Technical Working Group Session Summary

Date: 4/6/2018 **Time:** 9:00 AM - 3:00 PM

Location: Westin

Time	Agenda Item	Presenter
9:00 – 9:15	Welcome, Introductions and Housekeeping	Jordan
9:15 – 10:45	CONE - Review project objectives and progress - Review financial assumptions and reference technology screen	Adam / Michael (Brattle)
10:45 – 11:00	Break	
11:00 – 12:00	Resource Adequacy Modeling - Update on work completed - Review draft results - Discuss next steps	Steven
12:00 – 12:30	Lunch	
12:30 – 1:30	Resource Adequacy Modeling (Continued)	Steven
1:30 – 1:45	Break	
1:45 – 2:55	UCAP - Discuss further details on UCAP calculation methodology	Ketan
2:55 – 3:00	Session Close Out	Jordan

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(#)	Name	Company	Attendance Status (A) Attended / (R) Regrets
1.	Nicole Leblanc	AESO	A
2.	Colette Chekerda	Alberta Direct Connect	A
3.	Surendra Singh	Alberta Newsprint Company	A
4.	Hao Liu	AltaLink Management Ltd.	A
5.	Kurtis Glasier	ATCO	A
6.	Ricardo Rangel Ruiz	Capital Power	A
7.	Edmond de Palezieux	Depal Consulting	A
8.	Kelly Cantwell	Emera Inc.	R
9.	Molly Jerrard	EnerNOC	A
10.	Chris Joy	ENMAX	A
11.	Stephen Thornhill	EPCOR Utilities	R
12.	Derek Skeet	Husky Oil Operations Limited	A
13.	Vittoria Bellissimo	IPCAA	A
14.	Guido Bachmann	Kineticor Resources Corp	A
15.	Todd Cole	MEG Energy	A
16.	Dan Chapman	NRStor	R
17.	Doug Simpson	Office of the Utilities Consumer Advocate	A
18.	Kris Aksomitis	Power Advisory	A
19.	Danny O'Hearn	PowerEx Corp	A
20.	Leonard Olien	Solas Energy Consulting	A
21.	Akira Yamamoto	TransAlta Corporation	A
22.	Lars Linder	TransCanada Energy Ltd.	A
23.	Tory Whiteside	URICA Energy Management	A
24.	Jordan Ludwig	Stack'd Consulting	A
25.	Dustin Anderson	Stack'd Consulting	A
26.	Maria Gray	AESO – Observer	A
27.	Ketan Lakhani	AESO – Presenter	A
28.	Adam Gaffney	AESO – Presenter	A
29.	Steven Everett	AESO – Presenter	A
30.	David Johnson	AESO – Observer	A
31.	Ryan Scholfield	AESO – Observer	A
32.	Michael Hagerty	The Brattle Group	A
33.	Mike Tolleth	The Brattle Group	A – (Telephone)
34.	Sang Gang	Sargent & Lundy	A
35.	Patrick Daou	Sargent & Lundy	A – (Telephone)

CONE:

- **The working group has concerns that the forecasted ATWACC is too low, and not representative of the Albertan market. Members are also concerned that the emerging choices in reference technology may be too large of units given Alberta's current supply and forecasted load growth.**

- **Brattle Clarification:**
  - Reference Technology:
    - Indicative Plant Capital Costs:
      - Expecting to see the capital costs to be in the lower range of the band based on Alberta costs
      - Most of the lower Bands reflect the anticipated capital costs in Alberta and/or reflect the costs of recent development in Alberta
      - The higher range in the bands represent costs that were observed across North America
    - The AESO will be evaluating three options for reference technologies (Aero CT, Frame CT F-Class, and Combined Cycle H-Class)
    - CONE will be based on a greenfield development
    - The demand curve will be reviewed periodically, therefore the selection of the reference technology is for a 3-5 year period
      - We should only want to change the reference technology if there are fundamental changes in the market
    - The heat rate value for H-class turbine is a high-level estimate at this time
    - We will work with the AESO to understand the interconnection costs
  - Financial Assumptions:
    - Assumptions are based on balance sheet financing versus project financing.
      - This is due to the most likely development as based on recent planned and realized development in Alberta and other jurisdictions
      - It was also noted that assessing the corporate level risk and unbundling the risk at a project level may not be representative of the true cost of new entry for the reference technology
    - Will look at recent IPP projects that will give us indicative information on merchant projects

