

DATE/TIME	January 28, 2011 9:00 a.m. – 4:30 p.m.
LOCATION	Sutton Hotel, Chateau Belair 845 Burrard Street, Vancouver, B.C.
TYPE OF MEETING	Regular meeting of the BC Hydro Integrated Resource Plan (IRP) 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	Names are provided in the order that presentations were made: Nadja Holowaty, BC Hydro John Duffy, BC Hydro Basil Stumborg, BC Hydro Stefan Joyce, BC Hydro Warren Bell, BC Hydro Magdalena Rucker, BC Hydro Dave Ince, BC Hydro Kathy Lee, BC Hydro
ATTENDEES TECHNICAL ADVISORY COMMITTEE MEMBERS	Bill Andrews, British Columbia Sustainable Energy Association David Bennett, Terasen/Fortis BC David Craig, Commercial Energy Consumers Robert Duncan, First Nations Representative Derek Griffin, Ministry of Energy Matt Horne, Pembina Institute Loch McJannett, Clean Energy BC Andrew McLaren, First Nations Energy and Mining Council Randy Reimann, BC Hydro Richard Stout, Association of Major Power Consumers Mark Thomas, BC Utilities Commission Lori Winstanley, COPE Local 378
MEETING OBSERVERS	Thomas Hackney, BC Sustainable Energy Association (Alternate) Nicholas Heap, CANWEA Jim Weimar, Weimar Consulting Inc. Brian Wallace, Association of Major Power Consumers (Alternate) Peter Ostergaard
ATTENDEES BC HYDRO	Kenna Hoskins Kevin Maxwell Patrice Rother

PRE-READING MATERIAL / HANDOUTS / PRESENTATIONS

- 2011 IRP Technical Advisory Committee Meeting #2 Presentation Slides and associated Summary Briefs
- IRP Technical Advisory Committee Terms of Reference

1. INTRODUCTION/MEMBERSHIP/COMMENTS – Anne Wilson

The session was opened by Anne Wilson with the following items:

Rules of Conduct

Rules of conduct regarding respectful conversations and meeting etiquette were reviewed with the committee and included:

- Have one conversation.
- Allow people to finish their thought (speaking) before the next person speaks.
- Allow opportunity for first time speakers before speaking a second time.
- Focus on ideas, rather than people.
- Will not revisit previous decisions in order to ensure the momentum of the TAC work plan.

Members were in agreement of these rules of conduct and were asked to collectively be accountable to them.

Committee Membership

- A new member, Robert Duncan from the Hupacasath First Nation was welcomed and introduced to the committee.

Types of Submissions

Three types of written submissions have been received from committee members: comments, information requests, and areas of interest. Anne reviewed the three types:

Comments

- Comments that are received throughout the process, either verbally or in writing. People are welcome to submit comments at anytime. Written comments will be distributed to all TAC members and will become part of the public record eventually.
- Formal comments (those referred to in section 7.3 of the Terms of Reference) – on key IRP topics. BC Hydro will clarify what is expected of these, however, it is anticipated BC Hydro will ask for comments from TAC members following the April meetings and the tabling of the draft plan. These also will form part of the consultation record.

Information Requests

A number of information requests have been received and responses are as follows:

- The Load Forecast document is expected to be released in February and should address most of the load forecast questions raised. After reviewing that document, the information requests can be reviewed.
- DSM related information requests can be reviewed during that agenda item.
- Randy questioned whether TAC wanted to review information from these requests as a group at the April TAC meetings or how TAC wanted to consider the information. Some information requests are more easily responded to, and those can be accommodated.

Areas of Interest

Areas of interest are being reviewed.

ACTION: BC Hydro to clarify expectations regarding formal comments

Reviewed Agenda

The remainder of the day was spent with TAC continuing to review the inputs to the IRP analysis.

2. RESOURCE OPTIONS UPDATE – Nadja Holowaty

Nadja Holowaty presented a high level overview of the Resource Options Update process and the results of the resource options update including summary information for resource potential and costs for all options considered.

Points of clarification included:

- Existing and committed resources are not included in the potential resource option inventory. Existing resources are currently in operation; and a resource is committed when an electricity purchase agreement (EPA) is awarded.
- Generally, the main difference between 2008 and 2010 was when the supply curves were looked at the shapes were the same but the costs were higher this time around.
- From 2008 to 2010, in terms of volumes, run of river changed with larger capacity but not necessarily more energy.
- Resource options were excluded from legally protected areas, such as parks and although the resource density map may look like there are resource options in a park, like Strathcona, there is not a resource option sited there. What the bubble shows is a concentration of potential.
- Historically, the ROR has been compared to actual call results. In the 2006 IEP/ LTAP, by the end of the regulatory review process the market had increased – and prices were out of date because of the unstable economy. In the 2008 LTAP, an assessment showed the predicted ROR costs to the results of the Clean Power Call were within a dollar at \$124/ MWh.
- In general, the ROR is indicative, good for planning purposes.
- The backstop or firming of resources is undertaken at the portfolio analysis level. Additional resources are added to meet peak in the portfolio model runs and assessments done of how much can be integrated.
- Co-generation potential would be included if it is large enough to affect bulk transmission.

