Resource Capacity Accreditation in the Forward Capacity Market

Gas and Oil Modeling for the Seasonal Risk Assessment

Fei Zeng

TECHNICAL MANAGER
FZENG@ISO-NE.COM
413-540-4212

Resource Capacity Accreditation in the Forward Capacity Market	WMPP ID: 157

Proposed Effective Date: FCA 19

- The Resource Capacity Accreditation (RCA) project proposes improvements to ISO-NE's accreditation processes in the Forward Capacity Market (FCM) to further support a reliable, clean-energy transition by implementing methodologies that will more appropriately accredit resource contributions to resource adequacy as the resource mix transforms
- RCA provides an opportunity for continuous improvement of the Resource Adequacy Assessment (RAA) model that is used to calculate capacity requirements (demand side) and resources' reliability contribution (supply side)
- This presentation focuses on the discussions on the stakeholder feedback on the ISO's proposed gas and oil resource modeling presented to 2024 January RC

Outline of today's discussion:

- Recap of ISO's proposed gas and oil modeling (slide 4 – 14)
- Additional information requested by stakeholders (slide 15 – 17)
- Stakeholders' feedback and ISO's assessment (slide 18 – 24)
- Next steps (slide 25 – 26)

SUMMARY OF PROPOSED GAS AND OIL MODELING FOR RCA

Modeling of gas and oil resources for different RAAs during peak winter months (Dec-Feb)

Capacity Resource	Proposed RAA Resource Model	RAA Case
Gas Resources	Profile (a change from current Thermal Model) based upon Winter QC	• Seasonal Risk • Accreditation • Capacity Requirement
DFO Resources DFO-Only and Dual-Fuel using DFO	Storage (a change from current Thermal Model) based upon Winter QC (or back-up fuel capability)	• Seasonal Risk
	Thermal based upon a derated Winter QC (or back-up fuel capability)	• Accreditation • Capacity Requirement
RFO Resources RFO-Only and Dual-Fuel using RFO	Thermal based upon a derated Winter QC (or back-up fuel capability)	• Seasonal Risk • Accreditation • Capacity Requirement

SUMMARY OF PROPOSED GAS RESOURCE MODELING

Overall gas modeling methodology

- A regression model is used to establish a relationship between the amount of daily gas available to generation and temperature conditions based on historical data
- The amount of daily gas available to generation for each day and each load level simulated in the RAA models will be determined based on the implied HDD associated with the load and the relationship between the amount of daily gas available to generation and temperature conditions as established in the regression model
- The daily available gas will be apportioned to each hour during the day based on historical hourly gas generation patterns and the representative heat rate of the gas fleet
- The load/temperature-correlated hourly profile will be used to represent the hourly gas fleet generation in the RAA models for seasonal risk assessment and resource accreditation

Historical data and adjustments considered

- The historical dataset used for determining the historical gas availability to generation is December to February from 2014/15 to 2022/23 winters, focusing on the days with tight supply conditions identified using two thresholds
  - HDD >= 40
  - Oil generation has been observed (*daily oil generation* >= 100 MWh)
- Historical gas availability to generation will be based on the actual gas burn for generation, adjusted to account for the impacts of future availability/uncertainty associated with historical gas supplies

Adjustments to historical gas availability to generation

- Historical daily gas available to generation will be adjusted upward by 0.1 Bcf/d for the period prior to Algonquin Incremental Market (AIM) project
- Historical supply from Excelerate LNG will be excluded due to its uncertain future availability
  - The exclusion reflects an expectation/assumption of its future availability for the purpose of assessing system reliability. It does not prevent it from being a viable supply option in the market
    - Forward arrangements from Excelerate will be considered as additional incremental supply in the qualification and accreditation processes
- A balanced adjustment is considered to account for EMT impact given its future uncertainty
  - Historical generation from Mystic 8&9 will not be included due to their expected retirement
  - Additional gas beyond what has been injected historically into the gas pipeline system from EMT LNG will not be considered
  - To the extent that EMT remains in service, forward arrangements from EMT LNG will be considered as additional incremental supply in the qualification and accreditation processes

Adjustments to historical gas availability to generation, cont.

