Resource Capacity Accreditation in the Forward Capacity Market

Detailed Design

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Resource Capacity Accreditation (RCA) in the Forward Capacity Market (FCM)

WMPP ID: 157

Proposed Effective Date: Forward Capacity Auction 19 (FCA 19) with a one-year delay

- The RCA project proposes improvements to the ISO's accreditation processes in the 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

- Today's presentation continues the RCA detailed design discussion with a walk-through of seasonal and annual Marginal Reliability Impact (MRI) calculations, seasonal Qualified MRI Capacity (QMRIC) component calculations, and the FCA QMRIC calculations for different resource types, including:
  - Non-gas thermal resources, gas thermal resources, storage resources (including pumped hydro), small intermittent resources, large solar and wind intermittent resources, and large non-solar and non-wind intermittent resources

- Next month's presentation will conclude the detailed design review on the MRI and QMRIC calculations with co-located resources, distributed energy capacity resources (DECRs), pool-backed and resource-backed imports, and resources with zero winter or summer QC
  - February's material is also planned to include discussion on the validation of input parameters necessary for the MRI calculations, and the retirement and delisting process

Key Concepts

- **Accreditation Base Case:** Used to calculate resources' seasonal MRI values, the accreditation base case is a collection of load and resource models and assumptions in GE-MARS that results in a Loss of Load Expectation (LOLE) value at the one-in-ten standard
- **Expected Unserved Energy (EUE):** An output of the accreditation base case, EUE is a MWh measure of expected load shed, given the assumptions of the accreditation base case
- **Summer Season:** Defined as June through September in the accreditation base case
- **Winter Season:** Defined as October through May of the following year in the accreditation base case

SEASONAL MRI CALCULATIONS FOR THERMAL RESOURCES

Seasonal MRIs for Existing Non-Gas Thermal Resources will be Calculated in Four Steps

- Step 1: Calculate the total amount of EUE in the summer and winter seasons using the accreditation base case
- Step 2: In the accreditation base case, increase the size of the thermal resource by a small amount
  - Currently, the small increase is 0.5 MW of summer QC in the summer season and a proportional quantity of winter QC in the winter season, defined as:

$$Proportional\ increase\ in\ Winter\ QC = 0.5\ MW * \frac{Winter\ QC}{Summer\ QC}$$

  - Note that the ISO may use a small increase other than 0.5 MW to avoid numerical issues, as needed
- Step 3: After increasing the thermal resource's size, re-run the accreditation base case to calculate new EUE values in the summer and winter seasons
- Step 4: The resource's summer MRI will be the difference between the summer season EUE in Steps 1 and 3, divided by the change in summer QC (e.g., 0.5 MW). The resource's winter MRI will be the difference between the winter season EUE in Steps 1 and 3, divided by the change in winter QC (e.g., 0.5 MW * Winter QC/Summer QC)
- Seasonal MRIs for existing thermal resources will be driven by their equivalent forced outage rate on demand excluding events out of management control (xEFORd), and their size

Existing Gas Resources will have their Winter MRI Calculated using a Simple Approximation

- Due to the complexities associated with incorporating the gas constraint into the accreditation process, the winter MRI for gas resources will be calculated using a simple approximation:

$$MRI_{Winter,i} = (1 - xEFORd_i) * MRI_{Winter,PC}$$

- Where $MRI_{Winter,PC}$ will be a hypothetical "perfect capacity" resource's winter MRI (see "Seasonal and Annual MRI Calculations for Perfect Capacity")

Seasonal MRIs for New Thermal Resources will be Calculated using a Class Average Approach

- Because new resources will not be modeled in the accreditation base case, the ISO will assign "class average" seasonal MRIs to each new thermal resource, where the class average seasonal MRIs will be calculated as:

$$MRI_{Summer}^{Class} = \frac{\sum_{i \in class}(QC_{Summer,i} * MRI_{Summer,i})}{\sum_{i \in class} QC_{Summer,i}}$$

$$MRI_{Winter}^{Class} = \frac{\sum_{i \in class}(QC_{Winter,i} * MRI_{Winter,i})}{\sum_{i \in class} QC_{Winter,i}}$$

