2008 Long-Term Acquisition Plan

Intervenor Workshop #1
Review of Inputs to LTAP Analysis

March 5, 2008
The Sutton Place Hotel
### AGENDA

<table>
<thead>
<tr>
<th>Time</th>
<th>Agenda Item</th>
<th>Presenter</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:30 - 9:00</td>
<td>Coffee available</td>
<td></td>
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<tr>
<td>9:00</td>
<td>Agenda Overview</td>
<td>Anne Wilson</td>
</tr>
<tr>
<td>9:10 - 9:20</td>
<td>Context</td>
<td>Cam Matheson</td>
</tr>
<tr>
<td>9:20 - 9:40</td>
<td>Resource Options Update: Site C</td>
<td>Michael Savidant</td>
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<tr>
<td>9:40 - 10:40</td>
<td>Resource Options Update: Demand-Side Management</td>
<td>John Duffy</td>
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<td>10:40 - 10:55</td>
<td>Break</td>
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<tr>
<td>10:55 - 11:45</td>
<td>Electricity &amp; Gas Price Forecast</td>
<td>Dave Ince</td>
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<tr>
<td>11:45 - 12:15</td>
<td>GHG Offset Price Forecast</td>
<td>Patrice Rother</td>
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<td>12:15 - 12:45</td>
<td>Lunch</td>
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<tr>
<td>12:45 - 1:15</td>
<td>Risk Framework: An Introduction</td>
<td>Basil Stumborg</td>
</tr>
<tr>
<td>1:15 - 1:30</td>
<td>Close</td>
<td>Randy Reimann</td>
</tr>
</tbody>
</table>
Context

Cam Matheson
2008 LTAP Context - Summary

◆ 2006 IEP/LTAP filed in March 2006
◆ BCUC Decision released May 2007
◆ 2008 LTAP expected to be filed in Spring 2008
◆ LTAP 2 Year Planning Cycle

◆ 2008 LTAP Considerations
  ■ BCUC 2006 IEP/LTAP Decision
    • Agreement to address 2007 Energy Plan in next LTAP
    • Need for new resources accepted (further work on Burrard needed)
    • More work required on assessing risk
    • Cost-effectiveness continues to be critical test
  ■ 2007 Energy Plan
    • Target to acquire 50 per cent of BC Hydro’s incremental resource needs through conservation by 2020
    • Thermal generation GHG emissions to be fully offset or sequestered
    • 90% clean or renewable generation
    • Province to be electricity self-sufficient by 2016
      – Special Direction 10
  ■ New Approach to Assessing Risk
2008 LTAP Process

Step 1 - Establish Objectives

Step 2 - Load Resource Balance

Step 3 - Resource Options Inventory

Step 4 - Develop & Evaluate Portfolios

Step 5 - Portfolio Trade-Off Analysis

Step 6 - Long-Term Acquisition Plan

Inputs
- Resource Options
- Risks and Uncertainties
- Load Resource Gap

Inputs
- Load Forecast
- Key Risks and Uncertainties

Update
(UPDATE TODAY)

No Update

Limited Update
(REVIEW TODAY)

Update

Limited Update
(REVIEW TODAY)

No Update

Limited Update
(REVIEW TODAY)

No Update

Update
(UPDATE TODAY)

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(UPDATE TODAY)

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Update
(UPDATE TODAY)

Update
(UPDATE TODAY)

Update
(UPDATE TODAY)

Update
(UPDATE TODAY)
Expenditure Determinations

- DSM Plan
- Mica Unit(s) **
- Site C
- Burrard*

Justification to Expenditure Determinations

- Load Resource Gap*
- New Risk Framework
- 2007 Electricity and Gas Price Forecasts
- GHG Price Forecast
- Resource Options Update
- Portfolio Analysis*
- Contingency Resource Plans**
Questions?
Site C Update

Michael Savidant
Site C – Project Outline

◆ As directed in the BC Energy Plan, BC Hydro has begun consulting about the Site C hydroelectric project as a potential supply option

◆ Currently requesting approval for Stage 2 funding of $41 million

◆ Current work on the project is to preserve Site C as a potential option

◆ No decision has been made on whether to proceed with the project
Site C – Project Attributes

◆ Long operating life (more than 100 years)

◆ Site C would provide dependable energy and capacity
  ■ 900 MW of capacity
  ■ 4600 GWh of average energy

◆ Site C utilizes existing storage in Williston reservoir
  ■ Optimizes upstream storage and regulation

◆ Clean and renewable energy
  ■ Minimal greenhouse gas impact once operating
Site C – Project Cost

- Stage 1 report gave interim project cost range of $5.0 billion to $6.6 billion
- UEC ranges between $46/MWh to $97/MWh

<table>
<thead>
<tr>
<th>Change in Discount and Interest Rates</th>
<th>Risk Reserve ($million)</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>150</td>
</tr>
<tr>
<td>-2%</td>
<td>$5.0 billion A</td>
</tr>
<tr>
<td></td>
<td>$46 /MWh</td>
</tr>
<tr>
<td>-1%</td>
<td>$5.2 billion B</td>
</tr>
<tr>
<td></td>
<td>$54 /MWh</td>
</tr>
<tr>
<td>0%</td>
<td>$5.3 billion C</td>
</tr>
<tr>
<td></td>
<td>$64 /MWh</td>
</tr>
<tr>
<td>+1%</td>
<td>$5.5 billion D</td>
</tr>
<tr>
<td></td>
<td>$74 /MWh</td>
</tr>
<tr>
<td>+2%</td>
<td>$5.7 billion E</td>
</tr>
<tr>
<td></td>
<td>$85 /MWh</td>
</tr>
</tbody>
</table>

Project Cost (nominal)
Unit Cost (Cash) (F2008 $)

Reliable power, at low cost, for generations. Reliable power, at low cost, for generations. Reliable power, at low cost, for generations. Reliable power, at low cost, for generations.
BC Hydro is currently in Stage 2 of the process

Government decision required to proceed to each subsequent stage
Site C – Stage 2

