752,554.17	1,192,764	1,061,163	1,691,391	8.50	198,987
2004	315,586.15	115,716	102,949	212,637	9.50	22,383
2005	5,360,030.39	1,608,009	1,430,592	3,929,438	10.50	374,232
2006	1,710,297.18	399,064	355,034	1,355,263	11.50	117,849
2007	5,528,980.52	921,515	819,842	4,709,139	12.50	376,731
2008	1,653,946.22	165,395	147,146	1,506,800	13.50	111,615
2009	1,083,117.36	36,100	32,117	1,051,000	14.50	72,483
	22,698,403.06	8,054,025	7,165,405	15,532,998		1,827,007

COMPOSITE REMAINING LIFE AND ANNUAL ACCRUAL RATE, PERCENT.. 8.5 8.05

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Marijuana Growth in British Columbia

by Stephen T. Easton

Contents

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Executive Summary

The cultivation and production of marijuana in British Columbia highlights the problems inherent in the enforcement of laws that are generally ignored by broad sectors of the populace. Some 7.5 percent of all Canadians report they use marijuana currently, and over their lifetimes, 23 percent report themselves as having used marijuana at least once.

This paper raises several issues that have the cumulative effect of suggesting that in the long term, the prohibition on marijuana cannot be sustained with the present technology of production and enforcement. To anyone with even a passing acquaintance with modern history, it is apparent that we are reliving the experience of alcohol prohibition of the early years of the last century.

In Canada, and more specifically British Columbia today, as with alcohol nearly a century ago, marijuana is too easily produced and exported to be controlled with the tools available to law enforcement in a free society. The return on investment is sufficiently great so that for each marijuana growing operation demolished, another takes its place.

For a modest marijuana growing operation of 100 plants, harvest revenue is from 13 kilograms of marijuana sold in pound blocks out the back door valued at $2,600 per pound. This amounts to slightly less than $20,000 per harvest. With four harvests per year, gross revenue is nearly $80,000. A conservatively high estimate of production cost is about $25,000. The return on invested money is potentially high: around 55 percent.

The underlying characterization of the marijuana grow operation is that it functions as a profit-maximizing activity in which the values of output and costs yield a market equilibrium rate of return. Such an assumption permits an estimate of the total number of grow-ops. The range of estimates depends upon the value of the crop, the costs of production, the risk-adjusted rate of return to other small businesses, and the likelihood of discovery by the police. For the year 2000, the estimated number of "grow-ops" in British Columbia may be as high as 17,500. Combined with domestic consumption, numbers of this magnitude suggest that exports from British Columbia are worth nearly $2 billion.

Why is it that indoor marijuana cultivation and consumption appear to take place more openly in BC than elsewhere in Canada? The most striking difference between BC and the rest of Canada lies in the rate at which offences are settled by charging the offender (or "cleared"). Only 13 percent of possession offences in BC are cleared by charge. Elsewhere in Canada over 60 percent of possession offences are cleared by charge. In addition, the penalties for conviction appear to be low.

In a sample of Vancouver marijuana growing operations "busted" by the police, most of those who were convicted received no jail time: 55 percent. Five more percent were sentenced to a single day or less and another 8 percent received sentences of between one day and 31 days, while still another 8 percent received 60 days. Some 11 percent were sentenced to 90 days. Of those who are repeat offenders, half are reconvicted within the year. Of the 35 percent who were fined, the average fine amounted to less than $1,200: a small amount considering the size of most marijuana operations. While police resources are spent to destroy nearly 3,000 marijuana growing operations a year, the consequences are relatively small for those convicted.

Current public policy proposals emphasize decriminalization. Suppose, however, that marijuana were treated like any other product and were to be sold at retail cigarette value rather than in bulk. At current prices, a marijuana cigarette costs about $1.50 to produce, and sells for around $8.60. Since the consumer currently is willing to pay $8.60, imagine a tax on marijuana cigarettes equal to the difference between the local production cost and the street price. This would transfer the revenue from the current producers and middlemen, many of whom are associated with organized crime, to the government. Crudely, government would have revenue of about $7 per cigarette. Using conservative assumptions about Canadian consumption, this comes to revenue of over $2 billion, and should marijuana be taxed on the same basis for export (leaving aside obvious problems of international diplomacy with the United States), additional revenue could be generated. Further, policing assets currently involved in enforcing marijuana-related statutes could be deployed elsewhere.

What the analysis reveals is how widespread marijuana use is in Canada and how extensive production is in British Columbia. As a consequence, the broader social question becomes less about whether we approve or disapprove of local production, but rather who shall enjoy the spoils. As it stands now, growers and distributors pay some of the costs and reap all of the benefits of the multi-billion dollar marijuana industry, while the non- marijuana-smoking taxpayer sees only costs.

Marijuana Growth in British Columbia

The cultivation and production of marijuana in British Columbia highlights the problems inherent in the enforcement of laws that are generally ignored by broad sectors of the populace.[1] Some 7.5 percent of all Canadians report they use marijuana currently (or at least have done so during the past year). Of those aged 15 years and older, about 23 percent of the Canadian population report that they have used marijuana at least once in their life.[2] By province there are variations in recent marijuana use with British Columbia the highest at 11 percent, and Newfoundland and Ontario the lowest at 3.8 percent and 5.1 percent respectively. There is variation in use by age and sex, with younger people more likely to have used the drug than older people[3] with males using at twice the rate of females.

This paper raises several issues that have the cumulative effect of suggesting that in the long term, the prohibition of marijuana cannot be sustained with the present technology of production and enforcement. To anyone with even a passing acquaintance with modern history, it is apparent that we are reliving the experience of alcohol prohibition of the early years of the last century.[4] In that sorry episode, on both sides of the Canada-US border the widespread demand for prohibited alcohol led to the rapid growth of criminal enterprises that expanded to produce the product that the general population desired.[5] As a testament to the enduring significance of the period, recall that even today we cheer for Eliot Ness as he smashes the alcohol making stills of organized crime in endless television reruns of *The Untouchables*. Ironically, we may now sip a cocktail as we do so.

In Canada, and more specifically in British Columbia today, as with alcohol nearly a century ago, marijuana is too easily produced and exported to be controlled with the tools available to law enforcement in a free society. The return on investment is sufficiently great that for each marijuana growing operation demolished, another will take its place.

---

1 I am indebted to several people who have read, commented, and offered insight about drafts this paper. Jason Clemens, Herbert Grubel, David Easton, Malcolm Easton, Kash Heed, Fred McMahon, Robert A. Jones, Niels Veldhuis, and Michael Walker each offered valuable insights but are not responsible for the content. Liv Fredrickson helped with data input as well as advice. Obviously I am responsible for errors.

2 (Single *et al*., 1999.) Contrast these figures with lifetime use of 8.1 percent for cocaine and 10.4 percent for LSD, speed, or heroin. On the legal side, 72 percent of the Canadian population has used alcohol in the past year, and 27 percent identify themselves currently as tobacco smokers.

3 Among those 15 to 19 years old, about 25 percent have used in the past year (Single *et al*., table 5.3). Although it is not in the survey data, it may very well be that the younger set—aged 9 and up, should actually be queried as well. Data from grade schools suggest that use of marijuana in the past year in grade 7 is typically around 10 percent or below. The percentage swells to around 30 percent or higher by grade 9 (*New Brunswick Student Drug Use Survey 2002 Highlights Report*; *Nova Scotia Student Drug Use 2002 Highlights Report*; *Prince Edward Island Student Drug Survey 2002 Highlights Report*). Data from other provinces are consistent with these figures.

4 See, for example, Mark Thornton (1991), "Alcohol Prohibition was a Failure," *Cato Policy Analysis* No. 157 (January).

5 See, for example, Warburton (1932, chapter IX) or Thornton.

Although there are a host of important criminological, social, psychological, and economic issues associated with marijuana, this paper is primarily a framework that develops a series of "facts" and characterizations of the marijuana industry in British Columbia that can be revisited, revised, and challenged to make a sensible policy debate possible.[6] The first two sections of the paper organize the discussion using the economist's model of demand and supply with an emphasis on the latter. Subsequent sections include a methodology and estimate of the number of marijuana growing operations ("grow-ops" as they are popularly known) in British Columbia, some discussion of why British Columbia appears to be a significant location for marijuana production, and some thoughts about the transformation of currently illegal returns into tax revenue were marijuana to be made legal.

Canadian Marijuana Consumption

Marijuana consumption is difficult to measure. Although there are plenty of data about marijuana *use* in Canada, very little is quantitatively oriented. To say that someone "uses" once or twice a week is not very specific about the *quantities* they are likely to use. Reuter suggests that a "very heavy user of marijuana consumes about 3 marijuana cigarettes per day" (1996, p. 7).[7] In Australia, usage has been measured in the Australian Institute for Health and Welfare *1998 National Drug Strategy Household Survey*.[8] More Australians appeared to have tried marijuana (39 percent compared to 23 percent of Canadians), and more Australians have used marijuana "recently" (18 percent compared to 7.5 percent in Canada).

The average marijuana cigarette is 0.4 to 1.0 grams in weight (Adams and Martin, 1597). [9]For those who still think in Imperial units, there are about 28.35 grams in an ounce or about 453.6 grams in a pound. There are, of course, 1,000 grams in a kilogram. Consequently, even if marijuana use is measured in number of cigarettes, quantity is still difficult to assess. Loosely, 15 grams of marijuana generates between 15 and 30 cigarettes according to taste. I have found no correction for the strength of the active ingredients

6 I do not discuss the Canadian federal government initiatives to decriminalize small amounts of marijuana. Such a proposal deserves a separate and specific response.

7 On the other hand, asking around locally suggests that this is high for British Columbia leaf. Anecdotally, a heavy user is said to use one cigarette per day.

8 Digital document available at *http://www.aihw.gov.au/publications/health/ndshs98d/*. Although these data have more information about frequency of consumption, quantity must still be imputed.

9 Others find slightly lower values at roughly 0.39 grams per cigarette (W. Rhodes *et al*., 1995, *What America's Users Spend on Illegal Drugs*, 1988-93, Washington, D.C.: Office of National Drug Control Policy, p. 20, cited in Reuter, 1996.) In contrast, commercial cigarettes weigh-in at 0.77 grams, a weight that appears to have stabilized since 1988. Prior to 1988, the weight of a cigarette had fallen from over 1.6 grams in the early 1950s to about 0.77 today (*http://www.ncth.ca/NCTHweb.nsf/0/ac40b01bdef1ff99852569d60063e43b/$FILE/gdb6a-weight.pdf*).

on the "weight" of the cigarette. Some people report that they consume as many as 60 cigarettes per day, but they are obviously exceptional.

Some limits on the size of the *internal* market for marijuana

If roughly 7.4 percent of the Canadian population currently uses marijuana, then with 25 million Canadians aged 15 or over this implies about 1.87 million users. Table 1 puts this consumption into some kind of numerical perspective.[10] The first column identifies the number of users based on estimates of usage described in Single *et al*. (1999, Table 5.1) The second column gives an estimate in metric tons of internal Canadian marijuana consumption. The third column multiplies this by price to illustrate the size of the Canadian (consumption) market. This of course does not include exports. The final column details the expenditure by Canadians on (legal) tobacco for the past few years to illustrate the scale of the internal market.

How large is the industry? Expenditures on illegal marijuana in Canada are roughly the same order of magnitude as those on legal tobacco products. Substantial though these numbers may be, however, they are not the central issue. Even as the Government of Canada apparently plans to reduce the penalty for consumption, most attention focuses on production for which the external market in the United States is simultaneously an economic goldmine and a political landmine. As the evidence will show, it is obvious that much of the British Columbia marijuana crop is grown for export.

Table 1: Estimates of the Internal Canadian Market for Marijuana, 1988-2000

Year	Current users (millions)	Total internal consumption* (thousands of kilograms)	Annual expenditure on marijuana* (billions of dollars)	Annual expenditure on tobacco (billions of dollars)
1988	1.38	111.0	1.4	
1990	1.10	92.1	1.5	
1991	1.11	87.9	1.5	
1992	1.13	92.2	1.6	
1993	0.96	81.1	1.2	
1994	1.71	152.1	2.0	
1995	1.73	154.1	1.7	
1996	1.75	156.1	1.7	
1997	1.78	158.2	1.7	2.5
1998	1.80	160.1	1.9	2.5
1999	1.82	162.0	1.7	2.4
2000	1.84	164.1	1.8	2.3

*Table 1A provides upper and lower estimates.
Sources: See Appendix Table 1A.

10 This table is derived from Appendix table 1A, which details the sources and methods of construction. Table 1 uses the "low" estimates from table 1A.

Producing Marijuana in British Columbia

There is very little hard information about the actual number of marijuana growing operations ("grow-ops") in British Columbia. From the pattern of police enforcement we believe that the numbers have been increasing, but the actual scale of marijuana growing is difficult to know with assurance—for obvious reasons. From 1997 to 2000, Plecas *et al*. report that the number of grow-ops discovered and dismantled, or "busted" in the usual terminology, more than doubled: from 1,251 to 2,808. This issue is addressed below in the section titled "How Many Grow-ops are Out There?"

There are several ways to produce marijuana. I will discuss the outcomes of indoor supply, which is the most relevant to an urban setting and the current data set. Nearly 80 percent of all grow-ops discovered by police are indoor operations, although this reflects policing costs as well as the true distribution of grow-ops. Further, there are likely to be plenty of individual marijuana grow operations of a few plants that are not likely candidates to be busted and are consequently are not included in the statistics. Before turning to the production side of the marijuana industry, however, there is the matter of price that permeates any discussion of the business. The next section develops a characterization of the relationship between price and quantity that is used throughout the rest of the analysis. This is important because evaluating marijuana quantities sold at per pound prices of production may lead to different interpretations of size and significance of the industry than by evaluating marijuana sales at the more expensive "per cigarette" level of consumption.

The price of the product

To give some idea of the value of marijuana (Appendix A discusses the estimates in detail), table 2 uses estimated values computed from cross-Canada data gathered by the RCMP from 1995 to 1999. Aggregating these data and estimating a relationship for British Columbia gives a sense of the values appropriate for different quantities of the drug.[11]

Table 2: Retail Purchase Prices by Quantity of Purchase

Unit in which purchased	Year 2000 Canadian $ unit price	Gram weight of purchase	Price per gram of the purchase
0.5 gram	8.6	0.50	17.16
1 gram	15.3	1.00	15.33
1 ounce	254.5	28.35	8.98
1 pound	2,613.0	453.60	5.76
1 kilogram	5,077.0	1000.00	5.08

The underlying estimation appears as equation 2 in Appendix A.