- **WG Commentary**
  - Reference Technology:
    - Is an E-Class CT a better selection than an F-class for this market?
      - In considering the size of plant for the reference technology, a merchant producer needs to consider the size of the market (i.e. versus in the US where a utility might be predominately looking for efficiency).
      - The forecasted load growth in Alberta is less than it was in the past so that should be considered in selecting the reference technology.
    - Given the increased expectation of Wind in the province shouldn't the selection of the reference technology be done based on those requirements and reflect market design choices (i.e. EAS moving to 15-minute settlement and not paying for Ramp in the short-term)

- Considerations should be made on comparing cheapest vs what makes sense for the Alberta market
- What is actually being built in Alberta at this time (and forecasted for the future)?
  - Why hasn't the forecast for expected technology include what is happening in Alberta (e.g. Coal-to-gas, Cogen, etc.)?
    - Shouldn't the selection of reference technology correlate with and/or influence the future buildout in Alberta?
  - The currently proposed F-class frame technology that is planned in Alberta was intended for a different application when it was first built (i.e. Cogen) and is being transitioned to a Peaker
- Expected changes to the NOX regulation may impact SCR, which we may want to consider in the reference technology estimates
- Want better clarity in how Federal and Provincial GHG regulations are being considered in the analysis
- For CC H-Class shouldn't use 'Wet Cooling Tower' given water restrictions in Alberta – should consider air cooling

- Financial Assumptions:
  - Should Beta be based on Alberta context and not the historical stock returns of the overall market (i.e. therefore, the Beta should be higher in the AB context)?
  - The indicative discount ranges aren't representative of new merchant investment in AB.
    - If you look more at the Oil Sand ranges, this is more indicative of a new merchant cost of capital
    - The comparators you have chosen to reflect in the indicative analysis have PPA's to back the investment resulting in the lower cost of capital
  - When looking at the US comparators, were considerations made for the size of the US market in comparison to the size of the AB market?
    - US markets are 10X the size of the Alberta markets
  - Cost of equity is likely too low in your analysis
  - More consideration should be given for project financing
  - Worried more about the Energy market having sufficient value, than the cost of capital
  - Continue to consider the risk adjustments for the Alberta merchant market versus the US market (e.g. smaller, illiquid, not PPA backed, small obligation term, merchant in nature, etc.).
    - Assumption would be that the US market should be less risky than the Albertan markets
  - US IPPs aren't investing in this market and hence shouldn't be using that as a comparison (can assume they see this market more risky / smaller returns)
  - There has been a significant policy shift, including out of market payments, which is creating considerable uncertainty for investors (i.e. more risk for the introduction of the market)
  - Would be valuable to provide sensitivity analysis as it relates to ATWACC (e.g. tornado chart) as input into the CONE calculation

- **Outstanding Questions:**
  - How material will the change in the Net-CONE estimate be by selecting an E-class turbine over an F-class turbine (relative nameplate capacity)

Resource Adequacy Modeling:

- **Working group members are concerned with how the resource adequacy model will be translated in to a resource's UCAP but are generally supportive of the approach to the resource adequacy modeling and its emerging results, subject to the comments provided below.**

- **AESO Design Clarification:**
    - Self-Supply:
        - The AESO is modelling everything on a gross basis

- **WG Commentary**
    - General comments:
        - Does the model have a correction for the Fort McMurray wildfires?
        - With the increase in variable resources planned for the grid, will spinning reserves need to increase?
        - At this time, it does not appear that the resource adequacy model, and the UCAP calculations are aligned, which is causing concern with market participants
    - Cogeneration:
        - Aggregating all cogen assets doesn't seem appropriate given that the model accounts for other assets individually
            - Will you be diluting the volatility of modeling these sites independently?
            - Must consider the uniqueness of site variability
            - Alternative point-of-view: not certain that the way the calculation will have a material impact on the resource adequacy calculations
        - Seems like there is an inconsistency in modelling cogeneration and how you are treating self-supply from a UCAP perspective
            - Does it also imply a disconnect between what is being bought and sold (reliability vs availability)?
        - How are you taking in account temperature de-rates for cogeneration?
            - Implicitly calculating the profile through AC doesn't seem appropriate
    - Emergency Response / Ancillary Services:
        - Not clear how this accounts for Interties and available ATC
    - Interties:
        - Intertie modelling should be conducted independently (i.e. different calculations for each tie-line)
        - On this methodology it seems like you are relying on internal resources more than what would occur and would have an impact on TTF and TTR
    - Reserve Margin:
        - Would be valuable to add % EUE to the draft results
        - Why wouldn't you take outages out of months like August and move them into May/June and September/October?
    - Wind:
        - Not certain that it is useful to use historical wind profiles given existing and anticipated technology changes by 2021
    - Price-Responsive Load
        - If PRL is a supply resource, their response will differ from historical behavior (i.e. if they are a capacity provider, they will no longer respond to coincident peaks)

- **Outstanding Questions:**
    - Implications of losses on modelling and cost allocation (i.e. how are losses considered?)
    - Assess seasonal implications / component on co-gen profile
    - With anticipated increased NDV, will spinning reserves need to be increased in the model?
    - Would like to understand the implications of including PRL into the resource adequacy model (e.g. will the historical supply cushion pattern hold true if price-responsive load's behavior changes in the market?)

