2008 Resource Planning Process & Objectives

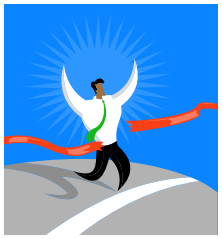
April 29th, 2008 Resource Planning Workshop

Ken Ross
Resource Planning Manager

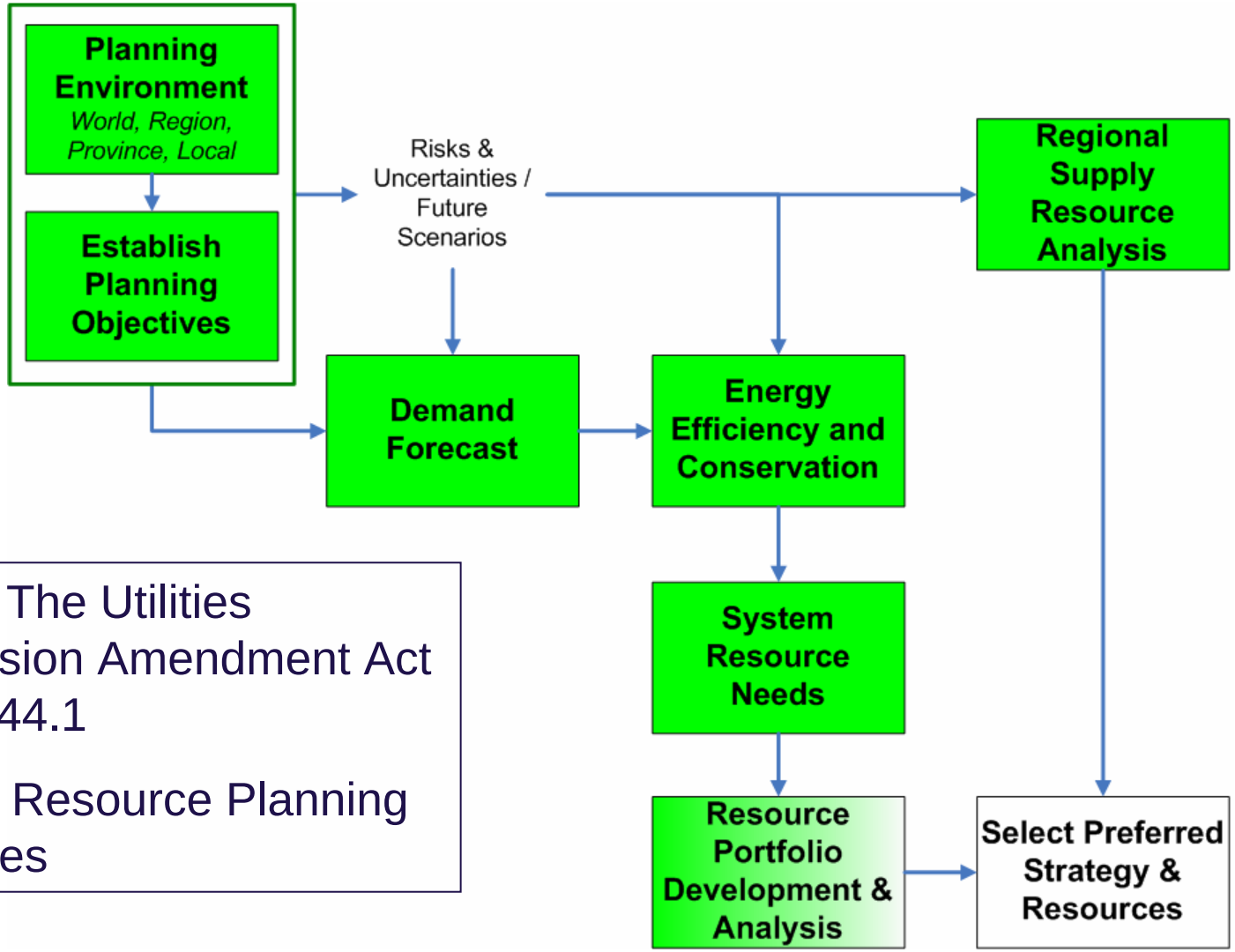
Resource Plan Workshop Agenda: 11:00 am – 1:00 pm

Introduction	**Ken Ross**, Resource Planning Manager
Fuel Competitiveness	**Dave Perttula**, Market Development & Analysis Manager
Demand Trends & Results	**Lee Robson** Customer & Energy Forecasting Manager
System & Regional Resources	**Edmond Leung**, Project Assessment Manager
	& **Cynthia Des Brisay,** Vice President, Gas Supply and Transmission

Next Steps / Discussion



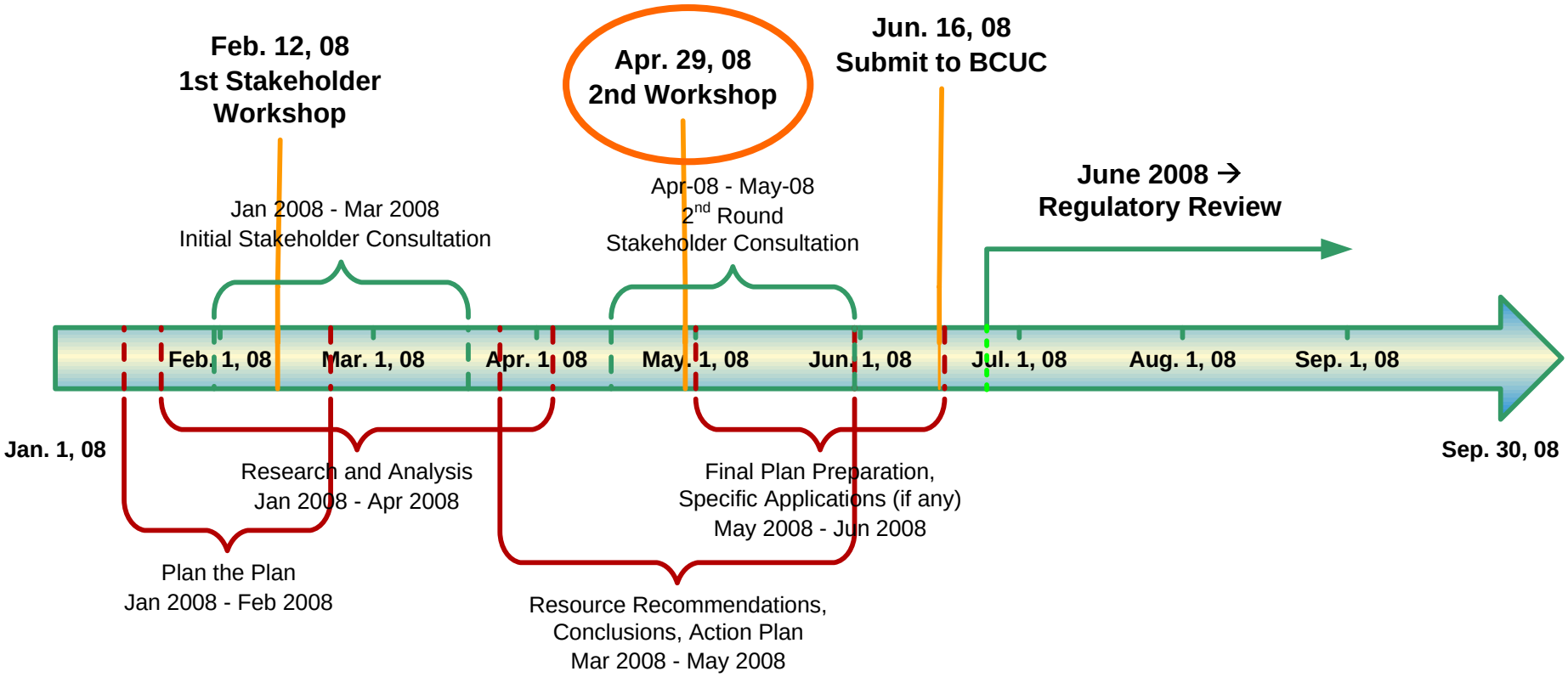
Resource Planning Process



Bill 15 – The Utilities Commission Amendment Act Section 44.1

BCUC – Resource Planning Guidelines

2008 Resource Plan / Timeline



February Workshop Topics

- Resource Planning process – timing, steps, objectives
- BC and Regional energy issues and challenges
- Regional gas supply planning challenges
- Trends and issues affecting demand
- Customer comfort and value initiatives
- Terasen's Energy Efficiency Application
- Innovative opportunities for electricity generation, biogas, transportation solutions and related environmental benefits

Feedback from February Workshop

- Regional energy supply implications and carbon emissions should be considered.
- Costs of electricity self-sufficiency are a concern.
- Need to address the goals of the Energy Plan.
- Increasing energy efficiency and conservation is imperative.
- Interest in industrial energy efficiency opportunities.
- Interest in opportunities at Terasen for electricity production, biogas and transportation fuel.

Feedback from Today's Session

- Taking Notes and Recording Questions

Contact:

Ken Ross
Resource Planning Manager
Terasen Gas
604-576-7342 / ken.ross@terasengas.com

Please submit any written comments you may wish to provide by: **May 9th**, 2008

16705 Fraser Highway
Surrey, BC V4N 0E8

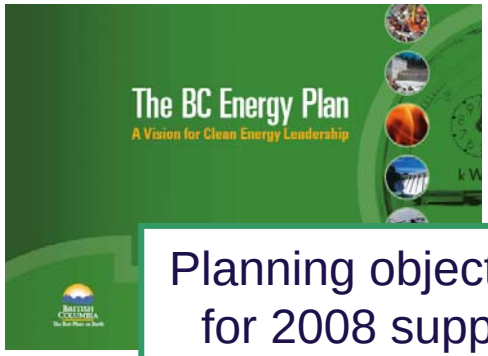
(feedback forms and mail in information provided)

Resource Planning Objectives

Achieving the proper balance between multiple objectives is a key challenge of Integrated Resource Planning

Terasen Gas planning objectives:

- **Safe, reliable and secure supply**
- **Cost effective service to customers**
- **Energy efficiency and conservation**
- **Manage social and environmental impacts**



Planning objectives for 2008 support the policies of the BC Energy Plan

Natural Gas Competitiveness

April 29, 2008 Resource Plan Workshop

David Perttula

Market Development & Analysis Manager

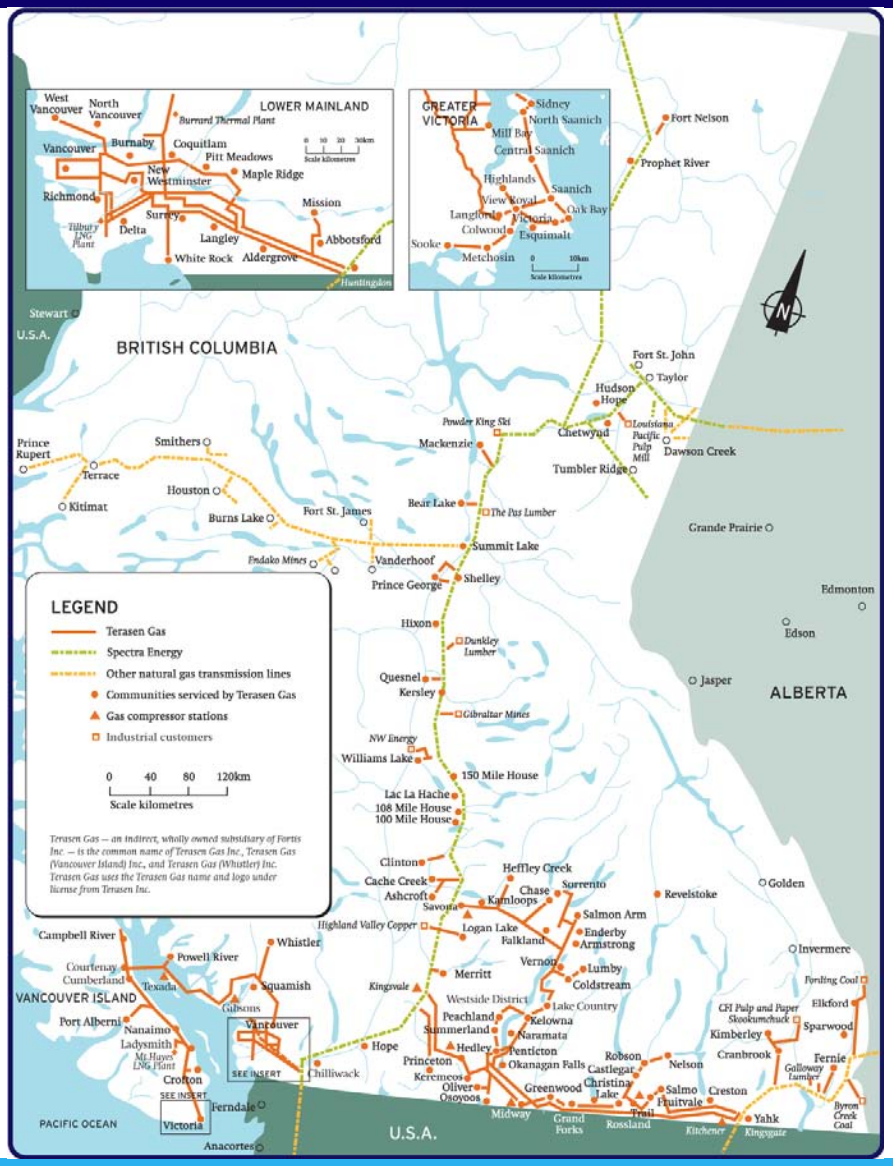
Gas Competitiveness - Issues

- Commodity pricing
- Electricity Prices in BC
- Carbon tax
- Energy Efficiency and Conservation

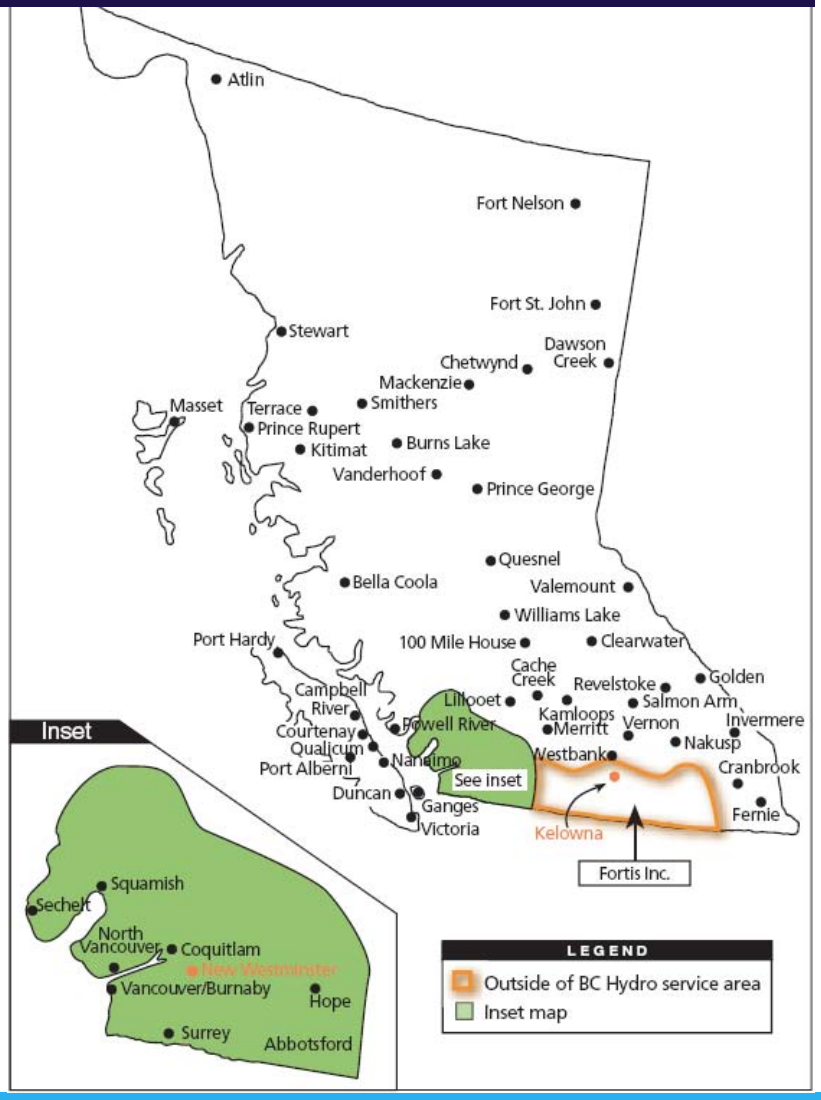
Gas Competitiveness vs. Other Energy Sources

- Electricity
  - TGI, TGVI and TGW
- Heating Oil
  - Mainly TGVI
- Propane
  - TGW and TGI
- Alternative Energy
  - TGI, TGVI and TGW

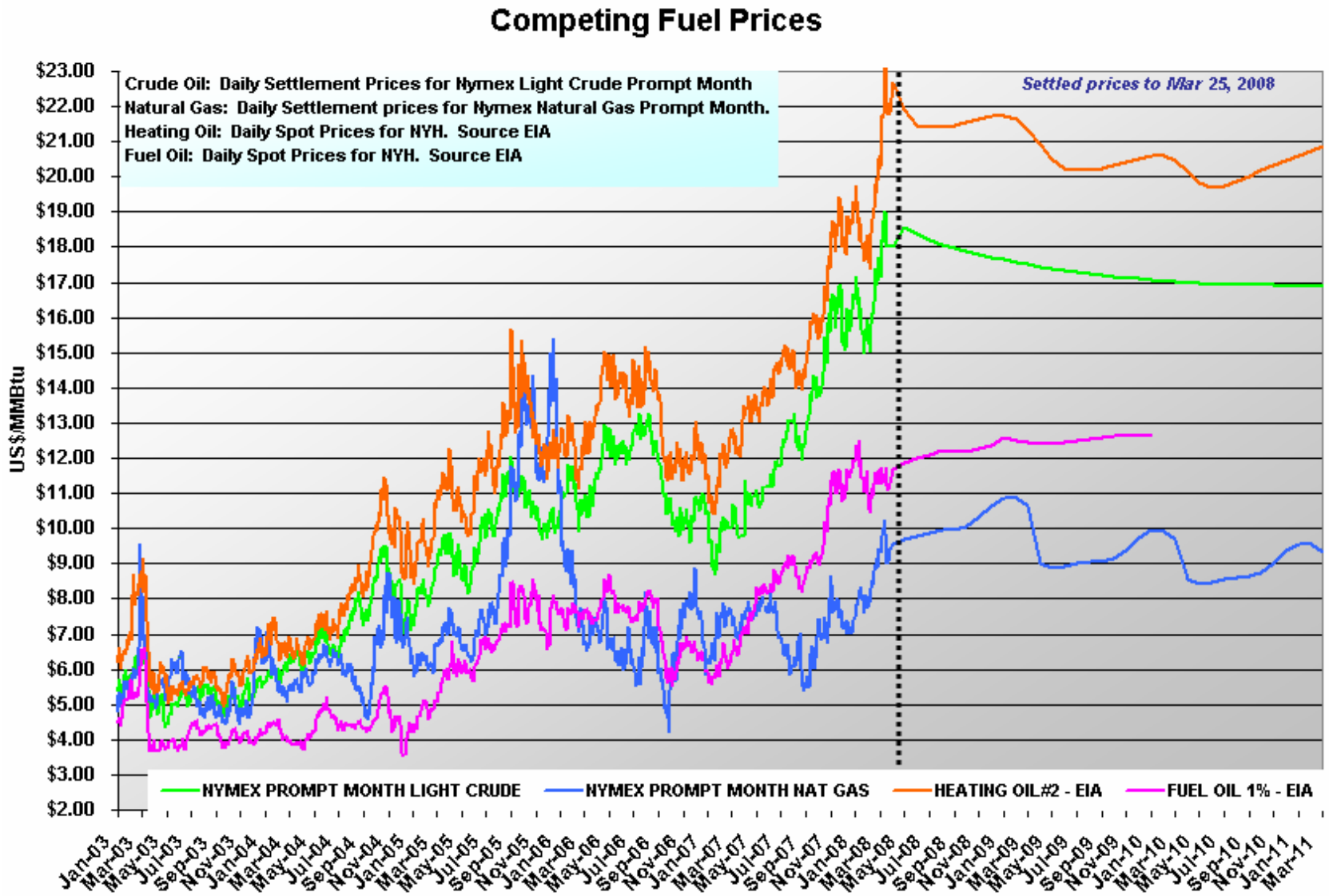
Gas & Electric Utility Service Territories



