INTEGRATED RESOURCE PLAN TECHNICAL ADVISORY COMMITTEE MEETING #3

February 14, 2011

BC hydro

FOR GENERATIONS

FORT NELSON / HORN RIVER BASIN

JOHN RICH

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OVERVIEW

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- Background
  - Current BC Hydro supply situation
  - Horn River Basin load requirements
- Key Challenges
  - Uncertainty of HRB development potential
  - Climate change policy considerations
  - Industry supply choices
  - Distances
- Preliminary Findings
- Questions being addressed in IRP

BACKGROUND: CURRENT SITUATION

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Fort Nelson far north of BC Hydro's integrated system

- Integrated with the Alberta system via a single 144 kV transmission line
- Electricity supply to the Fort Nelson area provided by the Fort Nelson Generating Station (FNG) with backup from Alberta
- Current and committed supply situation:

	FNG	Alberta
Current	40 MW	38.5 MW
Planned (2012)	75 MW	75 MW

- Horn River Basin (HRB) is further north, covers a vast area, and has no interconnections

BACKGROUND: HRB LOAD CENTRES

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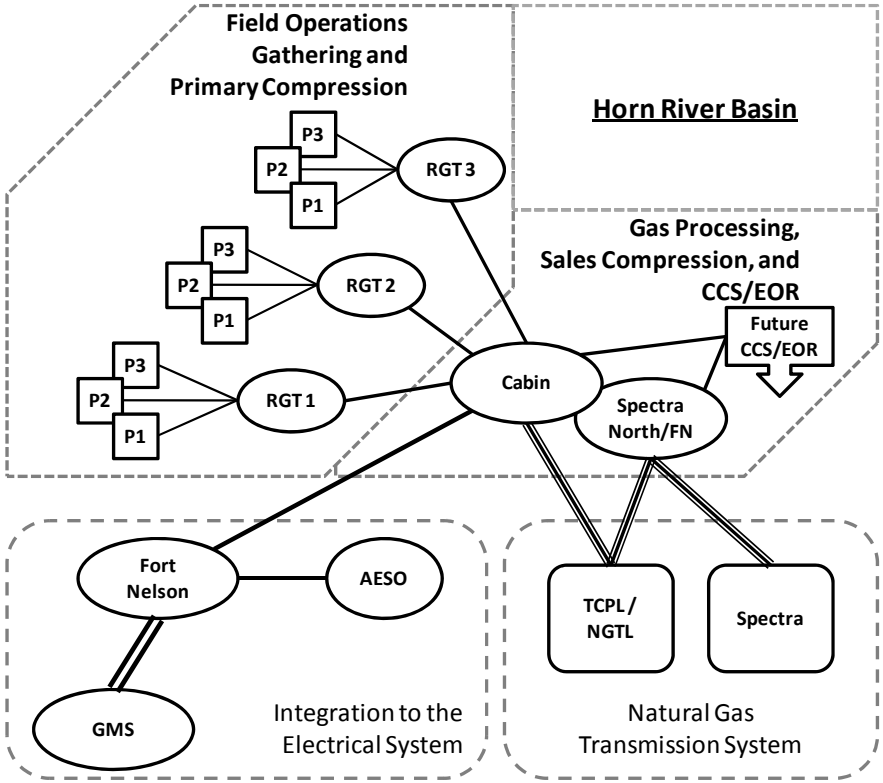
Two general work zones:

- Centralized processing plants
  - Natural gas processing
    - Significant heat load
  - Carbon dioxide (CO_2) extraction and compression for carbon capture and storage (CCS) / enhanced oil recovery
  - Sales gas compression
- Field operations
  - Raw gas treatment (RGT) stations, including primary compression
  - Wellhead gas extraction, including shale fracturing loads



