NEPOOL JOINT MARKETS AND RELIABILITY COMMITTEES | NOV 12-13, 2025 | WESTBOROUGH, MA

Capacity Auction Reforms: Seasonal/Accreditation (CAR-SA)

MRI Accreditation Framework for Energy Limited Resources

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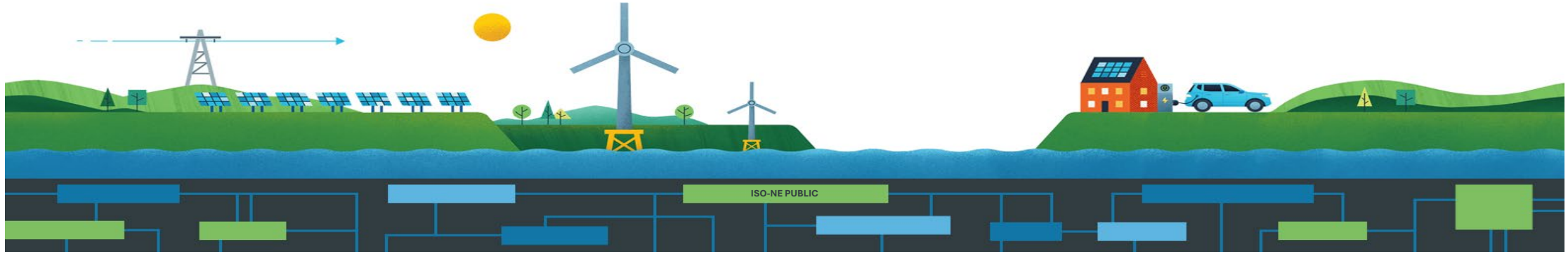
MANAGER, ECONOMIC ANALYSIS



CAR-SA Project

WMPP ID: 185

Proposed Effective Date: Q2-Q3 2027

- Energy limited thermal resources will be accredited based on their expected performance during the simulated “MRI Hours” where additional capacity could mitigate or reduce unserved energy
- Today’s discussion focuses on six topics:
  1. The proposed rules for determining when an oil, jet fuel, kerosene, or dual fuel resource would be considered energy limited
  2. The proposed modeling framework for the oil, jet fuel, and kerosene energy limited resources
  3. The dispatch logic for energy limited and energy storage resources in the resource adequacy software
  4. The MRI Hours where energy limited resources are dispatched to prevent unserved energy
  5. The three primary drivers of energy limited resources’ accreditation under the MRI framework: their equivalent forced outage rate on demand (EFORd), their Maximum Capability (MCap), and their daily energy limit
  6. The considerations that led to the proposed modeling and accreditation approach for energy limited resources



Additional topics are covered in the accompanying memo

- The Energy-Limited Resource Modeling and Accreditation memo provides additional details on the material covered in these slides and covers additional topics, including:
  - Proposed modeling and accreditation framework for energy limited and energy storage resources that share a source of energy
  - Mechanics of the MRI calculations for energy limited resources
  - Conceptual overview of the CAR framework for dual fuel resources that are considered energy limited
- ISO plans to provide specific details on dual fuel resource modeling and accreditation in January 2026

ISO welcomes stakeholder feedback

- This presentation and the accompanying memo reflect the ISO's current thinking on the modeling and accreditation approach for oil, jet fuel, and kerosene resources
- ISO welcomes stakeholder feedback on this proposal and all parts of CAR-SA as we continue to assess the design in the coming months

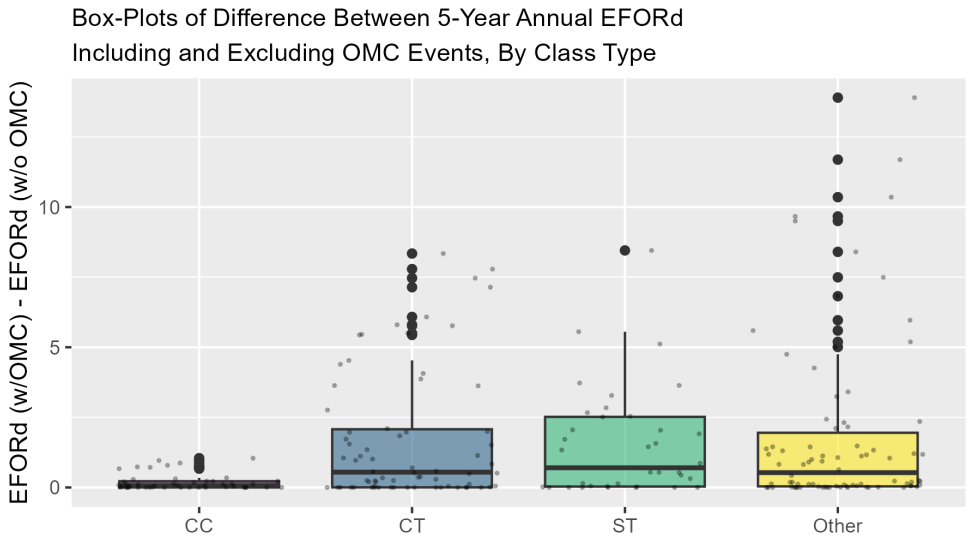
FOLLOW-UP TO STAKEHOLDER QUESTIONS FROM OCTOBER

Regarding Non-energy Limited Resource Modeling and Accreditation and Conforming Changes to EFORd Calculations

Differences between EFORd with and without OMC events are generally small

- Stakeholders requested additional information on the expected differences between equivalent forced outage rate on demand (EFORd) values excluding out of management control (OMC) events and EFORd values including OMC events
- ISO determined that the expected difference between including and excluding OMC events was small; the differences are close to 0 for most assets, with a few outliers
- As noted in October, the ISO proposes to continue the existing practice of excluding OMC events from EFORd calculations
- The next slide provides a box-and-whisker plot of the differences between the two sets of values at the asset level
- The slide after provides a table with summary statistics

Box-and-whisker plot of differences between EFORd with and without OMC events



Data is at the asset level.
Five Years covers May 2019 - April 2024.
Little dots represent the density of the data. The big dots are outliers.

- Y-axis measures the percentage point difference between EFORd with and without OMC events at the asset level
- EFORds calculated with OMC events are greater than or equal to EFORds calculated while excluding OMC events, but the differences at the asset level are most often close to 0
- A few notable outliers have differences greater than 10% points

Summary Statistics

Summary of EFORd With and Without OMC Events

5-Year Annual EFORd (May 2019-April 2024), Asset Level

Technology Group	Mean EFORd, with OMC	Mean EFORd, no OMC	Mean Difference	# Obs.
CC	4.212	4.023	0.190	46
CT	13.333	11.751	1.582	72
ST	19.817	18.194	1.624	36
Other	10.524	8.644	1.880	80

ISO is not planning to model energy limits for non-IPR municipal solid waste, non-IPR wood-burners, or non-IPR landfill gas/biogas

- Stakeholders requested additional information on how the ISO determined which resources should be modeled as energy limited
- The ISO is not planning to model energy limits for non-IPR municipal solid waste (MSW), non-IPR wood-burners (WDS), or non-IPR landfill gas (LFG) resources
- These resources represent only a small portion of the overall mix:
  - Non-IPR MSW: 156.7 MW
  - Non-IPR WDS: 305.9 MW
  - Non-IPR LFG: 16.8 MW
- While the ISO has data on the fuel inventories and replenishment timelines of oil, jet fuel, kerosene, and dual fuel resources, the ISO does not have comparable data for the MSW, WDS, or LFG resources

EXISTING ACCREDITATION RULES FOR ENERGY LIMITED RESOURCES

Energy limited resources are largely accredited based on their maximum capability

- Under existing rules, the energy limited resources are largely accredited based on their demonstrated audited capability over one to two hours
- Existing accredited capacity values do not account for their performance (the possibility that they may not be available due to forced outage or lack of energy during hours where resource adequacy is at risk)
- The MRI accreditation framework will improve upon the existing design by incorporating the forced outage rates and energy limits of these resources into their accredited capacity values

RULES FOR DETERMINING ENERGY LIMITED STATUS

Oil, jet fuel, kerosene, and dual fuel resources' energy limited status dependent on reported fuel inventories

- Under CAR, oil, jet fuel, kerosene, or dual fuel resources' energy limited status will be determined seasonally based on their usable fuel inventory levels over the last three seasons
- ISO will calculate a seasonal "Qualified Inventory" value for each oil, jet fuel, kerosene, and dual fuel resource
- If a resource's seasonal Qualified Inventory is such that they cannot run at their Maximum Capability (MCap) for at least 24 continuous hours, the resource will be considered energy limited in that season
  - Dual fuel resources that can burn gas will not be considered energy limited in the summer, regardless of their summer Qualified Inventory because the gas system is not constrained in the summer

Most oil, jet fuel, kerosene, or dual fuel resources will be modeled and accredited as non-energy limited thermal

- ISO estimates suggest less than 900 MW of the region's roughly 12,000 MW of oil, jet fuel, kerosene, or dual fuel resources will be considered energy limited in the winter and around 500 MW will be modeled as energy limited in the summer
- Oil, jet fuel, kerosene, or dual fuel resources with Qualified Inventory values greater than or equal to 24 hours will be modeled and accredited as non-energy limited thermal resources (see October memo for details)

Qualified Inventory requirement (24 hours) aligns well with ISO data

- The 24-hour Qualified Inventory requirement to be considered non-energy limited aligns well with ISO data on fuel inventory levels and replenishment capabilities
- Surveys suggest that, of the ~12,000 MW of oil, jet fuel, kerosene, and dual fuel resources, ~9,200 MW report that they can replenish within a day, have pipeline access to oil facilities that allow them to procure fuel on short notice, or have winter Qualified Inventory values that are greater than the number of hours in their replenishment wait time
- Nearly all the remaining ~2,700 MW of oil, jet fuel, kerosene, and dual fuel resources carry enough winter Qualified Inventory to run for two or more consecutive days at their MCap
- **Next:** step-by-step walkthrough of process to calculate Qualified Inventory values

Step 1: ISO surveys oil, jet fuel, kerosene, and dual fuel resources to determine inventory levels

- As described in ISO-NE Operating Procedure No. 21, the ISO regularly surveys oil, jet fuel, kerosene, and dual fuel resources to determine their onsite usable fuel inventory (survey question 2.2)
- ISO conducts this survey every other week in the non-winter months (March through November) and at least once a week during the winter (December through February)
- Resources must respond to the survey by the survey due date and time (generally Tuesdays at 10am)
- The current survey system allows participants to revise values up to 24 hours after the due date, although timely and accurate submissions are needed for operational purposes
- For the calculation of Qualified Inventory values, if surveys are not submitted within 24 hours of the due date, the ISO will assume the resource's usable fuel inventory is 0 for that survey period
- Currently, the surveys collected as part of OP-21 are used for operational purposes only. Changes to OP-21 would likely be required to use the surveys for accreditation