- Seasonal MRIs for new thermal resources will be driven by the average xEFORds of their class

New Thermal Resources will be Assigned to a Class Consistent with how they are Qualified

- Thermal resource classes include:
  - Gas-only
  - Dual-fuel
  - Oil-only
  - Nuclear
  - Coal
  - Fuel cells
  - Non-IPR hydro
  - Non-IPR landfill gas and waste
- Any generation capacity resource that consists of more than one technology component will be treated as a co-located technology

Some Hydro, Landfill Gas, and Waste Resources will be Modeled as Thermal Resources

- New and existing hydro, landfill gas, and waste resources that are modeled as thermal resources (as opposed to intermittent power resources) will have their seasonal MRIs calculated using the same steps used for other thermal resources detailed in this section

SEASONAL MRI CALCULATIONS FOR STORAGE RESOURCES

Seasonal MRIs for Existing Storage Resources will be Calculated in a Manner Similar to Existing Thermal Resources

- Seasonal MRIs for existing storage resources (including pumped hydro) will be calculated using the same four steps used to calculate seasonal MRIs for existing non-gas thermal resources
- In Step 2, when the summer and winter QCs for existing storage resources are increased, the resources' maximum stored energy limits and charge/discharge rates will be increased proportionally
  - E.g., for a two-hour battery, a 0.5 MW increase in their summer QC will be accompanied by a 1 MWh increase in their maximum stored energy limit, while for an eight-hour battery, a 0.5 MW increase in their summer QC will be accompanied by a 4 MWh increase in their maximum stored energy limit
  - Given a 0.5 MW increase in summer QC, the charge/discharge rates will be increased by 0.5 MW divided by summer QC, times the resource's existing charge/discharge rate
- As such, seasonal MRIs for existing storage resources will also be driven by how much energy they can store and how quickly they can charge

Seasonal MRIs for New Storage Resources will be Calculated using a "Proxy" Resource Methodology

- Because new storage resources will not be included in the accreditation base case, a "proxy resource" methodology will be used to calculate their seasonal MRIs
  - A class average approach would not work because new storage resources may have durations not currently modeled in the accreditation base case
- The proxy resource methodology will add a small amount of the new resource to the resource mix in the accreditation base case
- The four steps to the proxy resource methodology are provided on the next slide
  - Note that the primary difference between the proxy resource methodology and the seasonal MRI calculations for existing resources is that, with the proxy resource methodology, the new resource is not included in the accreditation base case

The Proxy Resource Methodology for Calculating Seasonal MRIs Includes Four Steps

- Step 1: Calculate the total amount of EUE in the summer and winter seasons using the accreditation base case
- Step 2: In the accreditation base case, add a small amount of the new resource
  - Currently, the small amount is 0.5 MW of summer QC in the summer season and a proportional quantity of winter QC in the winter season, defined as:

$$Proportional\ increase\ in\ Winter\ QC = 0.5\ MW * \frac{Winter\ QC}{Summer\ QC}$$

  - Note that the ISO may use a small increase other than 0.5 MW to avoid numerical issues, as needed
- Step 3: After adding the small amount of the “proxy” resource, re-run the accreditation base case to calculate new EUE values in the summer and winter seasons
- Step 4: The new resource’s summer MRI will be the difference between the summer season EUE in Steps 1 and 3, divided by the small amount of summer QC added (e.g., 0.5 MW). The resource’s winter MRI will be the difference between the winter season EUE in Steps 1 and 3, divided by the small amount of winter QC added (e.g., 0.5 MW * Winter QC/Summer QC)
- The proxy resource will include a stored energy limit and a charge rate, and so the proxy resource MRIs would also be driven by how much energy they can store and how quickly they can charge

SEASONAL MRI CALCULATIONS FOR LARGE SOLAR AND WIND RESOURCES

Seasonal MRIs for Large Solar and Wind Resources will be Calculated using Historical Data or Modeled Performance