Member comments on the ROU included:

- One member pointed out that currently biomass is listed as having a higher dependable generating capacity than combined cycle natural gas generation, which didn't make sense.

- For gas (and coal), it is not a true inventory as the ROU only shows a small number of potential locations.
 - Select locations were presented where it is believed a natural gas-fired plant could be sited and have access to both gas and electric transmission such as Kelly Lake, but it is not limited planners could look at anything that came up by adjusting for transmission costs.
 - The proxy location for coal with carbon capture and sequestration is close to coal deposits and oil fields where captured carbon could be sequestered.

ACTION: BC Hydro to review dependable capacity rates for biomass, natural gas, coal and geothermal resources.

3. DEMAND-SIDE MANAGEMENT (DSM) OPTIONS – John Duffy/Basil Stumborg

John Duffy provided a description of the DSM options to be used in the IRP analysis, including the 5 energy focused options and 3 capacity focused options.

Points of clarification regarding DSM options included:

- Incandescent bulb regulations are currently in the plan with its anticipated savings, and have been since 2008. Although there is little cost to BC Hydro and actions are not attributed to BC Hydro, they count towards the 66% savings target.
- Codes and standards count towards the 66% savings target.
- Eventually there is a point where savings and effects of a particular government regulation will not show up in the forecast of incremental DSM savings because it will be taken into account in the pre-DSM load forecast.
- The implementation of the small commercial rate structure has been deferred to 2018 so that experience can be gained from the general service rate structure first.
- \$124/MWh is what planners are using for the marginal cost of energy.
- Hotelling is a term that means taking advantage of the fact that in an average office building only a fraction (say 80%) of employees are present at any one time so through the use of shared work spaces you can get by with a smaller building for a given work force.
- With option 5, integration with the tax system is in scope but not listed in the slide. It is recognized as a tool in the tool box of codes and standards.
- The financing levels are listed in option 2 and then carried forward over to option 5 but with increasingly more effort.
- The costs of smart meters are not included in the IRP DSM option costs as the smart meter program has been regulated and is being implemented. Smart meters will be in place by the end of 2012.
- Regarding Smart Meters the question for DSM is how to take advantage of the smart meter program within the DSM programs. DSM programs can offer incentives for an in-home device so that customer can have real time information to create more of an awareness of energy consumption.
- Accumulated power smart savings over the past 20 years is in the range of 4,500 to 5,000 GWh/yr and some of the savings date back 20-years and are starting to decline. Also, note that these savings are only program savings whereas what we're looking at here is the combination of programs, codes and standards and rate structures.
- One member noted that what was spent over the past 20-years was miniscule compared to what spending is being planned now.
- In the associated capacity savings (mid probability) graph the ranking of the options changes (with option 5 moving to greater than 3). It is suspected this is because Option 5 has associated capacity benefits (more

capacity savings per unit of energy savings) as it targets more space heating load which tends to be greater during peak use times.

Member comments included:

- There was a continued concern expressed that there is a double counting problem when DSM savings are counted in the load forecast and also projected DSM savings – which shows up in the cross over between moving from a DSM forecast to embedding savings into the load forecast.
- A concern was raised under the residential rate structure, that in the longer term if customers don't see the 2 tiered price, or price signal, customers may not act.
- It was mentioned that the same barriers will not be there.
- One member raised the concern with Option 5 about the notion that rate structure could replace the need for incentive programs – that is an unrealistic assumption, and makes Option 5 unrealistic. Incentive programs, which disappear over time with Option 5, seemed problematic.
- A member raised concerns about the codes and standards' incremental change assumptions between the options and that devices, such as appliances (water heaters) are not being addressed in an order that one would normally assume
- One member suggested showing net present value for utility costs over the programs period rather than \$/MWh to get an idea of total costs.
- A member noted that all options are relatively cheap, way less than the long run marginal cost.

ACTION: Check the assumptions around incremental appliance codes and standards between options

4. DSM UNCERTAINTY ASSESSMENT – Basil Stumborg

Basil Stumborg presented the work which takes the DSM options and applies, through professional judgement, risk adjustments to each of these options. The initial savings are a starting point, and then the probabilities of getting more, less or mid way is assessed. This results in three probability curves for each option.

