

DATE/TIME	April 5, 2011 9:00 a.m. – 5:00 p.m.
LOCATION	Sutton Place Hotel, Room Versailles B 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	Lindsay Fane, BC Hydro Kathy Lee, BC Hydro Basil Stumborg, BC Hydro
ATTENDEES TECHNICAL ADVISORY COMMITTEE MEMBERS	Bill Andrews, BC Sustainable Energy Association David Bennett, Fortis BC David Craig, Commercial Energy Consumers Robert Duncan, First Nation Representative Matt Horne, Pembina Institute Loch McJannett, Clean Energy Association of BC Andrew McLaren, First Nations Energy and Mining Council Peter Ostergaard, Ministry of Energy Randy Reimann, BC Hydro Richard Stout, Association of Major Power Consumers Mark Thomas, BC Utilities Commission
MEETING OBSERVERS	Nicholas Heap, CANWEA Joe Mazza, Terasen Gas Jim Weimar, Weimar Consulting Inc.
ATTENDEES BC HYDRO	Amir Amjadi John Duffy Kenna Hoskins Bruce Laxdal (consultant) Susan Campbell, Recording Secretary, Kirk and Co.

PRE-READING MATERIAL / HANDOUTS / PRESENTATIONS

- Agendas for TAC Meeting #4 (Days 1 & 2)
- IRP Power point presentation slides 1–142
- Summary Brief – Incremental Demand-Side Management: Activities and Impacts
- Summary Brief – Market Price Scenarios: Further Description and Considerations
- Summary Brief – Applying Energy & Planning Objectives When Creating & Comparing Options
- Sample Consequence Table for Discussion
- Copy of the Public Consultation Workbook

KEY THEMES (APRIL 5)

- TAC asked whether the updated Site C cost estimate was available reiterating the desire to receive it as soon as possible.
- TAC expressed an interest in seeing scenarios that did not include self-sufficiency requirements and insurance as an alternative view of the energy gap even after being advised that it was outside of BC Hydro's mandate and the Clean Energy Act.
- TAC generally agreed with the aggregated approach with respect to the environment land impacts but suggested that the detail be kept behind the presentation material to support the conclusions. TAC further agreed to hold another discussion relative to this topic.
- Several TAC members commented on the need around the Demand-Side Management economic modelling to move from the modelling world to the real world to see what is happening with respect to buyer, seller and customer. The need to clearly communicate those differences was noted as well.
- Several TAC members observed, around the Demand-Side Management slides, that customer choice or take-up was an uncertainty and that risk or uncertainty did not seem to be adequately expressed in the modelling.
- TAC members commented on the value of the presentation material noting that it has helped provide good insight into the planning process; as well TAC members expressed appreciation for the robust dialogue.

1. WELCOME, AGENDA REVIEW AND ADMINISTRATION – Anne Wilson, Facilitator

The Facilitator welcomed everyone and reviewed the agenda for the meeting.

Membership

TAC was advised that Lori Winstanley, COPE 378 will no longer be attending TAC meetings due to other previous commitments. This resignation has been expected, and as well the COPE representative has advised BC Hydro that they will be submitting written comments for BC Hydro's consideration.

Distribution of Material

Based on a TAC member suggestion, TAC was advised there will not be specific guidelines regarding distribution of material by members however if a member would like the material to form part of TAC discussion then the material is to be forwarded to BC Hydro in advance to form part of the agenda making process.

TAC agreed that any issues members wished to discuss at the full TAC meeting would be forwarded to BC Hydro to form part of the agenda making process.

Attributed Comments – Consultation Workbook

TAC members are asked to respond to the same five questions as are being asked in the Public Consultation stream which are found in the Consultation Workbook (handout). This feedback is due May 4, 2011, and those feedback comments will be attributed to the individual members. The written comments will be reflected, as will all the input/comments from the public and the First Nations, in Consultation Summary Reports and posted on BC Hydro's website. The Feedback Form is also available online for reference.

Consideration of Input

There was a request from a TAC member to see how the TAC input has been used through this process. BC Hydro will collate all the input heard and put together a Consideration Memo relative to input received and how that input was addressed and currently there is a question about the timing of this consideration memo. It was commented that whatever BC Hydro is able to provide during the process is better than at the end of the process.