- All resources modeled in the RAA process as intermittent power resources (IPRs) will be modeled in the accreditation base case with an “energy profile” that reflects an IPRs output
  - The energy profile will vary throughout the hours modeled in the accreditation base case
- For existing, large (greater than or equal to 10 MW of nameplate capacity) solar and wind resources with more than five years of performance data, their energy profile will be constructed from the last five years’ performance data
  - Nameplate capacity is defined as the resource’s winter Network Resource Capability (NRC), which is generally the maximum loss-adjusted output of the resource in the winter. Winter NRC is used because it removes temperature issues or other transmission limitations
- For new, large solar and wind resources that do not have historical performance data with which to build an energy profile, their energy profiles will rely on profiles generated by the ISO’s consultant
  - A proxy resource methodology will be used to calculate seasonal MRIs for new, large solar and wind resources
- For existing, large solar and wind resources with less than five years of performance data, their energy profile will be constructed with what performance data is available, with the rest of the previous five years of data filled in by the profile generated by the ISO’s consultant

Seasonal MRIs for Existing Large Solar and Wind Resources will be Calculated in Four Steps

- Step 1: Calculate the total amount of EUE in the summer and winter seasons using the accreditation base case
- Step 2: In the accreditation base case, increase the size of the solar or wind IPR by a small amount
  - Currently, the small increase is 0.5 MW of nameplate capacity in both the summer and winter seasons. Note that, because the RAA process models IPRs with respect to nameplate capacity, the small increase in IPRs size is with respect to nameplate capacity
  - Note that this increase will proportionally change the associated energy output profile
- Step 3: After increasing the solar or wind IPR's size, re-run the accreditation base case to calculate new EUE values in the summer and winter seasons
- Step 4: The resource's summer and winter MRIs will be calculated as follows (assuming a 0.5 MW increase in nameplate capacity in Step 2):

$$MRI_{Summer,i} = \frac{EUE_{Step1,Summer} - EUE_{Step2,Summer}}{0.5\ MW} * \frac{Nameplate_i}{QC_{Summer,i}}$$

$$MRI_{Winter,i} = \frac{EUE_{Step1,Winter} - EUE_{Step2,Winter}}{0.5\ MW} * \frac{Nameplate_i}{QC_{Winter,i}}$$

Seasonal MRIs for New Large Solar and Wind IPRs will be Calculated using the Proxy Resource Methodology

- Step 1: Calculate the total amount of EUE in the summer and winter seasons using the accreditation base case
- Step 2: In the accreditation base case, add a small amount of the new resource
  - Currently, the small amount is 0.5 MW of nameplate capacity in both the summer and winter seasons
- Step 3: After adding the small amount of the "proxy" resource, re-run the accreditation base case to calculate new EUE values in the summer and winter seasons
- Step 4: The resource's summer and winter MRIs will be calculated as follows (assuming a 0.5 MW increase in nameplate capacity in Step 2):

$$MRI_{Summer,i} = \frac{EUE_{Step1,Summer} - EUE_{Step2,Summer}}{0.5\ MW} * \frac{Nameplate_i}{QC_{Summer,i}}$$

$$MRI_{Winter,i} = \frac{EUE_{Step1,Winter} - EUE_{Step2,Winter}}{0.5\ MW} * \frac{Nameplate_i}{QC_{Winter,i}}$$

SEASONAL MRI CALCULATIONS FOR LARGE NON-SOLAR AND NON-WIND IPRs

Seasonal MRIs for Large Non-Solar/Wind IPRs will be Calculated using Historical Data or the Class Average Approach

- As with existing, large solar and wind IPRs, for existing, large non-solar/wind IPRs with more than five years of performance data, their energy profile will be constructed from the last five years' performance data
  - Seasonal MRIs for these existing resources will be calculated with the same four steps used to calculate seasonal MRIs for the existing, large solar and wind resources
- For new, large non-solar/wind IPRs that do not have historical performance data with which to build an energy profile, a class average approach will be used to calculate seasonal MRI values for these resources
  - For existing, large non-solar/wind resources with less than five years of performance data, we employ a class average approach as well

Seasonal MRIs for New, Large Non-Wind/Solar IPRs will be Calculated using a Class Average Approach