KEY CHALLENGES

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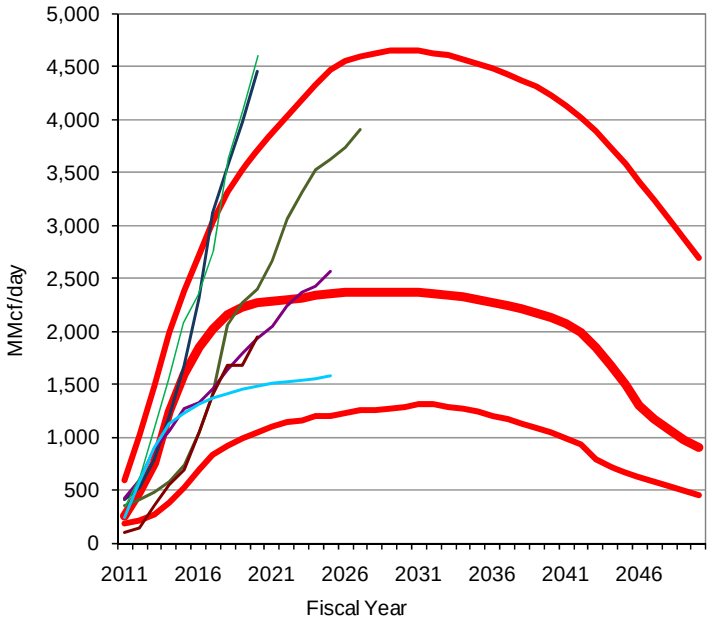
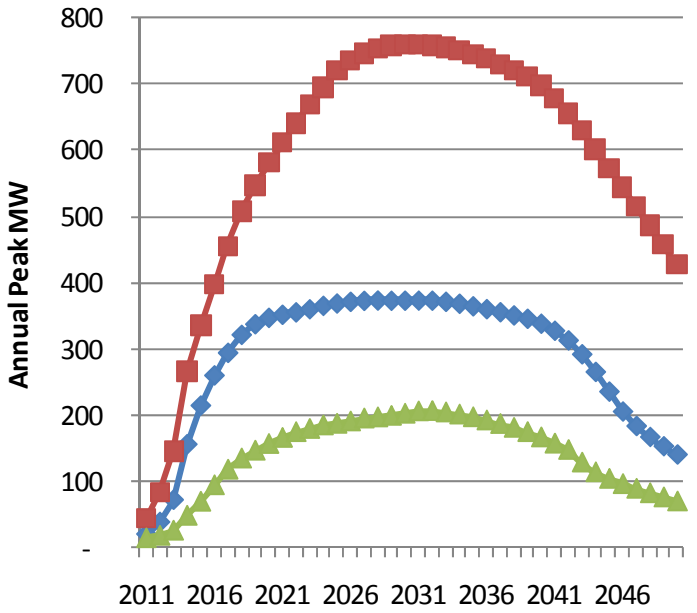
Wide range of natural gas production results in a wide range of work to process and ship the natural gas

Forecasts of HRB Natural Gas Production



Total Work Required to Process and Ship Gas including CCS



KEY CHALLENGES

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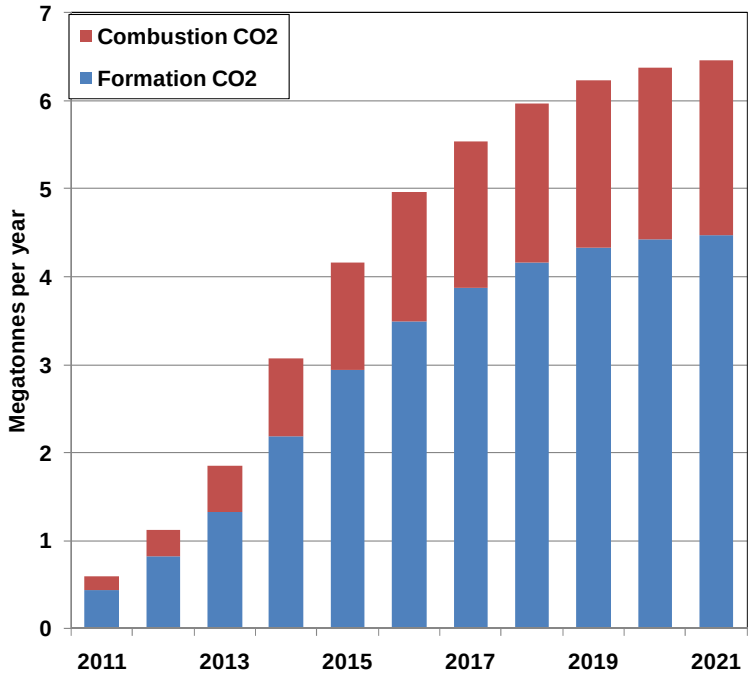
Climate Change Policy Considerations