Points of clarification regarding the DSM uncertainty assessment included:

- An example where there is cascading failure with implementing an option may be where BC Hydro implements a very aggressive rate and rather than getting the cultural change it is seeking instead it fails to incent change and creates a public backlash instead. This may be expanded to not only DSM risk, but company wide reputational risk.
- To ascertain the initial savings estimates, BC Hydro program managers provided initial numbers which were then added together. The spread of uncertainty (uncertainty assessment) was done next and, in some cases, shifted the expected level of savings down.
- The inputs into the IRP analysis are the three lines (probability curves) – high, medium, and low.
- The numbers are not a weighted average but a single number from, for example, the buy-back refrigerator program.
- Regarding what causes the risk; all the DSM portfolios are built together and depend on each other for their collective success. If the rates aren't successful at inducing change, then the rest of the tools may not work as intended either.
- Regarding the issue of societal changes over time, in reality every 5 years planners recalibrate and undertake a course adjustment. This analysis won't give an answer and maybe the answer is more dynamic and understanding there will be future course corrections.

- Option 4 performs worse than option 3 in some cases. Options 3 and 4 have the same programs. However, Option 4 represents a shift in focus away from traditional approaches towards market transformation, so there is a chance that this shift in focus may spread Hydro's attention too thin. Moreover, there is a chance that the new rates and Codes and Standards may not be as effective or acceptable as those in Option 3.
- BC Hydro has looked into other methodologies for capturing DSM uncertainties however the work that BC Hydro is undertaking is fairly leading edge work.

Member comments included:

- One member commented on whether BC Hydro had undertaken a risk assessment on the supply side, such as a huge backlash against new projects and wide spread protest.
- BC Hydro is contemplating supply side risk.
- One member stressed the need for verification of actual DSM savings being achieved through these programs.
- A member expressed concern that this is regret decision making rather than achievement decision making. Concern that going in the other direction (towards less DSM and increased purchases) will lead to much higher rates and backlash. This decision has a billion dollar impact on customers and the member will put some thought into details of a proposal.
- Concern that these options are being presented as mutually exclusive but they are not.
- Concern over the risk adjustment curves of Option 5 by having spending on programs decline you expose the possibility that if rates don't cause the intended effects there is no incentive for anything to happen.
- A suggestion was made to adjust option 5 don't give up on programs, so the worst case scenario is ambitious savings didn't materialize but then that would bring you back to the regular program.

ACTION: BC Hydro to look into addressing the verification of DSM savings at some level.

5. DSM CAPACITY FOCUSED OPTIONS – John Duffy

John Duffy provided a description of the three capacity focused options.

Points of clarification regarding DSM capacity focused options included:

- Currently the options consist of voluntary time of use rates, rather than mandatory time of use rates.
- With mandatory time-of-use (TOU) rates it may reduce the evening peak such that it's lower than the morning peak, and then rate would need to be extended to cover the morning too. This rationale prompted the decision, at this point to assume voluntary time of use rates.
- A research program on time of use rates concluded a 6% decrease in energy consumption and that not only has to do with capacity – that is a substantial energy benefit.
- The risk assessment has not yet been applied to capacity options, however, with respect to the mid probability estimates, following the risk adjustments it is not expected that the numbers will be lower but perhaps the time-based rates will come down. The assessment is anticipated to be finished next week.

Member comments included:

- A few members felt that mandatory time of use rates should be seriously considered.
 - IRP will look to what is the available capacity and how much more will be needed – then mandatory and voluntary TOU rates will be considered.

ACTION: Address mandatory TOU rates in the IRP.

Concluding Comments on the DSM Options and Request For More Information

A discussion regarding the additional levels of information detail requested by members resulted in the following points and comments:

- An aggressive IRP schedule is underway and the analysis has started, if there are some adjustments those can potentially be done.
- The question from BC Hydro is how realistic are the assumptions and input data – if there are areas of weaknesses in the characterizations we do need to know. What level of detail is needed?
- One member felt they needed that detail and would raise any issues at TAC.
- One member felt that in the last plan, the detailed DSM program was shown late in the day and urged BC Hydro to provide it as soon as possible.
- A member was interested in the course adjustment idea, that is choosing a more ambitious DSM option that can be improved over time with new learnings, and how that idea would come in to play with the discussion.
- The proposal from BC Hydro is to start with the five scenarios and consider impacts, outcomes and uncertainties. Based on that analysis ultimately the actions are recommended to Government and will be pursued and at that point a combination of savings and programs can be picked. There was a desire by BC Hydro not get too far ahead of the game at this point.
- Members expressed interest in looking at modified options, which would be part of a next steps discussion after the analysis.