11 Not all units were actually purchased or reported in the raw data. For example, the kilogram price is an extrapolation of the estimated power function that relates price to quantity. All the other quantities were part of the data set.

The table's first column reports the unit of purchase. The second column reports the average price of the purchase of that unit. The third column indicates the number of grams in the purchase bundle in order to put the purchases into a common unit. The final column reports the implicit price per gram at the different quantities. As is expected, larger quantities are cheaper on a per gram basis.[12]

Growth cycle and "bud" size

Outdoor crops mature once a year. Each indoor crop takes between 6 weeks and 4 months to mature.[13] To err on the side of caution, we will use a period that gives four harvests per year.

At harvest each plant produces one "bud" which is the structure that produces about 100 grams of usable marijuana. This, in turn, yields a dry weight of roughly 33 grams.[14] Although they may not be a representative sample, data from Vancouver police drug busts suggest that in 1998 a bud weighed about 3.3 ounces (100 grams). In 1999 the average bud had increased to 4.3 ounces (122 grams). Most estimates (Plecas *et al*., for example) take 100 grams as the relevant average. This assumption will also be made in what follows.

Potency

One frequently uttered sentiment is that British Columbia grown marijuana is on the stronger end of the spectrum. This may be true, but it is tricky to document systematically. Data collected by the RCMP tend to suggest that the potency, the THC content, has remained roughly constant over the 1995 to 1999 period. Nationally, there was no obvious increase in the measured quality of marijuana acquired by the police from various activities: busts, buys, and the like. Within British Columbia, although the mean THC content has increased over the same period, that increase is not statistically significant.[15] Consequently, although it is possible that there has been an increase in the THC content (if popular reports are to be believed), it remains to be observed systematically, though the raw numbers are not inconsistent with an increase in the late 1990s.

The house

The marijuana producer needs an establishment to house a grow-op. Typically, grow-ops have been found in rented houses. A house typically rents for about $18,000 a year, though there is evidence that increasing the scale of production demands alternatives.[16] Grow-ops arise (in part) because they have a very quick time to market compared to natural marijuana crops that have an annual cycle.[17]

The equipment necessary to run a grow-op includes supplies, lights, fans, seeds, and miscellaneous other materials. For a 100-plant operation,

12 For example, Caulkins (1994) finds a similar relationship for cocaine prices and quantities in the United States.

13 A relatively new phenomenon is that grow-ops are being found with "continuous cycle" harvesting. That is, there is a "circle" of plants with one at each stage in the productions process. Such a model takes more hands-on work, since one task or another has to be performed more frequently, but if the grow-op is busted by competitors, then there is much less market-ready product available. A clear trade-off is being made.

14 In addition, there are often several smaller buds, but I have not seen estimates of how many or how large they are.

15 Based on 2,089 BC observations, the THC (delta-9-tetrahydrocannabinol) content from 1995-1999 was 6.5, 6.9, 6.6, 7.1 and 7.4 percent (Ladds, 1999).

this amounts to about $10,000.[18] The electricity costs about $2,500 per year. Many growers gladly pay for it. Others fear that the hydro company will notice the extensive residential use of electricity and might investigate.[19] Still others simply steal the electricity.

Similarly, the grower cannot set up a generator in the back yard or on a balcony. It will make a conspicuous noise and will alert thieves who would help themselves to the maturing buds, an activity known as "grow-rips." Obviously, there is no public recourse if you, as a grower, are burglarized. Nor can you carry theft insurance for the valuable crop. This may also help to explain the boom in "guard" dogs in some parts of British Columbia's Lower Mainland as well as protection provided by organized crime for selected operations (Howell, 2002).

Ignoring electricity costs, table 3 reports that the total material cost of the operation is about $28,000. Obviously what is missing is the labour cost. At a minimum wage of $8 per hour over a 24-hour day to provide for constant security, the cost of labour could add another $70,000 to expenses. On the one hand, unlike the standard minimum wage paid and received, this is tax "free," and even the most intensively farmed grow-op does not really need 24 hour care all the time. Consequently, this is a *very* high estimate of labour costs, and means that we will tend to understate the profitability of grow-ops. On the other hand, there is always the possibility of violence associated with grow-ops, which adds a premium to the usual market wage. For obvious reasons it is difficult to document labour usage and remuneration patterns systematically.[20]

How much does such an operation produce?

Although most estimates of production are speculative or designed to serve a particular purpose, Plecas *et al*. (p. 35) find that the average number of plants discovered in all marijuana grow-op busts around the province has been on the increase. Across British Columbia from 1997 to 2000 the average number of plants seized rose from 140 to

16 Recent busts reported in Vancouver newspapers suggest that new houses worth $300,000 to $400,000 are being purchased and used for a year or so for such purposes. Large-scale production at greenhouse operations in more rural settings has also been found recently. This suggests that the scale of grow-ops is increasing and is not inconsistent with observations by Plecas *et al*.

17 A quick introduction to marijuana grow operations is available to anyone who wishes to peruse the Internet. The detail and apparent sophistication of the technology is voluminous. The police have provided tips for spotting grow operations: *http://www.city.richmond.bc.ca/emergency/police/grow_operations.htm*. There is information on the types of lights and programs necessary to maximize indoor yield by following the links at sites such as: *http://www.cannabislink.ca*; or *http://www.cannabisnews.com*. Easier yet, try typing something like "marijuana growing" into a search engine.

18 This is typical in the sense that even though the average size is higher than 100 plants per grow-op, most operations still remain small, and the high average is due to some really large and spectacular busts of thousands of plants. There are relatively few of these in the data. As a result, although I call this typical, it is a statement about most likely to be observed rather than mean number of plants. The average number of plants found in grow-ops is rising.

19 Interestingly, there is irritation among some in law enforcement that the electricity supplier is not active in identifying likely grow-ops unless they fail to pay their bills. If they fail to pay, or are found bypassing the meter, then the electricity company expects prompt action by the police since it is a theft in progress.

20 Sharecropping (in which the financer and the grower split the crop) also is known. Some informal reports to the author suggest a 50-50 split is common.

Table 3: A Calculation of Vancouver Grow-ops

Revenue	Numbers	Comment
Number of plants	100	Near both mean and median in 161 busts VPD* busts from 1994-1999
Number of seasons	4	From 6 to 12 weeks
Total number of buds produced during one year	4 x 100 = 400	Each bud is roughly 100 grams
Total weight in kilograms	13.3	(400 x 100) x ⅓ to account for dry weight
Price per pound (bulk)	$2,600	See table 2 (2.2 pounds per kilo)
Annual value of sales	$76,000	This is bulk (rounded)
Costs	**Numbers**	**Comment**
House rent	$18,000	Assumes full year occupancy
Supplies	$4,000	Fans, lights, containers, seeds, etc.
Wages (implicit or explicit)	$2,000	Care and clipping of plants
Electricity**	$2,500	Could be less if operator steals power
Operating Cost	$24,500	($1,500 per pound)
Share to operator	$38,000	50% of final product
Net revenue to investor*	$13,600	50% of revenue less operating cost
Return on a dollar of cost	55%	(All figures rounded)

*Source: Wicksteed (2002) provides data about the size distribution of busts and the cost of supplies. House rents are a casual average from local newspapers. Plecas *et al.* provide estimates of the size of buds.
**Electricity at 0.57 cents per kWh implies an annual cost of $2,500 for lighting this operation. More generally this amounts to roughly $8.50 per plant.

180. There are apparently more operations, and an apparent increase in size of these operations.

A rough calculation of a marijuana grow operation

To get a sense of the numbers for a typical operation, assume a grow-op has 100 plants. This puts it in the “modest size for commercial use” category. Harvest revenue comes from 13.3 kilograms of marijuana sold in pound blocks out the back door at $2,600 per pound.[21] This amounts to slightly more than $19,000 per harvest. Since there are four harvests per year (on the conservative side), gross revenue is about $76,000. Even if costs are about $24,500, and the final sales are split equally with the operator, the net rate of return on invested money is potentially very high. The 100-plant grow-op makes around 55 percent return for a year’s worth of activity using the most conservative assumptions.

But the rate of return is not *really* 55 percent. There is the chance that you will be busted–either by your colleagues on the wrong side of the law, or by the police. If 10 percent of grow operations were busted by police, competitors, or thieves, then the expected annual rate of return is about 40 percent.[22] This is still a fine rate of return if you can get it, but there are clearly risks in the busi-

21 This may be a little high currently, but see table 2. In discussing this figure with British Columbians who claim to know, they suggested that they were not able to get more than $1,900 per pound. This is casual empiricism and serves to alert the reader to the gross uncertainties of any estimates. Consequently, in estimating the number of marijuana grow operations (below), it is appropriate to use a wide range of assumptions.

ness that are not about business. Interestingly, the observation that there are additional risks and our knowledge of the returns to the marijuana grow-op business provide a mechanism for determining the number of marijuana grow-operations. This is discussed in the next section.

How Many Grow-Ops Are Out There?

One of the enduring problems facing anyone interested in the illegal, or "black," or even gray economy, is to derive an estimate of the underlying level of total activity from the sample of those that are detected. There are problems in doing this. A few might be catalogued under some broad headings:

- sample selection—only the unlucky or the least capable are caught;
- varying intensity of effort on the part of the authorities—more police "fishing" means a higher catch, at least initially; and
- an uncertain feel for what the alternatives are facing the agents who are thinking of going into illegal production—can they find a remunerative line of work in the legal sector, or are their alternatives really all about illegal alternatives to, say, marijuana production?[23]

This section proposes one calculation method to infer the number of grow-ops in British Columbia. More generally, it is a technique that could be used in a number of situations both current and historical. Although one may disagree in detail with *every* aspect of the analysis, it also provides a target to classify the underlying variables that may be important to any analysis of uncounted activities.

The approach

The underlying characterization is of the grow-op as a profit maximizing activity in which the value of output less costs, relative to the value of assets, yields the rate of return to assets. For each crop of a grow-op, all costs are fundamentally variable, so that we can write the rate of return as relative to costs.[24]

If the industry is in equilibrium, then the return on capital (or costs) is equated to the rate of return

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22 That is, with only a 90 percent chance of realizing your sales, the expected rate of return becomes: ((0.9 x (½ x $76,000) - 24,500)/24,500).

23 There is still plenty of disagreement about the number of marijuana grow operations in British Columbia. Mark Hume of *The Globe and Mail* of January 12, 2004 reports: "Police estimate 2,000 to 3,000 grow-ops are producing BC bud in Greater Vancouver" (p. A2). On January 31, 2002, however, the *Vancouver Sun*'s Scott Simpson reports that the head of the Vancouver drug squad, Inspector Kash Heed, "could not estimate the number of growing operations in Vancouver, but said the number for the Lower Mainland has been pegged as high as 15,000" (*http://www.mapinc.org/mjcn.htm*). Interestingly, on a different page of the January 12, 2004 *Globe and Mail,* Peter Cheney reports police estimates that there are now 15,000 marijuana grow operations in Ontario (p. A6).

24 The alternative is to assume that the capital is used for a number of crop cycles. This would have the effect of increasing the value of output relative to the asset base. Consequently, this assumption biases the return to growing marijuana downward. The "true" returns on invested capital are likely to be higher.

in other industries or activities on the margin. This is the key observation underlying the estimation of the total number of illegal activities. It is what links the unobserved illegal activity to the known, legal world.

More formally, we write the value of output, PQ (price times quantity) less cost, C, relative to the value of capital, or in this case, cost. This gives a rate of return to investment (cost) in a particular year.

Thus R is a return over costs and looks like:

1. $R = [PQ-C]/C$

The value of output less cost is net income, PQ-C, during the year, and the return over costs is akin to the usual calculation of the rate of return to capital. If we believe that the industry is in equilibrium, about which more will be said later, then the return on capital (or costs) is equated to the rate of return in other industries or activities on the margin. Thus $R = R^*$, where R^* is the market rate of return.

Unlike the market, however, a grow-op includes ingredients of extraordinary risk not captured by legal market entities. Let us add a probability of getting caught[25] in a grow-op and consequently the risk of losing the entire crop. If the probability of getting caught is π, then the harvester has a $(1-\pi)$ probability of being able to sell quantity Q at price P. Compared to a riskless sale, this lowers the return to any given investment.[26]

2. $[(1-\pi)PQ-C]/C = R^*$

The left-hand side tells us that the harvester has a $(1-\pi)$ probability of being able to sell quantity Q at price P. Compared to a legal sale, this lowers the return to any given investment. The investor is assumed to lose the costs, C, whether the crop can be sold or not.

The expected return is equated to the return that the investor can get in any other sector of the economy, R^*. In effect, we assume that the potential investor in the marijuana business is faced with two options: Our potential producer can invest in those activities that are legal and receive a normal rate of return of R^*; or our potential producer can invest in a grow-op that includes an extraordinary risk of crop loss.

A refinement

The market rate of return, R^*, constrains the amount of investment in marijuana grow operations. If more and more people get into the business, eventually it will drive the return below that which could be made in other business activities. This limits the size of the sector. Symmetrically, if the return to marijuana grow-operations is higher than the return in other activities, this leads to more investment going to the marijuana industry, eventually driving the return toward the market average. This basic framework may not fully capture the essential constraints on an illegal activity. Do potential growers of marijuana view the market return on funds as relevant in assessing their alternatives? If one were loaning funds to a grow-op producer, the lender may insist on a risk premium associated with the loan so that the constraint associated with an equilibrium in the

25 In this context, "getting caught" includes being shopped by unscrupulous competitors, as well as having your crops catch fire, or simply be stolen by thieves. A tip apparently led to the discovery of a "massive" hydroponic operation in Barrie, Ontario, in the old Molson brewery—a site in plain view of Highway 400 (*The Globe and Mail*, January 12, 2004, p. A1, A6.) In Vancouver, police speculate that a marijuana grow-operation is invaded each day by competitors.

26 The investor is assumed to lose the costs, C, whether the crop can be sold or not.

marijuana growing business is not the market return, R^*, but a return that is risk-adjusted above those associated with legal investments. As a result, the cost of funds that this group faces carries a risk premium relative to that of legal investments.[27]

This suggests an expression like 3 is relevant to the basic equilibrium:

3. $[(1-\pi)PQ-C]/C=R^*+\pi$

which equates the expected return on the left-hand-side to a higher-than-legal-market return by an amount of the risk, π. Although the risk may not simply be additive, Appendix B derives a form that is consistent with 3.