Step 2: ISO calculates median usable fuel inventory levels for last three seasons

- Using the surveyed usable inventory levels from Step 1, the ISO calculates the median usable fuel inventory levels for each oil, jet fuel, kerosene, or dual fuel resource for each of the last three summers and last three winters
  - Summer months are May through October
  - Winter months are November through April

Step 3: ISO calculates seasonal Qualified Inventory values

- To calculate a winter (summer) Qualified Inventory value, the ISO averages the median winter (summer) usable inventory values calculated in Step 2

Step 4: Recently commercial resources

- For recently commercial resources that may not have three seasons of survey data:
  - If like-season surveys are available when the resource was commercially operational, the seasonal Qualified Inventory values will be calculated using the median surveyed inventory from those like-season surveys
  - If no like-season surveys are available when the resource was commercially operational, the seasonal Qualified Inventory values will be calculated using the median surveyed inventory from surveys from the other season
  - If no surveys are available when the resource was commercially operational, the seasonal Qualified Inventory values will be calculated using the most recent available survey when the resource was in non-commercial testing
    - Surveys are distributed to generating assets who are either commercial or non-commercial testing
  - If no surveys are available, the seasonal Qualified Inventory values would be calculated as the resource's fuel tank size minus expected unusable fuel inventory

Step 5: Resources can challenge usable inventory levels

- ISO's current thinking is that, as part of a challenge process, resources will be able to request some surveys be excluded from the seasonal Qualified Inventory calculations
- E.g., a resource with a prolonged forced outage that required repairs to their fuel tank would be able to request that the surveys conducted during the forced outage period be excluded from the Qualified Inventory calculation
- Helps to avoid counting the unavailability from the outage and fuel unavailability twice
- ISO welcomes stakeholder feedback as we develop the challenge process in the coming months

PROPOSED MODELING FRAMEWORK FOR ENERGY LIMITED RESOURCES

ISO Objectives with Energy Limited Modeling

- ISO had several goals when considering how energy limited resources should be modeled
  - To the extent possible given available modeling options, resources' modeled available capacity should align with their expected capabilities (e.g., their MCap, their usable fuel inventory levels, and their replenishment timelines)
  - Resources energy limited status should be informed by their historical usable fuel inventory levels
  - Design should be responsive to stakeholder feedback that many oil, jet fuel, kerosene, or dual fuel resources can replenish their fuel daily
  - Modeling framework should be conceptually consistent with the modeling of energy storage resources, where applicable
- ISO also considered modeling and data limitations when weighing these goals

Energy limited resources will be modeled with the “EL3” framework

- Oil, jet fuel, and kerosene resources with less than 24 hours of seasonal Qualified Inventory will be modeled with the “Energy Limited 3” (EL3) framework in GE Vernova’s Resource Adequacy software (GE-MARS)
- EL3 resources have a “daily energy limit” that caps their total production within a single day
  - When an EL3 resource reaches its daily energy limit in a day, its available capacity for the rest of the day is 0 MW
- This effectively assumes that EL3 resources can replenish their inventory daily
- EL3 resources are only made available when needed to mitigate or prevent load shed
  - EL3 resources cannot charge energy storage resources

Important parameters for EL3 resources

- EL3 resources have three important parameters that determine how they are modeled in GE-MARS:
  - Maximum Capability (MCap)
    - Determines the maximum available capacity that the EL3 resource can provide when it is needed to mitigate/prevent unserved energy
  - Daily energy limit
    - An EL3 resource's daily energy limit determines the maximum amount of energy it can provide in a single day
    - Oil, jet fuel, and kerosene resources modeled with the EL3 framework will have their daily energy limits set by their seasonal Qualified Inventory
    - E.g., a 100 MW oil resource with a winter Qualified Inventory of 4 hours will have a daily energy limit of 4 hours * 100 MW = 400 MWh in the winter
  - Seasonal EFORd
    - Like non-energy limited thermal resources, resources modeled with the EL3 framework will also be modeled with forced outage rates
    - See ISO's memo on EFORd calculations
  - **Next:** first example provides simple demonstration of EL3 modeling

Example 1 Overview

- Example 1 considers “Oil1”, an energy limited resource with a Maximum Capability of 100 MW and an EFORd = 0%
- Oil1 has a Qualified Inventory of 4 hours and so has a daily energy limit of 400 MWh
- The example will compare load in each hour with the available capacity provided by both Oil1 and the other resources in that hour
- Example 1 serves as the foundation for subsequent examples
- **Next:** Example 1 demonstrates that EL3 resources will only be made available when needed to prevent unserved energy

EL3 resources are dispatched only when needed to avoid load shed

Hour	Oil1	Other Capacity	Total Capacity	Load	Unserved Energy
1	0 MW	1,000 MW	1,000 MW	900 MW	0 MWh
2	100 MW	1,000 MW	1,100 MW	1,100 MW	0 MWh
3	100 MW	1,100 MW	1,200 MW	1,200 MW	0 MWh
4	100 MW	1,000 MW	1,100 MW	1,200 MW	100 MWh
5	100 MW	1,000 MW	1,100 MW	1,100 MW	0 MWh

- Oil1 is not made available ("dispatched") in Hour 1 because it is not needed to meet load
- In Hours 2-5, Oil1 is needed to meet load and so is dispatched

DISPATCH ORDER FOR ENERGY LIMITED AND ENERGY STORAGE RESOURCES IN GE-MARS

Energy limited resources will be dispatched from longest to shortest duration

- In GE-MARS, energy limited resources (including battery and pumped hydro resources) will be dispatched from longest to shortest duration
- E.g., in a system with 12-hour, 10-hour, and 6-hour resources:
  - The 12-hour resources will be dispatched first;
  - If the 12-hour resources are insufficient to prevent unserved energy (or have already reached their daily energy limit/exhausted their limited energy), the 10-hour resources will be dispatched
  - If the 12-hour and 10-hour resources are insufficient to prevent unserved energy, the 6-hour resources will be dispatched
- **Next:** Example 2 adds a second resource to demonstrate the longest-to-shortest dispatch order

Example 2 Overview

- Example 2 is identical to Example 1 except it adds a second resource, Oil2
- Like Oil1, Oil2 has a 100 MW MCap and a 0% EFORd
- However, Oil2 has a Qualified Inventory of only 1 hour and so has a daily energy limit of 100 MWh
- **Next:** Oil1 is dispatched to prevent unserved energy before Oil2 in Example 2

Energy limited resources are dispatched from longest to shortest duration

Hour	Oil1	Oil2	Other Capacity	Total Capacity	Load	Unserved Energy
1	0 MW	0 MW	1,000 MW	1,000 MW	900 MW	0 MWh
2	100 MW	0 MW	1,000 MW	1,100 MW	1,100 MW	0 MWh
3	100 MW	100 MW	1,000 MW	1,200 MW	1,200 MW	0 MWh
4	100 MW	0 MW	1,000 MW	1,100 MW	1,200 MW	100 MWh
5	100 MW	0 MW	1,000 MW	1,100 MW	1,100 MW	0 MWh

- Oil1 is dispatched in Hour 2 to prevent unserved energy
- Oil2 is not dispatched in Hour 2 because it is not needed; Oil1 and Other Capacity can prevent unserved energy in Hour 2 without Oil2
- In Hour 3, Oil1 and Other Capacity can not prevent load shed alone, so Oil2 is dispatched
- Oil2 is not made available in Hour 4 to mitigate unserved energy because it reached its daily energy limit of 100 MWh in Hour 3

Longest-to-shortest dispatch minimizes expected unserved energy

- Dispatching energy limited and energy storage resources in GE-MARS from longest to shortest duration most efficiently uses the system's limited energy
- ISO has empirically tested different dispatch orders in GE-MARS using the same quantity of capacity in each case and found longest-to-shortest dispatch results in less expected unserved energy (EUE) and loss of load hours (LOLH) relative to shortest-to-longest dispatch
  - ISO has found similar results comparing longest-to-shortest dispatch to a proportional dispatch logic
- Current testing suggests that all energy limited resources receive higher accredited capacity values with longest-to-shortest dispatch relative to shortest-to-longest dispatch
- **Next:** Example 3 demonstrates how shortest-to-longest dispatch inefficiently uses the system's limited energy

Example 3: Dispatching Oil2 first increases unserved energy

Hour	Oil1	Oil2	Other Capacity	Total Capacity	Load	Unserved Energy
1	0 MW	0 MW	1,000 MW	1,000 MW	900 MW	0 MWh
2	0 MW	100 MW	1,000 MW	1,100 MW	1,100 MW	0 MWh
3	100 MW	0 MW	1,000 MW	1,100 MW	1,200 MW	100 MWh
4	100 MW	0 MW	1,000 MW	1,100 MW	1,200 MW	100 MWh
5	100 MW	0 MW	1,000 MW	1,100 MW	1,100 MW	0 MWh

- With shortest-to-longest dispatch, Oil2 is dispatched in Hour 2 instead of Oil1
- Because Oil2 reaches its daily energy limit of 100 MWh in Hour 2, it is unavailable in Hours 3 and 4 when unserved energy occurs
- Oil1 exits Hour 5 with unused energy: it has provided only 300 MWh of energy but has a daily energy limit of 400 MWh
- Total unserved energy in Example 3 (200 MWh) exceeds total unserved energy in Example 2 (100 MWh); by dispatching Oil2 first, the system did not efficiently use its limited energy to minimize EUE

ADDITIONAL DISCUSSION ON MRI HOURS

Three Types of MRI Hours

Hours where additional available capacity would reduce unserved energy in that hour or in a subsequent hour are MRI Hours. There are broadly three types of simulated hours that can be MRI Hours:

1. Hours with load shed
2. Hours where energy limited resources are dispatched to prevent load shed
3. Hours where energy storage resources are charging constrained

Examples 4-6 focus on hours where energy limited resources are dispatched

- Examples 4, 5, and 6 extend the previous three examples to focus on hours where energy limited resources are dispatched
- Example 4 demonstrates that hours where total available capacity exceeds load shed are not MRI Hours
- Example 5 demonstrates that some hours where energy limited resources are dispatched to prevent unserved energy are not MRI Hours
- Example 6 demonstrates that some hours where energy limited resources are dispatched to prevent unserved energy *are* MRI Hours

