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July 20, 2009

Commercial Energy Consumers Association of British Columbia
c/o Owen Bird Law Corporation
P.O. Box 49130
Three Bentall Centre
2900 – 595 Burrard Street
Vancouver, BC
V7X 1J5

Attention: Mr. Christopher P. Weafer

Dear Mr. Weafer:

Re: Terasen Gas Inc. ("TGI", the "Company"), Terasen Gas (Vancouver Island) Inc. ("TGVI") and Terasen Gas (Whistler) Inc. ("TGW")
Collectively the "Terasen Utilities"
Return on Equity and Capital Structure Application (the "Application")

Response to the Commercial Energy Consumers Association of British Columbia ("CEC") Information Request ("IR") No. 1

On May 15, 2009, the Terasen Utilities filed the Application as referenced above. In accordance with the British Columbia Utilities Commission Order No. G-70-09 setting out the Regulatory Timetable for the Application, the Terasen Utilities respectfully submit the attached response to CEC IR No. 1.

If there are any questions regarding the attached, please contact the undersigned.

Sincerely,

TERASEN GAS INC.
TERASEN GAS (VANCOUVER ISLAND) INC. and
TERASEN GAS (WHISTLER) INC.

Original signed by:

Scott A. Thomson
Vice President, Regulatory Affairs & CFO

Attachments

cc (email only): BCUC and Registered Parties

1. Exhibit B-1 - Cover Letter Page 1 - Use of AAM

The Terasen Utilities request that the Commission eliminate the use of an ROE automatic adjustment mechanism ("AAM") in the determination of the ROE to be used by the Terasen Utilities for rate-setting. While an AAM may be desirable for administrative efficiency, the AAM must produce an allowed ROE that is a fair return for the public utilities that are subject to the mechanism. The AAM used by the BCUC at the current time does not result in a fair return. For this reason, elimination of the current AAM is requested.

1.1 Does Terasen believe that an AAM is administratively efficient or not?

Response:

Yes, Terasen believes that an automated adjustment mechanism can be administratively efficient provided it is properly constructed, has transparent inputs and produces reasonable results. It must be remembered that the AAM is a proxy device to adjust the allowed return on an ongoing basis, not to establish the starting point. In other words, the Commission is responsible for establishing a fair and appropriate level of return for each utility under its jurisdiction. Once established, an AAM may be useful in adjusting the return from time to time and avoid lengthy and costly proceedings. In that way the AAM can be administratively efficient so long as the result it produces on an ongoing basis is appropriate.

1.2 If Terasen is uncertain as to whether or not an AAM is administratively efficient please provide an explanation of the uncertainty with regard to the desirability of AAM for administrative efficiency.

Response:

Please refer to the response to CEC IR 1.1.1.

1.3 Does Terasen believe that it would be fair just and reasonable for the Commission to eliminate the AAM for Terasen and not for other utilities regulated by the Commission?

Response:

Likely not. Terasen believes that the current mechanism produces results that are materially wrong for the Terasen Utilities and understand that the other utilities regulated by the commission have their returns set with reference to the return of TGI (set by the current AAM). We further understand that those utilities' utility specific risk adjustments are less than or equal to 70 bps currently.

However, it is not Terasen's place to seek changes to third parties allowed returns and it would be inappropriate for us to attempt to speak on their behalf.

1.4 In Terasen's view did the failure of the AAM to provide for a 'fair return for the public utilities' at the current time begin when the anticipated ROE fell below 8% and would it end if the formula produced an ROE greater than 8%?

Response:

No. When the current AAM was established by the Commission following the November 2005 hearing, it was anticipated that the mechanism would survive for five years but the Commission recognized that if it moved outside certain levels it might be appropriate to consider and earlier review and committed to canvassing the utilities if it fell below 8%. Further the Commission indicated in the Decision that any party could seek a review at any time.

The Terasen Utilities have been concerned with the results produced by the AAM since its inception. The current formula is flawed. The Terasen utilities are seeking the establishment of a new Benchmark return of 11%.

2. Exhibit B-1 – Cover Letter Page 1 – Capital Structure

TGI requests that the Commission alter and increase the common equity component of the capital structure of TGI for rate-setting purposes. TGI requests that the increased common equity component be included in the setting of TGI effective January 1, 2010.

2.1 Why does Terasen believe that the capital structure change it requests should begin January 1, 2010 on a different timeframe than the ROE change Terasen is requesting?

Response:

As discussed in the Application, TGI submits that should the Commission conclude that the relief it is seeking is appropriate then it believes it would be appropriate to adjust the ROE level and the capital structure as soon as is practical.

Due to the anticipated time to hear and decide the matter, it is unlikely that the Commission will reach its conclusions on the evidence until toward the end of the year. If the Commission agrees that an increase to the ROE is appropriate then it is by definition agreeing that the current allowed return is not. The Application was filed in mid May. It is a long established practice that the BCUC avoids retroactive rate making. That is why TGI sought to make its current rates interim in order to allow the Commission to reflect its final decision in rates from July 1, 2009.

In the case of the change to the capital structure, Terasen does not seek to earn a return on equity that is not actually invested in TGI, and due to the anticipated delay in the Commission reaching a decision until later in the year, TGI felt it appropriate to wait until the Commission had reached its decision and then move to implement the revised approved capital structure by increasing the equity investment. Given the anticipated timing of a decision, TGI believes the Commission will have reached its Decision in time to make an equity injection for January 1, 2010.

If the Commission had been in a position to render its Decision approving an increase in the equity thickness of the capital structure by July 1, 2009 it would have sought to increase it at that time.

2.2 Does Terasen believe that the ROE and Capital Structure determinations are distinct and separate and not integrated in the determination of what is a fair return at a given point in time?

Response:

As discussed in the Application, Terasen believes the ROE and Capital Structure determinations cannot and should not be made in isolation of each other and there can be more than one combination of each that would lead to a reasonable outcome. The combination sought in this Application is an 11% ROE on 40% equity. In a perfect world this would have been implemented on May 16, 2009 the day after the Commission received the Application. As a practical matter the Terasen Utilities have sought to have the new Benchmark ROE apply with effect from July 1, 2009 and TGI, recognizing that it is not practical that the capital structure be increased prior to a Decision being rendered is seeking to increase the equity thickness effective January 1, 2010.

3. Exhibit B-1 – Cover Letter Page 6 – Fair Return Tests

Therefore, the Board reaffirms the Fair Return Standard as articulated on page 17 of the RH-2-2004, Phase II Decision. The Fair Return Standard requires that a fair or reasonable overall return on capital should:

- be comparable to the return available from the application of the invested capital to other enterprises of like risk (comparable investment requirement);
- enable the financial integrity of the regulated enterprise to be maintained (financial integrity requirement); and
- permit incremental capital to be attracted to the enterprise on reasonable terms and conditions (capital attraction requirement)."

3.1 Does Terasen believe that these 'fair return' tests can be made in such a way as to provide a bright line between fair and not fair? Please explain.

Response:

As a practical matter no. In fact the current AAM suggests a level of accuracy and precision that does not exist. Many of the terms are subjective and require that reasoned judgment be applied. The first bullet discusses enterprises of "like risk". No two utilities are identical in all respects just as non-regulated businesses on which the comparable earnings test is applied are not identical to utility operations. Proxy groups are established in order to attempt to create a basis for applying the tests.

However, when you take the average of a sample group of utility companies, such as that examined by Dr. Vander Weide in his US sample, and these utilities:

- operate under substantially similar regulatory constructs, capital markets and tax regimes
- compete for capital from the same pool of North American investors as the Terasen Utilities and other Canadian utility companies, and
- have recently had their returns/capital structures litigated in hearings with reasoned judgment brought to bare by their respective regulators, and
- the net result is an average allowed return that is materially higher than the current AAM produces in the case of TGI ROE and the average equity thickness materially higher

than TGI is allowed and materially higher than TGI is seeking, then is not necessary to establish a bright line between fair and not fair.

An observer can readily see that something is wrong with a formula (i.e. the current AAM) that systematically produces materially lower returns than those determined through hearings across a broad swath of American utilities and a detailed, line by line comparison of all 83 utilities included in the sample group compared to TGI is not necessary. The utilities in the sample group will be riskier on some dimensions and less risky on others and on balance can be used to provide a proxy for a comparable return.

3.2 Does Terasen have a view with respect to the potential accuracy or range of variability which would be involved in determining a comparable enterprise and comparable risk for a 'comparable investment' test and if it does please provide Terasen's views?

Response:

The goal of comparable company analysis is to choose the largest set of comparable companies for which sufficient data are available to reliably estimate the fair return. It is preferable to have a reasonably large group of comparable companies because the cost of equity result for each company is generally based on estimates of variables such as investors' growth forecasts, relative risk adjustments, and required risk premiums, which are necessarily uncertain. However, the uncertainty in the estimate of the cost of equity for an individual company can be reduced by considering the average cost of equity result for a relatively large sample of comparable risk companies.

In choosing comparable groups for TGI, one must also recognize that in estimating a fair return for TGI, the selection of similar risk companies is not limited solely to other utilities. Unregulated companies also provide a relevant perspective on a fair return for TGI. With regard to proxy utilities, it is necessary to recognize that, there are not only few, if any, publicly-traded, pure Canadian local gas distribution companies but also few publicly-traded Canadian utilities in any utility sector with sufficient data to reasonably estimate the cost of equity. Given the desirability of using relatively large sample of proxy companies, and the lack of publicly-traded pure natural gas distribution companies, the only alternative is to choose groups of public utilities that are reasonably comparable, but not necessarily equal in risk to TGI. Since there are considerably more U. S. utilities than Canadian utilities, and the data required to estimate the cost of equity is available for most of these utilities, it reasonable to rely heavily on cost of equity estimates for both Canadian and U. S. utilities. Further, most U. S. utilities operate under substantially similar regulatory constructs, capital markets, and tax regimes as TGI. Thus, TGI believes that the regulator should consider the results of applying several methods of estimating the fair return,

applied to groups of low risk unregulated companies and to both Canadian and U. S. utilities. As shown in the written evidence of Ms. McShane and Dr. Vander Weide, the results of the tests applied to groups of Canadian and U. S. utilities and to unregulated companies consistently indicate that TGI's required ROE and equity thickness are materially higher than its allowed ROE and deemed equity thickness. Please also refer to the response to CEC 1.3.1 above.

3.3 Terasen defines financial integrity as being able to maintain and A category credit or bond rating (Exhibit B-1, Page 34). Does Terasen have a view with respect to the range of variability which would be involved in determining whether or not Terasen's financial integrity is being maintained and if it does please provide Terasen's views?

Response:

TGI interprets the financial integrity standard to mean a capital structure and ROE in combination that will allow a utility to maintain a minimum credit rating in the A category. As explained in the response to BCUC IR#1 Q18.1 and 18.2, TGI is not aware of a combination of ROE and equity thickness that will guarantee a minimum A rating, as a number of factors determine a credit rating.

Terasen believes that an ROE of 11% and capital structure with 40% equity is appropriate. There is no guarantee that a credit rating downgrade will not occur, however, in the light of increased business risks and weak credit metrics, the requested ROE and capital structure will make a downgrade more remote and will more adequately address the financial integrity requirement within the Fair Return Standard.

3.4 Does Terasen believe that 'reasonable terms and conditions' for attraction of capital are definitively definable or is there a range of variability and if so does Terasen have a view on what the range might be and if so please provide Terasen's views?

Response:

Terasen does not believe the reasonable terms and conditions for attraction of capital are definitively definable, as the requirement is qualified by the concept of reasonableness, which suggests a range.

In meeting the standard, the overall return, derived from both the ROE and capital structure in combination needs to be considered. However, the return must be considered in the context of market conditions and a utility’s business and financial risk. Therefore, it is not possible to define the range at which the requirement for capital attraction is definitively met. In addition, the capital attraction requirement is one element of determining the Fair Return Standard, and at the current ROE and equity ratio, the Fair Return Standard is not being met.

4. Exhibit B-1 – Cover Letter Page 7 – Worsening Market Conditions

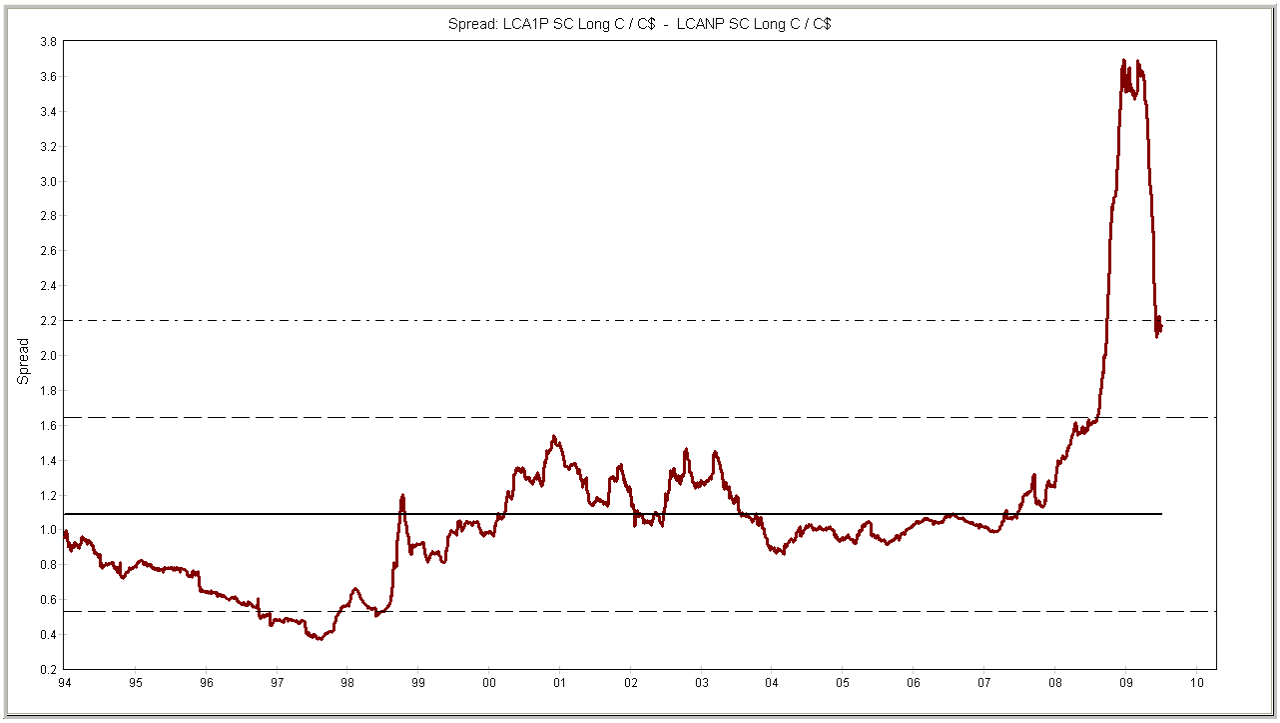
Since 2006, the current mechanism has driven allowed ROE levels lower and lower even while utility debt costs have moved higher in absolute terms. Risk has been re-priced by the market and the costs of debt and equity capital have increased, as noted by the Company's witnesses in this proceeding and by market commentators, and as evidenced by the dramatic widening of corporate credit spreads in recent months. This has exacerbated the inadequate formula-driven ROE results that pre-date the recent market developments as the allowed ROEs in BC under the formula have continued to decline steadily:

(Reference: Cover Letter, Page 7)

4.1 Since the AAM formula was introduced how often have the 'corporate credit' spreads widened and then retracted to more normal spreads?

Response:

Without a definition of what quantum of increase would reflect 'widening', and what baseline would represent 'normal', Terasen is not able to respond to the question directly. Since 1994, the year the AAM was introduced, there have been many instances of widening corporate spreads, followed by a return to lower levels which may be considered normal relative to the time frame in question. The attached graph, provided by Scotia Capital, demonstrates the historical spreads since 1994 on an A rated mid term corporate bond index in Canada.



The solid, horizontal line is the mean spread for 1994 to 2009. The dashed line above and below the mean represents a one standard deviation movement away from the mean. The dashed and dotted line represents a two standard deviation move above the mean (two standard deviation move below is not represented as it would be a negative spread). What this graph represents is that while there has been volatility in corporate spreads in the past, they are nowhere near as pronounced as the recent market turmoil.

4.2 How long have the spreads stayed at higher levels and then returned?

Response:

Please see response to CEC IR 1. 4.1.

4.3 Does the magnitude of the shift in corporate spreads and the duration of the shift have a bearing on how these market conditions impact 'fair return' assessments?

Response:

The impact of the magnitude of the volatility in corporate spreads on a fair return assessment depends in part on what is occurring in the equity market and what allowed ROE and capital structure has been awarded to a utility. To the extent that the factor(s) impacting the debt market are affecting the cost of equity in a similar manner, then the answer would be yes.

4.4 Does the graphic view of Canadian and US spreads at Page 21 of Donald Carmichael's Testimony represent the corporate credit spreads issue the company is raising?

Response:

No. The graph referenced in the question represents spreads for a broad portfolio of corporate, investment grade issuers, of varying terms to maturity.

4.5 Does the marked difference in spreads currently from the rises and falls of spreads in the past represent the distinction of these current market conditions versus other prior market conditions?

Response:

The relative increase in credit spreads, which has seen indicative credit spreads for TGI almost triple, as well as the speed and volatility of changes in credit spread is a marked difference from prior market conditions. Global capital markets are becoming more interconnected and dependent on one another than they have been in the past. Random exogenous events such as the melt down of U. S. sub-prime mortgage market have a significant impact on markets and credit spreads in Canada.

- The gap between returns in BC (and other Canadian jurisdictions which employ a similar formulaic approach) has continued to increase relative to those in jurisdictions that have not relied on a formula tied to long bond rates (most notably jurisdictions in the US);

(Reference: Cover Letter, Page 7)

4.6 Would the exchange rate difference between Canadian and US markets have an influence on the differential returns being received in the different markets? Please explain.

Response:

TGI presumes that the question refers to expected returns. In equilibrium, real returns between countries should be the same. All other things equal, the difference in the expected rates of inflation should determine the exchange rate, so that real rates of interest are the same when adjusted for inflation differences. In the case of Canada versus the U.S., the most recent long-term consensus forecast indicates that the average rates of inflation over the next 10-years (2010-2019) are expected to be very similar, 2.0% versus 2.1%, suggesting that the nominal costs of capital in the two countries, all other things equal, are very similar.

4.7 Would the anticipated future exchange rate differences between Canadian and US markets have an influence on the differential returns received in the different markets? Please explain.

Response:

If there is a major shift in inflation rates and thus in the exchange rate, the differential in expected nominal returns could change. While it is reasonable to expect that the exchange rate will exhibit volatility, the Consensus Economics *Consensus Forecasts* (June 2009) showed that the exchange rate, which at the date of the forecast (June 8) was 1.12, was expected to be 1.12 in 2011.

4.8 Does Terasen believe that the Canadian/US exchange rate is going to change significantly over the next several years and if so in what direction does Terasen believe the exchange rate will go and why?

Response:

Terasen is of the view that there will be continued ongoing volatility in the Canadian/US exchange rate and that this volatility will be consistent with recent history. Terasen does not have a strong view as to whether or not there will be a strong directional move either up or down, or what level the exchange rate will move to.

4.9 Does Terasen believe that the massive trillion dollar US deficits will impact exchange rate changes between the Canadian and US dollar over the next several years?

Response:

The Canadian/US dollar exchange rate will be affected by both the projected US and Canadian deficits. The impact from deficit spending will in part depend on the relative size of each county’s deficit and the impact on the financial position of each country.

- No new pipelines are being built under formula based allowed returns in Canada. These have been constructed under negotiated capital structures and ROEs as the formula based ROEs are not adequate; and

(Reference: Cover Letter, Page 7)

4.10 For how long have major pipelines been constructed under negotiated capital structures in Canada? Where around the world are major pipelines built without negotiated capital structures?

Response:

TGI has not studied the full history of pipelines in Canada nor has it studied global practice. To TGI’s knowledge, the first major pipeline constructed in Canada with a negotiated capital structure and ROE within the past 25 years was Alliance Pipeline, approved by the NEB in 1998.

4.11 Are major pipeline projects more risky than investment in local distribution utilities?

Response:

It depends on the characteristics of the project, i.e. what its supply sources are, whether it has long-term contracts, and whether it has assurance of full recovery of development and construction costs.

4.12 Do major pipeline investments occur over longer periods of time from inception of construction to completion than local distribution utility investment projects?

Response:

The time for construction varies with the nature and the location of the project. For example, the Trans-Alaska Pipeline (800 miles, three mountain ranges, 800 river and stream crossings) took three years to construct. Enbridge estimates that its Alberta Clipper project will take two years to construct. For a gas distributor, most projects are completed within a construction season, although projects like the Mt. Hayes storage facility may take 2-3 years.

- More recently, the formula is producing allowed returns that have narrowed in relation to investment grade utility corporate bond yields. In fact, in December 2008 indicative TGI 30 year new debt issue costs came within 18 basis points of the potential formula generated ROE based on that month's forecast of long-term GCB yields. This minimal spread between debt costs and formula based equity returns would not provide an adequate return for equity risk takers and underscores the fact that the formula isn't working.

(Reference: Cover Letter, Page 7)

4.13 Are the market conditions Terasen is most worried about the spreads on TGI debt relative to the returns on equity being allowed? Please explain.

Response:

As part of the Application, Terasen Utilities has requested an abandonment of the current AAM, as the application of the formula has led to inadequate benchmark ROEs. In regards to this Application, the worsening market conditions, which have seen both the cost of debt and equity increase, have highlighted clearly the inadequacy of the AAM. The AAM could lead to a reduction in the benchmark ROE, when both the market cost of debt and equity is increasing. This has been demonstrated, as the recent market condition has seen increased debt spreads and equity costs, while the AAM would generate a reduced ROE.

4.14 Does Terasen believe that the consequences of the financial crisis in the US and around the world will persist indefinitely at the levels experienced in December 2008 or will they abate from those levels?

Response:

The financial crisis has led to many consequences, including precipitating a severe global recession, job losses, bankruptcies, liquidity constraints for borrowers, and increased return requirements for investors in both corporate debt and equity. Terasen does not believe that all these consequences will persist indefinitely, and in some instances, there has been a lessening of the severity of these consequences.

However, easy credit conditions and the overly optimistic economic perceptions that existed before the onset of the financial crisis are unlikely to return for an extended period of time. The confidence of investors has been shaken and it can reasonably be expected that their increased return requirements will continue for the indefinite future.

Further, given that there are continued concerns over global economic conditions, ongoing or new financial crisis could develop rapidly that may bring on consequences similar to that experienced in the last number of months.

4.15 Does Terasen believe that the financial crisis precipitating the effects on corporate spreads has peaked? If so, why?

Response:

Terasen does not have a definitive view as to whether the current financial crisis referenced in the question has peaked. Terasen believes that this financial crisis for the time being has lessened given the massive government support provided to financial institutions in the US and Europe. However, there is no way to determine whether this current situation will worsen, or whether a new, unanticipated financial crisis develops. Both the Canadian and global economy remain in recession, which may lead to further significant losses amongst financial institutions. To the extent that governments are less able to respond in the form of further financial support programs (given the size of deficits incurred in the initial round of support programs) financial institutions could continue to fail, which could trigger a more severe financial crisis. What appears certain is that financial markets are set for a continued period of volatility. This volatility actually predates the current crisis, commencing with the market turmoil in mid-2007 arising from concerns over asset backed commercial paper.

5. Exhibit B-1 - Cover Letter Page 8 – Competition for Debt

In addition, the Commission should establish a capital structure for TGI that more appropriately reflects the business and financial risks of the company, and which is in line with its North American peers. Canadian utilities generally are thinly capitalized compared to the US utilities with whom they compete for capital. It is not sufficient to simply increase TGI's equity thickness to bring it in line with the increases in equity thickness granted to other Canadian utilities in recent years.

5.1 Please identify in the answer to BCUC IR Q3 all of the debt issues Terasen has made between US borrowings and Canadian borrowings.

Response:

BCUC IR Q3.2 requested a long-term debt continuity schedule for TGI. There are no US borrowings identified in the debt schedule. All borrowings are Canadian dollar based.

5.2 Does Terasen expect to borrow significantly more in US dollar denominated debt in the future than in the past? Please explain.

Response:

TGI currently does not expect to borrow in US dollar denominated debt. TGI's operations are based solely in BC, with Canadian dollar denominated revenue, which makes it appropriate and prudent to borrow its debt in Canadian dollars.

6. Exhibit B-1 – Cover Letter Page 10 and 11 – flawed methodology – Suspended Regulatory Judgment

"The now-universal generic ROE approach by Canadian regulators of major gas utilities has created some regulatory economies. But unfortunately its mechanistic character suspends for lengthy periods the previously-valued application of informed judgment to the results of alternative methods of achieving the FRS required by Canadian jurisprudence in ROE awards.

6.1 The Major/Priddle view that Canadian Regulators have suspended application of judgment is a foundation of the assertion that the methodology is flawed. Does Terasen agree with Major and Priddle that Canadian Regulators have suspended judgment?

Response:

Terasen agrees with Major and Priddle that the longer an AAM such as the current method operates without a re-examination or re-calibration to ensure it is producing appropriate results constitutes a suspension of judgment.

6.2 Does Terasen believe that the AAM methodology is fatally flawed or is it likely that the current financial crisis and the financial market consequences have underscored a weakness in the methodology which could be repaired?

Response:

As discussed in the Application and in response to CEC 1.1.1 above, there can be merit to using an adjustment mechanism to set returns from time to time so long as the mechanism produces fair and reasonable results. It is expensive and time consuming to litigate capital structure and allowed returns each year for every utility.

Terasen believes that the existing formula produces materially low and inappropriate returns. Terasen attempted to construct a formula that could be used to adjust the new Benchmark ROE it is seeking (see Section 6.2 of the Application) that would be robust and transparent but was unable to do so at this time. It also committed to continue to work towards something that could be introduced in the future. What is paramount at this time is establishing a fair and appropriate Benchmark ROE. How that may be adjusted in the future is a matter for a different application that may also be informed by research that is being conducted in other jurisdictions.

7. Exhibit B-1 – Cover letter Page 11 – flawed methodology – Low Interest Rate Response

"Absent such a reconsideration and consequent adjustment, in an environment of continuing very low interest rates and bond yields, the present generic ROE formula alone may not be protecting the public interest in the provision by incumbent utilities of a robust, flexible natural gas delivery structure financially strong to support future sustainability of our energy economy."

7.1 The Major/Priddle view that AAM formula response to 'very low interest rates' is inadequate seems to be critical to the assessment that the methodology is flawed. Does Terasen agree with Major and Priddle that the formula is not sufficiently responsive to very low interest rates? Please explain.

Response:

Terasen agrees that one of the factors that points to the AAM formula being flawed is the fact that it, like the NEB formula, is only adjusted based on movements in the forecast long Canada bond yield. That factor can cause problems in any interest rate environment because investor yield requirements are not driven solely by movements in the forecast 30 year Government of Canada Bond yields.

7.2 Does Terasen believe that the AAM formula might be given a more responsive portion dealing with very low interest rates and the consequences on utility financing? Please explain.

Response:

Terasen agrees that one of the factors that points to the AAM formula being flawed is the fact that it, like the NEB formula, is only adjusted based on movements in the forecast long Canada bond yield. That factor can cause problems in any interest rate environment because investor yield requirements are not driven solely by movements in Government of Canada Bond yields.

The Terasen Utilities believe the current formula is not working and does not produce a fair return today. A fair return would be in the range of 11% ROE on 40% equity for TGI. Dr. Vander Weide has presented evidence which suggests that adjudicated ROEs have been correlated at slightly less than 50% of the movement in long bond yields.

Therefore even if the formula was recalibrated to start at 11% at today’s long bond forecast any subsequent adjustments using a 75% adjustment factor for movements in the forecast long bond yield may not result in future appropriate ROEs. That factor may have to be adjusted and possibly others would have to be introduced to develop a more robust formula.

It is the Terasen Utilities hope that in time it may be possible to develop a workable formula for administrative efficiency as more research is done. In the mean time it is imperative that a fair Benchmark ROE be re-established.

8. Exhibit B-1 Cover Letter Page 12 – flawed methodology – 75% adjustment too high

mechanism that had been introduced in 1999. Nonetheless, the point of departure for the re-calibration of the current adjustment mechanism, which now adjusts for 75% of the change in forecast long-term GCB yields, was set based on an equity risk premium of 390 basis points over the forecast yield. This, when combined with the deemed capital structure of TGI, produces an allowed ROE that results in investors in TGI earning the lowest effective return in Canada.

8.1 Does Terasen believe that the inappropriateness of the 75% of change in forecast long-term GCB yields would be fixed if the adjustment mechanism were moved to 50% from a redefined starting point as identified at Page 32 and 33 of the Cover Letter to the Application? Please explain.

Response:

Terasen believes it would be an improvement over what exists today provided it was recalibrated to provide a fair return as the initial point of departure but it would still be a one factor formula. If Terasen believed that was all that was required to "fix" the current AAM then that is what it would have applied for.

8.2 Does Terasen believe that the AAM formula might be adjusted to be less sensitive to GCB yields?

Response:

That is not what Terasen is applying for at this time. Further, see the responses above.

9 Exhibit B-1 Cover Letter Page 14 – Comparison to US Utilities

The Commission should further consider that TGI competes for capital not just with utilities and other companies in Canada, but also with participants in capital markets outside of Canada. While TGI has the lowest effective return on equity in Canada, the returns on equity in Canada for the last 10 years have been substantially lower on average than they have been in the U.S (see figure below).

9.1 Does Terasen benchmark its performance as a utility against US utilities?

Response:

Terasen participates from time to time in surveys through the Canadian Gas Association and the American Gas Association.

9.2 Are US utilities more or less productive and efficient than Terasen?

Response:

The answer is that some US utilities may be more efficient than Terasen and others are less efficient than Terasen. As discussed elsewhere in the responses, the natural gas delivery business is a mature business whose primary investment are in long lived assets placed in the ground. Iron and steel piping is being displaced by plastic over time but the basic technologies have not changed dramatically in recent years. Information technology has allowed for more efficient dispatching of field crews and meter data collection and billing, etc.

These technologies have generally been embraced by the industry and widely adopted, however their contribution to the efficiency of specific organizations is impacted by economies of scale and geographic dispersion. Terasen's customer base is spread over a massive service territory and includes urban and rural areas. Certain costs are impacted by traffic congestion and require the company to place musters throughout urban centers in order to ensure emergency response times can be maintained increasing costs as congestion increases.

Having operated under various forms of incentive regulation since the early 1990s that encouraged and rewarded cost management and containment, Terasen has greatly improved its operating cost per customer profile in real terms over the years and would place itself in the top quartile of performers.

9.3 Does Terasen believe that the company's performance should have anything to do with the ROE it earns?

Response:

Yes. Ultimately the Company's performance should influence the return it earns but not the earnings opportunity included in rates, i.e. not its allowed ROE for ratemaking purposes. The allowed ROE is not a guarantee of such earnings; it is simply used in setting the rates of the utility. Under both traditional cost of service rate making and performance based rate making, utilities may earn more of less than their allowed ROE based on their performance.

9.4 Are the comparisons in the chart in section 1.4 on page 14 comparisons of allowed returns or of actual returns?

Response:

Please refer to the title of the chart in section 1.4 on page 14 which says "Allowed Returns on Equity for Canadian and US Utilities". There was no intent to cause confusion to the reader.

9.5 What are the actual return performances for the utilities?

Response:

Terasen does not have this information. Nor does Terasen believe it is relevant to the establishment of a fair level of Allowed Return. Please also refer to the response to CEC IR 1.9.3 above.

9.6 Which are the US utilities in the comparison and which are the Canadian utilities?

Response:

The Canadian utilities are found on Schedule 23, page 2 of 2 of Ms. McShane's evidence. The US utilities represent every major gas and electric decision compiled by Regulatory Research Associates since 1990. There are 192 companies in the US list which is included in the excel spreadsheet attached.

9.7 How many of the US utilities were operating under PBR type of regulation?

Response:

Terasen does not have this information however, as discussed in the response to CEC IR 1.9.4 above the chart depicts the allowed returns not the achieved returns so operating under PBR is not relevant to the establishment of an allowed ROE.

10. Exhibit B-1 Cover Letter Page 16 – Broken Formula

The shortcomings of the currently employed formulae include the facts that:

- They rely on a single variable, and adjust for 75% of the year over year change of the forecast 30 year GCB yield, which the evidence indicates materially overstates the relationship between the cost of equity and the long-term GCB yield;
- They ignore factors directly relevant to equity return requirements in the markets, such as returns available to comparable risk companies, changes in dividend yields, and changes in corporate bond yields;
- They do not consider changes in equity markets which have occurred over time; and
- By focusing solely on the change in long-term GCB yields, they are incapable of expressly taking into account returns available to enterprises or investments of comparable risk.

10.1 Why didn't Terasen propose changes to the formula to fix the purported shortcomings?

Response:

Terasen attempted to develop a proposal for a formula to adjust the Benchmark ROE once it had been recalibrated, but for the reasons noted in the Application it was unable at this time to come up with a formula it was confident would continue to produce appropriate results. It has committed to work towards the development of a proposal it might be in a position to bring forward in the future, ideally before the setting of rates for 2011.

This may or may not be possible.

10.2 Did Terasen examine any proposals to amend the formula and if so please provide copies of the internal or external examination of alternative formula mechanisms?

Response:

As discussed at Section 6.1 page 32 of the Application, Terasen considered the concept of introducing a two factor formula which incorporated Government Bond yields and corporate bond yield as well as one that worked off of corporate bond yields. However, Terasen believes that for any adjustment mechanism to be acceptable it must be transparent and readily

identifiable inputs. There is no publicly available Canadian utility bond index that could be used as an input to a formula that included a corporate bond component.

Terasen also looked a mechanism that is employed in California that adjusts the allowed ROE for 50% of the movement in the average corporate A rated bond yield with a 100 bps deadband. This was deemed not practical as for the same reason as the two factor formula since there is no transparent utility bond index upon which it would run.

10.3 Does Terasen agree with the Canadian Gas Association quoted on Pages 17 and 18 of the Cover Letter that there is a need to refresh the formula?

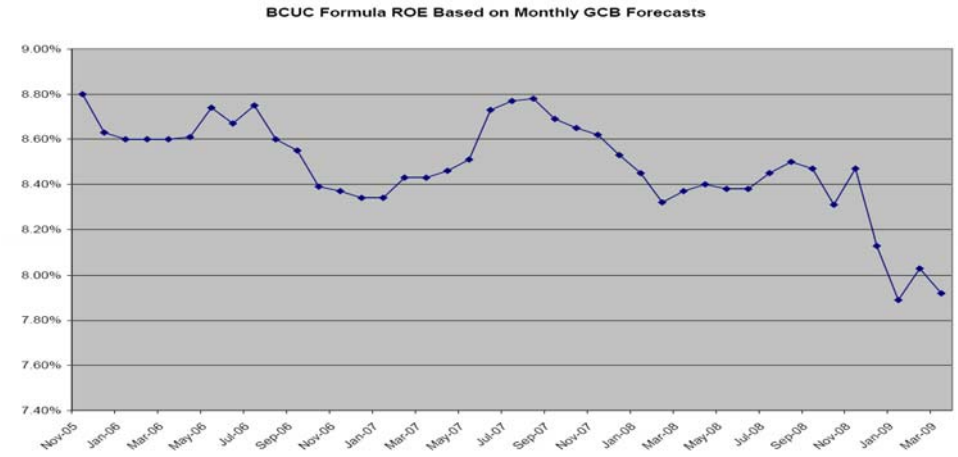
Response:

The CGA states that the ROEs for Canadian utilities “must be rebased based on a comprehensive review of the cost of capital using all accepted approaches including comparison with a broad comparator group extending across all reasonably comparable industrial groups and jurisdictions including the US.”

Thereafter, if a formula is to be used it must be adjusted. The CGA says: “in order to meet the requirements of transparency and stability the formula would need to be established on a reasonably stable and readily observable base with an adjustment factor that accounts as fully as possible for the changing relationship between the cost of equity and the cost of debt.”

Terasen agrees with those statements, which were included at page 18 of the Application. Simply tweaking the existing formula is not going to solve the problems with it.

11. Exhibit B-1 – Cover Letter Page 20 – Formula Results



11.1 Please update this chart for the most recent forecasts available.

Response:

Please refer to the updated chart below updated with forecasts to June 2009.

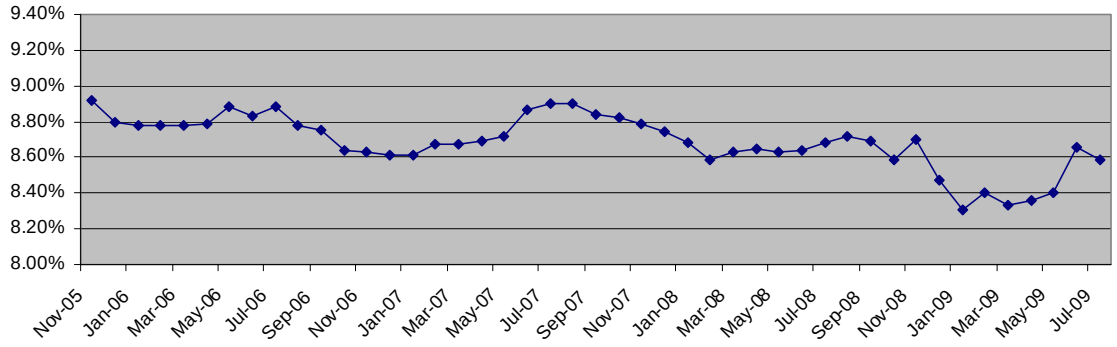
11.2 Please provide this chart with the assumption of a 50% adjustment instead of a 75% adjustment since inception of the formula.

Response:

Please refer to the chart below which includes the assumption of a 50% adjustment instead of a 75% adjustment since inception of the formula.

BCUC Formula ROE Based on Monthy GCB Forecasts

(based on a 50% adjustment)



12. Exhibit B-1 – Cover Letter Page 24 – Business Risk

The following key drivers of competitiveness and business risk have changed for TGI in recent years:

- Provincial climate change and energy policies has increased the risk inherent to TGI's core natural gas business;
- Natural gas' competitive position relative to electricity has been weakened;
- TGI is capturing a smaller percentage of new construction;
- Electricity is increasingly the choice of high-density housing;
- Alternative energy sources further weaken TGI's competitive position; and
- Fuel switching has also diminished demand for natural gas.

12.1 Are bullet points 2, 3, 4 and 6 really all the same business risk and the distinction is just that Terasen is pointing out the different sides of the coin or are there really major distinctions to be made between these points.

Response:

The question refers to four key drivers that impact throughput levels on the TGI system and contribute to the increased business risk of TGI:

- Natural gas competitive position (point 2);
- TGI is capturing a smaller percentage of new construction (point 3);
- Electricity is increasingly the choice of high-density housing (point 4); and
- Fuel switching has also diminished demand for natural gas (point 6).

These factors along with provincial climate change and energy policies, and the continued trend to find alternative energy sources further weaken the competitive position of the Terasen Utilities and therefore have increased the risk inherent to the core natural gas business and competitive position. These are recognized as individual factors because each item identified presents barriers or obstacles that must be overcome individually for throughput volumes to

stabilize or increase on the Terasen Utilities systems. The major reason for identifying these key drivers separately is to help understand the obstacles or barriers each factor present to the gas distribution business of the Terasen Utilities.

Due to the fact that each factor presents its own challenges and obstacles, by addressing and solving one factor, there is no guarantee that this will result in improved total throughput levels on the TGI system

Consequently, Terasen Gas has taken a multifaceted approach to address the challenges presented by these factors in hopes of reducing the risks that these factors pose to recovery of investment in gas distribution assets over the long term.

See the response to CEC IR 1.19.1 for discussion of activities that the Terasen Utilities have undertaking to address the competitiveness of natural gas to alternate energy sources.

12.2 What specific alternative energy sources other than electricity is Terasen referring to in bullet point 5?

Response:

Terasen Utilities at present refer to the following alternative energy sources that provide heat or thermal energy:

- Electricity;
- Geothermal or geo-exchange;
- Solar thermal;
- Biomass; and
- Waste Heat Recovery.

There may be other technologies that evolve over time that the Terasen Utilities would look to include on this list.

12.3 Please describe the tax reductions or tax deferrals Terasen has experience from the Federal Government and the Provincial Government since 2000 and identify the amount of the reductions and timing of the reductions and in what way they may affect business risk.

Response:

Annual tax reductions from 2000 to the present relate mainly to changes to the statutory corporate income tax rates and Capital Cost Allowance ("CCA") rates brought about by changes in tax legislation and regulations. Changes to Federal and Provincial income taxes and capital taxes are summarized as follows:

- Federal Income Tax rates have been reduced from 28% in 2000 to 19% in 2009;
- BC Income Tax rates have declined from 16.5% in 2000 to 11% in 2009;
- The Federal Corporate Surtax was eliminated on January 1, 2008;
- The Federal Large Corporations Tax was eliminated on January 1, 2006; and
- The BC Corporations Capital Tax was eliminated August 31, 2002.

The following table summarizes the annual statutory tax rate changes from 2000 to 2009:

	00	01	02	03	04
Income Tax Rates					
Federal basic	28.00%	27.00%	25.00%	23.00%	21.00%
Federal Surtax	1.12%	1.12%	1.12%	1.12%	1.12%
BC Rate	16.50%	16.50%	13.50%	13.50%	13.50%
Total	45.62%	44.62%	39.62%	37.62%	35.62%
Large Corp. Tax Rate	0.225%	0.225%	0.225%	0.225%	0.200%
BC Corp. Capital Tax	0.30%	0.25%	0.10%	0.000%	0.000%

Income Tax Rates	05	06	07	08	09
Federal basic	21.00%	21.00%	21.00%	19.50%	19.00%
Federal Surtax	1.12%	1.12%	1.12%		
BC Rate	12.75%	12.00%	12.00%	11.50%	11.00%
Total	34.87%	34.12%	34.12%	31.00%	30.00%
Large Corp. Tax Rate	0.175%	0.000%	0.000%	0.000%	0.000%
BC Corp. Capital Tax	0.000%	0.000%	0.000%	0.000%	0.000%

The primary CCA changes are highlighted as follows:

Effective February 2005

Asset Description	Previous CCA Rate	New CCA Rate
Natural gas transmission pipelines	4%	8%
Natural gas transmission compressors	4%	15%

Effective March 2007

Asset Description	Previous CCA Rate	New CCA Rate
Natural gas distribution pipelines	4%	6%
LNG Equipment	4%	8%
Non-residential buildings	4%	6%
Computer Hardware	45%	55%

Effective January 27, 2009 to January 31, 2011

Asset Description	Previous CCA Rate	New CCA Rate
Computer Hardware	55%	100%, no half year rule

The tax rate reductions are beneficial to customers as TGI's revenue requirement is reduced to reflect a lower required tax recovery. However, the beneficial tax changes do not directly improve TGI's business risk assessment to the extent that these changes do not apply solely to TGI relative to its competitors, and therefore, do not appreciably enhance TGI's competitiveness relative to its competitors.

In contrast to the tax reductions noted above, the carbon tax on fossil fuel was introduced in 2008, and has and will continue to increase TGI's business risk as it has increased the cost of natural gas versus non-fossil fuel based energy, as well as against imported electricity that is generated by fossil fuels, which is exempt from the carbon tax. As well, the Company's operating costs through TGI's own use cost of gas, has increased, which has a further negative impact on TGI's competitive position.

From a financial perspective, the tax rate reductions noted above have had a negative effect on TGI's interest expense coverage by reducing earnings before interest and tax ("EBIT"). This reduction in EBIT has negatively affected TGI's credit metrics, where further weakening of credit metrics may lead to a credit rating downgrade. In addition, the reduced EBIT has put some pressure on financial covenants, which in the future could put TGI in a situation where failure to meet financial covenants could restrict the issuance of long term debt, or contribute to non-compliance under its loan documents.