Calculating the number of grow-ops

How does all this help with a calculation of the number of grow-ops in British Columbia?

We need to assume something about π. We assume that it is the risk of being busted by the police.[28] If we assume that only the police bust grow-ops, then we can develop a measure of the total number of grow-ops in the province.

To see this, recall what we "know" in this context:[29]

- We know the price of the product (see appendix B)
- We know the quantity of product for each operation—or at least we know the average output of those that are busted.
- We know the cost of the operation, although there are a few nagging issues that make this a more speculative calculation than the other data.
- We know the market return on legal enterprises—although this can be argued, the range of variation is likely not to matter much as will become apparent in the calculation.
- Finally, we also have a measure of the number of operations that have been busted around the province.[30]

These data are sufficient to calculate the number of grow-ops. To see this, first consider the variable, π. Since π is the probability of being busted, we can think of π as being the ratio of busts relative to the total, T, the (unknown) number of grow-ops:

4. $\pi=B/T$

27 Note that this is not the same as another experiment: should a person participate in the legal or illegal market? In this case, clearly the decision is based on R^*.

28 It also should include any other risk associated with being illegal rather than legal, e.g., lack of resources for redress of theft, extras security, and the like. Underestimating the risk will underestimate the number of grow-ops.

29 In this context, "know" is speculative under the best of circumstances.

30 This, of course, is police busts. It should also include "busts," or thefts, or any other event that reduces the ability to sell the final product on the left-hand side of the equation. As discussed earlier, some reports have marijuana "rips" at one a day in the Vancouver area alone. Consequently, these calculations that use only police data to estimate the number of marijuana grow operations are very conservative.

Table 4: The Effect of Different Assumptions for Estimating the Number of Grow-Ops in BC

Actual Police Grow-op Busts	Assumed Return to Legal Activities	Assumed Ratio of Value to Cost	Market Return is R*		When the Return is risk Adjusted, R*+ π	
			Implied Total Number of Grow-ops	Implied Probability of being Busted	Implied Total Number of Grow-ops	Implied Probability of being Busted
B	R*	PQ/C	T	π	T	π
2,800	10%	5.0	3,590	0.78	4,308	0.65
		4.5	3,706	0.76	4,529	0.62
		4.0	3,862	0.73	4,828	0.58
		3.5	4,083	0.69	5,250	0.53
		3.0	4,421	0.63	5,895	0.48
		2.5	5,000	0.56	7,000	0.40
		2.0	6,222	0.45	9,333	0.30
		1.9	6,650	0.42	10,150	0.28
		1.8	7,200	0.39	11,200	0.25
		1.7	7,933	0.35	12,600	0.22
		1.6	8,960	0.31	14,560	0.19
		1.5	10,500	0.27	17,500	0.16
		1.4	13,067	0.21	22,400	0.13
		1.3	18,200	0.15	32,200	0.09
		1.2	33,600	0.08	61,600	0.05

Since we know the number of operations that have been busted by the police, B, everything is "known" (however imperfectly) except for T, the total number of grow-ops at risk. That is, we know P, price, Q, quantity and R*, the rate of return on legal economic activity.

Some manipulation gives us the following expression:

5. $\pi = B/T = \{[(PQ/C)-(1+R^*)]/[1+(PQ/C)]\}$

or, finally, an expression for the total number of grow-ops:

6. $T = B. [1+(PQ/C)]/[(PQ/C)-(1+R^*)]$

So what do the numbers look like? To illustrate: Let B = 2,800[31]; let R* = 10%; let (PQ/C) = 5

7. $T = 2{,}800.[(1+5)]/[(5-(1.10)] =$
$2{,}800.[6/(3.9)] = 4{,}308$

Table 4 reports what the theory implies for the number of grow-ops in British Columbia using various assumptions about the ratio of the value of output to costs. From the estimates in table 3, the number of grow-ops would be between 10,500 and 17,500 depending on the approach to risk. In later sections I use the 17,500 figure as I believe it best characterizes conditions in BC.

31 This is the number of "founded" cases in 2000 in all of British Columbia (Plecas *et al.*, 2002, p. 27.)

One point needs reinforcing. These are estimates for the numbers of "bustable" grow-ops. By that I mean that the small operations of a few plants that are for personal use generally are not "busted." The Vancouver Police busted 30 grow-ops with fewer than 50 plants over a period of several years. The average was 117 plants, with a median of 95 plants. The fewest seized in a grow-op bust were 25 plants, and the most seized were over 1,100 plants (Wickstead, 2000a). A reasonable interpretation of the data in the table is that for grow-ops over 25 plants, these are the total number of "bustable" operations implied.[32]

How reasonable are these estimates? If the reader wants a general rule for thinking about this, consider: what fraction of grow-ops is likely to be discovered and busted by the police? Suppose the police are able to bust one-half of all grow-ops. With 2,800 grow-op busts in the year 2000, it means that there were 5,600 grow-ops initially. If the police bust only 10 percent of grow-ops, then we can infer that initially there were 28,000 grow-ops. Although certainly not definitive nor a substitute for analysis, readers should use their "ingenuity guided by experience" to form their own tentative estimate.

Some of the limitations of this calculation

There are a number of limitations inherent in this calculation. First, the number of busts known is not the same as the number of actual busts as seen from the producers. We use known police busts. Clearly, if there are grow-rips by competitors or "colleagues," then the effect is to underestimate the riskiness of the enterprise.[33] Thus, the numbers in the table will underestimate the number of grow-ops. This is because the total number of grow-ops is, by formula, proportional to the number of busts as seen by the growers.

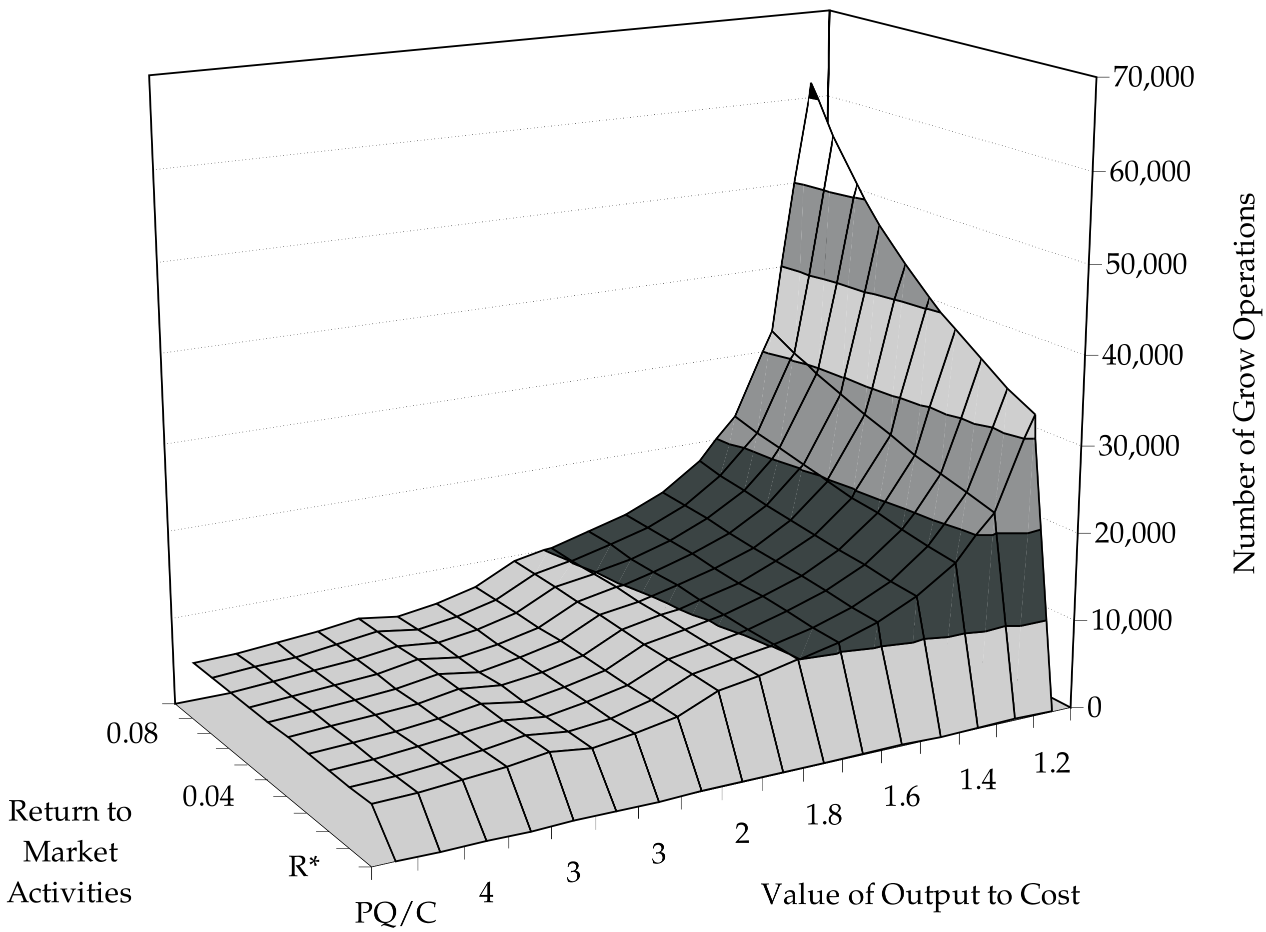
Second, increased enforcement implies increased numbers. Again, this is a consequence of the formula that requires the number of grow-ops to be proportional to the number of busts. The reason that the enforcement "doesn't matter" in the calculation is that the only thing assumed to be important to the producer is the actual number of busts relative to the total that gives rise to the risk. Yet most of us would be concerned that the calculated number of grow-ops should not increase merely with increased enforcement. This is a limitation of the model in the text that must be addressed. The standard way to solve the problem (that is akin to simultaneity in enforcement and production) is discussed below in appendix C, "A Richer Model."

Because of the many uncertainties associated with every ingredient of the formula, we want to look at a wide range of assumptions including different assumed rates of return available on outside investment. Figure 1 displays the patterns associated with a range of values relative to costs and rates of return. The ratio of value of sales to cost, PQ/C, is plotted on the "x"-axis; the measure of "R*", the market return on investment outside the industry (assuming additional risk at-

32 However, Plecas *et al*. report that in province wide data, there is at least one case in which a single plant was seized! For 1997-2000 they report the average number of plants seized increasing from 141 to 180 during the period.

33 According to Plecas *et al*., 2002, table 2.6, about 57 percent of all files being opened for grow-ops comes from Crimestoppers or anonymous tips. These leave plenty of room for competitors as well as offended members of the general public to identify grow-ops. "Grow-rips" as they are known, appear to be increasing. The police are responding to more calls for break-ins that are for the purpose of stealing marijuana, but the thieves have, by mistake, targeted non-marijuana growing houses (O'Brian, 2004; *Vancouver Sun*, Jan. 20, 2004).

Figure 1: Number of Marijuana Grow Operations as a Function of the Value of Output and Rate of Market Return



tached) is plotted on the "y"-axis; and the "Number of Grow-ops" is along the vertical axis. Although not plotted, the value of π, the probability of being busted, like T, is a calculated value.

Estimates of the total number of grow-ops applied to the regions of British Columbia

The most recent characterization of the number of grow-ops in British Columbia is to be found in Plecas *et al.*, 2002. For the year 2000 they suggest a figure of 2,808 incidents of busted grow-ops in British Columbia.

We can see the implications of the model by region if we are willing to go with a particular value of the rate of return and the value of output relative to costs. Table 5 takes model 2 in which the rate of return includes an explicit risk premium, and uses the value 1.5 for the ratio of the value of output relative to costs.

Although interesting, because they indicate the likely scope of the marijuana industry geographically, yearly variations in table 5 are

Table 5: Implied Number of Grow-ops by Region

District	1997	1998	1999	2000
Greater Vancouver	2,975	4,188	5,625	8,394
Fraser Valley	775	1,025	1,394	1,756
Squamish-Lillooet	81	106	106	206
Mainland/Southwest	3,831	5,319	7,125	10,356
Nanaimo	613	725	731	913
Comox-Strathcona	456	563	731	888
Capital	563	450	738	619
Cowichan Valley	275	519	581	406
Sunshine Coast	50	219	213	156
Alberni-Clayoquot	88	113	119	113
Powell River	—	100	94	119
Mount Waddington	38	63	75	56
Vancouver Island/ Coast	2,081	2,750	3,281	3,269
Thompson-Nicola	294	575	519	506
Central Okanagan	238	350	506	519
Northern Okanagan	169	313	294	500
Okanagan-Similkameen	175	231	269	344
Columbia-Shuswap	156	156	206	225
Thompson/Okanagan	1,031	1,625	1,794	2,094
Fraser-Fort George	144	175	269	406
Cariboo	144	181	163	381
Cariboo Overall	288	419	431	788
Central Kootenay	200	281	475	388
Kootenay Boundary	81	238	244	131
East Kootenay	88	125	138	181
Kootenay Overall	369	644	856	700
Kitimat-Stikine	63	75	75	156
Skeena-Queen Charlottes	44	38	31	13
Central Coast	6	—	—	6
North Coast Overall	113	113	106	175
Bulkley-Nechako	81	44	50	119
Stikine (region)	—	6	13	—
Nechako Overall	81	50	63	119
Peace River	25	31	69	44
Northern Rockies	—	6	13	6
Northeast Overall	25	38	81	50
Province Overall	7,819	10,956	13,738	17,550

Assumptions: Ratio of Sales to Costs (PQ/C) = 1.5
The Rate of Return to Enterprise: R* = 10%
π, the Probability of being Busted, is 16%
The Opportunity Cost for the grower is (R*+π)

Table 6: The Export Consequences of Different Estimates of the Number of Grow-Ops

Value of Output to Cost Ratio* PQ/C	Number of Grow-Ops*	Marijuana Production in British Columbia (metric tons)**	Marijuana Exports*** from British Columbia (metric tons)	Retail Bulk Value of Exports**** (Billions of dollars)
5.0	4,308	102	72	0.36
4.5	4,529	108	77	0.39
4.0	4,828	115	84	0.42
3.5	5,250	125	94	0.47
3.0	5,895	140	109	0.55
2.5	7,000	166	136	0.68
2.0	9,333	222	191	0.96
1.9	10,150	241	211	1.05
1.8	11,200	266	236	1.18
1.7	12,600	299	269	1.34
1.6	14,560	346	315	1.58
1.5	17,500	416	385	1.93
1.4	22,400	532	502	2.51
1.3	32,200	765	735	3.67
1.2	61,600	1,464	1,433	7.17

*See table 4 for the basis of the estimates.
**Assume 33.3 grams per plant and 180 plants per grow-op (Plecas *et al.*), and 4 crops per year.
***British Columbia exports are BC production less BC consumption. National consumption from table 1. BC consumption is 13 percent of the national total, adjusted for consumption per user or 30,600 kg.
****Assumed price of $5,000 per kg. (see table 2).

driven entirely by the number of busts in each region. Increased enforcement arising from local conditions are much more likely to have an impact in a region than they are in the overall scheme of things.

