

DATE/TIME	February 28, 2012 9:00 a.m. – 5:00 p.m.
LOCATION	Sandman Vancouver City Centre Moxie's Ballroom 180 West Georgia St., Vancouver, B.C.
TYPE OF MEETING	Regular meeting of the BC Hydro Integrated Resource Plan Technical Advisory Committee (TAC). TAC is a group of knowledgeable participants with significant interest, stake, and experience in BC Hydro's resource planning process assembled to provide detailed, technical input and feedback to BC Hydro during the development of the IRP.
FACILITATOR	Anne Wilson, BC Hydro
PRESENTERS	John Duffy, BC Hydro Lindsay Fane, BC Hydro David Ince, BC Hydro Kathy Lee, BC Hydro Doug Little, BC Hydro Randy Reimann, BC Hydro Basil Stumborg, BC Hydro
ATTENDEES TECHNICAL ADVISORY COMMITTEE MEMBERS	David Craig, Commercial Energy Consumers Robert Duncan, First Nation Representative Tom Hackney, BC Sustainable Energy Association Matt Horne, Pembina Institute Loch McJannett, Clean Energy Association of B.C. Andrew McLaren, First Nations Energy and Mining Council Peter Ostergaard, Ministry of Energy Jim Quail, Canadian Office & Professional Employees Union (COPE) Local 378 Randy Reimann, BC Hydro Richard Stout, Association of Major Power Consumers Mark Thomas, B.C. Utilities Commission Jason Wolfe, Fortis BC
MEETING OBSERVERS	Nicholas Heap, CANWEA Joe Mazza, Fortis BC Jim Weimar, Weimar Consulting Inc.
ATTENDEES BC HYDRO	Kenna Hoskins, BC Hydro Trudy Kwong, BC Hydro Michael Savidant, BC Hydro (Site C) Jim Scouras, BC Hydro Trudy Kwong, BC Hydro Amir Amjadi, BC Hydro Susan Campbell, Recording Secretary, Kirk and Co.

PRE-READING MATERIAL / HANDOUTS / PRESENTATIONS

- Agenda for TAC Meeting #5
- Summary Brief – 2011 Load Forecast
- Summary Brief – Fort Nelson and Electrification of the Horn River Basin
- Summary Brief – Overview of Updates
- Summary Feedback Report

The following reports were circulated on table:

- Hard copy of all power point presentations
- Back-up slide deck

Note: copies of all materials will be attached to and filed with the agenda materials from the meeting.

1. INTRODUCTION AND IRP PROCESS UPDATE – Anne Wilson and Randy Reimann

Introduction and IRP Process Update

The Facilitator, Anne Wilson, welcomed everyone, reviewed the agenda and objectives for the meeting. Process items were reviewed, and consisted of welcoming new TAC members, Jim Quail and Jason Wolfe, reviewing the rules of conduct, and the mandate of the committee in terms of welcoming feedback on the analysis.

Randy Reimann provided an update on the process of developing the IRP, associated timelines and anticipated outcomes. There was a question regarding when the last opportunity would be for the TAC to have input into the draft and whether there would be a meeting after July. The last meeting to review this draft IRP was suggested will occur around the end of May.

2. GOVERNMENT ANNOUNCEMENT – DOUG LITTLE

Government Announcement – February 3, 2012

Doug Little provided an update on the Government Announcement of February 3, 2012 in which the BC Natural Gas Strategy, the Liquefied Natural Gas (LNG) Strategy and re-definition of the Province's self-sufficiency policy was announced.

Discussion focused on the LNG plants in terms of the size, timing, project deliverability and supply options. It was confirmed that the point of no return would occur when the investment decision was made later this year. As well it was confirmed that options, other than BC Hydro, for supplying electricity, are being considered. The in-service date for the Kitimat LNG plant are 2015 and 2016; as well an additional potential plant (LNG3) may have four trains associated with it. The capacity load required quoted does not include pipeline compression needs, which are also being looking into. The capacity factor of these plants is very high. With respect to other potential LNG projects, there are in the conceptual stage, BC Hydro is monitoring their proposals and they are not public at this time.