- **Actions:**
    - Align the emergency tie-line procedure with the modeling approach (AESO)
    - Add % of expected unserved energy to the final versions of the resource adequacy model (AESO)

UCAP:

- **Working group members are concerned with the proposed approach to calculate UCAP, expressing concerns with the proposed framework, as well as the application of the framework. Specific questions / concerns included:**
    - Concerns with the proposed framework:
        - Issues with existing data and systems
        - Volatility within a resource's year-to-year UCAP
        - What incentives are we signaling to the market?
        - What is the risk to participants in their UCAP calculation?
            - Could the AESO consider a UCAP range for participants to allow it to better manage its risk?
    - Concerns with the application of the framework:
        - Alignment of the resource adequacy modeling, with UCAP values, and penalties for market participants
        - Consistency in approach across technology
        - Optionality of net treatment vs. gross treatment

- **AESO Design Clarification:**
    - Assets that are controllable / dispatchable will be given an availability factor; assets which have historically not as tightly correlated to dispatch (i.e. not controllable) are given a capacity factor.
        - AESO is still working through UCAP calculations for self-supply resources and interties
    - A self-supply asset can choose between gross or net, but cannot choose if AF or CF is used for Capacity Factor calculations

- **WG Commentary**
    - Historical data:
        - The data is noisy data and isn't purely reflecting availability
        - The reason and timing for taking a planned outage will be different in the future based on different incentives / penalties

- 100 Hours:
  - Historically, we used to manage 8760 hours in the energy market, and there was ~1000 hours that would determine the economic returns (and, could be hedged in the forward markets). Now the revenue will be impacted by 100 hours that cannot be hedged
  - Not clear how much the individual UCAP will move year-over-year and this data should be provided in the analysis. Considerably worried about the swings year-over-year
    - Perhaps, the AESO should assess an individual unit's UCAP over a 10-year period to assess the volatility / stability of its UCAP year-to-year
  - Many of the issues with the UCAP calculation are due to planned outages and the variability of the 100 hours selected
  - Historically, some of the tightest 100 hours in some of the years the intertie might have been taking power out (which was a rationale decision at the time) but would provide 0 UCAP at that time which wouldn't reflect availability of the intertie
- There is a large disconnect between how capacity costs are going to be allocated and paid for
- UCAP Calculation
  - Alternative proposal: Participant submits what they believe the UCAP value could be (within a range) and then accept and manage the performance obligations
    - Then the AESO can test these values based on historical availability information (possibly based on a band) and the AESO can be the party to initiate the dispute versus the participant
  - Alternative proposal: Calculate the system average for availability over the 100 hours to calculate the % of availability. Then adjust an individual asset based on availability across all hours by the stem average
  - AESO is using implied EFORD data in reliability calculations but is using UCAP for availability calculations
- Availability Factor and Capacity Factor:
  - Intertie should use AF as it highly correlated to dispatch
  - The graph that demonstrates capacity factor shouldn't be interpreted that that asset can't provide the available capacity because they were not historically dispatched below that value. If historically, they didn't dispatch to what they said was AC than the AESO should be aware of a compliance issue
    - The UCAP should include un-dispatched MWs
- Mothballing:
  - If you exclude mothball, this would be parallel to the intertie not flowing during certain times because it is not economic and therefore should be excluded
  - The treatment of an extended planned outage to be similar to what is being proposed for a mothballed asset
- Selection of Supply Cushion Hours:
  - Would like the data to be made publicly available used in the analysis (all hours – i.e. beyond the 500)

- **Outstanding Questions:**
  - What would occur for a resource's UCAP during the sale / purchase of an asset

Meet (#)	(#)	**WIG Action Items**	**Action by**	**Due Date**
2	1	Align the emergency tie-line procedure with the modeling approach	AESO	May 4
2	2	Add % of expected unserved energy to the final versions of the resource adequacy model	AESO	May 4