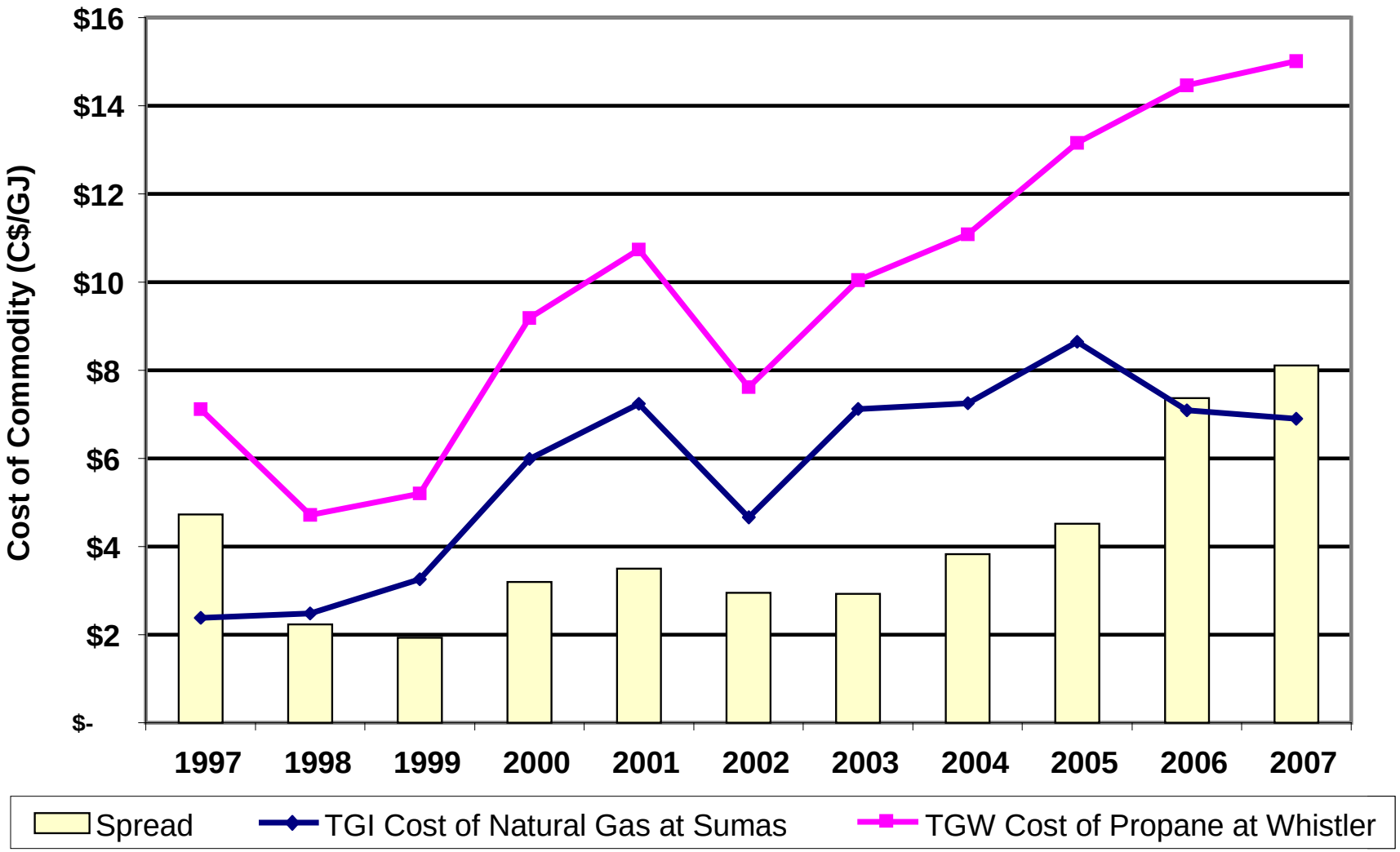
BC Hydro and Fortis BC Service Areas



Natural Gas / Crude Oil / Heating Oil Comparisons

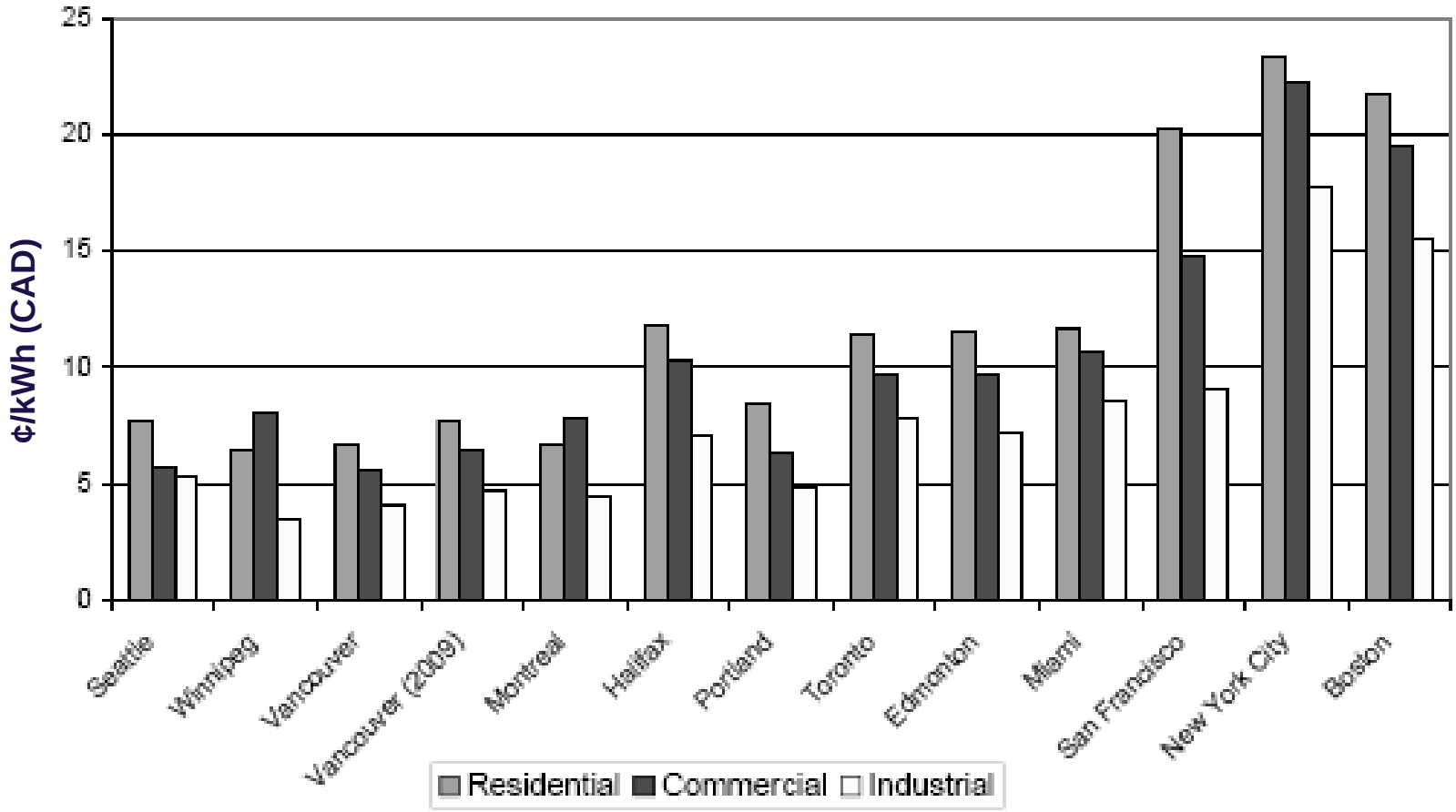


Whistler NG / Propane Commodity Cost Comparison



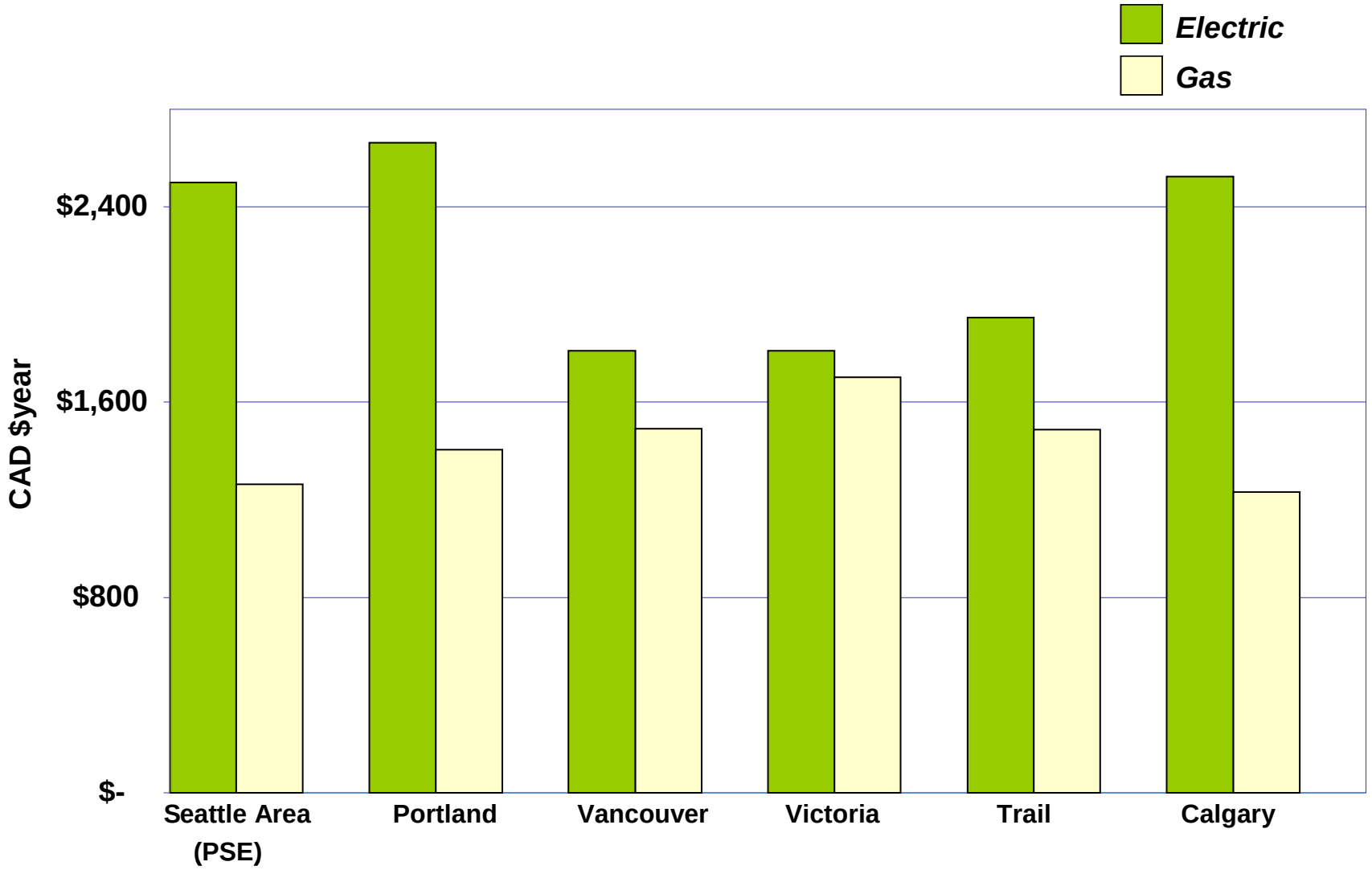
Electricity Rates - B.C. Competitiveness

Average Rate Comparison as of April 1, 2007 across North American Cities



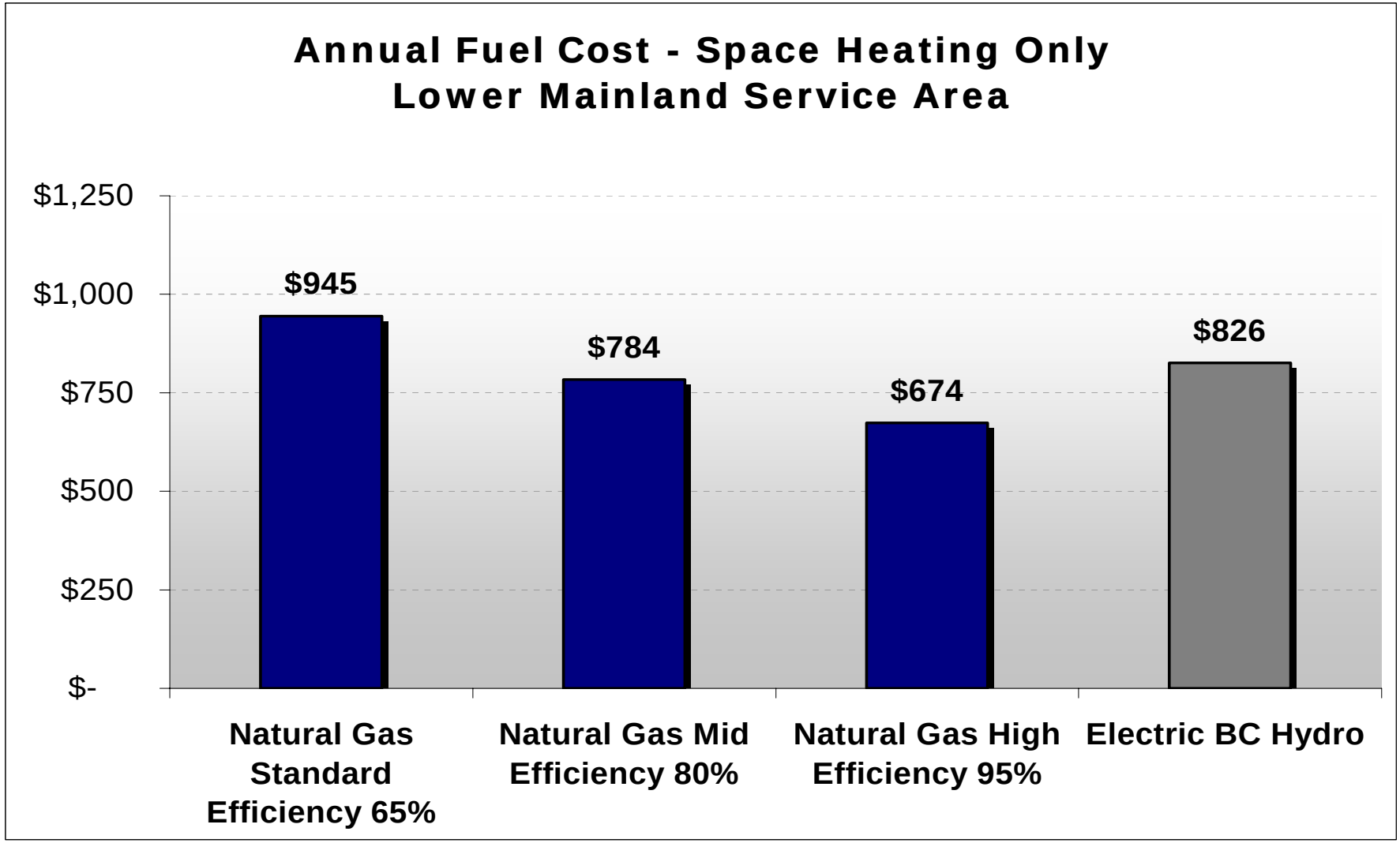
Source: BC Hydro F2009-F2010 Revenue Requirements Application, p. 1-14

Gas / Electricity Rate Competitiveness - PNW



Gas / Electricity Rate Competitiveness

for Space Heating (Current)