12.4 At Terasen's Customer workshop it describes new strategic directions for the company to aggressively get into the alternative energy business and to change several of these trends therefore reducing business risk and improving returns to shareholders. How can Terasen develop these directions such that the business risks it poses are offset?

Response:

In the recent TGI Revenue Requirement Application ("RRA") submitted on June 15, 2009, TGI has proposed a number of solutions to address the changing environment in which TGI operates. As the question indicates the Company intends to offer alternative energy solutions in combination with natural gas services, in order to provide a more comprehensive set of energy service options to meet the changing needs and expectations of customers.

The business risks that Terasen Utilities face as laid out in this ROE Application will continue to impact the existing natural gas business. However, Terasen Gas is seeking to find solutions to make natural gas a part of the energy mix in the long term, while helping to achieve the government's energy and climate change policy objectives.

With the introduction of the new energy solutions described in the RRA, TGI is trying to reduce the exposure that existing natural gas customers would face if TGI were to take a "do nothing approach". All else equal, if volumes decline on the TGI system, the remaining customer base would pay more for TGI delivery service due to an increase in the unit charge per GJ delivered to customers.

One of the objectives behind TGI offering new alternative energy solutions to customers is to spread common costs that exist in the natural gas business to these new alternative energy solutions. The sharing of common costs will be beneficial to existing natural gas customers, however it is likely to be a number of years before this benefit is materially realized. The alternative energy solutions that TGI has included in the RRA therefore do not immediately reduce the business risk inherent to the natural gas business.

The alternative energy proposals have not yet been approved by the Commission. The natural gas business risk will be mitigated to a degree if the Commission agrees with the new alternatives development and the Terasen Utilities are successful in attracting new business in these areas so that enough shared services costs can be allocated to these new energy alternative solutions over time to help in offsetting the impact of lost throughput on the natural gas systems. It is also the intent that by providing new alternative energy solutions, the Terasen Utilities will be better able to keep natural gas as part of the solution relating to delivering integrated energy solutions to customers.

13. Exhibit B-1 – Cover Letter Page 25 – Business Risk and ROE

Notwithstanding the fact that the ROE formula is broken and demands a response from the Commission to establish a more appropriate, higher level of ROE for TGI, TGI's increased business risk warrants (i) a higher return than it did in 2006 when the Commission last considered the benchmark ROE and (ii) the equity component of TGI's capital structure be increased.

13.1 Does Terasen have any quantitative assessment of how much ROE increase should be associated with how much increase in business risk and how much ROE decrease should be associated with how much decrease in business risk?

Response:

A business risk assessment is by its very nature qualitative, not quantitative. The various elements of business risk are inter-related and, for ROE purposes, it is impossible to isolate and quantify individual business risk factors. Moreover, there is no accepted methodology for quantifying increments of ROE for individual business risk factors. Nevertheless, there is a positive relationship between business risk and cost of capital, that is, the higher the business risk, the higher the cost of capital. In preparing its 2009 ROE and Capital Structure Application, the Terasen Utilities carried out a comprehensive qualitative analysis of its business risk to assess the trends over time. Although the TGI 2009 ROE and Capital Structure Application that was filed focuses on the changes since 2005 (and which were identified in the 2005 ROE Application), the Terasen Utilities extensively considered all the elements of business risk, which include: changes in natural gas supply environment, regulatory method, price and non-price competition from alternative energy sources, operating advantage/disadvantage of natural gas versus other energy sources, trends in market capture rates, trends in usage rates and potential accounting changes.

13.2 Does Terasen have a comprehensive assessment of risks, which it has studied and used to determine whether or not risk is decreasing or increasing as opposed to what looks like an ad hoc enumeration of selected qualitative issues?

Response:

Please refer to CEC IR 1.13.1.

14. Exhibit B-1 – Cover Letter Page 29 - AAM Formula Criteria

In designing an automatic adjustment formula, there should be a balance among the following criteria. An automatic adjustment formula should:

1. be relatively simple to understand and apply;
2. be based on changes in one or more reasonably available and verifiable variables;
3. exclude changes in variables due to abnormal market events;
4. incorporate variables which vary in a quantifiable way with the utility cost of equity; and
5. incorporate variables which are not vulnerable to changes caused by company-specific circumstances which may not impact on the cost of equity for the utilities to which the formula applies.

14.1 What specific variable would be reasonably required in order to meet the test of reasonable and verifiable variables?

Response:

The question does accurately paraphrase page 29 of the Cover Letter. The bullet paraphrased in the question said "reasonably available".

The Consensus forecast of 30 year GCB yields is one such variable that is reasonably available and verifiable. A Canadian utility corporate bond index compiled by a major stock exchange, if one were to exist, would be another such variable.

14.2 What changes in variables and what abnormal market events should be excluded?

Response:

As indicated in the Application and evidence of the experts, the Long Canada bond yields are abnormally low and reacting to the scarcity of supply and the financial crisis.

14.3 Isn't Terasen asking for a very abnormal financial crisis to be incorporated into the ROE?

Response:

No. The third criteria listed seeks to exclude changes in variables due to abnormal market conditions. The overall return being sought is one that is based on comparable returns that have been achieved and are expected from similar enterprises according to the Fair Return Standard. Such a return expectation does not fluctuate dramatically from month to month or year to year in response to movements in the long term GCB yield which the current AAM suggests.

14.4 Which variables would vary in a quantifiable way with utility cost of equity?

Response:

Terasen would expect that corporate utility bonds would be positively correlated with the utility cost of equity. There may be others though Terasen is not in a position to lead evidence on such variables nor does it have confidence at this time as to the degree of correlation of corporate utility bond yields with the cost of equity. Terasen believes it is reasonable to expect that corporate bonds would incorporate an element of a risk premium over similar term government bond yields related to the enterprise.

In the recent financial crisis, corporate bond spreads widened, more than offsetting the decrease in the abnormally low Canada bond yields, resulting in higher absolute costs of corporate debt issuance. In this instance, the corporate bond yields, given the underlying movement in credit spreads has moved in the same direction as the cost of equity in the market.

14.5 What variable would be not vulnerable to changes caused by company specific circumstances?

Response:

It is unlikely that GCB yields and inflation would be vulnerable to company specific circumstances. A Canadian utility bond index that incorporated the bonds of similar companies would in some ways be impacted by company specific circumstances, depending on the portion of the index relating to its bonds. The point is the Company is not proposing a formula at this time.

14.6 If the GCB yields was used to pick up interest rate sensitivity and Canadian Corporate Bond Spreads was used to pick up risk sensitivity and Canadian Equity Market Returns was used to pick up sensitivity to the cost of equity capital what proportions or mix of these would Terasen suggest might be appropriate?

Response:

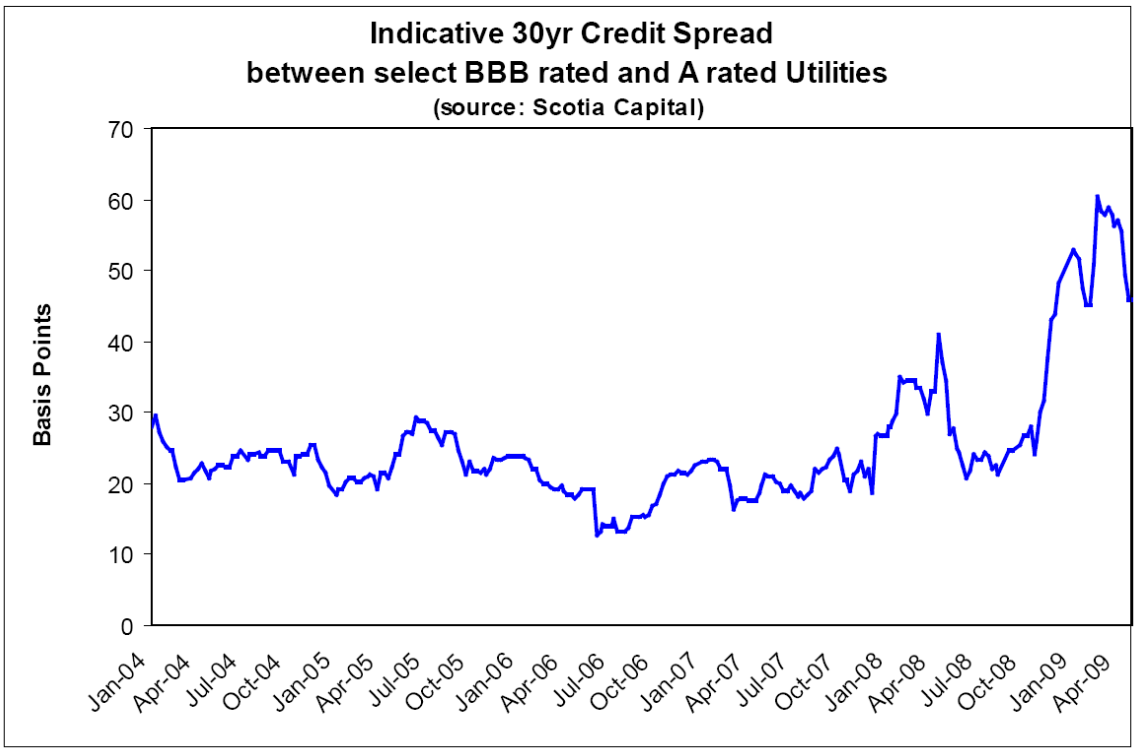
As discussed in the responses above, Terasen is not proposing a formula.

14.7 If not the variables above what other variables would Terasen recommend as fitting the requirement criteria described and in what proportions would they be appropriate?

Response:

As discussed in the responses above, Terasen is not proposing a formula.

15. Exhibit B-1 – Cover Letter Page 36 – Spread between BBB credit and A credit



15.1 What would the cost to customer be if Terasen were a BBB rated credit and the above spreads applied to Terasen debt?

Response:

It is not possible to determine the specific costs incurred, should TGI become a BBB rated credit. There would be both direct and indirect costs.

Direct costs would be primarily in the form of higher borrowing costs, such as:

- For LTD - As noted in the graph above, credit spreads for a BBB rated issuer, in current market conditions, is in the range of approximately 40 basis points to 60 basis points, which, on approximate $1.5 billion of long term debt, would be an incremental cost of $6 million to $9 million pre-tax on an annualized basis.

- For STD - In addition, as a BBB rated issuer, TGI would not be a commercial paper issuer and have to borrow on a short term basis through its operating credit facility. Utilizing the current bank facility, TGI would incur the bank borrowing margin which, for a BBB rated entity, would be in the range of 50 basis points. Assuming an average borrowing of between $200 million and $300 million, the incremental cost would be in the

$1 to $2 million, on a pre-tax basis annually. Note that TGI's bank facility matures in 2013. It's current bank facility borrowing costs are below market. A credit spread for a BBB rated entity would be in the range of 250 basis points, as opposed to 50 basis points. On an average bank balance in the $200 to $300 million range, the cost would be $5 million to $7 million annually.

- LCs - TGI currently has letters of credit outstanding of approximately $45 million. The letters of credit are provided by its credit facility at a cost of approximately 35 basis points. As a BBB rated issuer, an incremental cost of 15 basis points, or $70,000 would be incurred annually. Additionally, as a BBB rated issuer, counterparties on our gas supply portfolio may require credit support in the form of letters of credit. It is not possible to determine the quantum of letters of credit that may be requested, but to the extent letters of credit would be requested, the cost would be approximately 50 basis points on the face value of the letter of credit. For every $10 million letter of credit, the annual cost would be $50,000.

For indirect costs the primary impact would be restrictions on hedging activity. TGI does not hedge with counterparties that are less than A-rated so it may find that the number of counterparties willing to hedge is reduced and that the ability to enter into longer term hedges out to 36 months is constrained. In this situation, the customer would lose the benefit of gas cost stability that TGI provides through its price risk management program.

Finally, while it is accepted that costs will be higher due to a credit rating downgrade, it appears that the question is framing an argument that the cost to a downgrade can be compared to the incremental costs that would be incurred to provide an ROE and capital structure consistent with that being requested by TGI. TGI's request is appropriate and justified on the basis that it is addressing the Fair Return Standard. In addition, as the BCUC recognized in its March 2006 cost of capital decision:

> *"As for the JIESC's lowest cost argument, the Commission Panel shares the view of the NEB, which recognized that "lowest possible" was not the appropriate test when it stated, at page 25 of its RH-2-94 Decision on generic cost of capital:*
>
> > *'Contrary to what some parties advocated during the hearing, the Board is of the view that it is not appropriate to over-leverage a pipeline in order to identify the minimum acceptable deemed common equity ratio possible.'"*

16. Exhibit B-1 – Cover Letter Page 37 – Hedging Counter Party Credit Requirements

From an operational perspective, an A rating plays a key role in TGI's gas supply and hedging strategies. In a typical year, TGI will purchase in excess of $1 billion of natural gas depending on market prices. In addition, TGI utilizes commodity derivatives to hedge the price volatility of natural gas faced by consumers. Derivatives are placed on underlying gas supply for amounts in excess of $300 million in a typical year. Currently, counterparties to TGI do not require collateral in the form of letters of credit, nor has TGI experienced any restrictions on the amount of unsecured credit counterparties have extended to TGI. Such restrictions would limit TGI's ability to pursue its gas supply and hedging strategies. This lack of restrictions to date is due in part to the counterparties' view of TGI as a strong investment grade entity, based on the minimum A credit rating.

16.1 Given that Terasen has competitors for gas supply who will provide firm forward prices to customers, is it necessary for Terasen to take on the hedging risks and costs for all customers?

Response:

The Terasen Gas hedging program is an important tool in mitigating market price volatility on behalf of customers who choose to remain with the utility standard rate offering as opposed to the fixed price offerings offered by marketers under the commodity unbundling program. The costs or gains associated with the hedging activities are borne only by those customers that choose to remain on the Terasen Gas commodity offering. Terasen Gas views the hedging program as an essential part of the utility standard rate offering.

The primary objectives of the hedging program, which affects the Terasen Gas standard commodity offering, are to improve the likelihood that natural gas remains competitive with electricity over the term of the Plan, moderate the volatility of market gas prices and their effect on rates for customers, and reduce the risk of regional price disconnects.

The first objective of managing electricity rate competitiveness is important for both customers and Terasen Gas as retention and growth of customer load helps to maintain reasonable rates for all customers and in consideration of the fact that BC Hydro is facing an era of higher costs in increasing its electricity self-sustainability going forward. Terasen Gas believes these objectives have served customers well, providing value through rates significantly less volatile than prices in the natural gas marketplace at a reasonable cost.

The latter two objectives relate to reducing market price volatility and its effects on resultant rates for customers choosing to remain on the Terasen Gas standard rate offering. Customers have expressed their desire for rate stability through the results of the Residential Customer Price Volatility Preferences Study, conducted in February 2005 by Western Opinion Research Inc., submitted in the Terasen Gas 2005-2008 Price Risk Management Plan. The study results showed that customers were willing to accept a maximum annual bill increase of 17% (based on those study respondents with an average annual gas bill of over $900). This is certainly less than the volatility experienced recently in the natural gas marketplace. For example, during 2008 Terasen Gas' residential rates increased by a total of 22%, above the tolerable rate increase of 17% indicated in the customer survey. Residential commodity rate increases occurring in 2008 became effective April 1, 2008 and July 1, 2008, with each commodity rate change representing an 11% increase in residential rates. Without the use of hedges the rate increases requested in 2008 would have totalled approximately 36% (based on the cost of gas twelve-month outlook without hedges in place). The AECO forward price curve, looking 12 months out, increased by about 50% during the same period. In October 2008, Terasen Gas' commodity rate reverted back close to the level prior to the price run-up during the middle of 2008, with a reduction in the residential rate by about 15%. So while the Terasen Gas rate does not follow market prices all the way down following price spikes, it also does not follow prices all the way up either, saving customers from rate shock and the 'rollercoaster' ride of market price volatility and improving the probability of remaining competitive with electricity rates.

Should customers wish to have greater commodity rate stability than that provided by the Terasen Gas commodity offering, they have the choice to select a fixed rate for up to 5 years from a marketer.

With respect to the risks associated with counterparty credit exposure resulting from the hedging activity, Terasen Gas has prudent and well-managed controls and policies which protect Terasen Gas and its customers from such risks. To date, Terasen Gas has been successful in receiving all amounts owing from its counterparties despite the financial crises, wherein some counterparties have encountered credit rating downgrades or gone bankrupt, that have occurred over the past years.

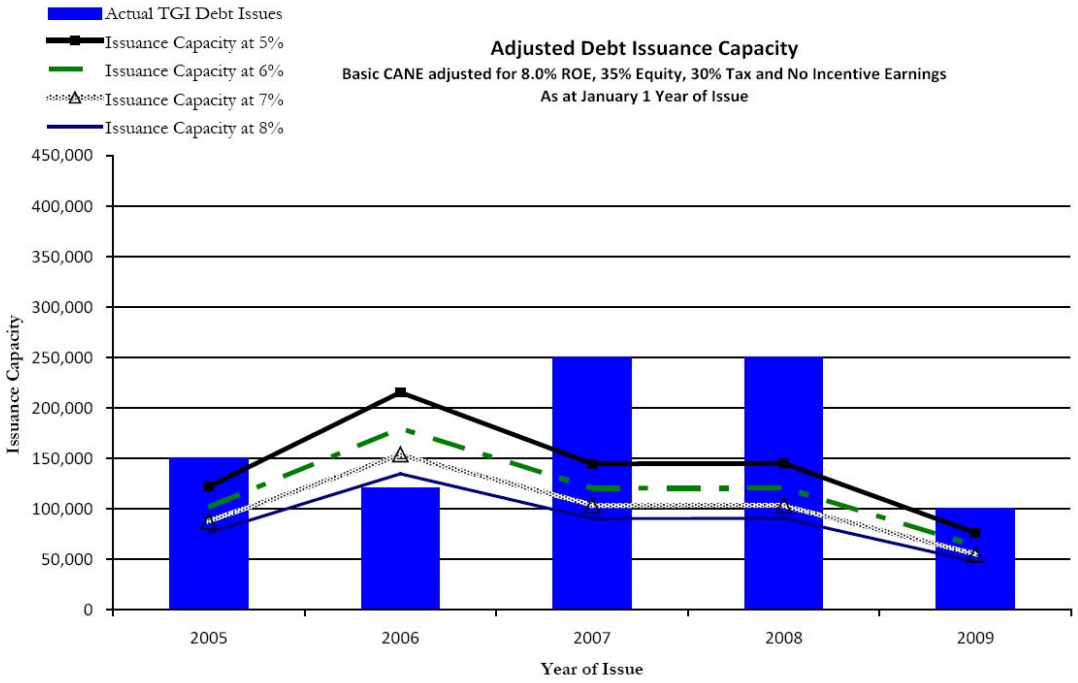
16.2 Would it be possible to pass on the costs of the hedging and price stability to customer who want that with a rate rider and exclude this cost for customers who do not want to pay the costs for the price stability?

Response:

Please see the previous response to CEC IR16.1 for a description of the objectives and benefits of the hedging activities performed by Terasen Gas for the benefit of the customers who remain with the Terasen Gas standard commodity rate offering. The hedging program objectives of price stability and competitiveness with other sources of energy benefits all customers that remain with the standard commodity rate offering and so it is appropriate that any associated costs or benefits are also borne by these customers. It is not practical to stream those costs or benefits to specific customers.

With the development of the Terasen Gas Customer Choice Program customers (residential and commercial) who want a greater degree of price stability have a vehicle to purchase gas from a third party on a fixed price.

17. Exhibit B-1 – Cover Letter Page 39 – CANE and Debt Capacity



17.1 How restrictive are the borrowing capacity limits Terasen refers to? Do they create a firm bright line or is there flexibility?

Response:

As TGI noted on page 38 of its Application, in recent years, the new issue incurrence test has not restricted debt issuance, as a combination factors including the achieved level of ROE, tax rates and incentive earnings contributed to a level of earnings sufficient to allow TGI to issue debt as required.

TGI, in the graph included in the preamble to question 17, has demonstrated that the test can be restrictive, in a scenario with continued low ROE, declining corporate tax rates and no incentive earnings, which is a situation currently facing Terasen.

The test itself is a bright line test in that TGI has to meet a minimum coverage of two times interest expense.

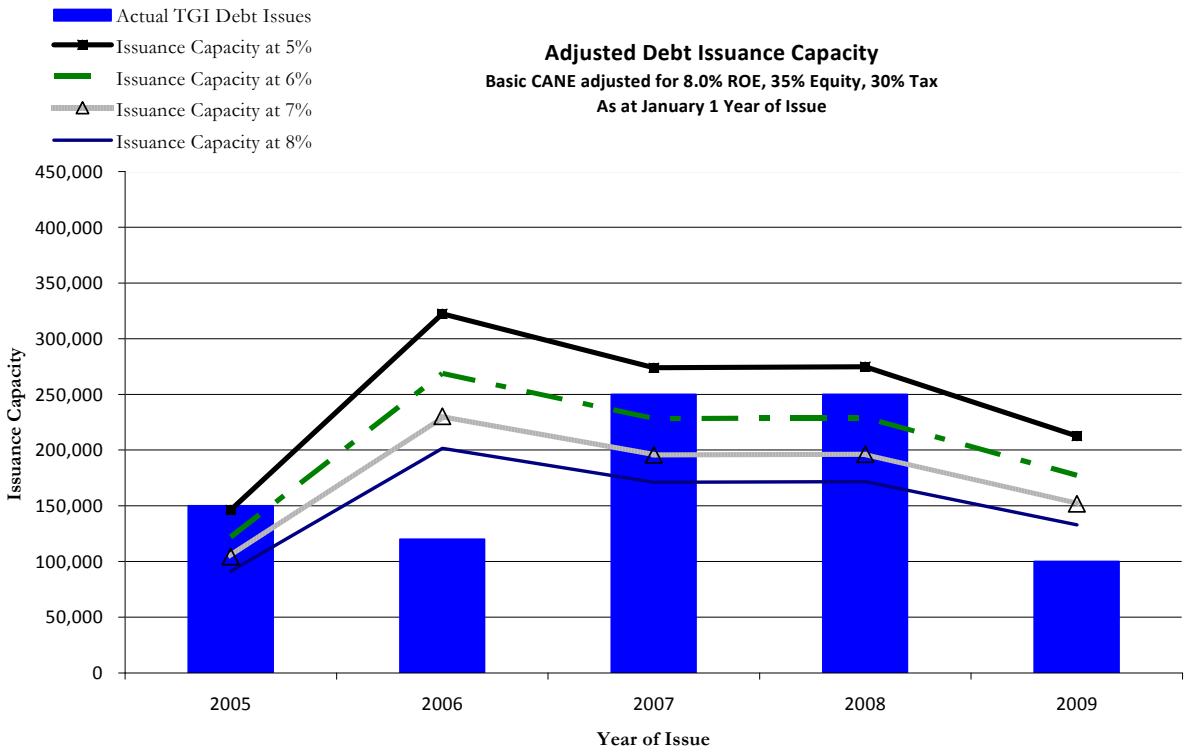
17.2 How much of this capacity is or has been dependent on the incentive earnings Terasen has been able to achieve?

Response:

Incentive earnings have in the past provided increased capacity to issue debt. The effect on capacity is illustrated in the recast graph found below in response to CEC IR17.3.

17.3 Please recast the second graph 'Adjusted Debt Issuance Capacity' with the incentive earnings included and the other variables the same.

Response:



18. Exhibit B-1 – Cover Letter Page 35 – Credit Rating

"TGI's financial metrics are generally weaker than those of its A3 rated global LDC peers such as Piedmont Natural Gas Company, Inc., Northwest Natural Gas Company, Connecticut Natural Gas Corporation, Public Service Co. of North Carolina, UGI Utilities and sister company, TGVI. Moody's recognizes that TGI's relatively weaker financial metrics are largely a function of the relatively low deemed equity and allowed ROE permitted by the BCUC. In general, Canadian deemed equity ratios and allowed ROEs are low relative to those of other jurisdictions and TGI's are among the lowest in Canada. However, TGI's A3 senior unsecured rating reflect Moody's view that TGI's relatively weaker financial metrics are offset to a significant degree by the supportiveness of the business and regulatory environments in which TGI. Moody's rating methodology model for North American LDCs indicates a Baa1 rating for TGI which is one notch below the company's A3, senior unsecured published rating assigned by Moody's rating committee. TGI's published rating exceeds the methodology-implied rating because Moody's rating committee places greater emphasis on the supportiveness of TGI's regulatory and business environments than the rating methodology model does. The methodology-implied rating falls within the one to two notch band that Moody's rating methodologies aim to achieve."[13]

18.1 If Moody's credit rating tolerates a lesser ROE and Capital Structure Equity Size because of the supportiveness of the regulatory and business environments would Terasen expect the regulatory environment to become less supportive if it were to be awarded the sort of return on equity and equity thickness it is asking for?

Response:

Holding constant the number of factors that determine a credit rating, TGI would not expect that a BCUC decision consistent with the requested ROE and equity thickness would be viewed by Moody's as making the regulatory environment less supportive.

By extension, awarding an 11% ROE and 40% equity ratio does not mean that Moody's would view the regulatory environment as more supportive, if for example that award was in relation to addressing increased risks faced by the Company. Moody's in this situation may determine that the level of support was similar to the past, to the extent the regulatory action was a fair and reasoned response to a changing set of circumstance.

19. Exhibit B-1 – Tab1, Page 1 – Traditional Business Risk

Historically, the elements that made up TGI business risk were: the competitiveness of natural gas to alternative energy sources, namely electricity; the ability to attract customers and retain its customer base. These two elements influence the volume of natural gas (throughput) flowing through the TGI system. Ultimately throughput is the vehicle, from variable rates charged to customers, by which almost all of TGI's investments are recovered. All else equal, if throughput levels decline for whatever reason, TGI business risk increases.

19.1 What has Terasen done to mitigate the issues it has with regard to the competitiveness of natural gas to alternative energy sources?

Response:

The Terasen Utilities continue to be proactive in taking steps to improve the competitiveness of natural gas to alternative energy sources, including electricity. Competitive barriers can be financial and non-financial in nature, but ultimately they are barriers that impact the use of natural gas in homes and businesses in B.C., impacting the total throughput on the systems of the Terasen Utilities over time.

The Terasen Utilities consider key business issues that impact throughput on their systems as being:

- Provincial climate change and energy policies have increased the risk inherent to the Terasen Utilities core natural gas business;
- Natural gas' competitive position relative to electricity has been weakened;
- The Terasen Utilities are capturing a smaller percentage of new construction with natural gas service;
- Electricity is increasingly the choice for space and water heating in high-density housing;
- Alternative energy sources further weaken the Terasen Utilities competitive position with respect to natural gas distribution; and
- Fuel switching has also diminished demand for natural gas.

When evaluating the business risk of a gas distribution utility, it is the longer-term fundamental business risks that must be given primary consideration. If these risks reduce throughput, all else equal, rates will rise, further increasing business risk.

Other business issues as discussed in BCUC IR 1.40.1 and 1.40.2, also pose risks to the Terasen Utilities. However, in this Application the Terasen Utilities have focused on the business risks that have significantly changed since the last ROE hearing in 2005. The proactive steps the Terasen Utilities have taken to address these changes since 2005 are discussed below.

As stated in CEC IR 1.12.1, the Terasen Utilities have recognized the 6 business issues as independent factors because each item identified presents barriers and or obstacles that must be overcome individually for natural gas throughput volumes to stabilize or increase on the Terasen Utilities’ systems. Due to the fact that each factor presents its own challenges, by addressing and solving one factor, there is no guarantee that this will result in improved total throughput. Consequently, Terasen Utilities have taken a multifaceted approach to address the challenges presented by these business issues in hopes of reducing the risk these factors pose to the ability of the Terasen Utilities to recover their investment over the long term.

Below is a summary table of the risks factors relating to competitiveness that the Terasen Utilities have outlined in this Application and the Companies’ responses to those challenges. A further detailed discussion then follows on each issue. The Terasen Utilities have been proactive in bringing forth solutions to meet customers’ needs and to help lessen the business risks that are impacting the Companies’ business.

Business Risk Factors that Impact Throughput on Terasen Utilities' Systems	Challenges or Barriers to the natural gas business	Solutions to Reduce Business Risk	Actions Taken by the Terasen Utilities to Reduce Business Risk
1) Provincial climate change and energy policies have increased the risk inherent to core natural gas business	• Consumers look to reduce their use of fossil fuels in order to align with climate change objectives • Changing perception and behavior of consumers, particularly in B.C. as to the use of natural gas as an energy source • Encouraging reduction of GHGs, lowering energy consumption, and developing alternative (renewable) energy sources	1. <u>One climate system</u> • Examining GHGs on a regional basis rather than provincial 2. <u>Efficient use of existing energy</u> • Energy efficiency and conservation • Encouraging the right energy source for specific end uses. Using the "right energy form, for the right activity at the right time" 3. <u>Integrated energy grids</u> • Energy moves freely between jurisdictions therefore need to develop solutions that reflect this reality 4. <u>Development of alternative energy sources</u> • Natural gas is a foundational energy form that will supplement the use of other energy sources 5. <u>Price signals</u> 6. <u>Education</u> • Consistent messaging to customers about the right use of energy	• Meeting with Government ministries and other related agencies to promote Terasen's view on assumptions, solutions and path forward on how we reach these government goals and objectives o Participating in government committees and working groups. • The following reports have been used to communicate the solutions: o Smart Gas Strategies for BC o QUEST White Papers o Northwest Gas Association White Paper • Expanded EEC programs • Expanded natural gas service offerings (i.e. NGV, LNG and biogas) and integrated alternative energy solutions that are contained in recent TGI and TGVI Revenue Requirement Applications

Business Risk Factors that Impact Throughput on Terasen Utilities' Systems	Challenges or Barriers to the natural gas business	Solutions to Reduce Business Risk	Actions Taken by the Terasen Utilities to Reduce Business Risk
2) Natural gas competitive position relative to electricity	• Decline in price advantage of natural gas compared to electricity in B.C. • Differing nature of how natural gas and electricity costs are set into customer rates • Volatility of natural gas commodity as compared to electricity • Carbon tax applied to natural gas • Reduced consumption and throughput levels on the natural gas system • Changing perception of customers about how the use of natural gas contributes to climate change and GHG emissions	1. <u>Price Signals</u> • Customers should make decisions based upon proper price signals for both gas and electricity. • Natural gas to compete against the marginal cost of electricity	• Relatively flat delivery rates over the PBR Period (contained costs) • Managing Gas Costs: o Annual Contracting Plans and Price Risk Management Plans to help enhance the competitiveness of natural gas relative to electricity o Working with other utilities in the PNW through the Northwest Gas Association • Customer Choice Unbundling Program provided options for customers to lock into rates mitigating price volatility • Participation in the BC Hydro 2007 Rate Design to advocate for appropriate price signals • Participation in the BC Hydro 2008 LTAP to promote right use of fuel in right application • Lowering barriers to attaching customers to the natural gas grid o Main Extension (MX) Test Application • Expanded EEC programs

Business Risk Factors that Impact Throughput on Terasen Utilities' Systems	Challenges or Barriers to the natural gas business	Solutions to Reduce Business Risk	Actions Taken by the Terasen Utilities to Reduce Business Risk
3) TGI is capturing a smaller percentage of new construction 4) Electricity is increasingly the choice of high-density housing	• High upfront capital and installation costs for natural gas space heating as opposed to electric baseboards o Most developers select energy forms or solutions based on potential for increased margins when selling homes • Increasing demand for perceived "green" energy	1. Price Signals 2. Education • the right energy form for the right application at the right time and encourage end use gas applications • natural gas, when used in end-use applications can result in lower GHG emissions and lower total energy use in the region by displacing electricity that is generated from fossil fuel.	• New technologies • Lowering barriers to attaching customers to the natural gas grid o Main Extension Test Application o In Suite Piping Application o Thermal Metering Application
5) Alternative energy sources including electricity further weaken TGI's competitive position	• Policies focusing on GHG emission reductions and developing alternative (and renewable) energy sources • Changing perception and behavior of consumers on use of natural gas as an energy source • Increased demand for perceived "green" energy	1. Investment in alternative energy solutions, in conjunction with natural gas as a foundational energy form 2. Integrated energy grids 3. Price Signals 4. Education	• Expanded natural gas service offerings (i.e. NGV, LNG and biogas) and integrated alternative energy solutions as introduced in recent TGI and TGVI Revenue Requirement Applications

Business Risk Factors that Impact Throughput on Terasen Utilities' Systems	Challenges or Barriers to the natural gas business	Solutions to Reduce Business Risk	Actions Taken by the Terasen Utilities to Reduce Business Risk
6) Fuel switching has diminished demand for natural gas	• High volatility and fluctuations in commodity price of natural gas • Differing nature of how natural gas and electricity costs are set into customer rates • Industrial customers seeking the lowest cost energy and have over time switched to biomass, used oil, coal and other energy sources to reduce costs and increase margin.		• Price of commodity determines what energy form industrial/commercial customers will use if they have the ability to switch energy forms (i.e., Greenhouses)

Actions Taken by the Terasen Utilities to Reduce Business Risk

1. Provincial climate change and energy policies has increased the risk inherent to core natural gas business

The Terasen Utilities do not foresee and nor expect to get an accommodation from government(s) once GHG regulations becomes further defined and implemented. In fact we are supportive of the government energy objectives in reducing GHG emissions. Rather than asking government for policy accommodations, the Terasen Utilities have communicated their proposed solutions to government at all levels on how to arrive at the optimal balance for reducing GHG on a regional basis through efficient energy use and the production of energy with an efficient regional integrated perspective. The solution assumptions also include market pricing signals and consistent messaging to consumers of energy. Once common ground is found amongst government, business and other stakeholders related to these solution assumptions, the Terasen Utilities believe that appropriate policy will be put in place by government to achieve these goals. The Terasen Utilities have been actively seeking ways to reduce the business risks rising from provincial climate change and energy policies by proposing solutions to meet the objectives. The Terasen Utilities will continue this discussion with government and other stakeholders in hopes of reducing the business risks that are currently impacting are business.

The Terasen Utilities do not foresee a regulatory environment that exempts the GHG emissions that come from our customers' use of natural gas, given that 17% of BC GHG emission output comes from the consumption of natural gas. Thus, the cost to comply with the provincial GHG reductions targets and/or future regulations will be embedded into the cost to the consumer for using natural gas, just as the carbon tax does today. The future cost may take another form, such as a purchase cost to buy an offset to comply with the regulation or provincial GHG reduction target. This will have a direct impact on natural gas competitiveness to other energy alternatives in the long term, just as the carbon tax does today.

Since the announcement of the Energy Plan in 2007, the Terasen Utilities have continued to bring forth solutions for customers that help them manage their energy cost and support the energy and climate change goals of the government. These programs are discussed below.

a. Expanded Energy Efficiency and Conservation ("EEC") Programs

In 2008, the Terasen Utilities filed an application seeking to expand overall Energy Efficiency and Conservation ("EEC ") expenditures in response to the government policy developments. In addition to the province's 2007 Energy Plan, the *Utilities Commission Amendment Act,* 2008, (Bill 15) demonstrated government's ongoing commitment to energy efficiency and conservation. The new section 44.2 of the Act, pursuant to which the Terasen Utilities brought this Application, requires the Commission to consider "government's energy objectives" in determining whether to approve proposed demand side management expenditures. With this expanded EEC strategy, which was approved by the Commission, the Companies anticipate that EEC activity will continue to provide good value for customers in a manner that is consistent with government's energy objectives. In June 2009, TGI and TGVI both filed revenue requirements applications which seek to increase the spending for EEC in low income and rental housing, interruptible industrial applications and innovative technologies.

The Terasen Utilities have been involved in communicating the benefits of efficient use of natural gas to customers through seminars, trade shows, and other means of communication. The Companies have held seminars with architects, engineers and builders/developers ("AEDs") and have participated in trade shows to increase awareness of natural gas as a foundation energy form and efficient energy source for commercial and industrial customers. Moreover, the Terasen Utilities have educated their residential customers about the right use of natural gas as an energy source through bill communications, website, and brochures for tips.

b. Expanded Natural Gas Service Offerings and Alternative Energy Options in Recent Revenue Requirement Applications

In response to government policies for GHG reduction and development of alternative energy sources, as well as the changing perception of consumers on the use of natural gas an energy source, TGI and TGVI presented in their recent Revenue Requirement Application for 2010 and

2011, economic test and regulatory framework to support new alternative energy solutions, such as gas compression service for Natural Gas Vehicles, biogas upgrading, geothermal and district energy systems. These new service offerings will help customers to meet challenges and capture opportunities presented by a new focus on climate change and alternative energy sources. Bringing these solutions forward is the first step to help reduce the impact of government policies on existing natural gas customers, as it is likely to be a number of years before the benefit of these undertakings is materially realized.

c. Meeting with Government at All Levels

Since the 2007 Energy Plan was announced, the Terasen Utilities have met with government ministries to discuss and advocate solutions to climate change and energy related issues and policies. Particularly, the Terasen Utilities have a close association with BC's Ministry of Energy, Mines and Petroleum Resources ("MEMPR"), but have also met with the Ministry of Environment, Ministry of Transportation, Ministry of Education, Ministry of Agriculture and the Climate Action Secretariat and others.

In these meetings the Terasen Utilities have presented solutions to help meet the government objectives by developing a vision of using alternative energy sources, which will be supplemented by natural gas as a foundational energy form. These solutions and vision are discussed in various publications that Terasen Utilities have help developed in recent years:

- Smart Gas Strategies for BC - Canadian Gas Association working in conjunction with Terasen produced a report describing three approaches to improve the energy system, including use available energy efficiently, introduce alternative energy options, and move towards integrated community energy solutions (See Attachment 19.1 for a copy of A Vision for British Columbia's Energy Future: Smart Gas Strategies).

- QUEST White Papers – The Terasen Utilities participated in Quality Urban Energy Systems of Tomorrow ("QUEST"), which is a consortium of municipalities, provincial and federal governments, utilities and private industry, workshops in working together to promote an integrated approach for energy services in Canadian communities. To reach the federal government's 2020 target of reducing national emissions by 20% from 2006 levels, addressing energy use and emissions in urban areas and communities must be part of the solution. These two White Papers are a synthesis of the discussions and conclusions from the workshops in 2008 and 2009 (See Attachment 19.1 for a copy of QUEST White Paper I and QUEST White Paper II).

- Northwest Gas Association White Paper – explores the role of natural gas in addressing climate change, some practical steps consumers across the region can take to reduce their carbon emissions and the policy principles and initiatives to climate change (See Attachment 19.1 for a copy of Northwest Gas Association White Paper)

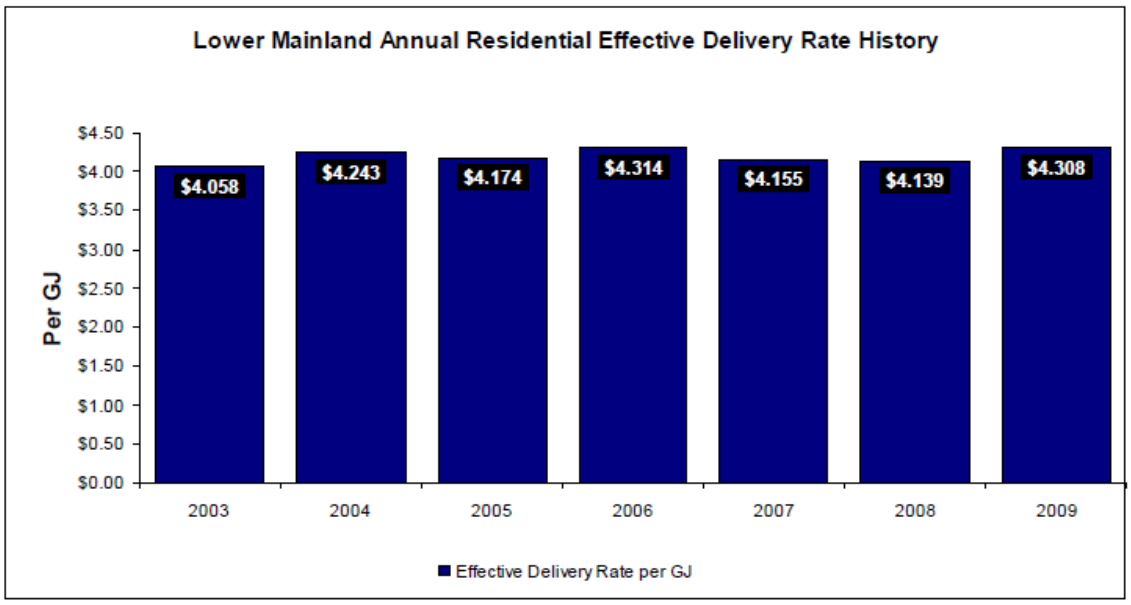
2. Natural gas' competitive position relative to electricity have been weakened

Energy decisions and use are becoming more complicated for customers to understand. There are more barriers that impact the use of natural in homes and business in B.C. today than in the past, which impact the total throughput on the Terasen Utilities systems over time. Undertakings of the Terasen Utilities to help overcome these competitive barriers are discussed below.

a. Relatively Flat Delivery Rates over the PBR Period

TGI has operated under an evolving model of performance-based ratemaking ("PBR") through settlements negotiated with customers and approved by the Commission, in which the Company has managed to keep delivery rates relatively flat over this time, despite throughput declining.

The following figure shows the effective delivery rate from 2003-2009 for Lower Mainland Residential customers and demonstrates the stability in delivery rates throughout the PBR Period. This similar pattern is also seen in other rate classes and service areas.



Assumes:
Natural gas use of 95 GJ
Terasen Gas effective rate includes basic charge and riders

b. Participation in the BC Hydro 2007 Rate Design

On March 15, 2007, BC Hydro filed its first general Rate Design Application ("RDA") since 1991 to update its rates and Terms and Conditions of Service. The Terasen Utilities' participation and position in this proceeding was mainly in the context that the BC Hydro RDA could do significantly more to promote achievement of the objectives included in the 2007 BC Energy Plan. In particular, the Terasen Utilities proposed there be initiatives or rate structures resulting in the avoidance of additional electric load, specifically, that load related to new space and water heating. The Terasen Utilities expressed their view that that electricity is not the "right energy form" for space and water heating.

c. Participation in BC Hydro 2008 Long Term Acquisition Plan ("LTAP")

On June 12, 2008, BC hydro filed the 2008 LTAP, a ten-year plan for acquiring demand-side and supply-side resources of electricity to meet demand in B.C. The Terasen Utilities' participation and position in this proceeding was mainly within the legislative and policy context, exemplified by "government's energy objectives" and the 2007 BC Energy Plan policy of "right energy form, for the right activity, at the right time". Within this context, the Terasen Utilities encouraged energy form switching and load avoidance consistent with that Provincial objective and promoted natural gas and alternative energy forms for space and water heating applications consistent with the 2007 BC Energy Plan.

d. Main Extension ("MX") Test Application

TGI and TGVI filed a System Extension and Customer Connection Policies Review Application in 2007. The Application was designed to ensure that the proper price signals were being sent to customers wishing to attach to the gas system. In addition the Application was designed to support the Companies' ability to promote the responsible use of natural gas as a method to achieve energy efficiency and optimal use of resources within the broader energy market. The changes requested send the appropriate market signals to developers and customers that are making decisions on using the energy form, for the right activity, at the right time. The changes requested, and approved by Commission, also offset some of the barriers deterring customers from connecting to natural gas. Consequently, the MX Test Review ensured that new customers were paying only fair share of costs to attach to the system.

e. Managing Gas Costs for Core Customers

Terasen Utilities continue to meet the objectives as defined in the Annual Contracting Plan and Price Risk Management Plan in providing reliable and cost effective gas supply for customers. Please see BCUC IR 1.40.2 and 1.88.1.1 for more details on these plans.

f. Customer Choice Unbundling Program

The Customer Choice Unbundling Program gives both residential and commercial customers the ability to manage their natural gas costs by purchasing gas at a fixed price in contracts ranging from 1-5 years.