The concern of stranded assets was discussed, particularly looking at huge reserves in china and BC is proposing to build huge infrastructure and what happens if BC supply falls off? The longevity of the plant is assumed to be 20 years. There are no issues raised about having enough gas reserves to meet potential exports of all of the gas. The risk of stranded assets remains a concern, and there will be commitment contracts locking in the sale of gas; the

transmission will be amortized over its normal life span; and the activities of other areas, including Australia and Asia will be considered.

With respect to long term rate impacts, it was clarified that rate differentials would be shown rather than impacts in this IRP, and as well anticipated rate impacts as a result of new LNG facilities would not be shown, in part because discussions are underway as to the project contribution of service.

A concern was raised by a TAC member about BC Hydro's intention of negotiating a greater contribution from customers for supplying electricity than would have been allowed under the current tariff. The member did not want to tinker with the postage stamp rates, asserting that gas fired generation should be looked at as the least cost alternative. It was mentioned that the government announcement asserted that mitigating rates for other customers is a key policy driver and that is driving a custom obligation for supply arrangements, and as well BC Hydro is looking for the best place for the 7% headroom on gas.

Some concerns were raised from members about BC Hydro and the province stating a 'green' policy of clean electricity but then exporting gas to be burned in Asia. It was mentioned that natural gas would be replacing more GHG intensive fuels abroad. It was clarified that BC Hydro will continue to focus on GHG emissions in BC, and the province will speak to policies related to global climate change.

There were questions raised as to whether BC Hydro has to serve these additional loads. The answer is not completely black and white, but rather if BC Hydro were to serve, what would the cost be. For instance, a question is whether it is economic to supply Horn River Basin development.

3. UPDATE, RECAP AND ANALYSIS RESULTS PRESENTATIONS

Updates were provided in the following areas: planning criteria, long-term load forecast, load resource balance, and the market price outlook. Basil Stumborg also provided a recap of the risk framework and portfolio analysis.

The BC Hydro planning team then provided presentations on the analysis results for the main discussion topics of the IRP. The following provides high level comments from the TAC members for each of these presentation areas.

4. ROLE OF NATURAL GAS-FIRED GENERATION – Kathy Lee

Comments from TAC members regarding the analysis included:

- If BC Hydro is to consider locational value, it should also look at Vancouver Island situation; particularly if Cheekeye/Dunsmuir line needs upgrading or refurbishing... the cost of that would be significant and a local solution may be more cost effective.
- Members asked some clarifying questions behind the UEC calculation of gas under different market scenarios.
- A member thought that BC Hydro understates the value of gas by using average prices
- A member wanted to challenge the government policy of 93%
- It was commented that much of the role of gas benefit analysis has been focused on economics... also need a balanced view looking at environmental indicators such as GHG and local air contaminants.

5. DSM/IPP MIX – John Duffy, Basil Stumborg, Kathy Lee

Comments from TAC members regarding the analysis included:

- Member would like clarity regarding what the persistence measure means and to provide consistency with how it is used in different forums
- Regarding the 66% target, it would be helpful to look at this metric on a yearly basis to highlight information about the timing of LNG loads and their impact on the DSM target.
- A member questioned whether BC Hydro was going to submit a plan that does not meet the 66% target, and what the implications may be for BC Hydro and the IRP.
- Comment that member has not seen evidence pointing to the success of rate design changes.
- General sentiment - didn't jump at NEB inclusion... general agreement from members that the shift in the number of programs would not be that great. (Although was noted that perhaps it was worth going back to look at the programs).
- Members did not express any discomfort with the ramp regret analysis.
- A member expressed that the costs DSM should be borne by the people receiving the benefits
- The view of the low gap should be a low priority/less of a focus as in reality BC Hydro would not see low gap with high DSM savings; there would be continual adjustments, such as in any subsequent IRP.
- Some conversation about how to read the rate differential analysis. Members agreed that a PV was a good way to look at it (if we can't show absolute rate impacts) however rate differential is useful but needs more description.
- Jurisdictional Review
 - One member commented that a lot of jurisdictions have much less than is listed here.
 - Confirmed that BCH just looked at jurisdictions across north America (with reasons)
 - Member thought it would be useful to provide the context as to how high option 3-5 would end up on the table of future DSM targets - the point being they would likely show up at 2.5% of annual energy savings as opposed to something much higher.
 - It would be useful to look at the rate of change for these jurisdictions and provide some context regarding their economic situation.
- One member reiterated their willingness to sit down with BCH to document some of the big ticket items that could affect DSM savings over the long term (e.g. electric vehicle conservation measures)
- A member commented about the asymmetry between uncertainty analysis on the DSM side and the supply side (that much more thought has gone into DSM uncertainty).
- A member reiterated the need to be flexible... don't need to make large expenditure decisions too soon, but move to a ready state.