- Additional available gas from Saint John LNG will be considered available to generation
  - Adjustment is limited to the lesser of the effective remaining LNG inventory and the effective remaining capacity headroom for delivery on M&N pipeline
  - Impact of historical eastern Canada export from Sable Island and Deep Panuke will be accounted for in determining the effective remaining LNG inventory
  - Forward arrangements from Saint John are inherently part of the total existing gas supply assumed in the RAA model for risk assessment and resource accreditation
    - Such arrangements will limit the total amount of non-firm supply available to other gas-fired generators

- The future uncertainty of Saint John LNG available supply to generation is not explicitly considered
  - The ISO will look into incorporating the impacts from future non-power gas demand changes as a result of the increase of electrification, retirement of EMT, and other factors possibly for auctions beyond FCA19

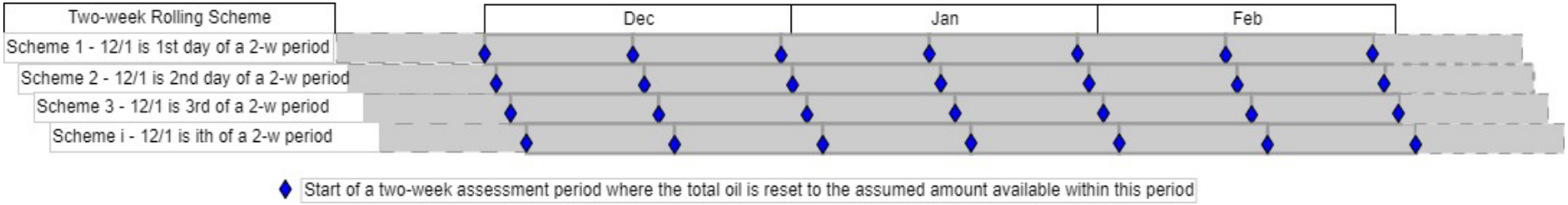
SUMMARY OF PROPOSED OIL RESOURCE MODELING

Oil resources modeled in RAA

- In the RAA for seasonal risk assessment:
  - RFO units will be modeled individually as thermal units using their respective xEFORd
  - DFO fleet fuel constraints will be captured by modeling the DFO resources as an aggregate energy storage resource with a limited amount of energy available during a two-week period
    - A two-week period is chosen to estimate the reliability impact of a prolonged cold snap
- In the RAA for accreditation:
  - Oil capacity (from oil-only and dual-fuel), including RFOs and DFOs, will be modeled as individual de-rated resources

DFO energy limitation modeled on rolling 2-week periods

- DFO constraint is assessed on a rolling two-week basis
  - Peak winter months from December to February is divided into a series of two-week assessment periods
  - There are many possible rolling schemes. One of them will be randomly selected for each replication



- The total amount of available energy of the aggregate storage resource used to represent the DFO fleet is reset to the assumed amount at the start of each two-week assessment period, and subsequently dispatched to serve demand when needed throughout the 2-week period

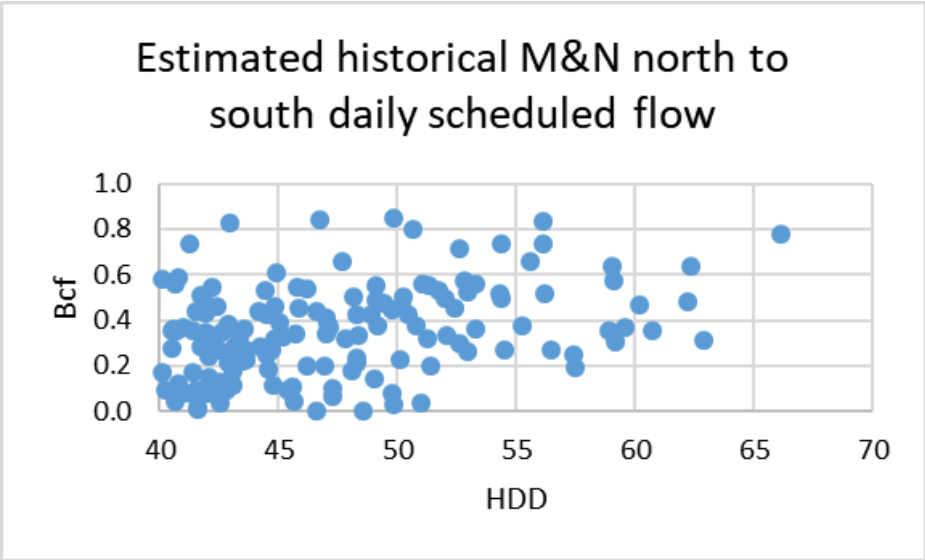
DFO fleet energy constraint during a 2-week period