◆ Project Definition
  ■ Engineering work to bring project up to date
  ■ Environmental and socio-economic studies
  ■ Update and refine major project features
  ■ Updated interim cost estimates at conclusion of Stage 2
  ■ Develop procurement strategy

◆ Public and First Nations Consultation
  ■ Local, regional, provincial communities and stakeholders
  ■ Started with Pre-Consultation
  ■ Consultation office in Fort St. John

◆ Stage 2 conclusion
  ■ Updated interim cost estimates
  ■ Updated analysis of benefits, costs, impacts, and risks of the project
  ■ BC Hydro recommendation to government – Fall 2009
## Site C – Next Steps

<table>
<thead>
<tr>
<th>Period</th>
<th>Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>December 2007 - January 2008</td>
<td>◆ Pre-Consultation</td>
</tr>
<tr>
<td>March – April 2008</td>
<td>◆ Pre-Consultation Summary Report released</td>
</tr>
<tr>
<td></td>
<td>◆ Design of Consultation Program</td>
</tr>
<tr>
<td></td>
<td>◆ Engineering and environmental studies underway</td>
</tr>
<tr>
<td>May 2008 to Fall 2008</td>
<td>◆ Initiate and conduct comprehensive consultation on project</td>
</tr>
<tr>
<td></td>
<td>◆ Engineering and environmental studies continue</td>
</tr>
<tr>
<td>Winter 2008/9 – Summer 2009</td>
<td>◆ Compile findings, consider input, develop reports</td>
</tr>
<tr>
<td></td>
<td>◆ Engineering and environmental studies continue</td>
</tr>
<tr>
<td></td>
<td>◆ Updated interim project cost estimates</td>
</tr>
<tr>
<td>Fall 2009</td>
<td>◆ BC Hydro’s recommendation to government</td>
</tr>
</tbody>
</table>

◆ Current $41 million request covers up to BCH recommendation
Questions?
DSM Decisions Sought

◆ 2008 LTAP
  ■ Approve proposed BC Hydro costs for:
    • implementation of X years of energy-focused DSM initiatives; and
    • definition of capacity-focused DSM initiatives

◆ Future applications
  ■ Approve proposed BC Hydro costs for next time period of DSM implementation

◆ Staged applications provide flexibility to periodically adjust DSM plan and expenditures based on new information
Assembling the DSM Scenarios

Supporting Initiatives
- Public Awareness and Communication
- Community Engagement
- Codes and Standards Support
- Technology Innovation

Codes and Standards
- Lower
- Higher

Rate Structures
- Lower
- Higher

Programs
- Lower
- Higher

Combined Scenarios
- Lower = lower codes and standards, rate structures and programs + program adjustments
- Higher = higher codes and standards, rate structures and programs + program adjustments
Strategic Framework for DSM

- Energy conservation can be influenced at 3 levels
  - individual, market and societal

- Majority of DSM plan effort is at individual and market levels
  - Individual: programs
  - Market: rate structures and codes and standards, with more to come

- Beginning to focus on societal level, with more to come
  - public awareness $\rightarrow$ attitudes $\rightarrow$ commitment
  - community engagement
Preliminary Analysis Results

<table>
<thead>
<tr>
<th></th>
<th>GWh in 2020</th>
<th>MW in 2020</th>
<th>All Ratepayers (TRC) Benefit Cost Ratio</th>
<th>All Ratepayers (TRC) Cost ($/MWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lower</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low (20%)</td>
<td>8,500</td>
<td>1,500</td>
<td>Planned 2.4</td>
<td>Planned 36</td>
</tr>
<tr>
<td>Mid (60%)</td>
<td>10,200</td>
<td>1,700</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High (20%)</td>
<td>12,000</td>
<td>1,900</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Higher</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>9,900</td>
<td>1,700</td>
<td>Planned 2.4</td>
<td>Planned 36</td>
</tr>
<tr>
<td>Mid</td>
<td>12,000</td>
<td>2,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>14,300</td>
<td>2,300</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Lower

Codes and Standards 31%
Programs 51%
Rate Structures 18%

Higher

Codes and Standards 27%
Programs 55%
Rate Structures 18%
# Codes and Standards

<table>
<thead>
<tr>
<th>Category</th>
<th>Planned GWh in 2020</th>
<th>Lower</th>
<th>Higher</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Electronics</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standby power, set-top boxes, external power supplies, battery chargers</td>
<td>1,310</td>
<td>1,310</td>
<td></td>
</tr>
<tr>
<td><strong>Incandescent lighting</strong></td>
<td></td>
<td>850</td>
<td>850</td>
</tr>
<tr>
<td><strong>Other residential equipment</strong></td>
<td></td>
<td>360</td>
<td>420</td>
</tr>
<tr>
<td>Ceiling fans, furnace blower motors, torchieres, hot tubs, small motors, seasonal lights, portable air-conditioners, drinking water coolers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Building code</strong></td>
<td></td>
<td>350</td>
<td>380</td>
</tr>
<tr>
<td><strong>Commercial equipment</strong></td>
<td></td>
<td>100</td>
<td>220</td>
</tr>
<tr>
<td>Dusk to dawn luminaires, streetlights, high intensity discharge lamps and ballasts, commercial building operators, packaged terminal air-conditioners, ice-cube makers, large air-conditioners, commercial clothes washers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Appliances</strong></td>
<td></td>
<td>200</td>
<td>200</td>
</tr>
<tr>
<td>Clothes washers, refrigerators, freezers, dishwashers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Large motors</strong></td>
<td></td>
<td>130</td>
<td>130</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>3,290</td>
<td>3,500</td>
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Rate Structures

<table>
<thead>
<tr>
<th></th>
<th>Planned GWh in 2020</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Lower</td>
</tr>
<tr>
<td>Residential inclining block</td>
<td>800</td>
</tr>
<tr>
<td>Small general service inclining block</td>
<td>100</td>
</tr>
<tr>
<td>Large general service inclining block</td>
<td>560</td>
</tr>
<tr>
<td>Transmission stepped rate</td>
<td>510</td>
</tr>
<tr>
<td>Total</td>
<td>1,970</td>
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</table>
# Programs