- Significant greenhouse gas (GHG) production associated with HRB
  - Formation CO_2 (12% of natural gas)
  - Combustion CO_2
- Creates new pressures to allow the resource development while managing climate change policy
- Electrification and CCS are potential opportunities to meet both objectives
- Producers consider electric service as a means of managing GHG
- No GHG benefit by trading industry natural gas drives for utility natural gas generation



KEY CHALLENGES

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Industry Supply Choices

- Remote natural gas developments such as HRB would have traditionally been “self-served”
  - Diesel engines
  - Direct drive natural gas turbines
  - Co-generation providing steam, heat and electricity
- Natural gas is readily available at site
- Utilities would not have been considered as the predominant source of work energy to develop these activities
- Industry choice appears to be shifting to considering utility supply as a means to reduce costs and mitigate GHG liability

KEY CHALLENGES

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Distance to the HRB Load Locations

- Fort Nelson is 410 km from existing BC Hydro interconnection points
  - Sufficient interconnections to Alberta would be significantly further
- Processing stations in Horn River Basin are a further 90 km from Fort Nelson → Comprises 25% to 40% of total HRB work load
- Raw gas treatment stations and drilling platforms could be spread over several hundred km → Comprises 60 to 75% of total HRB work load

KEY CHALLENGES

Timing of Electrification

- BC Hydro has not yet received any formal requests for service to the HRB
- BC Hydro is currently advancing through the development phase of the Northeast Transmission Line (NETL) project
  - Earliest in service date is 2017
- Industry is currently using self-supply to meet its needs
  - By the time the NETL could be in service, a significant amount of self-supply infrastructure will be in place
  - Expect some of the load to convert to electricity once electricity is available

PRELIMINARY FINDINGS

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Economics of Electrification for GHG Reduction

- Most significant GHG reduction would come through CCS, not necessarily electrification
  - Sequestering formation CO_2 has largest GHG reduction impact (i.e., formation CO_2 much larger than combustion CO_2)
  - Therefore value of electrification is only based on converting CCS work from thermal to clean systems
- Electrifying would involve use of clean resources
  - Likely located on the interconnected system
  - Would require new transmission infrastructure
- Electrification could be an economic GHG option if:
  - Clean energy cost + transmission cost - cost of local gas-fired electricity is less than GHG offset cost

PRELIMINARY FINDINGS

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- The combined transmission and sub-transmission cost to serve the HRB in the order of $1.5 to $2.0 billion
- The amount of load that industry would look to BC Hydro to serve remains uncertain
  - Lead time for BC Hydro to provide service is generally longer than lead time for industry to install infrastructure that may require electric service
- Carbon sequestration and electrification could reduce the GHG that would be produced in the HRB under business as usual
  - 65% to 70% reduction through carbon sequestration (if sequestration is feasible)
  - 10% to 15% reduction with electrification
- Electrification may be economic – initial analysis indicates that the effective cost/tonne of CO_2 reduction as a result of electrification is in the range of expected GHG offset costs

REMAINING QUESTIONS

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From BC Hydro's Perspective:

Available BC Hydro Supply Options

- Clean or renewable resources to supply the load
  - Transmission line from BC integrated system to Fort Nelson / HRB
  - Sub-transmission throughout HRB
- Utility-acquired thermal generation at Fort Nelson
  - Transmission line from Fort Nelson to HRB
  - Sub-transmission throughout HRB

Questions for the IRP Analysis

- What amount of CO_2 is produced in the HRB under various scenarios?
- What is the relative cost impact of using electrification for GHG mitigation?
- What effect would any BC Hydro service of the HRB have on its ability to meet the 93% clean or renewable electricity target?
- Are there any additional benefits of the NETL, such as access to new clean or renewable supply resources