3. TGI is capturing a smaller percentage of new construction while electricity is increasingly the choice of high density housing

Most developers select energy forms or solutions based on their ability to generate increased margins when selling properties. The high upfront capital and installation costs for natural gas space heating as opposed to electric baseboards have led to electricity becoming an increasingly choice of new construction, particularly of high density housing.

a. Sales Staff Working with Architects, Engineers and Builders/Developers

The Terasen Utilities have three regional sales teams focused primarily on maximizing natural gas use in residential new building construction. Our primary target is space and water heating, followed by lifestyle applications like fireplaces, cooking, barbeques, dryers, etc. The Terasen Utilities have primarily been focused on the multi-family market as this market constitutes the greatest percentage of new home starts in the region. The Companies' focus in this market begins at the planning stage with architects, engineers and builders/developers ("AEDs"). Generally through contacts in the industry, the companies are aware of plans prior to the building permit stage, and have an opportunity to influence energy choice.

Recently, the Companies have been successful in working with AEDs on hybrid solutions – combining gas requirements with renewable heat sources like geo-exchange and waste heat recovery. These hybrid solutions are perfect examples of how traditional gas utility service offerings must evolve to include alternative energy sources to optimize value for our customers, while minimizing the carbon footprint of the building. Hybrid solutions will form a fundamental service offering for the Terasen Utilities in this market now and into the future. The Companies sales staffs help developers determine the costs and the benefits energy usage in each individual project in the hope of determining the optimal energy solution for meeting both

economic thresholds but also energy efficiency and emissions reduction targets. Consequently, the Companies are seeing more and more developers moving towards a hybrid system that utilizes an alternative energy source married to traditional gas sources.

Additionally, the Terasen Utilities have been involved in lowering barriers to attaching customers to the natural gas grid through changes to the MX test and promoting a variety of technologies including in suite piping, and thermal metering, which are described below.

b. Wide Variety of Heating Technologies

The Terasen Utilities continue to investigate and encourage customers to use a variety of technologies for heating that can be both economical for the home/unit owner and beneficial to the developer, who pays for the initial capital installation. Some examples of these technologies include:

- High efficiency forced air furnaces, which are still the most common single family gas appliance;
- Residential boilers - provide heated supply return water to radiators or slab heating. These can be zoned but do not provide cooling. Cooling is traditionally from a separate appliance.
- Ground Source Heat Pumps can be married to a Rohbur Absorption heating/cooling unit. This is more common in European jurisdictions. However this is very costly but is starting to become more popular and costs are coming down.
- Combination Systems - Dual function hot water tanks provides heating hot water to a fan coil and hot air is then distributed through a forced air system and can provide both heating and cooling.
- Direct Vent Heaters – such as those manufactured by Bosche or Paloma. These heaters provide heated supply return water to radiators or slab heating.

c. In Suite Piping Application

TGI filed an Application for a change to the General Terms and Conditions of its Tariff in order to encourage the efficient use of natural gas in Vertical Subdivision developments in 2007. The Company proposed a new approach to providing Service (piping) to Premises (each individual suite) within Vertical Subdivisions, whereby the Company would install meters in the most appropriate location for the particular Vertical Subdivision, typically a meter closet, but continue the piping past the meter to the Premise. This approach would be undertaken in cases where the developer is not able to make space available to put the meter at the exterior wall of the individual Premises, but is able to make space available for a meter closet. In effect, TGI would install the Service Line to the Premises with the Meter Set part way along the Service Line.

d. Thermal Metering Application

TGI filed an Application in 2007 for Tariff Changes to allow for Thermal Metering, for a new program designed to encourage the efficient use of gas for space heating applications in Vertical Subdivision developments. Due to changes in the market place, in the Terasen Utilities' view, there were more Vertical Subdivisions using electric baseboards rather than natural gas for heating purposes. In addition, the 2007 BC Energy Plan highlights a number of options and policy directions aimed at both encouraging efficient use of energy and ensuring that the right energy form is used for the right activity at the right time. It was the Company's view that the introduction of thermal metering would address both the market conditions and the BC Energy Plan by providing a viable and affordable energy option for customers to use gas for space heating applications. While no customers are currently receiving this service, the Companies believe it is still important to have this option available.

4. Alternative energy sources further weaken TGI's competitive position

The overwhelming attention to GHG emission reductions has changed customers' perception of use of natural gas as an energy source and has increased demand for "green" energy and thereby development of alternative sources of energy. The Terasen Utilities, recognizing this need, have been involved in a number of initiatives in alternative energy solutions in conjunction with natural gas as a foundational energy form. These plans are descried in detail in both TGI and TGVI recent Revenue Requirements Applications that have been submitted to the BCUC.

19.2 Natural Gas technology has changes to become much more efficient.

(a) To what extent is any decline in the average use of natural gas due to new efficient furnace technology penetrating the market?

Response:

The main driver in declining use per customer rates is the replacement of low-efficiency natural gas furnaces with higher efficiency models. If all other variables could be held constant, the effect of retrofitting standard efficient furnaces with newer high-efficiency units is estimated to be a yearly decrease in residential use per customer rates of approximately 0.9 GJ per year. The effect of retrofitting mid-efficient furnaces with newer high-efficiency units is estimated to be a yearly decrease in residential use per customer rates of approximately 0.2 GJ per year.

(b) To what extent is the decline in average use of natural gas due to thermostat control technology?

Response:

Although Terasen is able to estimate a number of current characteristics and behaviors with regards to energy use in the home through preliminary figures from the 2008 Residential End Use Study (“REUS”), including the presence and use of thermostat technology, there is currently insufficient data available to estimate the extent by which thermostat technology is contributing to the decline in average annual use per customer.

(c) To what extent is the decline in average use of natural gas due to the trend toward smaller multi-family dwellings?

Response:

This trend towards smaller multi-family dwellings in the housing mix is impacting the average use per customer. The independent effect of the shift towards more multi-family dwellings in the housing mix is estimated to be a 0.1 to 0.2 GJ per year decline in average use per customer rates.

(d) To what extent are declines in average use due to decreases in average family sizes in the homes using natural gas?

Response:

As a result of a longer-term trend towards having fewer children, and also an increased presence of older households where children have left the home, the average household size is slowly but consistently declining. This trend does impact the demand for natural gas, since space and water heating requirements change as does the average household size. However, at this time Terasen is unable to estimate the impact of declining household sizes on average annual use, as there is not enough information available to assist in developing an estimate.

19.3 Why isn’t Terasen’s business risk decreasing with declines in average use? Doesn’t natural gas usage as a heating fuel become more competitive with alternative fuels the more efficiently it is used?

Response:

All else being equal, declines in annual throughput levels will impact the customers of the Terasen Utilities in a number of ways. First, the customer would realize savings from the commodity portion of the monthly bill. However, given there are fixed costs associated with the distribution of natural gas to customers, declining throughput places upward pressure on delivery rates. At the same time, customers who are contemplating purchasing more efficient space heating equipment would be faced with higher capital costs per GJ consumed, thereby increasing the payback period, and ultimately negatively impacting the competitiveness of natural gas with alternative fuels.

19.4 Why has Terasen acquired additional natural gas distribution investments if it views the business risks as increasing with time and exposure to these trends?

Response:

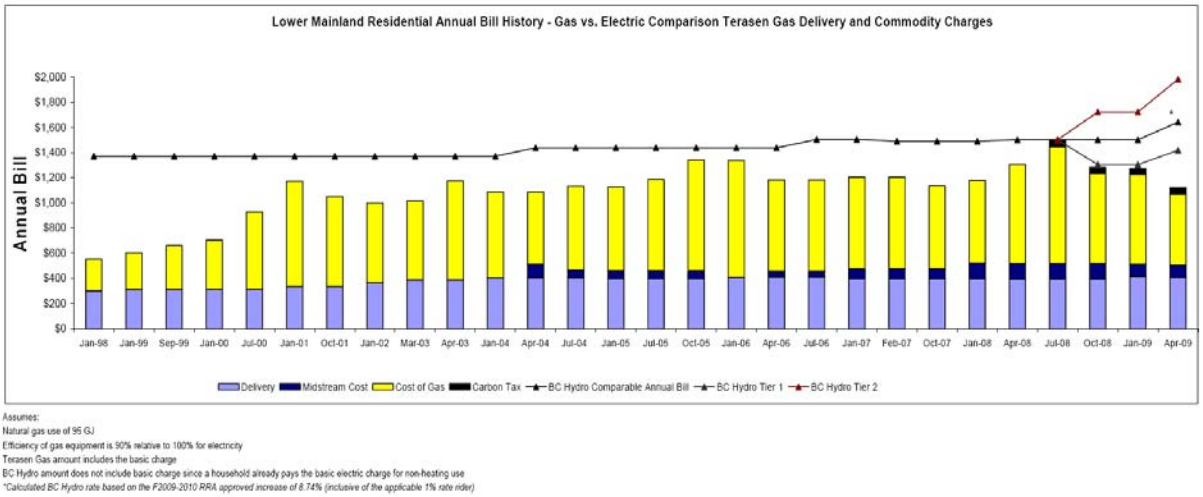
Terasen has continued to invest in the system because it has an obligation to serve and because prudent investments, including those of alternative energies that are complimentary to natural gas aid in preserving and protecting the existing franchise to mitigate risks. Every business enterprise has risk. Terasen strives to manage and mitigate its risks, but risk must be rewarded with a fair and appropriate return. Terasen has a right to expect that the Commission will establish a fair and appropriate return consistent with its obligations under the Utilities Commission Act. It is incumbent on the utility to make an application to the regulator when it believes it is not being afforded a fair return which is the purpose of this Application at this time.

20. Exhibit B-1 – Tab 1, Page 2 and Page 21 – Competitiveness to Electricity

1) The Competitiveness of Natural Gas Is Declining.

Natural gas no longer enjoys a substantial operating cost advantage over electricity. Electricity is a requirement for every home and business; adding a furnace and ducting for gas heating adds to the front end cost of building a home. As gas prices have risen over the past decade and electricity prices remained relatively flat (decreasing in real terms) natural gas has lost much of its competitive price advantage.

Figure 3.1.1
Residential Annual Natural Gas and Electric Energy Costs in the Lower Mainland
1998 - 2009



Assumes:
Natural gas use of 95 GJ
Efficiency of gas equipment is 90% relative to 100% for electricity
Terasen Gas amount includes the basic charge
BC Hydro amount does not include basic charge since a household already pays the basic electric charge for non-heating use
*Calculated BC Hydro rate based on the F2009-2010 RRA approved increase of 8.74% (inclusive of the applicable 1% rate rider)

20.1 Has Terasen used BC Hydro's LTAP long-term 10 year price increase information to project out the competitive position of natural gas versus electricity?

Response:

Please see responses to BCUC IR 1.31.3.1 and 1.31.4. BCUC IR 1.31.3.1 provides a chart with a simplified application of the LTAP long-term electricity increase forecast to each of the RIB Step 1 rate, the RIB Step 2 rate and the average rate. Terasen does not have the information necessary to make separate forecasts of the RIB Step 1 and Step 2 rates, mainly because the BCUC Decision on the BC Hydro RIB Application is not prescriptive as to how the Step 2 rate will be adjusted when a change in the cost of new electricity supply has been determined (BCUC RIB Decision, Order No. G-124-08, Reasons for Decision dated September 24, 2008, p.108).

Notwithstanding the depiction in BCUC IR 1.31.3.1 of an improving competitive position for natural gas on an operating cost basis, the response to BCUC IR 1.31.4 provides a number of reasons why the competitive position of natural gas in the future may not be as positive as shown in BCUC IR 1.31.3.1. As examples, carbon taxes on natural gas may continue to increase in the future beyond the maximum of $1.50 per GJ currently announced for 2012 and electricity rate increases may well be constrained to lower amounts than those identified in the LTAP due to the impact of Commission decisions in the regulatory review process.

20.2 Has Terasen anticipated any further changes in the price of Tier 2 electricity as they would be disproportionately applicable to the Tier 2 price versus the Tier 1 price?

Response:

In the chart in the response to BCUC IR 1.31.3.1 we have assumed for simplicity that both Step 1 and Step 2 rates are increased by the LTAP long term increases.

The BCUC Decision on the BC Hydro RIB Application is not prescriptive as to how the changes will be made to the RIB Step 2 rate once a new pricing point has been established for the cost of new electricity supply (BCUC Order No. G-124-08, Reasons for Decision dated September 24, 2008, p.108). If such new supply cost changes are phased in as to their impact on the RIB rates, it is possible that RIB Step 1 and Step 2 rates might change by the same or similar percentages. On the other hand, if such new supply changes were to be implemented at one time (i.e., without a phase-in) then rate changes would flow disproportionately to the RIB Step 2 rate in one period followed by one or more rate changes in subsequent periods in which the increases were disproportionately allocated to the Step 1 rate.

Terasen does not presume to know how the RIB Step 1 and Step 2 rates will change over time but offers the observation that a phased-in approach for implementing changes for the cost of new electricity supply in the Step 2 rate would have the benefit of maintaining a predictable relationship between the Step 1 and Step 2 rate levels which in turn would offer a stable price signal over time to influence customer behavior. On this basis the approach employed in BCUC IR 1.31.3.1 of increasing both the RIB Step 1 and 2 rates by the LTAP forecast increase percentages is reasonable.

20.3 Has Terasen anticipated any further developments of conservation rates for electricity pricing and analyzed the potential impact on Terasen's competitiveness?

Response:

Terasen is aware that BC Hydro is exploring the development of conservation rates in conjunction with its Energy Conservation & Efficiency and Smart Metering Initiatives. However, the nature and timing of such conservation rates is sufficiently uncertain that there is no practical way, in Terasen's view, to make an assessment of their potential impact on the competitiveness of natural gas in the province's energy mix.

20.4 Has Terasen analyzed the proportional impact of Tier 2 electricity prices on electric heating versus heating with other resource or fuel options?

Response:

Terasen has looked at the impact by housing type of RIB Step 2 electricity rates on electric space heating as compared with non-electric space heating. These comparisons were made using data provided in the BC Hydro RIB hearing regarding average electricity consumption by housing type for electrically space heated and non-electrically space heated dwellings. The following comments must be considered in the context that the observations are based on average consumption levels and there is a wide range of variation in energy consumption levels and usage patterns within any given dwelling type. For example with single family dwellings (SFDs) there is a wide variation in dwelling sizes that would suggest a corresponding large variation in energy consumption, other things being equal. Even within similar sized SFDs there can be considerable variation in overall energy efficiency of the dwelling.

With the preceding context in mind, much or all of the energy consumption for space heating in SFDs would be expected to come from the RIB Step 2 rate block. For townhouses much but likely not all of the energy consumption for space heating would come from the Step 2 rate block. For apartments only a small proportion or none of the energy consumption for space heating would be expected to come from the Step 2 rate block. With the province's strong policy focus on energy conservation and efficiency and GHG emission reductions, and an observed trend towards more multi-family and smaller footprint dwellings it is reasonable to expect that the share of space heating load exposed to the RIB Step 2 rate, as presently configured, will gradually diminish over time.

20.5 Has Terasen attempted to market natural gas developed from biomass as a clean heating fuel alternative?

Response:

Terasen Utilities are in the process of researching and developing a strategy and plan to market carbon neutral or renewable natural gas such as that produced from biomass sources or anaerobic digestion of organic materials, but has not yet marketed this product/service directly to any customers. At the same time, Terasen is continuing to work toward acquisition of sufficient quantities of renewable natural gas (or “biomethane”) that will allow us to offer such an alternative to customers. Initiatives such as Terasen’s Request for Expressions of Interest for Biogas Projects, the establishment of memoranda of understanding and negotiation of purchase agreements with first several biogas developers, and the biogas project demonstration phase for which Commission approval is being sought in the TGI and TGVI Revenue Requirement Applications are all very important early steps in the development of both a significant supply source and marketing plan for carbon neutral or renewable natural gas.

21. Exhibit B-1 – Tab 1, Page 2 and 33 – Declining Capture and Declining Average Use

2) TGI's Ability to Attract and Retain Its Customer Base Is At Risk.

TGI is being negatively affected by two trends: TGI's declining rate of capture of the new construction market and the continued decline in annual use rates from existing customers.

This puts further pressure on natural gas as a fuel choice. Over the past five years, approximately two-thirds of all housing starts have been multiple units and Terasen's capture rate in this segment is currently only 18%.

21.1 What has Terasen done to enable it to capture the multi-family unit dwellings? Does Terasen have a cost effective solution for multi-family dwelling units?

Response:

TGI has made a concerted effort to increase capture of multi-family buildings over the last few years. The decision to use electricity versus gas is based on a number of factors. TGI's focus has been on builders and developers because they are the decision makers regarding heating choices in buildings. Terasen has focused on helping to educate this community on the benefits of natural gas (such as being the cleanest fossil fuel and is an efficient use of energy). At the same time TGI has been working at making the process easier and less costly to the developer. Examples of this work include changes to the main extension test, TGI providing piping to individual suites and providing flexibility in meter locations.

TGI continues to look at other innovative ways to serve this market by providing natural gas in combination with both energy efficiency and conservation ("EEC") programs and alternative energy solutions. Section C.3 of the 2010-2011 TGI Revenue Requirement Application ("Energy Efficiency and Conservation and Alternative Energy Solutions"), discusses these initiatives. TGI believes recent provincial energy policy (BC Energy Plan 2007) initiatives and changes to the British Columbia Utilities Commission Act (2008) have provided an impetus for enhanced and extended service offerings from TGI.

TGI believes that natural gas is a cost effective solution when all factors are considered; however, the fact remains that gas is challenged on a lifecycle cost basis but once other factors are considered such as, lifestyle, environmental benefits, etc. it can be a cost effective solution.

Please also see the response to BCUC IR 1.37.1.

21.2 Why doesn't Terasen finance natural gas equipment for multi-family dwelling units to take away the up-front visible cost barriers to use?

Response:

In the past TGI has not found a way to provide financing in a form that it would create a competitive option for customers relative to other financing options available in the marketplace. Also, the challenge in most multi-family situations is to have the gas piping incorporated into the buildings in the design and construction phases. Retrofitting existing buildings for gas is not a practical option TGI continues to seek ways to enhance the competitiveness of natural gas as discussed in response CEC IR 1.21.1 above. An example that provides a similar outcome of reducing the visible up-front cost is the case of providing piping directly to the suite.

21.3 At its customer meeting work shop Terasen presented concepts for entry into district heating and application of heating based on hydronic heating systems which could be integrated with solar assisted thermal heating.

(a) How far along is Terasen in implementing this sort of model?

Response:

As discussed in the response CECIR 1.21.1 above, the Terasen Utilities have applied to the BCUC to begin delivering several different alternative energy programs which would include those referenced in the question. It is expected to take several years to develop this concept into a significant business however Terasen will expects to proceed expeditiously with these initiatives.

(b) Does Terasen have cost competitiveness analyses for this model which would lead to an ability to capture a greater percentage of the market?

Response:

The nature of this market is that each application and project tends to be unique. As stated in the response to CEC IR 1.21.1, TGI believes that natural gas does have a role to play in a cost competitive solution, all things considered. TGI is able to show analyses in many cases where natural gas on its own or in combination with alternative energy provides a competitive solution versus other options such as electric baseboard. As discussed in the response to BCUC IR 1.37.1 there are a number of factors that go into the decision making of fuel choice. One of the major issues facing TGI is that the public perceives electricity consumed in BC as "green". This combined with the fact that the price of electricity does not reflect the marginal cost of supply

creates a significant barrier to TGI, as natural gas rates include market-based commodity pricing which approximate the marginal cost of supply (and natural gas is not seen as being "green" when comparing GHG emissions based on end use alone). A simplistic view of this issue can drive a customer to choose electricity regardless of any analyses that TGI produces. TGI is not in the same position as it once was when single family dwelling construction was the dominant form of housing and natural gas captured better than 90% of the market based on decision making primarily driven by lower cost.

21.4 (a) If Natural Gas is not going to be competitive with alternative fuels, why would Terasen want to capture additional market share?

Response:

TGI believes that there are competitive solutions that include natural gas on its own or in combination with alternate fuels, including competitive solutions relative to the marginal cost of electricity was appropriately reflected in BC Hydro's customer rates. Because all customers share in the cost of service of TGI facilities, additional load or the avoidance of load loss is desirable to allow costs to be spread amongst as many customers as possible and over as much volume as possible. This improves costs for all customers and the competitiveness of the product. Increasing market share would not be desirable if doing so raised costs to non-competitive levels.

(b) Why wouldn't Terasen stick with its existing system and maintain it for the core captive domestic market and reduce risk that way?

Response:

As discussed in the question above, because all customers share in the cost of TGI facilities it is important to maintain the customer base and their throughput to ensure that the product remains competitive and cost effective for customers in the long run. TGI believes that unless it adapts to changing conditions in the market such as the growth in multi-family dwellings or in alternative energy, it actually increases risk for its existing customers through spreading fixed costs of the TGI system over a shrinking customer base (and throughput), driving their costs higher. Furthermore there is really no such thing as a core captive market in the long run as customers can, and do, change out appliances over time and it is likely they would substitute alternatives such as electricity, if natural gas did not remain competitive. This is a very real concern as evidenced by the fact that both residential use rates per customer and total delivery volumes have consistently fallen over the last number of years.

21.5 When does Terasen expect the decline in average use rate to bottom out?

Response:

The most significant driver behind declining average use per customer rates is the retrofit of low-efficient natural gas appliances to higher efficient units. It is assumed natural gas furnaces have a maximum expected life of 30 years, a low-efficient natural gas furnace has an AFUE rating of ~60%, a mid-efficient natural gas furnace has an AFUE rating of ~80%, and a high-efficiency natural gas furnace has an AFUE rating of ~90%. Under those assumptions, and given that changes to building codes in 1990 mandated mid-efficient furnaces as the minimum requirement for homes built since that time, it is reasonable to assume that all standard efficient furnaces will be effectively phased out by 2020. At that time, there would still be the ongoing retrofit of mid-efficient appliances to higher efficiency units, which would still impact average use per customer rates, albeit at a lesser rate of decline. Given recent changes to building codes that stipulate high efficiency furnaces as the minimum for new construction as of 2008 and place the same requirement on replacements beginning in 2010, it is reasonable to assume that mid-efficient furnaces will be phased out by 2040. Therefore, it is reasonable to assume the impact of retrofit activity will cease in approximately 30 years time.

The shift towards more multi-family dwellings is also contributing to declining average use per customer. Single family dwellings currently represent approximately 80% of all households, and the current mix of housing starts is approximately two-thirds multi-family dwellings and one-third single family dwellings. By assuming housing starts continue to be added at the current mix, TGI estimates the impact to average use per customer will continue through at least 2030.

Changes to building codes have also contributed to declining use per customer rates. Although difficult to forecast, given the governments commitment to achieve energy conservation and efficiency targets, it is not unreasonable to assume changes in building codes will continue in the future, ultimately contributing to continued declines in average use for natural gas over the long-term.

The above factors all contribute towards declining average use per customer. Although there is uncertainty regarding the specific duration over which they will continue to impact average use per customer, it is not unreasonable to assume they will continue to contribute towards declining use rates well into the future, at the very least over the next thirty years.

21.6 What use rate would be applicable to an efficient home versus an inefficient home?

Response:

As presented in the 2010-2011 TGI Revenue Requirement Application (Figure C-4-3, Page 280), the following illustrates the differences in annual consumption for space heating between an efficient and inefficient home.

Older Low Efficient Home in Vancouver

- One storey building with basement
- 2,500 square foot older home
- Below average insulation in ceiling and walls
- Single pane windows (USI 6.7 - Single)
- Average temperature 19 degrees Celsius
- Air tightness: 6.0 ACH (tested at 50 Pascals)
- Standard efficient furnace, AFUE of 71%

Space Heating Energy = 137.6 GJ/yr

New High Efficient Home in Vancouver

- One storey building with basement
- 2,500 square foot new home (code compliant)
- Above average insulation in ceiling and walls
- Energy Star windows (USI 2.0)
- Average temperature 21 degrees Celsius
- Air tightness: 5.4 ACH (tested at 50 Pascals)
- High efficiency condensing furnace, AFUE of 90%

Space Heating Energy = 50.7 GJ/yr

Source: Modelled through Natural Resources Canada's HOT 2000 software

Although the above provides a general estimate of the difference in space heating requirements between a low and high efficient home, it is important to recognize that there are many variables that influence the demand for natural gas. These would include construction materials used in building the home (the overall building shell, types of windows and doors installed, insulation levels, etc) and also appliances installed (and their respective efficiency ratings), and also the behaviors exhibited by the people living in those homes (temperature at which they are comfortable, overall levels of conservation efforts, etc.). And although differences in those variables would lead to changes in the above estimates, the significant gap seen between the low and high-efficient homes supports the assumption that declining average use per customer is not only affecting our Company now, but will continue to do so over the long term.

21.7 (a) What is the penetration into the market of all of the efficiency options for use of natural gas heating?

Response:

The best available information Terasen has with regards to penetration rates of all of the efficiency options for use of natural gas heating is preliminary figures from the 2008 REUS. It is estimated that approximately 91% of TG customers use natural gas as their primary space heating fuel, and there is no statistically significant difference in this estimate from prior surveys. It is further estimated that approximately 55% of TG customers have a standard efficiency furnace (less than 78% AFUE), 29% of TG customers have a mid-efficiency furnace (78% to 85% AFUE), and 17% of TG customers have a high efficiency furnace (90% AFUE or higher).

These figures should be viewed with caution, as there are two significant issues surrounding them. The first issue is there were a significant number of respondents that did not know the efficiency rating of their furnace, and this varied from approximately 9% of respondents in the Interior regions to 15% in the Lower Mainland region. The second issue was an apparent lack of movement from standard efficient to mid-efficient or high efficient furnaces since the 2002 REUS. Over that period, Terasen has provided incentives to install high efficiency furnaces for approximately 8,600 customers, but this was not reflected in the survey response data. Given these issues, the figures presented above should be viewed as approximations only.

(b) How much further does Terasen expect the penetration to go over what time frame?

Response:

Given that 91% of TG customers are currently using natural gas as their primary fuel for space heating, and that figure does not show a statistically significant difference from prior surveys, the best estimate going forward is that same figure. However, it should be noted that penetration rates for natural gas space heating is impacted by a number of factors, including the capital costs associated with installing the equipment (which is a significant barrier with respect to multi-family dwellings), public perceptions regarding natural gas (which is being viewed as a fossil fuel that is contributing towards the issue of climate change), and also government policies/programs (which currently do not identify the right fuel for the right application). Given these factors, Terasen believes there will be downward pressure with regards to penetration rates of natural gas space heating equipment.

22. Exhibit B-1 - Tab 1, Page 5 – Provincial GHG Policy and Targets

The government passed Bill 44 (2007 Greenhouse Gas Reduction Target Act) in the 3rd Session of the 2007 Legislative Session. Part 1 of Bill 44 outlines BC GHG emission targets levels as being:

> *"By 2020 and for each subsequent calendar year, BC greenhouse gas emissions will be at least 33% less than the level of those emissions in 2007; and by 2050 and for each subsequent year, BC greenhouse gas emissions will be at least 80% less than the level of those emissions in 2007."*[6]

22.1 What percentage of Terasen's throughput will have to be reduced for natural gas to meet its expected contribution to carbon reduction and GHG reduction?

Response:

Meeting the province's 33% reduction target by 2020 puts Terasen Gas' existing throughput levels at risk. This is due to BC's unique makeup of GHG emission sources compared with many other provincial and state jurisdictions in North America. Please see Section 1.2 of the Business Risk Tab 1 for further details.

GHG policy at federal and provincial (or state) levels in Canada and the U.S. is presently in a state of flux. This creates uncertainty on how BC's targets will harmonize with federal regulations, WCI agreements, and the possible implications of federal US laws. Given this uncertainty, Terasen Gas is presently unsure how the 33% reduction target will apply to our business and what will qualify as an offset.

Some examples of how the Terasen Utilities may comply with the GHG reduction targets beyond just a physical reduction in volume to match the reduction target include:

1) Terasen Utilities may be able to purchase offsets to meet the reduction targets. For example, "The Climate Action Revenue Incentive program will be a new conditional grant equal to what local governments pay in the carbon tax, with only one string attached – to be eligible, communities must sign onto the Climate Action Charter and commit to becoming carbon-neutral by 2012, If communities do that, and publicly report on their plan and progress in meeting that goal, they will be eligible to receive a grant equal to 100 per cent of their carbon tax costs." [1]

[1] Climate Action Revenue Incentive Program, quoting Premier Gordon Campbell from September 24, 2008 News Release

Under these conditions, municipalities may purchase offsets to reduce their emissions ‘footprint’, which then count against the reduction target. Terasen Utilities may be able to pursue this type of program to comply with the reduction targets.

2) Legislated targets for small emitters have yet to be determined, as well as their compliance mechanisms. Therefore, the impact on throughput will be determined partly on the requirements that are placed on Terasen’s residential and commercial customers, as well as the various compliance mechanisms (including purchasing offsets, buying into a technology fund, or paying carbon tax) that are introduced.

3) Efficiency Gains and Changes to Standards - Reductions in Terasen’s own emissions can and have been achieved through increased combustion efficiency, fugitive emission reductions, and improved venting practices.

Any of these reduction measures may or may not meet the goals of provincial GHG reduction targets, depending on the regulations that Terasen Utilities will need to comply with.

22.2 What are the expected financial projections for Terasen in the event this reduction in natural gas use happens?

Response:

Assuming the BC GHG reduction target (reduction of 33% by 2020) was achieved by a physical reduction in TGI throughput, all else equal, TGI delivery rate would increase to account for the 33% reduction in throughput to meet the GHG target. Assuming, a delivery rate of $4.308 for residential customers in 2009[2] and a reduction in volume of 33% to achieve the GHG target, TGI delivery rate would increase to $6.429 for residential customers. This increase to the delivery charge would have an impact on Terasen Gas competitiveness and as result impact TGI ability to recover the capital investment it has made to serve customers in a safe and reliable manner in the long term.

[2] TGI Revenue Requirement Application, date June 15, 2009, Part III: Section B-Tab 1:Respected and Trusted Operator- The Past, page 112

22.3 What is Terasen doing to mitigate any negative consequences of reductions in natural gas use and achieving GHG reduction targets?

Response:

Please see CEC IR 1.19.1

23. Exhibit B-1 - Tab 1, Page 7 – Provincial GHG Opportunity

With many policy items in the BC Energy Plan targeted at stimulating growth in the BC oil and gas sector, it will be a significant challenge for BC to reduce GHG emission from the fossil fuel production sector (21 per cent in Figure 1.2). This leaves the transportation sector at 36 per cent, other industry at 14 per cent, the residential and commercial sector at 12 per cent as the biggest areas for potential GHG reductions. By default this puts TGI's natural gas business at risk from the province's GHG reduction targets policy.

23.1 Given Terasen's view that the BC GHG policy and the focus of the opportunity being different from other jurisdictions because of the clean nature of electricity production in BC, does Terasen expect the BC Government to have policy which may provide an offsetting opportunity for Terasen?

Response:

No.

Terasen Utilities do feel that the existing government policy surrounding energy use and climate change does support the consumption of natural gas in direct use applications. Terasen points to the following statement that is contained in the 2007 BC Energy Plan:

> *"It is important for British Columbians to understand the appropriate uses of different forms of energy and utilize the right fuel, for the right activity at the right time. There is the potential to promote energy efficiency and alternative energy supplemented by natural gas. Combinations of alternative energy sources with natural gas include solar thermal and geothermal. Working with municipalities, utilities, and other stakeholders the provincial government will promote energy efficiency and alternative energy systems, such as solar thermal and geothermal throughout the province."*[3]

Terasen has relied on this, among other government policy statements contained in the 2007 BC Energy Plan in discussing Terasen views on energy use and the path forward on how to reduce GHGs from a regional perspective.

However, this interpretation of government policy is not supported by all stakeholders or competitors of Terasen Utilities. Given the fact that BC GHG reduction targets are embedded into law through the 2007 Greenhouse Gas Reduction Target Act, some have concluded that the GHG reduction targets take precedent over all other government policies. Terasen arrives at this conclusion based on the following statement made in the recent BC Hydro 2008 LTAP, where BC Hydro stated:

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[3] See Appendix C-2 for a copy of Energy Plan 2007: A Vision for Clean Energy Leadership, page 21

"MS. VAN RUYVEN: A: So if you have a house heated by gas, all of those incentives in the LiveSmart program were meant to get in high-efficiency gas furnaces. So make the envelope of the building that you are in the most efficient it can be, regardless of fuel choice. So that's number one. And then to the conversations we've had with government, overwhelmingly these things that they're trying to do are reducing greenhouse gases in British Columbia. So you can see switching from diesel to cleaner gas is a positive thing, whether it's the transportation sector or the utility sector. So you can see as you read through these that I think an overwhelming desire is to reach that legislated 32 percent reduction in greenhouse gases. And in the discussions that I've been in with government and with Terasen, they've been very clear that they don't want to put forward a policy that actually sees B.C. Hydro incenting increases in greenhouses gases in British Columbia. That goes against the legislated greenhouse gas reduction that they are very much trying to put lots of programs in place to get at.

MR. GHIKAS: Q: Ms. Van Ruyven, the expressed policy that we have is in the Energy Plan, and I believe that B.C. Hydro has made it clear that that be ignored at everyone's peril. Is that fair to say?

MS. VAN RUYVEN: A: Well, I was just stating a legislated requirement for greenhouse gas reductions in British Columbia, and I believe in the conversations I have had with government is they support programs that get at actual reductions of greenhouse gases in British Columbia.

MR. GHIKAS: Q: Okay. We're going to come to that in a moment, but from what I understand you saying is that the greenhouse gas reduction targets for provincial GHGs trump all other policy.

MS. VAN RUYVEN: A: That's what I'm saying. They trump, they trump a –"[4].

This interpretation of government policy has led BC Hydro and customer groups to not be supportive of consuming natural gas in direct use application in BC. This is concluded by the following statement made in the BC Hydro 2008 LTAP hearing, from BC Hydro Final Argument dated May 13, 2009:

"The Terasen Utilities Argument is laced with references to what would be in the best interests of BC Hydro's customers. BC Hydro does not accept that Terasen Utilities speak for any of its customers. Rather, BC Hydro looks to BCOAPO, JIESC, CECBC,

[4] BC Hydro LTAP 2008, Transcript Volume 3, February 13, 2009 page p. 281-283.

and BCSEA et al, which respectively represent its lower income residential, industrial, commercial and environmentally-minded customers. None of these customer intervenors support BC Hydro undertaking fuel switching from electricity to natural gas as part of BC Hydro's current DSM Plan or by the June 2010 timeframe advocated by Terasen Utilities:

- *BCOAPO strongly opposes Terasen Utilities' fuel switching proposal: "at this time, it is our unalterable position that such a program would be for the sole benefit of Terasen to the detriment of our clients". Because BCOAPO represents BC Hydro residential ratepayers who would be impacted by the proposed fuel switching initiative, BC Hydro submits that, in this instance, BCOAPO's position ought to be afforded significant weight*
- *JIESC submits that encouraging fuel switching from natural gas to electricity is "premature at this time". JIESC further submits that "until the government declares its views, neither BC Hydro nor the Commission should deliberately promote one fuel over the other"*
- *CECBC specifically supports BC Hydro's characterization of the GGRTA and its implications, and the other three B.C. GHG-related statutes, and states "the uncertainty which surrounds this area justifies patience and prudence on behalf of the Commission in terms of approving long term, high cost commitments, which may be impacted by these material policy matters which are actively under determination".* [5]

Thus, it is Terasen Utilities position that the interpretation of existing government policy by some has put Terasen's core natural gas business at greater risk than before the GHG reduction targets were announced and enacted into law. The GHG targets have changed customers and competitor's behavior and attitudes towards natural gas, which will likely have long term consequences to Terasen Utilities natural gas business.

Terasen Utilities do expect that over time, policy clarification and regulation will serve to reduce this negative tension between some provincial policies and the overarching global goal of reducing the impacts of climate change. At the present time, Terasen is unclear when this clarification might come.

[5] BC Hydro 2008 LTAP, BC Hydro Final Reply Argument, dated May 13, 2009, page 24.

23.2 Has Terasen been able to get any policy accommodation with respect to the potential impacts and changes it will face with respect to GHG reduction?

Response:

No.

As stated in BCUC IR 1.25.2, there is still uncertainty about how GHG regulations will be defined and implemented given all the different regulations being proposed at the provincial/state and federal governments in both Canada and the US. This is further complicated by regulations being proposed by the Western Climate Initiative, an organization that is not bound by political borders, and which B.C. is a member.

Terasen Utilities does not expect to get an accommodation from government once GHG regulations are refined. Terasen takes this view due to the overwhelming commitment all levels of government have shown in pursing policy and actions that reduce the impacts of climate change, which is mainly caused by GHG emissions.

Rather than asking government for policy accommodations, Terasen Utilities have communicated their proposed solutions to government on how to arrive at the optimal balance for reducing GHG on a regional basis with a view of using energy with an efficient regional integrated perspective. These solution assumptions also include market pricing signals and consistent messaging to consumers of energy. Once common ground is found amongst governments, businesses and other stakeholders related to these solutions, Terasen Utilities believe that more appropriate policies will be put in place by government to achieve these solutions.

The attachments contained the response to CEC IR 1.19.1 (Smart Gas Strategies for BC, QUEST (Two Whitepapers), and the Northwest Gas Association whitepaper entitled, Natural Gas and Climate Change in the Pacific Northwest) summarizes the solution assumptions supported by Terasen Utilities and these solutions have been communicated and discussed with government, customers and other stakeholders:

Terasen Utilities are committed to finding solutions to address climate change issues and will continue dialogue and discussion with government and customers as society moves down the path to an evolving and changing time in the energy marketplace.

23.3 Does Terasen have a set of policy accommodations that it is recommending to the Provincial Government to assist it with the challenges it will face? If so has Terasen advanced these to Government and if so what has been the response to date?

Response:

See response to CEC IR 1.23.2.

23.4 Does Terasen have plans to actively seek policy support in the future?

Response:

See response to CEC IR 1.23.3.

Terasen Utilities plan to continue to have communication with government, customers and stakeholders on policies or issues that impact the Terasen Utilities business now and into the future.

24. Exhibit B-1 – Tab 1, Page 11 – Carbon Tax effect on Natural Gas Competitiveness

The carbon tax reduces natural gas' competiveness relative to alternative energy sources that are not subject to the carbon tax, and the carbon tax will help to sensitize customers to the level of GHG emissions they generate by sending them price signals. The provincial carbon tax increases the business risks of TGI.

24.1 When Terasen makes this assessment of competitiveness relative to other energy alternatives does Terasen take into account the impacts of other Government policies, which for instance affect electricity prices alone (such as water rental rate increases recently implemented) and do not affect natural gas prices?

Response:

The Terasen Utilities do acknowledge that government policy, such as the cited example of water rental increases, can affect the price of electricity or other sources of energy and have little or no impact on natural gas rates.

For example, the requirement for BC Hydro to be self-sufficient by 2016 will more than likely have an impact on the cost of new electricity supply that BC Hydro must obtain to meet this policy (and now legislated) requirement. One result of fulfilling this requirement was identified in the BC Hydro 2008 LTAP proceeding, where BC Hydro indicates its current expectation for the cost of electricity supply from its new call for power is in the range of $120/MWh.[6] This cost of this new supply will at sometime in the future be reflected into BC Hydro's revenue requirements; however, the means by which and timing of when customers will receive efficient price signals in their rates about these new supply costs is the issue at hand.

According to the Commission Decision on the BC Hydro RIB Application in 2008, BC Hydro is to bring proposals forward to the Commission on how to work this new call price into rates.[7] Therefore, the price signal to the consumer about the marginal price of power, more than likely will be masked given that this new call for power ($120/MWh) is about 44 per cent higher than the current Step-2 rate (as of April 1, 2009 the Step-2 rates is $82.7/MWh).

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[6] BC Hydro 2008 LTAP, Exhibit B-10, page 25; Transcript, Vol. 9, page 1528

[7] BC Hydro 2008 RIB, Commission Decision page 108 states: "In addition the Commission Panel includes in its conditional design principles an instruction that, when circumstance dictate, BC Hydro must file an application to change its estimate of the cost of new supply and to include in that application a proposal on how to phase in the change, so that the allocation of reviews requirement increases between the Step-1 and the Step-2 rates will be reviewed on a case by case basis each time BC Hydro makes an application change its estimate of the cost of new supply".

While the Terasen Utilities can acknowledge the impact that government policy can have on other alternatives energy sources, including electricity, the Terasen Utilities competitive position is impacted by how and when these marginal costs of supply ultimately get set into electricity rates. In contrast, the price that the Terasen Utilities pay for natural gas, which is generally tied to daily or monthly natural gas market prices, is the marginal cost of supply for that period of time. The TGI commodity rate setting mechanism is reviewed quarterly to reflect the actual and forecasted gas so that natural gas commodity rates reflect a current market price signal relative to the masked or lagged price signals in BC Hydro's electricity rates.

24.2 By 2012 when the carbon tax has reached $30/tone and the projected impact on natural gas is $1.50/GJ, what percentage of total customer bill does Terasen expect the carbon tax to represent?

Response:

For a typical residential Lower Mainland customer consuming 95 GJ per year, a carbon tax of $1.4949 per year would represent approximately 12% of a customer's total annual bill. The total annual bill is based on current delivery and commodity rates (inclusive of applicable rate riders) as at July 1, 2009.

24.3 The carbon tax is not solely a tax on carbon, it is also a tax reduction for income taxes and other taxes. Does Terasen determine the effects of these offsetting tax reductions as they may be applicable to the price of natural gas?

Response:

As stated in the Provincial Summary Budget and Fiscal Plan -2008/09 to 2010/11, the intent of the carbon tax is to 'provide a key tool to meets its GHG reduction targets'. [8]
Thus, the purpose of the carbon tax is, by means of a consumption-based tax, to encourage businesses and residences of BC to consume less fossil fuels, including natural gas. This will ultimately have an impact on the throughput volumes transported on the Terasen Utilities pipeline networks.

[8] BC Government Provincial Summary: Budget and Fiscal Plan 2008/09 to 2010/2011, page 1

The Terasen Utilities acknowledge that the carbon tax is intended to be revenue neutral for the province, but the intent of the tax is to provide a price signal to customers about their energy consumption habits and GHG emissions. This is accomplished by having the cost of the tax show up as the customers pays for the fossil fuel they consume. To the extent that the planned revenue neutrality of the carbon tax results in lower corporate income tax rates these reductions will reduce the Terasen Utilities revenue requirement and delivery rates accordingly, but these tax rate-related reductions are very small in comparison with the carbon tax that is added on the customers' bills. It is Terasen Utilities' view that the income tax or other tax reductions that individual consumers receive on their personal income to make the provincial government revenue neutral are sufficiently separated from the carbon tax they pay on fossil fuel consumption that the consumer will make no linkage between the two. Thus, the carbon tax is a tax instrument that can help shape and influence customers' behavior. This tax will have an impact on how customers view and consume natural gas today and into the future, which translates into increase business risk for the Terasen Utilities.

24.4 Does Terasen take the view that only the negative impacts on its competitive position are increasing business risks or does Terasen take the view that the relative competitiveness is more important measure of the real risk?