Example 4 Overview

- Example 4 builds on the previous examples by adding a sixth hour
- Hour 6 is identical to Hour 1: it has the same load and the same amount of Other Capacity
- **Next:** Example 4 adds available capacity in Hours 1 and 6 to demonstrate that Hours 1 and 6 are not MRI Hours

Example 4: Hours with surplus available capacity are not MRI Hours

Hour	Oil1	Oil2	Added Cap.	Other Cap.	Total Cap.	Load	Unserved Energy	MRI Hour?
1	0 MW	0 MW	+1 MW	1,000 MW	1,000 MW + 1 MW	900 MW	0 MWh	No
2	100 MW	0 MW		1,000 MW	1,100 MW	1,100 MW	0 MWh	
3	100 MW	100 MW		1,000 MW	1,200 MW	1,200 MW	0 MWh	
4	100 MW	0 MW		1,000 MW	1,100 MW	1,200 MW	100 MWh	Yes
5	100 MW	0 MW		1,000 MW	1,100 MW	1,100 MW	0 MWh	
6	0 MW	0 MW	+1 MW	1,000 MW	1,000 MW + 1 MW	900 MW	0 MWh	No
						Total:	100 MWh	

- Additional capacity in Hours 1 and 6 has no impact on unserved energy; Hours 1 and 6 are therefore not MRI Hours
- Because Hour 4 includes unserved energy, it is an MRI Hour by definition
- **Next:** Example 5 demonstrates that Hours 2 and 5 are not MRI Hours, even though Oil1 is dispatched to prevent load shed in both hours

Example 5: Not all hours where energy limited resources are dispatched are MRI Hours

Hour	Oil1	Oil2	Added Cap.	Other Cap.	Total Cap.	Load	Unserved Energy	MRI Hour?
1	0 MW	0 MW		1,000 MW	1,000 MW	900 MW	0 MWh	No
2	100 MW - 1 MW	0 MW	+1 MW	1,000 MW	1,100 MW	1,100 MW	0 MWh	No
3	100 MW	100 MW		1,000 MW	1,200 MW	1,200 MW	0 MWh	
4	100 MW	0 MW		1,000 MW	1,100 MW	1,200 MW	100 MWh	Yes
5	100 MW - 1 MW	0 MW	+1 MW	1,000 MW	1,100 MW	1,100 MW	0 MWh	No
6	0 MW	0 MW		1,000 MW	1,000 MW	900 MW	0 MWh	No
						Total:	100 MWh	

- Additional available capacity in Hours 2 and 5 reduce Oil1's dispatch by 1 MW in each hour, but has no impact on unserved energy
- As a result, Hours 2 and 5 are not MRI Hours
- Even though the additional available capacity in Hour 2 reduces Oil1's dispatch by 1 MW, Oil1 never has insufficient energy to produce at its MCap and therefore is unable to deploy the additional MWh of energy to reduce unserved energy in a subsequent hour
- **Next:** Example 6 demonstrates that Hour 3 is an MRI Hour

Example 6: Some hours where energy limited resources are dispatched are MRI Hours

Hour	Oil1	Oil2	Added Cap.	Other Cap.	Total Cap.	Load	Unserved Energy	MRI Hour?
1	0 MW	0 MW		1,000 MW	1,000 MW	900 MW	0 MWh	No
2	100 MW	0 MW		1,000 MW	1,100 MW	1,100 MW	0 MWh	No
3	100 MW	100 MW - 1 MW	+1 MW	1,000 MW	1,200 MW	1,200 MW	0 MWh	Yes
4	100 MW	0 MW + 1 MW		1,000 MW	1,100 MW + 1 MW	1,200 MW	100 MWh - 1 MWh	Yes
5	100 MW	0 MW		1,000 MW	1,100 MW	1,100 MW	0 MWh	No
6	0 MW	0 MW		1,000 MW	1,000 MW	900 MW	0 MWh	No
						Total:	100 MWh - 1 MWh	

- An additional MW of available capacity in Hour 3 reduces Oil2's dispatch by 1 MW, allowing them to carry a MWh of energy into Hour 4
- Oil2's remaining MWh of energy in Hour 4 is used to reduce unserved energy by 1 MWh
- Because an additional MW of available capacity in Hour 3 decreased unserved energy, Hour 3 is an MRI Hour

Key Takeaways

- Some simulated hours where energy limited resources are dispatched to prevent unserved energy can be MRI Hours
- However, many simulated hours where energy limited resources are dispatched to prevent unserved energy are not MRI Hours
- Example 7 in the memo demonstrates that entire strings of hours where energy limited resources are dispatched to prevent unserved energy can include no MRI Hours

PRIMARY DRIVERS OF ENERGY LIMITED RESOURCE ACCREDITATION UNDER MRI FRAMEWORK

Accredited capacity calculations for energy limited resources

- Under CAR, energy limited resources will be accredited based on their expected performance in the simulated "MRI Hours" where additional available capacity would mitigate or prevent unserved energy
- In Example 6, because Hours 3 and 4 are MRI Hours, we can calculate Oil1 and Oil2's MRI Capacity as:

$$Oil1's\ MRI\ Capacity = \frac{100\ MW + 100\ MW}{2} = 100\ MW$$

$$Oil2's\ MRI\ Capacity = \frac{100\ MW + 0\ MW}{2} = 50\ MW$$

- Even though Oil1 and Oil2 are the same size and have the same EFORd, Oil2 receives a lower accredited capacity value, commensurate with the fact that they are more energy limited than Oil1

Three primary drivers for energy limited resource accreditation

- Under the MRI framework, energy limited resource accreditation will be driven by three primary factors:
  - Seasonal EFORd values
    - Energy limited resources that have higher EFORd values are more likely to be on forced outage during the MRI Hours (see Section 5.1 of the October memo)
  - MCap values
    - In general, resources with greater MCaps will have greater MRI Capacity values (see Section 5.2 of the October memo)
    - However, as resources become larger, their forced outages can become correlated with resource adequacy risk, negatively impacting their expected performance in the MRI Hours (see Section 5.3 of the October memo)
  - Daily energy limit
    - In general, resources that have higher daily energy limits (defined by their Qualified Inventory values) will have greater MRI Capacity values, all else equal

KEY CONSIDERATIONS BEHIND PROPOSED APPROACH

Key considerations that motivated proposed design

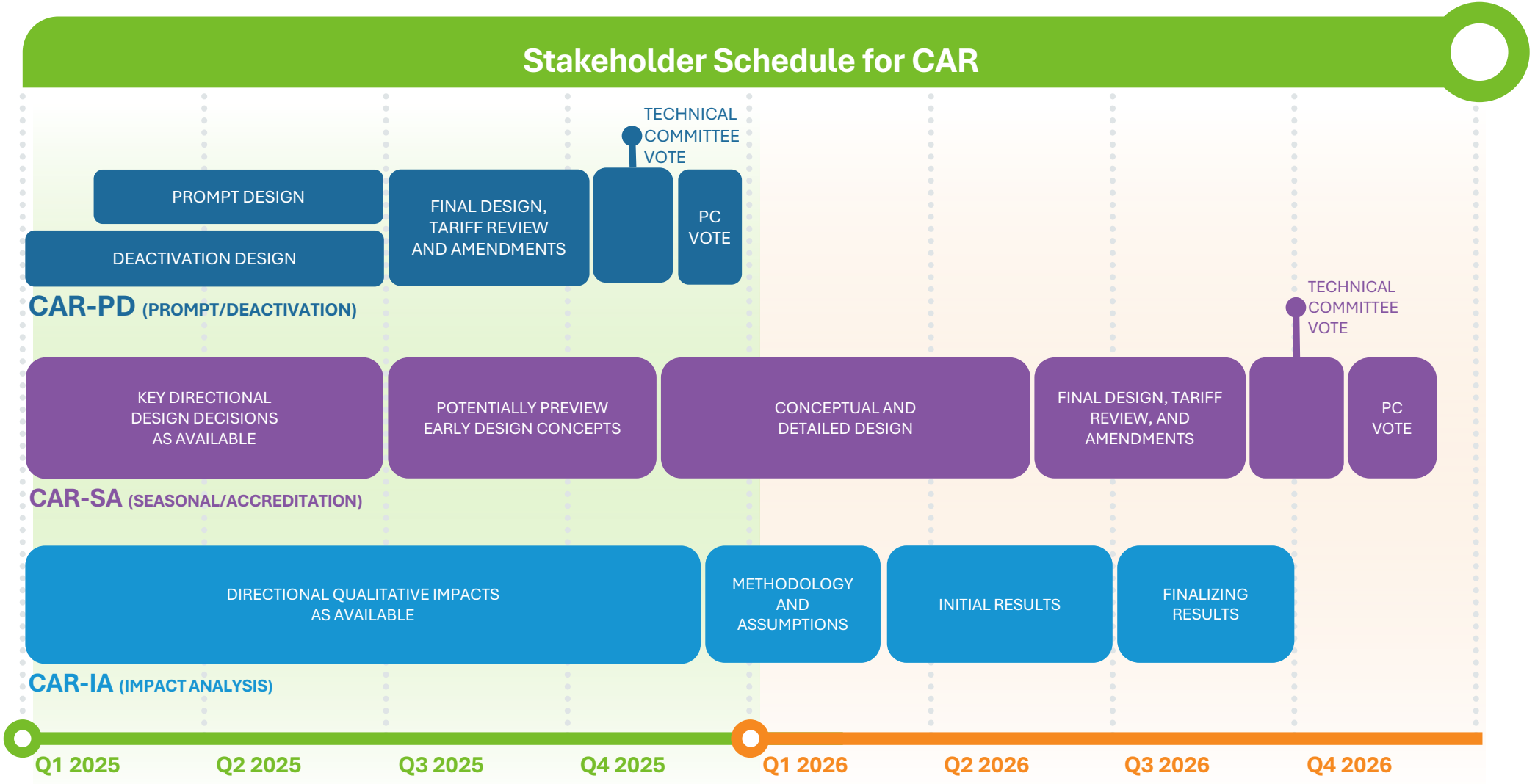
- ISO considered several frameworks for modeling the energy limited resources in GE-MARS, including other approaches in MARS as well as the derating approach proposed as part of the RCA project
- ISO is proposing to pursue the EL3 framework due to the following considerations:
  - Of the possible approaches, the EL3 framework is the most consistent with the energy storage framework that will be used for battery and pumped storage resources
  - Other frameworks in GE-MARS may provide a less accurate representation of resources' energy limitations
  - Stakeholder feedback that the 48-hour firm fuel requirement proposed as part of the RCA project was overly punitive for some resources that can replenish fuel daily
  - The 24-hour cutoff for energy limited status aligns well with the ISO's information on inventory levels and replenishment capabilities for oil, jet fuel, kerosene, and dual fuel resources
- See Section 5 of the memo for additional details