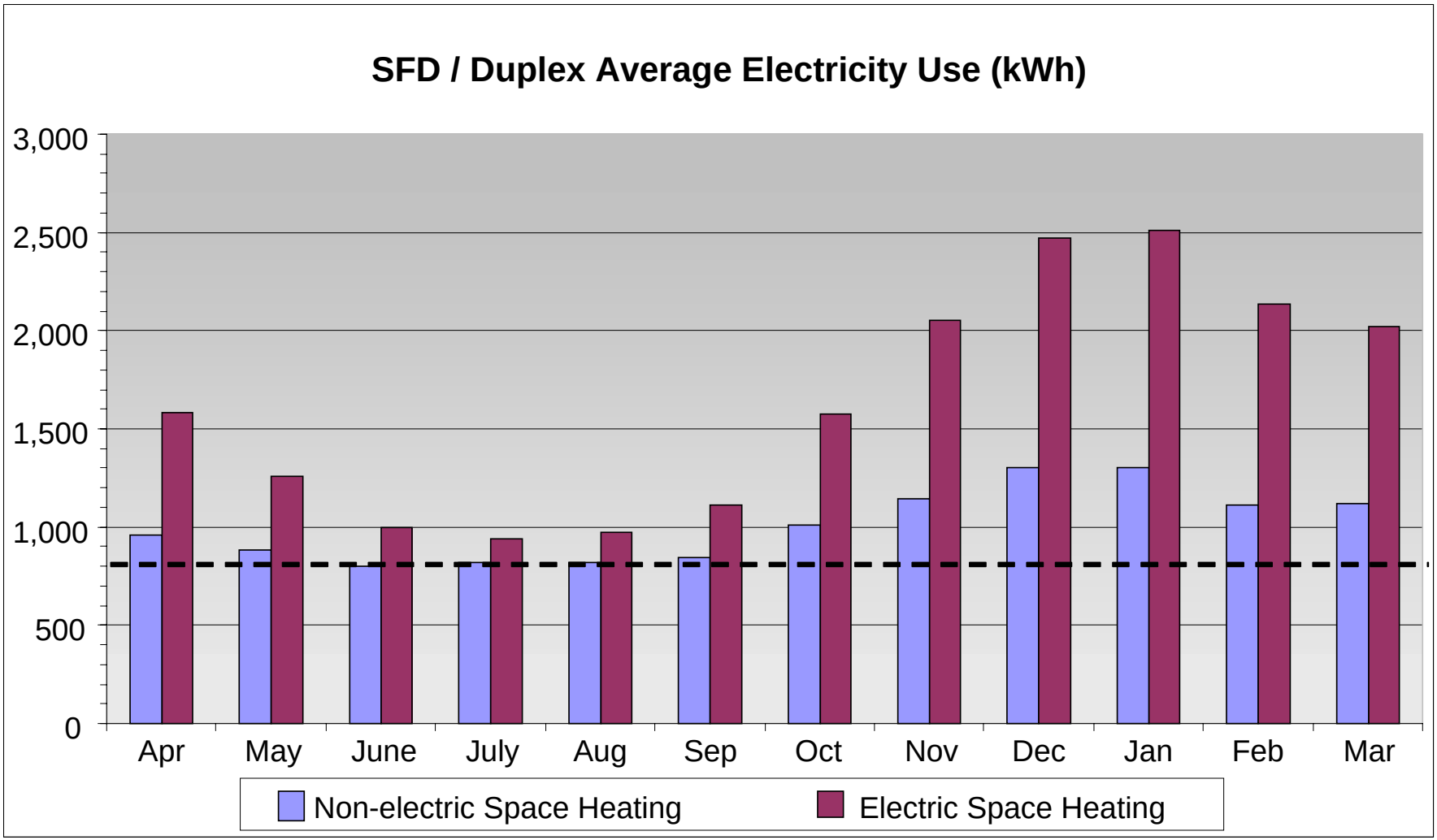


Electricity Rates

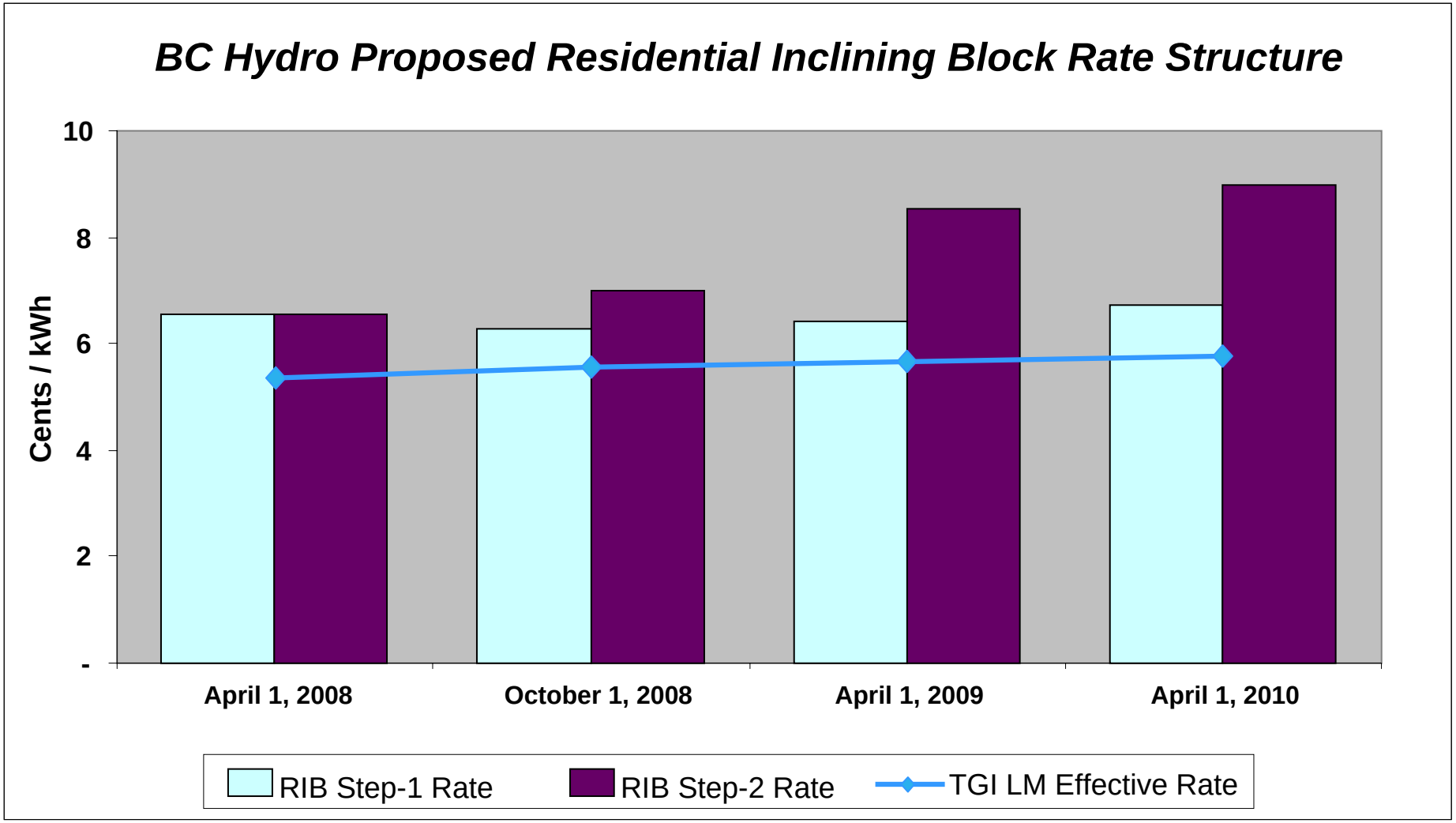
- Electricity Rate Pressures
  - Cost increases for upgrading and maintaining dams and electricity infrastructure.
  - Adding new higher cost power to the supply portfolio.
  - Rate design filings such as the Residential Inclining Block (RIB) Rate Application.

- Policy Changes
  - BC Energy Plan – self sufficiency goals
  - Bill 15 – Utilities Commission Amendment Act.
  - Carbon tax

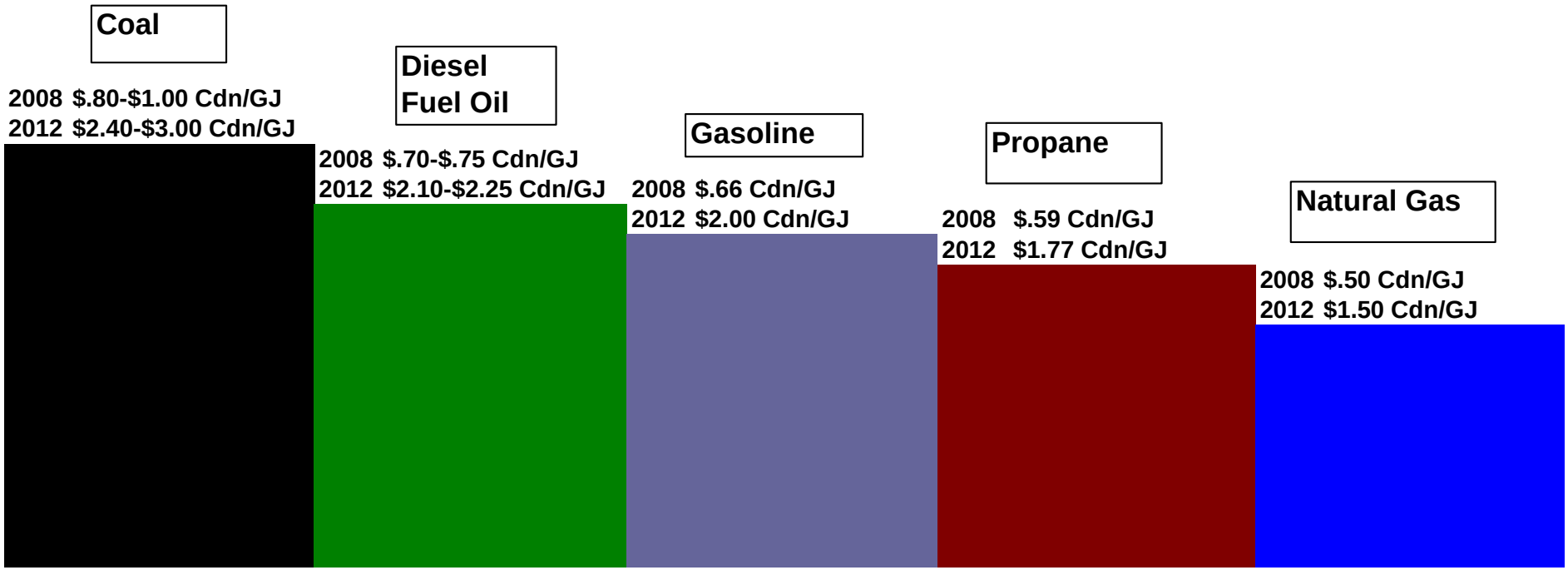
Monthly Electricity Consumption – SFD/Duplex



BCH Proposed Residential Inclining Block Rate



Cost of Carbon Tax for Different Fossil Fuels



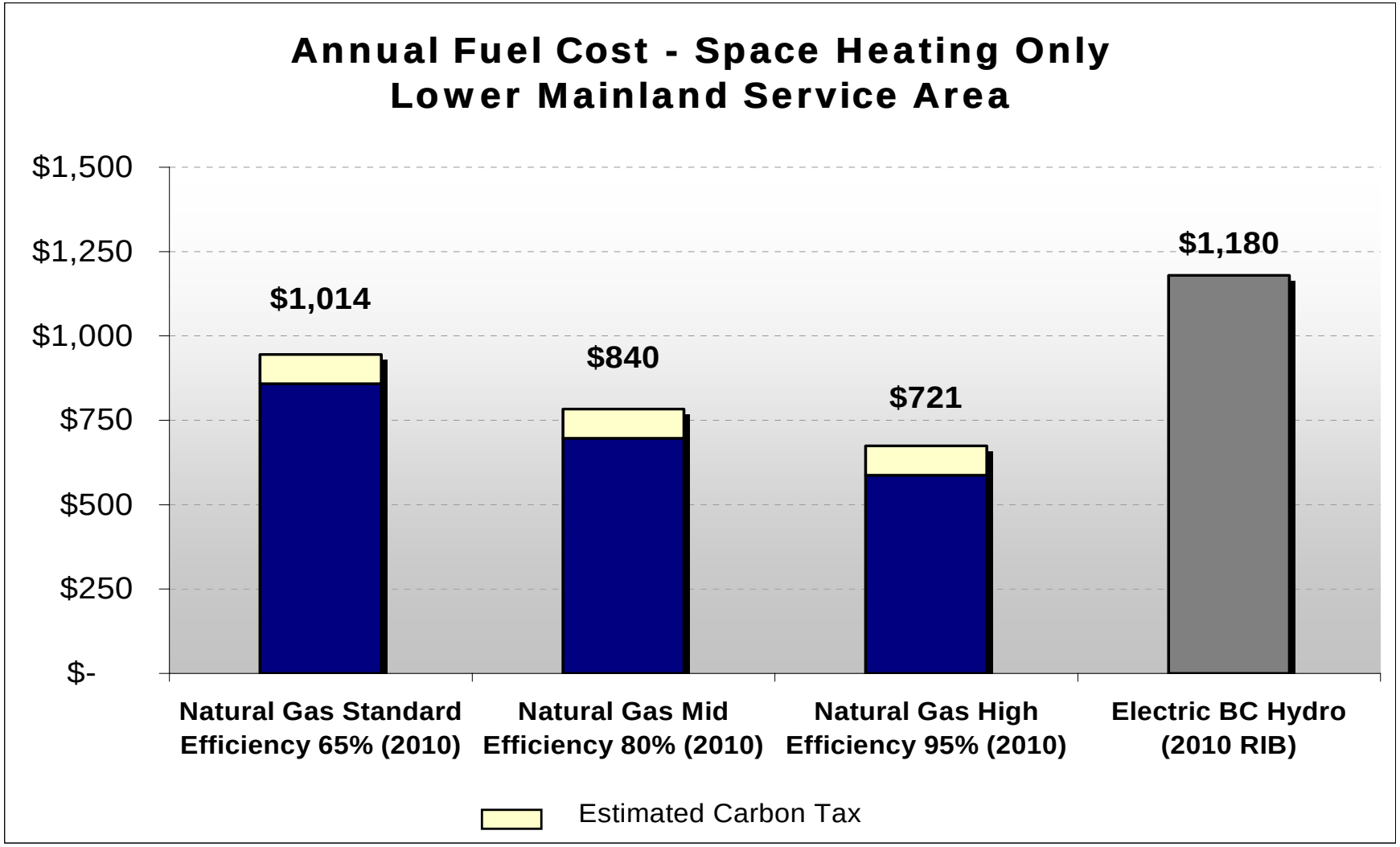
Assume cost of $10/tonne for GHG Emsssions for 2008
Assume cost of $30/tonne for GHG Emsssions for 2012

Electricity - Cost depends on generation mix

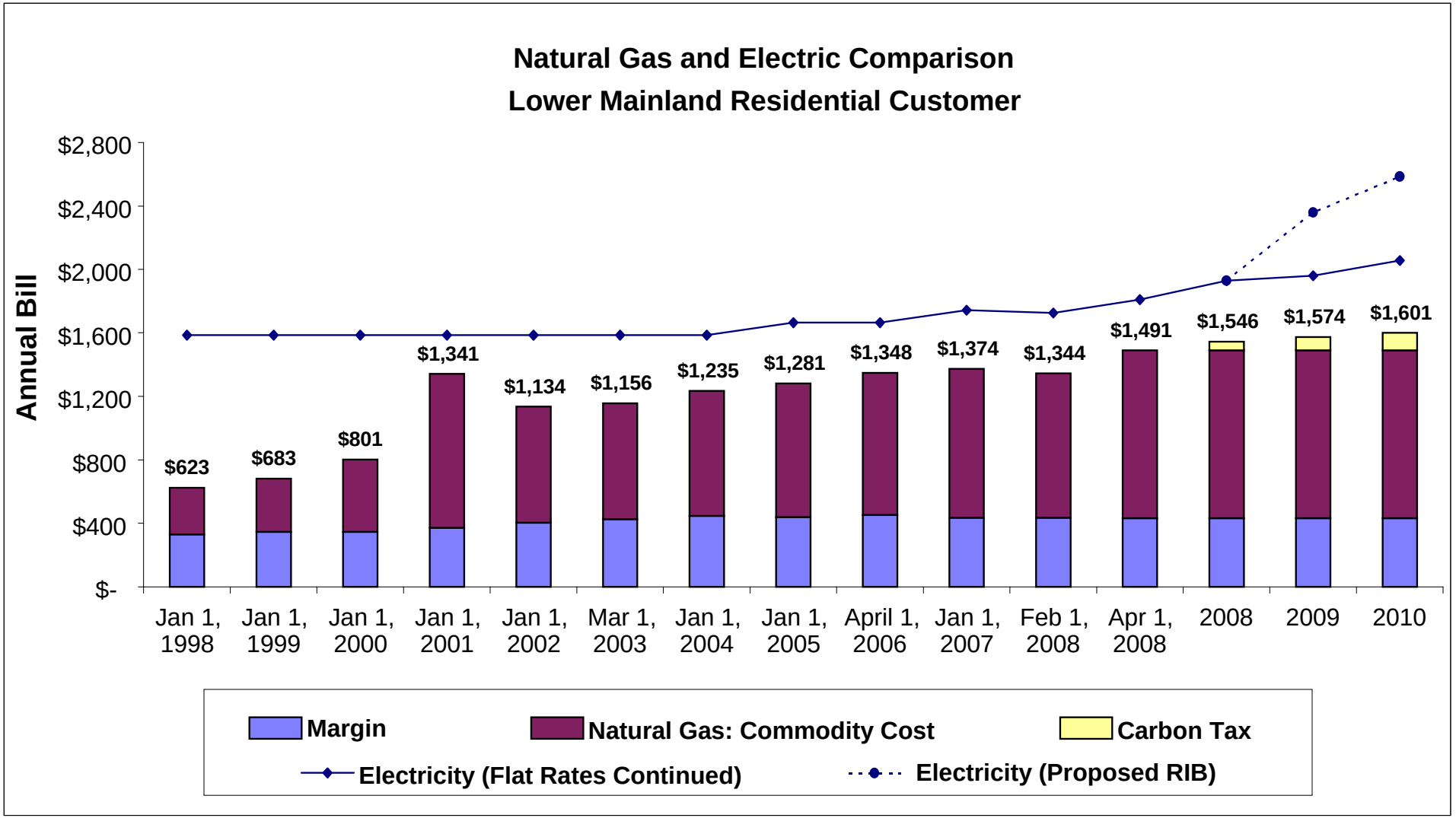
Domestic produced electricity - Yes

Imported produced electricity - No

Gas / Electricity Competitiveness
for Space Heating (Forecast 2010)



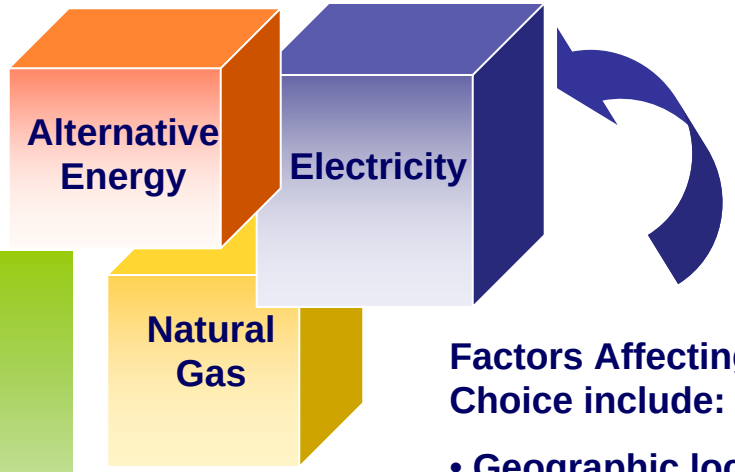
Gas / Electricity Rate Competitiveness



Energy Solutions

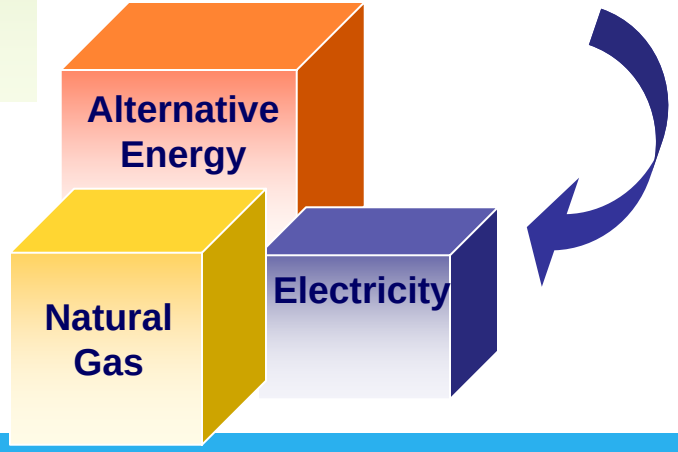
Energy Uses

- **Space and Water Heating**
- **Cooling**
- **Lighting, Computers, Appliances**
- **Cooking**



Factors Affecting Energy Choice include:

- **Geographic location**
- **Reliability/Infrastructure**
- **Costs and economics**
- **Environmental impact**



Summary

- All forms of energy face competitive issues going forward.
- Natural gas remains a favourable choice relative to other forms of energy in BC, even with carbon priced in.
- Natural gas is a complimentary energy source to alternative energy systems.

Demand Forecast and Scenario Analysis

April 29th, 2008 Resource Planning Workshop

Lee Robson

Customer & Energy Forecasting Manager

Demand Forecast

Recap of Demand Drivers

Review of Methodology

Demand Forecast

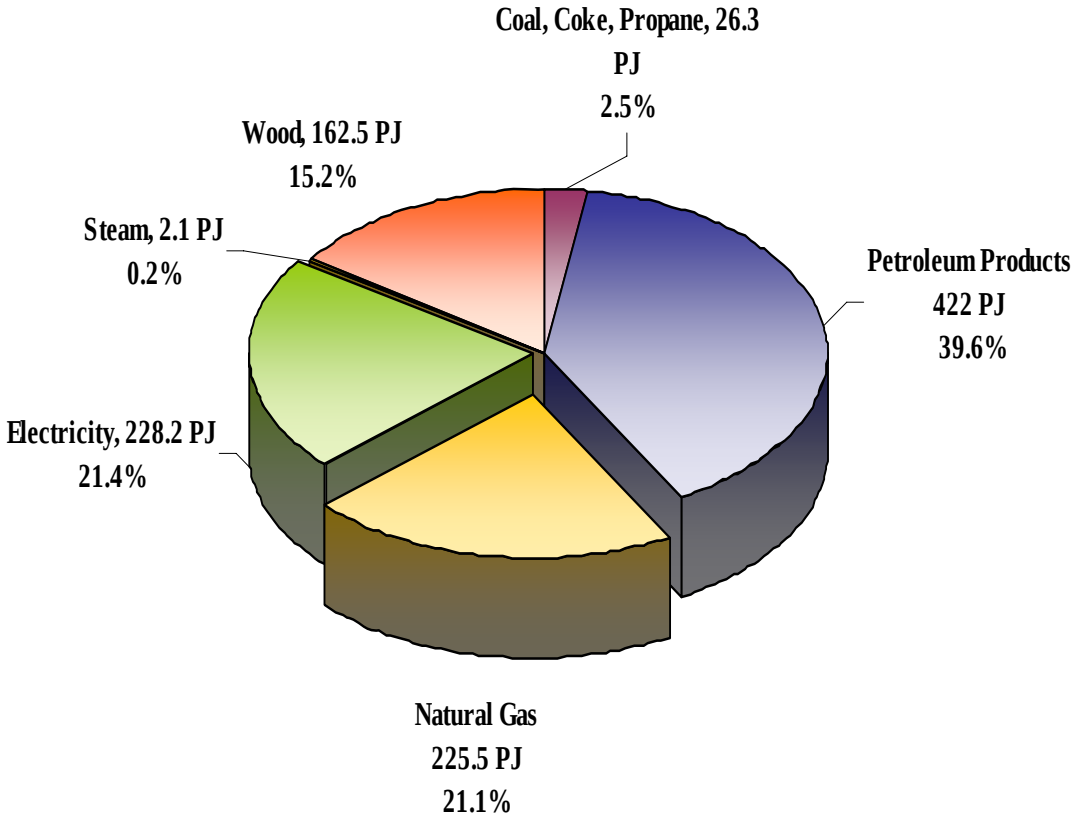
Forecast Scenario’s

Peak Day Demand

Drivers of Demand - Recap

- B.C. population expected to increase by 1 million over next 20 years
- Replacement of lower efficiency heating equipment
- Growth of multi-family dwellings
- Competitiveness of natural gas
- Government policies and public perceptions