- There is a class for each of the following technologies, by load zone:
  - Large hydro (modeled as an IPR)
  - Large landfill gas (modeled as an IPR)
  - Large waste (modeled as an IPR)
  - Large biomass
- As with new, non-gas thermal resources, class average seasonal MRIs will be calculated as follows:

$$MRI_{Summer}^{Class} = \frac{\sum_{i \in class}(QC_{Summer,i} * MRI_{Summer,i})}{\sum_{i \in class} QC_{Summer,i}}$$

$$MRI_{Winter}^{Class} = \frac{\sum_{i \in class}(QC_{Winter,i} * MRI_{Winter,i})}{\sum_{i \in class} QC_{Winter,i}}$$

SEASONAL MRI CALCULATIONS FOR SMALL INTERMITTENT POWER RESOURCES

Small IPRs will be Represented in the Accreditation Base Case by "Aggregated" Resources

- Small intermittent power resources (IPRs) will include onshore wind, solar, hydro (modeled as an IPR), landfill gas (modeled as an IPR), waste (modeled as an IPR), and biomass, with nameplate capacity < 10 MW
- Aggregated resources will be used to represent these small IPRs in the accreditation base case because it would be administratively and technically challenging to model this many IPRs
  - There are more than 600 individual IPRs with less than 10 MW of nameplate capacity
- Each IPR technology will have its own aggregated resource by load zone, where landfill gas, waste, and biomass will be represented by one aggregate resource per load zone
  - For classes with less than four resources within a load zone, the aggregated resource will include resources within that class from adjacent load zones
  - This is to protect individual resources' private information

New and Existing Small IPRs will have their Seasonal MRIs Calculated based on their Aggregated Resources

- Aggregated resources will have their seasonal MRIs calculated using the same four steps as the large, existing IPRs
  - For more information on how the profiles are generated for the aggregated resources, see December RC material
- New and existing small IPRs will be assigned seasonal MRIs equal to the seasonal MRIs of their aggregated resource
  - For new small IPRs, this will be equivalent to using a class average approach because their aggregated resource also represents their class
  - Note that the MWs associated with new small IPRs will not be included in the aggregated resource because they are not existing in the accreditation base case

SEASONAL AND ANNUAL MRI CALCULATIONS FOR PERFECT CAPACITY

Perfect Capacity's MRIs will be Calculated Using a Process Similar to Thermal Resources

- Step 1: Calculate the total amount of EUE in the summer and winter seasons using the accreditation base case
- Step 2: In the accreditation base case, add small amount (e.g. 0.5 MW) of perfect capacity in the summer and winter seasons
- Step 3: Estimate the total amount of EUE in the summer and winter seasons after the addition of the small amount of perfect capacity
- Step 4: The difference between the amount of EUE in the summer season between Steps 1 and 3, divided by the increase in perfect capacity (0.5 MW) is perfect capacity's summer MRI
  - Perfect capacity's winter MRI will be calculated using a comparable method, but with respect to changes in EUE in the winter season
  - Perfect capacity's annual MRI will be calculated by comparing the EUE across both seasons in Steps 1 and 3, relative to the small increase (0.5 MW)

SEASONAL QMRIC COMPONENTS AND FCA QMRIC

Non-Oil/Gas Seasonal QMRIC Components will be Calculated using Resources' Seasonal MRI

- Resources' seasonal QMRIC components will be calculated as follows:

$$QMRIC_{Summer,i} = \frac{MRI_{Summer,i}}{MRI_{Annual,PC}} * QC_{Summer,i}$$

$$QMRIC_{Winter,i} = \frac{MRI_{Winter,i}}{MRI_{Annual,PC}} * QC_{Winter,i}$$

- Where $QMRIC_{Summer,i}$ will be resource i's summer QMRIC component, $QMRIC_{Winter,i}$ will be resource i's winter QMRIC component, and $MRI_{Annual,PC}$ will be perfect capacity's annual MRI
- Note that the summer and winter QMRIC components will represent each resource's reliability contributions within the summer and winter seasons
- These components will be used for the calculation of FCA QMRIC and for seasonal PFP obligations

Gas/Oil Winter QMRIC Components will be Calculated using "Derated" Qualified Capacity

- For gas, oil, and dual-fuel resources, their winter QMRIC components will be calculated with respect to "derated" qualified capacity (DQC)
  - For more information on how DQC will be calculated, see the December MC material