NEXT STEPS: FOLLOW-UPS AND ENERGY STORAGE RESOURCES IN DECEMBER

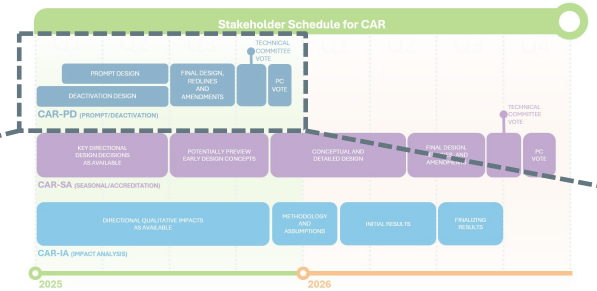
ISO to discuss energy storage resources in December

- In December, the ISO will aim to follow-up on any questions on energy limited resources and to introduce and discuss energy storage modeling and accreditation
- ISO plans to include discussion and examples on:
  - Energy storage resource charging order in GE-MARS;
  - Energy storage resource charging hours, including charging constrained MRI Hours
  - The impact that energy storage resource charging efficiency has on the MRI Hours
- In January, ISO plans to come back with additional examples on energy storage resources as needed
- Please submit follow-up questions on energy limited resources and any requests for examples pertaining to energy storage resources to Jasleen Singh (jsingh@iso-ne.com) by Wednesday November 19

STAKEHOLDER SCHEDULE


Stakeholder Schedule for CAR
TECHNICAL COMMITTEE VOTE
PROMPT DESIGN
DEACTIVATION DESIGN
FINAL DESIGN, TARIFF REVIEW AND AMENDMENTS
PC VOTE
CAR-PD (PROMPT/DEACTIVATION)
TECHNICAL COMMITTEE VOTE
KEY DIRECTIONAL DESIGN DECISIONS AS AVAILABLE
POTENTIALLY PREVIEW EARLY DESIGN CONCEPTS
CONCEPTUAL AND DETAILED DESIGN
FINAL DESIGN, TARIFF REVIEW, AND AMENDMENTS
PC VOTE
CAR-SA (SEASONAL/ACCREDITATION)
DIRECTIONAL QUALITATIVE IMPACTS AS AVAILABLE
METHODOLOGY AND ASSUMPTIONS
INITIAL RESULTS
FINALIZING RESULTS
CAR-IA (IMPACT ANALYSIS)
Q1 2025
Q2 2025
Q3 2025
Q4 2025
Q1 2026
Q2 2026
Q3 2026
Q4 2026

CAR-PD



Stakeholder Schedule for CAR-PD

PROMPT DESIGN

DEACTIVATION DESIGN

FINAL DESIGN, TARIFF REVIEW AND AMENDMENTS

TECHNICAL COMMITTEE VOTE

PC VOTE

CAR-PD (PROMPT/DEACTIVATION)

PROVIDE QUESTIONS AND FEEDBACK ON DESIGN

CONCEPTUAL AMENDMENTS

PRESENT AMENDMENTS

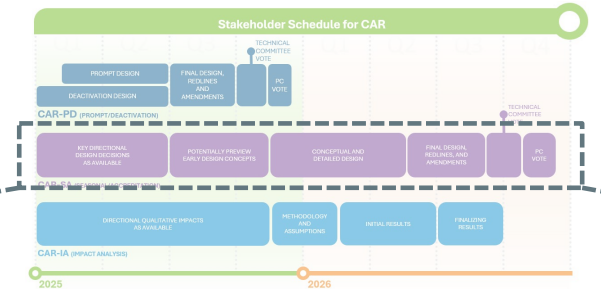
Stakeholder Activity

PRESENT DESIGN & RESPOND TO FEEDBACK

PROVIDE QUESTIONS AND FEEDBACK ON AMENDMENTS

ISO Activity

Q1 2025 **Q2 2025** **Q3 2025** **Q4 2025**



Stakeholder Schedule for CAR-SA

CORE MODELING AND ACCREDITATION CONCEPTS

SEASONAL/ACCREDITATION MODELING AND MARKET DESIGN

CONFORMING DESIGN DETAILS

FINAL DESIGN, TARIFF REVIEW AND AMENDMENTS

TECHNICAL COMMITTEE VOTE

PC VOTE

CAR-SA (SEASONAL/ACCREDITATION)

PROVIDE QUESTIONS AND FEEDBACK ON DESIGN

Stakeholder Activity

CONCEPTUAL AMENDMENTS

PRESENT AMENDMENTS

PRESENT DESIGN & RESPOND TO FEEDBACK

ISO Activity

PROVIDE QUESTIONS AND FEEDBACK ON AMENDMENTS

Q4 2025 | **Q1 2026** | **Q2 2026** | **Q3 2026** | **Q4 2026**

CAR-SA Schedule Projection

- **November**
  - Gas Design Conceptual Introduction (MC timeframe)
  - Gas Availability Study Methodology (Analysis Group) (MC timeframe)
  - Energy Limited Resource Modeling and Accreditation (MC timeframe)
  - Demand Response Modeling and Accreditation (RC timeframe)
  - Seasonal Tie Benefits Modeling (RC timeframe)
- **December**
  - Seasonal Market Design Concepts and Risk Split (MC timeframe)
  - Gas Availability Study Follow-up with Analysis Group (MC timeframe)
  - Gas Market Constraint Conceptual Introduction (MC timeframe)
  - Overview of Impact Analysis Plan (MC timeframe)
  - Energy Storage Resource Modeling and Accreditation (Includes Pumped Hydro) (RC timeframe)
  - Q4 Follow-up Medley (MC timeframe)

All NEPOOL members are invited to attend meetings where CAR topics are discussed

CAR-SA Preliminary Topic Schedule November and Beyond (Continued)

- The list below provides a projection of when core accreditation committee discussions will begin:

Topics	Projected Committee Discussions
Gas-only Resource Modeling and Accreditation	January – February
Development of Gas Market Constraint	January – March
Intermittent Power Resource Modeling and Accreditation (includes run-of-river hydro)	January – February

CAR-SA Preliminary Topic Schedule November and Beyond (Continued)

- The list below provides a projection of when core accreditation committee discussions will begin:

Topics	Projected Committee Discussions
Energy Limited Resource Modeling and Accreditation, Continued (Dual Fuel)	January-February
Import Resource Modeling and Accreditation	February
Modeling Deliverability: Summary of All Resource Types	February
Hybrid Resource Modeling and Accreditation	February – March

CAR-SA Preliminary Topic Schedule November and Beyond (Continued)

- The list below provides a projection of when core accreditation committee discussions will begin:

Topics	Projected Committee Discussions
ICR and Seasonal Demand Curve Estimation	February – March
Impact Analysis Initial Results	March – June
Q1 Follow-up Medley	March
Gas-only Resource Contract Requirements	April – May

memo

To: NEPOOL Markets Committee and Reliability Committee

From: ISO New England, Inc.

Date: November 5, 2025

Subject: Energy Limited Resource Modeling and Accreditation

Section 1. Executive Summary

This memorandum discusses the proposed modeling and accreditation framework for oil, jet fuel, kerosene, or dual fuel[1] resources that are considered "energy limited."[2] Under the Capacity Auction Reforms (CAR), the energy limited resources will be accredited based on their expected performance during the simulated "MRI Hours" where additional available capacity would mitigate or prevent load shed.[3] The MRI accreditation framework is motivated by the capacity market's three design objectives:

Reliability: to ensure that the capacity market is designed to satisfy the region's one-day-in-ten loss of load expectation (LOLE) resource adequacy standard.

Sustainability: to incentivize the investment needed to meet the reliability design objective over time as system and market conditions change.

Cost-effectiveness: to procure capacity to meet the reliability and sustainability design objectives while minimizing costs.

Under the existing design, the energy limited resources are accredited based on their audited maximum capability over one to two hours. As a result, the existing accredited capacity values for the energy limited resources do not reflect i) the possibility that the resources will be on forced outage when resource adequacy is at risk, or ii) the possibility that the energy limited resources will have insufficient fuel to operate for the duration of a reliability event. The MRI accreditation framework will improve upon the existing design by incorporating the forced outage rates and energy limits of these resources into their accredited capacity values. As a result, the MRI framework will provide capacity market compensation that better reflects the energy limited resources' expected

[1] Resources that can burn gas and either oil, jet fuel, or kerosene.
[2] Energy storage resources, including pumped storage and battery resources, will be discussed beginning in December.
[3] See the ISO's September memo on the MRI accreditation framework for additional details.

contributions to resource adequacy, helping the capacity market procure a set of resources that satisfies the market's three design objectives.

The remainder of the memo is split into five sections and three appendices:

- Section 2 provides background on energy limited modeling and accreditation by briefly reviewing the existing accreditation rules for energy limited resources, noting two areas for improvement with the existing design.
- Section 3 provides the proposed rules for determining when oil, jet fuel, kerosene, or dual fuel resources will be considered energy limited.
- Section 4 discusses the proposed modeling and accreditation framework for the oil, jet fuel, or kerosene energy limited resources, including:
    - The "Energy Limited 3" modeling framework in GE Vernova's Resource Adequacy software that will be used to model the energy limited resources.
    - Discussion on the dispatch logic for energy limited resources in the resource adequacy software.
    - Additional details on the MRI Hours where energy limited resources are dispatched to prevent unserved energy.
    - Discussion on the primary drivers behind energy limited accreditation: resources' equivalent forced outage rates on demand (EFORd), their size, and their energy limit.
- Section 5 discusses the key considerations behind the proposed energy limited modeling framework.
- Section 6 concludes the main body of the memo with key takeaways.
- Appendix A discusses the modeling of energy limited resources with shared inventories.
- Appendix B discusses the mechanics of the MRI calculations for energy limited resources.
- Appendix C provides a conceptual overview of the CAR framework for dual fuel resources that are considered energy limited. The ISO plans to provide additional details in January 2026 on the treatment of dual fuel resources and their interaction with the gas constraint design.

