Comprehensive Market Design Stakeholder Comment Matrix
Technical Working Group – *FINAL*

Please complete this matrix by February 27, 2018, and upload it to the "Feedback" folder on the CMD SharePoint site. The AESO will post all comment matrices received from working group members on www.aeso.ca. **Please note that the names of the parties submitting each completed comment matrix will be included in this posting.** The AESO does not intend to respond to individual submissions. If you have any questions about this comment matrix, please email capacitymarket@aeso.ca

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Date: February 27, 2018

CMD Key Design Questions	Comments and / or Recommendations
1. UCAP: Can you support the availability factor/capacity factor over the 100 hours of smallest supply cushion being used to calculate the UCAP?	ESC notes that calculation of the 100 tightest hours is based on historic data where the availability of generating resources has been a function of market signals emanating from the energy market. There is no reason to believe that in the future the 100 tightest hours under a capacity market scenario will bear any resemblance to historic 100 tightest hours. In fact, based on adaptive behavior theory it is highly likely that the 100 tightest hours will vary significantly from year to year as generators modify their planned outages to maximize revenue and/or minimize penalties. The addition of new technologies such as energy storage will also significantly impact the 100 tightest hours calculations. For example, it is possible that an energy storage facility could be charging, i.e. taking power off the grid, during a 100 tightest hour period. However, that facility could stop charging, thereby reducing demand and eliminating that hour as one of the 100 tightest hours. In addition, that facility, even if only partly charged, could provide electricity to the grid by discharging. Therefore, in calculating the 100 tightest hours the AESO will need to take into account not only the ES facilities discharge capacity, which may be discoverable through the ES bid process, but also its demand response capability when calculating the 100 tightest hours. **To do that the AESO needs to know the state of charge of energy storage facilities and hence those facilities' total capacity**. ESC understands that to date no discussions about the impact of energy storage on the 100 tightest hours has taken place. ESC urges the AESO to undertake these types of discussion as soon as possible. In addition, ESC suggests that the AESO maintain sufficient flexibility for future changes to the UCAP calculations to reflect adaptive behavior and technology changes impacts on the UCAP calculations.
2. UCAP: Can you support the UCAP calculation being based on 5 years of historical data?	Please see previous answer. ESC believes that a rolling five-year historical average for UCAP calculations may not survive the test of time as market participants adapt their behavior to changing conditions in the capacity market and as new technologies such as energy storage enter the capacity market. In addition, ESC urges the AESO to commence discussions immediately with energy storage proponents and other interested parties, to determine the best methodology for including energy storage in overall UCAP calculations and individual energy storage facility UCAP calculations.
3. UCAP: Are there risks with including planned outages in the availability factor data used to calculate UCAP? If so please describe.	ESC does not have an opinion on the use of planned outages in the availability factor data used to calculate UCAP. However, in a similar vein, ESC suggests that state of charge for ES facilities needs to be taken into account when calculating UCAP for both the overall UCAP calculations and individual facility UCAP calculations. ESC urges the AESO to commence such discussions as soon as possible.

CMD Key Design Questions	Comments and / or Recommendations
4. Demand Curve: Do you have any feedback on the material presented in the CMD 1? Note: AESO and the WG will revisit the shape of the demand curve once draft outputs from the Resource Adequacy model are available.	ESC is concerned that the demand curve calculations as currently structured will not take into account the dispatchable load capabilities of energy storage facilities. ESC urges the AESO to commence discussions with energy storage proponents and other interested stakeholders on the impact that energy storage facilities may have on the shape of the demand curve.
5. Load Forecast: Can you support the proposed approach to forecast load? Are there any outstanding comments or concerns with the proposed approach?	ESC does not have any comments on the proposed approach to load forecasting except to note that behind the meter generation and energy storage facilities may significantly affect net load in the near future. ESC urges the AESO to assess the impact that behind the meter generation and energy storage have had on load forecasts in other jurisdictions such as California and Germany, both of which have significant solar generation capability.
6. CONE: Can you support the intended Gross CONE estimation approach?	ESC understands that the Gross CONE used in the demand curve development are for a simple cycle gas turbine. For the analysis it was determined that the CONE calculations for energy storage were based on the data for a battery system gathered from a 2016 EIA report. ESC is concerned that using such information would provide inflated capital cost values for energy storage facilities. Also, using CONE for a battery system does not reflect other prospective candidate energy storage technologies specifically pumped hydro and compressed air energy storage. ESC respectfully requests that it be consulted regarding provision of realistic inputs for the CONE calculation for energy storage facilities.
7. CONE: What are the important considerations AESO needs to take into account when selecting the Energy and Ancillary Service offset estimation methodology?	Operational characteristics of the reference technology class must be followed. The reference technology, a simple cycle gas turbine, is generally operated as a peaker and therefore this operation must be reflected in the EAS revenue estimation. Using a simple cycle asset for baseload generation is not generally completed and therefore could introduce error (over or under estimation) in the Net-CONE calculation.
8. CONE: Are there any issues or gaps in our considerations or plan in Net CONE estimation?	Please see ESC's response to question 6 and 7.

General Comments: Any comments on relevant scope areas of the CMD that are not addressed above
ESC is concerned that the AESO is not engaging in specific discussions on how energy storage might fit into the capacity market and how energy storage might affect various inputs to the capacity market such as the calculations for determining the overall UCAP, the shape of the demand curve and load forecasting. Energy storage and behind the meter distributed generation combined with energy storage facilities have the potential to be very disruptive technologies that the AESO, and all stakeholders, should take into account in designing the Capacity Market.