2. PLANNING CONTEXT – Kathy Lee and Basil Stumborg

Kathy and Basil described the planning conditions being used for the IRP analysis. This includes a 15 branch probability tree which combines potential small, mid, and large gaps with the five potential market price scenarios. The small, mid and large energy gaps with and without Site C were also shown, along with load sensitivities (electrification and export) with and without Site C. The modelling assumptions were reviewed and sample portfolios were shown to discuss the environmental, economic development and financial attributes draft results.

Points of clarification and discussion with respect to the planning context included:

- It was confirmed that the market price scenario probability numbers shown here are the numbers that BC Hydro is using in the analysis.
- A summary brief was produced and further details on the market price scenarios are available in this brief. This was intended to guide TAC members as they work with the data (range of prices).
- The Summary Brief titled: *Market Price Scenarios: Further Description and Considerations* was circulated.
- One way of managing the data of the 15 branch probability tree is to look at the weighted averages of costs, for instance when considering a portfolio across a range of market price scenarios.
- With the small energy gap, it was confirmed that there is no gap until 2021 or 2022.
- The meaning of the size of the small gap, the mid gap, and the large gap were clarified. The small gap is a combination of low load and high demand-side management (DSM) savings; the mid gap is mid load, and mid DSM savings, and the large gap is high load and low DSM savings. For each of the DSM options there are different assumptions depending on the DSM option being considered.
- A TAC member noted an issue with filling in the gap is about *when* new resources are needed. There is a difference between having a gap in 3 years and having a gap in 20 years.
- It was clarified that the reason the DSM savings lines exhibit a narrow range in slide 13 (large gap scenario) and a broader range in slide 11 (mid gap) is because with the large gap, the DSM programs are under performing, so extra programs being added are not providing the expected level of savings.

- For the electrification sensitivities, it is assumed that Fort Nelson is integrated into the system which means that a bulk transmission line is built to interconnect the Fort Nelson/Horn River Basin areas with the integrated system.
- With regards to the sample portfolio on slide 21, it was confirmed that existing independent power producers (IPPs) also includes the clean power call, and the label on the graphs will be updated to show that.
- It was clarified that the sample portfolio on slide 21 shows the load line without the insurance requirement. The same line also appears on slide 23.
- It was clarified that for slide 24, showing portfolio costs, the optimization model first role is to fill the gap. Surplus comes with filling the gap and then this surplus gets traded with other jurisdictions, such as the US, which leads to trade revenues for B.C. These trade revenues are subtracted from the cost of the portfolio to provide a total portfolio cost.
- It was clarified, for slide 24, the value of trade will depend upon the models and what is likely to happen over the next 20-years. Portfolio present value differences under different market conditions will see differences in costs.

Member comments on the planning context included:

- TAC members requested to see the new DSM Option 5 in the analysis. BC Hydro responded that the planning team is in the process of working through a new DSM option 5, and the draft analysis for the new Option 5 is expected to be available at the end of April.
- A TAC member requested having a portfolio developed without the insurance requirement. BC Hydro responded that all portfolios will be complying with legislative requirements.
- A TAC member requested showing the gap without the self sufficiency and insurance requirement as a line on the graph, in order to better understand and feel comfortable with the analysis. This member would have a hard time endorsing the plan with their constituents without having a full picture of the implications of self sufficiency and insurance. The intention is to get at what is going on in the real world and if self sufficiency is a good idea then it will hold up with scrutiny.
- There was a request to more clearly communicate the meaning and assumptions regarding what constitute the small, mid and large gaps.
- Regarding the definition of the small, mid and large gaps, TAC members found the combination of low load and high DSM savings (small gap) very unlikely and not a reasonable approach. Equally unreasonable is the combination of high load and low DSM savings (large gap).
- A TAC member questioned whether updated Site C costs would be available for this analysis. BC Hydro responded that they are still being worked through and hopefully will be available at the end of the month.
- Questions arose regarding the contribution of renewable energy credits within the total portfolio costs on slide 24.
- Regarding portfolio costs and impacts of trading, a TAC member commented that the number for trading (\$6.6 billion) seems relatively large to the cost of filling the gap (\$8.5 billion) with new supply and transmission. It was clarified that the \$6.6 billion was trade revenues using the whole system. This analysis becomes more useful when portfolios are being compared.
- For Slide 25, there was a suggestion to put the size of the (description of market price scenario or gap size) icons proportional to the identified likelihoods of the scenarios. That would help the communication of the graph.
- A TAC member –commented that, by including high load and low DSM for the large gap, BC Hydro is making an illogical assumption; in the members opinion, under high load and high prices, there is no way BC Hydro will not undertake DSM and that it will not be successful. DSM doesn't operate statistically like the load

forecast. This member didn't find common sense in how the gaps are framed. The map is understandable but the probabilities are illogical.