ACTION: Details of programs, in the form of tables, will be circulated to TAC and comments back are to be provided before the February 14th meeting.

ACTION: BC Hydro will come back in April and review with TAC the analysis and talk about uncertainties and what it looks like;

ACTION: BC Hydro will draft the IRP and come back in the fall and talk about where BC Hydro landed and associated recommendations.

6. ENVIRONMENTAL ATTRIBUTES – Stefan Joyce

Stefan Joyce presented the environmental indicators being calculated for the IRP analysis.

Points of clarification regarding the environmental attributes included:

- There is no weighting or analysis of the ‘best use’ of a resource, for example with biomass – is it better to use it for electricity if wood could be used for other purposes. There is some competing use evaluation to inform quantities available.
- Environmental indicators of resource options were calculated for transmission, roads and at gate areas separately which gives an ability to look at data grouped in clusters versus not clustering.
- Layering on population and competing land use was not undertaken as part of the study, but it would be possible to cross compare if it is spatially orientated. The linear density measure might give a sense of population in the area.
- Site C is the only project that has a location specific set of environmental attributes. The resource options have only coarse data.

Member comments included:

- There is an overwhelming amount of information and a wondering as to how it will be used in decision making.
 - Information gathered can be rolled up or if the data granularity is needed, then it is here.
- There was an interest of seeing whether it was possible to choose resources based on lowest impact.
 - The portfolio modelling picks resources based on cost to minimize overall portfolio costs.
- It would be unlikely that the program could be modified to solve for 2 results, however, it can be considered.
 - It is also subjective to determine a preferable impact among environmental attributes.
- One member thought it would be interesting to conduct a sensitivity cost analysis, by choosing lower impact resources.

ACTION: Consider a methodology to assess impact of choosing lower environmental impact resources and how that may affect cost.

ACTION: Let TAC know when the full Resource Options Update report is posted on web site.

7. ECONOMIC DEVELOPMENT ATTRIBUTES – Warren Bell

Warren Bell provided a description of the economic development indicators to be used in the IRP analysis.

Points of clarification included:

- In the input/output model the job number is net jobs.
- Some local government taxation was considered but not property taxes.
- The modelling of economic impacts will take place in the context of portfolios and the objective is to meet the electrical needs of customers – within that a comparison can be made as to how different portfolios compare with respect to these economic indicators.
- When looking at different portfolios both of the resource options will have jobs attached and then look at job creation and evaluate.
- Cost will be the major factor when meeting the electrical needs of customers. From there, exports and electrification will be considered through building larger portfolios, and the impacts of jobs will be assessed. However, for the base portfolios, all of this will be modelled against the threshold of meeting the electrical needs of customers.
- There may not be the ability to say this portfolio contributes better to say the economy through job creation for a First Nations community – job creation has not been developed to the region or community specific level.

Member comments included:

- Concern was raised about the Clean Energy Act objective of retention of jobs, and how that is going to be tracked in the IRP. Specifically, there was a concern raised that 337 jobs will be lost due to smart meters, and this member wanted to ensure consideration of job retention within the analysis, as an energy objective in the CEA.

8. WIND INTEGRATION COST AND LIMIT – Magdalena Rucker

Magdalena Rucker presented the results of BC Hydro's wind integration study and provided background along with the proposed integration cost and limit to be used in the IRP.

Points of clarification regarding wind integration costs and limits included:

- When looking at results of integration costs from other jurisdictions, a combination of current embedded costs and forward looking estimates was shown.
- Extrapolating wind integration costs into the future is highly uncertain. For instance, the greater the penetration the more need for extra capacity which will increase the cost. However, the Federal Energy Regulatory Commission (FERC) is proposing reforms to its Open Access Transmission Tariff (OATT) in which the transmission scheduling would go from an hourly timeframe to a 15 minute timeframe. This would have a reducing impact on the cost.
- The wind integration cost is added to the unit energy cost of each wind project, essentially increasing the cost of each project by \$10/MWh.
- There is a distinction between portfolio analysis and power acquisitions. On the acquisition side –a volume of energy is specified and then independent power producers (IPPs) bid in and submit their cost. Least cost products are picked. With portfolio analysis, an additional \$10/MWh is included in the costs in order to get an 'apples to apples' evaluation across resources.
- The question really is how does the domestic customer get the best value from the system.
- If a firming tariff is provided by BC Hydro to IPPs, then the price charged for the firming tariff must be fair to its customers; that is, the price charged must compensate for the loss of flexibility in the system.
- The firming of resources for export relates to the within-hour component of the wind integration cost. The firming tariff is a piece that is still being developed.
- The wind integration cost BC Hydro is using, \$10/MWh, is somewhat lower than other jurisdictions, however it is in the range and there is some diversification expected which would lower the cost. Sensitivity tests will be done in the portfolio analysis.
- The 3000 MW limit identified for use in the IRP would correspond to a wind integration penetration level halfway between 25% and 35% of installed generating capacity.