<table>
<thead>
<tr>
<th></th>
<th>Planned GWh in 2020</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Lower</td>
</tr>
<tr>
<td>Residential</td>
<td>1,230</td>
</tr>
<tr>
<td>Commercial</td>
<td>1,490</td>
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<tr>
<td>Industrial</td>
<td>2,840</td>
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<tr>
<td>Total</td>
<td>5,560</td>
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## Residential Programs

<table>
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<th>Program</th>
<th>Planned GWh in 2020</th>
</tr>
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<tr>
<td></td>
<td>Lower</td>
</tr>
<tr>
<td>Behaviour</td>
<td>310</td>
</tr>
<tr>
<td>Voltage Optimization</td>
<td>240</td>
</tr>
<tr>
<td>Lighting</td>
<td>150</td>
</tr>
<tr>
<td>Windows</td>
<td>140</td>
</tr>
<tr>
<td>District Energy</td>
<td>110</td>
</tr>
<tr>
<td>Refrigerator Buy Back</td>
<td>90</td>
</tr>
<tr>
<td>Building Envelope</td>
<td>70</td>
</tr>
<tr>
<td>New Home</td>
<td>40</td>
</tr>
<tr>
<td>Low Income</td>
<td>30</td>
</tr>
<tr>
<td>Appliances &amp; Electronics</td>
<td>30</td>
</tr>
<tr>
<td>Self Generation</td>
<td>10</td>
</tr>
<tr>
<td>Variable Speed Motors</td>
<td>10</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1,230</strong></td>
</tr>
</tbody>
</table>

Reliable power, at low cost, for generations. Reliable power, at low cost, for generations. Reliable power, at low cost, for generations. Reliable power, at low cost, for generations.
## Commercial Programs

<table>
<thead>
<tr>
<th>Program</th>
<th>Lower</th>
<th>Higher</th>
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<tbody>
<tr>
<td>Power Smart Partners</td>
<td>630</td>
<td>750</td>
</tr>
<tr>
<td>Product Incentive</td>
<td>270</td>
<td>320</td>
</tr>
<tr>
<td>High Performance Building</td>
<td>240</td>
<td>310</td>
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<tr>
<td>Building Optimization</td>
<td>120</td>
<td>150</td>
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<tr>
<td>Voltage Optimization</td>
<td>80</td>
<td>80</td>
</tr>
<tr>
<td>Behaviour</td>
<td>70</td>
<td>60</td>
</tr>
<tr>
<td>Load Displacement</td>
<td>60</td>
<td>60</td>
</tr>
<tr>
<td>District Energy</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1,490</strong></td>
<td><strong>1,770</strong></td>
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### Industrial Programs

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<th></th>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower</td>
<td>810</td>
<td>470</td>
<td>420</td>
<td>280</td>
<td>250</td>
<td>240</td>
<td>220</td>
<td>140</td>
<td>2,840</td>
</tr>
<tr>
<td>Higher</td>
<td>940</td>
<td>710</td>
<td>900</td>
<td>340</td>
<td>250</td>
<td>290</td>
<td>220</td>
<td>320</td>
<td>3,960</td>
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Supporting Initiatives

◆ Public Awareness and Communication

- expanded school program and youth campaigns
- celebrity Team Power Smart and ambassador program
- re-emphasis on mass media communication aimed at public attitude and commitment
- internet strategy to create virtual conservation community and coordinated sources of information
Supporting Initiatives

◆ Codes and Standards Support

- actively build coalitions to support market transformation
- provide funding and technical support for standards development
- conduct research work on codes and standards in other jurisdictions
- focus future efforts on wider policy options that encourage investment in energy efficiency
- develop a strategy to align standards during First Nations treaty process
Supporting Initiatives

◆ Community Engagement

- support local government development of sustainable community plans and community energy planning
- explore opportunities to employ codes and standards at the local government level
- embed Power Smart specialists within communities to develop and support grassroots conservation efforts
- partner with non-government organizations for delivery of conservation initiatives
Supporting Initiatives

◆ Technology Innovation

- identify world-leading energy efficient technologies that can be brought to BC
- work with customers to demonstrate the potential of a technology
- implement a strategy to foster distributed generation among customers
- develop partnerships with other utilities, research organizations and industry
- track new business models, technology trends and investment
## Key Risks

<table>
<thead>
<tr>
<th>Codes and Standards</th>
<th>Rate Structures</th>
<th>Programs</th>
</tr>
</thead>
<tbody>
<tr>
<td>◆ government approval</td>
<td>◆ regulatory approval</td>
<td>◆ regulatory approval</td>
</tr>
<tr>
<td>◆ coverage</td>
<td>◆ coverage</td>
<td>◆ participation rate</td>
</tr>
<tr>
<td>◆ efficiency level</td>
<td>◆ price cap</td>
<td>◆ savings per participant</td>
</tr>
<tr>
<td>◆ compliance</td>
<td>◆ customer response (elasticity)</td>
<td></td>
</tr>
</tbody>
</table>
Towards Additional Savings

◆ Several DSM plan elements will set the stage for additional savings over the long term
  ■ codes and standards
  ■ rate structures
  ■ enhanced awareness/education
  ■ community engagement
  ■ technology innovation
  ■ niche DSM programs
  ■ DSM program components that target the market level

◆ Through these elements, BC Hydro expects to learn about new ways to save electricity that can be incorporated in future DSM plans
Questions?
Long-Term Electricity & Gas Price Forecast

David Ince
Purpose

Describe key developments in electricity and gas price forecasting methodology:

- **Scenario-based forecasting approach preserved:**
  - Scenarios must test plausible alternative future outcomes

- **Improved scenario design:**
  - Adopted California Energy Commission (CEC) gas price and new generation scenarios – developed by Global Energy and reviewed by stakeholders prior to adoption by CEC
  - High Gas case used in the 2006 IEP has been replaced.

- **Price scenarios are no longer simply averaged when applied to decision making:**
  - Structured approach used in determining weighting of scenarios

- **Greenhouse gas (GHG) adders applied to electricity price forecast**
The long-term forecast presents the market price forecast for spot electricity and gas under various scenarios.