BC End Use Energy Mix



Challenge is in assessing how much growth occurs, and how the "mix" changes

Annual Demand - Methodology

Residential and Commercial Demand

- Account additions based on household formations, CMHC forecasts and market knowledge
- Use Per Customer based on analysis of historical data, appliance retrofit activities, trends

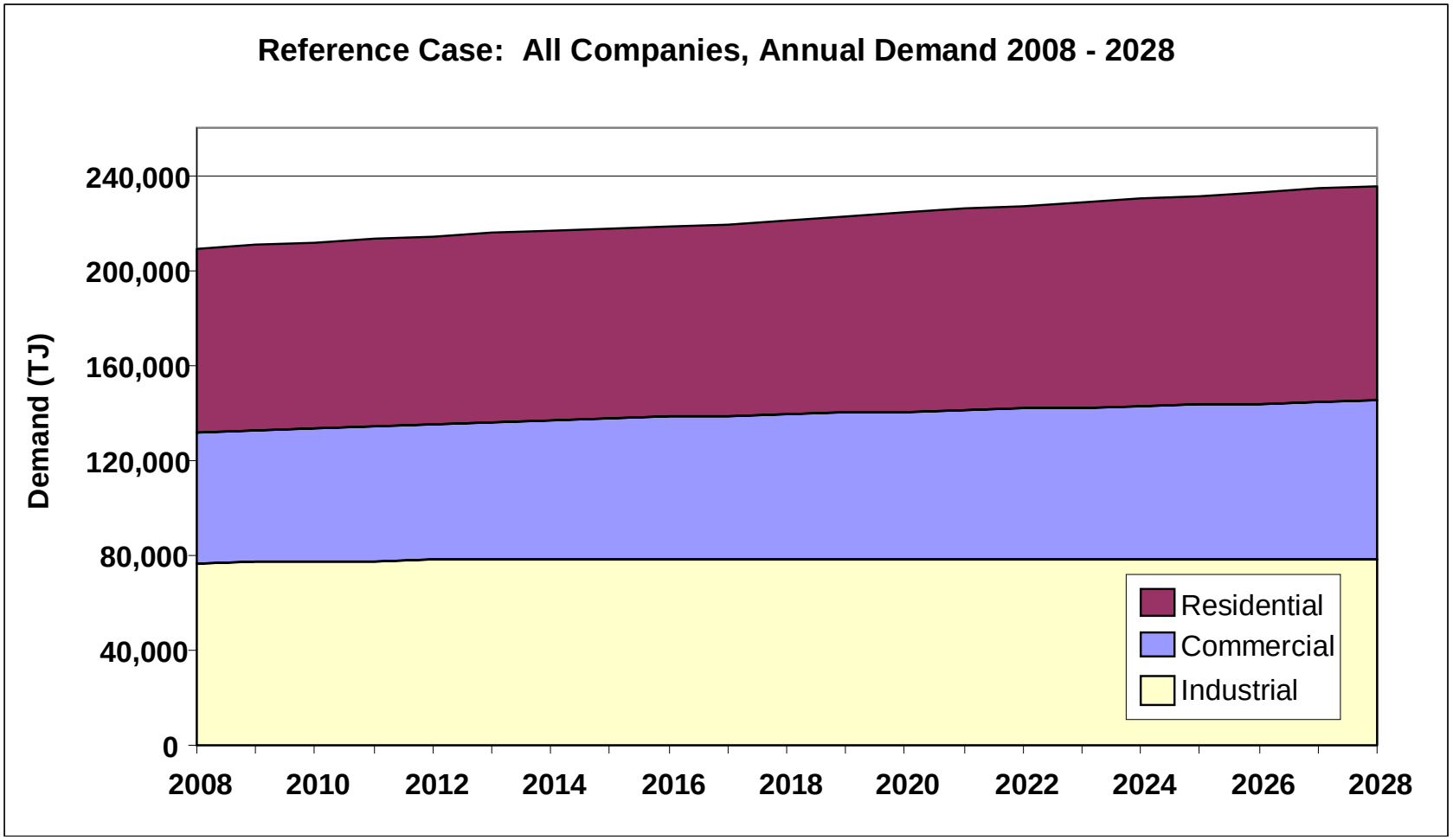
Industrial Demand

- Based on customer survey data for TGI and existing contracts for TGVI, and market knowledge

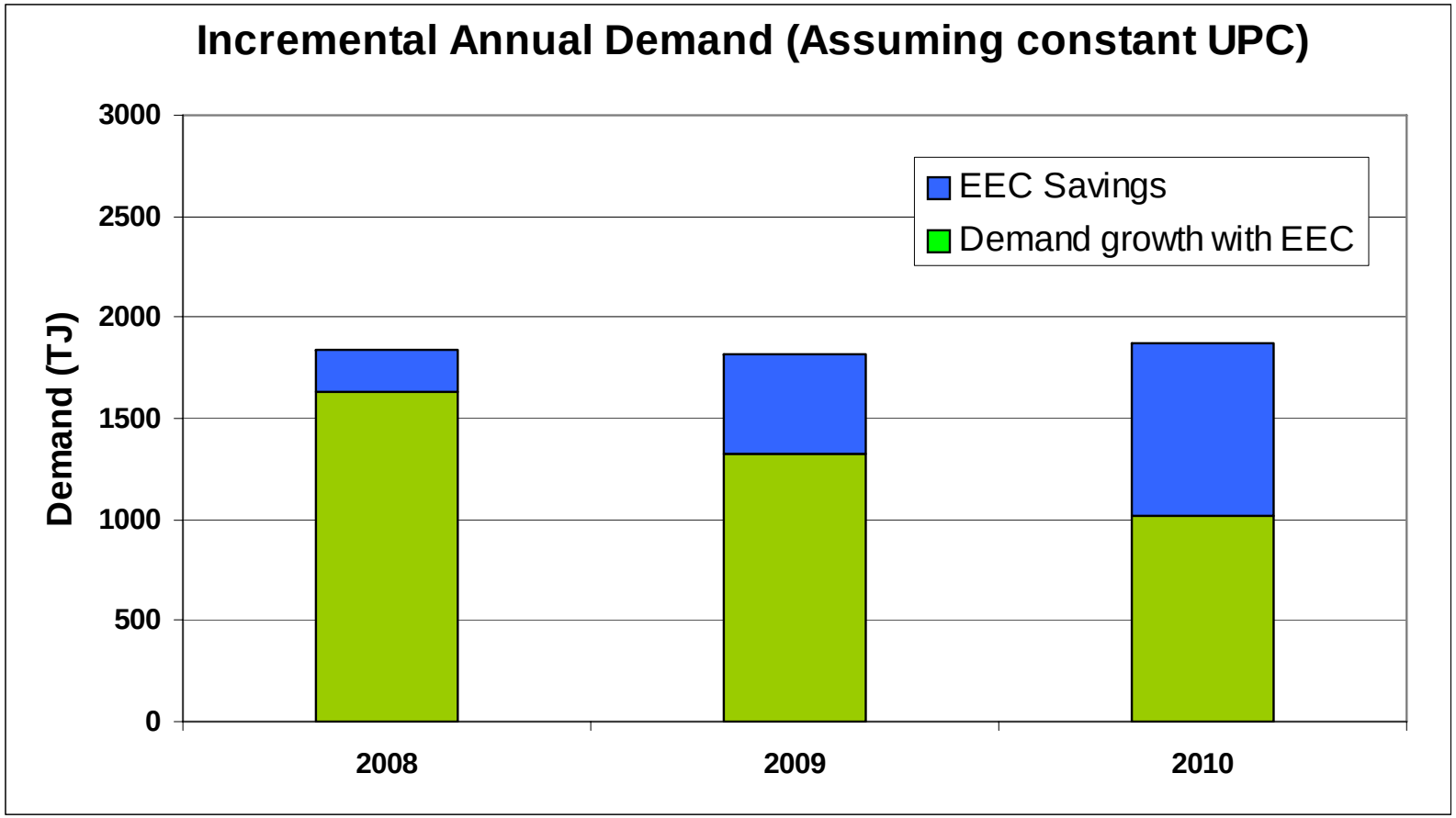
Reference Case Discussion

- Modest growth in customer additions across all companies (~250,000 customer additions) by 2028
- Residential UPC declining for TGI, but stable for TGVI and TGW
- Commercial Use Rates relatively stable across all companies
- Industrial demand as per survey results or existing contracts, then held constant

Reference Forecast – All Companies

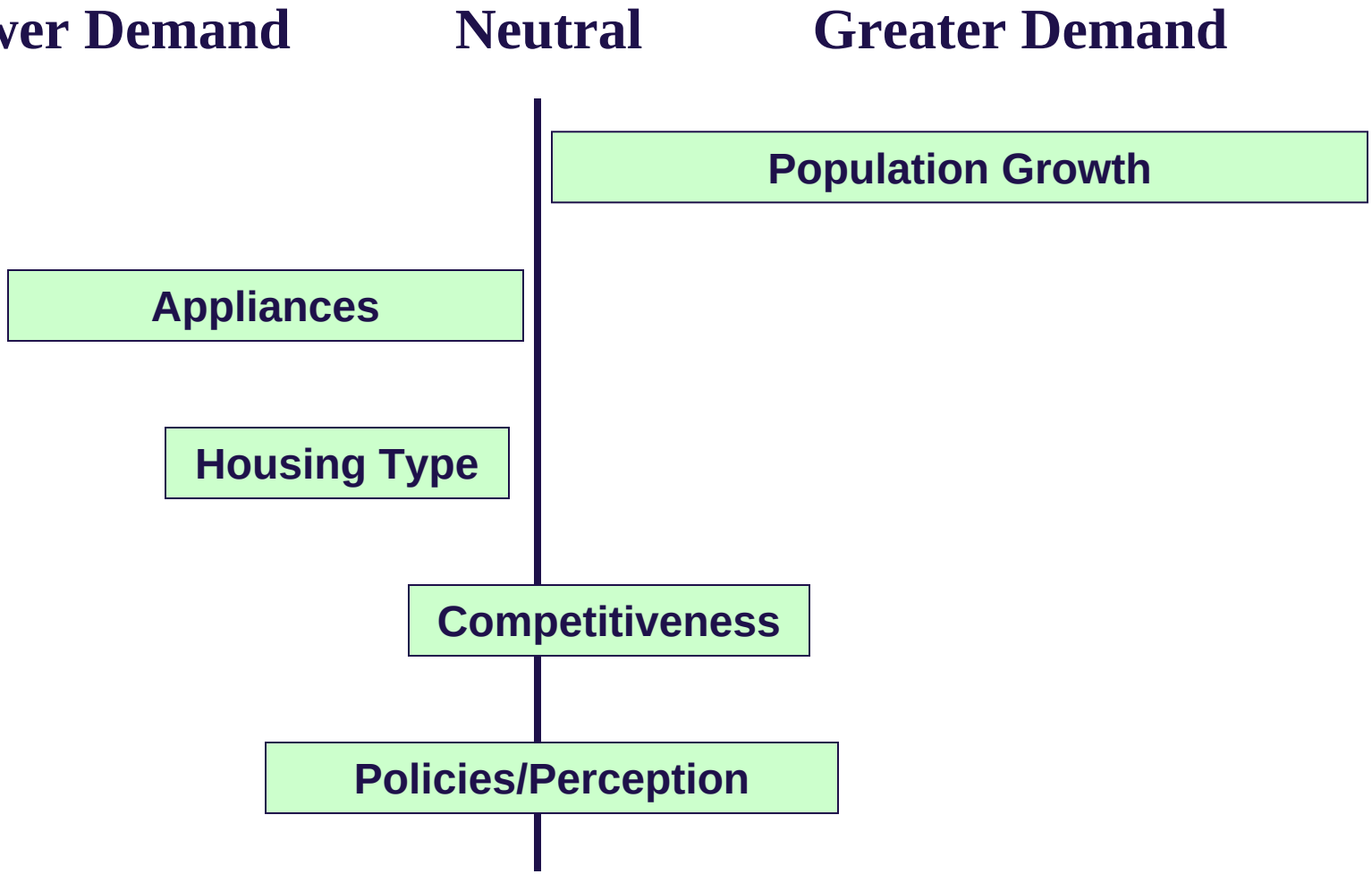


DSM Impact



- Filing application for 3-year program, decision Fall 2008

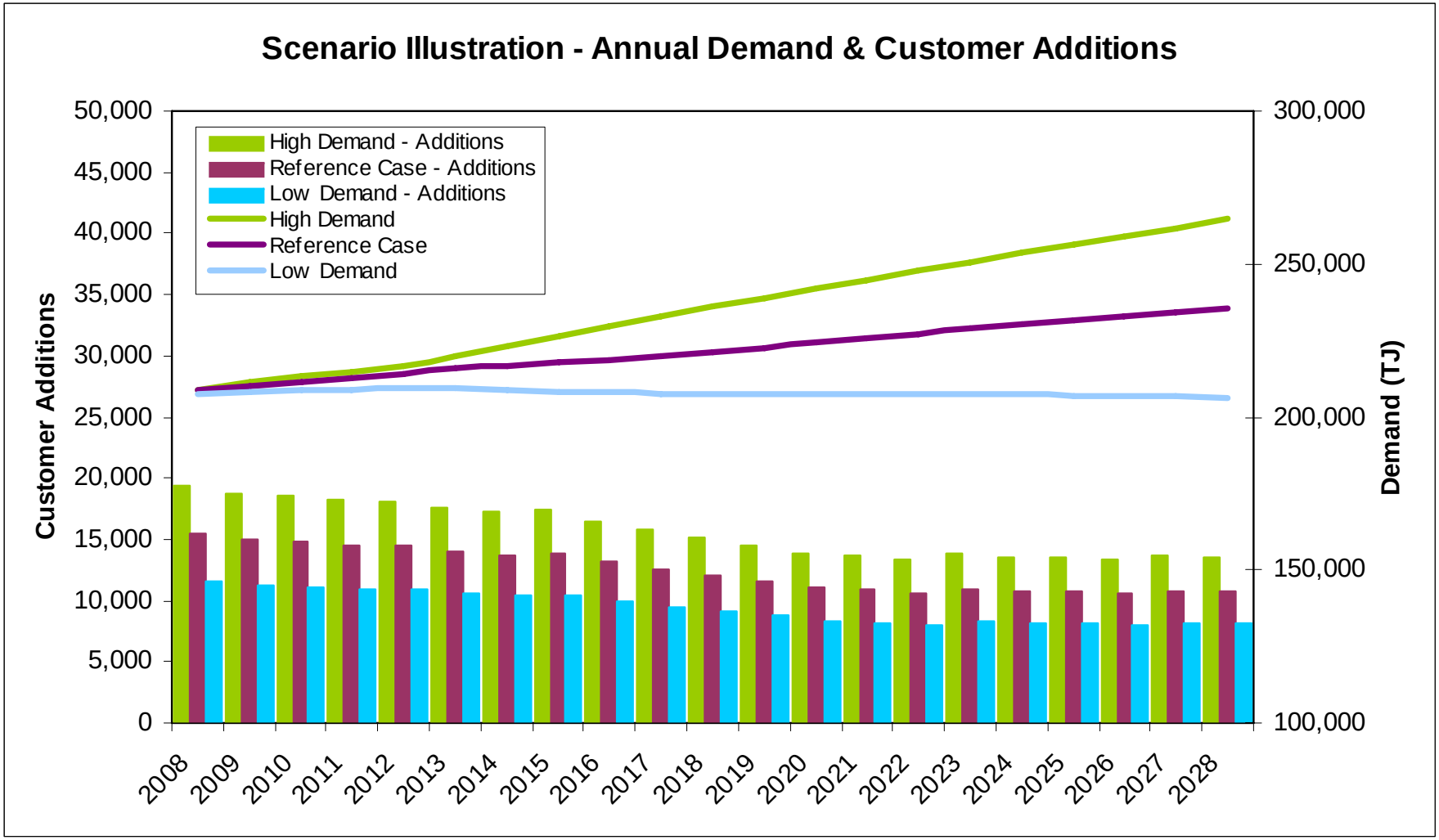
Effect of Demand Drivers



Scenario Description

Demand Driver	Low Demand	Reference Case	High Demand
Economic Growth	Slower growth, loss and/or contraction of sectors such as forestry or mining	Growth as expected by government & economists, similar mix as today	Over performs long-term forecasts, growth in industrial and commodities
Appliance Replacement	Accelerates due to technological advancements	Continuation of current trends	Offset by shift to natural gas space and water heating
Shift to Multi-Family Dwellings (MFD's)	Lower demand from MFD's – shift to electricity	Current trends are maintained	Increased demand from MFD's – thermal metering
Competitiveness	Natural gas competitiveness maintained	Natural gas competitiveness maintained	Electricity prices increase, while natural gas stable
Government Policies/Public Perception	Shift from natural gas as fossil fuels are avoided	Policies and perceptions remain neutral	Policies promote natural gas for space/water heating

Scenarios


Scenario Illustration - Annual Demand & Customer Additions
Customer Additions
Demand (TJ)
50,000
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
300,000
250,000
200,000
150,000
100,000
High Demand - Additions
Reference Case - Additions
Low Demand - Additions
High Demand
Reference Case
Low Demand
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
2026
2027
2028

Forecast Growth 2008 to 2028

Scenario	Customer Growth	Annual Demand	Average Use Per Customer
Reference	27% / 1.2%	13% / 0.6%	-11% / -0.6%
High Demand	34% / 1.5%	27% / 1.2%	-17% / -0.3%
Low Demand	20% / 0.9%	-1% / -0.03%	-5% / -1.0%

(Cumulative Growth / Average Annual Growth)

Peak Day Demand

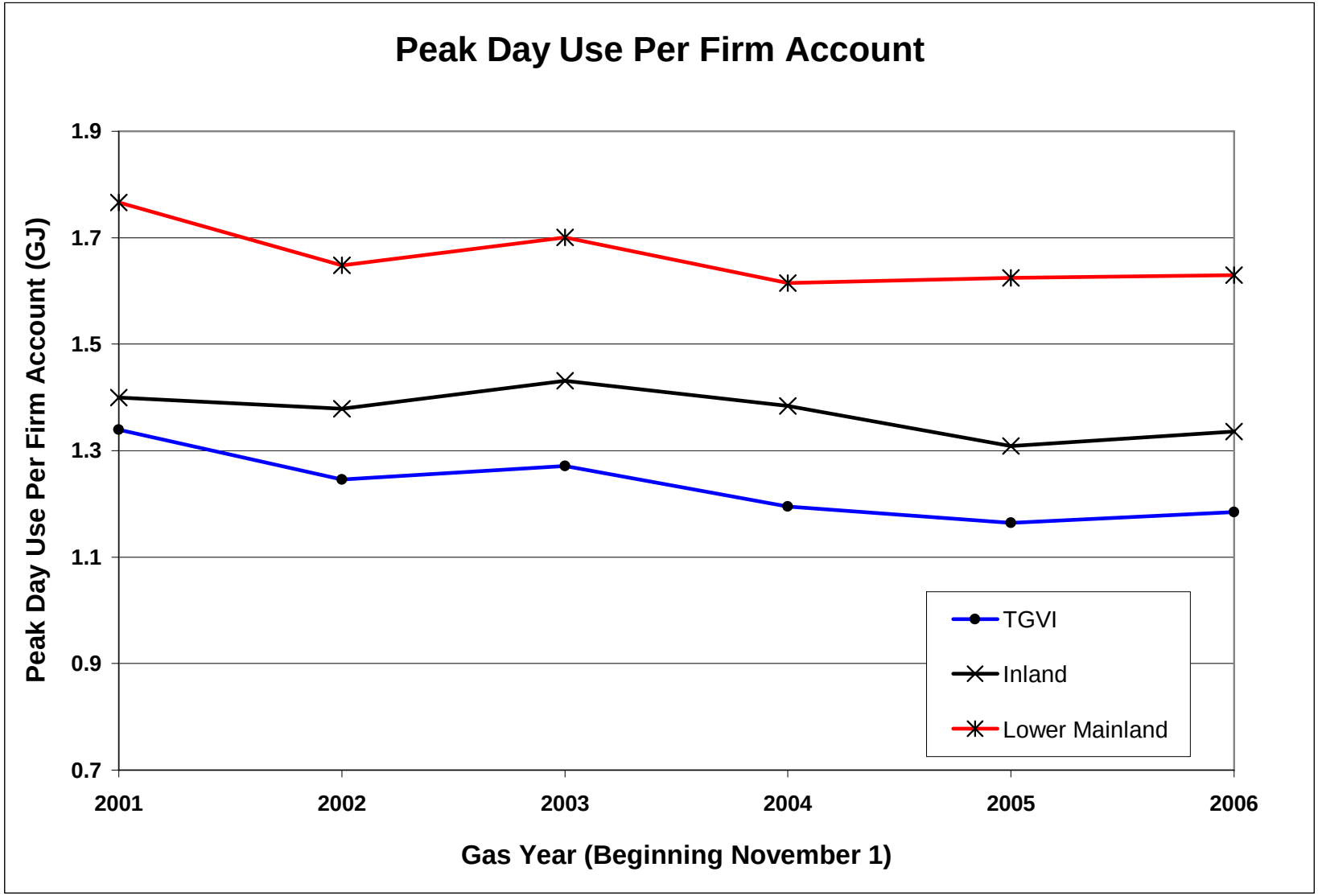
Methodology:

- Determine relationship between weather & consumption (averaged over past three years)
- Apply design day temperature (coldest day with a 1 in 20 year expected return period)
- Grossed up to reflect current customers

Results:

- Peak UPC has increased from 2006 for LML, INL & TGVI, but with 3-year average the effect is a decrease (~1.6% LML/INL, ~2.4% TGVI)

Peak Day UPC


Peak Day Use Per Firm Account
Peak Day Use Per Firm Account (GJ)
1.9
1.7
1.5
1.3
1.1
0.9
0.7
2001
2002
2003
2004
2005
2006
Gas Year (Beginning November 1)
TGVI
Inland
Lower Mainland

Conclusion

- Identify demand drivers
- Determine impact based on assumptions
- Develop demand forecast
- Vary assumptions to develop boundaries

Resource Development

April 29, 2007 Resource Planning Workshop

Cynthia Des Brisay
VP, Gas Supply & Transmission

&

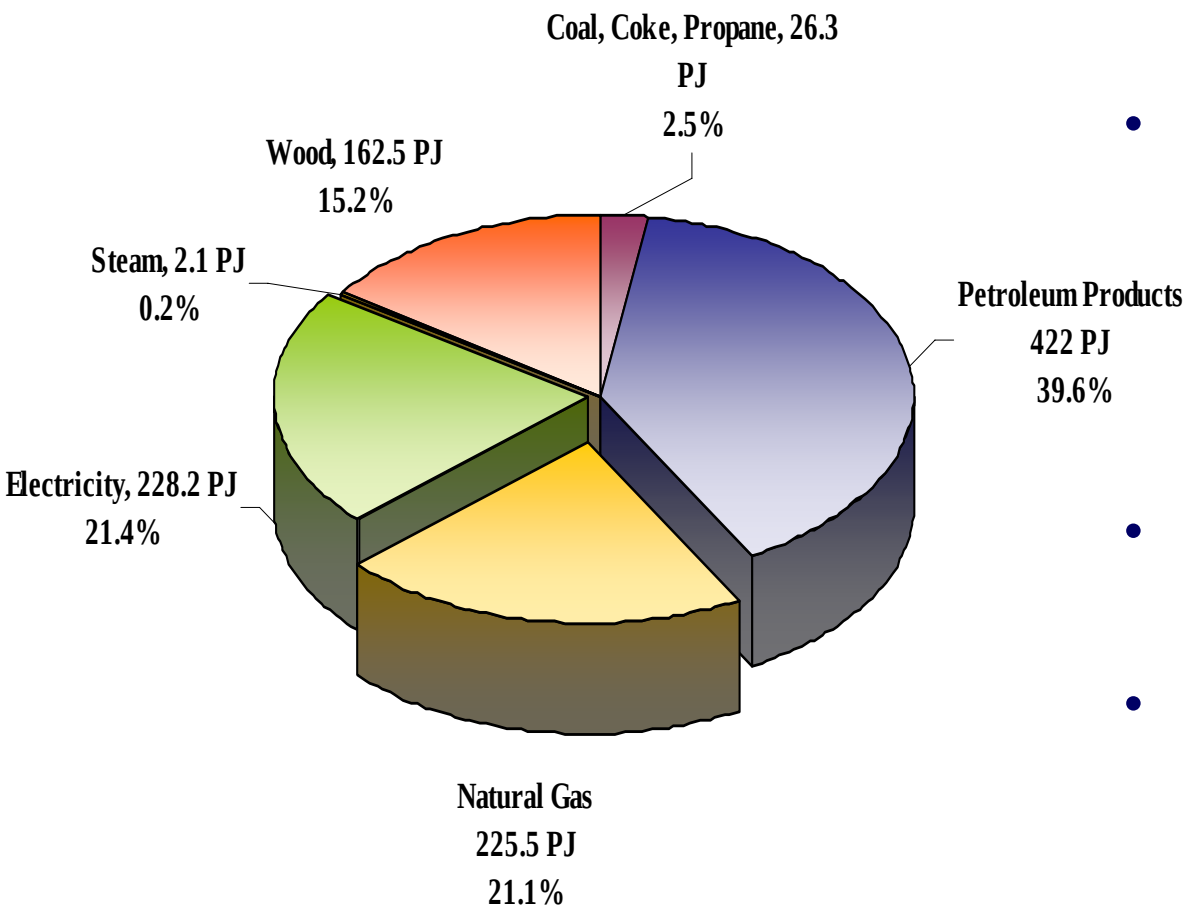
Edmond Leung
Project Assessment Manager

Regional Resource Planning

Terasen Gas Resource Development Driven by

- **Regional Infrastructure & Market Constraints**
- **On-System Customer Growth**
- **Alternative gas supply sources and energy efficiency**

BC End Use Energy Mix

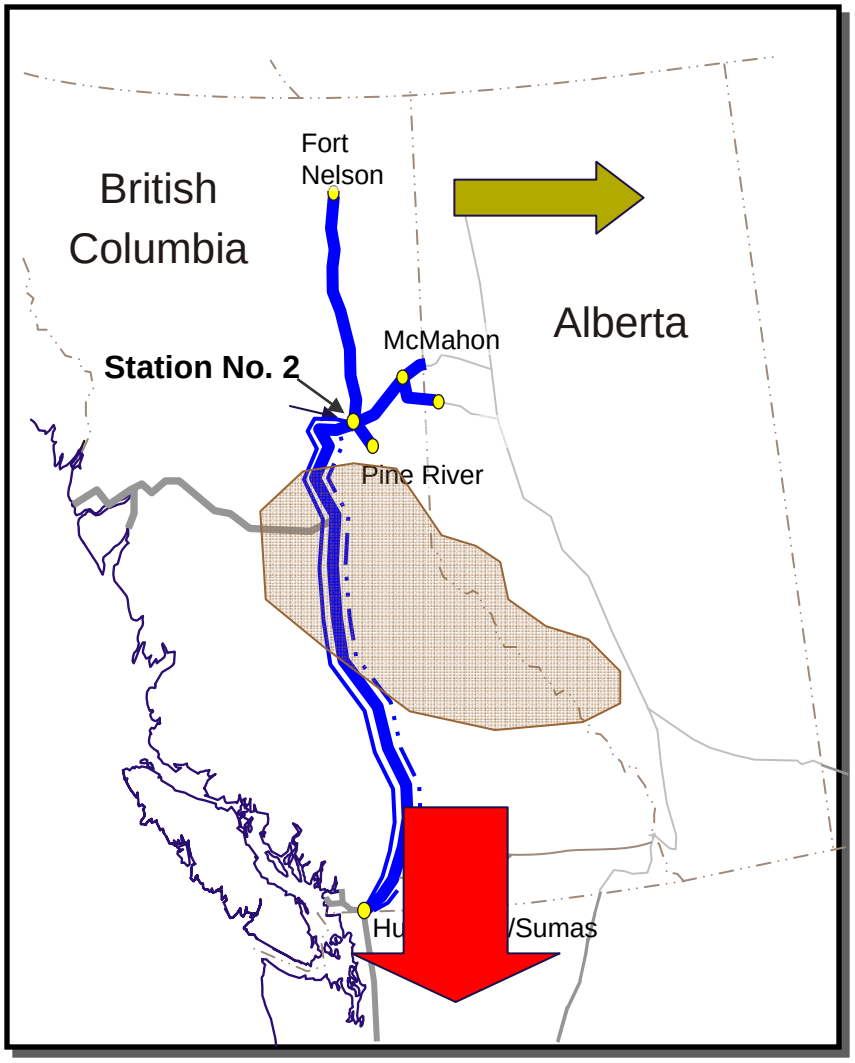


- Natural Gas and electricity each serve 20% of end use demand
- 20-30% of natural gas produced in BC is consumed in BC
- 15%-17% of electricity imported
- 90+% of petroleum products imported

BC Production Industry Growing

900 to 1100 PJ of production per year

Royalty revenue to BC in 2006/2007 about $2.3 Billion

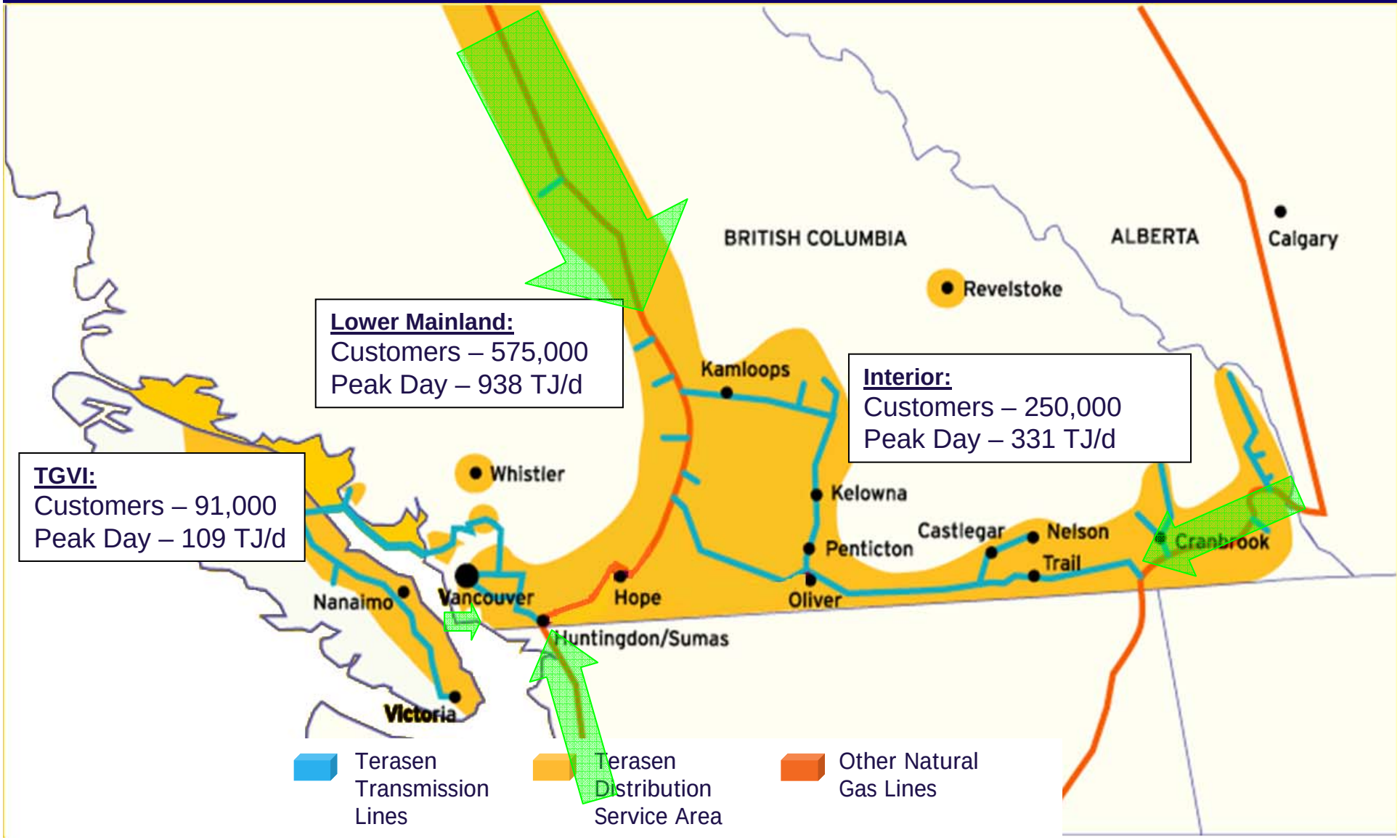


Alberta/Alliance Exports 25-40%

Domestic Consumption 20-30%

Huntingdon Export 25-40%

Resource Planning



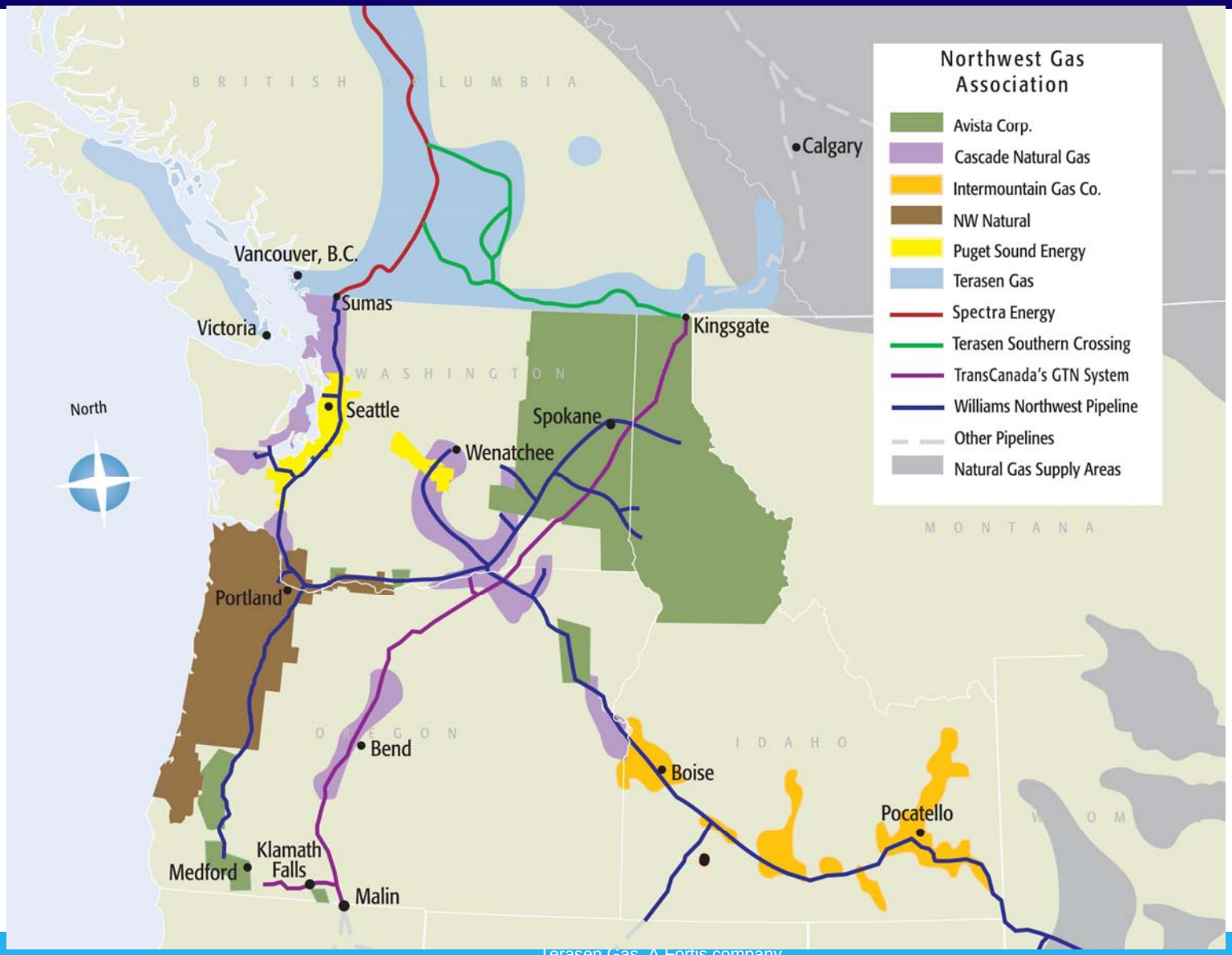
Lower Mainland:
Customers – 575,000
Peak Day – 938 TJ/d

Interior:
Customers – 250,000
Peak Day – 331 TJ/d

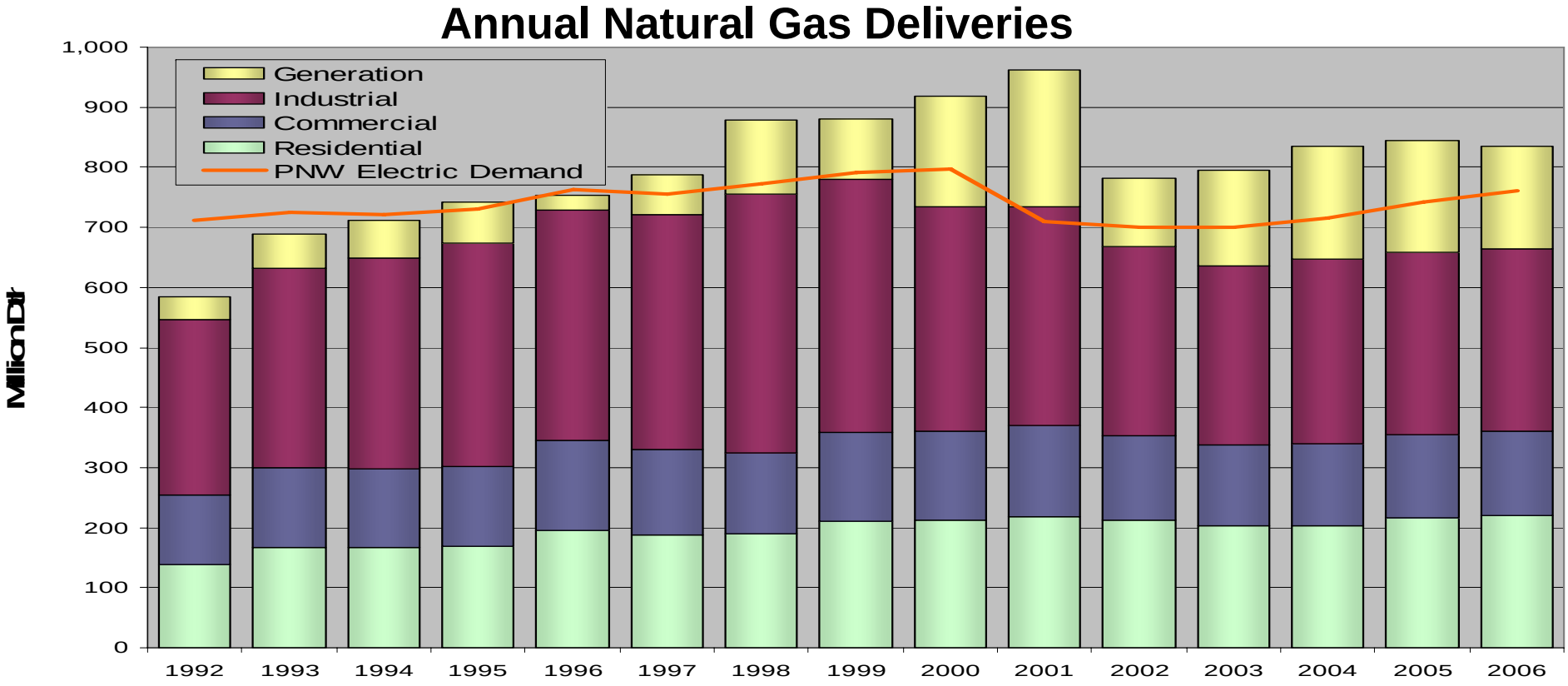
TGVI:
Customers – 91,000
Peak Day – 109 TJ/d