Potential British Columbia marijuana exports

Using the estimate of the number of grow-ops from table 4 will also allow an estimate of the total quantity of marijuana grown in British Columbia. Contrasted with the implicit demand of table 1, it gives a rough and ready sense of the level of exports by the industry. In table 6 the first column reports different possible output to cost ratios that are reasonable in assessing the British Columbia marijuana industry. Each of these numbers gives rise to an estimate of the number of grow-ops in the second column. The third column derives the implied quantity of production (measured in metric tons) associated with each of the estimates of the number of grow-ops. Since exports from British Columbia are the quantity of production less the amount absorbed domestically within the province, the estimate of the quantity of exports is generated by using the production figure of column four with the consumption from table 1 adjusted for the size of the province of British Columbia.

The value of exports is measured at an assumed price of $5,000 (Canadian) per kilogram. This is a bulk value since it is purchased and shipped in quantity rather than cigarette by cigarette. Of course the value of the exports at final sale will

Table 7: The Value of Grow-op Marijuana Relative to GDP in British Columbia

	1997	1998	1999	2000
BC's Gross Domestic Product (GDP) (billions of dollars)	114.4	115.6	120.6	130.8
Grow-op Sales as a Percentage of BC GDP	1.1%	1.6%	2.4%	2.8%

depend upon the prices in the US and will be substantially greater.

A reasonable supposition, given that British Columbia absorbs slightly more than its 13 percent of Canada's population, is that British Columbia's consumption is roughly between 21 and 54 metric tons (from table 1). The quantity of output is vastly greater: between 100 and 1,460 metric tons.[34] It is reasonable to conclude that most of the British Columbia crop is exported to the United States or in some measure to the rest of Canada. The estimate that appears to me to be the most reasonable (albeit tentative) generates exports of nearly $2 billion in year 2000.

The size of the British Columbia marijuana industry

To put this into some kind of perspective, table 7 measures the value of production of marijuana from grow-ops at between 1 percent and 2.8 percent of British Columbia's Gross Domestic Product (GDP) that was roughly $130 billion in 2000.[35] However useful this is insofar as it scales the cost of domestic production by comparing the wholesale value of BC's marijuana crop to GDP, the ratio is inflated since we are using final sales and not the value-added of the marijuana grow industry.[36]

To measure the value of the marijuana crop at final sale prices properly, we need to use the prices associated with the quantities that are sold on the retail market: the gram, ounce, pound, kilo etc., amounts since prices per unit vary by quantity. Similarly, prices vary by region and by type of product. Using a statistical analysis of price per gram as a function of quantity sold, region, urban-rural, and other variables, we can construct a retail price model for sales. If we were to assume that marijuana were sold by the pound, then in British Columbia in the year 2000, the retail price is about $2,600 in urban British Columbia. If we were to assume that marijuana was sold by the ounce, then it would be worth about $4,100 per pound on average. By the cigarette, a pound would sell for $7,800.

34 That is, with 7,000 to 17,500 grow-ops each producing about 13.3 kilograms annually, the total harvest is between 168 and 420 metric tons. Specifically, 33.3 grams per plant x 180 plants x 4 crops per year = 24 kilograms per year per grow-op.

35 Sales to the general public are assumed to be in the ounce range. In any case, table 2 permits the reader to calculate his or her own valuation.

36 Since GDP measures value added rather than final sales, the size of the marijuana industry appears too large relative to other industries. Rather than try to "guild the bud" by further refinements of the value added of the marijuana grow operations, the comparisons should be taken for what they are: an effort to get some sense of the overall scale of economic activity in the marijuana industry in BC. Obviously we can construct a value-added measure consistent with our representative grow-op of table 2, but this is placing a great deal of weight on a rather speculative calculation.

Table 8: The Value* of the BC Marijuana Harvest by Region Measured at "per Cigarette" Values (in millions of dollars)

District	1997	1998	1999	2000
Greater Vancouver	950	1,328	2,319	3,422
Mainland/Southwest	1,224	1,687	2,937	4,222
Vancouver Island/Coast	665	872	1,353	1,333
Thompson/Okanagan	329	515	740	854
Provincial Total	2,497	3,474	5,664	7,156

***The assumptions underlying quantities for this table are the same as those for table 5.**

So what are the bounds to a measure of retail value of sales? To answer this we need a measure of the price of what is sold. Significantly, the unit in which the marijuana is sold is an important consideration. From our estimates in table 2 and the supporting discussion in appendix A, we know the relationship between price per gram and quantities sold—be it a fraction of a gram, or by the kilo, and various quantities in between.

To carry this to the extreme, suppose that the British Columbia producers' crop was to be valued at the per cigarette street cost: the smallest and most expensive retail unit. Table 8 gives a sense of the values.

Table 8 reflects the retail value of the product from each of British Columbia's regions. The producers do not, of course, receive these amounts. Like many agricultural products, the "middle-man" receives much of the difference between the final sale price and the original producer. Transportation, packaging, marketing, and risk of confiscation by various competitors and law enforcement are all part of the difference.

Although the values do not reflect the actual receipts by the growers in each region, the numbers do reflect an estimate of the contribution to ultimate street sales made by each region should the final product be sold at British Columbia retail prices in British Columbia. Estimating the "true" street value of the actual product would necessitate knowing exactly where final consumption took place: both at home and in the United States.[37]

Although many underground activities have consequences for society ranging from alcohol prohibition of the 1920s to drug prohibitions today, economists have had a difficult time in describing the extent of production. The British Columbia marijuana industry is a good place to begin to study this problem. While decentralized, the characteristics of the grow-ops are relatively well known, and there is a considerable volume of product, much of which heads to the US.

37 There is a substantial marijuana trade with the US.

Why Does it Happen in British Columbia?

Although current federal initiatives to decriminalize the possession of small quantities of marijuana may change the traditional location of marijuana production, one of the enduring, frequently-asked questions is why it is that marijuana cultivation and consumption have traditionally taken place more openly in BC than elsewhere in Canada. Is it British Columbia's *indoor* climate? What is different on the Coast?[38]

Although there is no simple answer to such a question, several statistical observations may bear on the issue. One outstanding statistic is that possession incidents are not "cleared by charge" as frequently in British Columbia as they are in Canada's other provinces.[39] Although there are differences between BC and the rest of Canada for charges with respect to other drugs, the difference is greatest with respect to marijuana. Second, a look at the pattern of arrests and penalties facing marijuana growers in Vancouver also gives a sense of the consequences for (some) marijuana growers.

Table 9 reports drug incidents and charges for 2001. Only 13 percent of possession offences in BC are cleared by charge. Elsewhere in Canada over 60 percent of possession offences are cleared by charge. Even though BC has nearly twice as many offences relative to population as the rest of Canada, clearing by charge is one-fifth of that elsewhere in Canada. The reasons for such a pattern may depend upon the courts, the prosecutors, or the police, but it is surely indicative of a difference in perspective at some level in the enforcement of the law.[40]

Is clearing by charge the relevant data for explaining the size of the British Columbia marijuana industry? Are fines lower here than elsewhere? Probably not, but why this industry has been so successful in British Columbia and less so elsewhere remains a topic of serious interest. In that spirit, the next section considers the effect of being caught ("busted") in a marijuana grow-operation. Although I do not have comparative data on those caught for growing marijuana elsewhere in Canada, the kinds of punishments in British Columbia are consistent with a marginal level of deterrence.

What happens to marijuana growers?

Local conditions in British Columbia obviously play a role in the production of marijuana. If British Columbians really are producing the massive quantities of the drug that I have suggested, is-

38 Recent high-profile police busts in Ontario and Quebec make it clear that marijuana growing is no longer unique to British Columbia.

39 Actually, BC is far less likely to clear offences by charge than the rest of Canada for almost any drug possession offence. "Clearing by charge" means that a file is sent to Crown prosecutors for action on a criminal charge. Files can be closed in other ways if, for example, the person the police believe committed the crime has died or is being charged with a more serious offence on another charge.

40 The observation that BC does not often charge for marijuana possession (nor, for that matter, other drug possession), and yet the province has a particularly potent marijuana crop is a puzzle. Theory would suggest that if enforcement is very enthusiastic, then the crops would be small and of high potency. A less strict criminal enforcement environment would be expected to produce crops that are less strong and less intensively cultivated. BC appears to be the opposite.

Table 9: Drug Crimes and Drug Charges in Canada and British Columbia, 2001

Incidents Known to the Police	Actual Number in Canada	Actual Number in BC	BC as a Share of Canada	Incidents Cleared by Charge in BC	Incidents Cleared by Charge in Canada Net of BC
Heroin—Possession	504	367	73%	**37%**	**80%**
Trafficking	403	258	64%	74%	86%
Importation	58	13	22%	23%	22%
Heroin—Total	965	638	66%	51%	75%
Cocaine—Possession	5,478	1,744	32%	**38%**	**82%**
Trafficking	6,265	1,876	30%	70%	81%
Importation	490	53	11%	28%	36%
Cocaine—Total	12,233	3,673	30%	54%	79%
Other Drugs—Possession	3,982	675	17%	**25%**	**59%**
Trafficking	2,472	329	13%	43%	76%
Importation	1,302	231	18%	17%	14%
Other Drugs—Total	7,756	1,235	16%	28%	57%
Cannabis— Possession	49,639	11,757	24%	**13%**	**62%**
Trafficking	11,124	2,098	19%	62%	73%
Importation	739	203	27%	4%	21%
Cultivation	9,122	3,477	38%	27%	37%
Cannabis—Total	70,624	17,535	25%	22%	61%

Note: 2001 population: CANADA: 31,081,887; BC: 4,095,934. BC's population is 13% of Canada's.
Sources: Statistics Canada, *Canadian Crime Statistics 2001*, cat. no. 85-205 XIE, pp. 17 and 37.

sues of local law enforcement are clearly part of the cost of doing business. This section explores some of the consequences from fragmentary data arising from charges and convictions when grow-operation busts take place. Although the discussion is entirely in the context of Vancouver data, since Vancouver is an important source of British Columbia marijuana it is clearly a significant environment. The first subsection looks at the consequences for being caught by the Vancouver police in a marijuana grow-operation over the 1996-1999 period.[41] A second subsection characterizes those who are caught to see whether the punishments meted out give any hint about their effectiveness in deterring illegal marijuana grow operations. There are obviously many other important questions to be answered, such as connections with organized crime, and the financing and money laundering and trading for other illegal drugs, but the data are not able inform us on these issues.

Sentencing those found guilty

Table 10 details the outcomes for those who were sentenced after being convicted of offences associated with the busting of marijuana grow-ops in Vancouver. The first column indicates the num-

41 The raw data for this section relies on Wickstead, "Who Wants to be a Millionaire?" It relates to Vancouver between 1996 and 1999.

ber of days of the sentence. The second column gives the percentage of all those convicted (for whom we have relevant data, as some were still awaiting sentencing), and the third column reports the cumulative percentage of those sentenced, up to and including the number of days indicated.

Most who were charged and convicted received no jail time. In table 10, the first row indicates that 55 percent of convictions received zero days' jail time. Five percent of those convicted received a single day in jail. Another 8 percent received sentences between 1 day and 31 days, and still another 8 percent received 60 days. Some 11 percent were sentenced to 90 days. Sentences for the remaining 11 percent were spread out from 120 days to 540 days.

A number of ingredients go into sentencing. For the data available, the number of prior convictions (of any type) and the size of the operation in which the convicted person was caught appear to be positively associated with the length of the sentence, although it is clear that much more than those factors must influence sentencing.

Statistical analysis reveals that an additional prior conviction will increase the length of the sentence by on average, a little over three and one-half days.[42] Similarly, the value of the grow-operation affects sentencing. A $100,000 increase in the imputed value of the grow-op tends to add over 16 days to sentencing. However, what is equally interesting is that these two variables—prior convictions and the value of the operation—account for only about 16 percent of the explanation of the length of sentence. "Other factors" explain the length of sentences associated with marijuana grow-op busts. Whether this has to do with the judge in whose court the case is heard, the prosecutor who works the case, the defense counsel who defends, or specific details of the case not captured by our data, clearly more research has to be done to reach an understanding of the reasons for the observed durations of sentences.

Table 10: Sentenced Jail Time for Those Convicted in Marijuana Grow-Operations

Days	Percent Sentenced	Cumulative Percent
0	55.3	55.3
1	4.4	59.6
30-46	7.9	67.5
60-61	7.9	75.4
90	11.4	86.8
120	1.8	88.6
150	0.9	89.5
180	6.1	95.6
240	0.9	96.5
270	0.9	97.4
540	2.6	100.0
Total	100.0	100.0

Note: 114 observations.
Source: Wickstead, 2000a.

As might be expected, cultivation and drug trafficking were the majority of offences for which there were convictions. Table 11 indicates the range of days for those convicted of cultivation. One half, 50 percent, received no jail time. Two received 540 days. All but a handful received 90 days or fewer as a sentence. Of course not all these days are actually spent in jail since after one-sixth of a sentence, roughly, a convicted person is eligible for parole, and days in jail before conviction count for two days served after conviction.

42 See appendix E for the statistical details of the analysis.

Table 11: Days Sentenced for Cultivation Offence

Days of Sentence	Percent	Cumulative Percent
0	50.0	50.0
1	6.0	56.0
30-59	8.4	64.3
60-61	9.5	73.8
90	13.1	86.9
120	2.4	89.3
150	1.2	90.5
180	6.0	96.4
240	1.2	97.6
540	2.4	100.0
Total	100.0	100.0

Note: 84 observations.
Source: Wickstead, 2000a.

Outside of the loss of your equipment and product, how important are the personal costs for having been convicted in a marijuana grow operation dismantled by the Vancouver Police Department? Who are some of the people who are growing marijuana and are they deterred from returning to the business? To explore this issue we can look at some of the current producers' past run-ins with the law. What do their criminal records reveal?