Spot is: day-ahead non-firm – contingent on transmission access

Long-term resource acquisitions:
- Integrated Electricity Plans (IEP)
- Energy Call evaluations (example: seasonal and on/off peak price differentials)
BC is part of an interconnected electricity market that spans the western states, northern Mexico and Alberta.

Strong inter-tie connections with the US means that the value of our electricity is influenced by regional events (e.g. California energy crisis).

Our region is called the Western Electricity Coordinating Council (WECC).
WECC Topology: Global MARKETSYM model produces hourly resolution prices generated at each node.
Several market drivers influence the trend of spot market electricity prices:

- Reserve margins: the amount of excess generating capacity
- Technology mix: coal, hydro, natural gas, nuclear
- Fuel prices: natural gas, coal, fuel oil
- Spot market prices do not necessarily include generation capital cost recovery. In an adequately supplied market, spot prices should track the variable cost (only) of generating the electricity.
Alternative to Previous Gas Price Scenarios


- Final report issued by the CEC in December, 2007.
- The IEPR was the result of an extensive study, consultation, and regulatory process.
- CEC introduced gas price and resource strategy scenarios to test alternative electricity supply portfolios. Global Energy was the key consultant used in developing the scenarios.
- California is largest entity in the WECC
- Main themes of scenarios:
  - Natural gas prices
  - Renewables and DSM policies in the WECC
- Global Energy sells the model BC Hydro uses to generate its electricity price forecast (formerly the Henwood model).
Global Energy Decisions recently produced 8 separate gas forecasts for the California Energy Commission IEPR:

1b. Base Scenario
   Generally a continuation of current industry trends, but western states and provinces meet their stated renewable portfolio and energy efficiency standards.
   Plus P25 Low Stochastic Forecast around the base
   Plus P75 Stochastic Forecast around the base

2. Sustained Scarcity (High Scenario)
   3B. High Energy Efficiency in the West
   3C. High Energy Efficiency in Western States/Provinces committed to Greenhouse Gas MOU
   5B. Higher Energy Efficiency and Renewables in the West
   5B Plus. Same as 5B but with production curtailment response to low gas demand and decreased gas prices (Low Scenario)

Global recommended: to manage the number of scenarios, BC Hydro should select CEC scenarios 1b, 2 and 5B. This covers the full range of the gas price scenarios
Global Energy CEC vs. Previous BCH Gas Price Scenarios

2007 Scenarios:
- BC Hydro High Gas
- Energy Information Administration
- Confer Consulting Gas

Reliable power, at low cost, for generations. Reliable power, at low cost, for generations. Reliable power, at low cost, for generations. Reliable power, at low cost, for generations.
Historical Henry Hub Spot Gas Price

Short-Term Energy Outlook, February 2008

Hurricanes Katrina & Rita

$US per thousand cubic feet


Reliable power, at low cost, for generations.
Global Energy Decisions Base Price Case

Theme: “Current conditions extended into the future”

Key assumptions:

◆ Not dissimilar to Reference forecast of the US Energy Information Administration (EIA) in terms of underlying philosophy and resulting price
◆ Is the base gas price forecast from Global Energy Decisions Inc., but is updated with EIA’s higher long-term oil price forecast
◆ Assumptions in Global Base Case:
  ▪ Less LNG into North America due to global price competition
  ▪ Green premium – global push for cleaner fuels – higher gas prices
  ▪ Delayed Alaska North Slope gas from 2016 to 2018 and Mackenzie Delta from 2010 to 2014
  ▪ GHG offset costs included in electricity price modeling for the first time
High Gas Price Scenarios

Reliable power, at low cost, for generations.
Global Energy Decisions High Price Case

Theme: High sustained natural gas and coal prices

The High Price case is prefaced on the following key assumptions:

- Slow enactment of DSM and renewables policies – higher gas consumption for electricity
- Indigenous U.S. gas production drops sharply (35% decline relative to Base Case, by 2020)
- Alaska and Mackenzie gas pipelines delayed beyond 2020
- High world oil prices ($75 increasing to $85/bbl Real)
- Higher LNG development costs
Low Gas Price Scenarios

Henry Hub ($2006/ MMBTU)

- BCH 2007 Confer Gas
- Global Energy Scenario Low

Reliable power, at low cost, for generations. Reliable power, at low cost, for generations. Reliable power, at low cost, for generations.
CEC Low Price Case

Theme: High energy efficiency and renewables throughout the West and lower gas prices including production curtailment

Key assumptions:

◆ Assumes the WECC-wide use of renewable resources plus energy efficiency to attain government-mandated targets
◆ Region-wide DSM targets are not dissimilar to BC Hydro’s own targets
◆ 25% drop in WECC gas demand by 2020 – largely driven by reductions in gas-fired electricity generation
◆ Gas prices show significant decline – this forecast is approximately $5/MMBtu Real
◆ Continental gas exploration, drilling and production drops off in response to lower prices – assumed to be a 3-year lagged effect
Note: The content of this slide (Cambridge Energy Research Associates RPS map) has been removed to allow for electronic distribution of this presentation.
### Resource Additions in the WECC

The scenarios that BC Hydro ran not only included specific gas prices for each case, but different assumptions as to renewable energy and energy efficiency targets. To the right is a high-level supply and demand balance for the WECC region.

Case 1b is the Mid electricity price scenario. Case 2 is the high case. Case 5b results in the lowest electricity prices.