Response:

Ultimately business risk is a composite function of many factors, some of which are increasing business risk and others that may be mitigating business risk. The relative competitiveness of natural gas is an important indicator in the business risk assessment of TGI. The carbon tax is identified as increasing the business risk of TGI because it is a new discrete tax applicable to natural gas and other fossil fuels, but not to electricity, that did not exist at the time of the 2005 ROE hearing. The carbon tax also has the potential to increase over time and further erode the competitiveness of natural gas.

25. Exhibit B-1 – Tab 1, Page 12 – Carbon Tax effect on Business Risk

The Climate Action Plan maintains a consistent message from the provincial government about the commitment it has to reduction of GHGs and mitigation of climate change. As the summary of the Climate Action Plan suggests, "we are taking action in all sectors of the BC economy to help reduce emission". Given that about 17% of BC GHG emissions come from the direct consumption of natural gas this will no doubt increase business risk for TGI.

25.1 Terasen seems to take the view that the impact of Government GHG policy as it directly affects the Terasen costs for natural gas delivery to its customers is the primary story regarding business risk. Did Terasen examine a broader view of business risk and reject it or was this the extent of Terasen's examination of business risk?

Response:

When examining and presenting business risk factors in this Application, the Terasen Utilities focused primarily on factors that have changed since the last ROE preceding that took place in 2005.

The risk factors that have emerged since 2005 are:

- BC Government policies:
  - GHG reduction targets
  - BC Carbon Tax
- Aboriginal Rights

These new factors are in addition to the ones present in the 2005 ROE Application, which focused on natural gas competitiveness position to other energy alternatives and TGI ability to attract and retain its customer base.

Not only do these new risk factors increase costs for TGI to provide natural gas to customers, but they also change customers perception about using natural gas to meet their energy needs over the long term give the government's goal of reduction GHG emission in BC. This will ultimately have an impact on TGI ability to recover its investment over the long term.

Please see BCUC IR 1.40.1 and 1.40.2 for a broader discussion related to business risk that also impacts the Terasen Utilities.

25.2 (a) Did Terasen consider that one of the possible consequences of the Government GHG policy may be to dramatically shift fuel switching from oil and gasoline for transportation to electricity and that this may be a larger switch than the switches from natural gas to electricity?

Response:

The Terasen Utilities did consider the possibility of government policy increasing load on the electricity system due to "fuel switching" from oil and gasoline for transportation to electricity. This is evident by the Terasen Utilities recent BC Hydro 2008 LTAP Final Submission date April 27, 2009, which states on page 4:

> Electric Load Avoidance DSM represents [9]an important opportunity to address a portion of the widening load-resource gap in a cost-effective manner. The following points are addressed in this Part:
>
> (i) BC Hydro faces a difficult task in meeting its forecasted energy and capacity requirements, and attaining self-sufficiency. The load forecast in the LTAP may understate the load requirements given the potential for developments in areas such as electric plug-in vehicles.
>
> (ii) Residential space and water heating, for instance, contributes significantly to BC Hydro's energy and capacity requirements. This creates the imperative for BC Hydro to send effective price signals to encourage its customers to make efficient fuel choices.
>
> (iii) Cost-effective Electric Load Avoidance DSM can help to overcome inefficient price signals on a TRC basis arising from electricity rates based on embedded costs and differential capital costs, with the result that customers may choose an alternative to electricity as an energy source for particular end use applications.

If the load for "plug in" vehicles materializes, the Terasen Utilities agree that this would cause cost pressures for the electric utility and this is one reason why the Terasen Utilities put forth the argument in the BC Hydro 2008 LTAP that BC Hydro should be encouraging customers through their DSM programs, not to adopt electricity for end uses where electricity is not the most efficient energy source from a Total Resources Cost ("TRC") perspective. Thus, if BC Hydro was to encourage the use of natural gas or alternative energy forms rather than electricity to

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[9] Terasen have used the term "Electric Load Avoidance DSM" in these Submissions, rather than the term "fuel switching" to emphasize that the purpose of these measures is to avoid inefficient electric load. Also, the term "fuel switching" is subject to being misconstrued as referring exclusively to measures directed at existing customers that have already installed electric appliances, whereas new customers that have yet to install any appliances are also a key target of Electric Load Avoidance DSM.

provide heat to customers, the overall cost pressures to the electricity system could be dampened.

Based on BC Hydro’s final reply argument in the LTAP (refer to the response to CEC IR 1.23.1), customers of BC Hydro, as represented by intervenors in the LTAP, seem to be reluctant to explore the ideas being put forth by Terasen Utilities, even though these ideas might help reduce the cost pressures that may occur from servicing new load include plug-in vehicles.

(b) Did Terasen analyze the impacts on electricity prices if this sort of switch takes place or examine the BC Hydro LTAP evidence with respect to the potential range of consequences of such a switch?

Response:

The Terasen Utilities did not analyze the impacts of this switch[10] (from oil and gasoline to electricity for transportation) and how it may impact the electricity prices of BC Hydro. Indeed, BC Hydro did not add the new potential load from Electric Plug-in Vehicles (EPVs) into the load forecast that was presented in its Evidentiary Update (Exhibit B-10) as part of the BC Hydro 2008 LTAP.

The Terasen Utilities are familiar with the potential increased demand that may be placed on the BC Hydro system given the information on electrification scenarios that was presented in BC Hydro’s December 22, 2008 Evidentiary Update (Exhibit B-10) in the LTAP proceeding. The costs and benefits for the electricity grid of widespread adoption of EPVs are uncertain. The promoters of EPVs frequently point to EPVs as providing a potential system benefit and peaking resource in that they would be able to provide energy back into the grid in peak demand times and recharge their batteries in off-peak times. The balance between the costs of the additional energy consumed by EPVs and the system benefits they may contribute is a very complex analysis. The rate of adoption of electric vehicle technology and ultimate market share are also uncertain.

[10] BC Hydro 2008 LTAP, Exhibit B-10 dated December 22, 2008, page 11 states that new load for electric plug-in could be 9000 GWH

(c) Might these consequences offset or even outweigh the carbon tax impacts at some point in the future?

Response:

Increased loads on the electric system such as those that would arise from wide scale adoption of electric vehicle technology will increase costs over time for the electrical consumer in BC since the cost of new resources is generally more expensive than the embedded cost of supply. It is uncertain whether such cost increases will or will not offset the increases in carbon tax that will apply to fossil fuel consumption in BC.

The carbon tax is currently established to increase by $.25/GJ through July 1, 2012 to a rate of about $1.50 Cdn/GJ (or $30/tonne of C02e), but the carbon tax rates beyond 2012 are yet to be determined. In a recent report prepared by the National Round Table on the Environment and the Economy ("NRTEE") called "Achieving 2050: A Carbon Pricing Policy for Canada" it states on page 30 of the report:

> "A first element of our carbon pricing policy is to identify the carbon prices required to meet the government's 2020 and 2050 targets. Our research suggests that economy-wide carbon prices will need to rise to $100 per tonne of CO2e by 2020 and upward of $300 per tonne of CO2e by 2050."

There is uncertainty in how future electricity prices may increase and the rate structures that will exist in the future to reflect such increases in customer rates, as well uncertainty as to how much carbon taxes will increase (or how carbon cap and trade regimes will affect the costs of carbon emissions) in the future. These uncertainties make it very difficult to assess whether the impacts in BC on electricity consumers or the impacts on gas consumers are likely to be greater.

25.3 Did Terasen consider the impacts of the Provincial Government SD 10 self sufficiency and insurance policies for electricity and the extent of electricity price increases which may be driven by this policy?

Response:

Terasen has not explicitly considered the impacts of the SD 10 self sufficiency and insurance policies on electricity rate increases. Terasen notes that the impacts of these policies would be implicit in BC Hydro's long term forecast of rate increases as filed in the 2008 LTAP proceeding (LTAP Exhibit B-3, BCUC IR 1.7.1, Attachment 1). Terasen notes further that the government has also made policy commitments to keeping electricity rates low such as at page 15 of the

2007 BC Energy Plan where the government indicates its continued support for maximizing electricity trading benefits[11] "to keep electricity rates low for all British Columbians". Intervenors in BC Hydro's recent regulatory proceedings have been active in pointing out that there are significant potential cost impacts for ratepayers of the self-sufficiency and insurance policies. With the number of years remaining before the self-sufficiency requirement and insurance requirement take effect (2016 and 2026 respectively) it is not unlikely that ways will be found to mitigate significant portions of the negative cost impacts of these policies or that the policies will be modified.

25.4 Did Terasen consider the competitive position of BC commodity exports to other jurisdictions around the world if BC were not adopting leading GHG reduction policies and how that impact might work back to Terasen and to natural gas consumption were BC products to be viewed as coming from a non-progressive jurisdiction?

Response:

Terasen has not directly considered the impacts described in the question. Trying to estimate the impacts of the sort described would be speculative at best. Other jurisdictions are not standing still in these areas and many others are also aggressively advancing GHG reduction policies and seeking to develop alternative and renewable energy resources within their borders. BC may be viewed by many as a leader in these areas today but this position is not guaranteed going forward in the dynamically evolving areas of climate change, GHG reductions and energy.

[11] While presently under Heritage Special Direction No. HC2 the annual amount of trade income that can be credited to BC Hydro's rates is limited to a maximum of $200 million it is possible that this limit could be changed by future amendment to the Special Direction. Other mechanisms could also be established which could mitigate the cost impacts for BC Hydro's customers of self-sufficiency and insurance.

26. Exhibit B-1 – Tab 1, Page 12 and 13 – Climate Action Team recommendations

The specific policy recommendations that could have a direct impact to Terasen Gas business risk are:

- Increase the British Columbia carbon tax after 2012 (if required to achieve the emission targets) in a manner that aligns with the policies of other jurisdictions and key economic factors.

- Develop a comprehensive, multidimensional public engagement and outreach campaign in collaboration with public and private partners. This campaign will: 1) educate British Columbians about the importance of climate change and the policies that are necessary to address this issue and 2) help British Columbians reduce their own greenhouse gas emissions in the most efficient way possible, and 3) make British Columbians aware of the incentives and savings available by taking action on climate change.

- Update BC's Green Building Code at least every three years to ensure BC's code is a leader among North American energy codes.

- Require that, by 2016, all new publicly-funded buildings in the province have net-zero GHG emissions and that by 2020 all new houses and building have net-zero GHG emission.

- Introduce an aggressive energy efficiency and renewable energy program for houses and buildings, combining incentives and regulatory approaches and coordinated across governments and utilities.

26.1 Has Terasen evaluated and determined what the consequences of such policy recommendations might be and then modeled and projected the impact on Terasen's business?

Response:

Terasen Utilities have not evaluated and determined the impact of the 31 recommendations made by the Climate Action Team ("CAT") on Terasen's business. The intent of the recommendations as a whole is to help achieve the GHG reduction targets by identifying further policy items that will help achieve this goal. Given that 17% of BC's GHG emission comes from the consumption of natural gas there can be no doubt that these recommendations, if accepted

by government, will increase the business risk for the Terasen Utilities. This is supported by the discussion on page 5 to 10 of the Business Risks (Tab 1) contained in the Application.

Terasen Utilities have included the recommendations from the CAT in the Application to provide some insight into the thinking on how B.C. will move forward beyond polices implemented to date, in its goals to use energy efficiently and reduce BC's GHG emission output.

26.2 Has Terasen evaluated and determined what the potential opportunities in such policy recommendations might be?

Response:

Terasen Utilities have not focused on evaluating the Climate Action Team ("CAT") recommendations with an eye for potential opportunities at this time. But rather the opportunities that TGI has contained in the recent Revenue Requirement Application to the BCUC on developing and exploring new alternative energy solutions are based on the 2007 BC Energy Plan, which states:

> *"It is important for British Columbians to understand the appropriate uses of different forms of energy and utilize the right fuel, for the right activity at the right time. There is the potential to promote energy efficiency and alternative energy supplemented by natural gas. Combinations of alternative energy sources with natural gas include solar thermal and geothermal. Working with municipalities, utilities, and other stakeholders the provincial government will promote energy efficiency and alternative energy systems, such as solar thermal and geothermal throughout the province."*[12]

Terasen Utilities have evaluated the impacts of government policies contained within the 2007 BC Energy Plan and that is why TGI has brought forth a measured approached to these changing times with an ask for TGI to deliver new alternative energy solutions within the regulated utility.

[12] See Appendix C-2 for a copy of Energy Plan 2007: A Vision for Clean Energy Leadership, page 21

26.3 Has Terasen held any discussions with the Climate Action Team and or the Government with regard to how Terasen might assist the government in achieving its objective while protecting Terasen customer interests? If so please provide a full description and account of the Terasen actions.

Response:

Please see CEC IR 1.19.1.

26.4 Has Terasen evaluated the strategic directions it is proposing and has shown to customers in its Customer workshops to determine if these directions will be sufficient to offset the risks?

Response:

Please see CEC IR 1.12.4 and CEC IR 1.19.1.

27. Exhibit B-1 – Tab 1, Page 14 – Effects of Policy Changes if Left Unmitigated

Government policy that discourages consumers from using natural gas will have the effect of reducing throughput volumes on the TGI system and reducing the attachment of new customers. The recovery of fixed costs from a smaller customer base, and on lower throughput, leads to rate pressure for the remaining customers. Left unmitigated and unchecked, these effects can lead to loss of existing natural gas customers and a potential "downward spiral" in which the risk of non-recovery of invested capital increases and asset potentially become stranded.

27.1 Does Terasen believe that there are ways to mitigate the effects of the Government policy?

Response:

Please see responses to CEC IR 1.12.4 and 1.19.1.l

27.2 Has Terasen laid plans to mitigate the effects of the Government policy?

Response:

Please see response to CEC IR 1.19.1.

27.3 Has Terasen evaluated where it is in the process of mitigating the effects of government policy and does it know how much further it has to go?

Response:

Please see CEC 1.19.1.

27.4 What concepts and plans does Terasen have to reduce or eliminate risks of non-recovery of invested capital?

Response:

In their recent Revenue Requirement Applications, both TGI and TGVI have taken steps to reduce the risk of non-recovery of invested capital.

TGI and TGVI have requested that depreciation rates be increased to match the useful life of the assets and to comply with the accounting changes that are driven by a change from Canadian GAAP to International Financial Reporting Standards ("IFRS"). Canadian utilities will be required to comply with IFRS for financial reporting periods commencing on January 1, 2011, with comparative figures for 2010 restated to be in compliance with IFRS.

The second step relates to offering new energy solutions to customers to help them meet their changing needs. As discussed in CEC IR 1.12.4, the new energy solutions that have been put forward by TG and TGVI do not reduce the business risks inherent to the natural gas business. Rather it is an attempt to share common costs across different energy solutions. A byproduct of this approach is that by having more than just natural gas to present to customers, the Terasen Utilities believe they will be able to supplement alternative energies with natural gas to provide solutions for a broader set of customers. This is intended to keep natural gas in the mix as an energy source in the long term more than otherwise would have occurred if the Terasen Utilities were not able to provide flexibility in the energy solutions that we offer to customers.

If these proposals are accepted by the BCUC they should help reduce risk, but their acceptance will not change the fact that overall risk to the business has increased.

27.5 Does Terasen expect to take action to offset or eliminate these risks or does it plan to let them unfold and become a reality?

Response:

Please see responses to CEC IR 1.19.1 and 1.27.4 for details relating to the mitigating efforts the Terasen Utilities have undertaken to address these business risks.

28. Exhibit B-1 – Tab 1, Page 15 – Effects of Aboriginal Rights and Title Issues

Uncertainty of the nature and extent of aboriginal rights and title in B.C. and the lack of treaties, create operational and regulatory complexity, and a risk of litigation, that is greater than that faced by similar businesses in other jurisdictions. All of these factors contribute to TGI facing a higher degree of risk than utility operations in other provinces.

28.1 Does Terasen believe that Aboriginal Rights and Title issues will have a greater effect on Terasen's costs and natural gas prices or on BC Hydro's and BCTC's costs and prices?

Response:

Terasen has not examined the impact that this issue will have on BC Hydro or BC Transmission Corporation's costs. In examining changes to the risk profile of the Terasen Utilities since 2005 when the Commission last considered Terasen cost of capital it was identified that aboriginal rights and title issues had not been explicitly considered by the Commission in terms of the significant impact these issues can have on BC utilities. With the recent decision in the Court of Appeal requiring that the BCUC consider whether or not appropriate consultation had taken place before granting approvals for capital projects an additional hurdle has been put in place to the conduct of utility business. In addition, aboriginal groups are more active in raising concerns respecting new utility projects and historic grievances.

Terasen's geographic footprint in the province is very broad but BC Hydro and BCTC combined have a larger footprint and greater investments in assets than does Terasen. Siting issues affect Terasen and the Crown utilities but it is likely that the Crown has and will have more requirements for installing infrastructure that crosses public lands and will be affected by the duties to consult with First Nations, but the issues that must be dealt with are similar. Uncertainty and delays in obtaining project approvals add to cost and risk whether it be installing natural gas delivery infrastructure, for suppliers of gas to Terasen, or for the construction of electricity generation or distribution/transmission assets. These issues affect BC utilities to a greater extent than utilities in other Canadian jurisdictions where treaties are more prevalent.

See also the responses to BCUC IR 1.29.1 and 1.29.2.

28.2 Has Terasen evaluated the relative risk issues between electricity and natural gas as they relate to Aboriginal Rights and Title issues?

Response:

Please refer to the Response to BCUC IR 1.28.1.

29. Exhibit B-1 Tab 1, Page 17 and 18 – Declining Competitiveness of Natural Gas

One of the challenges that TGI has faced in recent years, and which it will continue to face, is the relative price advantage vis-a-vis electricity (the difference between natural gas rates and electricity rates) on an annual operating cost basis. Between 1998 and 2008, the price advantage of natural gas compared to electricity in B.C. declined from 63% to 18%27.

29.1 The declining position of natural gas to electricity occurred up until 2008 at which time the 2007 BC Government Energy Plan policy direction to have BC Hydro reflect appropriate price signals to customers regarding the cost of new supply of electricity began to be implemented for residential customers. Why doesn't Terasen reflect this policy change as reducing its business risk?

Response:

The Terasen Utilities acknowledge that the provincial policy change of reflecting price signals based on marginal costs in electricity rates represents movement in the right direction. The establishment of the RIB rate structure for the residential customers and the future establishment of similar rate structures in other customer classes may help the competitive position of gas versus electricity at some time in the future. However, the fact remains that the current and future BC Hydro RIB rates may take some time before the RIB Step 2 Rate reflects the true marginal cost of new supply. See BCUC IR 1.31.4 for further details. Until the RIB Step 2 rates better reflect the cost of new supply the Terasen Utilities business risks have not been reduced.

Further, for many customers the space and water heating energy requirements for a dwelling do not all come from consumption above the RIB Step 2 volume threshold. The RIB Step 1 rate is very low since it is calculated residually and is largely reflective of the fact that a large majority of BC Hydro's cost structure is based on low cost power from Heritage resources. The Terasen Utilities will continue to face competitive challenges based on the fact that the RIB Step 1 rate is as much or more the relevant comparator in many situations than the RIB Step 2 rate is.

29.2 Has Terasen identified the potential extent of the cost of new supply of electricity from BC Hydro's LTAP hearings and compared what these costs will do to the competitive position of natural gas, if they are put into price signals as the Government 2007 Energy Plan and BC Hydro plans require?

Response:

Terasen acknowledges at Tab1, page 18 of the Application that the implementation of the RIB rate structure, which has price signals linked to the marginal cost of electricity, may bring about improvements in the relative cost of natural gas compared to electricity. As expressed in other responses (see BCUC IR 1.31.4, for example) there are a number of qualifying factors which mean that the improvement to the competitive position of natural gas is only partial. Among these are the fact that there is a significant portion of residential customers for which the RIB Step 2 rate is not the effective price signal for space heating load and the fact that there must be a significant operating cost advantage for natural gas relative to electricity to recoup the extra upfront capital costs of a natural gas heated dwelling relative to an electrically heated dwelling.

Other things being equal, the implementation in the RIB rate structure of price signals based on a higher cost of new electricity supply such as that discussed in the LTAP hearing would provide some short term benefit to the competitive position of natural gas likely in the area of load retention for existing customers. However, other things will not remain equal and in the longer term factors such as increased carbon taxes and GHG emissions reduction policies and legislation are likely to cause substantial impairment to the competitive position of natural gas in BC.

29.3 Has Terasen considered that the drive toward conservation and alternative energy in the US and Canada may have moderating impacts on the commodity price of natural gas for some time into the future?

Response:

Please see the response to BCUC IR 32.1.

29.4 Has Terasen considered the possibility that its business risks have been dramatically reduced and that the previous historical decline in price competitiveness has been reversed?

Response:

The Terasen Utilities disagree strongly with the assertion in the question that that their business risks have been reduced at all, let alone dramatically reduced. Certain policies and changes in the competitive landscape, such as the introduction of residential inclining block rate structure,

provide partial mitigation at best against business risk increases in other areas such as the carbon tax and climate change / GHG reduction policies and legislation.

TGI price competitiveness against electricity has declined for the period 1998 and 2008[13], but this decline in operating cost competitiveness decline ignores any payback of the difference in capital and maintenance costs between a natural gas-heated home and one heated by electricity.

In the short term, with the recent decline in the natural gas commodity prices, the natural gas operating cost advantage compared to electricity has improved. However, due to the volatility in natural gas prices, the potential increases in carbon tax, and how the marginal cost of new electricity will get reflected in BC Hydro rates, will determine whether or not this operating cost advantage will continue. Given that not all space and water heating energy requirements should be compared against the BC Hydro Step 2 rate, natural gas will continue to face challenges as it competes against the dominant Heritage cost structure that keeps BC Hydro's overall revenue requirements and rates so low for customers.

A significant operating cost advantage for natural gas as compared to electricity is needed if natural gas is going to be competitive with electricity on a total cost basis.

Therefore, TGI does not believe its price competitive position has been reversed.

Please also refer to BCUC IR 1.33.1.

29.5 Terasen acknowledges the BC Hydro implementation of the RIB rate design for residential customers. Is there a reason that Terasen has not acknowledged that BC Hydro is about to file an application for a Large General Service conservation rate design which will bring the commercial rates under the same sort of competitive effects as the residential rates?

[13] See Business Risks (Tab 1) page 24, which states : "the continued decline in the operating cost advantage from 63% in 1998 to just 18% un 2008 for natural gas versus it primary competition (electricity) combined with the lower capital and installation costs for electric baseboard heaters has created a challenging competitive market environment"

Response:

Terasen is aware of BC Hydro’s obligation to file a Large General Service (“LGS”) rate design application and that an important objective of the LGS rate design application will be to implement conservation rates. Apart from a general expectation that the implementation of efficient price signals in that customer segment will have some benefits for the competitiveness of natural gas it is not possible to anticipate specifically what those benefits will be before the new rate structure is approved by the Commission. It is readily apparent from evidence with respect to LGS rate design proposals in BC Hydro’s 2007 Rate Design Application (RDA) that the LGS rate class is a diverse and heterogeneous customer class with wide variations in annual electricity consumption and varying load profiles. The issues of competitiveness between natural gas and electricity are complicated by the energy consumption diversity displayed in this class. BC Hydro’s LGS proposals in the 2007 RDA were rejected by the Commission and it is quite possible that the regulatory process with respect to BC Hydro’s upcoming LGS rate design application will result in changes to the LGS rate design proposals included in the application. In short, it is not possible to predict what benefit to natural gas competitiveness will arise from the LGS RDA regulatory process.

The costs arising from other policies and legislation such as the carbon tax and GHG reduction targets will have corresponding negative impacts on the competitiveness of natural gas among commercial and general service customer groups as they do in the residential class.

30. Exhibit B-1 – Tab 1, Page 24 – Pricing Differences between Electricity and Natural Gas

One of the reasons for the decline in the price advantage that natural gas has had against electricity is the manner in which these products are priced in BC. Natural gas commodity pricing for consumers in BC is market-based; in contrast a large percentage of the costs making up electricity rates are the low embedded costs of BC Hydro’s Heritage generation facilities. Please see Figure 3.1.4 below, which shows BC Hydro’s electrical rates are among the lowest in North America.

30.1 Is it not the case that BC Hydro has been moving aggressively to ensure that the long-run marginal cost of new supply for electricity will be reflected in its pricing and electricity conservation (DSM) investment policies?

Response:

The Terasen Utilities acknowledges that BC Hydro has been working towards the implementation of rate structures that include conservation price signals based on the marginal cost of electricity. The Terasen Utilities have generally supported the development and introduction of rates and tariffs of this nature in such proceedings as the BC Hydro’s 2008 Residential Inclining Block hearing and the 2007 Rate Design Application.

30.2 Does Terasen believe that the government’s 2007 Energy Plan policy on electricity pricing and BC Hydro’s moves to implement relevant price signals in its rate designs are addressing the historical concern about the differences between the two energy sources and their pricing?

Response:

Taken on their own rate structures such as the RIB rate are of some benefit in improving economic efficiency and sending appropriate price signals to energy consumers. However, since most of BC Hydro’s electricity supply continues to be produced at a cost far below the marginal cost of supply and rates overall must be set on a cost of service basis, the conservation rate structures involving marginal cost based pricing must involve making trade-offs.

Using the RIB rate structure as an example, trade-offs needed to be made on the size of first consumption block and the price difference between the Step 1 and Step 2 rates, among other things. In the end, each customer is affected differently by the rate structure adopted because of different electricity consumption and usage profiles. Lower volume users of electricity have

come out ahead under the RIB structure relative to the previous flat rate structure. A large group of BC Hydro's residential customers will not experience the intended conservation price signal. So even though the implementation of the RIB rate and conservation rates in other classes are steps in the right direction they cannot deal with all the competitive concerns between electricity and other energy sources.

30.3 Has Terasen evaluated the competitive price position of natural gas relative to BC Hydro's evidence that the marginal cost of new supply for electricity is in the range of $120/MWh or more and if not why not?

Response:

Please see Response to CEC IR 1.37.1 for an analysis of the competitive position of natural gas that includes reference to the anticipated increase in the marginal cost of new supply to $120/MWh.

The $120/MWh figure for the marginal cost of new electricity supply is an estimate based on BC Hydro's portfolio modeling in the LTAP but is not based on EPA awards in the current Clean Power Call so it is still uncertain whether the $120/MWh is appropriate or not.

The BCUC Decision on the 2008 RIB Application is not prescriptive on how a new determination of the marginal supply cost will be incorporated or phased in to the RIB rate structure. A RIB Step 2 rate at $0.120/kWh would be an increase of about 45% over the current Step 2 rate of $0.0827/kWh. Incorporating such a large increase into the Step 2 rate would have the potential to drive down the Step 1 rate since the Step 1 rate is calculated residually. Terasen does not have the capability of modeling the inter-relationship between the Step 1 and Step 2 rates, and revenue requirement increases, or know how BC Hydro would propose to phase in an increase in the Step 2 rate to $0.120/kWh. The Terasen Utilities believe that both the Step 1 and Step 2 rates have relevance in assessing natural gas competitiveness against electricity in the residential class so a comparison that only makes reference to a Step 2 rate at $0.120/kWh is an incomplete comparison.

30.4 Please calculate the comparative price advantage that natural gas would have at today's natural gas price versus a price signal of $120/MWh for electricity at the margin?

Response:

Please see response to CEC IR 1.37.1.

31. Exhibit B-1 – Tab 1, Page 26 – Comparative Advantage of natural gas to Other Jurisdictions

	ANNUAL BILL - NATURAL GAS	ANNUAL BILL - ELECTRIC	GAS VS. ELECTRIC PRICE ADVANTAGE	
Terasen Gas (Lower Mainland)	$1,118	* $1,641	-32%	lower
Puget Sound Energy - Washington	$1,476	$2,530	-42%	lower
Northwest Natural Gas - Oregon	$1,604	$2,142	-25%	lower
Direct-Atco - Alberta	$775	$2,979	-74%	lower
Union Gas - Ontario	$1,010	$2,366	-57%	lower
Enbridge Gas - Ontario	$875	$2,366	-63%	lower
Gaz Metro - Quebec	$1,543	$1,574	-2%	lower

31.1 Has Terasen calculated this table above based on the average cost of residential electricity or the Tier 2 marginal cost?

Response:

Terasen used a calculated BC Hydro rate based on their F2009-2010 Revenue Requirement Application. The Commission approved an increase of 8.74%, plus the applicable one per cent deferral account rate rider. Terasen added 8.74 per cent to the BC Hydro approved residential rate effective April 1, 2008 prior to the approval of the two tier Conservation Rate in October 2008. Terasen did not use the Tier 2 marginal cost due to not all space heating requirements come from Tier 2, therefore Terasen believes the average is a more applicable comparison.

31.2 Please compute the comparative advantage for Terasen based on the Tier 2 cost if this is not included above and supply the table with the recast numbers.

Response:

The revised table is below.

As noted in other responses, for many premises, particularly smaller ones, part or in some cases all of the electricity used for heating will be within the Tier 1 consumption level.

	ANNUAL BILL - NATURAL GAS	ANNUAL BILL - ELECTRIC	GAS VS. ELECTRIC PRICE ADVANTAGE	
Terasen Gas (Lower Mainland)	$1,118	* $1,983	-44%	lower
Puget Sound Energy - Washington	$1,442	** $2,607	-45%	lower
Northwest Natural Gas - Oregon	$1,568	** $2,253	-30%	lower
Direct-Atco - Alberta	$775	$2,979	-74%	lower
Union Gas - Ontario	$1,010	** $2,463	-59%	lower
Enbridge Gas - Ontario	$875	** $2,463	-64%	lower
Gaz Metro - Quebec	$1,543	** $1,772	-13%	lower

Notes:
**BC Hydro annual bill based on the RIB Step 2 rate Effective April 1, 2009 (inclusive of the applicable 1% rate rider)*

***To be consistent with utilizing the BC Hydro RIB Step 2 rate, annual electric bills of other utilites have been calculated using their highest tier rate, assuming that the household electricity use that would be displaced by natural gas would come out of the upper tier.*

Annual Bills for natural gas and electric, for all territories, are based on an annual use rate of 95 GJ.

The efficiency of gas equipment is assumed to be 90% relative to 100% for electricity to determine equivalent electricity. Lower gas efficiency appliances would result in lower gas price advantages than indicated above.

The annual electric rates do not include the fixed monthly charges since it is assumed that a household already pays the basic electric charge for non-heating use.

All rates are as at April 1, 2009.

All rates are exclusive of applicable franchise fees and/or taxes (with the exception of the Carbon Tax). Interior BC community customers pay a franchise fee of approximately 3%, which would reduce the indicated price advantage of gas by a like amount.

All annual bills are best estimates based on the information available from each utility.

31.3 What is the comparative cost of new supply for electricity in BC versus other jurisdiction?

Response:

Terasen does not have the relevant information on the comparative cost of new electricity supply in other jurisdictions relative to BC. The cost of new electricity supply in other jurisdictions is not particularly relevant to the competitiveness comparison between gas and electricity in BC or to the analysis presented in Figure 3.2 (Exhibit B-1, Tab1, p.26) that is partially reproduced in the question.

While the costs of developing a new electricity generation source of a given technology and size (i.e. a 500 MW Combined-Cycle Gas Turbine) might be expected to be fairly similar across jurisdictions the specifics for what technology and supply characteristics would constitute the marginal supply resource will vary considerably from one jurisdiction to the next. The electricity

supply in one region may be energy constrained while in another it may be capacity constrained. In some jurisdictions the electricity system may be summer peaking while in others it is winter peaking. Policies and legislation vary between jurisdictions governing matters such as renewable portfolio standards and restrictions on developing particular generation resources (such as the BC policies of prohibiting nuclear power and that coal-fired generation must have 100% carbon capture and storage.) The renewable power potential varies from one jurisdiction to the next both in overall quantity and in the potential by generation technology (wind, solar, run-of-river hydro, etc.). The foregoing is a limited set of the factors that could vary the makeup of the marginal cost of new electricity supply across jurisdictions.

The particular competitive circumstances and the set of policies and legislation that pertain to natural gas and electricity in British Columbia are what are germane to this proceeding.

31.4 What other jurisdictions are implementing electricity pricing reflecting the marginal cost of new supply in the same way BC Hydro is doing?

Response:

As observed from Appendix C in the 2008 BC Hydro Residential Inclining Block Rate Application (See Attachment 31.4) there are many utilities in Canada and USA that have residential inclining block rate tariffs. There are variations based on several factors such as different rate structures by season and the number of consumption blocks. The details of how the number of blocks, the block sizes, and the basis for setting the rates in each of the rate blocks are unique to each utility and jurisdiction. Marginal costs, system capacity constraints and the summer or winter peaking nature of the load are among the factors considered in establishing such rate structures.

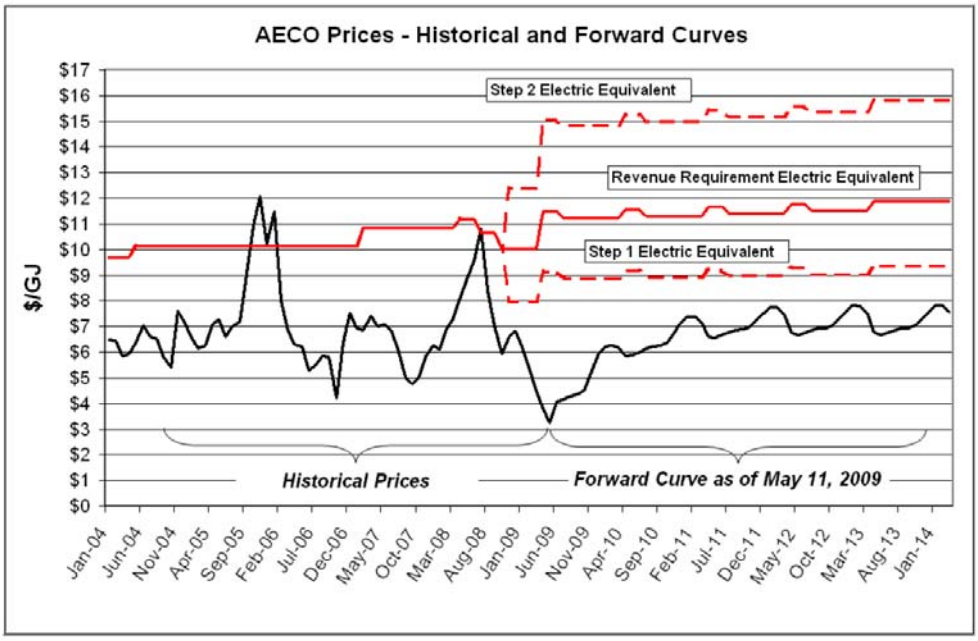
Specific to BC, the Terasen Utilities are unsure how BC Hydro's incremental cost of new supply of $120/ MWh as put forward in the BC Hydro 2008 LTAP will get established into customer rates. This is concluded by the following statement from the Commission's BC Hydro RIB Application decision that says on page 108:

> *"when circumstances dictate, BC Hydro must file an application to change its estimate of the cost of new supply and to include in that application a proposal of how to phase in the change, so that the allocation of revenue requirement increases between the Step-1 and the Step-2 rates will be reviewed on a case by case basis each time BC Hydro makes an application to change its estimate of the cost of new supply".*

The Terasen Utilities are unable to comment on how utilities in other jurisdictions with inclining block rate structures compare to BC Hydro, because the reasons for adopting the rate structures are somewhat different in each case and how BC Hydro will eventually reflect the marginal cost of new supply in rates is still to be determined. See BCUC IR 1.34.1 for more details on why BC Hydro Step 2 rate may not reflect the marginal cost of new supply in the coming years.

32. Exhibit B-1 – Tab 1, Page 28 – Comparative Advantage for Natural Gas versus Electricity

Figure 3.3: AECO Prices vs. Electric Equivalent Commodity Component Current Prices as of May 11, 2009



32.1 The price increase assumptions for electricity embedded in the graph in Figure 3.3 appear to move electricity from $15/GJ equivalent in June 2009 to $16/GJ equivalent in January 2014. This would appear to be a 6.6% increase over approximately 5 years. Where did the price assumptions for the Tier 2 price over this period of time come from?

Response:

Please see response to BCUC IR 1.33.2.

32.2 Has BC Hydro indicated in any of its evidence that it intends to move the Tier 2 price relative to any other sources of information regarding the cost of new supply of electricity at any time during the next five years?

Response:

Terasen is not aware of any evidence from BC Hydro that states how it plans to adjust the RIB Step 2 rate based on particular sources of information regarding the cost of new electricity supply. Terasen has taken its views of what will happen to the RIB Step 2 rate from page 108 of the Commission Decision on the RIB Application (BCUC Order No. G-124-08) which states as follows:

> "In addition the Commission Panel includes in its conditional design principles an instruction that, when circumstances dictate, BC Hydro must file an application to change its estimate of the cost of new supply and to include in that application a proposal of how to phase in the change, so that the allocation of revenue requirement increases between the Step-1 and the Step-2 rates will be reviewed on a case by case basis each time BC Hydro makes an application to change its estimate of the cost of new supply."

The RIB Decision does not prescribe either the basis for BC Hydro coming up with a revised cost of new supply or how exactly such a change in cost of new supply will be incorporated into the RIB Step 2 rate. The RIB Decision used the results of BC Hydro's 2006 Call for Power as representative of the cost of new supply and to derive the current Step 2 rate of 8.27 cents/kWh. The RIB Decision does not say that the results of future calls for power must be used to reset the RIB Step 2 rate although it is a reasonable assumption to expect that they would. The RIB Decision clearly contemplates phasing in changes to the Step 2 rate, presumably to allow for the situation where a large change in the cost of new supply would cause large decreases in the Step 1 rate if brought in too quickly.

32.3 Has Terasen consider what may happen to electricity prices after March 2010 when the Commission's previous rate rebalancing decision becomes eligible for reconsideration and implementation?

Response:

The Terasen Utilities are aware that the full restriction on the Commission's ability to require BC Hydro to do rate rebalancing for the purpose of changing revenue to cost (RC) ratios ends on

March 31, 2010. After that date the Commission is limited to requiring rate rebalancing that increases revenue to cost ratios for any given class by a maximum of 2% per year. With the 2% per year limitation it would be approximately five years for the residential RC ratio to reach unity if the Commission's requirement was reinstated that BC Hydro do rate rebalancing to achieve 1 to 1 RC ratios in the rate classes (and assuming that RC ratios have not changed appreciably since the 2007 RDA).

What must be remembered in the context of rate rebalancing is that it is revenue neutral overall so that rate rebalancing-driven increases in the residential class will be offset by decreases in other classes. BC Hydro's small general service rate class had RC ratios in the 2007 RDA that were the most in excess of 1 to 1 and would therefore stand to benefit from rate reductions under rate rebalancing.

Therefore for natural gas there would be improved competitiveness in the residential class but the opposite in the general service classes. Furthermore it is not certain that a proceeding before the Commission to reinstate the RDA Decision rate rebalancing provisions (in a manner permitted by the legislation) would lead to a similar BCUC decision that rate rebalancing should proceed until 1 to 1 RC ratios are achieved.

32.4 Has Terasen considered what will happen to electricity prices when BC Hydro reveals the bid price information from its 2008 Clean Power Call?

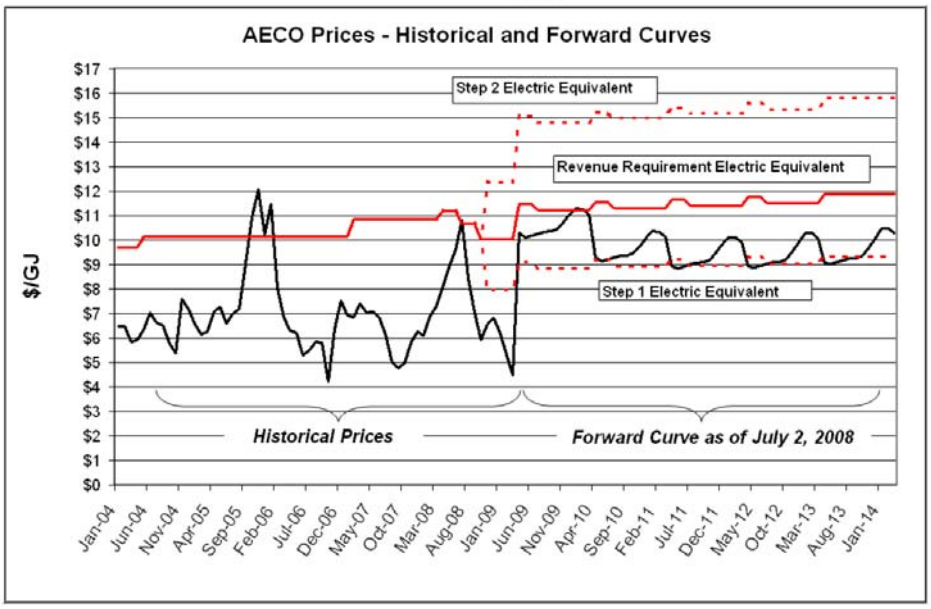
Response:

Terasen is expecting that in due course after the 2008 Clean Power Call is complete and any EPA awards have been approved by the Commission an application will be filed as directed at page 108 of the RIB Decision indicating what the revised cost of new electricity supply is and seeking approval for a phasing in the corresponding new value into the RIB Step 2 rate over several years. There would be a similar process to reset the Step 2 rate for the Transmission Service class. Also, if conservation rates based on the cost of new electricity supply have been established by then in any other classes such as the Large General Service class the rate adjustments would be made there as well.

While Terasen expects the sequence of events described above to be the likely course of events it is quite possible that other outcomes could occur.

33. Exhibit B-1 – Tab 1, Page 30 – Natural Gas Price Volatility

Figure 3.3.1: AECO Prices vs. Electric Equivalent Commodity Component Prices as of July 2, 2008



33.1 Why is the pattern of volatility in the historical information so different from the pattern of volatility reflected in the forward price curve?

Response:

The pattern of volatility in the historical prices is different from the pattern of volatility associated with the forward price curve because the historical prices are reflective of specific events that impact market prices in the near term whereas the forward price curve volatility is reflective of forecast and perceived supply and demand factors that could impact prices in the future. For example, the price spike that occurred in the summer of 2005 was primarily the result of one specific factor, that of the active hurricane season and significant reduction in available Gulf of Mexico gas supply going into the winter season. The recent price dip occurring in 2009 is primarily the result of the slowdown in economic activity in North America combined with strong production levels. However, given that there is less certainty around specific market-influencing events in the future, the forward price curve is relatively smooth compared to historical prices and displays the seasonality associated with summer and winter demand.

The forward curve will change to some degree each day as new information regarding future supply and demand factors is determined in the marketplace. When forward prices ultimately settle, and become historical prices, they may be significantly different than were presented in the forward curve due to the multitude of short term supply and demand variables that can influence prices in the near term.

33.2 The difference between May and July is provided to reflect the fact that the market reflects substantially different price differentials at different times. Has the natural gas commodity reflected this sort of volatility from time to time for say the last ten years?

Response:

The difference in the forward AECO price curves as of May 11, 2009 and July 2, 2008 reflects the ability of forward prices to move substantially over time. The volatility associated with the changes between these two price curves can be measured by the percentage difference in the average prices. The average of the forward prices out to 2014 as of May 11, 2009 is $6.69/GJ while the average as of July 2, 2008 is $9.71/GJ. This represents a $3.02/GJ or 45% difference from May 11, 2009 to July 2, 2008.

The historical AECO monthly prices for the past ten years have also displayed a significant amount of volatility. One method of measuring this volatility is by comparing the standard deviations of prices (as an indication of variability about the mean) relative to the average prices over the past ten years. For the ten year period of August 1999 to July 2009, the AECO monthly index standard deviation is $2.10/GJ on an average of $5.98/GJ, which yields a volatility factor of 35%.

When selecting a shorter time horizon, such as the past twelve months (from August 2008 to July 2009), the volatility factor is higher, given the significant run up in energy prices last summer. The volatility factor on AECO historical prices for this period is 45%.