- Has BC Hydro considered mid DSM across the board (across low, mid and high loads?) BC Hydro responded that the gaps push variables from a planning perspective. There are resource constraints. As well, DSM 2 results are just one result, all of the options will be modelled. BC Hydro clarified it started with DSM 2 because that is the current target.

3. COMPARING OPTIONS – ATTRIBUTES – Basil Stumborg

Basil Stumborg walked the TAC through the draft analysis from the sample portfolios, and described how the large amount of information shown for the environmental, economic development and financial measures could be managed to allow more informed comparisons between portfolios. Basil walked through the first couple of environment attributes, the net primary productivity and linear density metric results to get initial feedback on presentation and method of data management.

Environmental Attributes

Points of clarification and discussion on the environment attributes included:

- It was noted that the net primary productivity results are off by an order of magnitude in the consequence table.
- It was clarified that the portfolio results are based on the optimization model bringing on projects of least cost and other factors of attractiveness.
- It was clarified, at this time; bulk transmission is not included in the analysis, however it will be included in the next round of analysis.
- There is a daunting amount of information and when looking at many portfolios and impacts there needs to be some way to simplify the story to make some sense of it.
- The consultants have not provided advice to date on the weighting of the categories.

Member comments on the environmental attributes included:

- A TAC member pointed out, for the net primary productivity land metric, that the weighted average is really an arithmetic average as the classifications do not have weights associated with them.
- A TAC member suggested it was more appropriate to show total rather than average because the measure is total hectares. It was agreed that totals were more appropriate.
- A TAC member questioned whether there was a way to weight the degree of net primary productivity.
- A TAC member suggested to perhaps consider total of grams of Carbon as the measure rather than hectares.
- It was suggested that all of the information be kept and available so people have a chance to dig into the data if they wish; and at the same time will allow the simplification of data if all of the measures are telling the same story.
- There was a suggestion to show total hectares disturbed and then show the percentages within each category.
- A comment was made that if grams of carbon are looked at, an area like the boreal forest would have its grams of carbon locked into the soil and not necessarily in the vegetation.
- There was a question when the release of the report would be available. BC Hydro responded soon, and the TAC will be informed when it is.

Basil made a suggestion to take the input received, and when the final data is available to write up a recommendation to be distributed to the TAC for comment via a face-to-face meeting or a conference call.

Comments regarding this suggestion were as follows:

- There was a suggestion that a detailed write up is not needed for the TAC member as they trust BC Hydro technical judgement, however the main concern is that BC Hydro can justify the decisions in the future. Make sure there is a robust rationale.
- All members were interested in participating in a discussion on the recommendations.
- Suggestion to provide as much explanation as possible.
- Sometimes helpful to equate a non financial attribute to a financial one; for instance to calculate the portfolio costs and hectares impacted to get a cost per hectare impacted.
- BC Hydro should consider looking at GHG in a more complex way the next time, such as carbon sinks analysis, etc.
- BC Hydro should consider looking at incorporating environmental and/or economic development factors into portfolio design. For example, with GHGs, is there a way to design a portfolio to minimize environmental footprint.
- BC Hydro should be considering the dispatchability of resources and how being non dispatchable contributes to environmental impacts.
- The approach suggested makes sense. Support getting together to discuss the recommendation.

ACTION: Basil will circulate a recommendation to address the environmental attributes, which will be followed up with a meeting (likely conference call) to discuss.

Economic Development Attributes

Points of clarification and discussion on the economic development attributes included:

- It was clarified that, for the employment measure, person years is total person years over the life of the project.
- The employment metric at this point is not discounted.
- Induced jobs are included in the employment metric.
- In the total set of government revenues, water rentals are not a major driver compared with various other taxes.
- It was clarified that direct spending is what BC Hydro spends, indirect is what suppliers spend and induced is what people spend when they have more disposable income. The metric is trying to get at the total spend.
- The economic development metric is being updated to include a responding effect, which means people have more income to spend due to savings generated through conservation programs.