#### 2009 Dependable Capacity (MW)

<table>
<thead>
<tr>
<th></th>
<th>Initial Base Case (Case 1) - Continuation of current trends</th>
<th>Case 1B - Compliance to Renewable Portfolio Standards</th>
<th>Case 2 - High Gas and Coal Prices</th>
<th>Case 5B - High Energy Efficiency and Renewables (Low Gas)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dependable Load</td>
<td>155,659</td>
<td>155,659</td>
<td>155,659</td>
<td>155,659</td>
</tr>
<tr>
<td>Resources:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Demand</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Demand (EE and PV Solar)</td>
<td>2,812</td>
<td>4,683</td>
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<td>9,686</td>
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<td>9,685</td>
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<tr>
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<td>Generic Coal Capacity</td>
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<td>500</td>
<td>500</td>
<td>500</td>
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<td>Named Capacity Additions*</td>
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<td>10,996</td>
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<tr>
<td>Existing Capacity</td>
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<td>183,608</td>
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<td>Total Capacity</td>
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<td>Reserve Margin</td>
<td>34.6%</td>
<td>35.8%</td>
<td>34.9%</td>
<td>36.5%</td>
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</table>

#### 2020 Dependable Capacity (MW)

<table>
<thead>
<tr>
<th></th>
<th>Load</th>
<th>Dependable Load</th>
<th>Resources:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>191,372</td>
<td>191,372</td>
<td>Demand (EE and PV Solar)</td>
</tr>
<tr>
<td></td>
<td></td>
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<td>2,817</td>
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</tr>
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<td></td>
<td></td>
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<td>12,102</td>
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<td></td>
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<td>Generic Gas Capacity</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>37,665</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Generic Coal Capacity</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>6,300</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Named Capacity Additions*</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>12,910</td>
</tr>
<tr>
<td>Existing Capacity</td>
<td>174,513</td>
<td>176,051</td>
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<tr>
<td>Total Capacity</td>
<td>246,307</td>
<td>250,615</td>
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<tr>
<td>Reserve Margin</td>
<td>28.7%</td>
<td>31.0%</td>
<td></td>
</tr>
</tbody>
</table>

Source: Scenario Analysis of California Electric System for the 2007 Integrated Electricity Plan - Third Addendum


*Named capacity additions are units that are currently in development or construction, and are deemed to have a high probability of completion. These additions are common to all scenarios. Of the named additions in the Global database, the capacity breakdown is approximately: Gas – 60%, Wind – 15%, Coal: 15%, Hydro – 5%, Other – 5%.
Electricity Prices – Mid Case

March 2007 to Jan 2008 with GHG Offset costs

Average Electricity Market Clearing Price (Real 2006 USD/MWh)

Years

Jan 2008 Mid Case - Ave
March 2007-EIA07 - Ave

Reliable power, at low cost, for generations. Reliable power, at low cost, for generations. Reliable power, at low cost, for generations. Reliable power, at low cost, for generations.
Results: Gas Forecast Scenarios - Henry Hub

Note: No simple average case. A specific weighting will be applied to each of the scenarios.
Electricity Prices – Mid Case

2008 Forecast with GHG Offset Costs

Reliable power, at low cost, for generations. Reliable power, at low cost, for generations. Reliable power, at low cost, for generations. Reliable power, at low cost, for generations.
# GHG Offset Costs

<table>
<thead>
<tr>
<th>Year</th>
<th>GHG Cost ($C/tonne) - BC Hydro 2005 REAP Submission</th>
<th>GHG Cost WECC ($C/tonne) - Natsource</th>
<th>GHG Cost Canada ($C/tonne) - Natsource</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>15</td>
<td>0</td>
<td>15</td>
</tr>
<tr>
<td>2015</td>
<td>25</td>
<td>14</td>
<td>15</td>
</tr>
<tr>
<td>2020</td>
<td>25</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>2025</td>
<td>32</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>2027</td>
<td>-</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>2030</td>
<td>41</td>
<td>39</td>
<td>39</td>
</tr>
</tbody>
</table>

**Thermal generation plant performance standard:**
- Alberta: 600 tonnes/GWh
- Washington, Oregon, California: 360 tonnes/GWh
- Rest of WECC: 600 tonnes/GWh
- BC: zero
- CCGT: 360 tonnes/GWh, SCGT: 450 tonnes/GWh, Coal: 1000 tonnes/GWh
The effect of including the Greenhouse Gas offset cost adder to WECC thermal generation is indicated here. The uplift at Mid-Columbia is approximately US$2-4/MWh.
These are the simulated spot market electricity prices for Mid-Columbia. This is the weighted average of On and Off-peak prices.
Summary

Key Differences/Updates in Methodology:

◆ Scenario-based forecasting approach preserved:
  ■ Scenarios must test plausible alternative future outcomes

◆ Improved scenario design:
  ■ Improved high energy price scenario
  ■ Scenarios developed by Global Energy: a credible third-party forecaster
  ■ Scenarios have been tested thoroughly in a previous review setting (CEC long-term planning process), and adopted by CEC

◆ Price scenarios are no longer simply averaged

◆ GHG adders applied to electricity price forecast
Questions?
GHG Offset Price Forecast

Patrice Rother
Presentation Outline

- Why the GHG price forecast is needed
- Differences between earlier forecast and today’s
- Driving forces influencing GHG price
- Methodology
  - Scenario analysis
  - Use of economic models
- Results and conclusions
Why Forecast GHG Price?

- Increased public attention to climate change have spurred policy developments in the GHG regulatory framework at the provincial, federal (Canada and US), US state, and international levels.

- These policies are expected to create and influence the market price for GHGs through mechanisms such as offsets and emissions trading.

- This presents a risk to BC Hydro, with the potential to influence resource mix on the basis of cost:
  - Increased costs to operate BGS
  - Increased operating costs for new thermal resources
  - Impacts on emission trading and related decision making
  - Potential offset opportunities / costs and related decision making
New forecast compared to 2006

- The consulting group Natsource prepared an earlier forecast for BC Hydro, used for the 2006 Integrated Electricity Plan.