Therefore, while the historical volatility over the ten year period is less than that experienced in forward prices from July 2, 2008 to May 11, 2009 (due to the longer term horizon which has the effect of dampening short term price volatility), the historical volatility over shorter periods of time has reflected similar volatility to that reflected in the forward price curve changes.

34. Exhibit B-1 – Tab 1, Page 30 – Comparative Advantage of Natural Gas

One might conclude from Figure 3.3.2 that at current forecast gas costs, TGI has a competitive advantage against the listed electricity equivalent rate comparisons on an operating cost basis.

34.1 Does Terasen conclude that natural gas has a comparative advantage against electricity?

Response:

The Terasen Utilities agree that on an operating cost basis (excluding the capital and maintenance costs difference between a natural gas and electric heated home) that natural gas does currently have a operating cost advantage against a home heated by electricity.
This is supported by the charts presented on pages 21-23 of the Business Risks section (Tab 1) of the Application. However, Section 3.4 of Tab 1 discusses the fact that natural gas needs a significant operating cost advantage over electricity in order to recoup the extra upfront capital costs and ongoing maintenance costs of a gas heated dwelling relative to an electrically heated dwelling. The magnitude of the operating cost advantage needed was estimated to be in excess of $10/GJ in Figure 3.4 (Tab 1, page 30).

To determine whether or not the Terasen Utilities have a competitive advantage against electricity on a total cost basis, the Terasen Utilities point to the conclusion arrived at by BC Hydro in its CPR 2007 results and discussed on page 24 of the Business Risks (Tab1) which states:

"[I]n the BC Hydro Conservation Potential Review Summary Report (Fuel Switching: Residential Sector) dated November 20, 2007, BC Hydro determined that no fuel switching (electricity to natural gas) measures were achievable.[14] In other words, the measure payback period either exceeds the life of the measure or the measure never pays back the original investment.[15]"

[14] BC Hydro Conservation Potential Review 2007, Fuel Switching: Residential Sector, November 20, 2007, Page 112, Achievable Potential is defined: The portion of savings identified in the Economic Potential that could realistically be achieved within the study period through government and utility-led interventions and programs given institutional, economic and market barriers.

[15] BC Hydro Conservation Potential Review 2007, Fuel Switching: Residential Sector, November 20, 2007, page 89, study was for new and existing measures.

34.2 Does Terasen conclude that the comparative advantage of natural gas against electricity has improved with the advent of the BC Hydro RIB Tier 2 rate?

Response:

Please refer to CEC IR 1.34.1. and 1.29.1.

35. Exhibit B-1 – Tab 1, Page 31 – Capital Cost Investment Differential

When the capital cost differential of $10.31 per GJ is added to the numbers outlined in Figure 3.3, natural gas for space heating applications is not competitive relative to any of the electric rates outlined in Figure 3.3, even the Step 2 RIB rate. The disparity in the overall competitiveness of natural gas taking into account upfront capital costs is very concerning given that natural gas commodity prices are lower today than in recent years and are actually below the costs of finding and developing new natural gas supply resources which suggests that natural gas prices are bound to increase in the future.

35.1 Please compute the capital cost differential based on the same 6% discount rate, $4500 capital cost and instead use a 25 year economic life for the furnace, and reduce the annual maintenance requirements to $50. What would the capital cost differential calculate out to be in $/GJ for these assumptions?

Response:

The table below is the same as Figure 3.4 on page 31 of Business Risks (Tab1) within the Application, except for changes to the life of the furnace (18 to 25 years) and a reduction in maintenance costs (reduced from $100 to $50). These changes drop the operating cost advantage needed from $10.31 GJ to $8.04 GJ to recover the difference in capital costs between a natural gas heated home and a home heated with electricity, related to a single family home located in the Lower Mainland.

Payback of Capital Costs (New Construction)

Space Heating Requirement Only New Construction of home in Lower Mainland (2500 square feet in size)	
Capital Costs for High Efficent Furnace (90%) and ducting/installations	$7,000.00
Capital Cost for Electric Baseboards	($2,500.00)
Difference in up front capital costs	$4,500.00
Interest Rate	0.06
Measureable Life of Furnace (years)	25
Amount that has to be recovered in operating cost annually to payoff difference in capital cost	$352.02
Add in furnace maintence costs per year	$50.00
Total ($)	**$402.02**
Energy consumptions for natural gas space heating (GJ's)	50
Difference in cost that needs to exist between natural gas heated home and electrcity heated home in $/GJ over 25 years	**$8.04**

35.2 Would natural gas be competitive with electricity if these parameters were realistic?

Response:

Please refer to BCUC IR 1.35.1.

Terasen Utilities believe the assumptions contained in Figure 3.4 on page 31 of Business Risks (Tab 1) are reasonable and realistic.

35.3 Does Terasen have a view as to whether or not it is possible to reduce the capital costs for furnaces if the heat is produced more centrally in a new neighbourhood and distributed hydronically?

Response:

A district energy system ("DES") is a complicated system and as such it is not possible to determine if capital costs are lower if the system is a central system as opposed to individual systems. The capital costs for a district energy system, due to the inherent complexity, are not commoditized in the same manner as a gas furnace. Each and every DES system would have different variables and capital costs based upon factors such as heating source, heat distribution piping, individual heat exchangers, furnaces/boilers, number of customers, and the heat delivered per customer. These factors could result in the capital costs being less per customer or the capital costs could be more per customer.

The advantage of a DES is not so much the cost of the system but rather the energy efficiency of the system and the potential of reducing greenhouse gas emissions. A DES system could use a variety of heating sources from gas to geo-exchange, to solar to electricity and biomass. In addition, sources of excess heat from existing buildings (such as swimming pools or industrial applications, and cold from skating rinks can be moved from one area of the DES to another, further increasing the efficiency of the system. This may or may not result in a lower cost of delivered energy as compared to the lifecycle cost of an individual furnace and the cost of gas for the furnace, but can result in a system that emits fewer GHGs.

35.4 Has Terasen determined if there may be a more economical way to provide heat to homes in the future, particularly to the new multi-family dwellings which Terasen is having trouble capturing?

Response:

Yes, Terasen continues to investigate and encourage customers to use new technologies for heating that can be both economical for the home/unit owner and beneficial to the developer (who pays for the initial capital installation). Some examples of home heating appliances include:

- Forced air furnaces, which are still the most common single family gas appliance;
- Residential boilers - provide heated supply return water to radiators or slab heating. These can be zoned but do not provide cooling. Cooling is traditionally from a separate appliance.
- Ground Source Heat Pumps can be married to a Rohbur Absorption heating/cooling unit. This is more common in European jurisdictions. However this is very costly but is starting to become more popular and prices are coming down.
- Combination Systems - Dual function hot water tanks provides heating hot water to a fan coil that is then distributed through a forced air system. Both located in the utility room or basement. Can provide cooling by DX cooling application
- Direct Vent Heaters – such as those manufactured by Bosche or Paloma. These heaters provide heated supply return water to radiators or slab heating. This type of heating can be but similar to residential boilers, there is not a cooling option. Cooling is traditionally from a separate appliance.

However, even with this effort and the new technologies available, this alone will not overcome the difficulties in attaching customers in multi-family units. As is partly described in BCUC IR 1.37.1, much depends upon the developer's design of the building, the space available for heating appliances in the individual suites and the end use customer's willingness to pay for the increased costs for some heating appliances. Due to the increased space requirements for in suite gas space heating appliances as compared to electrical or radiant heating options, it is often not economic for a developer to allocate the valuable space to gas heating equipment. Instead a developer will allocate the space to something that will bring a higher return on investment than heating equipment.

35.5 Does Terasen agree that if and when BC Hydro's rates reflect the long run marginal cost of new electricity supply that natural gas will be very competitive with electricity?

Response:

Please refer to CEC IR 1.37.1.

36. Exhibit B-1 – Tab 1, Page 32 – Declining New Customer Capture Rate

A utility's ability to manage risk is in part dependent on its ability to attach and retain customers. These factors are a significant influence on the throughput volume that will flow across the utility's distribution system over the long term and will have a major effect on the long-term ability of the utility to recover its investment. In TGI's case, the Company is capturing a declining percentage of the new housing starts in BC, TGI is also experiencing declining use rates for existing customers. These factors were occurring even before the provincial Energy Plan was announced, which has a strong focus on energy conservation, and therefore, this trend can reasonably be expected to accelerate.

36.1 When Terasen provides service to a multi-family dwelling unit does it provide the service often through a single account?

Response:

Historically, Terasen has provided service to multi-family dwellings through a single account, and those types of attachments represent approximately 80% of our multi-family dwelling customers. However, over more recent years Terasen has been providing service to multi-family dwellings through multiple accounts, one for each individual unit. And, the intent is to continue attaching multi-family dwellings through one account for each individual unit within that multi-family dwelling.

36.2 Are the statistics for new multi-family dwellings based on one for each home in a multi-family dwelling?

Response:

Yes, the statistics for new multi-family dwellings are based on one for each home in a multi-family dwelling (i.e. one for each unit).

36.3 How is the Terasen capture rate for multi-family dwellings calculated and determined?

Response:

The capture rate for multi-family dwellings is calculated by determining the total number of units that have been attached in a given year (obtained through CAFÉ – Customer Attraction Front

End reporting tool), and then dividing that figure by the total number of multi-family dwelling units that have been started in that year (obtained from the CMHC).

36.4 What strategies is Terasen using to capture multi-family dwellings? What strategies are working?

Response:

The Terasen Utilities have three regional sales teams focused primarily on maximizing natural gas use in residential new building construction. Our primary target is space and water heating, followed by lifestyle applications like fireplaces, cooking, barbeques, dryers, etc.

We have primarily been focused on the Multi-family dwelling business, understanding that this form or housing has an appeal to first time home buyers, and as demographics change, for those interested in downsizing. This building type has also recently found favour with municipal planners interested in increasing urban density as a strategy in support of greener communities.

Our focus in this market begins at the planning stage with architects, engineers and builders/developers ("AEDs"). Generally through our contacts in the industry, we are aware of plans prior to the building permit stage, and have an opportunity to influence fuel choice. We have developed special products targeted specifically at this market as well (vertical subdivisions, piping-to suites, and thermal metering being recent examples). Early influence and special products can make a difference in fuel choice, but electric baseboards remain the heating source of choice for entry level and low price point consumer markets.

Recently, we have been successful in working with AEDs on hybrid solutions – combining gas requirements with renewable heat sources like geo-exchange and waste heat recovery. These hybrid solutions are perfect examples of how traditional gas utility service offerings must evolve to include alternative energy sources to optimize value for our customers, while minimizing the carbon footprint of the building. Hybrid solutions will form a fundamental service offering for the Terasen Utilities in this market now and into the future.

36.5 What strategy development effort does Terasen have underway to capture more multi-family dwellings and how much is Terasen spending on changing its capture of multi-family dwellings over what timeframes?

Response:

Since 2004, Terasen Utilities have had a focus on addressing the challenges in the multi-family dwelling marketplace. Please see response CEC IR 1.36.4 for additional information.

During this time we have also reallocated resources and priorities within the Marketing Department which resulted in sales manager roles being developed whose focus is working with builders, developers, engineers and architects that build multi-family dwellings. Staffing levels and the associated budgets proposed in the Revenue Requirements Application should support more presence at the early planning stages for these types of buildings. It is anticipated that this increased presence will result in increased market penetration.

Over the course of the 2008/2009 winter period, TGI engaged a third party consultant to help the Terasen Utilities develop a strategic approach to meeting our customer's energy needs. This along with anecdotal information brought back from our sales and account management staff has shown a desire for customers to look beyond gas applications for multi-family housing to hybrid solutions, using gas and an alternative fuel, and in some cases primarily alternative energy solutions. To meet these customer needs and to increase our penetration in the multi family market, we have proposed to move into the Alternative Energy field as part of the TGI and TGVI Revenue Requirements Applications.

36.6 Does Terasen have a view with respect to the economics of hydronic distribution of heat in multi-family dwellings versus conditioned air circulation in multi-family dwellings versus natural gas distribution to each dwelling unit?

Response:

As noted in response to question IR CEC 1.35.3, the economics of a hydronic heat distribution to multifamily dwellings versus air conditioned circulation versus natural gas distribution to each dwelling are dependent upon each individual project and the variables inherent in those projects. In some projects it may be more or less economic for each of the technologies identified.

However, there are far more options than those noted above that are considered for a multifamily development and in many cases could include a combination of all three of hydronic heating, conditioned air and gas distribution to each dwelling for every unit in a building. For example, there are some buildings which have a central gas fired boiler for space heat, separate cooling and natural gas separately metered and delivered to each suite for appliances such as fireplaces, cook tops, barbeques and hot water heaters. Some of the additional options and considerations that affect the economics of providing heating and cooling to a multifamily development include:

- Building Type – Different building type will lead to different heating and cooling options.
    - Wood frame up to 6 stories high depending on fire rating.
    - Concrete Tower type 6 stories to 60 plus stories.

- Target Market – depending upon the target market, a developer will install different equipment to maximize return on investment.
    - Low end, entry level.
    - Mid end
    - High end Luxury
    - Resort, seniors housing, intermediate care, traditional residential;

- Region and Associated Customer Requirements – Different regions have different requirements and customer tastes.
    - Vancouver Island and Lower Mainland - small suite footprint, low cost no air conditioning, electric fireplaces, some lifestyle gas including - ranges, barbeque, dryers, fireplace;
    - Interior - larger suite footprint, air conditioning is required. Higher gas loads in mid and high end market.

- Types of Gas Fired System – There are many types of gas fired systems that can be selected by a developer.
    - Central Applications
        - Hot water heating - Central boiler piped supply and return to suites from a central mechanical room to radiators, convectors or slab heating in the suite. No cooling;
        - Water Loop Heat Pump Heating and Cooling. (WLHP) - Ideal if there is a commercial space on main floor. Very cost effective. Boiler and cooling tower create ideal temperature conditions 60 to 100 F for individual heat pumps in suite or commercial space.
    - Individual Suite applications
        - Furnace - Condensing furnace contained in suite utility room provides heating or cooling through a ducted system.
        - Combination System - Dual function hot water tank provides heating hot water to a coil in a fan coil. Both located in the utility room of the suite. Can provide cooling by either central chilled water system or by DX cooling application. Power vented application;
        - Wall Pak - Provides heating or cooling through a ducted system to the suite. Sits on the outside wall of the suite usually in a small room on the outside deck.
- Alternative Energy Options – depending upon end use customer target market, a developer may choose to supplement, or replace, gas and electricity usage with alternative energy. Options include:
    - Ground Source Heat Pump
    - District Energy Systems
    - Air Source Heat Pump
    - Solar Thermal

In other words there are a significant number of options that can be considered for a multi-family development, each with its merits, and each option will drive an economic result that the developer must consider. Our sales staffs help developers determine the costs and the benefits energy usage in each individual project in the hope of determining the optimal energy solution for meeting both economic thresholds but also energy efficiency and emissions reduction targets.

36.7 What are the best practices for a utility like Terasen, taken from other jurisdictions, to deal with capturing the multi-family dwelling market?

Response:

The Terasen Utilities have not undertaken a study of best practices in the capture of this market segment. However, such a study might not provide much value as in conversations with other utilities, it has become apparent that the energy landscape, and natural gas as an energy solution, in BC is unique. In most other jurisdictions, natural gas is seen as a solution for reducing green house gas emissions. Further, in those jurisdictions, electricity is priced closer to the margin. As a result, the gas utilities in these jurisdictions are not facing the same competitive pressures and business risks as the Terasen Utilities and have therefore not been as aggressive and creative at trying to find a solution to customer’s needs.

37. Exhibit B-1 – Tab 1, Page 36 – No Relief on the Horizon

While the revenue stabilization mechanism of TGI provides short term intra-year relief from declining use, it does not offset the fundamental competitive pressure that results from declining use, particularly when electricity pricing based on a very large historic hydro component is the primary alternative fuel. There appears to be no relief on the horizon available to TGI to mitigate the business risks from these factors.

37.1 Why does Terasen not believe that pricing marginal use of electricity above a certain threshold consumption is some significant form of relief when compared to what was in place the last time its ROE was reviewed?

Response:

The Terasen Utilities agree, as stated in the response to CEC IR 1.29.1 and elsewhere, that the introduction of electricity rate structures, such as the BC Hydro RIB rate, designed to send price signals based on marginal cost, represents a step in the right direction. However, as also stated in CEC IR 1.29.1, the RIB Step 2 rate is not the sole relevant comparator for natural gas. Some of the residential electricity consumption for which natural gas is a substitute would come from the Step 1 consumption block. BC Hydro's embedded average cost of electricity is dominated by power from low cost Heritage generation resources so that if some of the electricity provided to a customer class is priced on a higher marginal cost basis, such as with the RIB Step 2 volumes, the balance of the electricity consumed by that class must be priced at a rate lower than the embedded average cost. For the portion of residential energy consumption that the Step 1 rate is the valid comparator the competitive challenge against electricity is greater than under the old flat rate structure.

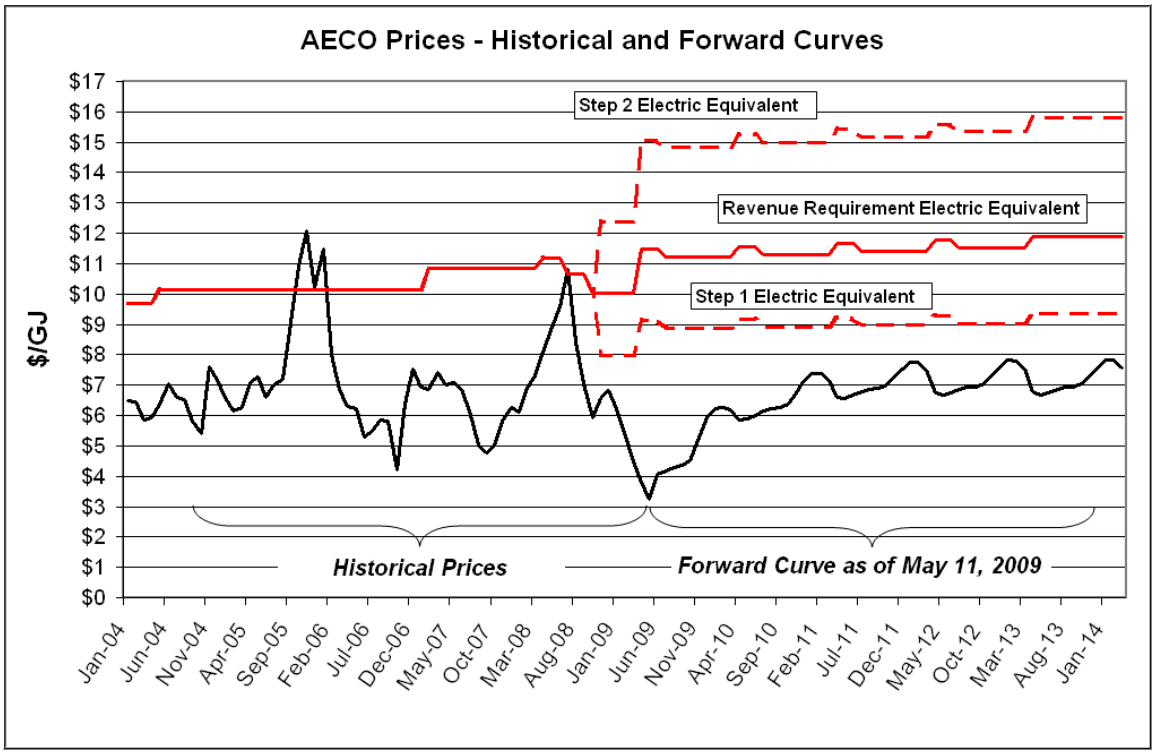
However, given that the BC Hydro marginal cost of new supply ($.120/kWh from BC Hydro LTAP) is over 40% higher than the current RIB Step 2 rate ($.0827/kWh as of April 1, 2009), there is a great deal of uncertainty on how the competitiveness of natural gas and electricity will unfold into the future. This is further complicated by the ever-changing natural gas commodity marketplace and the potential for policies such the carbon tax to have a larger impact on fossil fuels in BC than on electricity.

The Terasen Utilities competitive position against electricity through 2008 has declined[16] when looking at an operating cost comparison of natural gas versus electricity. On a go forward basis the interplay between when and if the BC Hydro rates reflect marginal supply costs and what happens to natural gas prices will determine if natural gas competiveness to electricity improves in the coming years. This is evident from the following series of graphs.

[16] As stated on page 24, of the Business Risks (Tab 1):"The continued decline in the operating cost advantage from 63% in 1998 to just 18% in 2008 for natural versus its primary competition (electricity)"

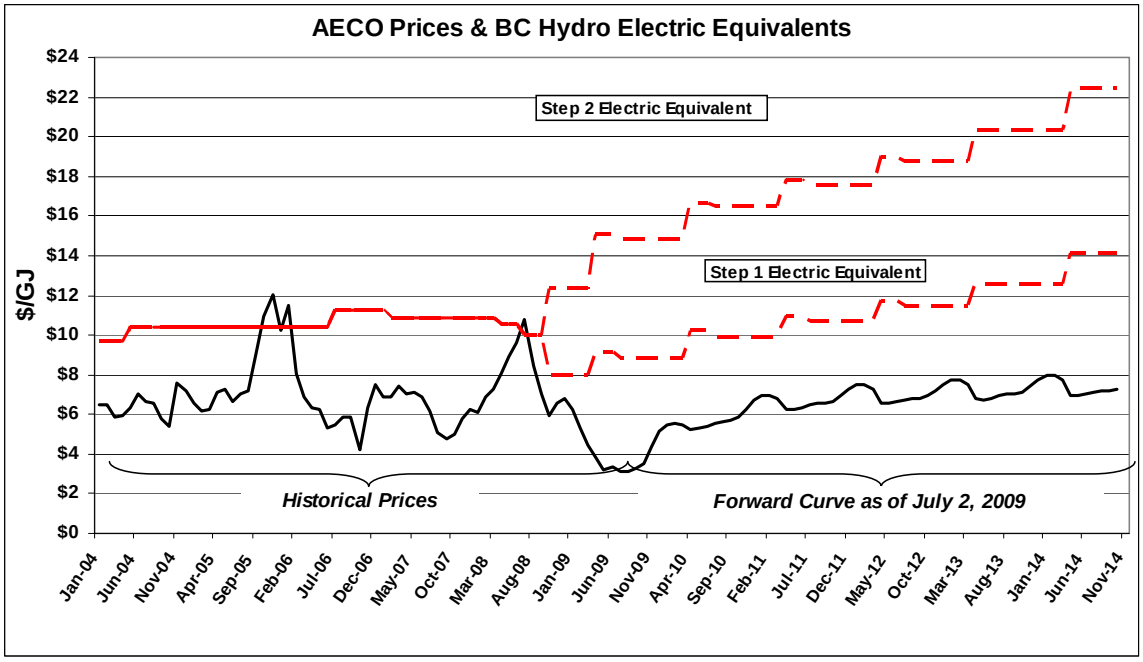
The first graph in the sequence is from page 28 of the Business Risk section (Tab 1) and repeated here for convenience. The main point in reference to this graph is that Terasen Utilities have displayed increases for BC Hydro's rates in a conservative manner. Please see BCUC IR 1.33.2 for more detail on why the Terasen Utilities have taken this approach.

Graph 1:



The second graph in the sequence updates the forward natural gas prices to July 2, 2009 versus May 11, 2009 in the original and changes the BC Hydro electricity prices to reflect the long-term forecast increases set out in Exhibit B-3, BCUC IR 1.7.1, Attachment 1 from the 2008 LTAP proceeding. In this graph the competitive position of natural gas improves on an operating cost basis, if the electricity rate increases are implemented according to the forecast in BCUC IR 1.7.1, Attachment 1[17] and actual natural gas prices equal the forecast.

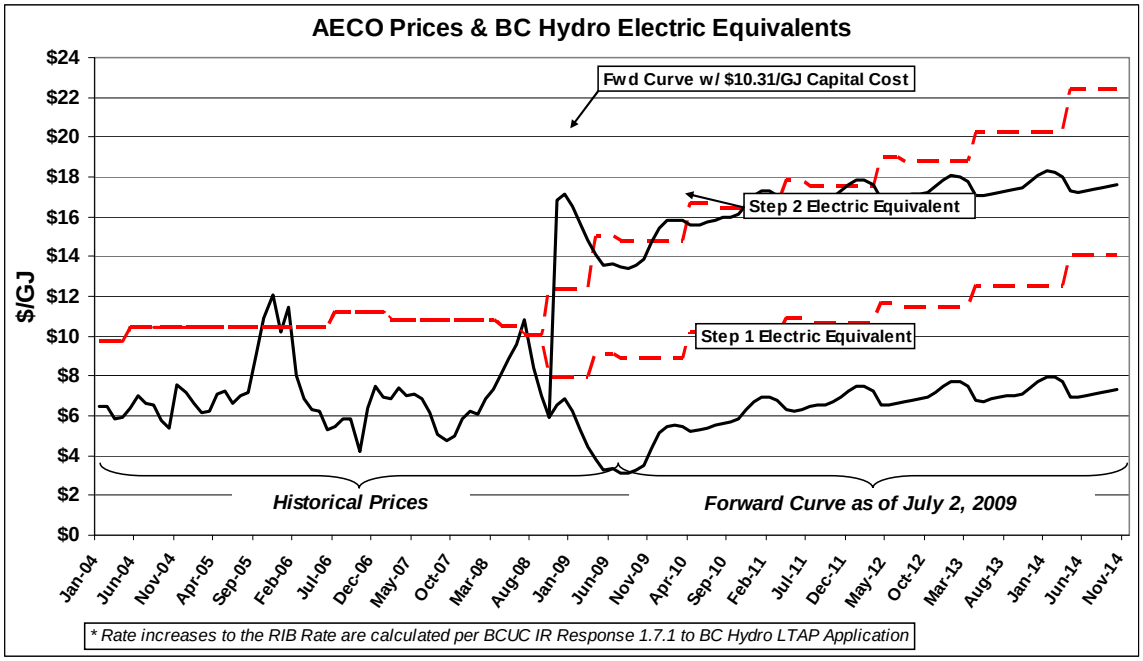
Graph 2:



[17] See BCUC IR 1.31.4 for a list of reasons why BC Hydro's increases may not equal the amounts set out in the LTAP.

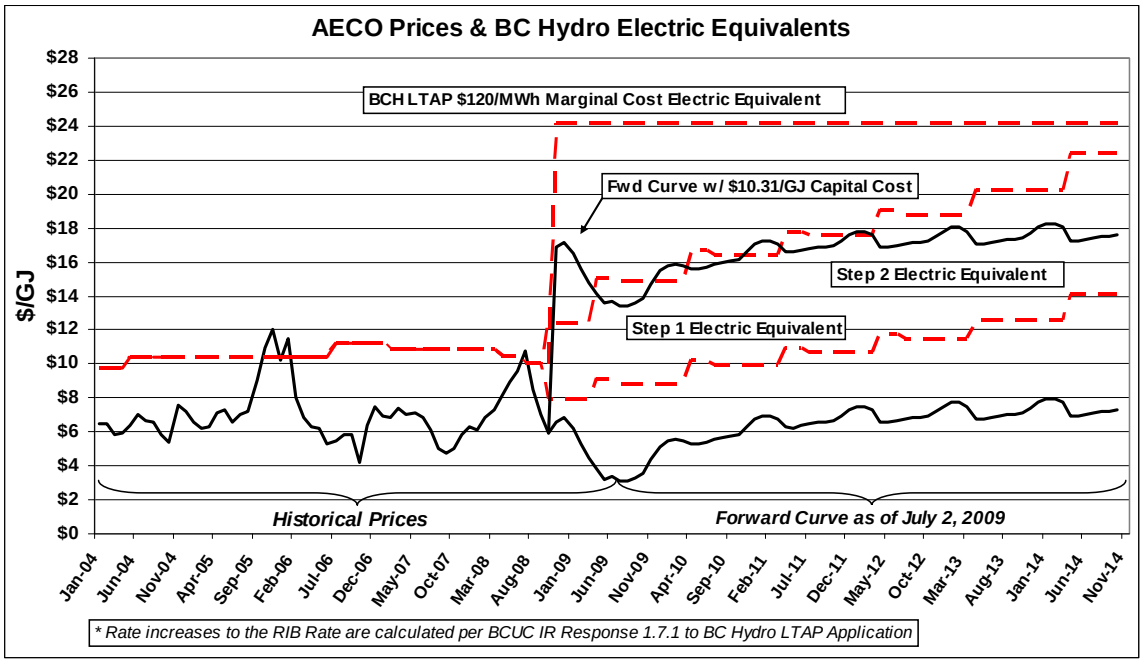
However, once an allowance for the capital costs difference between a natural gas-heated home and an electrically-heated home are factored in, the competitive advantage based on operating costs alone is erased (as the next graph demonstrates). The support for this capital cost allowance of $10.31/GJ comes from Figure 3.4 on page 31 of the Business Risk Tab1. It should be noted that the calculations to determine the $10.31/GJ are based on a new single family home (located in the Lower Mainland, 2500 square feet in size), with consumption of 50 GJ for space heating requirements. In other dwelling types such as multi-family units it is possible that the capital cost allowance would be higher since the capital cost difference will be similar but the annual energy used for space heating would be smaller. Secondly, space heating energy requirements should not all be measured against the BC Hydro Step 2 rate.

Graph 3:



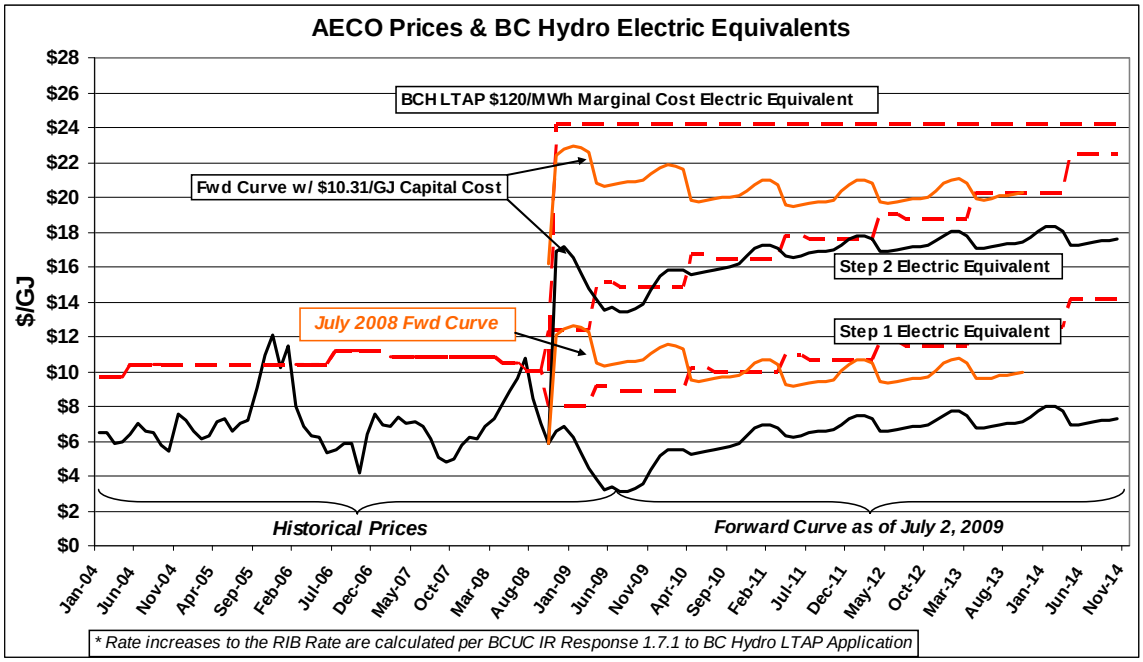
In the fourth graph an extra line is added in to reflect the estimated marginal cost of new electricity supply of $120 / MWh from the LTAP. In this case natural gas competitiveness against the RIB Step 2 rate is improved but for any volumes for which the RIB Step 1 rate is relevant the competitiveness of natural gas would be worsened. (The Terasen Utilities do not have the information to calculate what the implied RIB Step 1 rate would be where the Step 2 rate is based on $120 / MWh but it would by inference have to be lower than Step 1 electric rate derived from the LTAP long-term forecast increases (i.e., the lowest dashed red line).

Graph 4:



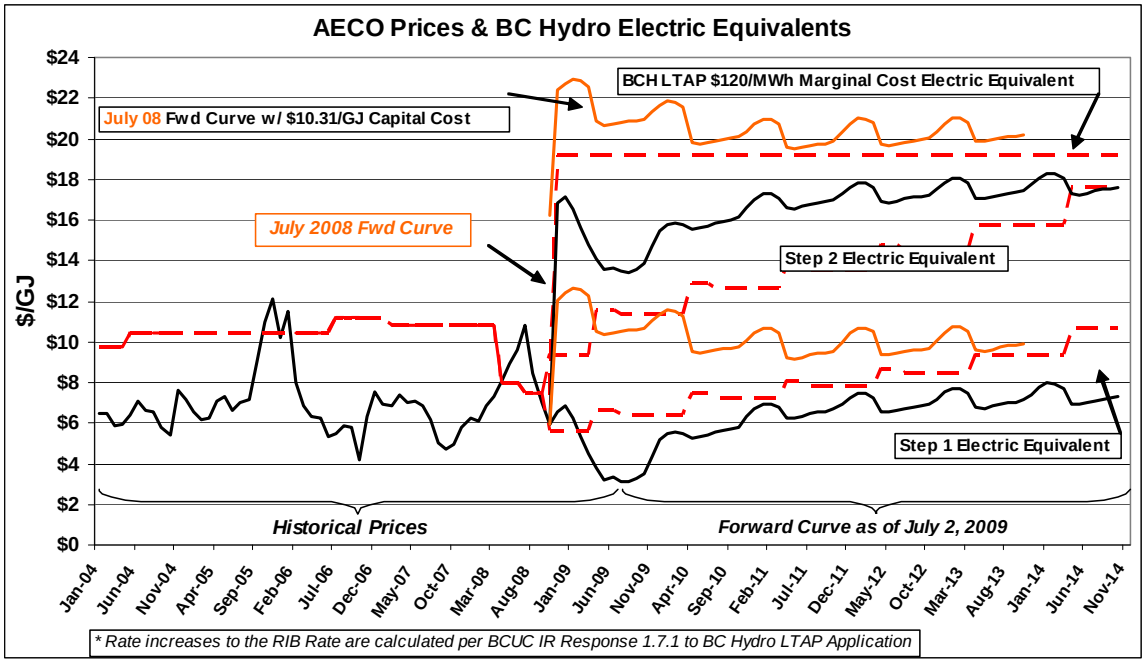
In the fifth graph two additional lines are included to add in the July 2008 natural gas forward price curve, a point in time when gas prices were higher, in order to give a range on the fluctuations in natural gas prices based on what has actually occurred in the recent past. Using a range of natural gas price forecasts illustrates the potential impact of natural gas price volatility, a stated concern of stakeholders such as BCOAPO (Application, Tab 1 - Business Risks, page 20). The additional two lines (in orange) still show a positive competitiveness against the RIB Step 2 rate if it was based on $120 / MWh but considerably diminished. Natural gas competitiveness against the RIB Step 1 rate would be decreased by a similar amount if the July 2008 forward curve prices are used.

Graph:



In the final graph all of the same lines from the fifth graph are displayed, however in this case the thermal efficiency of the natural gas equipment is assumed to be 75% instead of 90%. A 75% thermal efficiency factor would be more representative of an average existing gas customer rather than a new higher efficiency customer. With this changed assumption natural gas (with the capital allowance) is uncompetitive against the RIB Step 2 rate based on $120 / MWh with the July 2008 natural gas forward curve (the upper orange line) although still somewhat better than electricity using current forward prices (the upper black line). The conclusion is that to the extent that lower thermal efficiencies are a relevant factor in the competitiveness comparison between gas and electricity, the challenge for natural gas is increased.

Graph 6:



In summary natural gas for residential customers would be expected in most cases to be competitive against a RIB Step 2 rate derived from an expected cost of new electricity supply of $120 / MWh. However reflecting the natural gas forward pricing volatility that has occurred in the recent past, would mean on an all-in basis that natural gas is still uncompetitive against the RIB Step 2 rate at that high level. To the extent that the RIB Step 1 rate is the relevant comparator for natural gas versus electricity for some energy consumers, natural gas on an all-in basis would be expected to be at a competitive disadvantage in all the cases considered. All the scenarios presented above have held the carbon tax costs on natural gas to $1.50/GJ after 2012, so carbon taxes increases above that level would further erode the competiveness of natural gas.

37.2 Why does Terasen not believe that its new strategic directions with respect to the supply of heat to the end use customer market will not provide some significant form of relief when compared to a time when Terasen was only considering strategies as a natural gas distribution company?

Response:

Please refer to the response to CEC IR 1.12.4.

Attachment 9.6

Companies with an ROE determined 1990-2009

Company
AEP Texas Central Co.
AEP Texas North Co.
ALLETE (Minnesota Power)
Appalachian Power Co.
Arizona Public Service Co.
Arkansas Oklahoma Gas Corp.
Arkansas Western Gas Co.
Atlanta Gas Light Co.
Atlantic City Electric Co.
Atmos Energy Corp.
Avista Corp.
Baltimore Gas and Electric Co.
Bangor Hydro-Electric Co.
Bay State Gas Co.
Black Hills Colorado Electric
Black Hills Iowa Gas Utility
Black Hills Kansas Gas Utility
Black Hills Nebraska Gas
Boston Gas Co.
Brooklyn Union Gas Co.
Cambridge Electric Light Co
Cap Rock Energy Corp.
Cascade Natural Gas Corp.
CenterPoint Energy Houston
CenterPoint Energy Resources
Central Hudson Gas & Electric
Central Illinois Light Co.
Central Illinois Public
Central Maine Power Co.
Central Vermont Public Service
Chattanooga Gas Company

Chesapeake Utilities Corp.

Cheyenne Light Fuel Power Co.

Cleco Power LLC

Cleveland Elec Illuminating Co

Columbia Gas of Kentucky Inc

Columbia Gas of Ohio Inc

Columbia Gas of Pennsylvania

Columbia Gas of Virginia Inc

Columbus Southern Power Co.

Commonwealth Edison Co.

Commonwealth Electric Co.

Connecticut Light & Power Co.

Conowingo Power Co.

Consolidated Edison Co. of NY

Consumers Energy Co.

CT Natural Gas Corp.

Dayton Power and Light Co.

Delmarva Power & Light Co.

Delta Natural Gas Co.

Detroit Edison Co.

Duke Energy Carolinas LLC

Duke Energy Indiana Inc.

Duke Energy Kentucky Inc.

Duke Energy Ohio Inc.

El Paso Electric Co.

Electric Transmission Texas

Empire District Electric Co.

EnergyNorth Natural Gas Inc

Entergy Arkansas Inc.

Entergy Gulf States LA LLC

Entergy Louisiana Holdings

Entergy Mississippi Inc.

Entergy New Orleans Inc.

Entergy Texas Inc.

Equitable Gas Company

Fitchburg Gas & Electric Light

Florida Power & Light Co.

Florida Power Corp.

Frontier Communications Corp.

Georgia Power Co.

Granite State Electric Company

Green Mountain Power Corp.

Gulf Power Co.

Hawaii Electric Light Co Inc

Hawaiian Electric Co.

Hope Gas Inc

Idaho Power Co.

Illinois Power Co.

Indiana Gas Co.

Indiana Michigan Power Co.

Interstate Power & Light Co.

Interstate Power Co.

Jersey Cntrl Power & Light Co.

Kansas City Power & Light

Kansas Gas and Electric Co.

KCP&L Greater Missouri Op Co

Kentucky Utilities Co.

KeySpan Gas East Corp.

Kingsport Power Company

Laclede Gas Co.

Long Island Lighting Co

Louisville Gas & Electric Co.

Madison Gas and Electric Co.

Maine Public Service Co.

Massachusetts Electric Co.

Maui Electric Company Ltd

MDU Resources Group Inc.

Metropolitan Edison Co.

Michigan Consolidated Gas Co.

Michigan Gas Utilities Corp

MidAmerican Energy Co.

Mid-Kansas Electric Company

Minnesota Energy Resources

Mississippi Power Co.

Mobile Gas Service Corp

Monongahela Power Co.

Mountaineer Gas Company

Nantahala Power & Light Compan

Narragansett Electric Co.

National Fuel Gas Dist Corp.

NC Natural Gas Corp.

Nevada Power Co.

New England Gas Company

New Jersey Natural Gas Co.

Niagara Mohawk Power Corp.

North Shore Gas Co.

Northern Illinois Gas Co.

Northern States Power Co - WI

Northern States Power Co. - MN

Northwest Natural Gas Co.

NorthWestern Energy Division

NSTAR Electric Co.

NY State Electric & Gas Corp.

Ohio Edison Co.

Ohio Power Co.

Oklahoma Gas and Electric Co.

Oncor Electric Delivery Co.

ONEOK Inc.

Orange & Rockland Utlts Inc.

Otter Tail Corp.

Pacific Gas and Electric Co.

PacifiCorp

PECO Energy Co.

Pennsylvania Electric Co.

Peoples Gas Light & Coke Co.

Peoples Gas System

Piedmont Natural Gas Co.

Pivotal Utility Holdings Inc.

Portland General Electric Co.

Potomac Edison Co.

Potomac Electric Power Co.

PPL Electric Utilities Corp.

Public Service Co. of CO

Public Service Co. of NC

Public Service Co. of NH

Public Service Co. of NM

Public Service Co. of OK

Public Service Electric Gas

Puget Sound Energy Inc.

Questar Gas Co.

Rochester Gas & Electric Corp.

Rockland Electric Company

San Diego Gas & Electric Co.

Savannah Electric & Power Co.

SEMCO Energy Inc.

Sierra Pacific Power Co.

SourceGas Distribution LLC

South Carolina Electric & Gas

South Jersey Gas Co.

Southern California Edison Co.

Southern California Gas Co.

Southern Connecticut Gas Co.

Southern Indiana Gas & Elec Co

Southern Union Co.

Southwest Gas Corp.

Southwestern Electric Power Co

Southwestern Public Service Co

Tampa Electric Co.

Texas-New Mexico Power Co.

Toledo Edison Co.

Tucson Electric Power Co.

UGI Central Penn Gas

Union Electric Co.

United Illuminating Co.

Unitil Energy Systems Inc.

UNS Electric Inc.

UNS Gas Inc.

Upper Peninsula Power Co.

Vectren Energy Delivery Ohio

Virginia Electric & Power Co.

Virginia Natural Gas Inc.

Washington Gas Light Co.

West Penn Power Co.

Westar Energy Inc.

Western Massachusetts Electric

Wisconsin Electric Power Co.