Regional Resource Planning

Regional Resource Planning



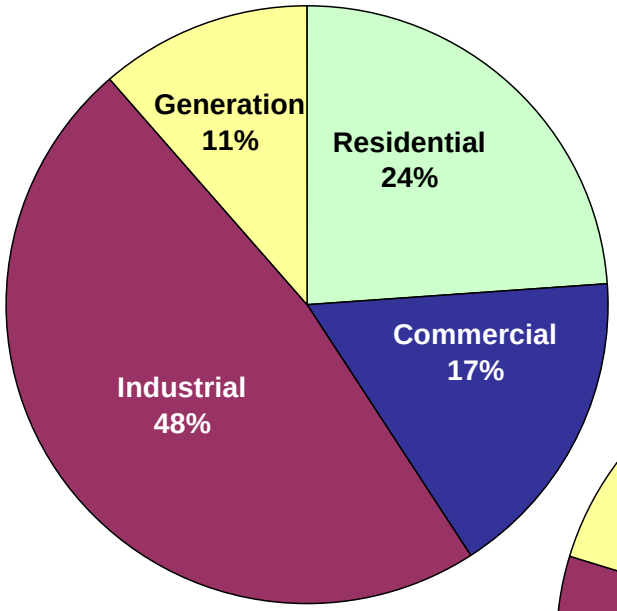
Regional Energy Market Outlook



- Economic Recovery from 2000/2001 energy crisis
- Permanent reduction in industrial demand
- Current growth driven by generation and residential demand

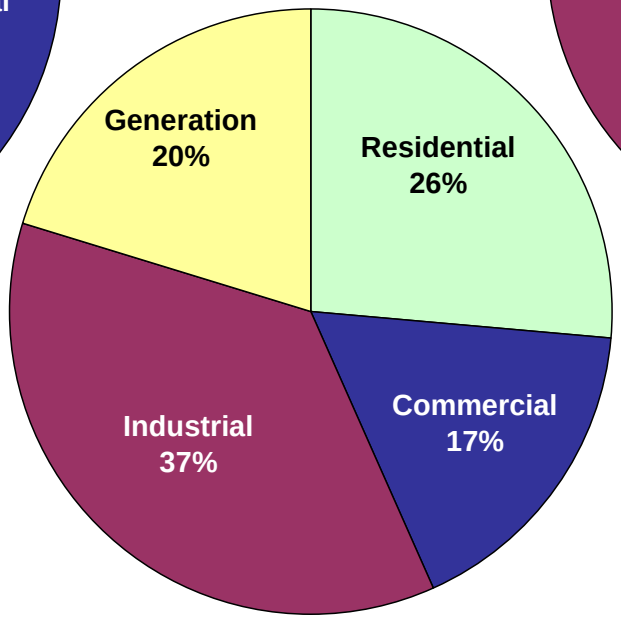
PNW: Generation & Residential Driving Growth

Share of Load by Sector, 1999



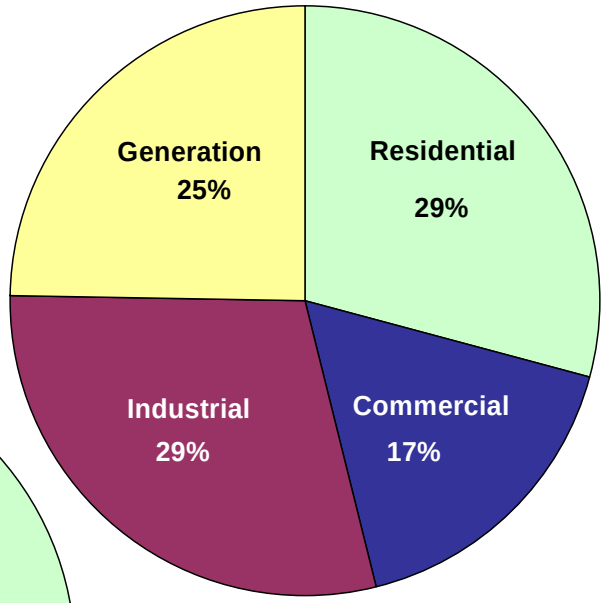
928 PJ

Share of Load by Sector, 2006



881 PJ

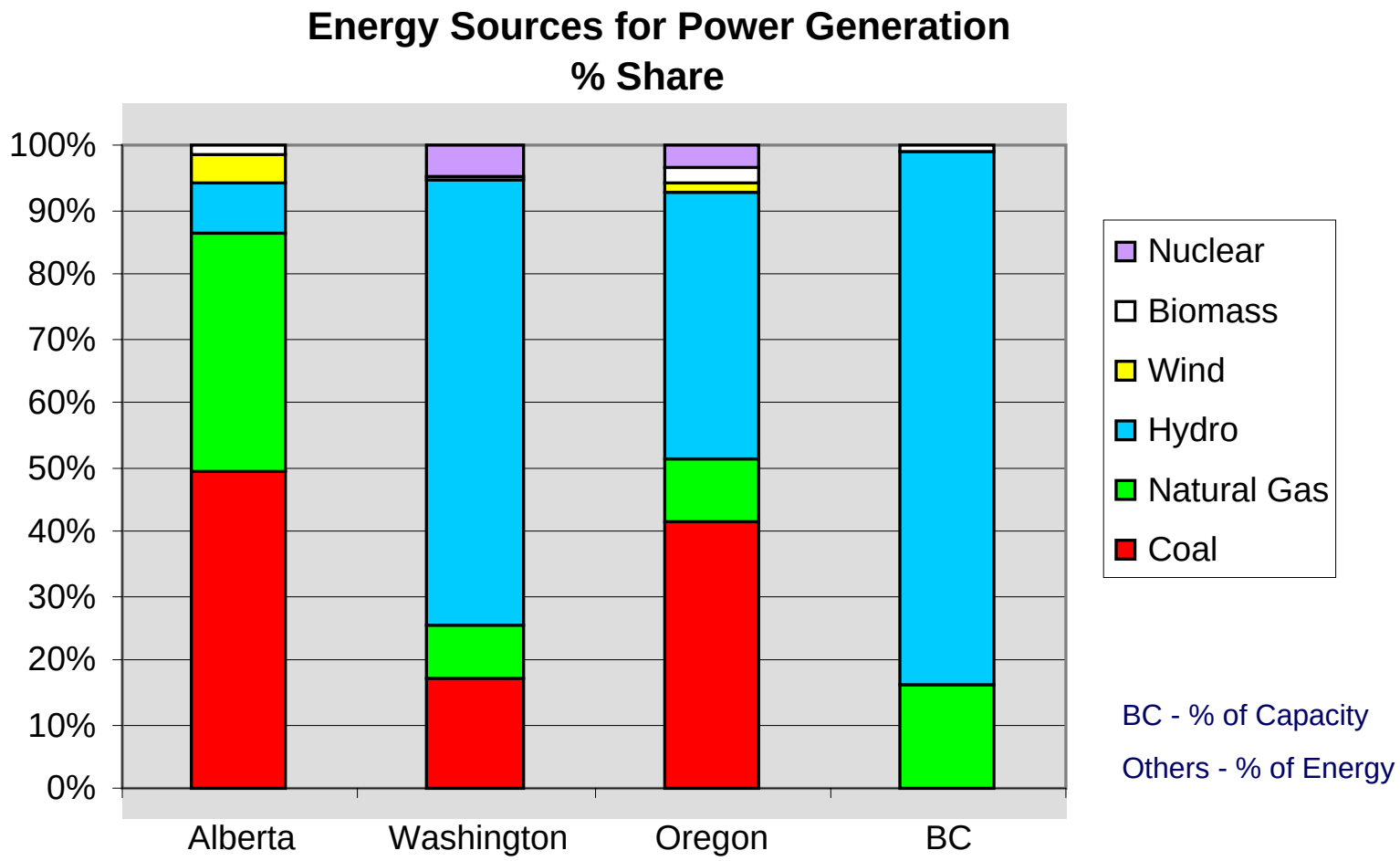
2011-12 Projected



914 PJ

Source: EIA, StatCan, NWGA

Regional Power Mix



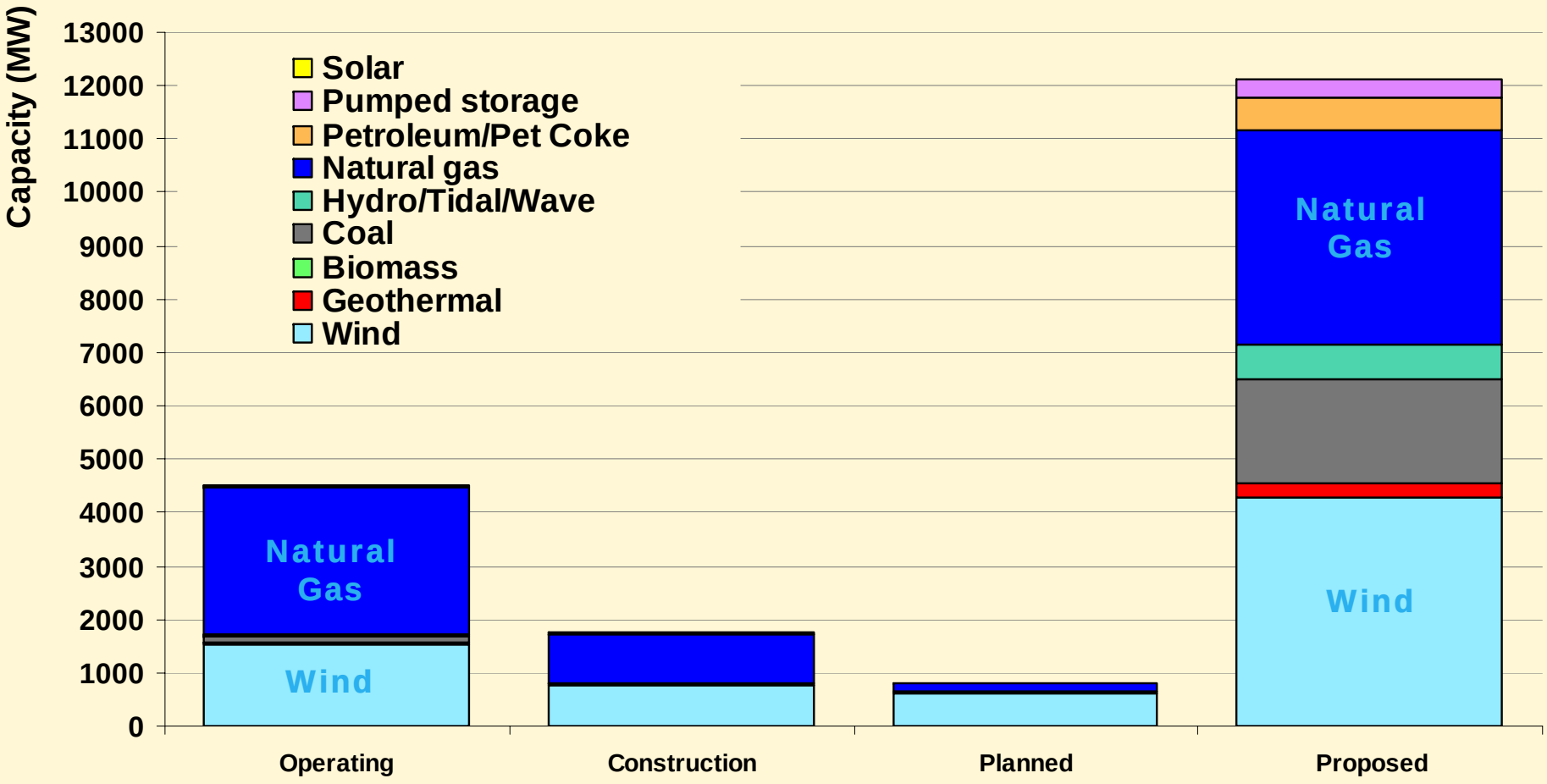
BC - % of Capacity

Others - % of Energy

Source: CGA

PNW Power Plant Development 2002 - 2007

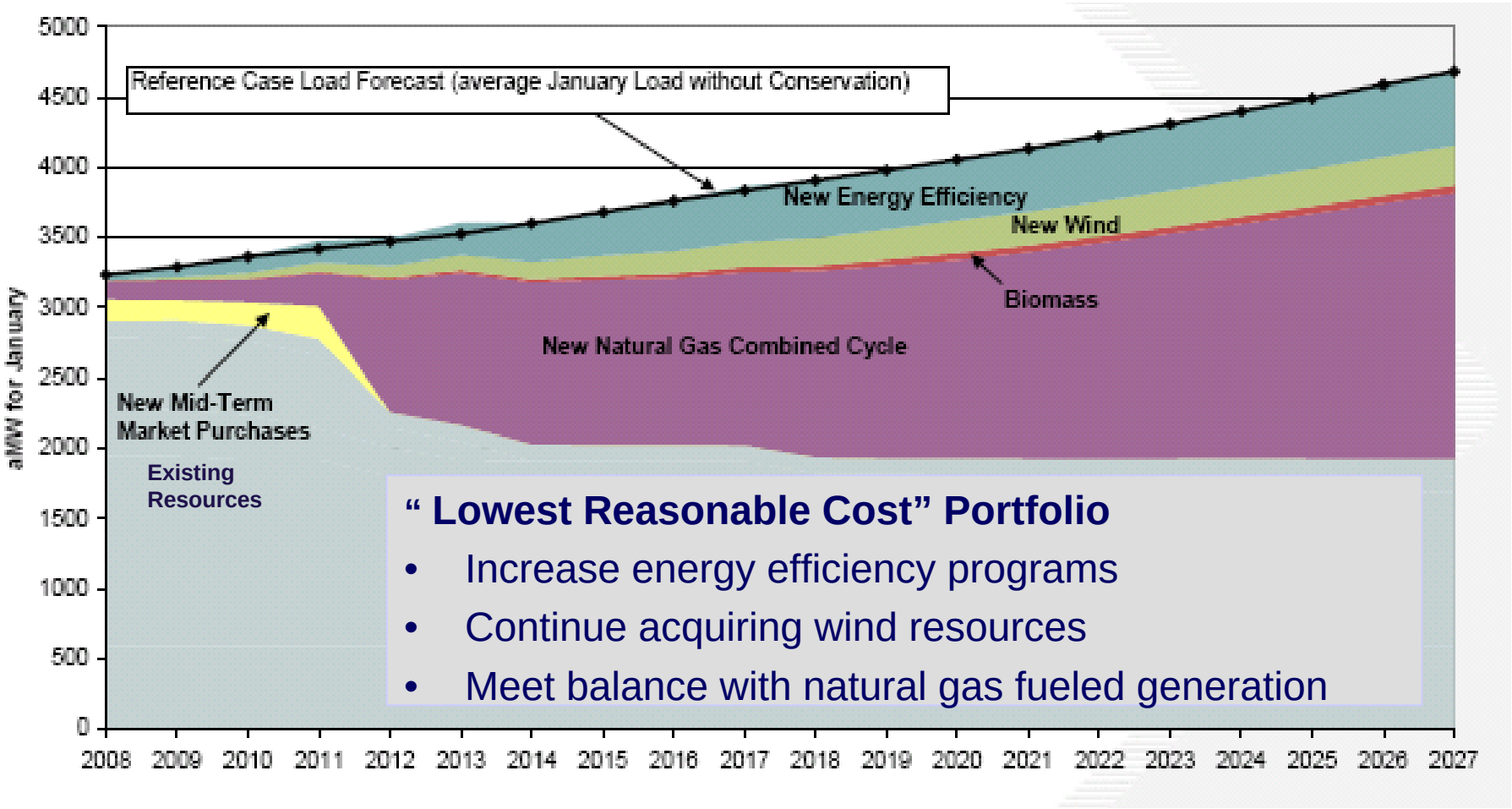
Generating Project Development Activity in the Northwest



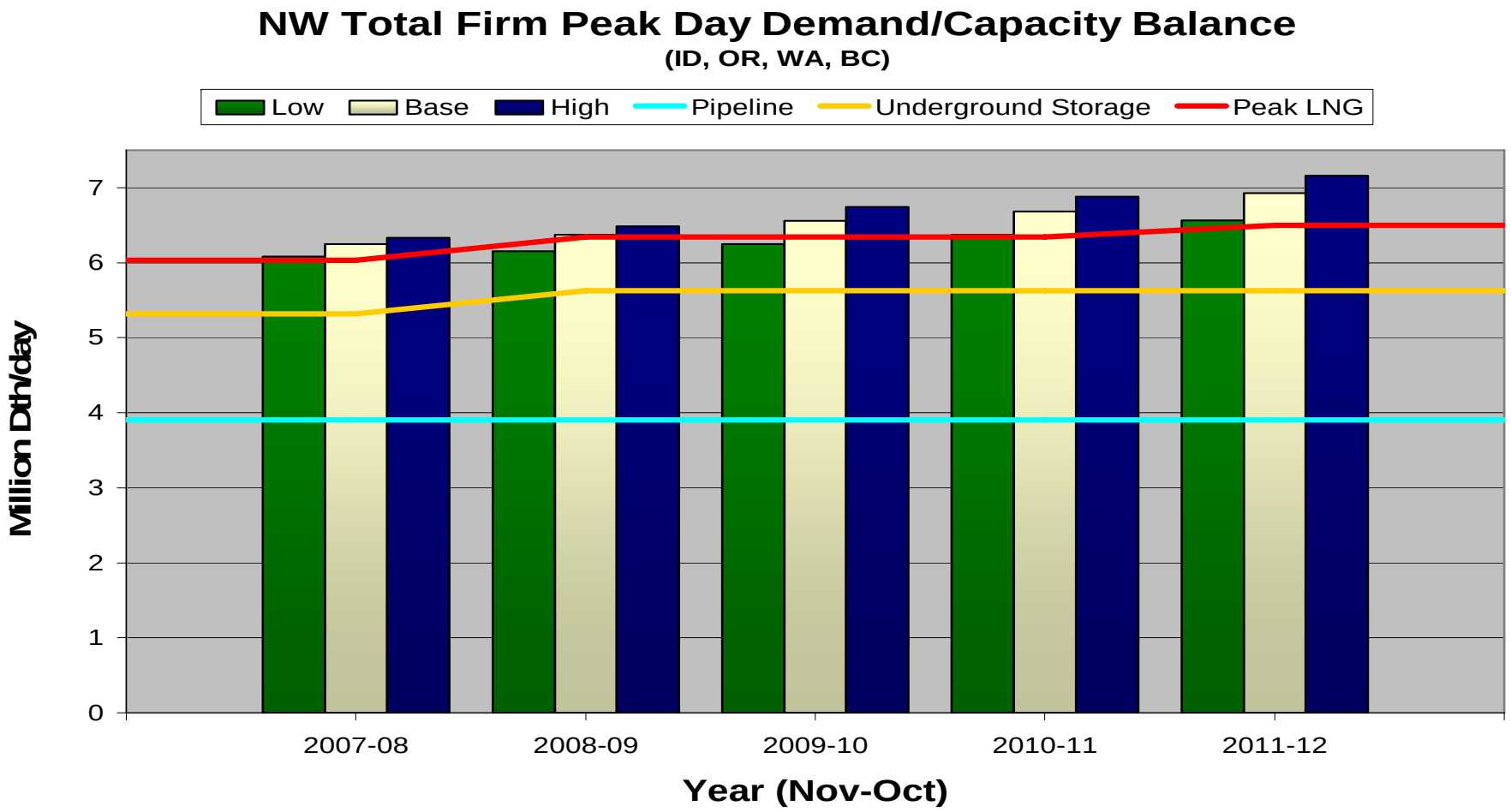
Northwest Power and Conservation Council