- Natsource was retained to update the forecast to reflect recent developments in the GHG regulatory framework. Key changes:
  - Increased certainty since the IEP that there are no policy scenarios with a $0/tonne GHG price
  - Probabilities have been assigned to the three scenarios used to bound the forecast prices
  - The range of regulatory developments in the interim period and relevant economic models have been considered to develop scenarios and evaluate price implications.
Driving forces influencing GHG price

- The forecast considers two key drivers influencing GHG price:
  - the stringency of regulatory policy (targets); and
  - the flexibility of compliance mechanisms (supply/availability).
- The forecast is a starting point to estimate future costs, considering uncertainties and the early state of GHG markets.
Driving forces influencing GHG price

The Report evaluates recent policy developments in BC, neighboring states and provincial jurisdictions and Canadian and US federal policy:

- Legislated BC target of 33% emission reduction levels by 2020.
- Establishment of the Western Climate Initiative (WCI), a partnership of 7 US states and 2 provinces including BC, to develop regional strategies to address climate change. A cap and trade program is being designed by the WCI partners.
- Legislative proposals before the US Congress that require reductions and incorporate emissions trading.
- US state GHG-related legislative targets and proposals, with emphasis on WCI and Western Electricity Coordinating Council (WECC) states. WECC is responsible for coordinating and promoting electric system reliability within the western region of interconnected power systems.
- Canada’s Regulatory Framework for Air Emissions.
Driving forces influencing GHG price

The review of regulatory developments concluded that the key policy drivers impacting the price of GHGs to BC Hydro include:

- The evolving relationship between the GHG policies of BC and the states in the WCI and WECC;
- The evolving relationship between the GHG policies of Canada and the US at the Federal level; and
- The approach that BC takes in response to Federal policy.
Three scenarios were created to describe the range of potential GHG policy outcomes for 2007-2050 and bound the associated forecast GHG prices:

- **Price Cap**: Canada and the US are outside of an international agreement and implement less ambitious policies, including capped prices on GHG emissions per the current Regulatory Framework in Canada and less-stringent legislative proposals in the US.

- **Linked Markets**: Canada and the US establish more ambitious targets and link trading programs after 2015. They join an international framework by 2020, with limited constraints on domestic and international offsets.

- **Made in North America-Aggressive Targets**: Canada and the US establish more aggressive targets and link trading in 2012, but do not join an international regime. International offsets (outside of North America) are not allowed.

- No $0 scenario was included. Given public awareness of climate change and current political momentum, the consultants concluded there are no foreseeable policy scenarios with a $0 price.
Scenario Overview

- Two sensitivity cases were described for the near term 2007-2020, when BC may decide to pursue emission reduction programs, either on its own or as part of a regional group such as WCI or WECC:
  - **BC only**: BC will meet its stated reduction targets with legally binding hard caps, without using offsets or compliance instruments from outside the province.
  - **WCI/WECC**: BC will meet its stated reduction targets as a participant in a WCI regional trading program starting in 2012. Eligible offsets would be created within the WCI/WECC region.

- The BC only case was not considered likely; the current activity of the WCI in developing a cap and trade system was considered more likely to influence GHG price in the near term.

- In all scenarios and sensitivity cases, regional regulatory programs are forecast to be replaced by national programs by 2020.
Use of economic models

- Natsource relied on an evaluation of existing economic models that incorporate GHG policy scenarios to derive future GHG prices.
- Both “global” and “US-centric” models were used in the analysis.
- Global models estimate the economically efficient emission reduction trajectory consistent with achieving a given target.
  - least-cost models
  - assume reductions take place in transparent markets with no transaction costs
  - allow technology to evolve (most reductions take place in the second half of the century).
- US-centric models incorporate hard targets and timetables specific to individual legislative proposals or regulatory frameworks.
- Global models result in lower estimates than US-centric models. Natsource provides an assessment of the key assumptions and uncertainties in economic models reviewed to explain rationale in their usage and the conclusions derived.
## Results: Scenarios

### Price Estimates for Planning Scenarios (CDN $2008)

<table>
<thead>
<tr>
<th>Year</th>
<th>2010</th>
<th>2012</th>
<th>2015</th>
<th>2020</th>
<th>2030</th>
<th>2040</th>
<th>2050</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Price Cap Scenario</strong></td>
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<tr>
<td></td>
<td>$14</td>
<td>$14</td>
<td>$18</td>
<td>$18</td>
<td>$18</td>
<td>$18</td>
<td>$18</td>
</tr>
<tr>
<td><strong>Linked Markets Scenario</strong></td>
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</tr>
<tr>
<td><strong>Price Range</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Canada:</td>
<td>$14</td>
<td>Canada:</td>
<td>$18</td>
<td>$15-25</td>
<td>$24-54</td>
<td>$39-59</td>
<td>$63-97</td>
</tr>
<tr>
<td><strong>Mid Point</strong></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Canada:</td>
<td>$14</td>
<td>Canada:</td>
<td>$18</td>
<td>$20</td>
<td>$39</td>
<td>$49</td>
<td>$80</td>
</tr>
<tr>
<td><strong>Made in North America Aggressive Targets Scenario</strong></td>
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<td></td>
</tr>
<tr>
<td><strong>Price Range</strong></td>
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</tr>
<tr>
<td>Mid Point</td>
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<td>$24-47</td>
<td>$35-57</td>
<td>$65-84</td>
<td>$112-124</td>
<td>$166-187</td>
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<td>$20</td>
<td>$36</td>
<td>$46</td>
<td>$75</td>
<td>$118</td>
<td>$177</td>
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</table>

### Price Estimates for Sensitivity Cases (CDN $2008)

<table>
<thead>
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<th>Year</th>
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<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BC compliance instruments only</strong></td>
<td></td>
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<tr>
<td>As applied to all scenarios</td>
<td>Range</td>
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<td>$140-258</td>
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<td>Mid Point</td>
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<td>$199</td>
<td>&gt; $291</td>
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<td><strong>WCI/WECC compliance instruments only</strong></td>
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<tr>
<td>Price Cap scenario (^1)</td>
<td>Range</td>
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<td>$16-46</td>
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<tr>
<td>Mid Point</td>
<td>$12</td>
<td>$31</td>
<td>$78</td>
</tr>
</tbody>
</table>

---

Reliable power, at low cost, for generations. Reliable power, at low cost, for generations. Reliable power, at low cost, for generations. Reliable power, at low cost, for generations.
Comparison of forecast to other utility IRPs

GHG cost adders used by several US utility Integrated Resource Plans were reviewed to evaluate the forecast results.