Wisconsin Gas LLC

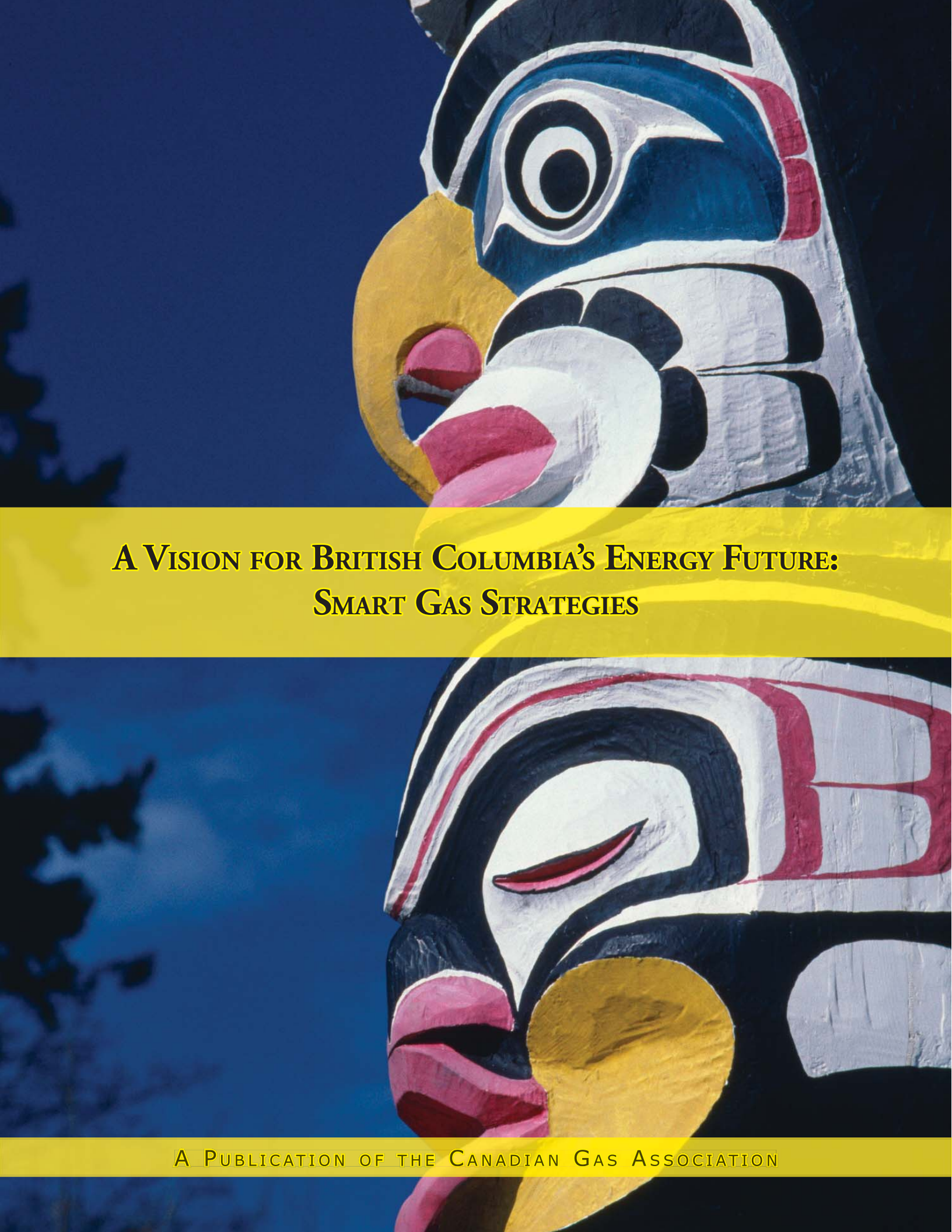
Wisconsin Natural Gas Co

Wisconsin Power and Light Co

Wisconsin Public Service Corp

Yankee Gas Services Co.

Attachment 19.1



A Vision for British Columbia's Energy Future: Smart Gas Strategies

A Publication of the Canadian Gas Association

Canadian
Gas Association

Association
canadienne du gaz

Published October 2008

Table of Contents

Executive Summary

Achieving greenhouse gas emissions reductions of 33% by 2020 and 80% by 2050 will mean a significant break from B.C.'s historical trend, accommodating ongoing GDP and population growth while reducing emissions.

Deep emissions reductions will require a fundamental change in the energy system, change that will extend beyond large industrial emissions sources to include the over 50% of emissions associated with energy use in our communities.

An improved energy system will be developed with many small steps and very few great leaps. These changes will take decades to happen as a variety of assets, from power generation plants energy infrastructure to homes and cars, need to be replaced or refitted towards improving the energy system. Three key approaches to improve the energy system are:

1. Using Available Energy Efficiently
2. Introduce Alternative Energy Options
3. Move Towards Integrated Community Energy Solutions

B.C. policy is already supportive of and taking action in the three approaches. We recommend further enhancements and action to improve the energy system and achieve the province's emissions reduction targets.

Using Available Energy More Efficiently

- Recognize the benefit of direct use; using the most appropriate energy resources from both a cost and greenhouse perspective in end use applications.
- Continue to expand demand side management programs in both scale and scope.
- Ensure that new buildings have the venting and piping to accommodate efficient heating services.

Introduce Alternative Energy Options

- Promote renewable natural gas production.
- Offer alternative energy solutions within a regulated construct.
- Support the deployment of mobile onshore power supply at B.C.'s ports.
- Support the deployment of natural gas fuelled heavy duty, refuse and forklift vehicles.

Move Towards Integrated Community Energy Solutions

- Support investment in integrated community energy systems.
- Encourage regulated natural gas utilities to invest in integrated community energy systems.

The three approaches build upon each other to improve the energy system.

Using available energy more efficiently is the first obvious step in increasing the efficiency of the energy system and reducing the energy intensity of the economy. It speaks to stepping up support for demand side management and energy efficiency as well as better matching the demand for energy with the available sources.

Introducing alternative renewable energy options is the next step, enabling effective and efficient partnering between existing energy grids and renewable resources to meet the energy service demands of B.C. homes, businesses and institutions, for example renewable natural gas production and solar/natural gas water heating.

Finally, a community based integrated approach to meeting the demand for energy services that matches land use, energy and transportation needs with waste and water management will result in dramatic reduction in energy and carbon intensity of the economy and assist B.C. in meeting its greenhouse gas emission goals to curb the draw on all energy grids: gas, electricity and petroleum products.

Energy Use in British Columbia

B.C.'s energy use is split among four large segments of the economy; transportation, industry, energy supply and the buildings sector (comprised of the residential, commercial and institutional sectors). Similarly, the majority of greenhouse gas emissions derive from these four sectors.[1]

A Positive Energy Supply Story

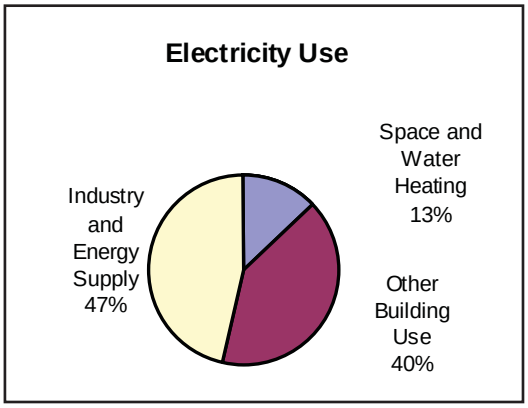
BC Hydro has over 11,300 megawatts of installed capacity, and paid over $1 billion to the province and municipal governments in the form of a share of income, water rentals, school taxes, grants and other taxes.[2] B.C. has also attracted over $4.7 billion in upstream oil and gas investment, with over 1,400 wells drilled in the province in 2006, generating over $2 billion in revenues for the provincial treasury. Natural gas is gathered, transported and processed using more than 32,000 kilometres of pipeline and 47 processing plants.[3] Natural gas is then delivered to almost one million homes, businesses and institutions through 46,000 km of local distribution pipelines.[4]

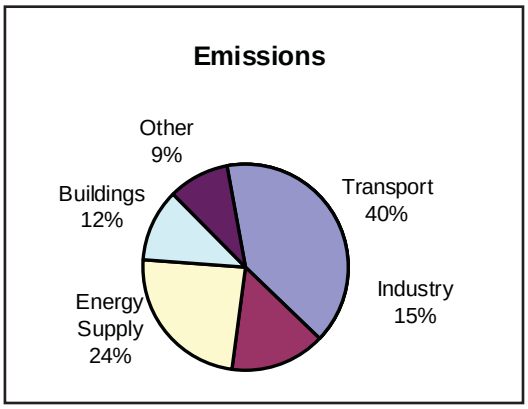
Prior to fiscal 2008, BC Hydro was a net importer of electricity for seven consecutive years due to average or below average system water conditions every year.

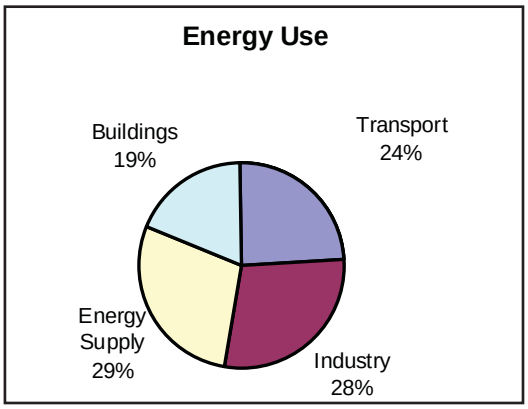
Source: BC Hydro 2008 Annual Report, page 67

While B.C.'s electricity supply is closely balanced with demand – the province is a net exporter or importer of electricity in a given year – natural gas supply is about four times the province's own use. B.C.'s traditional natural gas resources and new sources such as shale gas, ensures B.C. residents have a homegrown solution to their energy needs and a long-term reliable source of energy and revenue.

Despite a constrained electricity system and abundant natural gas supply, space and water heating in the buildings sector make up 13% of electricity use. This highlights an obvious opportunity to improve the energy system which is discussed in more detail later in this paper.[5]







The Challenge

The government recently outlined its plans to reduce greenhouse gas emissions 33% by 2020 and 80% by 2050. At the same time, government policy is for B.C. to be self-sufficient in electricity. Achieving the reductions will mean a significant break in the historical trend, accommodating ongoing GDP and population growth while reducing emissions and containing electricity demand growth.

Deep emissions reductions will require a fundamental change in how the province produces, delivers, and uses energy. The change will extend beyond large industrial emissions sources to include the over 50% of emissions associated with energy use in our communities – communities that are expected to grow substantially between now and 2050.

This change will take decades to happen as a variety of assets, from power generation plants energy infrastructure to homes and cars, need to be replaced or refitted towards improving the energy system.

[1] Climate Action Plan data.
[2] BC Hydro 2008 Annual Report and GRI Comparative Index.
[3] Ministry of Energy, Mines and Petroleum Resources, Statistics and Resource Potential, 1996-2006.
[4] Terasen Gas and Pacific Northern Gas websites.
[5] Climate Action Plan and Natural Resources Canada's energy use database data.

Improving the Energy System

With the introduction of a carbon tax, B.C. established itself as a North American leader on climate change policy and putting a price on greenhouse gas emissions.

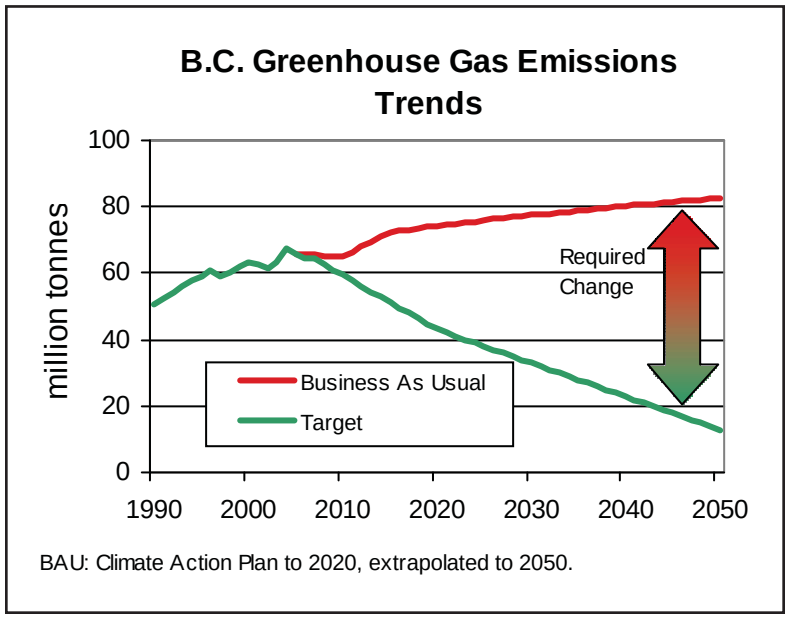
Principles for an improved energy system

To achieve the deep reductions in greenhouse gas emissions and move towards a more sustainable energy system, policy needs to be aligned with a broader set of principles.

1. A sustainable energy system needs to do more than have low greenhouse gas emissions. Being 'carbon lean' is one aspect, but a sustainable energy system must also deliver affordable and reliable energy services to communities and industries. As such, sustainability is not an end state but an evolution that involves many small steps and very few great leaps.

2. Policies need to account for the complexity and not direct the energy system, from supply through to end use buildings, equipment and vehicles, based on one metric. In addition, policies should reflect the evolutionary nature of technology development, capital stock turnover and changing consumer attitudes despite the conceptual appeal of an immediate revamping of the energy system.

3. The overriding driver for improving the energy system, as with the economy as a whole, is productivity or, to put it in energy terms, efficiency. B.C. needs to make effective and efficient use of all resources and do so while minimizing both the environmental and social impacts entailed in developing those resources. To do this the energy system needs to be looked at as a whole instead of discreet and unrelated supply and end use.



BAU: Climate Action Plan to 2020, extrapolated to 2050.

Moving towards an Integrated Approach to Community Energy

The Canadian Gas Association (CGA) and its B.C. member companies, Terasen Gas and Pacific Northern Gas, have been active in promoting such, "total system efficiency" as a solution to environmental goals that protects and enhances energy reliability and affordability. The citiesPLUS initiative, launched in 2002 and supported by CGA, developed Canada's first 100-year plan for a sustainable metropolitan area using Vancouver as the planning basis. The citiesPLUS submission won grand prize at the World Gas Conference in 2003, beating eight other competitors from around the world.

More recently, CGA helped to launch Quality Urban Energy Systems of Tomorrow (QUEST) in 2007. QUEST envisions that a system-based approach to communities will improve energy efficiency and reduce greenhouse gas emissions. A system-based approach to thinking, planning and acting addresses the complexity and interconnectedness of energy, transportation, water and waste management. In addition, given the increased diversity and redundancy of integrated systems, such an approach will be more adaptable to change and reliable in responding to unforeseen events.[6]

Integration of energy systems at the community level will produce the maximum economic, social and environmental benefits and meet many objectives, including:

- Reduced demand on centralized energy generation and transmission systems,
- Streamlined urban transportation systems,
- Increased local employment and economic development,
- Improved air quality, and
- Improved overall quality of life in communities.

Following up 2007's launch, the QUEST II workshop will take place in Victoria, from November 24th to 27th, 2008.

A QUEST LESSON

On November 14-15, 2007 over 60 key players from the energy industry, environmental movement, three levels of government, academia and consulting community spent a day and a half discussing options for reducing the environmental footprint of growing communities.

Observations included that:

- The present approach to energy planning that focuses mainly on improving the performance of the discrete components of the energy system, is necessary but insufficient.
- The historic silo-based approach to planning land-use, energy production, delivery and use, transportation, waste and water, often supported by legislation that specifies the areas of influence that each participant may have, must therefore change.

[6] "Integrated Energy Systems in Canadian Communities: A Consensus for Urgent Action." Quality Urban Energy Systems of Tomorrow, March 2008.

Three Approaches to Energy System Sustainability

Based on CGA's experience with national and provincial energy policy development, citiesPLUS and QUEST, we believe that the small steps needed to create the necessary long-term change can be classified into three approaches:

1. Using Available Energy More Efficiently

2. Introduce Alternative Energy Options

3. Move Towards Integrated Community Energy Solutions

B.C.'s current policy environment advances these three categories. The following sections outline CGA's recommendations to make further progress in each of the three approaches.

Using Available Energy More Efficiently

Currently in British Columbia

B.C.'s gas utilities look forward to continued policy support towards expanding demand side management (DSM) programs in the coming years. The province's LiveSmart consumer incentives and rebates and requirements for carbon neutral government will support this trend by encouraging more market demand for efficient energy use investments.

Moving Forward

B.C. can advance efficient energy use by continuing to expand DSM programs and by taking steps to ensure total system efficiency. Total system efficiency is about matching the energy form to the desired energy service. Put simply this means use heat energy if you need heat, and use electrical if you need electricity.

An example of failing to match form to service is seen with electric heating. Nearby jurisdictions that lack B.C.'s abundant hydro resources rely on burning fossil fuels to generate electricity and typically use two to three units of fossil fuel to produce one unit of electricity. In terms of energy forms, they are using two to three units of thermal energy to make one unit of electrical energy.

When a B.C. home or office uses electrical energy to provide heat – a thermal service – more demand is put on B.C.'s power grid, resulting in increased imports, decreased exports or even fossil-based generation in B.C., such as at the Burrard Thermal plant. The bottom line is higher regional greenhouse gas emissions because, with the electric grid as an intermediary, two to three units of heat are being used to provide one unit of heat to the end consumer.

Taking an integrated approach to the system, and matching energy forms to energy services yields a different result. Direct use of natural gas – matching thermal form to service (e.g. space heating) – is an efficient solution. Natural gas can be used at 90%+ efficiency, thus using about half the total system energy and creating half the total greenhouse gas emissions to provide heat versus using electrical energy for heat. In addition, using natural gas in place of electricity will help B.C. to achieve electricity self-sufficiency by taking advantage of the province's natural gas surplus.

Energy Forms and Services

Electrical
Lighting, electronics and for equipment or processes that can only run on electricity.

Mechanical
Mechanical power from engines primarily used in transportation.

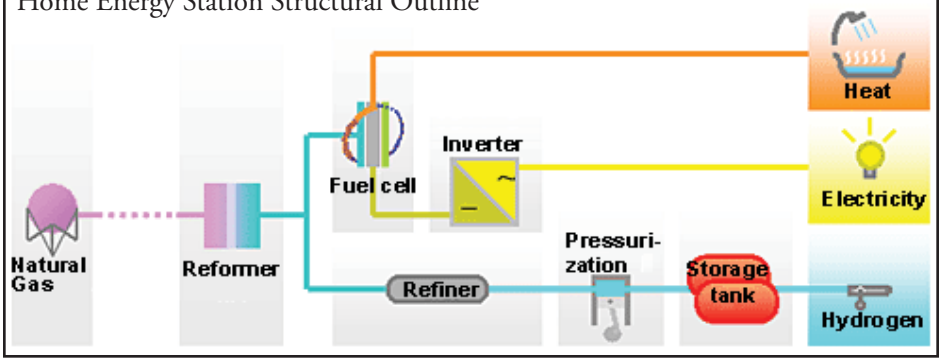
Thermal
Primarily space and water heating or cooling, and industrial processes.

Recommendations

To take advantage of natural gas and other thermal energy, buildings need to be constructed with a changing energy system in mind. When constructed for electric baseboard heating, buildings lack the venting and piping necessary to deliver heating services and adapt to changing technologies and alternative energy options – their energy system is locked in to an 'all electrical' energy system.

Locked out options include high-efficiency furnaces, small-scale cogeneration of heat and electricity and community energy systems that can connect bioenergy, solar energy and heat pumps to the system. Furthermore, as technology advances, future innovations are also locked out from the buildings that do not possess the necessary venting or piping. For example, the picture below depicts a home energy system that uses fuel cell technology to produce heat and electricity for the home and hydrogen to fuel a vehicle. To work, waste heat from the fuel cell needs to be matched to thermal services, such as hot water, in the home.

Home Energy Station Structural Outline



Customers have choices in selection of energy providers but are likely challenged, lacking the necessary expertise and resources to make informed decisions on choice of energy systems. To encourage faster adoption and greater acceptance of alternative energy systems, we recommend that alternative energy systems and services be offered within a regulated construct to both the private and public sector. Doing so will also allow for risk sharing and transparency in costs. Recognizing the provincial government's mandate for its facilities to be carbon neutral by 2010, we believe having alternative energy under regulation provides an immediate and effective solution to meeting the government's challenge.

To advance efficient energy use we recommend that:

- B.C. recognizes the benefit of direct use; using the most appropriate energy resources from both a cost and greenhouse perspective in end use applications,
- B.C. expands its demand side management programs in both scale and scope, and
- Building codes ensure that all new buildings have sufficient venting and piping for use with efficient furnaces, boilers, heat pumps or heat exchange technologies.

Utilities have the necessary customer base and expertise to scale-up demand side management programs. Such utility programs should not be constrained to electricity and natural gas; they should include alternative energy solutions to open up the current energy system to more diverse options.

Amended building codes will serve to encourage community energy systems and prevent low-emissions building policies from promoting a mismatch between energy forms and services.

Introduce Alternative Energy Options

Currently in British Columbia

Alternative energy solutions are supported on a broad scale through electricity policy as well as renewable fuel and low carbon fuel requirements. In addition, the Innovative Clean Energy fund supports specific alternative energy projects that will increase B.C.'s capacity to deploy such technologies going forward.

Moving Forward

Even with efficient energy use, more needs to be done to achieve 33% and 80% greenhouse gas reductions. Alternative energy solutions, including renewable energy and using traditional sources in new ways is an additive approach towards achieving environmental goals.

Bioenergy in the form of renewable natural gas or in community energy systems provides clean renewable and locally produced heat, thus reducing dependence on long-distance energy transmission while still being able to take advantage of local energy distribution systems. Additional local resources include solar heating as well as waste heat recovered from sewage systems and geothermal energy.

In addition, using clean burning natural gas in vehicles or at shipping ports can replace the use of diesel and bunker oil. This is an example of using a traditional energy source, natural gas, in a new way to take advantage of local energy distribution systems and reduce greenhouse gas emissions.

To advance alternative energy solutions CGA is working with the Alberta Research Council to study renewable natural gas' potential, and working with Terasen Gas and other partners, funded a study into the feasibility of biogas upgrading and grid injection in the Fraser Valley. Taking the next step, Terasen Gas issued on September 17, 2008, a preliminary request for expressions of interest for biogas production with the intent of purchasing and subsequently upgrading the biogas to pipeline-quality renewable natural gas.

Current provincial policies establish renewable requirements for two of the three main components of our energy system – liquid transportation fuels and the electricity grid – but not the natural gas grid. Furthermore, looking at the transportation sector, car and truck efficiency regulations and public transit investments address personal transportation but not freight transportation.

Addressing these gaps requires alternative energy solutions. Given energy markets and the current policy framework, B.C.'s alternative energy marketplace continues to expand, driven by growing interest and demand. However, it is still a developing and somewhat fragmented marketplace requiring significant financing requirements.

Renewable Natural Gas Coming to B.C.

Approved Innovative Clean Energy (ICE) fund projects, announced in July, include renewable natural gas. Terasen Gas and QuestAir's winning proposal is for an advanced gas purification system that recovers pipeline-quality methane from Metro Vancouver's Lions Gate Wastewater Treatment Plant.

Recommendations

To advance alternative energy solutions we recommend that:

- B.C. promotes renewable natural gas production,
- Alternative energy solutions be provided within a regulated construct to both the private and public sector,
- B.C. support the deployment of mobile onshore power supply at ports, and
- B.C. encourage the use of natural gas fuelled heavy-duty vehicles for freight transportation.

Recognizing the provincial government's mandate for its facilities to be carbon neutral by 2010, renewable natural gas can play a role in providing carbon neutral energy services and, furthermore, we believe that having alternative energy under regulation provides an immediate and effective solution to meeting the government's challenge.

Targeting freight transportation emissions, gas-fired onshore power supply at ports can replace the burning of bunker fuel in ships at port, reducing greenhouse gas emissions and improving air quality. Heavy duty natural gas vehicles can replace diesel-burning trucks and operate on either conventional fossil gas or renewable natural gas. There are a growing number of factory-produced natural gas vehicles that incorporate engine technology from B.C. companies Westport Innovations and Cummins Westport. Encouraging the use of natural gas refuse trucks, urban delivery trucks, forklifts and highway tractor trailers reduces greenhouse gas emissions while providing air quality benefits.

Lifecycle Emissions of Heavy Duty Compressed Natural Gas (CNG) Vehicles			
	Diesel (g/km)	CNG (g/km)	Benefit of NG (%)
CO_2	1811.7	1402.4	22%
CO	0.546	0.297	46%
NOx	3.271	1.498	54%
VOC	0.312	0.224	28%
SOx	1.19	0.436	63%
Source: Canadian Natural Gas Vehicle Alliance, using GHGenius 3.12b			

Move Toward Integrated Community Energy Solutions

Currently in British Columbia

Community energy systems, while implicitly supported through the above policies are also explicitly supported through the province's Bioenergy Strategy, which set a goal of 10 community bioenergy systems by 2020.

Moving Forward

As noted at QUEST 2007, the community is the most promising place for the integration of energy systems and achieving the maximum savings and reductions in greenhouse gas emissions. In addition, investing in flexible and adaptable energy solutions best prepares communities for ongoing changes in energy markets, technologies and emerging environmental concerns.

A basic requirement of every Canadian community's energy system is to provide heating services, but the current approach to heating services and heating equipment limits the viability of alternative heating solutions and efficient energy use. Homes built with baseboard heaters mismatch form and service; they are built without the necessary venting or piping to connect with community energy systems, thus limiting opportunities to harness local alternative energy sources and reducing total system efficiency.

Continuing the current approach will require a growing network of large centralised generation plants and the associated transmission infrastructure to provide even the most basic local heating services. To minimize greenhouse gas emissions from electricity generation, B.C. will increasingly rely on intermittent renewables such as wind and small hydro facilities. These technologies, when partnered with local co-generation solutions (simultaneously generating electricity and usable heat), can provide the desired emissions reductions without sacrificing reliability and affordability, but local co-generation requires local heating demand.

Community energy systems can connect this heat to consumer demand, thereby helping to improve the reliability of the total energy system by reducing dependence on long-distance energy corridors and by providing a local basis for high-efficiency co-generation; and can enable further emissions reductions by connecting to local alternative energy resources.

Looking ahead, natural gas utilities will no longer be focused on just delivering natural gas but will increasingly be offering an expanded range of energy offerings and therefore should be viewed as complete energy services delivery companies.

Better Than -80% Emissions

Victoria's Dockside Green development is targeting greenhouse gas neutrality for its energy system. The project starts with efficient building design, lighting and appliances to halve its energy use.

Second, heating is provided by a community energy system that uses local wood residues and that can be connected to local solar and waste heat resources.

Natural gas is used to underpin the system, providing affordable and reliable backup and peaking heat and ensuring that residents get the amount of heat that they want, when they want it.

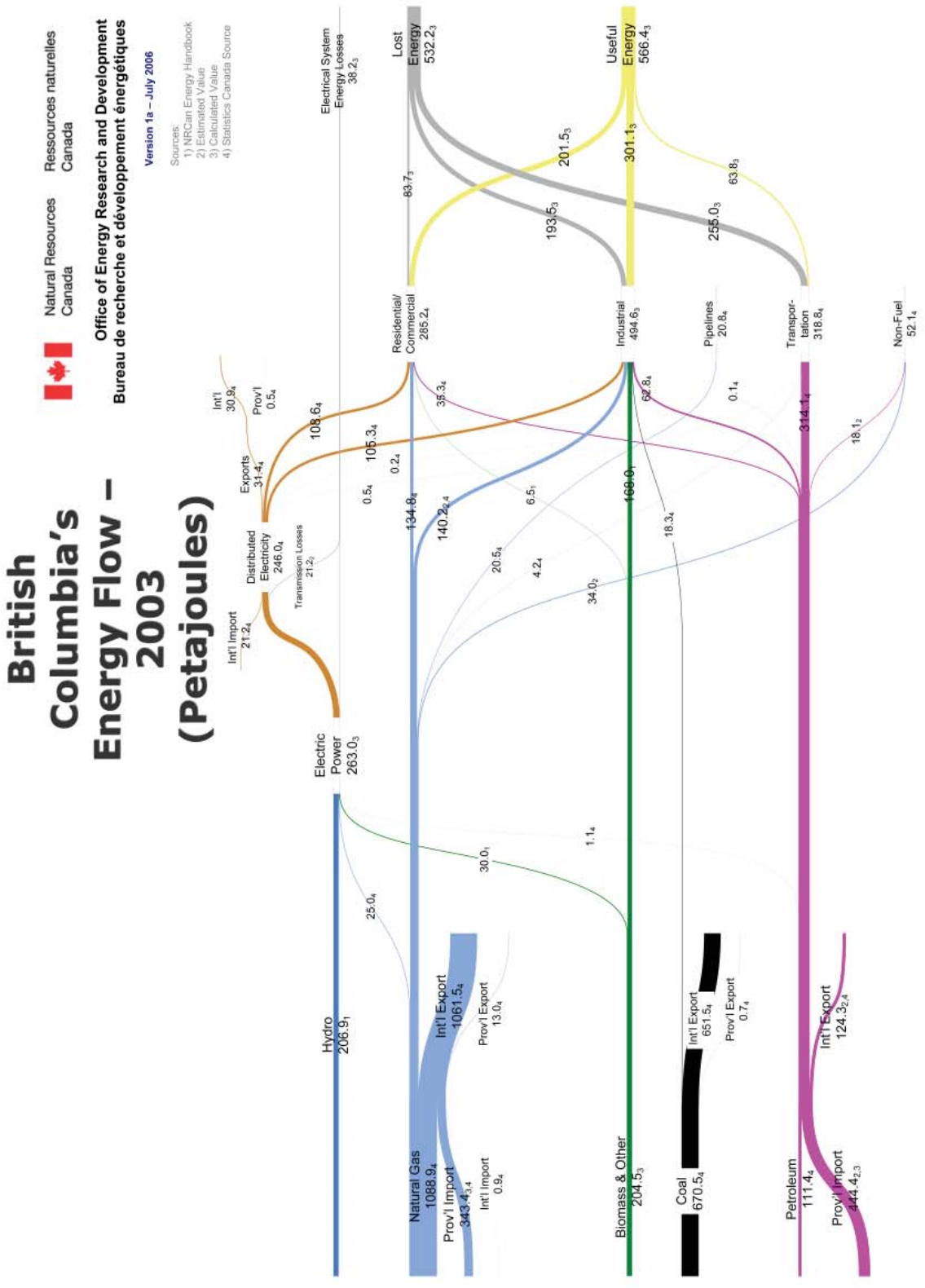
Recommendations

To advance community energy systems we recommend that:

- B.C. supports investment in integrated community energy systems, and

- B.C. encourages regulated natural gas utilities to invest in integrated community energy systems.

Regulated natural gas utilities will apply their operational and financial capacity to connect alternative energy solutions at the community level. They also provide security in sharing the risks, providing customer support and have proved to be a viable medium for the introduction of new technologies. Priority should be given to cogeneration systems that provide heat and local electricity generation and systems that use local waste energy sources, such as waste heat and biomass, in combination with natural gas peaking and backup supply to reduce emissions while providing reliable and affordable energy services.


British Columbia's Energy Flow – 2003 (Petajoules)
Natural Resources Canada
Ressources naturelles Canada
Office of Energy Research and Development
Bureau de recherche et développement énergétiques
Version 1a – July 2006
Sources:
1) NRCan Energy Handbook
2) Estimated Value
3) Calculated Value
4) Statistics Canada Source
Int'l Import 21.2
Int'l 30.9
Prov'l 0.5
Exports 31.4
Distributed Electricity 246.0
Transmission Losses 21.2
Electrical System Energy Losses 38.2
Lost Energy 532.2
Useful Energy 566.4
Residential/ Commercial 285.2
Industrial 494.6
Pipelines 20.8
Transpor-tation 318.8
Non-Fuel 52.1
Electric Power 263.0
Hydro 206.9
Natural Gas 1088.9
Prov'l Import 343.4
Int'l Import 0.9
Int'l Export 1061.5
Prov'l Export 13.0
Biomass & Other 204.5
Coal 670.5
Int'l Export 651.5
Prov'l Export 0.7
Petroleum 111.4
Prov'l Import 444.4
Int'l Export 124.3
108.6
105.3
0.2
0.5
134.8
140.2
35.3
6.5
20.5
4.2
34.0
160.0
62.8
18.3
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314.1
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25.0
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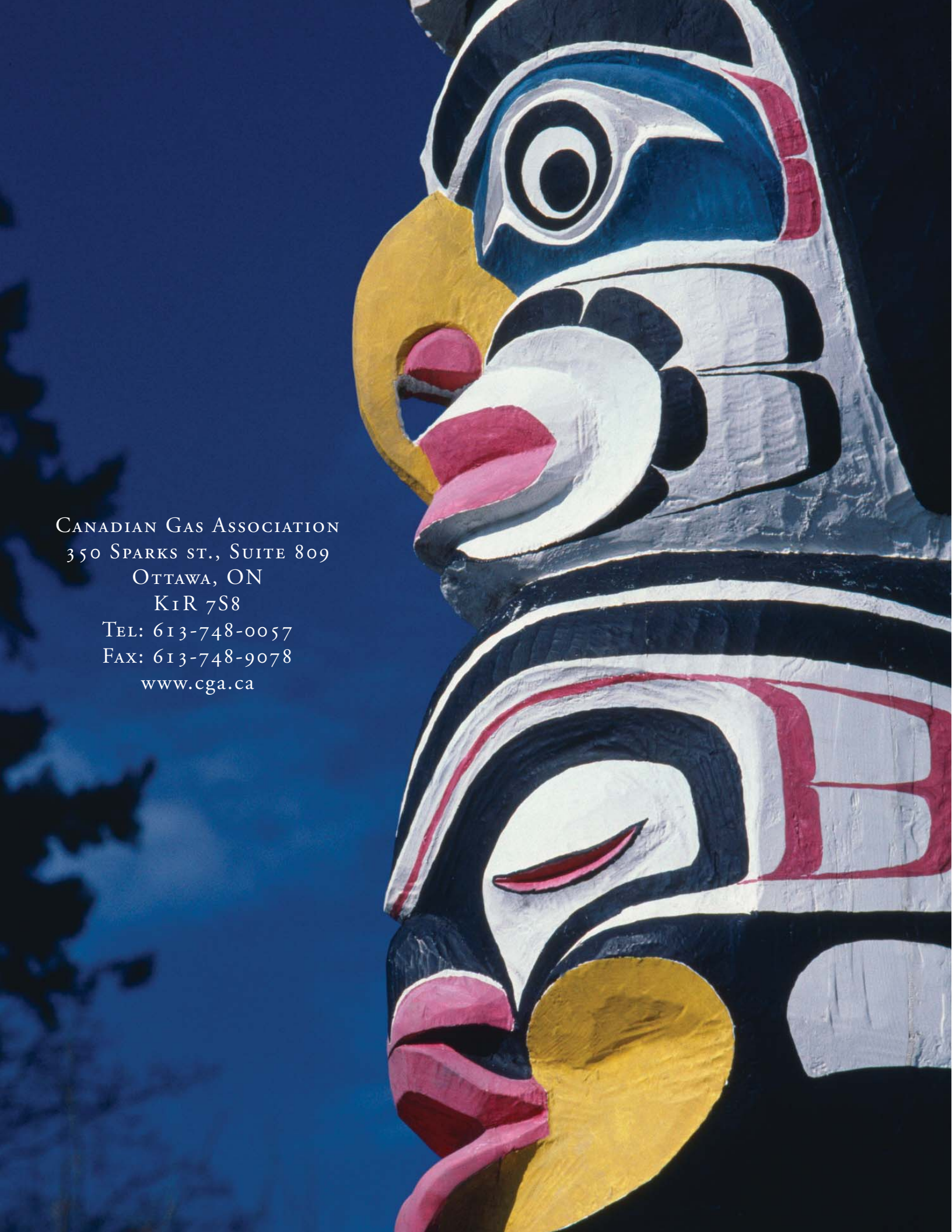
193.5
301.1
255.0
63.8
page 25 of 28
Canadian Energy Flow

Canadian
Gas Association

Association
canadienne du gaz



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QUALITY URBAN ENERGY SYSTEMS OF TOMORROW

GREENING ENERGY CONSUMPTION:
CREATING THE CONDITIONS

Integrated Energy Systems in Canadian Communities: A Consensus for Urgent Action

March 2008

Quality Urban Energy Systems of Tomorrow

Jointly supported by:
Canada Green Building Council
Canadian Electricity Association
Canadian Energy Efficiency Alliance
Canadian Gas Association
Federation of Canadian Municipalities
Industry Canada
Natural Resources Canada
Ontario Power Authority
Pollution Probe

QUALITY URBAN ENERGY SYSTEMS OF TOMORROW

GREENING ENERGY CONSUMPTION: CREATING THE CONDITIONS

INTEGRATED ENERGY SYSTEMS IN CANADIAN COMMUNITIES: A CONSENSUS FOR URGENT ACTION

EXECUTIVE SUMMARY

An emerging commitment towards an integrated approach for energy services in Canadian communities. Key players from the energy industry, environmental movement, governments, academia and consulting community agree that:

- Meeting ambitious long-term climate change objectives that involve greenhouse gas (GHGs) emission reductions of 60 percent or more by 2050 will need a fundamental transformation of how we produce, deliver and use energy.
- Addressing the 50% of GHGs emissions that come from housing, buildings and transportation is essential to meet this challenge.
- The potential exists to continue our economic growth while significantly reducing our environmental footprint.
- The community is the most promising place for the integration of energy systems and it will achieve the maximum savings and reductions in GHGs.
- Implementation needs to be at the smallest practical level but vision, leadership and policy support are needed at the national and provincial levels.
- Investing in flexible and evolutive energy solutions will allow us to adapt to an uncertain and changing future.
- There are challenges in implementation but also evidence from experience in Canada and elsewhere in the world that the economic, environmental and social benefits are well worth the effort.

There is consensus that serious action requires:

- Pricing carbon appropriately, to take into account the impact that carbon emissions cause to the environment, public health and the economy.
- Increasing the awareness of decision and policy makers about the benefits and challenges facing the implementation of integrated system approaches at the community level.
- Deepening the understanding and quantification of the benefits of the approach and supporting the development of that understanding.
- Improving cross sectoral information exchange and collaboration in order to develop partnerships between the private and public sectors, implement innovative financing mechanisms, and identify opportunities and concrete support for pilot and demonstration projects.

The participants in the workshop have come up with a set of principles for change and these principles received a high degree of consensus among the very wide set of stakeholders who took part in QUEST.

QUEST participants are committed to continue working to make Canada a world leader in urban integrated energy systems.

THE QUEST EVENT

- On November 14-15, 2007 in Niagara-on-the-Lake, ON, over 60 key players from the energy industry, environmental movement, three levels of government, academia and consulting community spent a day and a half discussing options for reducing the environmental footprint of growing communities.

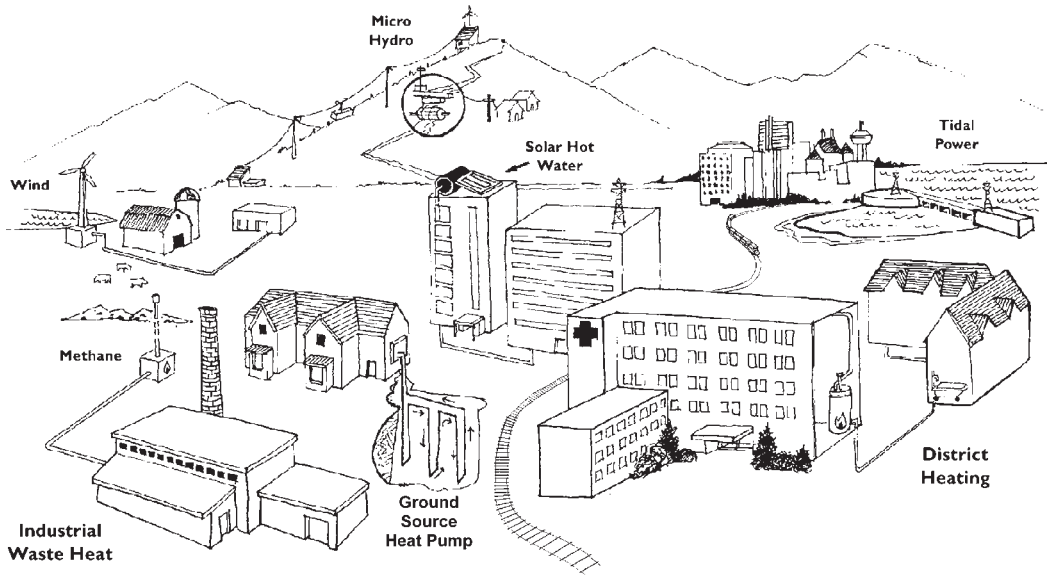
- The workshop was convened jointly by the Canada Green Building Council, Canadian Electricity Association, Canadian Energy Efficiency Alliance, Canadian Gas Association, Federation of Canadian Municipalities, Industry Canada, Natural Resources Canada, Ontario Power Authority and Pollution Probe.

- Through a hands-on process reflecting the real world complexity of coming up with a cohesive, operational plan, participants worked towards the development of a long term energy plan integrating the buildings, transportation and industry sectors.

- Experts / influencers led panel discussions on what changes need to happen to realize the vision of the future, and how to effect these changes.

- This paper is a synthesis of the discussions and conclusions from the workshop and it does not necessarily represent the position of the organizers and participants.

Some Possible Features of an Integrated Energy Future…



Source: Green Municipalities - A Guide to Green Infrastructure for Canadian Municipalities; prepared for the FCM by the Sheltair Group, May 2001

Key Features of Integrated Urban Energy Systems

In an integrated system approach to land-use, energy, transport, water and waste management, greater emphasis is placed upon achieving efficiency for the systems as a whole, and upon creating systems that are more resource efficient, adaptable, resilient and sustainable. This includes:

- Clustered, higher density, self-reliant, mixed use developments of energy efficient housing, commercial space and industry which facilitate implementation of more efficient, accessible and affordable energy, water, waste and transportation infrastructures.
- District energy / utility grids and cascading of energy use between industrial, commercial and residential applications.
- Smaller scale urban energy systems, distributed more widely, located closer to and within buildings, integrated with elements of buildings, and integrated with other infrastructure systems.
- Increasing contribution from multiple local energy sources: solar; geothermal; energy from landfill and municipal, agricultural and forestry waste; wind; hydro; supplemented by larger scale electricity and gas grids as necessary.

Examples in Canada and around the world show that compared to a traditional approach, over 50% reduction in grid energy use can be achieved using an integrated approach.

Integrated Energy Systems in Canadian Communities: A Consensus for Urgent Action

QUALITY URBAN ENERGY SYSTEMS OF TOMORROW
GREENING ENERGY CONSUMPTION: CREATING THE CONDITIONS

QUEST: The Problem

A challenging future for energy in Canada.

- Canadians expect that the energy needed to support their heating and cooling, lighting, plug load and mobility needs is provided in a safe, reliable, secure, affordable and environmentally sustainable manner.
- The federal government, through its *Turning the Corner* policy statement, has committed to a greenhouse gas emission (GHG) reduction target of 60% to 70% below 2006 level by 2050. The National Round Table for the Environment and the Economy (NRTEE) has developed scenarios to achieve these levels of reduction. These scenarios show the need to start immediately on planning to the transition to the medium and longer term.
- Achieving 60% to 70% reduction in energy-related GHG emissions in Canada is a major challenge. It means reductions, starting now and building up to close to 1000 Megatonnes per year (Mt/yr) by 2050, compared to a business-as-usual scenario.
- In such a highly carbon constrained economy, energy will still be needed to provide a comfortable living and working environment, run our institutions, grow our economy, and support commerce.
- Our communities represent close to 50% of total energy end-use and of GHGs in Canada. A growing population and increased urbanization will put further pressures on existing energy and transportation infrastructures.

All sectors of the economy need to be engaged.