Time between convictions

Although charges are not the same as convictions, past convictions and current charges provide their own feel for the drumbeat of suspect economic activity in the marijuana trade. Figure 2 plots the histogram of the days between charges for those apprehended in current grow-ops. Prior charges were varied, although many relate to marijuana.

The distribution in figure 2 (reported in the legend) shows that the average time between convicted offences is about 14 months. In the figure, the horizontal axis shows the number of days between convictions. The vertical axis shows the frequency with which each number of days between charges is observed. The median is 11 months (328 days). This means that as many are charged in under 11 months as after 11 months. So among those with more than a single arrest, if charges are leveled this frequently, it is reasonable to suggest that whatever it is that many of these people are doing, they are continuing to do it![43] From the point of view of an ongoing business, court time, or a charge, are simply part of the costs of doing business.

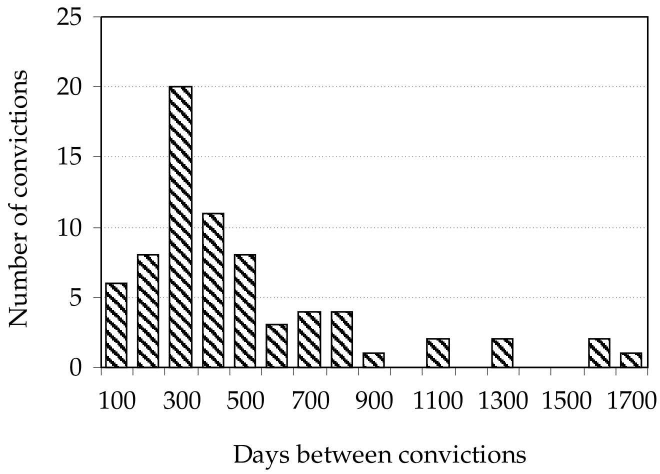
This sense is heightened by the data in table 12 that reports the outcome of all the charges for which data are available about those who were charged in the Vancouver police busts, many who have had multiple incidents in the past.

The first column of table 12 reports the number and proportion of all those who are currently charged with running a grow-op (or who face other charges arising from the arrest) and who have been convicted in the past. Of those now charged, about 70 percent were convicted and only 3 percent acquitted. Twenty-two percent had charges stayed with four percent discharged or dismissed.

Among the 670 convictions, there were 237 fines imposed (a little over a third of those convicted.) These fines averaged $1,167. To put this into per-

43 Two observations were excluded as the time between charges was 4,500 and 5,000 days. These were well above any other observations. The data in the text use a cutoff of 2,000 days. The mean for the whole sample, including the two very high observations, was 551 days.

Figure 2: Days Between Convictions



spective, with only 100 plants, we saw about $170,000 per operation in sales. The effective fine is far less important than having to set up all over again in another house. Recall that the equipment costs over $10,000 and that with the bust, the producer lost the last crop, seed, and house lease.[44]

Restitution is theoretically a tool that can be used to undo the damage of the grow-op. Destruction of a house, damage to power connections, and miscellaneous damage to other facilities are all the types of things eligible for restitution. What is the record? Of the 167 cultivation cases, 11 involved restitution. These had a mean of about $3,500. Of the 167 cases, 45 paid fines for which the average $2,550. Only two fines were over $6,500. Compared to the rewards of growing marijuana, these are not substantial amounts.

In summary

Marijuana production in British Columbia is substantial. Based on Vancouver data, a third of those who are caught are repeat offenders while two-thirds are first-time offenders. The penalties for being caught growing marijuana do not appear to be particularly stringent, and repeat offenders appear to average being caught marginally less than once a year. Fines appear to be modest and not sufficient to deter the behaviour. It is difficult to evaluate a policy that induces police to assign resources to catch nearly 3,000 grow operations a year, yet treats offenders to what must be seen as relatively minor punishment. These punishments do not seem to prevent recidivism. As argued in earlier sections, it is too profitable to prevent new people moving into production and to prevent old producers from rebuilding.

Legalization in Canada: Suppose We Tax it Like Other Sins?

What kind of money are we talking about if we try to reduce the crime and punishment associated with marijuana? Although there are many issues associated with the full or even partial legalization of marijuana, one of the most important is how much the demand for marijuana changes when the price changes. Measuring the demand for legal products is hard task, but it is doable, and forms core employment for legions of economists. For marijuana, an illegal product, it is a more difficult job and impossible to do directly.[45] Fortunately, some issues can be ad-

44 In a case I recently observed, the convicted grower asked the judge in all innocence, "Do you want that in cash?" causing all in the courtroom to shake their heads.

Table 12: The Result of Past Charges of those Currently Charged in Busts of Grow-ops

	Convicted	Stayed	Acquitted	Discharged	Dismissed	Fines
Number	670	212	26	21	23	237
Percent of charged	**0.70**	0.22	**0.03**	0.02	0.02	
Percent of convicted						35
Average fine of those fined						$1,167

Source: Wickstead, 2000a.

dressed without detailed knowledge of the elasticity of demand.

Crude estimates in a revenue "switching" regime

Based on the grow-op data, for an investor we have assumed relatively high costs of around $62,600 to produce, conservatively, 400 plants per year. That works out to $156 per plant, and a plant produces 33.3 grams for a production cost of $4.70 per gram.[46] A gram makes anywhere from one to three cigarettes. So today, *with the substance illegal*, we are looking at a per-cigarette wholesale price of $1.60 to $4.70 as opposed to the current "retail" price of $8.60 per half gram.[47] This is still more expensive than tobacco, but then the tobacco industry has had a head start on mass production techniques, and by including very expensive labour costs, these are extreme assumptions about the production costs of marijuana.[48]

What about tax revenue? If we substitute a tax on marijuana cigarettes equal to the difference between the local production cost and the street price that people currently pay—that is, transfer the revenue from the current producers and marketers (many of whom work with organized crime) to the government, leaving all other marketing and transportation issues aside we would have revenue of (say) $7 per cigarette. If you could collect on every cigarette and ignore transportation, marketing, and advertising costs, this comes to over $2 billion on Canadian sales[49] and substantially more from an export tax, and you forego the costs of enforcement and deploy your policing assets elsewhere.[50]

Notice that we have merely substituted government taxation for the premium on illegality. We

45 Appendix F reviews some approaches to an estimate of the demand for marijuana.

46 To make the point that these "estimates" are fraught with uncertainty, I will round the numbers ruthlessly.

47 Contrast this with the current price of tobacco cigarettes that sell for about 24 cents of which 9 cents is production and distribution. Tax makes up the difference.

48 In the long run, the cost of producing both tobacco and field marijuana is likely to be similar since both are weeds amenable to cultivation. A pound of tobacco wholesales for about $3 Canadian a pound (between $1.75 and 2.00 per pound US depending on the grade. See *http://www.ers.usda.gov/ publications/ agoutlook/Jan1999/ao258b.pdf*).

49 That is, from appendix table 1A, year 2000 low weight is 160,000 kg, or 160,000,000 grams. Assume .5 grams per cigarette or 320 million cigarettes. At a cost of approximately $1.60 per cigarette, available revenue (plus transport and marketing that are assumed to be negligible) is 320 million cigarettes x ($8.60 - $1.60) = $2.24 billion.

have not changed anything else. We have kept the price the consumer pays the same, and we have not altered the structure of production. We would still grow marijuana in "flower pots" except now it would be in the open and taxed like any other commodity at the retail level.

Importantly, this approach has the effect of transferring to the government revenue currently received by illegal producers as reward for their cost of production and risk.[51] Unless we wish to continue to transfer these billions from this lucrative endeavor to organized crime, this policy should be considered. Not only would we deprive some very unsavory groups of a profound source of easy money, but also resources currently spent on marijuana enforcement would be available for other activities.

Advanced production techniques

If we were to assume that the wholesale price of marijuana would fall if it were legalized, since it would become cheaper to produce with proper mass production techniques—remember the difference between gin produced in hidden stills during Prohibition and modern distilleries—then both the cost and retail prices would most certainly fall. If we assume that the elasticity of demand is 0.6—a common estimate for tobacco and alcohol demand (see appendix F)—at the current price, then dropping the price from \$8.60 to \$0.10 per cigarette would increase the quantity consumed by nearly 60 percent, but less than in proportion to the fall in price. However, by increasing taxes, the \$8.60 per cigarette retail price can be maintained with an increase in government revenue of another few billion dollars. The simplest taxation arithmetic is basic. The government can transfer revenue from organized crime and other small producers to itself by taxing a legal product to the level consumers have already revealed they are willing to pay. There are questions about how we collect taxes on exports, and what would happen should the US retaliate against our legalization, but the basic argument would be the same: we affect no change in price, we only transfer the revenue from current producers.

As for those current producers who argue for legalization, recall the old proverb, "Be careful what you wish for; your wish may be granted." Many of those who advocate legalization for pecuniary reasons are perhaps thinking primarily of the increase in demand associated with legalization.[52] However, as with the transition from prohibition to legalization of liquor early in the last century, we may note that very few of the "ma and pa" stills are currently in operation. Although there is always room for home and boutique production, large, sophisticated industries would quickly supplant local suppliers of marijuana with a corresponding decrease in costs.

50 Of course marijuana enforcement is only one aspect of drug enforcement and only one aspect of overall enforcement. There are economies of scope and scale that may well make this issue more complicated. Further, since we believe a lot of the product is sold in the US, it is unlikely that Canada would be able to collect much of this revenue.

51 In a wild flight of fancy, the government could even choose not to tax, but current policy obviously emphasizes taxes on "sin," and in this, marijuana is no different than tobacco, alcohol, and gambling, and no doubt would be taxed accordingly.

52 The current Canadian proposal to decriminalize up to 15 grams of marijuana possession is an interesting exercise. It has the potential to increase demand without legalizing supply. If prices rise at all, it is likely that they will rise in the short run. In all probability, the supply response will be sufficiently great to keep the price stable in the medium and long term. Higher prices in the short run will only reward current producers—including organized crime. I hope these are merely unintended consequences of an inadequately thought out policy shift.

Conclusion

Marijuana is grown all over the world. In British Columbia (as in other provinces, notably Quebec and Ontario), it is a significant crop that fuels organized crime. Marijuana production appears to have been growing robustly during the past decade. Like many illegal products and services, it is difficult to measure the level of marijuana production. This is particularly the case when it is cheap to set up a grow operation and the market is substantial. In this paper I have reported a methodology for estimating the output of illegal production. Using estimates of marijuana growing in British Columbia based on this methodology, I have developed an estimate about the overall size of the local market and the implied level of exports.

The analysis reveals how widespread is the use of marijuana in Canada and how extensively it is produced in British Columbia. Consequently, the broader social question becomes less whether or not we approve or disapprove of local production, but rather who shall enjoy the spoils. As it stands now, growers and distributors pay some of the costs and reap all of the benefits of the multi-billion dollar marijuana industry while the non-marijuana-smoking taxpayer sees only costs. Alcohol prohibition in the US expanded organized crime in North America. Removing alcohol prohibition generated many problems, but none like those afflicting society in the days of Al Capone and his ilk. Removing the prohibition on marijuana production would permit society to replace today's gift of revenue to organized crime with (at the very least) an additional source of revenue for government coffers.

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Appendices

Appendix Table 1A

Table 1A puts Canadian marijuana consumption into some kind of numerical perspective that is commensurate with the degree of uncertainty associated with it. Row 1 identifies the number of users based on estimates of usage described in Single *et al.* (1999, table 5.1). User numbers are imputed (using rates of change from Rhodes *et al.*) for years not sampled. Row 2 gives the actual surveyed percentage of Canadians over the age of 15 who are users. Row 3 assumes per-user consumption of marijuana cigarettes (based on US data.) Rows 4 and 5 use two estimates for the size of

Table 1A: Estimates of the Internal Canadian Market for Marijuana, 1988-2000

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1. Millions of Current Users in Canada[a]	1.38	1.41	1.10	1.11	1.13	0.96	1.71	1.73	1.75	1.78	1.80	1.82	1.84
2. Actual surveyed users as a % of the population 15 or older*		6.5	5.0			4.2	7.4				,		
3. Number of cigarettes used per month**	16.9	17.3	17.6	16.6	17.2	17.8	18.7	18.7	18.7	18.7	18.7	18.7	18.7
Weight of one cigarette													
4. Low (grams)***	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
5. High (grams)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Implied Average Annual Marijuana Consumption per user (grams):													
6. Low weight estimate	77.0	79.5	82.0	76.2	78.4	82.4	86.5	86.5	86.5	86.5	86.5	86.5	86.5
7. High weight estimate	202.8	207.6	211.2	199.2	206.4	213.6	224.4	224.4	224.4	224.4	224.4	224.4	224.4
8. Price per ounce (in year 2000 $C)****	370.3	377.6	476.1	474.0	482.3	418.0	382.7	321.5	303.9	308.1	331.9	303.9	303.9
9. Price per gram $C	13.0	13.3	16.8	16.7	17.0	14.7	13.5	11.3	10.7	10.8	11.7	10.7	10.7
Total Canadian Internal Consumption (in thousands of kgs—metric tons)													
10. Low weight average	106.3	111.7	90.1	84.8	88.2	78.8	147.7	149.7	151.6	153.7	155.5	157.4	159.4
11. High weight average	279.8	291.9	232.0	221.5	232.3	204.3	383.2	388.2	393.2	398.6	403.3	408.2	413.4
Total Canadian Internal Consumption Annual Expenditure (in billions of dollars)													
12. Low weight average	1.4	1.5	1.5	1.5	1.6	1.2	2.0	1.7	1.7	1.7	1.9	1.7	1.8
13. High weight average	3.6	3.9	3.9	3.7	3.9	3.0	5.2	4.4	4.2	4.3	4.7	4.4	4.4
14. Amount Canadians Spend on Tobacco										2.5	2.5	2.4	2.3

Notes: All figures are in 2000 Canadian dollars.
[a]Data from surveys reported by Single (1999) interpolated with rates of growth of US use reported in Rhodes *et al*. (2000)
*Single (1999).
** US data (Rhodes *et al*.)
***US data (Rhodes *et al*.) converted from ounces to grams.
****Author's calculation using Canada-wide data for 1998-2001 and US data to track relative price movement. See the section below on pricing marijuana in Canada. Rhodes *et al.* use ⅓ ounce as a purchase unit. This accounts for the difference between the prices in rows 8 and 9 and those of table 2 in the text. All are derived from the pricing formula of appendix A.

each marijuana cigarette. These are reasonable low and high values. The price estimates are developed (Appendix A) and are adjusted by an available US price series for marijuana to account for relative price movements.[53] The next two rows refer to the high and low estimates of metric tons of internal Canadian marijuana consumption. The final rows multiply this by price to illustrate the size of the Canadian (consumption) market. Of course this does not include exports.