<table>
<thead>
<tr>
<th>Entity</th>
<th>Process</th>
<th>GHG Adder Range $^{118}$ (CDN$2008/tonne of CO$_2$e)</th>
<th>Timeframe of Analysis for GHG Adders</th>
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</thead>
<tbody>
<tr>
<td>PacifiCorp</td>
<td>IRP (2007)$^{119}$</td>
<td>$0 - $69.60</td>
<td>2007-2026</td>
</tr>
<tr>
<td>Northwestern Energy</td>
<td>RPP (2005)$^{120}$</td>
<td>$6.50 - $36.93</td>
<td>2010-2025</td>
</tr>
<tr>
<td>Idaho Power Company</td>
<td>IRP (2006)$^{122}$</td>
<td>$0 - $60.06</td>
<td>2006-2025</td>
</tr>
<tr>
<td>Avista Utilities</td>
<td>IRP (2007)$^{123}$</td>
<td>$0 - $41.57</td>
<td>2015-2027</td>
</tr>
<tr>
<td>Portland General Electric</td>
<td>IRP (2007)$^{124}$</td>
<td>$8.36 - $69.19</td>
<td>2010-2027</td>
</tr>
<tr>
<td>Seattle City Light</td>
<td>IRP (2006)$^{125}$</td>
<td>$6.01 - $101.16</td>
<td>2006-2026</td>
</tr>
<tr>
<td>Tri-State</td>
<td>IRP (2007)$^{126}$</td>
<td>$11.71 - $43.65</td>
<td>2007-2026</td>
</tr>
<tr>
<td>Colorado Springs</td>
<td>IRP (2007, Draft)$^{127}$</td>
<td>$0-$108.26</td>
<td>2010-2027</td>
</tr>
<tr>
<td>San Diego Gas and Electric</td>
<td>RFG$^{131}$</td>
<td>$10.22</td>
<td>n.a.</td>
</tr>
</tbody>
</table>

Reliable power, at low cost, for generations. Reliable power, at low cost, for generations. Reliable power, at low cost, for generations. Reliable power, at low cost, for generations.
Results: likelihood of scenarios

◆ Linked Markets considered most likely (60%)
  - Globally, a 550 ppmv CO₂ concentration target is under consideration by many countries; US legislation considered most likely uses this target.
  - In Canada, the business community is calling for a national GHG reduction program with harmonization and consistency across provinces.

◆ The “Made in North America” scenario 2nd most likely (25%)
  - If Canada and the US seek to facilitate the turnover of older emissions-intensive power plants. The importance of coal in the US and Canadian power sectors suggests this may be less likely than the Linked Markets approach with broader offsets and compliance flexibility.

◆ “Price Cap” scenario least likely (15%)
  - Legislative proposals with less ambitious targets were considered less likely to be acceptable to the public. Although there is interest in evaluating mechanisms to control costs, price caps appear to have less support in the US than previously. International offsets were considered a more likely approach to reduce costs.
  - The current Canadian price cap proposed under the Federal Regulatory Framework is not specified beyond 2017.

◆ The WCI/WECC sensitivity case was considered most likely for estimating GHG price in BC for the near-term 2012 – 2015.
## Conclusions: Likely price scenarios

<table>
<thead>
<tr>
<th>Year</th>
<th>2012</th>
<th>2015</th>
<th>2020</th>
<th>2030</th>
<th>2040</th>
<th>2050</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Most Likely Policy Scenario</strong></td>
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<td>WC/WECC Compliance Instruments Only</td>
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<td></td>
<td></td>
</tr>
<tr>
<td><strong>BC Price Ranges (all prices CDN$2008/tonne CO₂e)</strong></td>
<td>$9-14</td>
<td>$16-46</td>
<td>$15-25</td>
<td>$24-54</td>
<td>$39-59</td>
<td>$63-97</td>
</tr>
<tr>
<td><strong>BC Mid-Point</strong></td>
<td>$12</td>
<td>$31</td>
<td>$20</td>
<td>$39</td>
<td>$49</td>
<td>$80</td>
</tr>
<tr>
<td><strong>Canadian Federal Program (intensity target and price cap through 2015) Price Ranges</strong></td>
<td>$14</td>
<td>$18</td>
<td>$15-25</td>
<td>$24-54</td>
<td>$39-59</td>
<td>$63-97</td>
</tr>
<tr>
<td><strong>Canadian Mid-Point</strong></td>
<td>$14</td>
<td>$18</td>
<td>$20</td>
<td>$39</td>
<td>$49</td>
<td>$80</td>
</tr>
<tr>
<td><strong>U.S. Mid-Point</strong></td>
<td>$15</td>
<td>$14</td>
<td>$20</td>
<td>$39</td>
<td>$49</td>
<td>$80</td>
</tr>
</tbody>
</table>

Reliable power, at low cost, for generations.
BC’s Carbon Tax

On February 19, 2008, the BC Government’s 2008 provincial budget included the intention to introduce a revenue-neutral carbon tax (subject to approval by the legislature).

The tax will apply to the purchase or use of virtually all fossil fuels within the Province of B.C.

The carbon tax has been set at $10 per tonne of associated CO2-equivalent emissions, starting July 1, 2008, increasing annually to $30 per tonne of CO2-equivalent on July 1, 2012.

Natsource’s conclusions regarding GHG prices assumed the prime driver for emissions reductions in BC’s power generation sector would be legislation and accompanying regulation associated with GHG trading programs. The assumption remains valid because:

- The carbon tax price signals are for the purpose of setting the rate of the carbon tax within B.C.
- In its 12 February 2008 Throne Speech, the Provincial Government clearly signaled its intention to introduce legislation to facilitate B.C.’s participation in the regional cap and trade system being developed for large industrial emitters under the WCI.
- It is BC Hydro’s understanding that it will be subject to the carbon tax, as well as offset requirements to meet Energy Plan policy actions related to thermal generation.
Conclusions

◆ Linked Market most likely scenario to 2050, with WCI/WECC activity influencing price in the short term.

◆ The price forecast compares to those prepared for IRPs for other utilities in the US.

◆ Natsource concluded that a $0 scenario is not foreseeable.