6. SITE C –Kathy Lee

Comments from TAC members regarding the analysis included:

- A member commented a key uncertainty is the regulatory schedule and 9 years seems optimistic, and may want to put some uncertainty bands around it. Members questioned the reasonability of having site c on line in 2021 and the IRP should consider this uncertainty.

- Members questioned the role of analysis for Site C. BC Hydro confirmed that it thinks site c is an attractive option, and needs this alternatives analysis for the environmental impact assessment.
- Again, a member commented that they would not put results showing a low gap in front of government/decision makers, and believes this situation will not happen.
- The members took some time discussing the environmental footprints and economic development slides and what it means, and as well the rationale for going from the large consequence table to the high level table of results. There was a request to see individual projects that make up the portfolios.
- Member commented that there is development risk; and FN comment that FN consultation and accommodation still needs successful resolution.

7. ACQUISITIONS –Kathy Lee

Comments received from TAC members regarding the analysis included:

- With the rate differential graph, again, the rate differential doesn't make intuitive sense and needs an explanation. There was discussion regarding the influence of site c. Generally members felt it was useful to show with a description and context, but absolute rate changes would be preferred.
- TAC members had some questions regarding the wind integration costs. It was confirmed that transmission reinforcements and penetration levels are reflected in the costs.
 - An observer commented that the wind integration adder is high (an outlier) and that penetration levels in the BC Hydro system are currently at 2%. Wind integration adder is more like \$2.50.
 - Confirmed that the \$10 is a proxy for effect on whole system
- With the diversification resource mix graph - need to be clear about what this graph means, could be misleading if people are looking at it from a 'north coast' perspective

8. FORT NELSON SUPPLY AND ELECTRIFICATION OF THE HORN RIVER BASIN –John Rich

Comments from TAC members regarding the analysis included:

- Feedback from member that the electrification of the Horn River Basin within the 93% target is completely unmanageable, and could build generators in the Yukon and have short transmission lines to service the area across the border. Or, alternatively, let the producers self-supply.
- A member questioned whether BC Hydro was taking a macro view of viability of options. It is not just about export markets but also the use of the gas domestically, there is a need to take a bigger picture.
- TAC members posed questions regarding the ability for customers to demand electric supply; and concerns that the transmission costs would be extremely high in comparison to self-supply.
- Member stressed to ensure the development is economic and competitive.
- Member comment on the framing of electrification around the GHG objectives: that since the majority of CO2 would be formation CO2 (over 60% of total GHG emissions) than electrification is basically an economic one and won't solve the environmental issue.
- Could develop wind with self-supply supporting; instead of building the transmission line.
- A member asked whether BC Hydro tried a collaborate approach with Alberta to looking at options.
- One member appreciated the inclusion of GHG emissions in the analysis.

- Request to have the results available for other gas production scenarios.
- It was clarified that GHG emissions are just over the 17 period.
- It would be useful to show cost per tonne of CO₂. Then BC Hydro could look at where in the province it could get the most value from the cost.
- One member questioned the policy of development and the scale and pace of development and thinks it needs to be a provincial discussion.
- Sequestration would involve putting the CO₂ into the ground in the area and a member commented on the liability risk associated with that.
- Important conclusions that need to be addressed is that if the development goes ahead, the CO₂ targets will not be met, and the transmission line is uneconomic. There has to be some give in the policy.
- A member appreciated the analysis to make the decisions clear.

9. NORTH COAST/LIQUIFIED NATURAL GAS –Kathy Lee

Comments from TAC members regarding the analysis included:

- Questions arose about the transmission line to the north coast, and it's capability with respect to new mines and the Kitimat LNG coming on line. The mine loads are probability weighted.
- One member was looking for a breakdown of costs for the transmission line versus local generation, and what is included in these costs. Also, not all transmission costs are included as the transmission line has a 40 year life and so costs are allocated over those years.
- There was some discussion of gas plant efficiencies
- It was clarified that the GHG emissions are cumulative over 17 years.
- Some discussion of GHG emission rates with SCGT versus CCGT. Clarified that emissions are from peaking plants. GHG emissions may be underestimated with SCGTs because of effects of ramping up and ramping down.
- One member suggested to package it all up: north coast, Horn River Basin, and look at the collective, holistic picture.
- It was suggested also to show CCGT running without renewables to illustrate what emissions are.