- The total amount of energy available from DFO fleet during a two-week period is formulated based on the historical OP-21 weekly generator fuel survey data from the past five winters
  - Starting inventory level at the beginning of the week
  - DFO fleet replenishment during the next 2 weeks
    - The sum of these two quantities forms the expected amount of energy the DFO fleet would have been able to provide during a 2-week period
- Seasonal risk assessment will consider different DFO inventory levels of the last five seasons and the winter/summer LOLE split target will reflect an probability-weighted outcome

ADDITIONAL INFORMATION REQUESTED BY STAKEHOLDERS

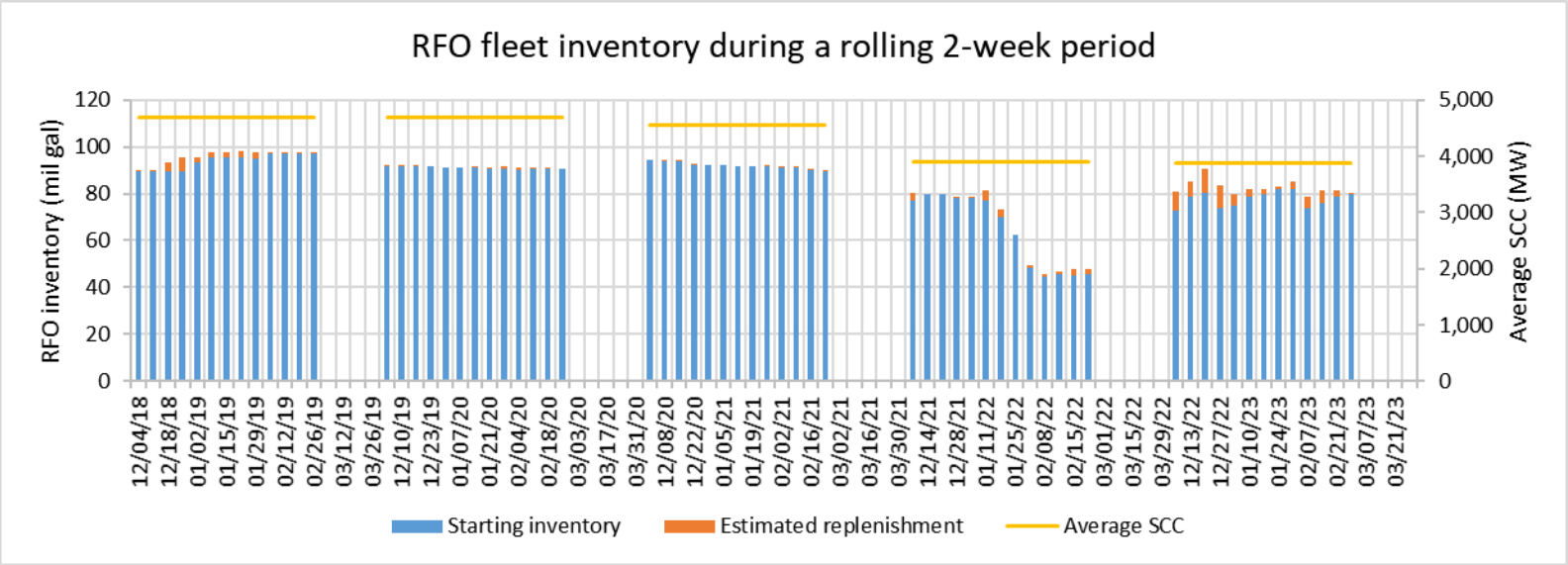
Request #1: historical Saint John LNG import

- Estimated M&N north to south daily scheduled flow
  - December to February from 2014/15 to 2022/23 winters for days with the tight gas supply conditions (based on HDD >=40 and oil generation >=100 MWh)