◆ Carbon tax not expected to impact the GHG offset price forecast.
Questions?
The Risk Framework: An Introduction

Basil Stumborg
General Introduction

- LTAP addresses implementing the 2007 Energy Plan
  - Actions and choices largely determined by Energy Plan targets, guidelines
  - Key issue is to demonstrate impacts and manage risks
  - Will result in Base Plan plus Contingency Plans to manage risks

- Analysis will be to develop:
  - Short term actions
  - Longer term direction
  - Milestones and offramps for future decisions
Introduction to the Risk Framework

- Uncertain world out there – with lots of moving pieces

- We need a way to:
  - Characterize risks
  - Understand the value of keeping options open
  - Assess tradeoffs

- Risk Framework - a process to work through key risks / understand impacts
  - Process and probability trees are representations of risks that exist

- At end of the risk process, we will need to assess how this drives our actions
  - Need to keep separate analysis from decision making
Explanation of Risk Framework

1. Key Elements
2. Estimating “Uncertainty”
3. Building a Probability Tree
4. Contingency Plans
5. Portfolio Analysis to Highlight:
   - Resource Additions
     - Timing/size
   - Milestones
   - Offramps
6. Key Policy Questions
1 – Key Elements

Key drivers of uncertainty to be examined:

- BGS
- ILM
- IPP Attrition
- Load Growth
- DSM
- Gas/Electricity/GHG prices
2 – Estimating Uncertainty for Each Element

Moving from qualitative discussion to quantitative measures

e.g., Gas/Electricity Price Scenarios

List of Key Uncertainties

• Issue #1
• Issue #2
• Issue #3
• Issue #4

<table>
<thead>
<tr>
<th>Issue #</th>
<th>Rank of Likelihood</th>
<th>Qualitative Comparison</th>
<th>Relative Likelihood</th>
</tr>
</thead>
<tbody>
<tr>
<td>Issue #1</td>
<td>Most Likely</td>
<td>Twice as likely as #3</td>
<td>60%</td>
</tr>
<tr>
<td>Issue #3</td>
<td>Middle</td>
<td>Three times as likely as #4</td>
<td>30%</td>
</tr>
<tr>
<td>Issue #4</td>
<td>Least Likely</td>
<td>Base of Comparison</td>
<td>10%</td>
</tr>
</tbody>
</table>
2 – Estimating Uncertainty for Each Element

- Can be put into a probability tree

<table>
<thead>
<tr>
<th>Issue #</th>
<th>Rank of Likelihood</th>
<th>Qualitative Comparison</th>
<th>Relative Likelihood</th>
</tr>
</thead>
<tbody>
<tr>
<td>Issue #1</td>
<td>Most Likely</td>
<td>Twice as likely as #3</td>
<td>60%</td>
</tr>
<tr>
<td>Issue #3</td>
<td>Middle</td>
<td>Three times as likely as #4</td>
<td>30%</td>
</tr>
<tr>
<td>Issue #4</td>
<td>Least Likely</td>
<td>Base of Comparison</td>
<td>10%</td>
</tr>
</tbody>
</table>

![Probability Tree Example](image)
Can move from complex trees to:
- Simple representations
- Full Distributions

Distribution for Comm Rates (Structural, Aggressive)/C20

20% High
35% Low
45% Low

Mean = 658.3

Values in Thousands

0.000 0.050 0.100 0.150 0.200 0.250 0.300

Values in C/1000

Reliable power, at low cost, for generations. Reliable power, at low cost, for generations. Reliable power, at low cost, for generations. Reliable power, at low cost, for generations.
2 – Estimating Uncertainty – cont’d

◆ Conclusion

- Involves structured but qualitative assessments
- Uses a range of expected outcomes:
  - Reduces emphasis on producing “the correct” number
  - Makes us think about upside and downside risks to avoid giving the wrong (i.e. too narrow) range
- A simple way of comparing the likelihood of uncertain outcomes
- Actual discussions will look very different from item to item
- A consistent, bottom up approach to expressing uncertainty
Putting these elements together creates a probability tree.

Each node represents a chance event.

Probabilities are spelled out.

End node contains the probability of seeing that combination of chance events.

Example on next page.
Even if each chance event is represented as Hi/Mid/Low, tree grows quickly.

Some simplifications will be needed.

We will need to balance:
- Insight
- Precision
3 – Building a Probability Tree – cont’d

◆ Conclusions

- Probability tree collapses individual sensitivities into one view
- Each path (start to end node) represents a “scenario”
- Allows us to be explicit about our probability judgments
- Provides framework for examining the likelihood of LTAP risks
- Goal is to separate out probability judgments from value judgments in analysis
4 – Contingency Plans

◆ Conversation guided by probability tree
◆ Some paths are in the range of the “expected”
◆ Others are outside of this range
◆ Keeping supply = demand in more extreme scenarios forces us to be clear about:
  • What contingency we are planning for
  • Its relative likelihood
  • What resources we would use to meet that contingency
  • What the impacts would be in that instance
5 – Portfolio Analysis

- Goal is to model portfolios to meet specific scenarios
- If some resource additions are common to portfolios across diverse scenarios
  - Put into LTAP as a needed resource
- If there are key differences in resource additions among scenarios
  - Develop offramps and key milestones for future planning decisions
6 – Method to Examine Key Issues

◆ Probability tree forms basis for analysis.
◆ Approach is a “with/without” comparison.
◆ Example – Option Analysis
  - For all (key?) scenarios, optimize resource additions
  - If many paths along the tree are modeled, this will give a cost distribution

![Probability Tree Diagram]

Option A included

Cost (NPV ($))

Reliable power, at low cost, for generations. Reliable power, at low cost, for generations. Reliable power, at low cost, for generations. Reliable power, at low cost, for generations.
Example cont’d

- Then do the same but a restricted set of options
- This will generate a different cost curve
- These curves can then be compared (see below)
Conclusion

◆ Goals of the Risk Framework:

- Characterizing risks (probabilities and consequences)
- Separating probability judgments from value judgments
- Describing contingency plans
  - Under what scenarios
  - Relative likelihoods
- Describing tradeoffs clearly
- Link analysis clearly to:
  - Near term decisions
  - Future decisions (milestones and offramps)
Questions?
For More Information

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