10. ELECTRIFICATION –Warren Bell

Comments from TAC members regarding the analysis included:

- There was discussion regarding the composition of abatement curves and the split between biofuels and electricity, and the penalties driving electrification (30\$/ton)
- A member commented that the assumption of holding technology current (no technological advances) doesn't make sense
- It was clarified the analysis did not look into whether the biofuels were carbon neutral
- The analysis assumes that we are not working alone (i.e. adjacent jurisdictions also have imposed similar measures).

- Comment that if BC wants to play a leadership role, should do that by not just looking within our BC borders but also across the world.

11. EXPORT – Rohan Soulsby

Comments from TAC members regarding the analysis included:

- TAC members had some questions regarding whether California could apply a carbon charge to BC energy under the cap and trade system - given BC imports energy when it can be bought cheaply and exports during times when the market is higher; and that would apply when it is sold as a green product.
- Some clarifying questions regarding the production tax credit.

12. TRANSMISSION/CLUSTER –Amir Amjadi

Comments from TAC members regarding the analysis included:

- Some questions regarding the Transmission system map.
- Some questions regarding the regulatory time frame for building Transmission. Members want to provide feedback on BC Hydro undertaking pre-work to prepare for future growth, and encouraging BC Hydro to move towards early approvals. Member commented that the decision to build is political.
- A member commented that it may be worth looking at prebuilding a number of lines to keep the calls competitive.
- TAC members noted the challenge of putting a new line n from Williston to Skeena (EISD 2018) and having the timing work for the LNG3 load.
- Some concern of putting a second line on the existing right of way (for the Williston to Skeena line) due to common load failures. BCH response was that it was an acceptable risk.

Cluster Analysis

- Member comment that the difference in savings with clusters was due to modelling error. Any advancement would be for saving time rather than a financial reason.

13. CAPACITY/CONTINGENCY PLANNING –Lindsay Fane

Comments from TAC members regarding the analysis included:

- For capacity contingency planning, members provided feedback about ensuring other forms of capacity reduction are looked at; in particular industrial load curtailment.
- Member comment that geothermal should still be listed as an option.
- Member feedback that the labelling of options should be changed - for example labelling DSM 'uncertain' speaks to a bias; and when they look at Site C there is just as much uncertainty.

- Member expressed confusion over the use of Burrard, and questioned why BC Hydro could rely on more from Burrard, such as up to 600. Member questioned why not look at redeveloping Burrard.
- Members wanted to discuss interruptible load as it is flexible. For example, electro chemical plants. Interruptible doesn't necessarily mean the plant gets shut down, but they may rely on the market prices and import. BC Hydro hasn't looked at these options. Member suggested using interruptible load, and backing up with Burrard if it doesn't materialize. BCH response that the plan would not contradict the intention of the legislation.
- Regarding the 'regret for bridging strategy and large gap'... members felt that there should be a probability distribution around the purple line, and believes BCH is doing less than it could if it shows this graph to government.
- Members commented that as time moves on can put in gas turbines quite quickly, so may not be the problem you think.
- Question as to why doesn't BCH include environmental and economic development implications for this question too. Response was that we did not undertake portfolio runs.

14. ROUND TABLE - FINAL COMMENTS ON ANALYSIS

Comments from TAC members regarding the analysis included:

- Analysis helps to highlight tradeoffs between competing policy objectives. Eg. 93% clean with economic development, GHG reduction targets, and keeping customer rates low.
- Suggestion to look at the IRP by CEA objective. For instance, all of the presentations/IRP components stated which CEA objectives related to it, and can BCH take each CEA objective and look at each across the components with key threats and opportunities for each.
- It will be important to keep the analysis current, for example the gas forecast.
- From a FN perspective, still a lot of work to do, and the corresponding FN IRP consultation is an important element and it will take time.

15. CLOSURE

The meeting ended at 4:30 p.m.