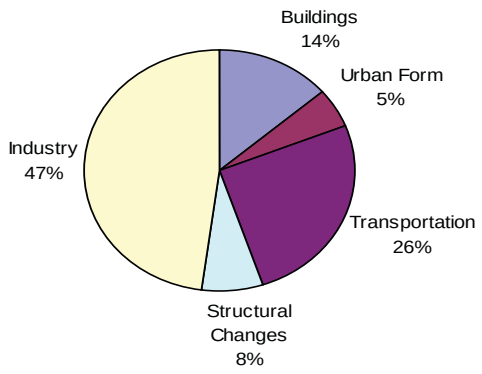
- The public debate on energy to date in Canada has centred on energy supply, but has been very limited on the end-user side. Measures to address greenhouse gas emissions from industrial large final emitters have been in the forefront of the climate change agenda, but the end-use residential, commercial, institutional and transportation sectors have been neglected.
- This one dimensional thinking is inherently unsustainable and we need a fundamental change in the way we develop our energy system. In addition to regulating emissions from large industry, Canada also needs to turn its attention to "the other 50%" – starting with the environmental footprint of its communities.
- The 2006 NRTEE's "Advice on a Long-term Strategy on Energy and Climate Change" scenario of 60% reduction by 2050 shows that close to half of the reduction could come from buildings, transportation and urban form. Chart 1

A silo-based approach will not bring optimal solutions.

- The present approach to energy planning that focuses mainly on improving the performance of the discrete components of the energy system, is necessary but insufficient to meet the challenge in front of us.
- The historic silo-based approach to planning land-use, energy production, delivery and use, transportation, waste and water, often supported by legislation that specifies the areas of influence that each participant may have, must therefore change.

Chart 1

2050 GHGs Emissions Reduction Scenario



Source: CGA's calculation based on NRTEE's "Advice on a Long-term Strategy on Energy and Climate Change", 2006

The Urban Energy Picture

• In 2005, it is estimated that urban energy consumption from houses, commercial and institutional buildings, transportation and small industry represented close to half of Canada's energy end-use. Chart 2

Chart 2

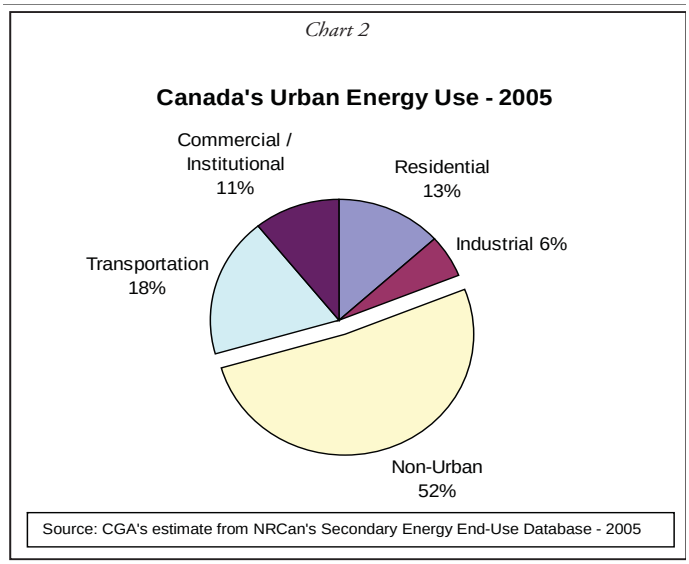
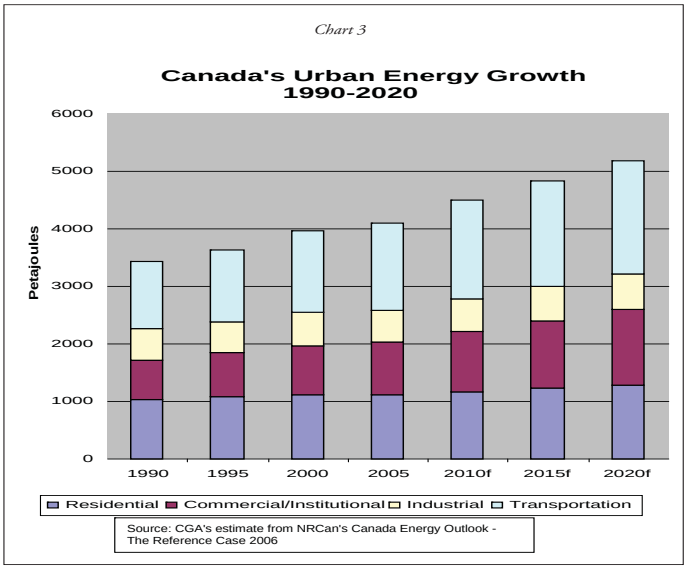


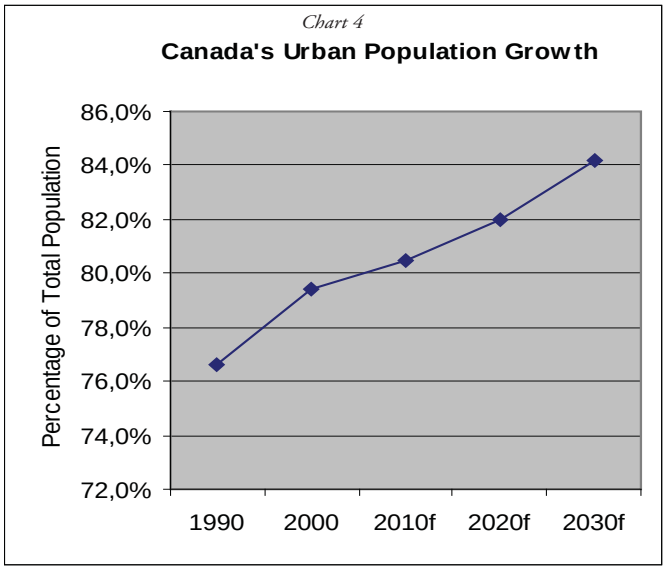
Chart 3



• From 1990 to 2005, urban energy use has grown by 20%. This increase was fuelled by the growth in the Canadian population and economy, leading to increased number of households, business activity and travel. Chart 3

• Canadian population is forecast to reach over 39 million by 2030, a 15% increase from today, with a continuing trend towards increased urbanization. About 80% of Canada's population lives in urban centers and this proportion is rising steadily. Chart 4

Chart 4



QUEST: The Vision

An integrated, community based approach to address energy end-use and reduce GHGs will get the best results.

- An integrated system based approach of thinking, planning and acting allows us to effectively deal with the complexity and interconnectedness of our energy, transportation, water and waste management systems.
- Because of increased diversity and redundancy, integrated systems are more efficient, flexible, resilient, reliable and sustainable.
- The community, with its use of energy in houses, business, institutions, industry and transportation, is the most promising place to act.
- An integrated approach at that level allows balancing energy demand and supply between different sectors, accounting for the impact of one system versus the other, and leads to optimal results in providing community services.
- Integration of energy systems at the community level brings the maximum economic, social and environmental benefits and meets many objectives, it:
    - Meets Smart Growth development principles,
    - Fosters innovation in advanced energy systems technology,
    - Alleviates demand on centralized energy generation and transmission systems,
    - Reduces pressure on water and waste management infrastructures,
    - Facilitates development of efficient urban transportation systems,
    - Creates local employment and economic development opportunities,
    - Leads to much reduced GHGs emissions and improved local air quality, and
    - Makes for better overall quality of life in communities.

Challenging Opportunities

Excellent opportunities exist to accelerate the widespread implementation of community based, integrated energy systems, but there are challenges:

- Integrated approaches have been implemented successfully in several communities, or are in the process of being implemented, but overall benefits have not been adequately quantified and widely publicized amongst decision makers.
- The integration of urban systems leads to longer term benefits for the community but it involves multiple players in the planning and development process which increases upfront complexity, development time and costs.
    - It typically involves investments in urban infrastructures that need longer term financing.
    - It challenges existing planning and regulatory frameworks, which takes time, effort and resources to change.
- Many technologies to improve the overall performance of energy systems do exist, but their integration raise particular challenges, risks and costs which developers, builders and smaller innovative companies cannot support alone.
- Provincial differences in energy mix and costs and their associated environmental impacts, create different opportunities, but also particular challenges that need to be considered in the implementation of projects.

Integrated Energy Systems - From Vision to Reality

Dockside Green -Victoria, British-Columbia

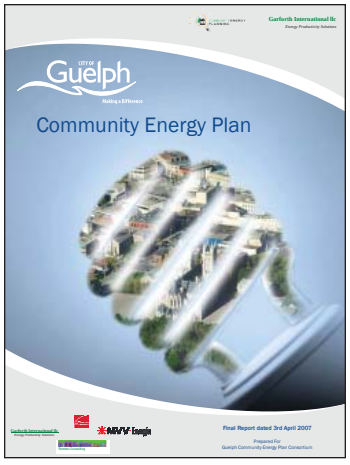
- In Victoria, the Dockside Green community is being developed on fifteen acres of former harbourfront industrial land, incorporating 26 buildings with a planned total of 1.3 million square feet of mixed residential, office, retail and commercial space and it showcases green building and best-practice energy technologies.
- As a LEED Platinum targeted project, Dockside Green will function as a total environmental system in which form, structure, materials, mechanical and electrical systems will be interrelated and interdependent - a largely self-sufficient, sustainable community where waste from one area will provide fuel for another.

Green Energy Benny Farm Redevelopment - Montreal, Québec

- This urban, landscape and architectural project is a model integration of buildings, infrastructure and community-driven housing development. It involves the sustainable construction and renovation of 187 housing units on four properties, and links each with a shared green infrastructure.
- The project integrates proven solar and geothermal technologies within the constraints of existing buildings, new construction and established urban design guidelines. The shared infrastructure will allow future flexibility in adding renewable heat sources and redistributing these energies between buildings. The backup systems are shared across the site and between buildings meaning they are cheaper and more efficient. Economies of scale bring greater value out of capital expenses, compared to discrete systems for separate projects.

The City of Guelph Community Energy Plan, Ontario

- Guelph, with its current population of 115,000, plus an additional 18,000 students during the academic year, is a thriving city that is attracting significant growth. Guelph's population is expected to grow to 180,000 supported by significant commercial and industrial development. To support this growth, the city has made a commitment to implement a Community Energy Plan (CEP) which outlines several ambitious targets and actions to address barriers to urban integrated energy systems and will ensure the long-term competitiveness and environmental performance of the city.
- Several priorities have been identified in the CEP: maximize energy and water efficiency for buildings, vehicles and industry; maximize use of heat generated in electricity generation and existing industrial processes; incorporate as many renewable energy sources as feasible, and; team with the existing electricity and gas networks to avoid wasteful duplication of assets. The CEP outlines several ambitious targets and actions to address barriers to urban integrated energy systems, including a recommendation to implement the concept through community scale projects.



QUEST: A Framework for Change

Strategy

"Organized central intelligence, implemented through multiple individual actions".

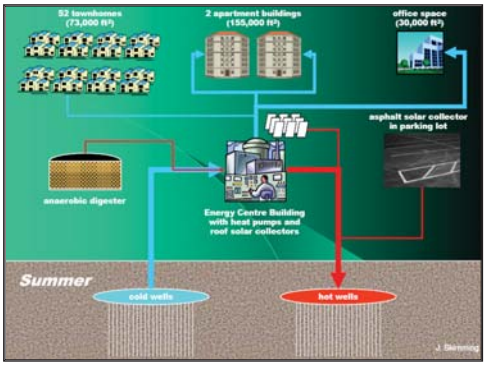
- The development of an integrated approach to energy systems necessitates a concerted effort from all levels of government to facilitate private sector actions.
- It relies on the collaboration and on the particular responsibilities, strengths and capabilities of all stakeholders from the public and private sectors: federal, provincial and municipal governments, regulators, utilities, planners, designers, developers, builders, and other community stakeholders.
- Federal and provincial governments need to provide leadership and framing of the issue, policies to address market failures, and support to sustain intellectual infrastructure; these policies and actions should be flexible and incremental, with a continuous review of the outcomes.
- Implementation needs to be at the smallest practical level to account for, and adapt to localised circumstances, increasing buy-in from the public.

Actions

Several actions are needed to set the stage and accelerate the adoption of an integrated approach to energy systems.

- Introduce appropriate market based pricing of carbon to take into account the impact that carbon emissions cause to the environment, public health and the economy, and to send a clear signal to all members of society that the environment cannot be used as a free GHG/waste receptacle, and to accelerate market adoption of technologies that are already widely available.
- Provide leadership, central coordination, clear objectives and information to individuals, households, businesses, and cities on what can be done to improve the delivery of energy services in order to build up commitment and initiate actions by all members of the community.
- Increase the dialogue and collaboration between energy, transport, land-use and technology players, and with all levels of government to improve the alignment of the interventions and optimize solutions.
- Document performance and benefits, make available project experience and case studies, and develop performance targets, metrics and evaluation tools for integrated community energy systems.
- Develop capacity at the municipal, regional and provincial levels for long term integrated energy demand and supply planning and hold municipalities accountable for developing and implementing integrated community development plans.
- Ensure a sufficient revenue base for municipal governments to plan and manage integrated energy plans and implement innovative solutions.
- Encourage more interaction and collaboration, and develop institutional arrangements between the public and private sectors e.g. utility and municipality partnerships for the development and operation of community based energy systems.
- Develop innovative financial mechanisms to manage front-end investment risks and accelerate private sector investments e.g. green financing for home owners and better performing buildings; incremental capital at low interest for long pay back energy systems.
- Fund and implement pilot, demonstration and showcase projects e.g. micro-utilities, on-site distributed generation.

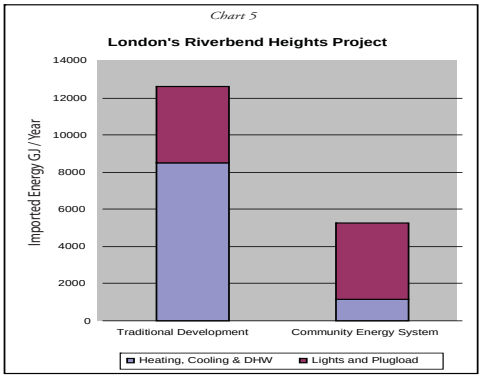
Integration Brings Significant Benefits



The Riverbend Heights Community Energy System - London, Ontario

- Riverbend Heights is a community designed using the "Placemaking" - smart growth principles developed by the City of London, Ontario.
- This mixed-use development would include most of the key features of an integrated energy system: energy efficient buildings; advanced sewage collection and anaerobic digestion of organic waste; combined heat and power generation; low temperature district heating and cooling; aquifer thermal energy storage (ATES); active solar thermal and air source domestic hot water heat pumps.
- The project's feasibility study shows that, compared to a traditional approach, a community based integrated energy system would lead to a 58% overall reduction in grid energy use and a 86% reduction in energy for hot water, space heating and cooling. Both approaches assume high efficiency housing at the Energy Star level and LEED certified commercial buildings. Chart 5
- The mix of land use and density helps make the ATES-based system feasible and will help encourage sustainable modes of transportation. Inclusion of additional features, such as solar photovoltaic, would bring the development close to a net-zero community.

Chart 5



QUEST: Building on the Momentum

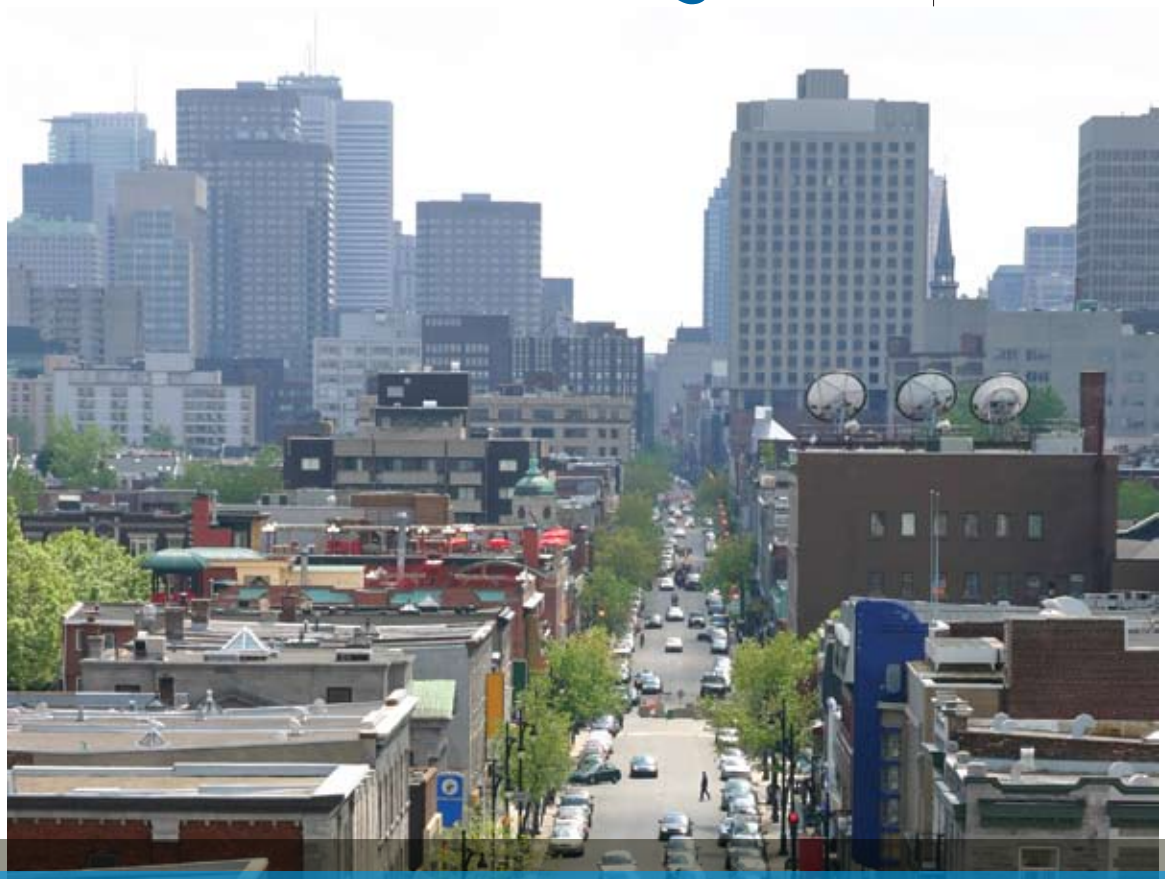
There is a sense of collective urgency coming out of the QUEST Workshop. Physical systems we are building today will define our environment for decades. We need to act now and learn through practice.

- The outcome of QUEST, carried through this White Paper, is the basis for participants to deliver a consistent message to policy and decision makers who have the ability to influence and accelerate implementation of future developments.
- QUEST is a first step towards drawing a consensus and establishing a long term vision for a fundamentally different, carbon-lean urban energy future and will be used as input to other stakeholders' long term strategic planning exercises, such as NRTEE's.
- Following the delivery of this White Paper to key policy makers and influencers and its wider distribution, the Steering Group will help promote further discussions and more specialised workshops to overcome strategic gaps, build new partnerships and help develop leadership in community energy efficiency in Canada. More specifically:
  - Surveying QUEST participants on what needs to change to achieve the goal of integrated system approaches,
  - Identifying and developing case studies of integrated systems,
  - Developing baseline indicators and quantifying benefits,
  - Choosing an easily accessed location to accumulate up-to-date information on needs, case experience and measurement tools,
  - Increased networking through mechanisms such as Smart Growth Canada, and
  - Developing partnerships to implement pilot and demonstration projects.

QUEST participants believe that integration is fundamental to meeting the energy and GHGs emission reduction challenge facing Canada. They are committed to making Canada a world leader in urban integrated energy systems.

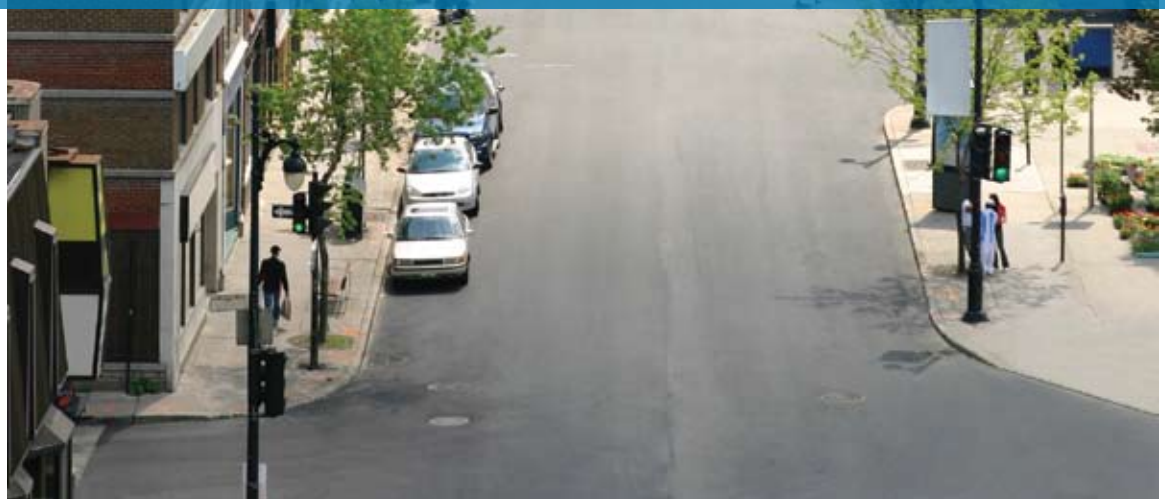
QUEST

Quality Urban Energy
Systems of Tomorrow



MOVING FORWARD:
THE INTEGRATED ENERGY SYSTEMS APPROACH IN CANADIAN COMMUNITIES

MARCH 2009



This document contains content excerpted
from "QUEST Policy and Next Steps" Ken Ogilvie,
November 17, 2008; and, documents provided
by Scenarios to Strategy (S2S) Inc.

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CHAIRMAN'S MESSAGE

Currently 95 percent of Canadian's live in or within an hour of one of our 120 larger city centers. Cities are where the majority of our resources are consumed and the majority of our greenhouse gas and air pollutant emissions are produced. Decisions we take today about land use in our cities and their energy, transportation, water and waste management infrastructures will have consequences in decades to come. A better integration of these infrastructures and systems will address energy end-use and significantly reduce emissions. QUESTs vision, mission and six guiding principles are the basis to ensure a cleaner, more efficient, affordable and reliable energy system for Canadians.

Mike Harcourt

Michael Harcourt
QUEST CHAIRMAN

EXECUTIVE SUMMARY

Canada's energy use is rising. Urban areas are a major source of Canada's greenhouse gas emissions. To reach the federal government's 2020 target of reducing national emissions by 20% from 2006 levels, addressing energy use and emissions in urban areas and communities must be part of the solution. Preliminary results of a study commissioned by QUEST on the potential energy savings and GHG emissions reduction of urban integrated energy systems are promising and indicate that significant reductions would be possible through stringent land use policies, and that these policies would enable implementation of several technologies and further reductions.[1]

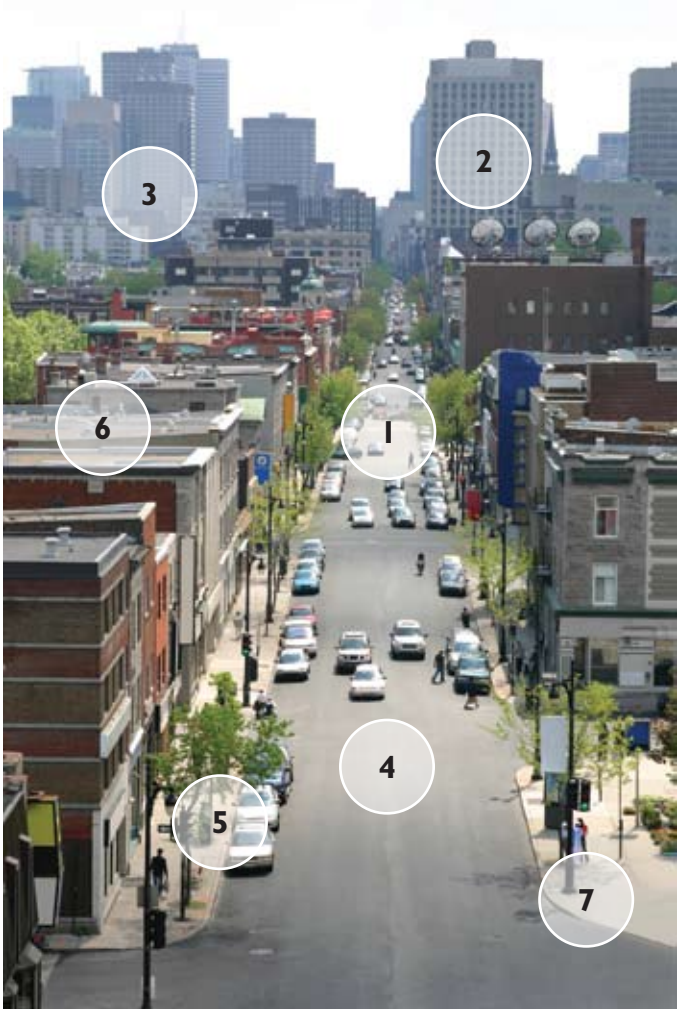
QUEST (Quality Urban Energy Systems of Tomorrow) is a collaborative of key players from industry, the environmental movement, governments, academia and the consulting community that is encouraging all levels of government, industry and citizens to support integrated approaches to providing energy services in Canadian communities.

The **QUEST mission** is to foster a community-based integrated approach to land-use, energy, transportation, waste and water and reduce related greenhouse gas, air pollutant emissions and waste.

The **QUEST vision** is that by 2050 every community in Canada is operating as an integrated energy system, and accordingly, all community development and redevelopment incorporates an integrated energy system.

The underlying QUEST proposition is that meeting Canada's climate change and clean air goals will require large reductions in energy consumption in urban areas and communities, as well as greater integration of on-site renewable sources of energy with existing energy grids.

[1] Exploration of the capacity to reduce GHG emissions by 2020 and 2050 through application of policy to encourage integrated urban energy systems. MK Jaccard and Associates Inc., January 2009.



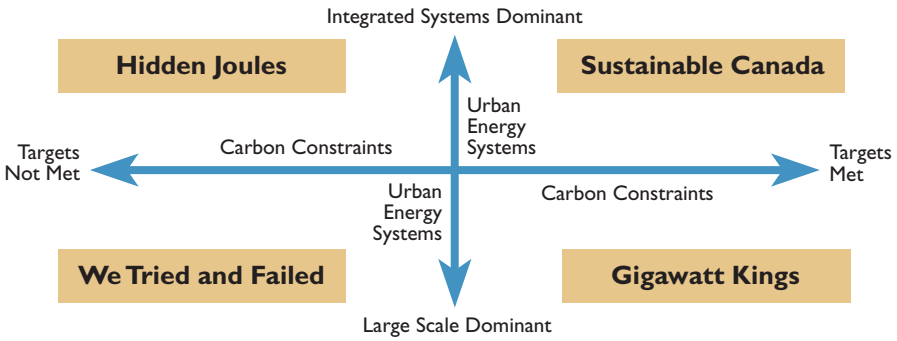
A mixed-use, higher density community is the foundation for an integrated energy system.

1. Mixed-use and higher density development allows the cost-effective integration of systems, including transportation.
2. LEED certified buildings reduce energy use and environmental impacts.
3. The unique characteristics of each energy form is matched with its end-use.
4. A district energy system allows thermal energy to be effectively managed across the different end-uses.
5. Energy from waste, such as from the sewer system and garbage, is recovered.
6. Local renewable energy contribution, like solar energy, is maximized.
7. Electricity and gas grids allow optimization of the overall system and ensure reliability.

Individuals from across the QUEST collaborative developed four scenarios with a goal of building understanding about the complex, interacting forces and key uncertainties shaping the future of carbon-constrained energy end use in Canada and the adoption of Integrated Urban Energy Systems (IUES).

The four scenarios describe substantially different yet plausible paths for Canada's energy future; paths that diverge based on decisions made today regarding carbon constraints and IUES.

SCENARIO FRAMEWORK



Of note is that the Sustainable Canada scenario represents a plausible way to simultaneously achieve greenhouse gas emissions targets while building more sustainable communities. These communities optimize infrastructure investments and implement innovative technologies to reduce energy use and the associated costs and environmental impact, while improving the energy system's reliability and making better use of local energy resources. In doing so, these investments create local jobs and reduce each community's dependence on distant resources and exposure to volatile commodity markets. While implementing these concepts will have the largest impact in urban settings, many of the practices and technologies can be applied in smaller communities.

The four scenarios were examined and discussed at the QUEST II Conference in Victoria in November 2008, which was a successful staging ground for generating new ideas and launching new efforts to further build momentum. Conference participants agreed that additional progress needs to be made along two key paths.

1. Move to Action, and
2. Develop a Knowledge Base.

1. Move to Action

QUEST needs to expand its network and appeal to a wider range of perspectives. Such an expansion should proceed along the following lines:

- Build political champions,
- Develop regional and provincial QUEST models,
- Engage key stakeholders, and
- Develop federal and provincial government relationships.

2. Develop a Knowledge Base

QUEST will undertake the development of a knowledge base containing the following elements:

- Study on the Potential Energy Savings and Associated Environmental Benefits,
- Develop an inventory / case studies of successful projects, best practices and funding sources, and
- Work with municipalities to develop a toolkit to facilitate implementation of IUES.

To succeed QUEST needs ongoing support from all levels of government and active engagement from environmental groups, builders, utilities and other private-sector stakeholders that are doing leading edge work in the area. When QUEST principles are reflected in their decisions, the QUEST vision will be achieved.

INTRODUCTION

QUEST

Meeting Canada's climate change and clean air goals will require large reductions in energy consumption in all sectors of the economy, including the 50% of energy used in urban areas and communities, by matching the type of energy with its use, better heat management across applications and sectors, converting waste to energy, as well as greater integration of on-site renewable sources of energy with existing energy grids.

QUEST (Quality Urban Energy Systems of Tomorrow) is a collaborative of key players from industry, the environmental movement, governments, academia and the consulting community that is encouraging all levels of government, industry and citizens to support integrated approaches to providing energy services in communities.

The **QUEST mission** is to foster a community-based integrated approach to land-use, energy, transportation, waste and water and reduce related greenhouse gas, air pollutant emissions and waste.

The **QUEST vision** is that by 2050 every community in Canada is operating as an integrated energy system, and accordingly, all community development and redevelopment incorporates an integrated energy system.

The first QUEST workshop in November 2007 in Niagara-on-the-Lake, ON saw the emergence of a commitment towards an integrated approach for energy services in Canadian communities. Participants agreed that integration is fundamental to meeting the energy and GHG emission reduction challenge facing Canada.[2]

The QUEST vision builds on progress that has been made on energy-efficient appliances, eco-efficient buildings, district heating systems, renewable energy technologies, waste heat utilization, waste recycling and landfill gas capture, net zero energy homes, green roofs, and many more innovations that have paved the way for radical changes in the way quality energy services can be provided. The vision calls for greater integration of these innovations in community-wide energy systems in order to address energy end-use and reduce greenhouse gases.

The Drake Landing Solar Community in Okotoks, Alberta has successfully integrated solar energy and seasonal energy storage with grid energy for a fisty-two R-2000 energy efficient homes development.

[2] Integrated Energy Systems in Canadian Communities: A Consensus for Urgent Action. QUEST, March 2008.

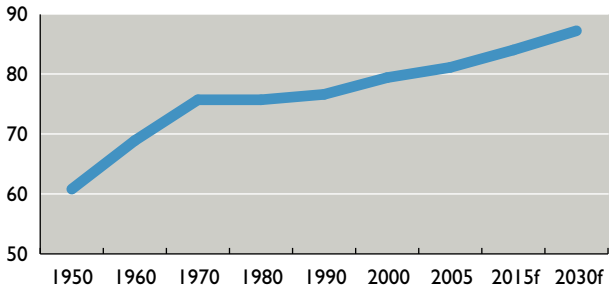
The mission is premised on **six principles that guide sustainability in urban energy systems**:

- **Improve efficiency** – first, reduce the energy input required for a given level of service;
- **Optimize "exergy"** – avoid using high-quality energy in low-quality applications;
- **Manage heat** – capture all feasible thermal energy and use it, rather than exhaust it;
- **Reduce waste** – use all available resources, such as landfill gas, gas pressure drops and municipal, agricultural, industrial and forestry wastes;
- **Use renewable resources** –tap into local biomass, geothermal, solar, wind energy and hydraulic; and
- **Use grids strategically** – optimize use of grid energy and as a resource to optimize the overall system and ensure reliability.

QUEST Context

Fifty percent of Canada's greenhouse gas emissions come from large-scale energy resource developments, large industry and centralized power generation. The other fifty percent is emitted in urban areas and communities where over eighty percent of Canadians live. The federal government has set targets of reducing Canada's greenhouse gas emissions 20 percent by 2020 and 60-70 percent by 2050 while reducing industrial emissions by as much as 50 percent by 2015 for key air pollutants.

Figure 1: CANADIAN URBAN POPULATION (%)



Source: Globalis
Note: f = forecast

The challenge facing Canada is to achieve the environmental targets and standards in ways that have broad public support, that improve competitiveness and create new investment and jobs and improve overall quality of life in our communities. To meet this challenge, current macro-energy policies, which focus on decarbonising large-scale fossil fuel resource development and use, must be complemented by micro-energy policies that reduce the demand for energy, and related emissions, in urban areas while providing the energy services that Canadians expect.

Urban areas are a major source of Canada's greenhouse gas emissions. This is not surprising given that about 80% of Canadians live in urban areas. Furthermore, the urban population is growing faster than the non-urban, and has been doing so for some time (Figure 1), making urban areas a core feature of ongoing economic growth. In addition, while implementing the QUEST vision will have the most impact in urban settings, most of QUEST's principles can be applied in smaller communities.

As a result, more efficient use of energy in Canada's urban areas and communities is needed to address environmental goals and, increasingly, to ensure that these growing communities are not built to be reliant on cheap energy. The environmental and economic imperatives coincide in this case – more sustainable energy systems, particularly at the community-level, serve to protect the environment, create local jobs and reduce energy costs.

Preliminary results of a study commissioned by QUEST on the potential energy savings and GHG emissions reduction of urban integrated energy systems are promising and indicate that stringent land use policies to encourage densification, including constraints on the geographic footprint of cities, specification of densification corridors with fast and reliable transit, and reform of the property tax system, have the capacity to significantly reduce direct and indirect urban emissions, and that these policies would enable wide scale implementation of technologies such as district heating, combined heat and power, waste recovery systems and other alternative energy sources with accompanying additional reductions.[3]

The current policy setting, while focused on large industries and centralized power, provides some support for improvements to urban energy systems, but the design of the support does not encourage integration across sectors. Canada needs to move quickly on the QUEST vision to ensure investments in community energy infrastructure are made in a way that will allow implementation to provide the most short and long-term economic, environmental and social benefits.

Examples of relevant programs, incentives and initiatives that support elements of the QUEST vision

- Federation of Canadian Municipalities, Green Municipal Fund
- Municipal Rural Infrastructure Fund
- Technology Early Action Measures
- Sustainable Development Technology Canada
- NRCan (various program, such as at the Office of Energy Efficiency and CANMET Energy Technology Centre)
- Urban Transportation Showcase Program, Transport Canada
- Infrastructure Canada
- EcoTrust
- Moving on Sustainable Transportation
- Ontario Power Authority programs and incentives (e.g., Renewable Energy Standard Offer, Clean Energy Standard Offer, Demand Response Program)
- Ontario Greenbelt
- Vancouver and area initiatives (e.g., EcoDensity, Translink, Greenways Plan, Community Visions Program)
- Revi-Sols, Montreal and Quebec City

A major challenge in achieving the QUEST vision will be to cross-link existing programs and incentives to enhance their effectiveness by integrating them into a more cohesive framework.

[3] Exploration of the capacity to reduce GHG emissions by 2020 and 2050 through application of policy to encourage integrated urban energy systems. MK Jaccard and Associates Inc., January 2009.

QUEST SCENARIOS

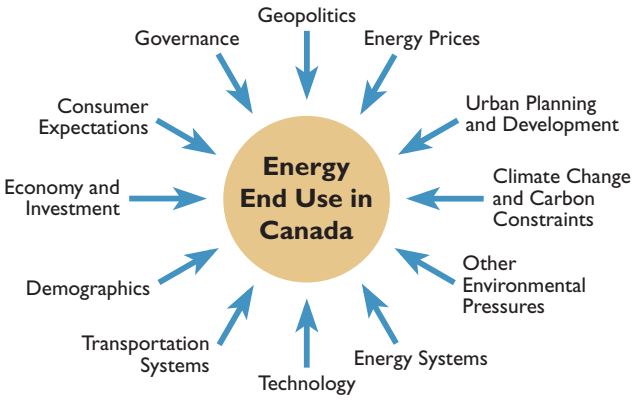
In the Fall of 2008, individuals from across the QUEST collaborative developed four scenarios with a goal of building understanding about the complex, interacting forces and key uncertainties shaping the future of carbon-constrained energy end use in Canada and the adoption of Integrated Urban Energy Systems (IUES). The IUES approach, involving integrated, smaller scale, more-distributed energy systems, is dramatically different from our current approaches to energy systems and would require major changes in thinking, planning, investment and policy.

The scenarios were discussed at the QUEST II Workshop in November 2008 where participants used them as a tool to help develop a more broad understanding about the future, the external environment and strategic risk. Participants built a shared understanding of the forces driving change and the key uncertainties shaping the future. The scenarios are now being used to help QUEST more fully understand strategic risk and make better strategic decisions.

Of the 12 driving forces identified, two critical uncertainties were identified as most important:

- Urban Energy Systems – whether they are large-scale dominant or integrated systems dominant, and
- Carbon Constraints – whether targets are met or not met.

12 DRIVING FORCES



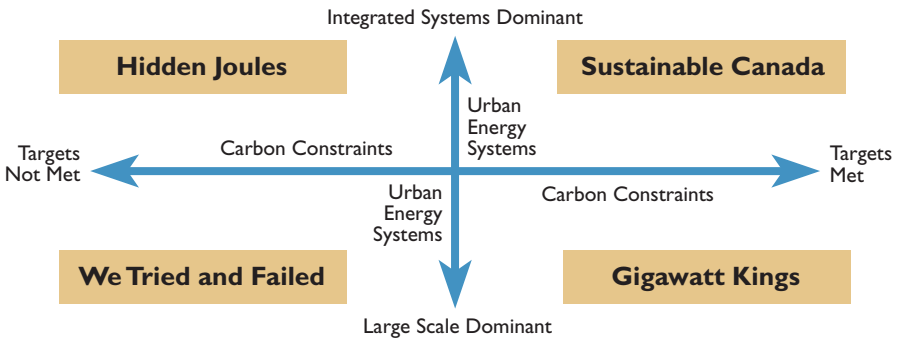
Scenarios

Scenarios are a vehicle for strategic conversation to build shared understanding, encourage creative thinking and provide a context for strategy development and action. Scenario planning is particularly valuable in turbulent uncertain environments facing structural change.

Scenarios are not predictions; they are stories about the future designed to gain insight into the forces driving change and the major uncertainties shaping the future. Scenarios chart the waters ahead so that the consequences of today's decisions can be played out, evaluated and tested against the uncertainty of the future. Scenarios are intended to challenge assumptions, explore issues and broaden understanding of the range of future paths to better inform decision-making.

Understanding the influence and range of outcomes for each critical uncertainty is important to developing challenging scenarios for energy end use in Canada. The two critical uncertainties define a space with four different energy futures for Canada. These four scenarios demonstrate paths representing both success and failure in achieving emissions targets and taking full advantage of IUES' with an integrated approach to urban energy systems.

SCENARIO FRAMEWORK



Hidden Joules

Despite competing priorities and conflicting signals from senior governments, a number of municipalities lead in initiating projects to increase energy efficiency and reduce GHGs emissions across urban systems.

Sustainable Canada

Significant shifts in social values drive acceptance of environmental costing and new paradigms for urban energy systems in Canada.

Gigawatt Kings

Urgency and determination to deal with climate change as a national issue leads to increased central regulation, control and focus on large scale solutions.

We Tried and Failed

Carbon concerns drive policy. Canada focuses on large-scale solutions with little emphasis on small-scale solutions. Other nations embrace alternative energy. Diverging paths lead to trade barriers that undermine economic growth.

The four scenarios describe substantially different yet plausible paths for Canada's energy future; paths that diverge based on decisions made today regarding carbon constraints and IUES.

Of note is that the Sustainable Canada scenario represents a feasible way to simultaneously achieve greenhouse gas emissions targets while building more sustainable communities. These communities optimize infrastructure investments and implement innovative technologies. By doing so they reduce energy use and the associated costs and environmental impact, improve the energy system's reliability, make better use of local energy resources, create local jobs and reduce each community's dependence on distant resources and exposure to volatile commodity markets.

The implications of the four QUEST scenarios are varied and QUEST II participants discussed a range of implications for QUEST moving forward. To focus discussions, participants addressed the following question:

> *How do we shift our paradigm to advance the potential of integrated urban energy systems (including our approaches to energy, water, waste and transportation systems) to reduce the carbon footprint of urban areas and to make Canadian cities sustainable?*

Conference participants recommended the general framework for moving forward should include:

- Enhanced political mobilization track to put QUEST on the agenda of all levels of government and reach out to a wider stakeholder group; and,
- Developing a base of knowledge for both the macro level (e.g. community level metrics, quantification of the potential benefits, road map for implementation) and the micro level (e.g. inventory of successful projects, case studies, a 'how to' manual or checklist for municipal governments).

They also recommended a more formalized organization/secretariat for QUEST, with dedicated resources to support the higher level of effort needed to advance the action-oriented vision.

NEXT STEPS

QUEST 2009

QUEST II participants called for a significant increase in QUEST activity for 2009, from gaining the interest of key policy makers to working with a variety of current public and private stakeholders while simultaneously completing research into the implementation of and benefits provided by IUES.

As a first requirement to implementing an aggressive plan for 2009, QUEST is in the process of establishing a permanent secretariat with dedicated resources. To maintain momentum and follow up on the advice received at the QUEST II workshop, additional progress needs to be made along two key paths.

1. Move to Action, and
2. Develop a Knowledge Base.

1. Move to Action

QUEST needs to expand its network and appeal to a wider range of perspectives. Such an expansion should proceed along the following lines:

- Build political champions,
- Develop regional and provincial QUEST models,
- Engage key stakeholders, and
- Develop federal and provincial government relationships.

Build Political Champions

Awareness and support of the QUEST vision will be expanded by increasing political awareness and building political champions that support the value of community-level initiatives and local environmental progress.

Develop Regional and Provincial QUEST Models

To advance leadership, a framework for provincial and municipal models for QUEST will be developed wherein provincial stakeholders can work to further QUEST's vision while working within the unique structure of any given province's energy system and legislative framework. Municipal stakeholders will also have access to a coordinated regional approach to developing IUES within their communities.

Engage Key Stakeholders

As was identified in the 2008 Study on Stakeholder Engagement and Government Initiatives, builders are a key stakeholder group for QUEST success. In 2009, QUEST will pursue more involvement from builders and other key groups.

Develop Federal and Provincial Government Relationships

Specific engagement with Sustainable Development Technology Canada (SDTC) and the National Roundtable on the Environment and the Economy (NRTEE) will be pursued to establish IUES as a key attribute for funding; and to raise awareness of IUES and their potential contribution to greenhouse gas emissions reductions.