- For gas and oil resources:
  - $QMRIC_{Winter,i} = DQC_i * \left(\frac{MRI_{Winter.i}}{MRI_{Annual,PC}}\right)$

- For dual-fuel resources:
  - $QMRIC_{Winter,i} = \frac{DQC_{oil,i} * (MRI_{Winter,oil}) + DQC_{gas,i} * (MRI_{Winter,gas})}{MRI_{Annual.PC}}$

FCA QMRICs will be Calculated by Summing Resources' Seasonal QMRIC Components

- Resources' FCA QMRIC will be calculated as follows:

$$FCA\ QMRIC_i = QMRIC_{Summer,i} + QMRIC_{Winter,i}$$

- FCA QMRIC replaces FCA QC as resources' accredited capacity, the maximum amount of CSO they can sell in the FCA

ANNUAL MRI AND RMRI CALCULATION FOR ALL RESOURCES

Annual MRIs and rMRIs will be Calculated from Resources' Seasonal MRIs

- While the processes that calculate FCA QMRIC and other key parameters will rely on seasonal MRIs, annual MRIs will be distributed to individual resources for informational purposes

$$MRI_{annual,i} = \frac{MRI_{Summer,i} * QC_{Summer,i} + MRI_{Winter,i} * QC_{Winter,i}}{FCA\ QC_i}$$

- Annual rMRI will be a scalar that can be multiplied by FCA QC to yield FCA QMRIC, and will represent how much a resource contributes to reliability, per MW, relative to perfect capacity
  - Annual rMRI will be calculated as a resource's annual MRI divided by perfect capacity's annual MRI

NEXT STEPS

Next Steps

- This presentation discussed the seasonal MRI, annual MRI, seasonal QMRIC component, and FCA QMRIC calculations for non-gas thermal resources, gas resources, storage resources, large solar and wind IPRs, large non-solar/wind IPRs, and small IPRs
- Next month's discussion will conclude the detailed design review of these calculations with co-located resources, distributed energy capacity resources (DECRs), pool-backed and resource-backed imports, and resources with zero winter or summer QC

STAKEHOLDER SCHEDULE

Stakeholder Process - Overview

- There are several broad phases laid out in the stakeholder process:
  - RCA Refresher: October 2023
  - Conceptual & Detailed Design: November 2023 – March 2024
  - Finalize Design, Review Tariff Language, and Stakeholder Amendments: April 2024 – June 2024
  - Voting: July 2024 (Technical Committees) and August 2024 (Participants Committee)

- In addition, there are several key dates for the revised impact analysis projected in the process:
  - January 2024: Review revised input assumptions and scenarios
  - February 2024 – May 2024: Review available results
  - June 2024: Final report

	2023			2024											
	Q4			Q1			Q2			Q3			Q4		
	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
Current Schedule	Refresher	Conceptual and Detail Design					Final Design, Review Tariff, and Amendments			MC/RC Vote	PC Vote File			Eff. Date	

Review Revised IA Input Assumptions and Scenarios

Review Available IA Results

Final IA Report

Parallel Stakeholder Processes

- While the ISO continues to evaluate plans of moving to prompt and/or seasonal auctions for CCP 19 and beyond, it is still developing and preparing to implement RCA for CCP 19 with the auction delayed to 2026
- Below are the parallel stakeholder processes, with initial target dates, associated with these FCA 19-related efforts

	2023			2024											
	Q4			Q1			Q2			Q3			Q4		
	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
RCA Forward, Annual (for FCA 19 with One-Year Delay)	Refresher	Conceptual and Detail Design					Final Design, Review Tariff, and Amendments			MC/RC Vote	PC Vote; File			Eff. Date	
FCA 19 One-Year Delay	Review Tariff; MC Vote	PC Vote; File		Eff. Date											
Alternative FCM Commitment Horizons	Analysis - Scope & Methodology		Analysis Findings & Stakeholder Feedback		ISO recommendation on whether to develop prompt proposal ___________ If ISO recommends developing a prompt proposal, introduce FCA 19 additional delay	MC Vote on additional FCA 19 delay	PC Vote on additional FCA 19 delay; File		Eff. Date						

Questions