The final rows of table 1A indicate that the bounds on Canadian domestic consumption of marijuana bracket substantial differences. Appropriate interpretation of such uncertainty is that we need to know more about the true quantitative measures of consumption to understand how much of the crop is used locally and how much is exported. How large is the industry? To illustrate the internal market, the final row of table 1 lists Canadian expenditures on legal tobacco. Notice that the value of legal tobacco expenditures lies roughly in the middle of the two estimates of the value of Canadian consumed marijuana.

Appendix A: Pricing Marijuana in British Columbia and Canada

What prices are used to evaluate the quantities of marijuana sold? This is an interesting question that has been explored in the context of gram quantities of heroin and cocaine as distinct from pound or kilogram quantities. Using gram prices leads to a higher evaluation of the amount of a drug than using the bulk quantity value. If there is a systematic relationship between them, then it is less important since one or the other form of pricing may be relevant to a particular problem, but one can go either forward or backward to generate the price relevant to the question being asked, and with knowledge about quantities sold, an average price can be generated.

Locally, Plecas *et al.* suggest:

> Current estimates of the average wholesale market value of a kilogram of dry local marijuana in British Columbia, sold in large quantities of a kilogram or more, vary from $3,500 to $7,500 per kilogram. Estimates of the retail value of a kilogram of dry local marijuana in British Columbia, sold by the pound or by the ounce, vary between $3,500 and $9,000 per kilogram. One can reasonably assume that the average market price in British Columbia during the period [1997-2000] considered was probably somewhere between $5,000 and $7,000 per kilogram. (p. 37)

Caulkins (1994) considers the problem of quantity discounts in the following way. Let P(x) be the market price of x grams (note this is *not the price per gram of x grams sold* but the price of x grams sold). If f(x) is the distribution of retail sales – the frequency with which each gram quantity x is sold, then the total amount paid is $\int P(x)f(x)dx$ and the total quantity purchased is $\int xf(x)dx$. The average price paid for the total consumption of marijuana is then

$$1. \qquad \overline{P} = \frac{\int P(x)f(x)dx}{\int xf(x)dx}.$$

To know the value of final sales of the total amount sold, multiply $\overline{P}$ by total quantity sold.

53 All prices, however, are in 2002 Canadian dollars.

While this formula is undoubtedly correct, we do not have good information about the true distribution of quantities sold, f(x). Further, we need to assume something about the relationship between price and quantity sold. What is assumed is that $P(x) = ax$ in which the power reflects the quantity discount. If $\beta = 1$, then price is proportional to quantity. If $\beta < 1$, then there are quantity discounts and the price per gram is falling with increasing quantities. How fast it falls depends on β.

In general, if P(1) is the price of one gram, then $P(1) = \alpha$, and $P(x) = P(1)x^{\beta}$ so that increases in price are relative to the gram price.[54]

To understand marijuana pricing in British Columbia we have the RCMP data from 1995-1999.

The relevant approach is to estimate the relationship $\ln(P) = \alpha+\beta\ln(Q)$ where price is the price per unit for the chosen quantity and the term "LN" refers to the natural logarithm. For example, based on the data available we find the equation for table 2 in the text:

2. $$LN(P) = \underset{(31.31)}{2.73} + \underset{(39.3)}{0.84}*LN(Q)$$

$R^2 = 0.95$

$N = 86$

In comparison, Caulkins (1994) finds that $\beta = 0.80$ for heroin based on the US Drug Enforcement Administration's STRIDE data with some 301 observations. I find the similarity between the two estimates striking in light of the different product and location. Taken at face value, it suggests that the cost of the cutting, repackaging, and retailing are adding to cost in a similar way in both disparate data sets.

But there is clearly more to the price than simply a power function of the observed relationship between quantity and price. There are other dimensions to the pricing function for which this literature does not usually control.

Fortunately, the price data come with some additional information attached as to the location of purchases and the type of marijuana purchased. In British Columbia, for example, I find that equation 3 in the table below best characterizes the relationship between price per gram and independent attributes such as weight in which the marijuana is sold, urban or rural, home grown or commercial, and whether or not the crop was grown hydroponically. Also included in this national data set are provincial dummies and whether the purchase was of imported marijuana or not.

In Equation 3, where PPG is the price per gram, WEIGHT is the actual weight sold, CITY is a dummy variable for urban or rural; HG refers to home grown (as distinct from "commercial"); HYDRO refers to hydroponically grown.[55] There are also a series of dummy variables for provinces. The regression suggests that there is, for example, a 1.7 percent increase in the price per gram for a 10 percent increase in the quantity unit sold. The data also suggest that there is a discount on home-grown marijuana and a premium for hydroponic marijuana. Similarly, marijuana sold in the city is cheaper than that sold in rural areas.

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54 That is $d\ln[p(x)/p(1)] = \beta.d\ln(x)$ so that β is the percentage increase in price with respect to a percentage increase in quantity. A value of $\beta < 1$ means that when quantity purchased increases by 10 percent, the price increases by less than 10 percent.

55 The form of this equation is similar to that of 2 except that we are looking at price per gram on the left hand side. The coefficient on the natural logarithm of weight is consequently β-1 which implies that a point estimate of $\beta = 0.83$.

Equation 3—Full

Dependent Variable: LOG(PPG)

Price per gram of marijuana

Included observations: 86

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LN(WEIGHT)	-0.2	0.0	-9.3	6.9E-14
CITY	-0.33	0.14	-2.38	0.02
HG	-0.59	0.25	-2.40	0.02
HYDRO	0.36	0.14	2.59	0.01
IMPTD	0.10	0.18	0.52	0.60
ALTA	0.06	0.20	0.31	0.76
SAS	0.16	0.16	0.98	0.33
MAN	0.26	0.20	1.30	0.20
ONT	0.12	0.16	0.76	0.45
QUE	0.21	0.25	0.82	0.41
NUN	1.1	0.2	5.8	1.E-07
NWT	0.53	0.25	2.12	0.04
NS	0.49	0.18	2.67	0.01
C	2.6	0.1	29.	3.3E-41
R-squared	0.66	Mean dependent var		2.25
Adjusted R-squared	0.60	S.D. dependent var		0.64
S.E. of regression	0.41	Akaike info criterion		1.18
Sum squared resid	11.9	Schwarz criterion		1.58
Log likelihood	-36.9	F-statistic		10.9
Durbin-Watson stat	1.33	Prob(F-statistic)		2.4E-12

The variable IMPTD refers to whether the product was imported or local. Among the provincial dummies, British Columbia is the home province and consequently does not appear on the list. The provincial dummies are self-explanatory. Other than British Columbia, those that do not appear were excluded because of problems with a small number of observations.

The points of interest in the provincial dummies is that there is a substantial increase in price associated, not surprisingly, with Nunavut and the Northwest Territories, and a premium for Nova Scotia. The rest of the provinces have prices not distinguishable from those in British Columbia. Overall, about 60 percent of the price variance is explained, and of that, about 50 percent is explained without provincial dummies.

Appendix B: Risk and the Alternatives

Suppose that an investor has a bond that pays $1 per year in perpetuity. The formula relating the price of the $1 per year and the rate at which the future is discounted to the present at the interest rate, r, is:

4. $P_b=(1/r)$.

If we have an investment that is likely to be destroyed in any period at a rate of $(1-\pi)$, then the price of the $1 per year is now:[56]

5. $P_b= (1-\pi)/(r+\pi)$.

Since P_b and the rate of discount are inverses, the discount of the future is:

6. $(1/P_b) = (r+\pi)/(1-\pi)$

The text assumes for analytic simplicity that this is approximated[57] by $(r+\pi)$ and that in turn, this is represented by, $R^*+\pi$: the alternative return available to our grow-op operator. It is an alternative at the same risk as would be found in the grow-op business, which is what puts all legal investments at risk.

Appendix C: A Richer Model Police Enforcement Enthusiasm

The primary problem with the model thus far is that it does not take into account different conditions that affect the number of busts carried out by the police (or for that matter by others who want to rip off grow-ops.)

Grow-op busts as a function of resources spent

To see how this affects the framework developed above, assume that the number of busts, B, is a product of the number of grow-ops, T; the number of police assigned to the "grow-busters," N; the amount of security installed by the grow-ops themselves, S; and other stuff, x. This leads to an expression:

7. $B=\exp(b_0).T^{b_1}N^{b_2}S^{b_3}x^{b_4}$

that can be rewritten in log-linear form as:

8. $\ln(B)=b_0+b_1\ln(T)+b_2\ln(N)+b_3\ln(S)+b_4\ln(x)$.

Since we know that the number of busts is related to the total number of grow-ops as:

9. $$T=B.\left(\frac{1}{1-\left(\frac{C.\left(1+R^*\right)}{P.}\right)}\right)$$

or, for simplicity write as:

10. $T=B.v$

where the expression in equation 9 in large brackets is **v**.[58]

Now take the natural log of both sides of 10 and substitute from 8 so that we have:

56 That is, $P_b=\sum_{t=0}^{\infty}\left(\frac{1-\pi}{1+r}\right)^t-1$

57 Clearly this is a better approximation, the smaller is π.

ln(T) =
$b_0+b_1\ln(T) + b_2\ln(N) + b_3\ln(S) + b_4\ln(x) + \ln(v)$.

This leads to a reduced form for the total number of grow-ops, T*, as:

$$\ln(T^*) = \left(\frac{1}{1-b_1}\right)[(b_0 + b_2\ln(N) + b_3\ln(S) + b_4\ln(x)) + \ln(v)]$$

Without further identification of the coefficients, little can be said. However, if we assume that all except b_3 are positive, and that only a fraction of grow-ops are busted so that $0<b_1<1$, then the number of grow-ops will be greater than those developed by our formula by an amount, proportional to **v** raised to the power $[1/(1-b_1)]$ for given values of the other variables.

Since b_1 is such an important number, we may want to know something about it. It is the scale effect of grow-ops on the number of busts. It is not obvious that it is a large number. Suppose that there was plenty of "space" and an additional grow-op faced no constraints that were different than those that had gone before. Holding everything else constant, the coefficient is the change in the number of busts because of a change in the number of grow-ops. This is likely to be a small number. Unless there is crowding or congestion—as has been alleged in some locales—the change in the number of busts because of an additional grow-op is likely to be small.

Suppose, for example, that $b_1 = 0.01$. That is, an increase of 100 grow-ops increased the likelihood that 1 additional bust would take place. In this case, the estimates in the table would have to be increased as a function of **v** raised to the power $[1/(1-b_1)]$. If v is 5, then the estimate is increased by 1.6 percent. If $b_1 = 0.1$, then the estimates would increase substantially. If the value of b_1 is not too large, it is not likely to impart much of a downward bias to the estimates.

Notice that we can, in fact, estimate a relationship that calculates b_1 in principle. Writing the equation for the number of busts, B, which is at least partially observable, as a reduced form, that is as a function of T*, the equilibrium number of grow-ops, we have an estimating equation:

$$\ln B = \ln T^* - \ln(v)$$

that reduces to the measurable:

$$\ln B = \left(\frac{1}{1-b_1}\right)\big(b_0 + b_2\ln(N) + b_3\ln(S) + b_4\ln(x) + \ln(v)\big) - \ln(v)$$

or,

$$\ln B = \left(\frac{b_0}{1-b_1}\right) + \left(\frac{b_2}{1-b_1}\right)\ln(N) + \left(\frac{b_3}{1-b_1}\right)\ln(S) + \left(\frac{b_4}{1-b_1}\right)\ln(x) + \left(\frac{b_1}{1-b_1}\right)\ln(v)$$

that permits identification of the coefficients and a reduced form estimate of the impact of the different variables on the number of busts.

Since we can know at least the number of police, N, tasked to finding grow-ops, and we have our estimates for v, subject to the vagaries of S and x, we can estimate b_1. A first step in this analysis is in Appendix D below.

58 Note that the value of **v** is likely to lie somewhere between 1.2 and 3 and depends entirely on the cost of production, revenue, and yield on alternative opportunities.

Appendix D: Delay Times and the Number of Grow-Ops

To get an estimate of the delay times we use data from Plecas *et al.* for 32 regions. In the regression we have the log of the time to bust, D, regressed against the log of the number of busts, B. The panel data are based on eight regions and four years of data using a fixed effect model since the regions do not change and may have individual characteristics. The coefficient on D tells us the effect of delay on the number of busts. In this case, a 10 percent increase in the time of delay results in a 1.4 percent decrease in the number of busts. In terms of the model, it suggests that the effect of the number of grow ops measured is affected by the number of grow ops. With more delay, fewer grow-ops are discovered. Although there may be many reasons for this, the subtleties of the model in appendix C are clearly an issue that should be investigated.

Dependent Variable: LOG(B?)

Method: GLS (Cross Section Weights)

Sample: 1997 2000

Included observations: 4

Number of cross-sections used: 8

Total panel (unbalanced) observations: 31

One-step weighting matrix

White Heteroskedasticity-Consistent Standard Errors & Covariance

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(D?)	-0.14	0.017	-8.48	0.0000
YEAR	0.22	0.013	16.7	0.0000
Fixed Effects				
C—C				4.14
K—C				4.44
M—C				6.80
NC—C				2.70
T—C				5.40
V—C				5.95
NE—C				1.86
NK—C				2.28

Weighted Statistics			
R-squared	0.998	Mean dependent var	6.73
Adjusted R-squared	0.997	S.D. dependent var	4.33
S.E. of regression	0.216	Sum squared resid	0.98
F-statistic	12060	Durbin-Watson stat	2.49
Prob(F-statistic)			0.00
Unweighted Statistics			
R-squared	0.988	Mean dependent var.	4.45
Adjusted R-squared	0.98	S.D. dependent var.	1.66
S.E. of regression	0.218	Sum squared resid.	0.996
Durbin-Watson stat.	2.81		

Appendix E

The regression underlies the remarks in the text. It is a regression of sentenced days in jail on prior offences and the value of the grow-op as estimated by the police. The coefficient on PRIORS tells us the effect of a change in the number of prior offences on the length of sentence. On average, an additional prior offence adds about 3.58 days to the sentence. The number of priors runs from 0 to 25 so in the extreme, priors may add 90 days to a sentence. Looking at the coefficient on the value of grow-ops (measured in units of $100,000 as reported by police), an increase of $100,000 implies an increase of about 16 days in sentenced jail time. Since the estimated value of the marijuana grow operations runs between $75,000 and $3.6 million, the effect on sentencing can be substantial. At the extreme, the value can add 540 days to the jail sentence.