2. Develop a Knowledge Base

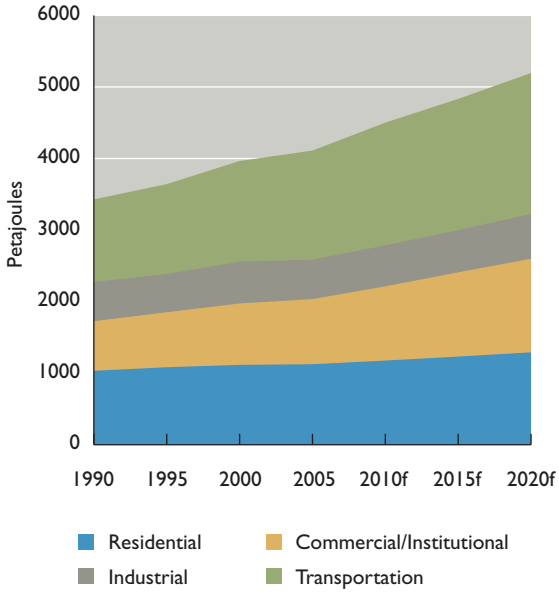
A common observation from QUEST II was the need for a more in-depth knowledge base to help in developing policies, programs and activities in support of IUES. Inline with this directive, QUEST will undertake the development of a knowledge base containing the following elements:

- Study on the Potential Energy Savings and Associated Environmental Benefits – Initial findings of Phase 1 of this study, initiated in 2008, indicate promising results, and therefore the objective is to proceed with Phase 2. Phase 2 would consist of an in-depth analysis/modeling of the energy savings and GHGs emissions reduction impact of the IUES approach for Canada.
- Develop an inventory and case studies of successful projects, best practices and funding sources, and
- Work with municipalities to develop a toolkit to facilitate implementation of IUES.

Moving Ahead

Canada's energy use is rising. Urban areas are a major source of Canada's greenhouse gas emissions (Figure 2). To reach the federal government's 2020 target of reducing national emissions by 20% from 2006 levels, urban areas, and smaller communities, must be part of the solution. Decisions made today about the infrastructures of our cities and communities will affect energy use and our environment for decades and centuries to come.

Figure 2: CANADA'S URBAN ENERGY GROWTH 1990-2020



Source: CGA's estimate from NRCan's Canada Energy Outlook – The Reference Case 2006

QUEST is calling for an integrated approach to land-use, energy, transport, water and waste management in all Canadian communities – one in which emphasis is placed on achieving much greater efficiency in these systems as a whole, rather than treating each in isolation. The result will be more resource efficient, adaptable, resilient and sustainable urban energy systems.

QUEST's plans for 2009 build on the 2008 momentum and represent early steps towards achieving the QUEST vision. QUEST is securing dedicated resources, developing provincial models, engaging more stakeholders and pursuing in-depth analysis and energy system modelling.

To succeed QUEST needs ongoing support from all levels of government and active engagement from environmental groups, builders, utilities and other private-sector stakeholders that are doing leading edge work in the area. When QUEST principles are reflected in their decisions, the QUEST vision will be achieved.

APPENDIX ONE: THE EVOLUTION OF QUEST

2006

- Canadian Gas Association and Pollution Probe agree to work together on developing a credible view on the consumption end -'the other 50%'- of the energy system and contribute to the policy conversations.
- An outreach effort attracts additional stakeholders from the energy industry, building industry, environmental groups, academe and representatives from municipal; provincial and federal governments.
- The stakeholders resolve to hold a structured dialogue to explore the benefits and opportunity for collaboration.

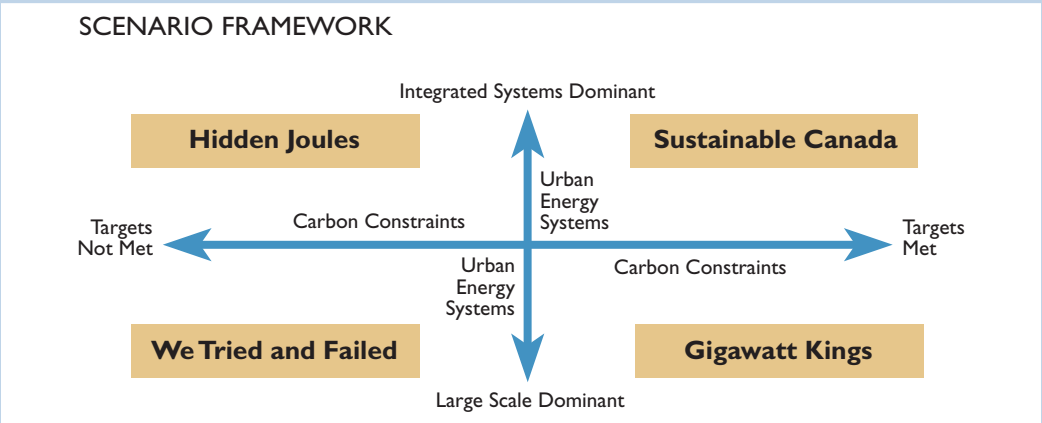
2007 – QUEST I

- A core group composed of Canada Green Building Council, Canadian Electricity Association, Canadian Energy Efficiency Alliance, Canadian Gas Association, Federation of Canadian Municipalities, Industry Canada, Natural Resources Canada, Ontario Power Authority and Pollution Probe coalesces around the need to focus on an integrated approach to energy, transportation, land-use, waste and water at the community level.
- In November, in Niagara-on-the-Lake, Ontario, over 60 key players from the energy industry, environmental movement, three levels of government, academia and consulting community spent a day and a half at the QUEST I workshop discussing options for reducing the environmental footprint of growing communities. The stakeholders observed:
  - Meeting ambitious long term greenhouse gas reductions of 60 per cent or more by 2050 needs a fundamental transformation of how we produce, deliver and use energy in Canada.
  - Integration of energy systems with land use, transportation, waste and water at the community level is essential to maximize energy savings and reductions in greenhouse gas emissions while continuing economic growth.
  - A broad based coalition under the banner of QUEST is necessary to bring about the change.
- The group identified the need to develop better information on the stakeholder community, current government programs that support the QUEST vision as well as the barriers. The group also identified the need for undertaking a credible study that quantifies the green house gas reduction potential of implementing the QUEST vision.
- The QUEST White Paper was presented to the Deputy Ministers of Natural Resources Canada, Transport Canada, Environment Canada and the Presidents of the National Round Table on the Environment and Economy (NRTEE) and Sustainable Technology Development Canada (SDTC) as well as provincial politicians and senior officials in Ontario, British Columbia and Saskatchewan.

2008 – Outreach, Studies and QUEST II

- The core group membership expanded beyond the founding group to include representatives from Transport Canada, the Government of British Columbia, the Canadian Urban Institute, BC Hydro, Ontario Power Authority, the Canadian GeoExchange Coalition, the Canadian Institute of Petroleum Producers, Karen Farbridge, Mayor of Guelph and Michael Harcourt ex-Premier of British Columbia as Chair.
- The study on stakeholders and government programs was completed and the potential study launched.
- Natural Resources Canada embarked on a federal/provincial/territorial initiative to develop a Community Energy Solutions Road Map for review by the Council of Energy Ministers, coordinating with QUEST work and interacting with the QUEST community.
- The QUEST II workshop in Victoria B.C. in November attracted 80 stakeholders from a broader stakeholder base than the previous year, including more industry representatives, a wider representation of environmental organizations, a larger number of federal and provincial government representatives, of academics and many more municipal leaders from British Columbia.
  - Participants considered a number of scenarios for the future of Canada's energy system that had been developed over the course of the preceding six months based on interviews with prominent stakeholders and a working session with a small select sub-group of the stakeholders. The scenarios provided an excellent framework for a conversation among the participants and helped crystallize the QUEST vision.
  - The end result was a resounding confirmation of the need for the QUEST initiative and coalescence of opinion that it is time QUEST focused its efforts on implementation of the vision.

APPENDIX TWO: QUEST SCENARIOS



Hidden Joules – Integrated Systems Dominant, Targets Not Met

- Limited commitment to GHG targets; senior governments distracted by competing priorities
- Municipal champions overcome barriers & build partnerships to initiate projects
- Initially focus on small & manageable opportunities
- Conflicting signals lead to "system stuck in transition"
- Diffusion slow then accelerating; projects to integration to institutional planning
- By 2028 targets not met but IUES accelerating

Sustainable Canada – Integrated Systems Dominant, Targets Met

- Significant shift in social values, environmental costing accepted
- New paradigms in Canada about urban development and urban energy systems
- Thinking supported by alternative energy technology
- Optimize existing investments
- Progressively advance and adopt new approaches and technology over time to effect a system-wide transition
- By 2028, targets for a 30% reduction in GHG emissions are achieved and Canada is on track to achieve a 60% reduction by 2050

We Tried and Failed – Large Scale Dominant, Targets Not Met

- Carbon concerns mount with solutions predominantly focused on large-scale emitters
- Environmental management efforts fall to basic enforcement and compliance
- Green trade barriers emerge
- Environment degrades, Canadian competitiveness is hampered, Canada's social fabric affected
- As the world starts to embrace alternative energy, Canada does not have the capacity to embrace new opportunities and we remain dependent on silos & large-scale energy systems
- By 2028, having missed its GHG targets, Canada is at risk of falling further behind

Gigawatt Kings – Large Scale Dominant, Targets Met

- Climate change urgent national issue; commitment to targets
- US leads in developing system of GHG constraints
- Focus on regulation & control
- Large scale infrastructure & technology solutions seen as only path to meeting GHG targets; massive investment in nuclear, IGCC, CCS, natural gas
- Problem-solution "fix-it" mentality precludes long term systems thinking
- Cities little influence; suburban growth; car-centred society
- By 2028, GHG target met through massive investment in nuclear & CCS

APPENDIX THREE: QUEST SUPPORTERS

QUEST is a collaborative among a range of organizations across Canada. Participants in QUEST workshops and other initiatives include federal, provincial and municipal officials, industry associations and company representatives, academics, environmental organizations, charitable foundations, technical experts and consultants.

Supporters include:

- BC Hydro
- Canada Green Building Council
- Canadian Association of Petroleum Producers
- Canadian Electricity Association
- Canadian Energy Pipeline Association
- Canadian Gas Association
- Canadian GeoExchange Coalition
- Canadian Petroleum Products Institute
- Canadian Urban Institute
- Federation of Canadian Municipalities
- Government of British Columbia
- Imperial Oil Foundation
- Natural Resources Canada
- Ontario Power Authority
- Pollution Probe
- Transport Canada

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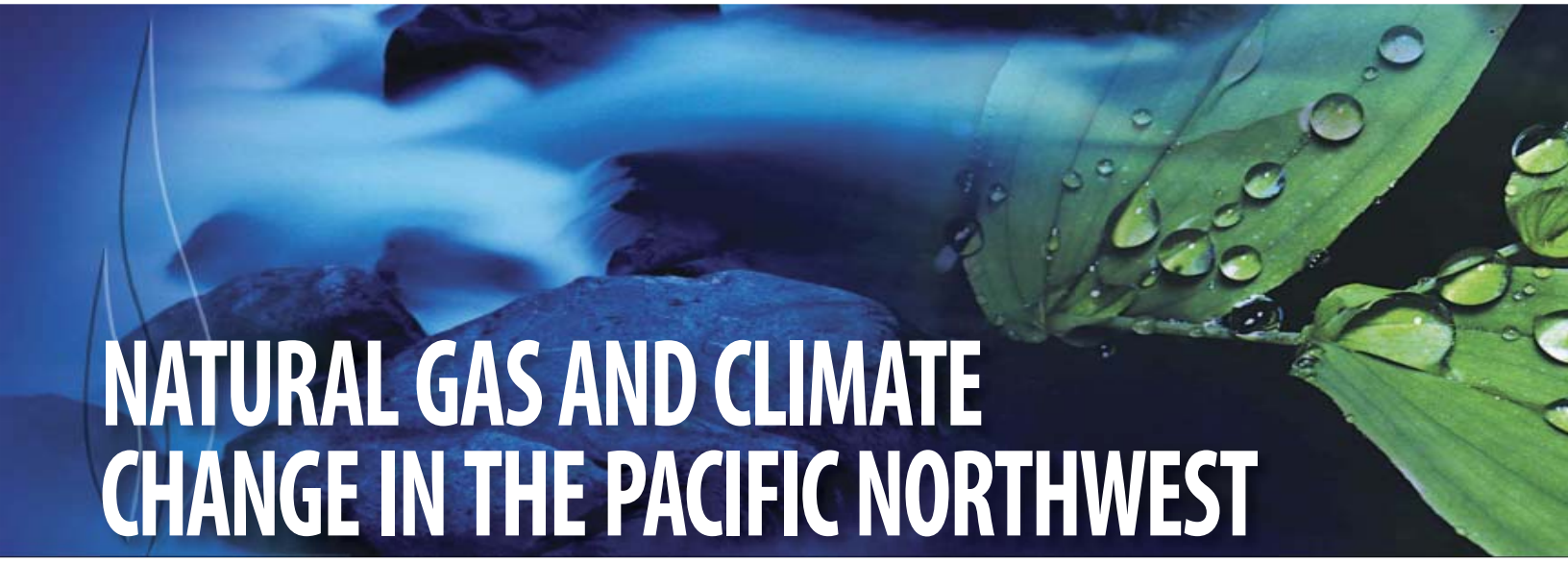
VOLUME 2, ISSUE 2

NWGA
NORTHWEST GAS ASSOCIATION



NATURAL GAS AND CLIMATE CHANGE IN THE PACIFIC NORTHWEST

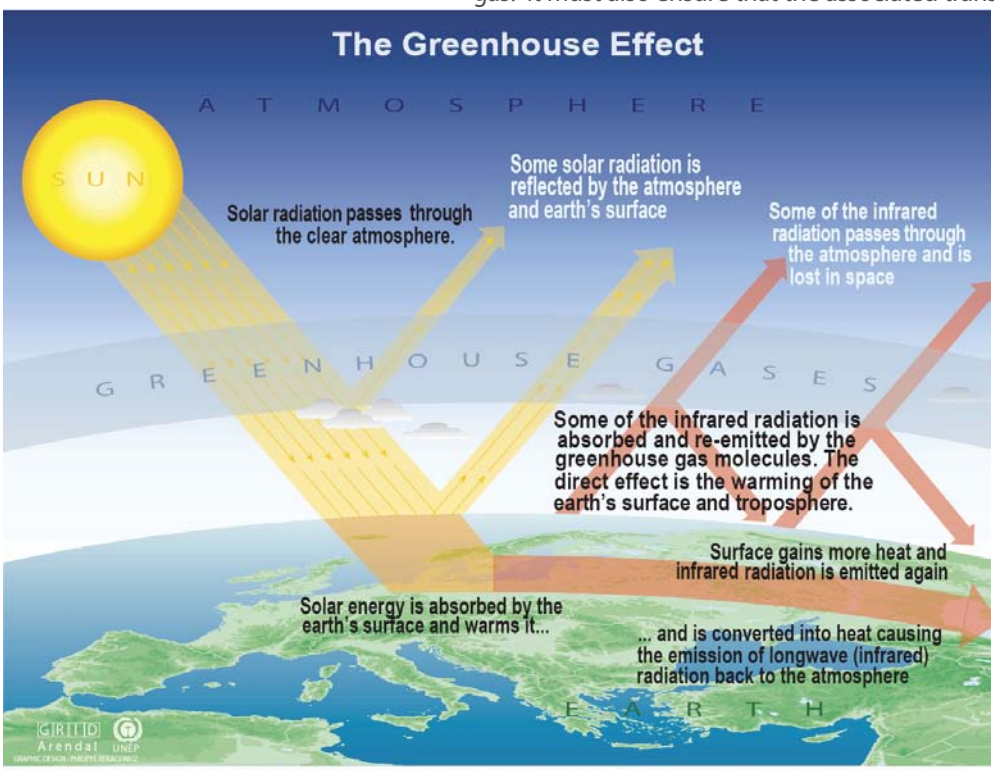
IN THIS ISSUE

Growing concern about global climate change is triggering change in the political climate. As decision makers craft near- and longer-term policies aimed at reducing greenhouse gas (GHG) emissions, consideration must be given to the vital role of natural gas in the equation. Because it is the cleanest burning of all fossil fuels, natural gas is a centerpiece in regional, national and international efforts to address climate change.

An analysis of proposed U.S. Climate Change legislation (S.280) recently released by the Natural Gas Council (NGC) - representing every segment of the U.S. natural gas industry - confirms as much. In a related press release dated October 3, 2007, the NGC said, "[We] firmly believe that natural gas will be a critical component in achieving greenhouse gas emission reductions under any climate change legislation."

The Pacific Northwest is in the vanguard with several states and provinces having recently enacted climate change policies. Because natural gas is a valuable resource and such an important part of the region's economy, regional policymakers must ensure that it is utilized as effectively as possible. The region must retain and secure additional access to abundant and diverse sources of supply as climate change policies increase regional demand for natural gas. It must also ensure that the associated transmission, storage and distribution infrastructure can grow as necessary.

This white paper explores the role of natural gas in addressing climate change, some practical steps consumers across the region can take to reduce their carbon emissions and the policy principles adopted by the NWGA Board to guide our approach to climate change-related policy initiatives.



Sources: Okanagan University College in Canada, Department of geography, University of Oxford, school of geography; United State Environmental Protection Agency, Washington; Climate change 1995, The Science of Climate Change, contribution of working group 1 to the second assessment report of the intergovernmental panel on climate change, UNET and WMO, Cambridge University Press, 1996.

NATURAL GAS AND CLIMATE CHANGE IN THE PACIFIC NORTHWEST

THE ROLE OF NATURAL GAS IN ADDRESSING CLIMATE CHANGE

In order to develop solutions that both reduce our contribution to climate change and sustain our energy needs, we need to make full use of our current infrastructure and resources. This includes continuing to improve technology and emphasize energy efficiency. It also includes converting uses from fuel oil and coal to natural gas – the cleanest of all fossil fuels – where it makes sense to do so.

Natural gas serves as a blue bridge to a greener world. When burned natural gas produces mostly CO_2 and water vapor – the same compounds that humans produce when we exhale. Fuel oil and coal both contain more nitrogen and sulfur along with a higher carbon ratio resulting in higher levels of harmful emissions, including carbon, nitrogen oxides (NO_x) and sulfur dioxide (SO_2), as well as ash particles that can cause or worsen many respiratory illnesses.

By comparison, natural gas emits very little NO_x or SO_2, virtually no ash, and about half as much CO_2 as coal according to the U.S. EPA (US Greenhouse Gas Inventory Reports - Annex 2, April, 2007). This makes natural gas an ideal fuel source to help reduce CO_2 being transmitted into the atmosphere – as recognized by the United Nations Intergovernmental Panel on Climate Change (IPCC) and others.

HUMAN-CAUSED GREENHOUSE GASES

Carbon dioxide (CO_2) may account for as much as 84 percent of GHG emissions, according to the Energy Information Administration. Nearly all atmospheric CO_2 from human sources comes from burning fossil fuels.

Methane (CH_4) is emitted during production and transport of fossil fuels. However, the largest methane emission sources are cattle and other livestock, biomass burning, decaying organic waste in landfills, and biological activity in rice paddies and swamps.

Nitrous Oxides (N_2O) causes thinning in the Earth's protective ozone layer where it can remain for about 150 years due to its extremely stable properties. Fossil fuel and biomass combustion during industrial, agricultural and forestry activities is the largest contributor of these emissions.

Fluorinated Gases (hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride) are powerful synthetic GHGs emitted from industrial process such as magnesium, aluminum and semiconductor manufacturing. Fluorinated gases are sometimes used as substitutes for ozone-depleting substances (e.g., chlorofluorocarbons) in refrigeration, air conditioning and aerosols. Although typically emitted in smaller amounts, they are sometimes referred to as High Global Warming Potential (High GWP) gases.

ENVIRONMENTAL ENHANCEMENT: TAKING FULL ADVANTAGE OF NATURAL GAS

Natural gas is already popular as a clean source of fuel for generating electricity. In fact, natural gas is the fuel for the vast majority of new electrical generating capacity built in the U.S. over the last fifteen years. During the past two decades, increased use of natural gas helped reduce the level of GHG emissions relative to the United States gross domestic product, according to the Energy Information Administration. Direct use of natural gas – in home heating, water heating and stovetops – is the most efficient, cost-effective and environmentally beneficial way to use it.

Increasing our use of compressed natural gas as a transportation fuel for both heavy and light duty applications will also contribute to reducing our carbon footprint. Significant reductions in CO_2, NO_x and other emissions can be achieved by substituting natural gas for gasoline or diesel fuels not only in passenger vehicles and buses, but also in industrial equipment, business and transport fleets, port applications, ferries and more.

The technology for natural gas-powered vehicles has existed for many years, and although several factors have served to slow its adoption, advances continue to be made. Meanwhile, businesses and government agencies continue to establish and expand CNG refueling infrastructure and increase their use of natural gas for powering their buses, delivery vans, taxis, postal vehicles and the like. In addition, ports are reducing emissions by fueling on-board ship generators with natural gas instead of diesel.

NWGA CLIMATE CHANGE PRINCIPLES

In state and provincial capitals across the Pacific Northwest, policymakers are addressing the region's role in mitigating greenhouse gas (GHG) emissions. The region's natural gas industry remains a committed partner in this ongoing effort. Our industry's effectiveness on this issue, however, largely depends upon how well policymakers understand the role that natural gas can play in tackling climate change.

The following summarizes the Northwest Gas Association's policy recommendations to address climate change by revamping energy use, developing and implementing effective measures that embrace the unique role of natural gas in furthering a cleaner, healthier environment and by ensuring that the region retains access to abundant and diverse sources of natural gas. We ask Northwest policymakers at all levels – local, state/provincial and federal – to incorporate the following principles as they craft and implement climate change policies across the region:

"We don't need to wait for revolutionary technology or expensive government programs to make progress reducing greenhouse gases. Using gas directly in high-efficiency equipment can reduce our carbon footprint now."

Mark Dodson
CEO of Portland based NW Natural

First and foremost, the NWGA asserts that coordinated emissions regulation should occur at the federal level in the U.S. and Canada in order to prevent regional regulatory disparities and competing compliance standards.

In addition, climate change policies must recognize that significant changes in energy use cannot happen overnight – time must be allowed to build capital-intensive new infrastructure and for the economy to develop and provide cost-effective, efficient new fuels and technologies. Policymakers must begin now while the issues can still be addressed thoughtfully.

Climate change policies should promote energy efficiency first - Reducing the amount of energy used is the most effective and least expensive method of controlling emissions and conserving resources. Natural gas utilities have a long history of helping their customers to use energy wisely and reduce emissions and will continue their efforts in this regard. Related policies should:

- Support and promote market-based, cost-effective energy efficiency measures.
- Support the development and cost-effective deployment of energy efficiency technologies. For instance, NWGA members are developing new technologies for home and business that allow consumers to more accurately track their energy use and costs so that they can improve both and contribute to the goal of conserving energy.
- Rate structures should promote energy efficiency without creating a disincentive for the utility. Innovative strategies benefiting consumers and the environment have proven effective, both in the Northwest and elsewhere.

Climate change policies should promote the right fuel for the right use - Applying this principle will maximize the benefits of the energy used. For instance, the direct use of natural gas is the best way to take full advantage of the energy contained in and environmental gain from using natural gas. For example, new natural gas-fired furnaces are 90-95 percent efficient in converting gas to heat. Related policies should:

- Promote the right energy source for the right use. For instance, high-efficiency end-use natural gas applications such as residential furnaces, tank and instantaneous tankless water heaters, commercial boilers, industrial furnaces and combined heat and power systems are all applications where natural gas is more energy efficient than equivalent electric systems.

NWGA CLIMATE CHANGE PRINCIPLES

- Promote increased energy efficiency in all appliances, tools and vehicles. Energy efficiency should be a central goal of how we build homes and offices, design neighborhoods and cities, and live our daily lives.

- Reflect the high efficiency of natural gas transportation and delivery systems (less than 1 percent loss compared to 10 percent loss in electric transmission and delivery), making natural gas even more environmentally attractive.

Climate change policies should utilize market forces to encourage use of the cleanest resources – Natural gas emits about 45 percent less carbon dioxide (CO_2) per million Btus than coal and 30 percent less than fuel oil. Even though natural gas fuels more than 90 percent of the electric generating capacity that has been added over the past 15 years, coal still accounts for more than 50 percent of our overall electric generation, while natural gas provides only 17 percent. A properly designed regulatory regime will result in lower CO_2 production as natural gas replaces higher emission fuels. Related policies should:

- Accelerate the development of new technologies to ensure North America's vast energy resources remain viable in a carbon-constrained context, and to help reduce our dependence on foreign energy sources. Examples of developing technologies include gasification of coal and bitumen, CO_2 sequestration and more efficient generators.

- Promote the development of additional low-greenhouse gas emitting electrical generation in order to enhance fuel diversity and reduce our reliance on natural gas and other carbon fuels. Examples include solar, wind, geothermal, nuclear, wave, and other renewable resources.

- Be structured to ensure that they do not divert energy consumers from more efficient fuels sources such as natural gas to less efficient and more polluting energy forms.

Climate change policies must provide for additional natural gas supplies – Displacing high-carbon fuels with natural gas will contribute to a reduction in GHG emissions across the region and is likely to drive additional demand for natural gas in the Pacific Northwest. The regional demand for natural gas is projected to increase by almost 7.2 percent over the next five years and could grow by more than 30 percent over the next two decades. Gas required to serve electric generation in the Pacific Northwest is projected to grow by more than 12 percent over the next five years. Meeting the region's energy needs as well as its environmental and economic goals will require greater access to domestic and international gas supplies. Related policies must:

- Support removing the barriers to access new supplies (e.g. exploration moratoria, land use restrictions, permitting delays, redundant oversight).

- Support the development of infrastructure that enhances our region's access to a variety of abundant supply resources (e.g. transmission pipelines, storage facilities).

- Acknowledge that direct access to liquefied natural gas (LNG) imported from overseas will directly benefit gas users served by NWGA member companies through enhanced supply availability and reliability.

- Encourage research and development of unconventional resources such as coal-bed methane, natural gas from shales, methane hydrates and bio-gas from landfill and dairy operations.

"Unless policymakers adopt policies that encourage ample, environmentally responsible production of the natural gas we need to meet climate change goals and keep us globally competitive, future generations of American businesses and families will pay a hefty price."

David Parker, CEO
American Gas Association

NATURAL GAS AND CLIMATE CHANGE IN THE PACIFIC NORTHWEST

SUPPLY RESPONSE REQUIRED

According to the EIA, there are currently more than 6,000 trillion cubic feet (Tcf) of proven (can be produced with today's technology at today's prices) natural gas reserves around the world – more than sixty years of production at current usage rates. And more will become available as technology improves.

In order to compensate for increased natural gas demand that is likely to occur across North America as a result of proactive climate change policies, we must expand access to available natural gas supplies. Current policies and restrictions compromise our ability to take full advantage of the proven environmental benefits of natural gas in addressing climate change.

In testimony before the U.S. House Committee on Energy and Commerce in March, 2007, the American Gas Association representatives noted that supply constraints have driven natural gas prices to triple and quadruple their 2000 levels. "Any climate change program must include measures to increase the availability of natural gas to support its important role in reducing domestic greenhouse gases," they testified.

The Pacific Northwest is blessed by its proximity to prolific natural gas production areas but it faces increasing competition from other regions of North America for the supplies upon which it depends. That fact coupled with its leadership on enacting climate change policies – policies that promote the use of natural gas – combine to make encouraging access to new sources of supply a regional priority.

For instance, building a liquefied natural gas (LNG) receiving terminal in the Pacific Northwest (U.S. and Canada) will promote supply abundance and diversity and may help to preserve the region's low-cost energy advantage. Building new energy infrastructure like an LNG import facility can be compared to the investments our region made in hydropower more than seventy years ago – an endowment that continues to pay dividends today. In addition, restrictions on exploring for new gas reserves across North America – including those located offshore – should be loosened, and the region should seek direct access to frontier gas supplies (e.g. Alaska, Mackenzie) when they become available.

REDUCING OUR CARBON FOOTPRINT BEGINS AT HOME

We can start reducing greenhouse gas emissions today with easy solutions found right in our basements. The direct use of highly efficient natural gas in water heaters, furnaces and other appliances can help cut carbon dioxide emissions by thousands of tons each year.

Electric utilities continue to turn to clean-burning natural gas for electricity generation as an environmentally-friendly alternative to coal and fuel oil. But the direct use of natural gas in appliances brings even greater benefits to the consumer and our planet.

Recently, NW Natural of Oregon examined the full carbon footprint associated with an all-electric house. We replaced the appliances with a natural gas furnace, water heater, cook top and dryer, using carefully vetted assumptions regarding technology and efficiency. We found that using these appliances reduced greenhouse gas emissions by more than 20 percent compared to their electric counterparts. In areas served by more coal-dependent electric utilities, the carbon reduction can be greater than 50 percent.

These are changes that we can implement today. We don't have to wait for future inventions or new environmental programs to get started. All it takes is a gas line and a trip to the appliance store.

By Bill Edmonds
Director - Environmental Policy & Sustainability,
of Portland, Oregon based NW Natural.
Condensed from "Reducing our Carbon Footprint
Begins in the Basement"
[American Gas, August-September 2007]

MITIGATING CLIMATE CHANGE WITH EFFECTIVE PUBLIC POLICY

We may never know everything about the dynamics of climate change, but we do know enough to take action. Energy companies, scientists, and government leaders are expanding policies to more fully address the issue.

At the federal level, the U.S. and Canada continue developing policies that encourage emission reduction. In the U.S. for example, some $35 billion has been invested (via tax incentives) to promote cleaner energy sources and emission-reducing technologies. A number of proposals have been introduced in the past year, all aimed at enacting even more comprehensive remedies.

In Canada, the federal government released its Regulatory Framework for Air Emissions. The Framework expects industrial emitters to reduce emissions intensity by 18 percent between 2008 and 2010 and then further reduce intensities at an increasing rate beginning in 2010. The Framework's overall goal is real reductions of 150 million tons of GHG emissions by 2020.

NATURAL GAS AND CLIMATE CHANGE IN THE PACIFIC NORTHWEST

Along with California, Pacific Northwest policymakers are at the cutting edge. Washington and Oregon recently enacted standards requiring that significant proportions of electricity be generated by renewable resources. Both states also adopted standards that limit GHG emissions from any new electric generation resources. Idaho enacted a temporary moratorium on mercury emissions, precluding the construction of any new coal-fired generation there.

British Columbia has announced its intent to reduce GHG emissions by 33 percent from current levels by 2020 (among other actions). The Province of Alberta has put in place GHG emissions intensity targets effective July 1, 2007, and is one of the first jurisdictions in the world to mandate such targets.

"Puget Sound Energy's future is both windier and gassier."

Steve Reynolds
CEO of Bellevue based Puget Sound Energy
as delivered to the NWGA Spring Energy Conference May 2007.

In addition, several states and provinces across the region are participating in the Western Climate Initiative, a regional effort to establish common GHG reduction targets and strategies and a regional carbon trading market.

VITAL CONSIDERATIONS

In order for public policy to be truly effective long-term, policymakers should consider the following:

- Controls on GHG emissions need to be attained primarily by promoting conservation and energy efficiency.

- Competing fuels should be treated equally and in a manner consistent with their contributions and economic impact. All economic sectors must play a role in emissions reduction. Policies and regulations that divert consumers to less efficient, more-polluting energy sources will only serve to worsen the impact on the environment.

- Expanding the use of natural gas, particularly for direct uses such as home heating and appliances, should be encouraged. Ways to promote this include tax credits, direct subsidies, and/or allowance mechanisms that recognize the significant CO_2 reduction potential of natural gas. New policies must also allow increased access to natural gas supplies and include regulatory changes that will help utilities to encourage greater energy efficiency without incurring debilitating financial losses. (*See NWGA Climate Change Principles for expanded discussion of these points.*)

CONCLUSION

Natural gas is a resource that is immediately available to help significantly reduce GHG emissions. The NWGA intends to be fully engaged in discussions with regional stakeholders concerning the role of the natural gas industry in addressing challenges associated with managing GHG emissions and climate change. Furthermore, the industry will participate constructively in regional efforts to craft environmentally sensitive and economically sensible energy policies.

Attachment 31.4

2008 Residential Inclining Block Rate Application

BC hydro

APPENDIX C

Utility Survey Results

1.0 Residential Rate Structure Review

This appendix summarizes the commonly used rate structures of a default residential tariff. The summary is based on a review of the tariffs offered by a sample of 88 utilities in North America, Europe and Asia. This sample contains large utilities, has good Canadian representation, and spans winter and summer-peaking regions. The review leads BC Hydro to conclude that a year-round two-step tariff is common among Canadian and non-Canadian utilities that use an inclining block structure, thus supporting the adoption of BC Hydro's preferred RIB rate design as a first step in re-designing residential tariffs in British Columbia.

Table C-1 reports the number of utilities included in the tariff review that use a particular tariff structure, which may be an inclining block, declining block, flat, or time-of-use (TOU) structure.

The following observations emerge from this table:

- Three (18 per cent) of the 17 Canadian utilities have inclining block tariffs,[1] three (17 per cent) have declining block tariffs, 11 (65 per cent) have flat rate tariffs, and none use TOU pricing for a default tariff;

- Eighteen (30 per cent) of the 61 U.S. utilities have inclining block tariffs year round, five (8 per cent) have summer inclining block but winter declining block tariffs, two (3 per cent) have inclining block summer and flat winter tariffs, three (5 per cent) have flat summer and declining block winter tariffs, two (3 per cent) have declining block tariffs year round, and 31 (51 per cent) have flat rate tariffs. None uses TOU pricing for a default tariff;

- One (12.5 per cent) of the 8 European utilities has an inclining block tariff, one (12.5 per cent) has a declining block tariff, five (62.5 per cent) have flat rate tariffs, and one (12.5 per cent) has a TOU tariff;

- Both Asian utilities (100 per cent) (Hong Kong and Japan) have inclining block tariffs; and

- Overall, 47 (53 per cent) of the 88 utilities have flat rate tariffs, 24 (27 per cent) have inclining block tariffs, six (7 per cent) have declining block tariffs, five (6 per cent) have

[1] Toronto Hydro was chosen as a representative electricity distribution utility (EDU) in Ontario because all EDUs regulated by the Ontario Energy Board (OEB) offer seasonal inclining block tariffs that reflect the provincial rates set by the OEB for generation energy. As of January 2008, these generation energy rates are 5 cents/kWh for winter consumption up to 1,000 kWh/month during November - April, and 5.9 cents/kWh for consumption above the 1,000 kWh/month threshold. The summer threshold is 600 kWh/month.

summer inclining but winter declining block tariffs, two (2 per cent) have inclining block summer but flat winter tariffs, three (3 per cent) have flat summer but declining block winter tariffs, and one (1 per cent) has TOU tariffs.

The above observations show that:

(a) simplicity is a common feature of a default tariff, as suggested by the flat rate tariffs' popularity; and

(b) after the flat rate structure, the inclining block is the second most commonly used rate structure.

Table C-1 Number of Utilities Offering a Particular Default Residential Tariff

Tariff Structure	Canada	US	Europe	Asia	Total
Inclining block year round	3	18	1	2	24
Summer inclining block but winter declining block	0	5	0	0	5
Inclining summer flat winter	0	2	0	0	2
Flat summer declining winter	0	3	0	0	3
Declining block year round	3	2	1	0	6
Flat rate year around	11	31	5	0	47
TOU	0	0	1	0	1
Total	**17**	**61**	**8**	**2**	**88**

Table C-2 presents the number of utilities offering year-round inclining block tariffs with a particular number of steps, which may range from two to six. Of the 24 utilities shown in Table C-1, 13 (54 per cent) utilities have tariffs with two steps, six (25 per cent) have inclining blocks with three steps, and five (21 per cent) have inclining blocks with four or more steps. However, all three Canadian utilities have two-step inclining block tariffs.[2]

[2] Hydro Quebec has a $/kW-month charge for very large customers (e.g., apartment buildings) with winter (December - March) demand of over 50 kW.

Table C-2 Number of Utilities Offering Year-Round Inclining Block Tariffs by Number of Steps

Number of steps	Canada	US	Europe	Asia	Total
2	3	10	0	0	13
3	0	5	0	1	6
4	0	0	0	1	1
5	0	3	0	0	3
6	0	0	1	0	1
Total	**3**	**18**	**1**	**2**	**24**

Table C-3 below delineates the 24 year-round inclining block tariffs in Table 1-1 in this appendix by season (e.g. summer versus winter), location (e.g. coast versus inland), end-use (e.g. non-electric versus electric heating), and dwelling type (e.g. single versus multi-family).[3] It shows that two (67 per cent) of the three Canadian utilities using an inclining block structure have simple tariffs, with rates and thresholds that do not vary by season, location, end-use, or dwelling type.[4] The simple two-step tariffs are also popular among the European and Asian utilities. In the U.S., five of the 18 utilities have the simple two-step tariffs.

Table C-3 Number of Utilities Offering Year-Round Inclining Block Tariffs by Usage Attribute

Rate and threshold that vary by usage attribute	Canada	US	Europe	Asia	Total
(1) None	2	5	1	2	10
(2) Season only	1	6	0	0	7
(3) Location only	0	0	0	0	0
(4) End-use only	0	1	0	0	1
(5) Dwelling type only	0	1	0	0	1
Combination of two or more of (2) to (5) above	0	5	0	0	5
Total	**3**	**18**	**1**	**2**	**24**

The following tables provide further information used to create the foregoing tables

[3] The summer-only inclining block tariffs, by default, vary by season.

[4] The lone exception is Toronto Hydro whose seasonal component is regulated by the OEB.

Table C-4 Default Tariffs Offered by Utilities in Canada (Year-Round Inclining Block)

Utility	Province	Attributes				
		Number of steps	Season	Location	End-use	Dwelling type
1. Hydro Quebec[a]	Quebec	2				
2. Toronto Hydro[b]	Ontario	2	X			
3. Yukon Energy	Yukon	2				

Notes: a See footnote 2.
b See footnote 1.

Table C-5 Default Tariffs Offered by Utilities in Canada (Year-Round Declining Block)

Utility	Province	Attributes				
		# of steps	Season	Location	End-use	Dwelling type
1. Manitoba Hydro	Manitoba	2				
2. Maritime Electric	PEI	2				
3. New Brunswick Power	New Brunswick	2				

Table C-6 Default Tariffs Offered by Utilities in Canada (Year-Round Flat)

Utility	Province	Attributes				
		Number of steps	Season	Location	End-use	Dwelling type
1. ATCO Electric	Alberta	NA				
2. Direct Energy	Canada	NA				
3. EPCOR	Alberta	NA	X	X		
4. Fortis BC	BC	NA				
5. Hydro One[a]	Ontario	NA	X			
6. Newfoundland and Labrador Hydro	Newfoundland	NA				
7. Newfoundland Power	Newfoundland	NA				
8. Northland Utilities (ATCO)	Northwest Territories	NA				
9. Nova Scotia Power	Nova Scotia	NA				
10. Sask Power	Saskatchewan	NA		X		
11. Saskatoon Power and Light	Saskatchewan	NA				

Note (a) Hydro One's Standard Supply Service's (UR2) monthly energy charge is a monthly weighted average of hourly spot market prices.

Table C-7 Default Tariffs Offered by Utilities in U.S. (Year-Round Inclining Block)

Utility	State	Attributes				
		Number of steps	Season	Location	End-use	Dwelling type
1. AEP (Indiana Michigan Power Co.)	MI	2			X	
2. Arizona Public Service (APS)	AZ	3	X			
3. Avista Utilities	WA	3				
4. City of Seattle	WA	2	X	X		
5. Consumers Energy Company	MI	2	X		X	
6. Duke Energy Corp.	NC	2	X			
7. Florida Power and Light	FL	2				
8. Georgia Power	GA	3	X			
9. Jersey Central Power and Light	NJ	2	X			
10. PacificPower	OR	3				
11. PECO Energy	PA	2	X		X	
12. PG&E	CA	5	X	X	X	X
13. Progress Energy (Florida)	FL	2				
14. Public Service Electricity and Gas Co.	NJ	2	X			
15. Puget Sound Energy	WA	2				
16. SCE	CA	5				X
17. SDG&E	CA	5	X	X	X	X
18. SMUD	CA	3	X			

Table C-8 Default Tariffs Offered by Utilities in U.S. (Inclining Block Summer and Declining Block Winter)

Utility	State	Attributes				
		Number of steps	Season	Location	End-use	Dwelling type
1. Alabama Power Company	AL	2	X			
2. Consolidated Edison	NY	2	X			
3. Dominion Virginia	VA	2	X			
4. Duke Energy Corp.	OH	2	X			
5. Long Island Power Authority	NY	2	X		X (3-step)	

Table C-9 Default Tariffs Offered by Utilities in U.S. (Inclining Block Summer and Flat Winter)

Utility	State	Attributes				
		Number of steps	Season	Location	End-use	Dwelling type
1. Idaho Power	ID	2	X			
2. United Illuminating	CT	2	X			

Table C-10 Default Tariffs Offered by Utilities in U.S. (Flat Summer and Declining Winter)

Utility	State	Attributes				
		Number of steps	Season	Location	End-use	Dwelling type
1. Ameren Union Electric	MO	2	X			
2. Commonwealth Edison	IL	2	X			
3. Kansas City Power and Light	MO	3	X		X	

Table C-11 Default Tariffs Offered by Utilities in U.S. (Year-Round Declining Block)

Utility	State	Attributes				
		Number of steps	Season	Location	End-use	Dwelling type
1. Indianapolis Power and Light	IN	2			X	
2. MDU Resources Group Inc.	WY	2				

Table C-12 Default Tariffs Offered by Utilities in U.S. (Year-Round Flat)

Utility	State	Attributes				
		Number of steps	Season	Location	End-use	Dwelling type
1. Alaska Electric Power and Light	AK	NA				
2. Alaska Power	AK	NA		X		
3. Allegheny Power	PA	NA				
4. Anchorage Municipal Light and Power	AK	NA				
5. Baltimore Gas & Electricity	MD	NA				
6. Bangor Hydro	ME	NA				
7. Carolina Power and Light Co.	NC	NA				
8. Cheyenne Light Fuel and Power Co.	WY	NA				
9. Chugach Electric	AK	NA				
10. Connecticut Light and Power	CT	NA				
11. Detroit Edison	MI	NA				
12. Duquesne Light	PA	NA				
13. El Paso Electric	TX	NA				
14. Flathead Electric Coop	MT	NA				
15. Gulf Power	FL	NA				
16. Idaho Falls Power	ID	NA				
17. Inland Power & Light	WA	NA				
18. Jacksonville Electric Authority	FL	NA				
19. Los Angeles DWP	CA	NA				
20. Massachusetts Electric Co.	MA	NA				
21. Mission Valley Power	MT	NA				
22. Montana-Dakota Utilities	MT	NA				
23. Northern States Power	MN	NA				
24. Northwestern Energy	MT	NA				
25. NSTAR	MA	NA				
26. Rocky Mountain Power	ID	NA				
27. Rocky Mountain Power	WY	NA				
28. Salmon River Electric Coop	ID	NA				
29. Wisconsin Electric Power Co.	WI	NA				
30. Wisconsin Public Service	WI	NA				
31. Xcel Energy	CO	NA				

Table C-13 Default Tariffs Offered by Utilities in Europe and Asia (Year-Round Inclining Block)

Utility	Country	Attributes				
		Number of steps	Season	Location	End-use	Dwelling type
1. Enel (SPA)	Italy	6				
2. China Power and Light	Hong Kong, China	4				
3. Tokyo Electric Power Co.	Japan	3				

Table C-14 Default Tariffs Offered by Utilities in Europe and Asia (Year-Round Declining Block)

Utility	Country	Attributes				
		Number of steps	Season	Location	End-use	Dwelling type
1. London Energy	UK	2				

Table C-15 Default Tariffs Offered by Utilities in Europe and Asia (Year-Round Flat)

Utility	Country	Attributes				
		Number of steps	Season	Location	End-use	Dwelling type
1. Electricidade de Portugal	Portugal	NA				
2. Electricite de France	France	NA				
3. EnviaM	Germany	NA				
4. Hafslund	Norway	NA				
5. Mosenersgobyte (Moscow Energy)	Russia	NA		X		X

Table C-16 Default Tariffs Offered by Utilities in Europe and Asia (Seasonal)

Utility	Country	Attributes				
		Number of steps	Season	Location	End-use	Dwelling type
1. Bewag	Germany	NA	X			