Section 2. Background on energy limited resource modeling and accreditation

Under current rules, resources' accredited capacity is their Qualified Capacity, or QC. Oil, jet fuel, kerosene, and dual fuel resources' QC values are determined by their maximum audited capability over one to two hours in each season. The MRI Framework for Accrediting Resources memo notes

that the existing process does not consider these resources' forced outage rates or energy limits in their accredited capacity calculations. Failing to account for these attributes when accrediting resources results in two areas for improvement:

- The capacity market could procure accredited capacity that is frequently unavailable in the hours where resource adequacy is at risk (see Section 2.1 of the MRI framework memo.)
- Capacity market compensation may not provide the most accurate reflection of resources' expected resource adequacy contributions. In particular, some resources that are expected to contribute more to resource adequacy may be paid less than other resources that are expected to contribute less. This could distort the market signals that are key to maintaining reliability and minimizing consumer costs. (See Section 2.3 of the MRI framework memo.)

Section 3. Proposed rules to determine energy limited status

Under CAR, oil, jet fuel, kerosene, and dual fuel resources' energy limited status will be determined seasonally based on their reported fuel inventory levels over the last three seasons. Specifically, for each oil, jet fuel, kerosene, or dual fuel resource, the ISO will calculate summer and winter "Qualified Inventory" values using reported inventory levels from the Generator Fuel and Emissions survey. If a resource's seasonal Qualified Inventory is such that they could run at their Maximum Capability (MCap) for at least 24 continuous hours, they will be classified as non-energy limited in that season and will be modeled and accredited as described in the Non-Energy Limited Thermal Resource Modeling and Accreditation memo. If an oil, jet fuel, kerosene, or dual fuel resource has a seasonal Qualified Inventory less than 24 hours, they will be modeled and accredited as an energy limited resource in that season. Dual fuel resources with gas capability will not be considered energy limited in the summer, regardless of their summer Qualified Inventory, because the gas system is not constrained in the summer.

- Section 4 provides details on the proposed modeling and accreditation framework for the oil, jet fuel, and kerosene energy limited resources.
- Appendix C provides detail on the conceptual framework for dual fuel resources with Qualified Inventory values less than 24 hours. Since nearly all dual fuel resources currently have Qualified Inventory values that exceed 24 hours, the vast majority of dual fuel capacity will be modeled and accredited as non-energy limited thermal resources.

Based on current data, the ISO estimates that less than 900 MW of the region's ~12 GW of oil, jet fuel, kerosene, and dual fuel resources will be modeled as energy limited in the winter, and around 500 MW will be modeled as energy limited in the summer.

Section 3.1 breaks the calculation of Qualified Inventory down into five steps and Section 5 provides the ISO's motivation for proposed design.

Section 3.1. Calculation of resources' seasonal Qualified Inventory values

This subsection provides a step-by-step breakdown of the proposed process for calculating resources' Qualified Inventory values.

Step 1: As described in ISO-NE Operating Procedure No. 21 – Operational Surveys, Energy Forecasting & Reporting and Actions During An Energy Emergency, the ISO regularly surveys oil, jet fuel, kerosene, and dual fuel resources to determine their onsite usable fuel inventory levels (survey question 2.2.) Specifically:

- The ISO conducts surveys every other week in the summer and at least once a week during the winter to determine resources' current usable inventory levels, fuel replenishment timelines, etc.[4]
- Resources must respond to the survey by the survey due date and time (generally on Tuesdays at 10am.) If a resource does not respond to a survey within 24 hours of the survey due date and time, the ISO will assume their fuel inventory value is zero for that survey period.

Step 2: Using the surveyed inventory levels from Step 1, the ISO calculates the median inventory levels for each resource for each of the last three summers and last three winters, where the summer months are May through October and the winter months are November through April.[5]

Step 3: To calculate a winter (summer) Qualified Inventory value, the ISO averages the median winter (summer) usable inventory values calculated in Step 2. In this way, a resource's seasonal winter (summer) Qualified Inventory is the median seasonal surveyed usable inventory, averaged over the last three winters (summers.)

Step 4: For recently commercial resources that may not have three seasons of survey data:

- If like-season surveys are available when the resource was commercially operational, the seasonal Qualified Inventory values will be calculated using the median surveyed inventory from those like-season surveys.
- If no like-season surveys are available when the resource was commercially operational, the seasonal Qualified Inventory values will be calculated using the median surveyed inventory from surveys from the other season.
- If no surveys are available when the resource was commercially operational, the seasonal Qualified Inventory values will be calculated using the most recent available survey when the resource was in non-commercial testing. (Surveys are distributed to generating assets who are either commercial or non-commercial testing).
- If no surveys are available, the seasonal Qualified Inventory values would be calculated as the resource's maximum usable fuel inventory capacity.

[4] The ISO will sometimes survey more frequently in the winter if conditions are expected to be tight.
[5] For more information on the season definitions under CAR, see the presentation here.

Step 5: The ISO's current thinking is that, as part of a broader "challenge process" to be discussed in a future month, resources would be able to request that some surveys be excluded from the seasonal Qualified Inventory calculations. For example, if a resource was on a prolonged forced outage that required repairs to their fuel tank, the resource would be able to request that the surveys conducted during their forced outage be excluded from their Qualified Inventory calculation. This would help to avoid a "double-penalization" problem, where the resource would be penalized for their forced outage through a higher modeled forced outage rate and penalized a second time for that forced outage through a lower Qualified Inventory value. The ISO welcomes stakeholder feedback as we develop the challenge process in the coming months.

Section 4. Proposed modeling and accreditation framework for energy limited resources

The ISO's September memo on MRI accreditation notes that there are three broad groups of modeling frameworks with which resources can be modeled in GE Vernova's Resource Adequacy software: "thermal" modeling, "energy limited" modeling, and "profile" modeling. With CAR, oil, jet fuel, and kerosene resources with less than 24 hours of Qualified Inventory in a season will be modeled in that season using the resource adequacy software's "Energy Limited 3" (EL3) framework. This section discusses the mechanics of how the EL3 resources will be modeled and accredited. Section 5 provides the key considerations that led the ISO to propose this framework.

A resource modeled with the EL3 framework will have a daily energy limit that caps their total production within a single day.[6] When an EL3 resource has reached its daily energy limit for the day, its available capacity will be 0 MW until the start of the next day. Note that, like energy storage resources, EL3 resources are only made available when needed to mitigate or prevent unserved energy. Note that EL3 resources cannot be dispatched to charge energy storage resources. The three important resource parameters for the EL3 model are:

- **Maximum Capability (MCap.)** An EL3 resource's MCap determines its maximum available capacity in the model. When needed to mitigate or prevent load shed, an EL3 resource can be made available up to their MCap (when not on forced outage), unless they have reached their daily energy limit.

- **Daily energy limit.** An EL3 resource's daily energy limit determines the maximum amount of energy it can produce in a single day. The oil, jet fuel, and kerosene resources modeled with the EL3 framework will have their daily energy limits set by their seasonal Qualified Inventory.

    - For example, a 100 MW oil resource with a winter Qualified Inventory of 4 hours will have a daily energy limit of 4 hours * 100 MW = 400 MWh. Such a resource would be able to provide no more than 400 MWh of energy in any single day.

[6] While the EL3 framework can also include monthly energy limits, the ISO is not proposing to model such limits for the energy limited resources. As described in Section 5, the ISO's survey data suggests that the vast majority of the oil, kerosene, jet fuel, or dual fuel resources have replenishment timelines that would make monthly energy limits overly punitive.

- **Seasonal equivalent forced outage rate on demand (EFORd.)** Like non-energy limited thermal resources, resources modeled with the EL3 framework will also be modeled with forced outage rates defined by their seasonal EFORd. See the ISO's memo on seasonal EFORd calculations here. Sections 4 and 5 of the ISO's memo on non-energy limited thermal resource modeling and accreditation provides details on the modeling of forced outage rates in the resource adequacy software.

Section 4.1. Simple example of EL3 resource modeling

This section provides a simple example of EL3 modeling. Example 1 demonstrates that EL3 resources will only be made available when needed to prevent unserved energy. Example 1 serves as the foundation for subsequent examples that consider the dispatch order of energy limited resources, as well as examples on the MRI Hours and the calculation of MRI Capacity values.

Example 1 considers the modeled performance of an oil resource, Oil1, across five hours in a single day.

- Oil1 has an MCap of 100 MW and a 0% EFORd. Oil1 has a Qualified Inventory of 4 hours and so has a daily energy limit of 400 MWh.
- Column 2 ("Oil1") provides Oil1's available capacity by hour.
- Column 3 ("Other Cap.") provides the available capacity provided by other resources in the mix.
- Column 4 ("Total Capacity") provides the sum of the available capacity provided by Oil1 and the other resources in the mix.
- Column 5 ("Load") provides energy demand in each hour.
- Column 6 ("Unserved Energy") calculates the unserved energy, by hour, as the difference between total capacity and load (columns 4 and 5.)

Table 1: EL3 resources are dispatched only when needed to avoid load shed

Hour	Oil1	Other Capacity	Total Capacity	Load	Unserved Energy
1	0 MW	1,000 MW	1,000 MW	900 MW	0 MWh
2	100 MW	1,000 MW	1,100 MW	1,100 MW	0 MWh
3	100 MW	1,100 MW	1,200 MW	1,200 MW	0 MWh
4	100 MW	1,000 MW	1,100 MW	1,200 MW	100 MWh
5	100 MW	1,000 MW	1,100 MW	1,100 MW	0 MWh

A few notes:

- Oil1 is not made available ("dispatched") in Hour 1 because it is not needed to meet load. Other capacity in Hour 1 (1,000 MW) can satisfy load in that hour (900 MW) without Oil1.

- In Hours 2 and 3, however, Oil1's capacity is needed to meet load and so Oil1 is dispatched. In Hour 2, Oil1's 100 MW plus the 1,000 MW of other capacity are just enough to meet the energy demand of 1,100 MW. Similarly, in Hour 3 Oil1's 100 MW plus the 1,100 MW of other capacity are just enough to meet the energy demand of 1,200 MW.

- In Hour 4, Oil1 is needed to mitigate load shed and so is made available at its MCap. Total capacity from Oil1 and other capacity (1,100 MW) is insufficient to meet load (1,200 MW) which results in 100 MWh of unserved energy.

- Hour 5, like Hours 2 and 3, requires Oil1 to be dispatched to avoid load shed.

Next, Section 4.2 discusses the modeled dispatch order of the energy limited resources.