Member comments on the economic development attributes included:

- There is a difference between indirect and induced jobs and BC Hydro should be clear within the description about what is being referred to.
- Employment person years and government revenue are a subset of Gross Domestic Product (GDP), so to include all three BC Hydro is duplicating measures. Including three different ways of showing dependent variables puts a larger weight on the results. The most comprehensive measure is GDP.
- There is the concept of sustainable economic development that is missing from this measure as it leads you to say that more and more is better.

ACTION: Basil will circulate a backgrounder once the full dataset for the analysis is considered which will provide a recommendation for presentation of the economic development metrics.

Additional comments on the economic, rate and financial measures included:

- BC Hydro should clarify that DSM Option 2 is currently focussed on in the analysis because it is BC Hydro current target.
- BC Hydro should be looking at factors of sustainable economic development. There is a risk that people will look at the GDP numbers and base decisions on it, without considering it in context.
- For both the environmental and economic development, BC Hydro needs to look at the specific portfolios to be able to consider regional impacts. For example politically, in terms of new generation, a centralization of jobs would be found with Site C and a centralization of political conflicts compared to the IPPs. There is no measure of political conflict engendered in this data.
- Somewhere there should be a measure of the flexibility of the portfolios. The rate impact 20-years from now is very different from increasing the rate today and if BC Hydro can capture that it would be useful. The impact on land today is very different from 20-years from now. Flexibility of portfolios would be helpful.
- A member was interested in looking at portfolios from the perspective of project viability. For instance, some projects will not reach operation.

4. DEMAND-SIDE MANAGEMENT (DSM) – DRAFT ANALYSIS – Basil Stumborg

Basil Stumborg presented the draft DSM results of the portfolio analysis. Portfolios were developed looking at DSM Options 1-4 with one market price scenario (B) over the three gap sizes. These combinations were looked at with Site C and without Site C. Bruce Laxdal, consultant to BC Hydro, supporting the analysis was invited to join the discussion.

Points of clarification and discussion on the DSM portfolio analysis included:

- It was clarified that the costs of DSM Option 1 differ with the expected savings contributed in the small, mid, and large gap because DSM comes with fixed and variable costs and that different savings results effects the overall DSM cost.
- It was clarified that DSM Option 1 meets approximately 66% of new incremental load; Option 2 meeting 74%, Option 3 meets 78% and Option 4 is in the low 80's%.
- Using the same methodology was used in the LTAP, the costs of programs are levelized costs over 10 years and the present value of DSM option costs is calculated over 17 years.
- It was clarified that incremental cost from moving from DSM Option 1 to 2, 2 to 3, and 3 to 4, is calculated for each gap by taking the difference in the cost savings between options and the difference in DSM savings going from one option to the next and dividing them.
- Regarding Site C, the DSM option between 3 and 4 had a higher cost without Site C, however, it is relatively small and getting fine grained and doesn't really change the conclusions.
- BC Hydro has considered supply curves on the supply-side, which is a fairly easy exercise. However, it is more difficult to develop on the DSM side, and the best attempt is to take the packages and say incremental changes moving from package to package.
- Regarding slide 67 on the DSM near term uncertainty, the load growth is fixed.
- The potential to over deliver in the near term stays flat for the first three options, and it higher for the fourth option generally because targeting incremental volumes of DSM, more can go wrong then can go right.

Member comments on the DSM portfolio analysis included:

- High load and low DSM savings (large gap) seem counterintuitive, and concurrently low load combined with high DSM savings (small gap) is similarly counterintuitive.
- 10% probabilities associated with these small and large gaps seem too high (related to previous point).
- On slide 60 and 61, marginal costs should read average incremental costs.
- In calculating the unit energy costs on slide 61, non firm energy is being used. BC Hydro should recalculate these numbers using firm energy.
- BC Hydro needs to more clearly communicate the assumptions behind the numbers, and in particular the expected incremental DSM costs and Supply savings.
- The incremental costs should be shown net of trade.
- BC Hydro needs to relate the analysis back to the real world, what is happening to the buyer, seller and customer.
- With the portfolio comparison of DSM options, its difficult to evaluate when the analysis is controlling for two different variables, specifically, the large gap includes low DSM which intuitively doesn't make sense.
- This analysis is missing a dynamic planning of DSM and that problem is showing up in the models. Customer take up is a key variable.
- Instead of net present value, the title should be present value on slide 63.
- DSM will change over a few years and not just out 20-years so conclusions don't make a lot of sense but still it is an interesting analysis of where the planning sits.
- A TAC member was surprised by this statement 'DSM Option 4 never produced more economic value than options 2 or 3'. BC Hydro response was that it may look cost effective but when you look at the number you have to spend a certain amount more to get a bit more of DSM savings.
- A TAC member commented that it's people's responses which have the greatest uncertainty. BC Hydro responded that this is analysis are fixed views of the world and are not meant to predict the path it will go, it should inform the actions that BC Hydro will recommend to move forward with now.
- TAC member asserted a premium should be placed for a portfolio that is more flexible and can change over time.
- A TAC member commented with slide 67, DSM near term uncertainty, the data comes from people who will be more inclined not to over promise on the upside and you end up seeing that reflected in the data.
- A TAC member noted that if BC Hydro is worried about the downside of DSM BC Hydro should do more. This TAC member encourages BC Hydro to look at responding on both the demand and supply-side depending on what BC Hydro decides in a couple of years. Plan on it, rely on it, but spend something more to have the capacity to go to the upside of DSM – same as you are planning on the supply-side. BC Hydro should be thinking DSM responses that are known to work well and develop flexibilities. Some are responses and some are regulatory change – there is a wide-range of thinking available and BC Hydro is not utilizing the significant tools that are available.
- A TAC member questioned, with respect to the load forecast and moving closer to 2016, how will BC Hydro know how close it is to meeting the self sufficiency requirement? Once BC Hydro is one year away that is the last point to test the criteria. BC Hydro response that the closer to 2016 the more certain BC Hydro will be in terms of its ability to make target.

5. CLOSING COMMENTS

Closing comments from members included:

- In terms of today and the agenda – BC Hydro has crunched numbers and it has been very useful and the presentation material has helped provide insight to the planning process.
- The biggest insight is that there is a good solid number available to deal with the biggest issue that the province is facing on integrated resources planning – design and build towards flexibility and response.
- The biggest inflexibility is the Clean Energy Act and if we need to head towards electrification it would be valuable to have non-firm available. It has been very useful to have that quantification. I am looking forward to next steps and ‘good job to the presenters’ of today.
- This session was useful, and we are starting to see the real results and that is encouraging but qualms about some of the assumptions and the make-up of portfolios and troubled by low DSM expectation and high gap scenarios. In the real world, one of the scenarios for my client is what if self-sufficiency and insurance disappears then the low load starts to look like mid load.
- With respect to the near term certainty it seems like a big gap on either side – it seems like a fairly large gap and the strategy should focus in the middle of that. It was a pretty good session and I am looking forward to the session tomorrow.
- I am still struggling with the arithmetic and I may have more questions. Generally speaking, this was one of the best sessions today.
- I like the way it is going and I am sure that we will hear very interesting material the next time we meet.
- With respect to the economic development session I was very keen on that and DSM. I share the short-term concern on DSM and have a nervousness about DSM and achievability and I am wondering how it will shape out with the ultimate operation and planning and how aggressive you can be. We approached this last slide relative to the messaging around the target. A lot was taken in today and it was a terrific session.
- Thank you to BC Hydro staff for their hard work. One last comment, if DSM is over performing through resources and underperforming then throttle back.
- I am glad we went ahead with this meeting and it will be very helpful to get to real results. The opportunity to have a further conversation on the environmental attributes will be appreciated. The uncertainty on the supply-side is a question and should be handled in an integrated way. I do not understand high load DSM and low load DSM around how DSM costs are calculated and discounted. The self-sufficiency target is the elephant in the room relative to the constraints of the energy act.
- BC Hydro response was to thank members for their feedback. As members know BC Hydro is consulting with the First Nations and the public through stakeholder meetings and open houses and BC Hydro is compiling the information together and there will be equal weighting to all process streams. This is tough work and it is always a wake-up call to bounce off others and the work of TAC has been very valuable. TAC has another day tomorrow and more days at the end of April and all the sessions will help BC Hydro to propose actions.

With respect to the TAC meeting held on March 10 – it was clarified that the draft notes were sent to TAC members and that the BC Hydro planning group went through the action items and Anne will check and see whether this material can be brought forward or not.

The Facilitator thanked everyone for their engaged participation.

The meeting ended at 4:45 p.m.