Request #2: historical RFO inventory

- Historical RFO total inventory (starting + estimated replenishment) during a rolling 2-week period was generally able to support more than 20 hours of continuous operation daily at Seasonal Claimed Capability (SCC)



ISO RESPONSES TO STAKEHOLDER FEEDBACK DELIVERED AT THE JANUARY RC

Feedback on EMT retirement impact

- *How would the historical gas availability be impacted in a world without EMT since its daily sendout has been historically used for serving both LDC demands and generation demands?*
- **ISO's considerations**:
  - The currently proposed gas modeling accounts for the EMT impact in a balanced way given its uncertain future status. The adjustments made to historical availability to generation do not contemplate a single scenario of EMT either continuing operation or retired, therefore fewer additional adjustments will be needed when EMT status becomes known. (More on next slide)

Feedback on EMT retirement impact, cont.

- **ISO's considerations**:
  - Additional adjustments to the historical availability to generation will need to be considered when EMT status becomes certain
    - If EMT continues to operate:
      - Need to consider additional available gas to generation EMT can provide through the remaining capacity headroom into AGT and TGP
    - If EMT is retired:
      - Need to consider how the affected LDCs would mitigate this loss of gas supply, and the subsequent impact on generation availability

Feedback on Saint John LNG availability

- *The proposed gas modeling assumes higher LNG imports from Saint John than have been observed historically, which will tend to overestimate availability of gas and underestimate the reliability risks*

- **ISO's considerations**:
  - The proposed gas modeling derives the gas availability to generation based on the gas system infrastructure capability to serve both LDC and generation demands with consideration of historical supply conditions
    - The amount of remaining gas after meeting the LDC demand is considered available to generation
  - Unavailability due to economic reasons for the future is very difficult to predict and is generally not considered in the resource modeling, *e.g.*:
    - xEFORd used for modeling a thermal resource does not consider the availability when it is not on demand
    - Economic curtailments under DNE are reconstituted back into the historical profiles of intermittent resources

Feedback on variability of gas profile

- *Historical data set only reflects the gas (LNG) supply and weather conditions that have materialized, and may not be able to capture certain scenarios that are worth being considered. For example, historical data had not captured the scenario of tight LNG supply coupled with cold seasons having cold snaps*
- *The proposed gas modeling uses a single gas profile to estimate average gas availability from historical data, but reliability risks are most significant during extreme weather years, and winter demand is inversely correlated with gas supply to the generation fleet, so we recommend a gas profile method that allows for some variation around the average to account for increased reliability risks during lower than average gas supply years*
- *It seems improper to set a non-firm gas unit accreditation based on availability that is roughly 50% of the time and that if a deterministic model is used, it should be based on a curve set to the level that is exceeded most of the time (e.g., using a regression line that is exceeded 90% of historic dates)*

Feedback on variability of gas profile, cont.

- **ISO's considerations**:
  - The ISO relies on historical data to model the expected performance for nearly all resource types
    - Historical hourly outputs are used for all profiled resources, *e.g.* IPR, ADCR
    - xEFORd calculated based on historical performance is used for all thermal resources
  - Variability of historical performance is reflected for some resource types based on modeling needs and/or software modeling capabilities
    - Multiple profiles are used for most of IPRs
    - Single profile is used for solar during summer
    - Single xEFORd based on 5-year average is used for thermal resources
    - Single profile is used for gas resource during peak winter months

Feedback on variability of gas profile, cont.

- **ISO's considerations**:
  - The ISO believes the current proposed deterministic gas profile reasonably reflects the gas fleet availability under different temperature conditions, and is open to further evaluating the inclusion of variability in the gas profile modeling as a future enhancement given the annual forward RCA project timeline
    - The ISO has explored development of stochastic distribution to model gas availability, but has not identified a robust probabilistic model that would be superior to current model due to limited data availability under high HDD conditions
    - The proposed gas modeling does not explicitly consider non-power demand uncertainty in future years. However, the ISO will look into incorporating the impacts from future gas demand changes, especially as electrification increases

NEXT STEPS

Next steps

- The ISO has applied the proposed gas and oil modeling to conduct seasonal risk assessment and resource MRI calculation for the impact analyses whose results will be reviewed at the MC
- The ISO will evaluate further enhancements

Questions