Section 4.2. EL3 resource dispatch order in resource adequacy software

Under CAR, energy limited resources (including battery and pumped hydro energy storage resources) will be dispatched in order of their maximum possible duration, from longest to shortest. Specifically, the energy limited resources will be placed in a "priority order", where their place in that order depends on either their Qualified Inventory for EL3 resources or their maximum stored energy level for energy storage resources. For example, consider a resource mix that includes: i) an EL3 resource with 12 hours of Qualified Inventory, ii) a 10-hour battery, iii) a second EL3 resource with 6 hours of Qualified Inventory, and iv) a 2-hour battery. The priority dispatch order for this resource mix will be:

1. 12-hour EL3 resource
2. 10-hour battery
3. 6-hour EL3 resource
4. 2-hour battery

That is, if energy limited resources are needed to mitigate or prevent unserved energy, the 12-hour EL3 resource will be dispatched first. If that resource is insufficient to prevent unserved energy (or has already reached its daily energy limit), the 10-hour battery will be dispatched. If the 12-hour EL3 resource and the 10-hour battery are insufficient to prevent unserved energy (or have already reached their daily energy limit/exhausted their stored energy), the 6-hour battery will be dispatched, etc.

Consider Example 2 below. Example 2 is identical to Example 1, except it adds a second energy limited resource, Oil2. Like Oil1, Oil2 has an MCap of 100 MW and a 0% EFORd. However, Oil2 has a smaller daily energy limit than Oil1: Oil2 has a Qualified Inventory of 1 hour and so has a daily energy limit of 100 MWh. As a result, Oil2 can only be available at its MCap for one hour every day. See Table 2 below.

Table 2: Energy limited resources are dispatched from longest to shortest duration

Hour	Oil1	Oil2	Other Capacity	Total Capacity	Load	Unserved Energy
1	0 MW	0 MW	1,000 MW	1,000 MW	900 MW	0 MWh
2	100 MW	0 MW	1,000 MW	1,100 MW	1,100 MW	0 MWh
3	100 MW	100 MW	1,000 MW	1,200 MW	1,200 MW	0 MWh
4	100 MW	0 MW	1,000 MW	1,100 MW	1,200 MW	100 MWh
5	100 MW	0 MW	1,000 MW	1,100 MW	1,100 MW	0 MWh

A few notes:

- Total Capacity in Table 2 is identical to Total Capacity in Table 1. Oil2's 100 MW of available capacity in Hour 3 was pulled out of Other Capacity, so that Other Capacity is now 1,000 MW in all five hours.
- As in Table 1, Oil1 is dispatched in Hour 2 to prevent load shed. Because Oil1 is a longer duration resource than Oil 2 (four hours vs. one hour), it is first in the priority order and so is dispatched before Oil2.
- Oil2 is not dispatched in Hour 2 because Oil1 and Other Capacity can meet load alone.
- In Hour 3, both Oil1 and Oil2 are dispatched because both resources are needed to prevent unserved energy. (Oil1, Oil2, and Other Capacity together provide 1,200 MW of available capacity, just enough to meet load in Hour 3).
- By providing 100 MW of available capacity in Hour 3, Oil2 has met its daily energy limit of 100 MWh and will be unavailable in subsequent hours of the day. As a result, Oil2 is modeled at 0 MW in Hour 4 even though Hour 4 includes load shed.

The ISO proposes to dispatch the energy limited resources from longest to shortest because, in general, this dispatch order most efficiently utilizes the system's limited energy. To see this, consider Example 3 below. Example 3 is identical to Example 2 except Oil2 (the shorter duration energy limited resource) is dispatched before Oil1 (the longer duration energy limited resource).

Table 3: Dispatching shorter duration resources first increases unserved energy

Hour	Oil1	Oil2	Other Capacity	Total Capacity	Load	Unserved Energy
1	0 MW	0 MW	1,000 MW	1,000 MW	900 MW	0 MWh
2	0 MW	100 MW	1,000 MW	1,100 MW	1,100 MW	0 MWh
3	100 MW	0 MW	1,000 MW	1,100 MW	1,200 MW	100 MWh
4	100 MW	0 MW	1,000 MW	1,100 MW	1,200 MW	100 MWh
5	100 MW	0 MW	1,000 MW	1,100 MW	1,100 MW	0 MWh

A few notes:

- In Hour 2, because resources are dispatched from shortest to longest duration in this example, Oil2 is dispatched to prevent unserved energy before Oil1. This results in Oil2 reaching its daily energy limit by the end of Hour 2.
- In Hour 3, Oil2 cannot provide available capacity because it has already met its daily energy limit. As a result, 100 MWh of unserved energy occurs in Hour 3.
- As in the previous examples, Oil1 and Other Capacity are insufficient to meet load in Hour 4, resulting in another 100 MWh of unserved energy.
- Total unserved energy in Example 3 (200 MWh) exceeds the total unserved energy in Example 2 (100 MWh): dispatching the energy limited resources from shortest duration to longest duration increases unserved energy.
- Note that Oil1 exits Hour 5 with unused fuel in its tank: it has provided 300 MWh of energy but has a daily energy limit of 400 MWh. By dispatching Oil2 to meet load in Hour 2 instead of Oil1, the system does not efficiently use its limited energy to minimize unserved energy.

The ISO has tested empirically how different dispatch orders impact expected unserved energy (EUE) and loss of load expectation (LOLE) using the resource adequacy software. The ISO found the following:

- Consistent with the example above, dispatching the energy limited resources from shortest duration to longest duration resulted in an inefficient use of the system's limited energy, resulting in much higher EUE and LOLE values.
- Dispatching the energy limited resources proportionally (i.e., without a priority order) resulted in modest increases in EUE and loss of load hours (LOLH) relative to dispatching the resources from longest duration to shortest duration.

Key Takeaway: Energy limited resources (including resources modeled with the EL3 framework, battery energy storage resources, and pumped storage resources) will be dispatched from longest to shortest duration. This dispatch order generally allows for the most efficient use of the system's limited energy, relative to other dispatch orders.

Section 4.3. MRI Hours where energy limited resources are dispatched to avoid load shed

MRI Hours are the simulated hours where additional available capacity would mitigate or prevent unserved energy. As discussed in Section 4.2 of the September memo on the MRI framework for accreditation, there are three types of MRI Hours:

1. **Hours with load shed.** Simulated hours with load shed are MRI Hours because additional available capacity in such hours would reduce unserved energy.
2. **Hours where energy limited resources are dispatched to prevent load shed.** Hours where energy limited resources are dispatched to prevent unserved energy ahead of a load

shed event can be MRI Hours because additional available capacity in those hours could allow the energy limited resources to save some of their energy for a future load shed event.

3. **Hours where energy storage resources are charging constrained.** Hours where there is not enough surplus available capacity for all energy storage resources to charge at their maximum can be MRI Hours if there is a load shed event before the energy storage fleet can fully recharge.

This section focuses on the MRI Hours where energy limited resources are dispatched to prevent load shed. (Additional discussion on the charging constrained MRI Hours is planned for December.) The following provides a brief roadmap of the examples:

- Example 4 demonstrates that hours where total available capacity exceeds load shed are not MRI Hours.
- Example 5 demonstrates that some hours where energy limited resources are dispatched to prevent load shed are not MRI Hours because additional available capacity in those hours has no impact on unserved energy.
- Example 6 demonstrates that some hours where energy limited resources are dispatched to prevent load shed can be MRI Hours.
- Example 7 makes a slight modification to the examples to show that it is possible to have a string of hours where energy limited resources are dispatched to prevent unserved energy with no MRI Hours.

Section 4.3.1. Example 4

We start with Table 4, which builds on the previous examples above. Table 4 adds a sixth hour to the example. Hour 6 is identical to Hour 1: it has the same load (900 MW) and the same amount of Other Capacity (1,000 MW.) Table 4 demonstrates that Hours 1 and 6 are not MRI Hours because additional available capacity in those hours has no effect on unserved energy.

Table 4: Hours with surplus available capacity are not MRI Hours

Hour	Oil1	Oil2	Added Cap.	Other Cap.	Total Cap.	Load	Unserved Energy	MRI Hour?
1	0 MW	0 MW	+1 MW	1,000 MW	1,000 MW + 1 MW	900 MW	0 MWh	No
2	100 MW	0 MW		1,000 MW	1,100 MW	1,100 MW	0 MWh	
3	100 MW	100 MW		1,000 MW	1,200 MW	1,200 MW	0 MWh	
4	100 MW	0 MW		1,000 MW	1,100 MW	1,200 MW	100 MWh	Yes
5	100 MW	0 MW		1,000 MW	1,100 MW	1,100 MW	0 MWh	
6	0 MW	0 MW	+1 MW	1,000 MW	1,000 MW + 1 MW	900 MW	0 MWh	No
						Total:	100 MWh	

Note that Table 4 has a new column, Added Cap., which represents the additional capacity added to the system to check whether an hour is an MRI Hour. The additional MWs of available capacity in

Hours 1 and 6 increase total available capacity in those hours but have no impact on unserved energy. That is, because there is already more than enough available capacity to meet load in Hours 1 and 6, additional available capacity in those hours has no impact on unserved energy. As a result, Hours 1 and 6 are not MRI Hours and are marked as such in the final column, "MRI Hour."

However, note that Hour 4 is marked as an MRI Hour. As noted above, all hours with load shed are MRI Hours because additional available capacity in such hours will directly reduce unserved energy.

Next, Example 5 demonstrates that Hours 2 and 5, where Oil1 is dispatched to prevent load shed, are not MRI Hours.

Section 4.3.2. Example 5

In Hours 2 and 5, Oil1 is dispatched to prevent unserved energy in those hours. Example 5 builds on Example 4 by adding available capacity in Hours 2 and 5 to determine if they are MRI Hours.

Table 5: Not all hours where energy limited resources are dispatched are MRI Hours

Hour	Oil1	Oil2	Added Cap.	Other Cap.	Total Cap.	Load	Unserved Energy	MRI Hour?
1	0 MW	0 MW		1,000 MW	1,000 MW	900 MW	0 MWh	No
2	100 MW - 1 MW	0 MW	+1 MW	1,000 MW	1,100 MW	1,100 MW	0 MWh	No
3	100 MW	100 MW		1,000 MW	1,200 MW	1,200 MW	0 MWh	
4	100 MW	0 MW		1,000 MW	1,100 MW	1,200 MW	100 MWh	Yes
5	100 MW - 1 MW	0 MW	+1 MW	1,000 MW	1,100 MW	1,100 MW	0 MWh	No
6	0 MW	0 MW		1,000 MW	1,000 MW	900 MW	0 MWh	No
						Total:	100 MWh	

A few notes:

- In Hours 2 and 5, the additional MW of available capacity reduces Oil1's dispatch by 1 MW. That is, because there is more available capacity from resources that are not energy limited, less of Oil1's capacity is needed in Hours 2 and 5 to avoid load shed. This allows Oil1 to save energy for a future hour, if needed.