Also of interest is the adjusted R^2 that indicates that about 16 percent of the variance of days sentenced can be explained by the two variables in the regression. This is the basis for the remarks in the text suggesting that there is much left to explain: 84 percent, to be precise.

Dependent Variable: SENDAYS

Included observations: 111

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-8.85	15.8	-0.56	0.58
PRIORS	3.58	1.79	1.99	0.05
VALUE/100000	16.2	4.09	3.97	0.00
R-squared	0.17	Mean dependent var		52.1
Adjusted R-squared	0.16	S.D. dependent var		101.
S.E. of regression	93.1	F-statistic		11.2
Log likelihood	-659.	Prob(F-statistic)		0.00

Appendix F: The Demand for Marijuana

Although not used in this analysis, a critical value for many problems with respect to marijuana is the elasticity of demand. The elasticity of demand measures the percentage change in the quantity consumed associated with some percentage change in price. Although conventionally expressed as numbers like 0.5 or 1 or 1.5, elasticities are negative since an increase in price reduces the quantity demanded. An elasticity of 1 implies that a 10 percent fall in price is associated with a 10 percent increase in quantity. An elasticity of less than one means that a fall in price of say, 10 percent, engenders an increase in the quantity consumed of less than 10 percent.

One approach to finding a value for the elasticity of demand for the consumption of marijuana is to use an analogy. We can measure the demand for other addictive substances that are legal and commonly used, such as tobacco, for which the elasticity of demand is about 0.5; and for alcohol, another addictive substance, for which the measured elasticity is between 0.18 and 0.86 in the short run.

Estimates for marijuana use span values between 1.4 and 0.1. However, it is important to recall that these estimates are not of the usual kind. They estimate some form of usage rather than quantity. The fact that you smoke once a month is recorded rather than the quantity of marijuana that you purchase. Survey data suggest a very inelastic demand for marijuana (0.2), while purchase-related data tend to find elasticities around 1.0 (Nisbet and Vakil,1972) although Clements and Daryal (1998) and Daryal (2002) find elasticities between 0.5 and 0.1. Saffer and Chaloupka (1999) estimate an elasticity for marijuana use of 0.28 and 0.44.

About the Author

Stephen T. Easton is a professor of Economics at Simon Fraser University and a Senior Scholar at The Fraser Institute. He received his A.B. from Oberlin College and his Ph.D. from the University of Chicago. Recent works published by The Fraser Institute include *Privatizing Prisons* (editor, 1998), *The Costs of Crime: Who Pays and How Much? 1998 Update* (with Paul Brantingham, 1998), and *Rating Global Economic Freedom* (editor, 1992). He was also co-author of *A Secondary Schools Report Card for British Columbia* (1998), *The 1999 Report Card on British Columbia's Secondary Schools*, *Boys, Girls, and Grades: Academic Gender Balance in British Columbia's Secondary Schools* (1999), and *The 1999 Report Card on Alberta's High Schools*. Other publications about education include "Do We Have a Problem Yet? Women and Men in Higher Education," in David Laidler (ed.), *Renovating the Ivory Tower: Canadian Universities and the Knowledge Economy* (Toronto: C.D. Howe Institute 2002), pages 60–79; "Plus ça change, plus c'est la même chose" in Stephen B. Lawton, Rodney Reed, and Fons van Wieringen, *Restructuring Public Schooling* (Berlin: Springer-Verlag, 1997) and *Education in Canada: An Analysis of Elementary, Secondary and Vocational Schooling* (Vancouver: The Fraser Institute, 1988). His editorials have been carried by the *Vancouver Sun*, the *Globe and Mail*, the *Financial Post*, the *Ottawa Citizen*, the Stirling chain and many other newspapers around the country. Professor Easton continues his work as co-author of the Institute's *Report Cards* on schools in Alberta and British Columbia.

LEDs in spotlight

Much of the research is now focusing on the effect of different colours on crops.

Written by **Dr. Elly Nederhoff**

Lemnis LED lights with water cooling in a large-scale trial in tomatoes at Redstar (the Netherlands).

Introduction: Artificial lighting in greenhouses is common practice in greenhouses in northern Europe and Canada. It’s necessary for growing crops like tomatoes and roses through winter. In the Netherlands alone, an estimated 2,000 hectares of greenhouses are lighted. The standard lamp used since the 1990s is the high-pressure sodium (HPS, SON-T-Agro). Obviously the investment and running costs of lighting are high.

When LED lighting was introduced into the horticultural market in 2007, salespeople promised extremely high efficiency and exceptional yields thanks to special light colours. However, test results in the first winter season were disappointing, and so was the efficiency. In the second and third season, the results were mixed. Depending on circumstances, LEDs gave lower, equal or higher yields than HPS lamps. This was under equal light levels, expressed in micromol□m2□s. Meanwhile, several practical applications are doing really well. Important differences between LED and HPS are the spectrum (light colours) and heat delivery, as well as the price.

Dr. Elly Nederhoff

HPS lighting: HPS lamps have pros and cons. HPS provides a good spectrum (mix of light colours), which has proven to work well for plants. The so-called wall-plug efficiency of HPS lamps is in the order of 30 per cent. Thus, of the incoming electricity, about 30 per cent is converted to light and the remaining 70 per cent is converted to heat. This is very good compared to incandescent lamps (six per cent light), but 70 per cent "loss" is still a lot.

Extra heat in winter is mostly beneficial, as it increases the air and plant temperature. But under milder weather conditions, the heat from HPS lamps can be excessive. Then thermal screens and even vents have to be opened, which is a waste of energy. With screens partly open, some light escapes and this is regarded as "light pollution" in the Netherlands. Another disadvantage is that the reflectors of HPS lamps cause shading (light loss) all year round.

LED lighting: Unfortunately, most LEDs are not much better than HPS in wall-plug efficiency. In the order of 30 per cent of electricity is converted to light and 70 per cent to heat (note that LEDs have a wide quality range).

The difference is that the large HPS lamps deliver a huge heat load on one spot, whereas the small LEDs give a nicely distributed heat output. Moreover, LEDs produce heat at the back. This heat is dissipated in the ambient air, or can be removed by water-cooling (e.g., Lemnis systems), which can be an advantage. Therefore with LED light, there is no overheating and screens don't have to be opened, so there is no "light pollution."

Testing the effect of different light colours for crop steering in capsicum (at Dingemans, Netherlands).

Other advantages are that LEDs run on low voltage, and can be dimmed (in principle). However, LED lighting is still much more expensive than HPS lighting. It is expected that the price will come down when supply increases further.

Spectrum: Spectrum is the mix of light colours. Light colour is characterised by wavelength, e.g., red has wavelength around 650-700 nanometer (nm). HPS lamps produce a mix of yellow, orange and red, plus some blue light. In contrast, one individual small LED produces one colour only, and there is a range of

colours available.
Manufacturers select LEDs of different colours and combine them in a LED module (array). Custom-made LED modules give exactly the spectrum required for a certain application. A different spectrum is required for growing with or without natural light, e.g., in a greenhouse, multi-layer cultivation or growth room. For tomatoes in green-houses, the popular choice is mainly red light (say 90 per cent) with some added blue (10 per cent). Red light is "cheapest" (because less electricity is needed to produce one mol of red light than to produce one mol of blue light). Blue LEDs are added to get optimal plant shape.

INTERLIGHTING AND OVERHEAD LIGHTING

Because the heat from LEDs is nicely spread out, LEDs can be placed much closer to the plants, even between the plants ("interlighting"). Light between the plants keeps the lower leaves alive longer, while the mild warmth from the LEDs keeps the plants dry, and thus reduces fungal diseases. In addition, perhaps less light is lost.

Plant temperature is another factor, even with LEDs installed overhead. HPS lamps radiate a lot of heat directly on the heads of the plants, whereas LEDs don't do that. This may cause small differences in head temperature, development rate and□or transpiration, which have advantages and disadvantages.

GROWTH DEPENDS ON LIGHT INTENSITY

Two main processes in plants are growth (weight gain) and development (shape). Growth rate depends on the rate of photosynthesis or assimilation (CO2 uptake), which in turn depends strongly on the amount of light. The light quality (light colour) is less important, because photosynthesis responds well to any colour of visible light (waveband 400 to 700 nm).

So more light means more photosynthesis. Growers in the Netherlands choose light intensity for LED light between about 100 and 200 micromol□m^2□seconds, and use the lights for up to 18 hours a day. This raises the daily light sum in winter to (early) spring levels. It is very important to use the correct units, especially when comparing HPS and LED. The only correct unit is micromols per m^2 per second. This is called the Photosynthetic Photon Flux (PPF). Light measurements in Watt, lux, lumen, candela, etc., are not good.

Philips LEDs are shown here in overhead lighting and inter-lighting at Wageningen University in Bleiswijk.

PLANT SHAPE DEPENDS ON LIGHT COLOUR

Plant development and plant shape depend on the light quality, which is the light colour or spectrum. Blue, red and far-red light are especially important, as is the time of the day when these particular colours are given □at night, day, morning or evening. These colours can steer flower initiation, stretching, branching, plant balance, stomata opening and more. This is known as "plant steering" (officially "morphogenesis" and "morphogenic effects").

A lot of research is now focusing on the effect of light colours. Scientists want to understand the "hidden effects" of light colours in LED light on tomato and rose plants, e.g., on stretching, branching, bud formation, etc. Other scientists are working on flower initiation in ornamental plants that are normally long-day or short-day plants. These plants can be tricked into flowering "on demand" with special colour

Appendix BCUC IR1 83.4.1

treatments. When light colour effects are better understood, growers will be able to avoid unwanted side-effects and to use LEDs for accurate control of how plants grow, develop, flower and produce.

LED systems: There are some special requirements for application in greenhouses: right spectrum, water-proof, robust, reliable, stable and causing minimal shading of
natural light.

One of the treatments in an experiment at Wageningen University in Bleiswijk features a combination of HPS and overhead LED lighting.

Two examples of specialized horticultural LED systems are: Philips GreenPower LED and Lemnis lighting LED modules. Lemnis LEDs have water-cooling. Both manufacturers provide custom-made solutions (light colour, light level, number of LEDs, dimensions). Systems are available for assimilation lighting, multi-layered cultivation or cyclical lighting. New modules are being developed continuously.

The future: Knowledge on LEDs has increased rapidly in the last three winters, but new questions arise all the time about the finer art of growing under LED lighting. In a later article we can summarize the conclusions of in-depth research done in the Netherlands on growing tomatoes under LEDs.

LEDs can have a bright future if their efficiency increases and the price comes down, and if scientists continue to gain new knowledge, and growers learn more about how to grow best with LED light.

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June 24, 2012

Charlotte Greenham
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Dear Mrs. Greenham

Thank you for your request for an opinion with respect to the potential and probable impacts of AMI deployment within the geographic area served by Fortis BC. I understand that, more specifically, you would like my opinion to be structured in the following manner:

Review the information and provide a written opinion as to the validity of the forecast in light of current research on the subject of energy theft and the distribution of marihuana production in British Columbia. The opinion should specifically address:

- i. *A prediction of changes in marijuana producer behaviour with only BCHydro AMI deployment and also with FortisBC deployment (i.e. what percentage will choose to steal versus pay for electricity).*
- ii. *A prediction of the net change in the number of marihuana producers at FortisBC with only BCHydro AMI deployment and also with FortisBC deployment (i.e. what percentage will go off the FortisBC grid).*
- iii. *Reasoning to support the opinion.*
- iv. *A specific comment on the validity of the financial model used in the FortisBC AMI Application in view of the Consultant findings.*

Prior to writing this opinion I have been provided with and have read and reviewed the following documents: a 9 page document from Fortis BC titled 5.3.2, Theft Reduction; a series of Excel tables from Fortis, Theft Benefit NPV, Probable Table, Potential Table, Historical Files, Number of Lights; A Theft Deterrence Chart, June 25, 2012; a further set of Excel files with titles, General BC Stats, Billing Costs, Monthly Billing Forecast, Customer Service Costs, Meter Reading Costs, Meter Exchange Costs, Compliance Exchanges, Remote Disconnects and Reconnects, Energy Costs, Meter List, Time of Use Rates, Residential Load, Old Theft Reduction; Tab 3, Load and Customer Forecast, 2012-2013, pages1 to 11; Response to BCUC Information Request No. 1, September 29, 2011, pages 1 to 8, System Losses and Peak; Response to BCUC Information Request No. 2, October 21, 2011, pages 1 to 8, Gross System Losses; Hydro One, Distribution Line Loss, Filed August 15, 2007, pages 1 to 13.

I have also canvassed relevant academic and other literature related to the theft of electricity in British Columbia, and literature related to the industry of marijuana production, both past and present. Finally I have considered the impact and relevance of The Safety Standards Amendment Act, B.C., 2006, notably in relation to sections 19.2 and 19.3, requiring the disclosure of account information (consumption data) to local governments, when requested by those governments. Finally, I attach a copy of my curriculum vitae.

I begin with the estimated 2012 AMI Theft Benefit Calculation, Table 5.3.2a:

□able □□□□a: Estimated □□1□ A□I □heft Benefit Calculation

A	□otal marihuana sites in BC	Ple□as Re□ort	13□□0
B	□ortisBC □ro□ortionate share of resi□ential □ustomers	O□erating statisti□s	□□
C	Mari□uana sites in □BC	A □B	□20
D	A□erage num□er of 1000□ lights □er site	□ortisBC	30
E	Days in gro□ □y□le	Ple□as Re□ort	□0
□	Daily □□ h □er light	Ple□as Re□ort	14
□	□um□er of gro□ □y□les □er year	Ple□as Re□ort	4
H	Annual energy □er light □□□ h□	E □□ □□	5040
I	Annual energy □er site □□□ h□	D □H	151,200
□	Annual marihuana energy use □M□ h□	□C □I □1000	123,□20

The number of marijuana cultivation sites in British Columbia has been addressed most recently by Diplock and Plecas (2011).[1] These authors draw on research conducted by Easton (2004) and Bouchard (2007) to estimate the total number of indoor marijuana growing operations in the province; these two researchers have used different methods to calculate the number of active grows, with calculations current to 2012 yielding figures in the range of 13,000. I can, therefore, support the Fortis BC working assumption that there are 13,660 sites in B.C. and the corollary expressed in the Table 5.3.2 above – that there are, given the Fortis BC share of sites in the province, approximately 820 indoor growing operations within the area served.