Includes OR, WA, ID, MT
Updated November 2007

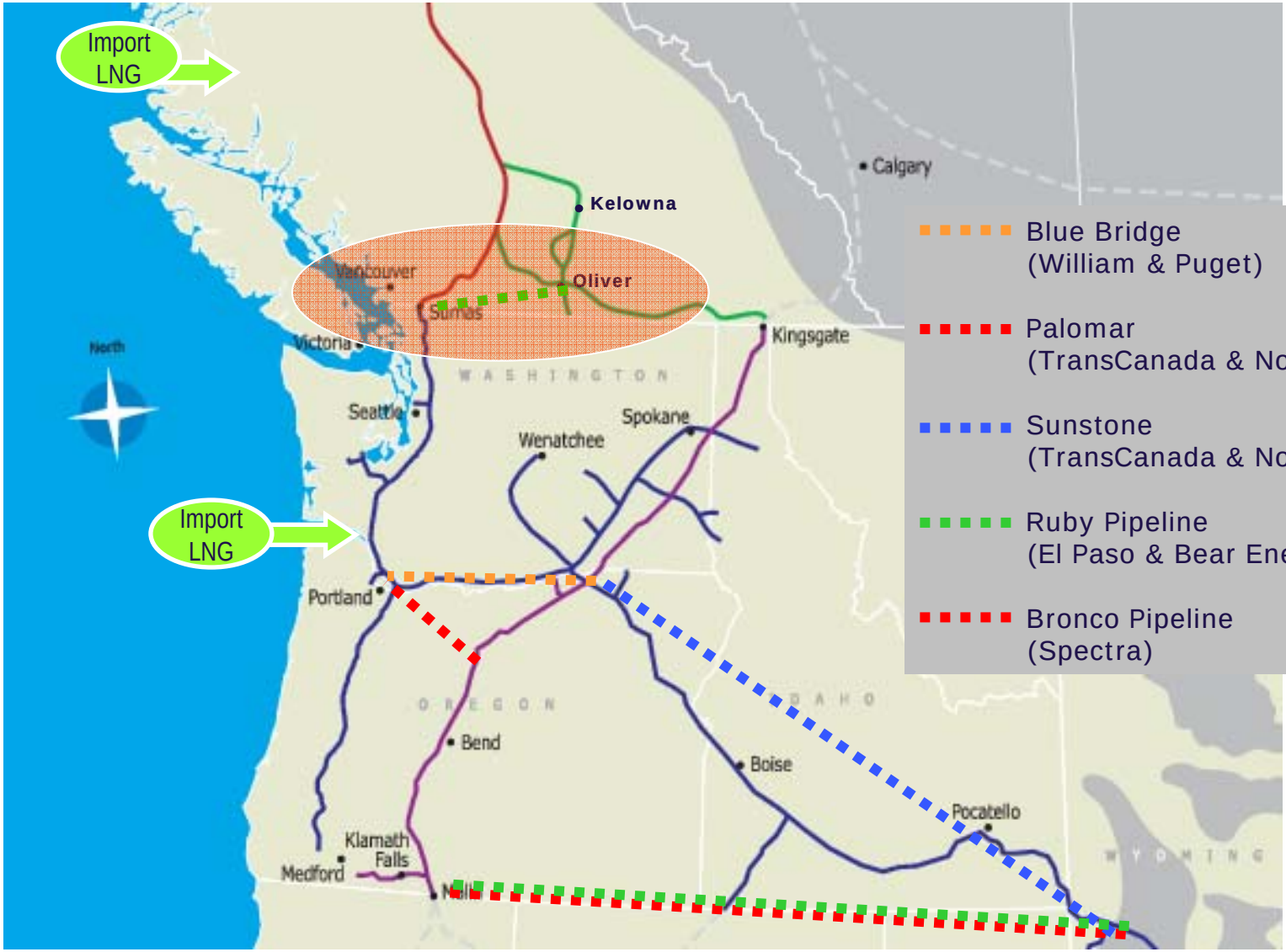
Puget Sound Energy
2007 Integrated Resource Plan



Regional Energy Market Outlook



Regional Infrastructure Proposals



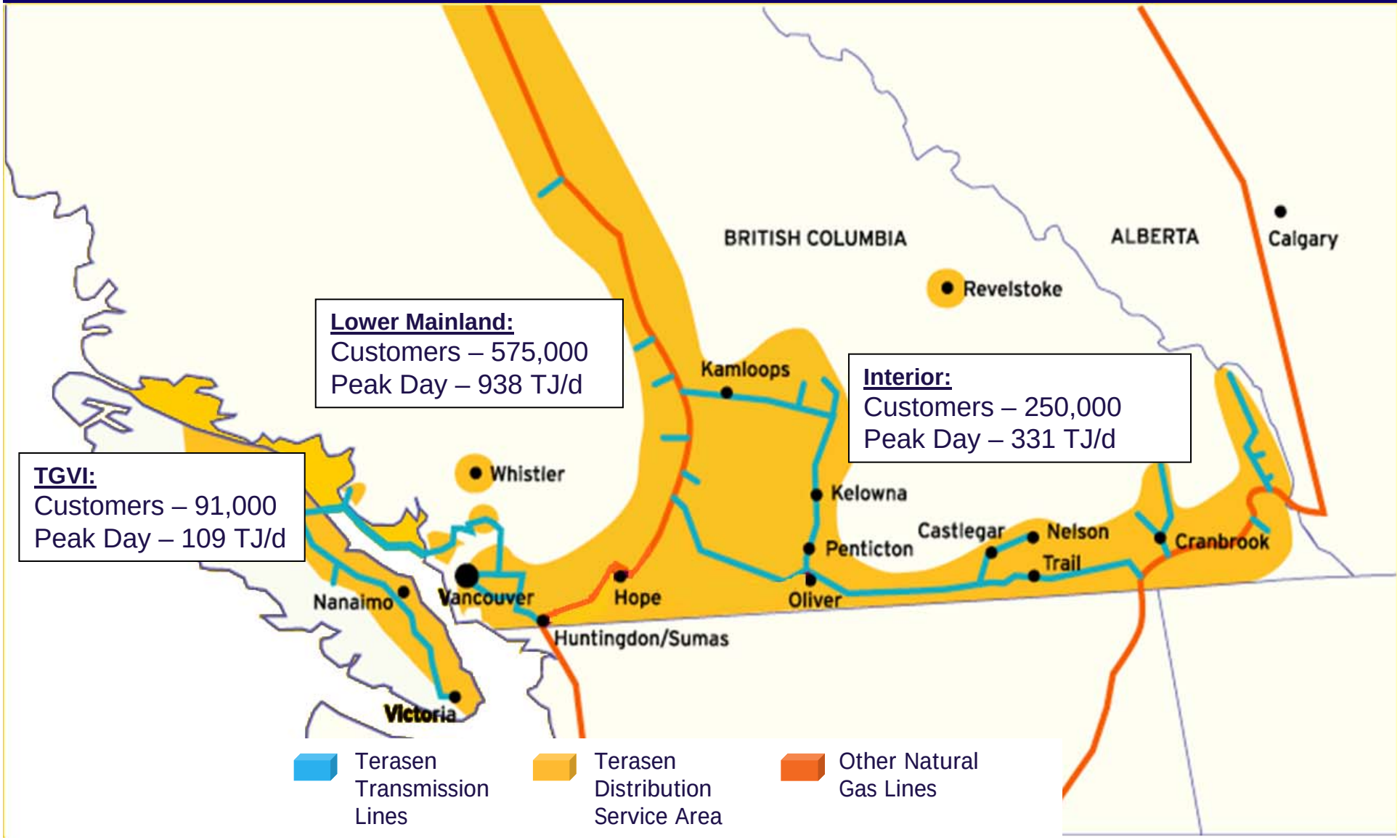
Resource Planning

Regional Supply & Infrastructure Opportunities

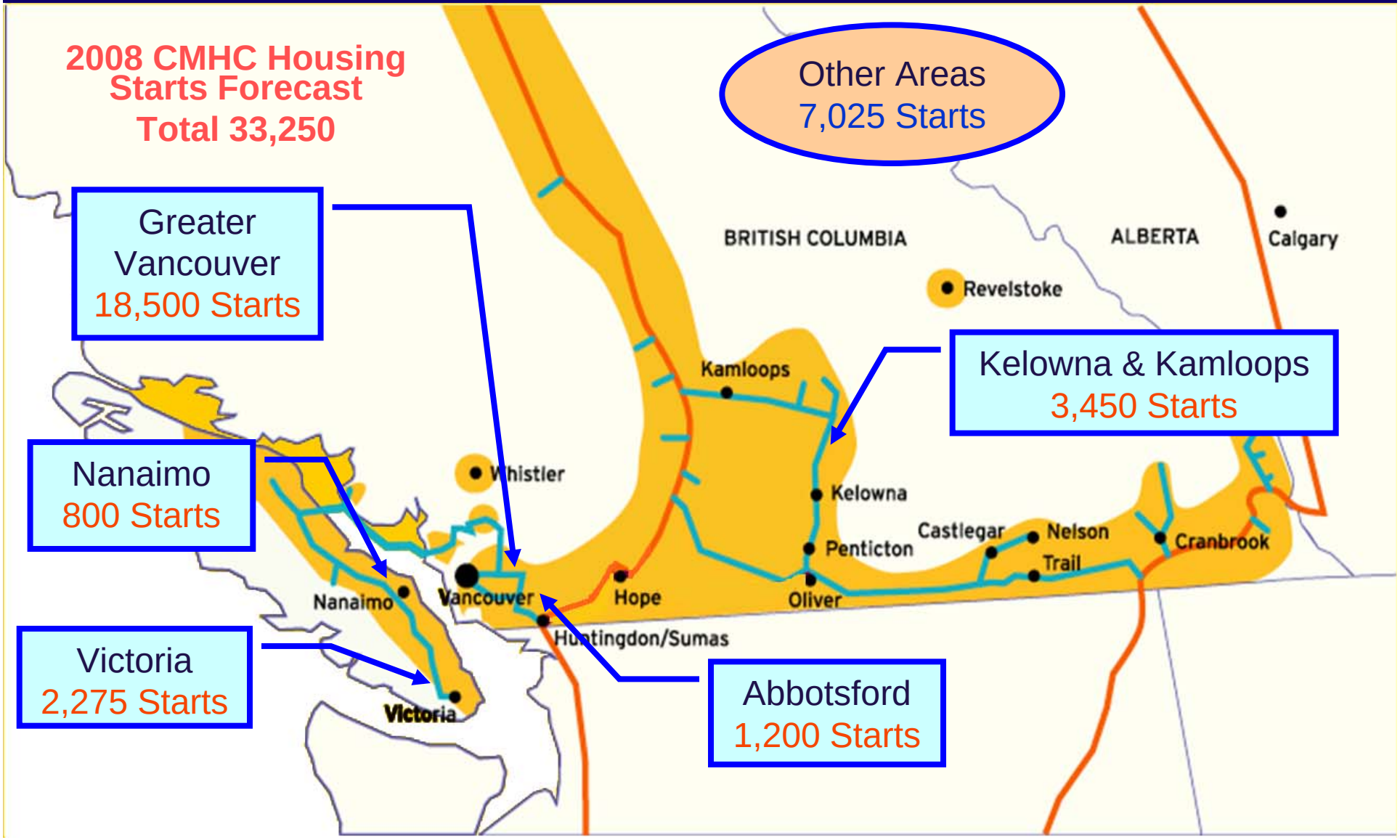
- **Expansion of Southern Crossing**
- **On-System Storage Expansion**

On-System Customer Growth
System Resource Development

Resource Planning



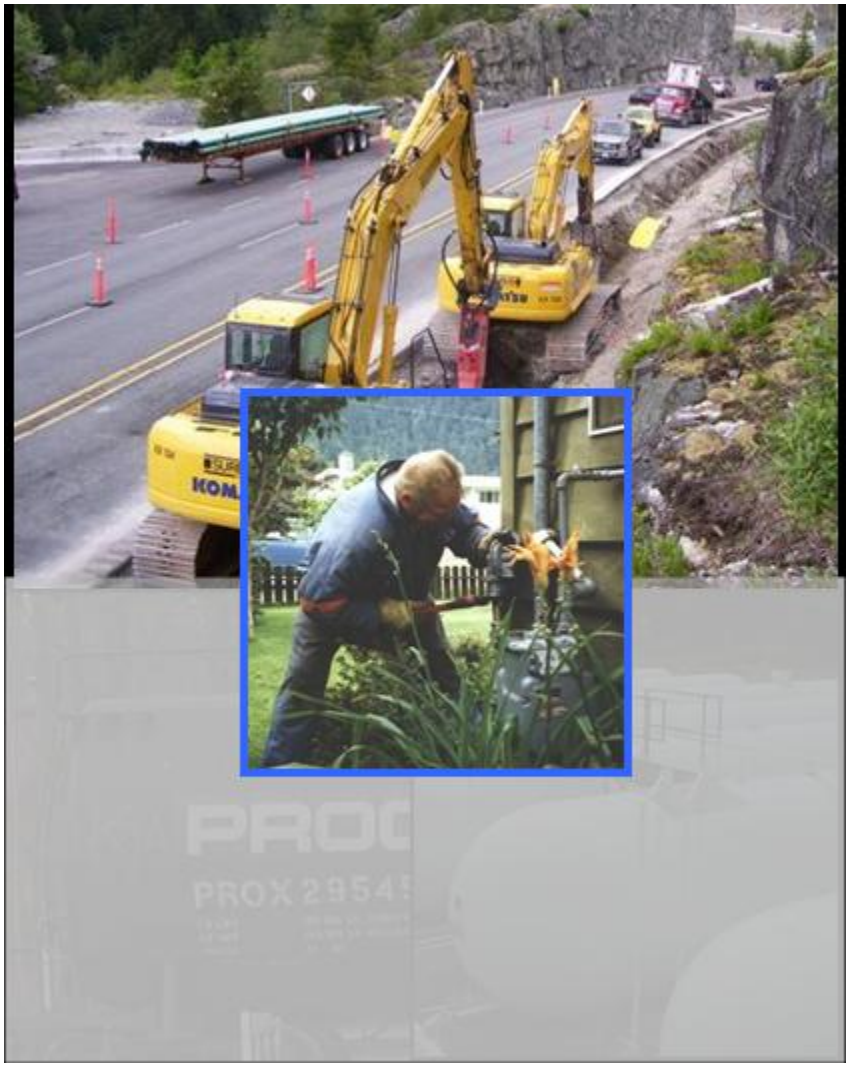
Customer Growth drives System Resource Development



Terasen Gas 2006 Resource Plans

- Terasen Gas (Vancouver Island) Inc (July 2006)
  - On-island peakshaving LNG facility would meet capacity and storage requirements for TGVI & TGI
  - Texada Island Compressor retention and upgrade required
- Terasen Gas Inc (July 2006)
  - Lower Mainland – No major requirements before 2011
  - Interior System - No major requirements before 2013
  - On-system storage would reduce dependence on third party storage resources
- Terasen Gas Whistler (November 2005)
  - Conversion of propane system to natural gas is the preferred long term solution

Terasen Gas Whistler

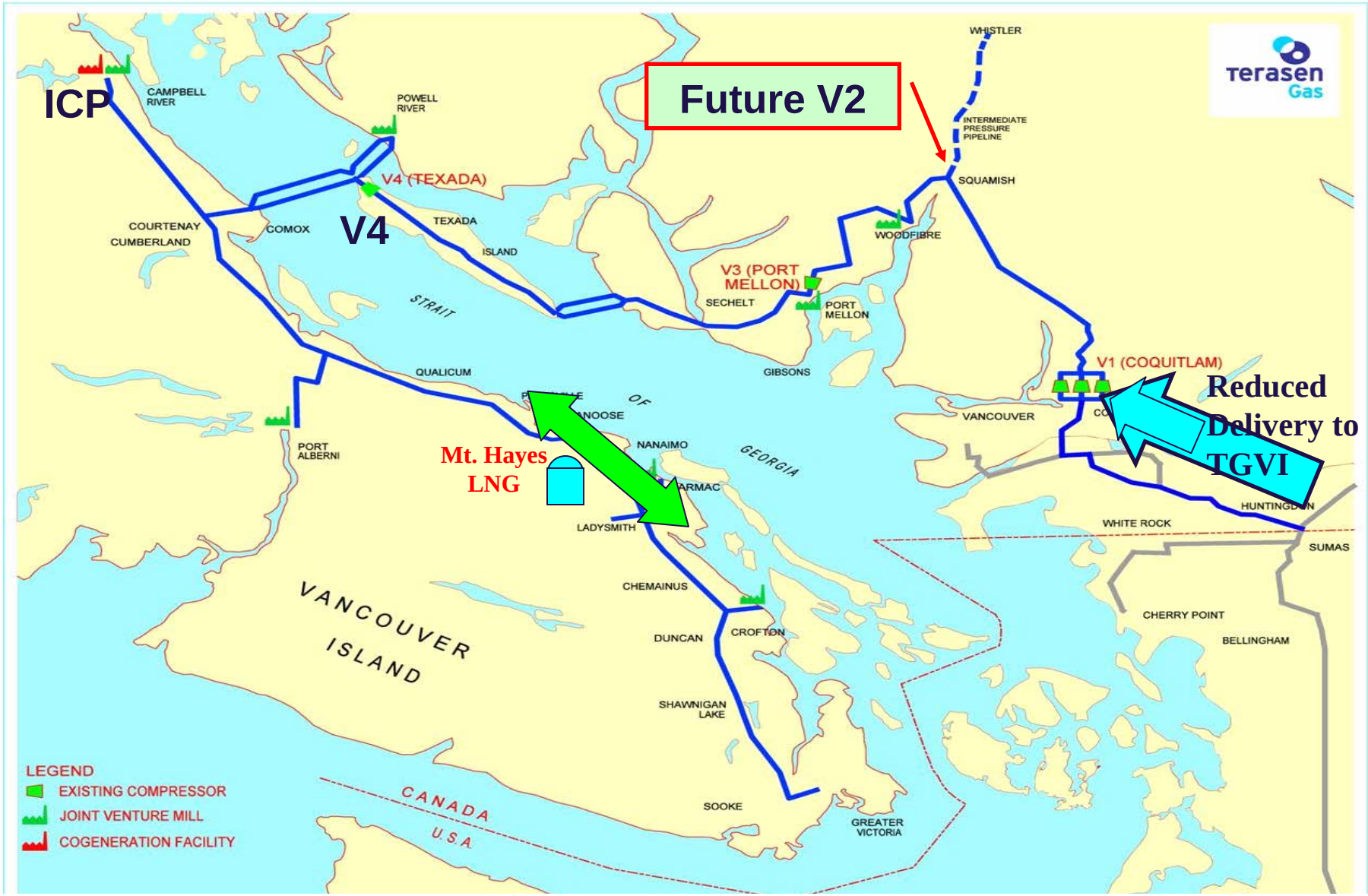


- Conversion of propane system to natural gas preferred as long term solution
- Pipeline extension underway
- Pipeline completion and natural gas conversion expected in 2009