Member comments included:

- One member expressed a concern about B.C. power system being devalued (through a loss of flexibility in the system) by taking on wind.
- One member expressed an interest in seeing the wind prices change as a function of the penetration level into the system.
 - The wind integration prices will not be assigned dynamically as a function of penetration level, however the sensitivity of the portfolios to the integration cost by using different fixed integration costs will be considered.

9. ELECTRIFICATION – David Ince

Dave Ince provided a presentation on the electrification sensitivities to be used in the IRP analysis.

Member comments included:

- One member expressed concern over making the assumption that electric would be chosen over gas for the Fort Nelson area, particularly given rate forecasts and the price of gas.
 - The advantage to electric includes electric drivers are very efficient, reliable and natural gas engines don't operate well across a wide range of speeds. At tariff rates electric drives may be more attractive.
- One member was not convinced that the forecasted offsets in the scenarios are real.
- One member commented that for the increased load with electrification, the assumption considers DSM as a single strategy, but efficiency in transportation can also come from reductions in miles driven and that can have a significant impact.
- One member questioned how the increase in load would affect the amount of self sufficiency surplus, and suggested BC Hydro take a look at that.

10. PORTFOLIO ANALYSIS – Kathy Lee

Kathy Lee presented an outline of the portfolio analysis to be undertaken and the analytical questions to be addressed. Two sections of the presentation, the analysis of exports and capacity needs will be presented at the February 14th meeting.

Member comments included:

- One member highlighted the importance of looking at the costs and economic impacts, including jobs.
- One member wondered what incentives would be required to achieve electrification, and that there is a need to know how it is done before the rate impacts can be assessed.
- A need to look at emissions outputs in the north east under various portfolio analysis, including a comparison between carbon reductions and cost.
- One member thought gas should be used to service additional Fort Nelson load, as it is still offsetting more GHG intensive Alberta based coal.

TAC agreed to continue this discussion and finish the presentations at the Feb 14 meeting.

11. CLOSING COMMENTS

TAC came to agreement on the next meeting dates:

- TAC agreed to meet again on February 14.
- TAC confirmed the April 5 and 6 meeting dates.
- TAC confirmed the April 27 meeting date (Lori Winstanley advised that she was not available), and further agreed to hold the date of April 28 as a place holder for a meeting if needed.

Closing comments from members regarding the inputs included:

- One member found the summary notes from the Dec 14 meeting difficult to consume. There is still one week for others to respond with feedback.
- Presentations were ambitious and interesting.
- Wanted more opportunity for dialogue.
- One member reflected on GHG costs going into pricing for the most likely market scenarios, and was not sure about adding these prices.
- One member isn't convinced the current electrification approach is great policy, but understands the need to model. Not sure about E3s approach and whether it is a realistic load forecast. It's a bigger issue needing a bigger dialogue.
- Option 5 for DSM options –it looks advantageous to optimize this options so not crippled it from the starting gate.
- One member wanted more scope for gas, particularly rethinking buying the coal-based energy from Alberta.
- As a suggestion perhaps a pre-meeting briefing session for the basics?
- Suggestion to look at in-between options on DSM it might be 4.5 or 3.5.
- A number of issues verging on out of scope and this plan having legitimacy in the public and this member would like to have a discussion about policy pieces not within our control.
- A member looking forward to the detailed load forecast.
- A member is very concerned about the approach taken with DSM.
- A member is concerned about the framework adopted with scenarios and how this will affect resource planning and contingent decisions affecting future decisions. Assumptions end up embedded in policy is static and that is policy BC Hydro has adopted and yet the next 20-years will have a big impact as will technology changes and plans need to adjust or there will be serious problems.
- Concerns about environmental issues and GHGs and seems a very small subset to the approaches, particularly around electrification and selected options.
- Lots of kudos to BC Hydro for the quality of organization, structure and process – it has been run extremely well.
- A member highlighted that there is other First Nations consultation taking place and there will be court implications and precedents that will take time to get through there is a need to understand how that translates to the planning process.

The meeting ended at 4:30 p.m.