- While Oil1 enters Hour 6 with an additional 2 MWh of energy, that energy is not needed to prevent or mitigate unserved energy: Oil1 has enough fuel to provide available capacity at its MCap in all four hours where its capacity is needed to prevent or mitigate unserved energy. Effectively, for this event, Oil1 is not energy limited.

- As a result, the additional available capacity in Hours 2 and 5 has no impact on unserved energy and so Hours 2 and 5 are not MRI Hours.

Next, Example 6 demonstrates that Hour 3 is an MRI Hour.

Section 4.3.3. Example 6

In Hour 3, both Oil1 and Oil2 are dispatched to prevent load shed. Example 6 builds on the previous examples by adding available capacity in Hour 3 to determine if it is an MRI Hour.

Table 6: Some hours where energy limited resources are dispatched are MRI Hours

Hour	Oil1	Oil2	Added Cap.	Other Cap.	Total Cap.	Load	Unserved Energy	MRI Hour?
1	0 MW	0 MW		1,000 MW	1,000 MW	900 MW	0 MWh	No
2	100 MW	0 MW		1,000 MW	1,100 MW	1,100 MW	0 MWh	No
3	100 MW	100 MW - 1 MW	+1 MW	1,000 MW	1,200 MW	1,200 MW	0 MWh	Yes
4	100 MW	0 MW + 1 MW		1,000 MW	1,100 MW + 1 MW	1,200 MW	100 MWh - 1 MWh	Yes
5	100 MW	0 MW		1,000 MW	1,100 MW	1,100 MW	0 MWh	No
6	0 MW	0 MW		1,000 MW	1,000 MW	900 MW	0 MWh	No
						Total:	100 MWh - 1 MWh	

Table 6 includes an additional MW of available capacity in Hour 3. Let's consider the consequences of this additional MW of capacity step by step:

- The additional MW of available capacity in Hour 3 means one less MW of available capacity is needed from Oil2. This allows Oil2 to carry over 1 MWh of fuel into Hour 4.
- In Hour 4, Oil2 uses that additional MWh of energy to mitigate load shed. Total Capacity increases to 1,101 MW, which reduces unserved energy in Hour 4 to 99 MWh.
- Because an additional MW of available capacity in Hour 3 decreased unserved energy, Hour 3 is an MRI Hour.

To summarize, while there is no unserved energy in Hour 3, it is an MRI Hour because additional available capacity in Hour 3 would reduce unserved energy in a subsequent hour.

Section 4.3.4. Example 7

Example 7 demonstrates it is possible to have a stretch of hours where energy limited resources are dispatched to prevent unserved energy without any MRI Hours.

Example 7 modifies the previous examples by decreasing load in Hour 4 from 1,200 MW to 1,100 MW. Example 7 then adds an additional MW of available capacity in all six hours to determine if any of those hours are MRI Hours.

Table 7: With less demand in Hour 4, no MRI Hours occur

Hour	Oil1	Oil2	Added Cap.	Other Cap.	Total Cap.	Load	Unserved Energy	MRI Hour?
1	0 MW	0 MW	+1 MW	1,000 MW	1,000 MW	900 MW	0 MWh	No
2	100 MW - 1 MW	0 MW	+1 MW	1,000 MW	1,100 MW	1,100 MW	0 MWh	No
3	100 MW	100 MW - 1 MW	+1 MW	1,000 MW	1,200 MW	1,200 MW	0 MWh	No
4	100 MW - 1 MW	0 MW	+1 MW	1,000 MW	1,100 MW	1,100 MW	0 MWh	No
5	100 MW - 1 MW	0 MW	+1 MW	1,000 MW	1,100 MW	1,100 MW	0 MWh	No
6	0 MW	0 MW	+1 MW	1,000 MW	1,000 MW	900 MW	0 MWh	No
						Total:	0 MWh	

Note that by reducing energy demand in Hour 4 by 100 MW, unserved energy does not occur in any hour of the example. Because no hour includes unserved energy, additional available capacity in all six hours has no effect on unserved energy. As a result, even though energy limited resources are dispatched to prevent load shed in four of the example's six hours, none of the hours are MRI Hours.

Section 4.4. Accredited capacity calculations for energy limited resources

Under CAR, energy limited resources will be accredited based on their expected performance during the simulated MRI Hours where additional available capacity would mitigate or prevent load shed. In Example 6 above, Hours 3 and 4 are MRI Hours. Oil1 and Oil2's accredited capacity can then be calculated as their expected performance in those two hours:

$$Oil1's\ MRI\ Capacity = \frac{100\ MW + 100\ MW}{2} = 100\ MW$$

$$Oil2's\ MRI\ Capacity = \frac{100\ MW + 0\ MW}{2} = 50\ MW$$

Note that, even though Oil1 and Oil2 are the same size and have the same forced outage rate, Oil2 receives a lower accredited capacity value. While Oil1 has sufficient Qualified Inventory that it can be available at its MCap in both MRI Hours, Oil2 only has enough Qualified Inventory to be available at its MCap in one of the two MRI Hours.

Section 4.4.1. Primary drivers of energy limited resource accreditation with the MRI framework

Under the MRI framework, energy limited resource accreditation will be driven by three primary factors: their EFORd, their size, and their daily energy limit. Specifically:

- Energy limited resources that have higher EFORd values are more likely to be on forced outage during the MRI Hours. Consequently, higher EFORd values will yield lower accredited capacity values, all else equal. See Section 5.1 of the ISO' October memo on non-energy limited thermal modeling and accreditation for additional information.

- In general, resources with greater Maximum Capabilities will have greater MRI Capacity values. However, as resources become larger, their forced outages can become correlated

with resource adequacy risk, which can cause their accredited capacity per MW of Maximum Capability (their rMRI) to decrease. See Sections 5.2 and 5.3 of the ISO's October memo for additional information.

- In general, resources that have higher daily energy limits will have greater MRI Capacity values, all else equal. This is demonstrated by the accredited capacity values of Oil1 and Oil2 above.

Section 5. Key considerations behind proposed energy limited modeling framework

The ISO considered several potential frameworks for modeling the energy limited resources in the resource adequacy software, including the Energy Limited 1 (EL1) and Energy Limited 2 (EL2) frameworks[7], as well as the derating approach proposed as part of the Resource Capacity Accreditation (RCA) project. The ISO is proposing to pursue the EL3 framework because of the following considerations:

- Of the possible approaches, the EL3 framework is the most consistent with the energy storage framework that will be used for battery and pumped storage resources. Like the energy storage modeling approach, the EL3 framework dispatches energy limited resources only when needed to mitigate or prevent load shed and EL3 resources cannot charge energy storage resources.
- The EL1 and EL2 frameworks may not provide an accurate representation of resources' energy limits. For example:
    - The EL1 framework does not model resources as energy limited directly (i.e., EL1 resources are not limited in the number of consecutive hours that they can provide available capacity) and instead the EL1 resources are stochastically unavailable to represent the possibility the resources would be unavailable due to lack of fuel.
    - With the EL2 framework, energy limited resources are only dispatched around the peak load hour. As a result, their limited energy may not be used efficiently if, for example, their energy was needed earlier in the day but was not needed around the peak.
- Capacity derates intended to approximate the reliability impact of energy limits (such as those proposed under the RCA project) can provide an overly conservative representation of energy limited resources' expected availability, particularly during shorter duration events.
    - E.g., during a period with 6 MRI Hours, we would expect an energy limited resource with a 10-hour Qualified Inventory to be able to provide available capacity at its MCap in all of the hours where it is needed to mitigate or prevent load shed. However, with a 48-hour firm fuel requirement as proposed under RCA, the resource

[7] See GE Vernova's MARS Overview training material for information on the resource adequacy software's energy limited modeling capabilities.

would be modeled as available at only (6 hours/48 hours)*100 = 12.5% of its MCap in those hours.

- This observation is consistent with stakeholder feedback the ISO received during the RCA process, where stakeholders noted that a 48-hour firm fuel requirement was overly punitive for many smaller tank resources that could replenish daily.

- The 24-hour cutoff for energy limited status aligns well with ISO's information on the usable fuel inventory levels and replenishment capabilities of the oil, jet fuel, kerosene, and dual fuel resources.
  - Responses to the ISO's fuel inventory surveys (see Section 3.1) suggest that, of the roughly 12,000 MW of oil, jet fuel, kerosene, or dual fuel resources, approximately 9,200 MW report that they can replenish within a day, have pipeline access to large oil facilities that allow them to procure oil on short notice, or have winter Qualified Inventory values that are greater than the number of hours in their replenishment wait time. Nearly all of the remaining roughly 2,700 MW of oil, jet fuel, kerosene, or dual fuel resources carry enough winter Qualified Inventory to run for two or more consecutive days at their MCap.

Section 6. Key takeaways

- The proposed modeling and accreditation framework for energy limited resources will improve upon the existing rules by incorporating resources' size, EFORd, and energy limits into their capacity market compensation. This will help the capacity market to achieve its design objectives of Reliability, Sustainability, and Cost-Effectiveness.

- The ISO will calculate a summer and winter Qualified Inventory value for each oil, jet fuel, kerosene, and dual fuel resource. A resource's seasonal Qualified Inventory value will be the average of their last three season's median reported usable inventory values.

- If a resource's seasonal Qualified Inventory value is less than 24 hours, they are considered energy limited in that season. Dual fuel resources that can burn gas will not be considered energy limited in the summer, regardless of their summer Qualified Inventory value.

- Oil, jet fuel, and kerosene resources that have a seasonal Qualified Inventory less than 24 hours will be modeled with the EL3 framework in the resource adequacy software. The primary parameters for a resource modeled with the EL3 framework are their MCap, their seasonal EFORd, and their daily energy limit. The daily energy limit for resources modeled with the EL3 framework will be set to their Qualified Inventory value. E.g., a resource with an 8-hour Qualified Inventory will be available at their MCap in at most 8 hours within a simulated day.

- Energy limited resources (including resources modeled with the EL3 framework, battery energy storage resources, and pumped storage resources) will be dispatched from longest

to shortest duration. This dispatch order allows for the most efficient use of the system's limited energy, relative to other dispatch orders.

Appendix A. Modeling energy limited resources with shared inventories

Some energy limited or energy storage resources share stored energy, including pumped storage resources that share a pond, or oil resources that share an oil tank (or tank farm.) One approach for modeling and accrediting such resources would split the shared stored energy among the individual resources. However, this approach would likely overstate the resources' energy limitations. For example, if one resource is assigned a portion of the shared energy but is on forced outage, the resource's unused energy cannot be reallocated for use by other available resources that share that energy source.