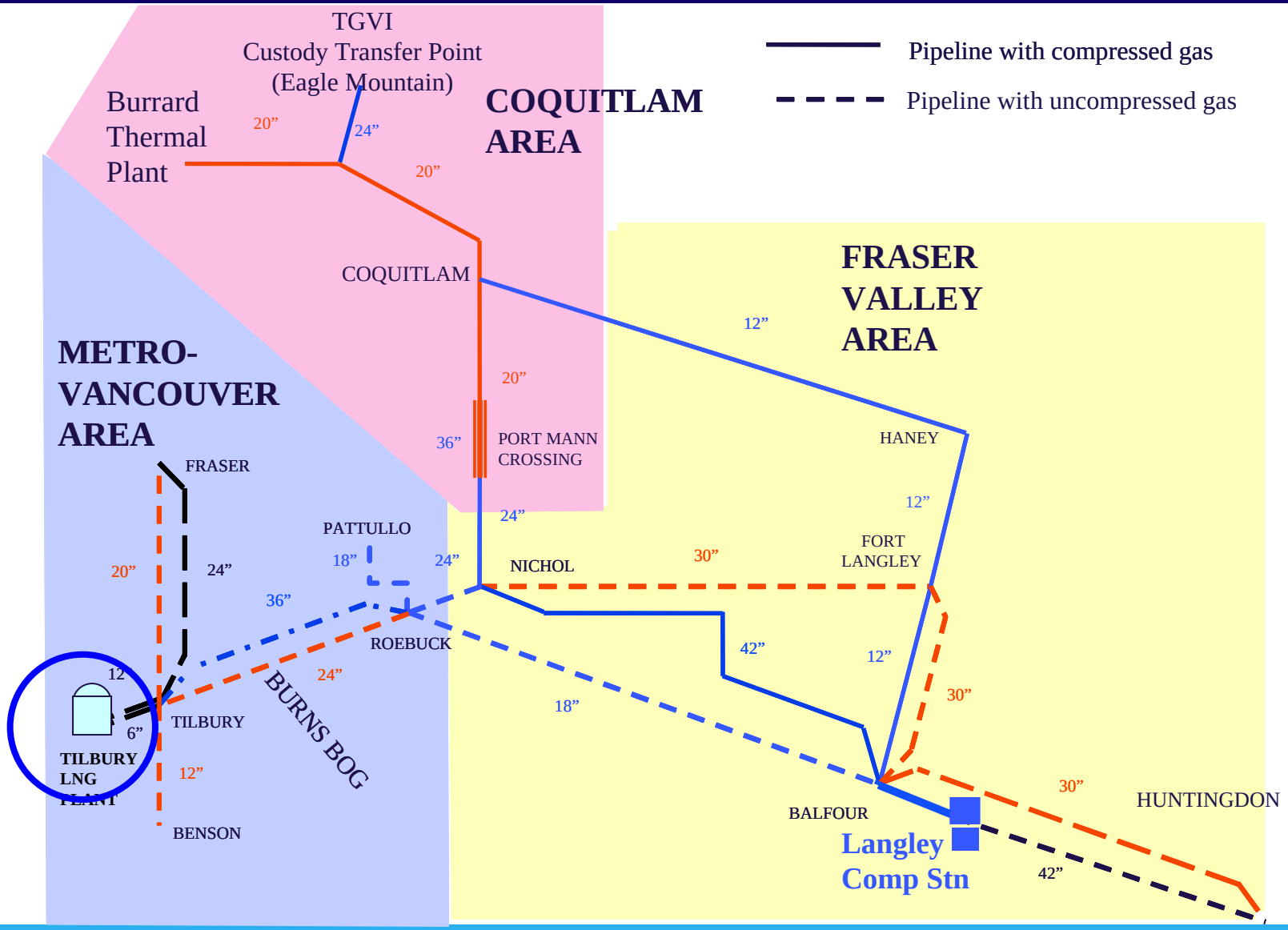
Terasen Gas Vancouver Island

- On-island peakshaving facility as preferred option to meet capacity and storage requirements for TGVI & TGI
- Mt. Hayes Storage Facility
  - Capacity 1.5 BCF
  - Deliverability 150 MMcfd
  - Construction start Apr 2008
  - In-Service Date Nov 2011
  - Expected Cost $195 million
- Texada (V4) Compressor
  - upgraded for permanent operation

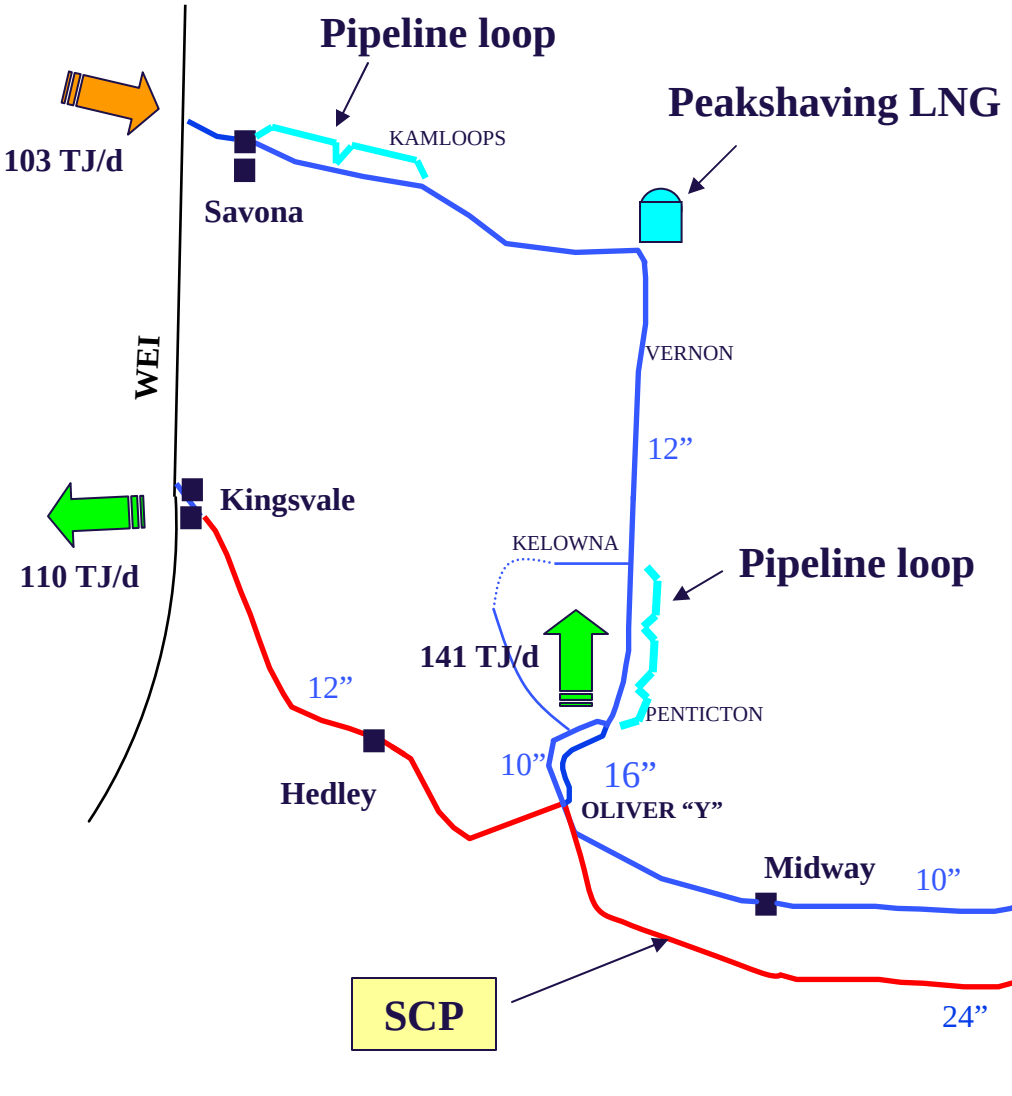
Terasen Gas Vancouver Island



Lower Mainland – Coastal Transmission System



Southern Interior – Interior Transmission System



- Additional system resource required in 2016+ to meet demand growth
- Schedule could be advanced due to:
  - new industrial demand
  - optimization of SCP capacity

On-System Resource Development

- **Terasen Gas (Vancouver Island) Inc**
  - Mt. Hayes storage facility under construction
  - No further major expansion before 2021
- **Terasen Gas Inc – Lower Mainland**
  - No expansion requirement due to customer growth
  - Potential expansion of Tilbury LNG for additional supply benefit or LNG as transportation fuel
- **Terasen Gas Inc – Interior**
  - Expansion required by 2016 due to growth in the Okanagan
  - Expansion schedule could be accelerated due to new industrial load or optimization of SCP to increase access to Alberta gas supply
- **Terasen Gas Whistler**
  - Pipeline extension under construction
  - Conversion of propane system to natural gas by 2009

Alternative Energy & Energy Efficiency

Alternative Energy Opportunities

Supports BC's Energy & Environmental Policy

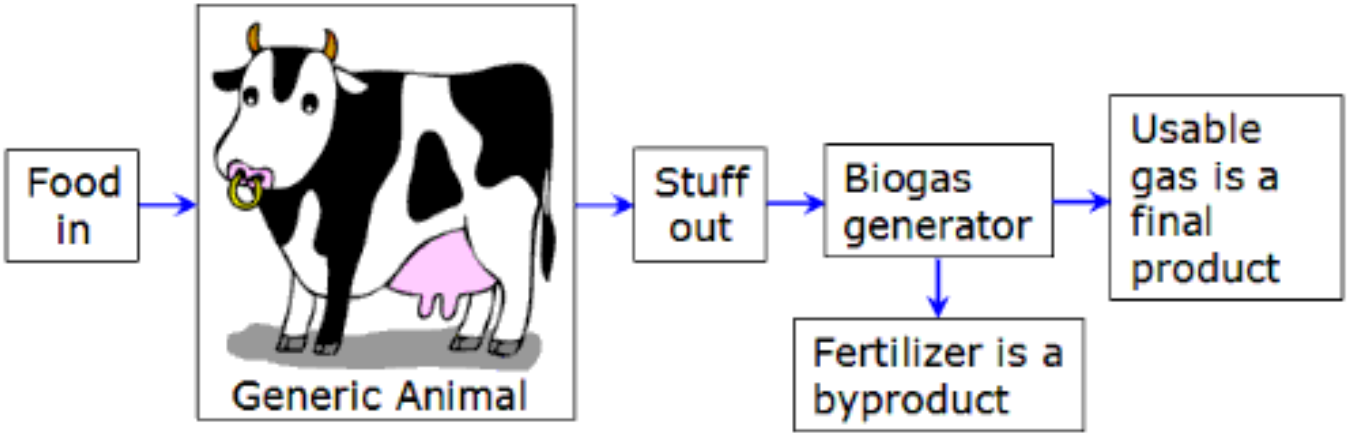
- ✓ Support 2007 BC Energy Plan
- ✓ Balancing of Energy, Environment & Economy
- ✓ Source of Clean Electricity for BC Hydro
- ✓ Reduce Carbon Footprint from operations

Project Opportunities

- ✓ Biomethane Production
- ✓ Natural gas for the Transportation Sector
- ✓ Waste Heat Electricity Generation
- ✓ Pressure Letdown Electricity Generation

Biogas Upgrading

- Multiple Sources of Energy
  - Agricultural Waste (Fraser Valley)
  - Landfill
  - Wastewater Treatment – (Lions Gate, CRD)
- Supports BC Bioenergy Strategy
  - Methane Capture
  - Energy from Agriculture

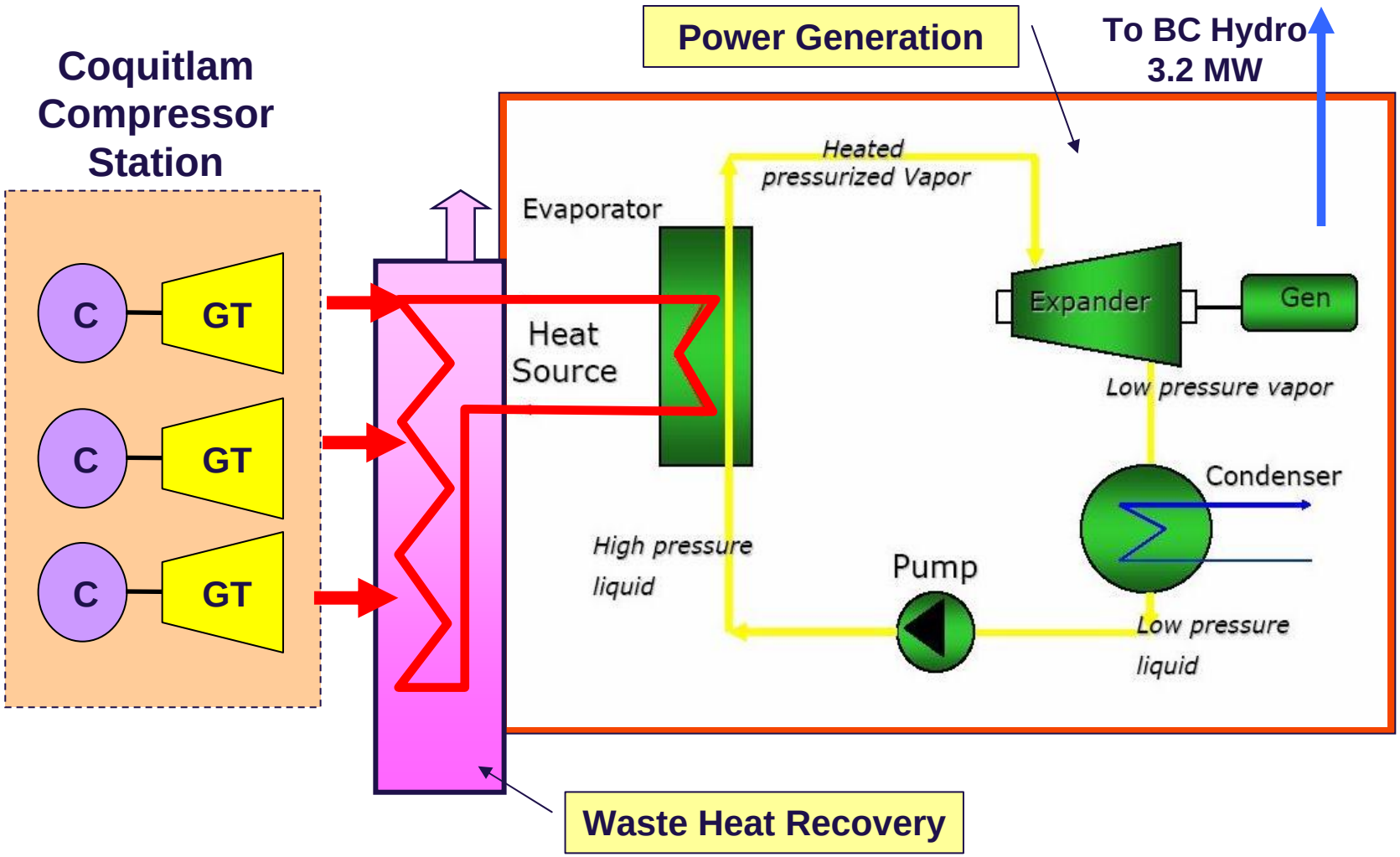


Natural Gas - Transportation

- Natural Gas Transportation Applications
  - Municipal Fleets (Waste Haulers, Buses etc..)
  - Trucking Fleets (LNG)
  - Forklifts and other Port Vehicles
  - Port Electricfication

- Benefits
  - 25 to 40% reduction in Fuel Consumption
  - 15 to 25% reduction in GHG Emissions
  - 50 to 80% in NOx SOx, and Particulate Matter

Waste Heat Recovery Generation



Waste Heat Recovery

Benefits

- Produces >15,000 MWh per year clean electricity
- Provides clean electricity supply to BC Hydro under the Standing Offer Program
- Efficient use of electricity transmission system
  → electricity production in the load centre
- Increasing efficiency of the gas transmission system
  → 40% increase in efficiency of compressor operation (gas compression plus power generation)

Questions

Action Items and Next Steps

April 29th, 2008 Resource Planning Workshop

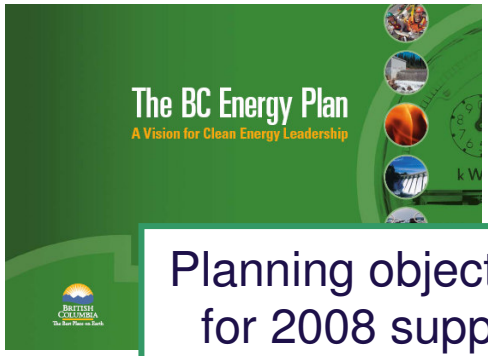
Ken Ross
Resource Planning Manager

Resource Planning Objectives

Achieving the proper balance between multiple objectives is a key challenge of Integrated Resource Planning

Terasen Gas planning objectives:

- **Safe, reliable and secure supply**
- **Cost effective service to customers**
- **Energy efficiency and conservation**
- **Manage social and environmental impacts**

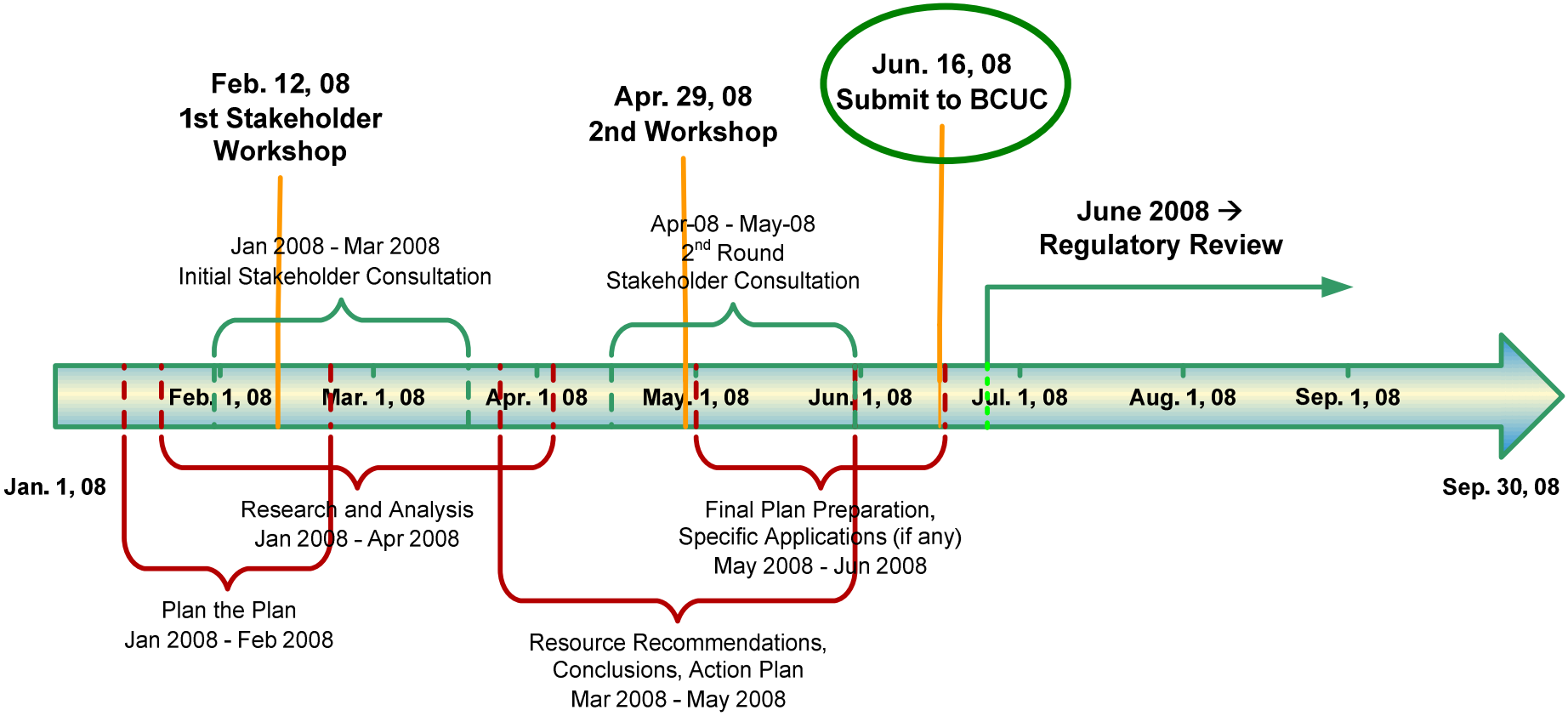


Planning objectives for 2008 support the policies of the BC Energy Plan

Draft Action Items

- Implement new EE&C programs and research and plan for future EE&C programming.
- Participate in FortisBC and BC Hydro resource planning.
- Influence Provincial and regional energy and climate related policy development.
- Develop and evaluate alternatives for system expansion in the Okanagan area.
- Investigate regional pipeline or storage infrastructure alternatives.
- Pursue innovative clean energy solutions for BC: NGV, biogas, electricity from waste heat

Next Steps


Feb. 12, 08
1st Stakeholder Workshop
Apr. 29, 08
2nd Workshop
Jun. 16, 08
Submit to BCUC
Jan 2008 - Mar 2008
Initial Stakeholder Consultation
Apr-08 - May-08
2nd Round
Stakeholder Consultation
June 2008 →
Regulatory Review
Feb. 1, 08
Mar. 1, 08
Apr. 1, 08
May. 1, 08
Jun. 1, 08
Jul. 1, 08
Aug. 1, 08
Sep. 1, 08
Jan. 1, 08
Sep. 30, 08
Research and Analysis
Jan 2008 - Apr 2008
Final Plan Preparation,
Specific Applications (if any)
May 2008 - Jun 2008
Plan the Plan
Jan 2008 - Feb 2008
Resource Recommendations,
Conclusions, Action Plan
Mar 2008 - May 2008

Feedback from Today's Session

Contact:

Ken Ross
Resource Planning Manager
Terasen Gas
604-576-7342 / ken.ross@terasengas.com

Please submit any written comments you may wish to provide by: **May 9th**, 2008

16705 Fraser Highway
Surrey, BC V4N 0E8

(feedback forms and mail in information provided)