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1 Jordan Diplock and Darryl Plecas, The Increasing Problem of Electrical Consumption in Indoor Marijuana Grow Operations in British Columbia, University of the Fraser Valley, Centre for Public Safety and Criminal Justice Research, April, 2011, pp.1-7. See also Steve Easton, Marijuana Growth in British Columbia, Vancouver, B.C., Fraser Institute, 2004, and Martin Bouchard, "A capture-recapture model to estimate the size of criminal populations and the risks of detection in a marijuana cultivation industry", Journal of Quantitative Criminology, 23, 221-241, 2007.

The average number of 1000W lights per site is taken from data compiled by Fortis of investigations undertaken between 2006 and 2012, and I have no reason to doubt its legitimacy; I would say that the Plecas Report calculations of 90 days in the grow cycle and 4 grow cycles per year likely assume a degree of organization that does not exist with most grow operations – that is, most growers are unlikely to be so organized as to consistently generate this annual energy per light, dependent, as it is, upon continuing operations for 360 of 365 days in a calendar year. Put differently, growers of cannabis are not a homogeneous group that is entirely committed to an intensely focussed approach, and maximizing all opportunities for profit.

If we take a more conservative approach we might reset the equation for annual energy expended per light to 90 X 14 X 3 = 3,780 kwh. Accordingly, the annual use of energy for marijuana production in the area served by Fortis BC is 11,400 kwh per site (3,780 X 30 lights), and translated into Mwh for all 820 grow operations, 93,480 Mwh, approximately, or 93.5 GWh. With residential load for Fortis BC in 2012 estimated at 3,502 GWh, we can see that the industry of marijuana production accounts for approximately 2.7 per cent of electricity use (93.5/3502).

Fortis BC is making net present value projections for two different scenarios, one with the existing theft investigation program in place (status quo), and one with AMI deployment. With the status quo, Fortis is forecasting that approximately 30 per cent of all growers will steal electricity, a pattern that is relatively consistent, though slightly higher than their more recent experiences of the past six years; they are projecting this rate of theft for the full period, 2012 to 2032. They are also forecasting that the number of grow operations will almost double by 2032, but with the most significant growth occurring between 2012 and 2016.

With AMI deployment Fortis is forecasting that by 2016 no more than 5 per cent of growers will steal electricity, and that this pattern of theft will continue to 2032. They are also forecasting that the number of grow operations will increase by less than 10 per cent to 2016 and then continue to increase at a rate of approximately 2 per cent per year to 2032.

I will first make a number of general observations regarding these predictions before moving to a discussion of their specifics. The industry of indoor marijuana cultivation is a relatively recent phenomenon. Prior to the mid to late 1980s marijuana distribution was almost exclusively an import-export business in Canada and in most other western states, but the technology of cultivation and 1000W lights have now transformed both production and distribution, so that production, distribution and consumption can now take place in any location that has access to electricity.

It is very difficult to forecast with any degree of certainty the future of marijuana production, distribution and consumption in Canada, and globally, particularly given the time frame presented in the Fortis application: 2012 to 2032. Public opinion polls in Canada demonstrate significant support for the decriminalization of possession, and for some degree of regulation of the industry. The medical marijuana movement is in a state of flux, with new regulations planned, and research among growers and users has focussed on developing the ability to grow the drug with fewer energy requirements; cannabis culture forums discuss the emerging efficacy of LED lighting, with its reduced energy consumption, as an alternative to the current industry standard of 1,000W lights.[2]

If marijuana production was globally tolerated, with some forms of regulation attached, there would be little perceived need for electricity theft, but AMI deployment would have value, though somewhat attenuated, serving to deter a relatively small percentage of unethical growers. In this scenario Fortis BC revenues generated by the electricity use required for marijuana production would almost certainly increase from their present values. Regulation of the tolerated industry would improve the safety of electrical installations, relative to current practices. If alternative technologies for growing are implemented, with a reduction in current requirements for electricity (for example, more widespread use of LED lighting), Fortis revenues from marijuana production would decline, but the social, economic and environmental benefits of such reduced consumption would outstrip the inevitable loss of revenue.

In sum, there cannot be much certainty regarding the further evolution of the marijuana industry and its control over the period, 2012 to 2032. The projections made by Fortis BC are necessarily limited because of continuing political and social conflicts regarding the legitimacy of cannabis, as well as the probability of emerging and evolving technologies of cultivation. Changes within the industries of control and production could dramatically affect the validity of any projections made, whether by Fortis, myself, or other researchers – and these changes are entirely within the realm of possibility.

The Status Quo Projection

Without AMI deployment, it does seem likely that a significant percentage of growers will continue to steal electricity. The post 2006 Fortis BC strategy for responding to theft of electricity is noteworthy. A Fortis investigator receives information from either the RCMP or internally (from within Fortis) and opens a file. After a visit to one of these locations the investigator is able to determine whether theft of electricity is taking place. If there is a theft of electricity the investigator reports this finding to the police; if there is no theft, the file is closed and nothing is reported, irrespective of whether there may have been a grow operation at the location. With this approach in place – enforcement of theft and tolerance of paying customers – the rate of theft appears to have declined since 2006.

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2 For a discussion of these issues see Robin Room et al., Cannabis Policy: Moving Beyond Stalemate, Oxford, Oxford University Press, 2010.

<u>Theft Deterrence Calculation Chart, Fortis BC, April 2012</u>

Files Opened		Diversions	High Load Paying	total # of sites	Ratio of Theft to Paid
2006	568	57	71	128	45%
2007	254	21	21	42	50%
2008	206	28	27	55	51%
2009	189	13	32	45	29%
2010	215	18	52	70	26%
2011	262	12	49	61	20%
2012	134	10	22	32	31%

What appears to be relevant to these figures is the absence of the operation of the <u>Safety Standards Amendment Act</u> of 2006. There are no local governments served by Fortis BC that require Fortis to disclose account information of customers with high loads. It seems probable that marijuana producers served by Fortis have become aware that they will not be targeted by the energy authority unless they choose to steal, and, as a consequence, they appear to be less likely to steal.

Consider, alternatively, the approach taken by Mission, B.C., Surrey, Abbotsford, and a number of other Lower Mainland municipalities. A 2011 report by Plecas, Chaisson, Garis and Snow notes that in the period from 2000 to 2005 only 13% of indoor grows discovered in the city of Mission had stolen electricity. In the period 2006 to 2010 the incidence of theft of electricity in uncovered grows in the city was almost five times higher; 57 per cent of these operations had evidence of theft: the grows were larger, with more plants, and a higher average number of lights.[3]

It is worth noting that we have a province-wide 2005 report of theft -- a highly reliable source of data, as it was based on 25,000 incidents of marijuana cultivation coming to the attention of the police in British Columbia between 1997 and 2003; that report found theft in an average of 20 per cent of these 25,000 cases.[4] It seems a reasonable hypothesis, given these circumstances, to suggest that the Act of 2006 has prompted more marijuana producers to steal electricity in order to avoid detection through the reporting of high levels of energy consumption.

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[3] Darryl Plecas, Kristen Chaisson, Len Garis & Andrew Snow, <u>The Nature and Extent of Marijuana Growing Operations in Mission, British Columbia: A 14 Year Review (1997-2010),</u> University of the Fraser Valley, School of Criminology and Criminal Justice, 2011.

[4] Darryl Plecas, Aili Malm & Bryan Kinney, <u>Marihuana Growing Operations in British Columbia, Revisited, 1997-2003</u>, Abbotsford, B.C., University College of the Fraser Valley.

More specifically, it seems likely that the increased incidence of theft is tied to actions taken by some municipalities, subsequent to the passage of the Act of 2006. Growers who may have chosen to pay their electricity bills now know that their high levels of consumption are more likely to be reported to local governments, and, ultimately, to police. In this environment, theft of electricity reduces the risk of detection; the unintended consequence of the Act appears to be an increase in theft. As Diplock and Plecas note in their 2011 report, cited above, "…the proportion of growers stealing power appears to be approximately 52%, which is more than double the proportion reported by Plecas et al. (2005), based on information from 1997 to 2003."

If Fortis BC was to resist AMI deployment and local governments in the region were to simultaneously embrace the Act of 2006, a worst case scenario seems likely to emerge. The number of growers in the region would increase, given knowledge of the lack of AMI deployment, and the majority would steal electricity, knowing that their high levels of consumption would be reported by Fortis to local governments, and, in turn, to police.

If Fortis merely resisted AMI deployment and local governments continue to operate without the Act of 2006, it is reasonable to conclude that more marijuana producers would come into the Fortis area, as Fortis would become the only provincial energy authority without AMI. The Fortis projections suggest a 40 per cent increase by 2016 in the number of sites, with a rate of theft slightly greater than the current level of 20 per cent. This figure probably contains more precision that we can be sure of; the range of increase in these circumstances may be as low as 10 per cent, though I think a growth of more than 40 per cent is unlikely. Given that the Act of 2006 is not at all uniformly applied across the province, growers would not be motivated to come to Fortis in order to operate their businesses, but only for the more specific objective of theft of electricity – and as the cost of electricity does not dramatically impact the profitability of cannabis production, this seems unlikely. Put differently, those who come would almost exclusively be coming for the express purpose of theft, diminishing deterrent impacts of the current theft program. I should add that the complete rollout of AMI by BC Hydro remains uncertain, as some customers have, to date, been able to resist the technology.

Additionally, growers new to the region may act pre-emptively to avoid detection by stealing, at least until they know that high load customers who pay their bills will not ultimately be reported to the police. I would project a theft rate in excess of 50 per cent if local governments within the Fortis BC area were to follow the actions taken by some Lower Mainland municipalities in relation to the Act of 2006. Deterrence of theft would decrease, and revenues for Fortis would, correspondingly, decrease.

AMI Deployment

The prediction that no more than 5 per cent of growers will steal under AMI cannot be made with precision. It seems a virtual certainty that theft will decrease markedly under AMI, but we cannot sure about a number of variables, most notably the extent and timing of the AMI rollout throughout the rest of the province, as well as the resources that will be put in place and available to the energy authority and to police to respond effectively to evidence of theft. As a consequence, it may be that thefts will take place in a larger percentage of grow operations than the 5 per figure suggested by Fortis. Additionally, it is possible that the technology of AMI will be able to be subverted by innovative counter-technologies designed to disguise the “footprint” of the grower.

Additionally, one must acknowledge that there is a significant range of individuals involved in marijuana production. While many are not involved in any kind of crime other than marijuana production, there are some who have longstanding involvements in crime, and may steal, simply to increase the profitability of their cultivation, irrespective of either risk, or the ability to pay for their consumption. The 2005 study of 25,000 grow operations noted that 47 per cent of identified suspects had criminal records, and that those with prior criminal records had an average of seven previous convictions.[5]

If no more than 5 per cent of growers are stealing – because the risks of detection and arrest are simply overwhelming -- then it follows that there may not be any increase in marijuana grows in the Fortis region, but perhaps even a decrease in the number of sites, contrary to the projections made by the company. If growers who steal (currently estimated to be about 20 to 30 per cent within this region) are faced with a 95 per cent probability of detection and arrest, a certain percentage will go off the grid to generators, invest in alternative energy sources, or relocate to areas without AMI. This will lead, accordingly, to a relative drop in the total number of grow operations, somewhat below the modest growth projected from 2012 to 2032 within the Fortis BC territory.

One additional comment needs to be made in relation to the deployment of AMI. If the local governments within the area served by Fortis BC adopt the approach made possible by the Act of 2006, attempting to legislatively entrap all commercial growers through the combination of the AMI technology and collection of data regarding high payload customers, we may see a significant percentage of growers consider the theft of alternative forms of energy – gas and propane, along with off the grid possibilities such as generators. In this circumstance public safety will be placed at greater risk, as more risky forms of energy use replace electricity use, and a significant segment of the industry itself moves, metaphorically at least, underground, with fewer opportunities for oversight.

Finally, with respect to the financial model advanced by Fortis BC, I will make the following observations. Without AMI in place in the Fortis area (and in place elsewhere in the province), it is likely that theft will remain close to current levels (in the range of 20 to 30 per cent of all sites), as there are no data or evidence to suggest that this crime will be more easy to detect than it is at present. Further, as noted earlier, there will be some influx of growers, seeking to avoid AMI, and these growers may come to Fortis, with the intent of continuing their past practice of theft. With AMI in place in all jurisdictions within the province, theft will decrease, but the number of sites and the revenue produced by these sites may also decrease, given fears of detection that prompt going off the grid and/or changes in growing technology that permit reductions in energy consumption. If AMI is in place, and the local governments within Fortis BC do not

[5] See note 4, above, Plecas, Malm and Kinney, pages 35 to 39.

adopt the provisions of the Act of 2006, this will serve both to enhance electrical safety and increase revenues to the energy authority. Put differently, those jurisdictions which focus on theft -- and, simultaneously ignore the presence of high load paying consumers (except for reasons of electrical safety) – will better serve the financial and public safety interests of their customers.

Given the argument that I have set out, and the caveats attached, I cannot say with confidence that the forecast savings (varying between $42 and $58 million over the 2012 to 2032 term) represent an accurate assessment. I can say, however, that if there are no changes in the technologies of growing, no changes in current patterns of cannabis distribution and export, and the status quo of criminal prohibition is maintained over this 20 year period, the savings from AMI deployment (in contrast to the status quo) should be significant. I should add, again as noted above, that this benefit will be significantly diminished by the potential operation of the Safety Standard Amendment Act of 2006, in concert with AMI, within the area served by Fortis BC.

Finally, I note that the material provided to me by Fortis does not quantify the potential public safety benefits of AMI (in relation to the dangers inherent in theft of electricity). More specifically, the avoidance and/or limitation of fatalities and serious injuries to citizens have economic costs that should be considered.[6]

I thank you again for the opportunity to provide an opinion on this important matter.

Sincerely,

Neil Boyd
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[6] See, for example, T.R. Miller et al., Victim Costs and Consequences: A New Look, Research Report NCJ 155282. Washington, DC: US Department of Justice, National Institute of Justice