The ISO plans to address this shortcoming by modeling sets of resources that share stored energy as part of a resource aggregation. Specifically:

- A resource aggregation would have an MCap equal to the sum of the MCaps of the individual resources that share a single source of stored energy.
- An aggregation's energy limit (the daily energy limit for EL3 resources or the maximum stored energy limit for energy storage resources) would be the shared stored energy limit of the aggregated resources. (E.g., if three pumped storage resources share a single pond, the energy limit for the aggregation would be the size of the shared pond.)
- An aggregation would be modeled with partial outages that reflect the possibility that one or more of the aggregated resources are unavailable due to forced outage. This will allow the resources that are not on outage to fully utilize their shared energy.

Consider a simple example with two oil resources that share a tank, where the first oil resource has a 75 MW MCap and the second oil resource has a 25 MW MCap. Assume that the Qualified Inventory for the shared energy is 300 MWh or 3 hours when both resources are providing energy at their MCap. The aggregation of the two oil resources would then have a 100 MW MCap and a daily energy limit of 300 MWh. The aggregation would have four forced outage states:

1. 100 MW, reflecting the hours where neither resource is on outage. In this outage state, the aggregation can provide 100 MW of available capacity for up to 3 hours before it hits its daily energy limit of 300 MWh.
2. 75 MW, reflecting hours where only the 25 MW resource is on outage. In this outage state, the aggregation can provide 75 MW of available capacity for up to 4 hours before it hits its daily energy limit of 300 MWh.
3. 25 MW, reflecting hours where the 75 MW resources is on outage. In this outage state, the aggregation can provide 25 MW of available capacity for up to 12 hours before it hits its daily energy limit of 300 MWh.

4. 0 MW, reflecting hours where both resources are on outage.

Modeling the aggregations with partial outages in this way allows the resources that share stored energy to best utilize their shared energy in the event of outages.

To accredit the individual resources that share stored energy, the ISO plans to calculate MRI Capacity values for the resource aggregations and then allocate that MRI Capacity to the individual resources. The ISO is currently considering two allocation methodologies:

- First, the ISO could allocate the aggregation's MRI Capacity proportionally to the individual resources using their Dependable Capability (DCap) values.
- Second, the ISO could allocate the aggregation's MRI Capacity to the individual resources as a function of the resource's MCap and EFORd values.

The ISO welcomes stakeholder feedback on this proposal and plans to return with additional details in the future.

Appendix B. Calculation of MRI values for energy limited resources

Under the MRI accreditation framework, a resource's MRI Capacity can be thought of as their expected performance during the simulated MRI Hours where resource adequacy is at risk. In practice, the ISO will calculate MRI Capacity values for most resources in a multi-step process:

Step 1: The ISO will estimate how a small increase in a resource's size would impact expected unserved energy (EUE) as measured by GE Vernova's Resource Adequacy software. We call this a resource's MRI value. Note that, for resources modeled with the EL3 framework, a small increase in their size includes an increase in their MCap and a proportional increase in their daily energy limit. For example, an EL3 resource with a 12-hour daily energy limit would see its daily energy limit increased by 12 MWh with a 1 MW increase in its MCap.

Step 2: The ISO will estimate how a small increase in "perfect capacity" would impact EUE in GE Vernova's Resource Adequacy software, where perfect capacity is defined as capacity that is always available in every hour.

Step 3: The ISO multiplies the ratio of the resource's MRI value to perfect capacity's MRI value with the resource's Maximum Capability. For a given resource i, its MRI Capacity is calculated as follows:

$$MRI\ Capacity_i = \frac{MRI_i}{MRI_{PC}} \times MC_i$$

Consider this three-step process with respect to Oil2 in Table 2 above. In Step 1, Oil2's Maximum Capability is increased by 1 MW. Because Oil2's MCap is increased by 1 MW and their Qualified Inventory is 1 hour, their daily energy limit is increased by 1 MWh. The table below shows that the small increase in Oil2's MCap and daily energy limit decreases unserved energy by 1 MWh. As a result, $MRI_{Oil2} = \frac{1\ MWh}{MW}$.

Hour	Oil1	Oil2	Other Cap.	Total Cap.	Load	Unserved Energy
1	0 MW	0 MW	1,000 MW	1,000 MW	900 MW	0 MWh
2	100 MW	0 MW	1,000 MW	1,100 MW	1,100 MW	0 MWh
3	100 MW	100 MW	1,000 MW	1,200 MW	1,200 MW	0 MWh
4	100 MW	0 MW + 1 MW	1,000 MW	1,100 MW + 1 MW	1,200 MW	100 MWh - 1 MWh
5	100 MW	0 MW	1,000 MW	1,100 MW	1,100 MW	0 MWh
6	0 MW	0 MW	1,000 MW	1,000 MW	900 MW	0 MWh

Note that, with the 1 MW increase in its MCap, Oil2 could provide 101 MW of available capacity in Hour 3. However, because only 100 MW of Oil2's capacity is needed to prevent load shed in Hour 3, only 100 MW of Oil2 is made available. This allows Oil2 to preserve its additional MWh of stored energy for Hour 4, when it can reduce unserved energy.

In Step 2, perfect capacity's MRI is calculated by adding 1 MW of perfect capacity to each hour. See the table below.

Hour	Oil1	Oil2	Perfect Cap.	Other Cap.	Total Cap.	Load	Unserved Energy
1	0 MW	0 MW	+ 1 MW	1,000 MW	1,000 MW	900 MW	0 MWh
2	100 MW	0 MW	+1 MW	1,000 MW	1,100 MW	1,100 MW	0 MWh
3	100 MW	100 MW - 1 MW	+1 MW	1,000 MW	1,200 MW	1,200 MW	0 MWh
4	100 MW	0 MW + 1 MW	+1 MW	1,000 MW	1,100 MW + 2 MW	1,200 MW	100 MWh - 2 MWh
5	100 MW	0 MW	+1 MW	1,000 MW	1,100 MW	1,100 MW	0 MWh
6	0 MW	0 MW	+1 MW	1,000 MW	1,000 MW	900 MW	0 MWh

The table shows that a small increase in perfect capacity decreases EUE by 2 MWh. As a result, $MRI_{PC} = \frac{2\ MWh}{MW}$.

Finally, in Step 3, we multiply the resource's MCap by the ratio of the resource's MRI value with Perfect Capacity's MRI value:

$$MRI\ Capacity_{Oil2} = \frac{1\frac{MWh}{MW}}{2\frac{MWh}{MW}} \times 100\ MW = 50\ MW$$

Note that Oil2's MRI Capacity calculated through this three-step process equals their expected performance during the MRI Hours (Hours 3 and 4).

Appendix C. CAR framework for energy limited dual fuel resources

As noted in Section 3, dual fuel resources with Qualified Inventory values greater than 24 hours will be modeled and accredited as non-energy limited thermal resources, as described in the October memo. Current data suggests that most dual fuel resources carry sizable fuel inventories. Consequently, only a couple of dual fuel resources are likely to be considered energy limited. This section provides a conceptual overview of the ISO's current thinking on the modeling and

accreditation of energy limited dual fuel resources, where the ISO is planning to bring additional details in January 2026 as part of the gas-only modeling and accreditation discussion.

The CAR framework for dual fuel resources with Qualified Inventory values less than 24 hours can be split into three steps:

1. A dual fuel resource with less than 24 hours of Qualified Inventory will be modeled and accredited as a gas-only resource.
    a. As noted in the ISO's November "Gas Constraint Conceptual Overview" presentation, gas-only resources' accredited capacity values will not reflect the expected reliability impact of the regional gas constraint. Instead, the reliability impact of the regional gas constraint will impact gas-only resources' capacity market compensation through the price they are paid.
2. An energy limited dual fuel resource's accredited capacity would then be split into "firm" and "non-firm" portions. The "firm" portion will be calculated by approximating the accredited capacity the resource would have received if it was oil-only and modeled as an EL3 resource. Specifically, the firm portion of the resource's MRI Capacity will be calculated using the rMRI of a proxy EL3 resource with the same Qualified Inventory and forced outage rate. The "non-firm" portion is the remainder of the resource's MRI Capacity that is not considered "firm."
3. The firm portion of the resource will be compensated based on their zonal clearing price (if it receives a CSO award), while the non-firm portion of the resource will be compensated based on the gas-only clearing price.

This three-step process was designed so that dual fuel resources are always at least as well compensated as they would have been if they were oil-only or gas-only resources. Consider a simple numerical example of a dual fuel resource with an MCap of 10 MW, a 20% EFORd, and an 8-hour Qualified Inventory.

- In Step 1, the resource is accredited as a gas-only resource. Assume that its MRI Capacity value is 8 MW, reflecting only the impact of its EFORd.
- In Step 2, the firm portion of the resource is determined using the rMRI of a proxy EL3 resource with an 8-hour Qualified Inventory and a 20% EFORd. Assume that the rMRI of the proxy resource is 60%. Then the firm portion of the resource's MRI Capacity would be:

$$MRI\ Capacity_{Firm} = MCap * rMRI_{proxy,8\ Hours} = 10\ MW \times 60\% = 6\ MW$$

  The non-firm portion of the resource's MRI Capacity is thus:

$$MRI\ Capacity_{NonFirm} = MRI\ Capacity - MRI\ Capacity_{Firm} = 8\ MW - 6\ MW = 2\ MW$$

- In Step 3, the cleared firm MRI Capacity is paid the zonal capacity clearing price and the cleared non-firm MRI Capacity is paid the gas-only clearing price. Assume that the

resource's zonal capacity clearing price is $4 per MW and the gas-only capacity clearing price is $2 per MW. Then, assuming the entire resource receives a capacity supply obligation, the resource's total capacity market compensation would be:

$$Capacity\ Market\ Compensation = MRI\ Capacity_{Firm} \times \frac{\$4}{MW} + MRI\ Capacity_{NonFirm} \times \frac{\$2}{MW}$$
$$= 6\ MW \times \frac{\$4}{MW} + 2\ MW \times \frac{\$2}{MW} = \$24 + \$4 = \$28$$

Note that the resource's capacity market compensation as a dual fuel resource is greater than its compensation would be if it was either an oil-only or a gas-only resource. If it was an oil-only resource, its capacity market compensation would be approximately:

$$Capacity\ Market\ Compenation_{OilOnly} = MRI\ Capacity_{Firm} \times \frac{\$4}{MW} = \$24$$

While, if the resource was a gas-only resource, its capacity market compensation would be:

$$Capacity\ Market\ Compensation_{GasOnly} = MRI\ Capacity \times \frac{\$2}{MW} = 8\ MW \times \frac{\$2}{MW} = \$16$$