memo

To: NEPOOL Markets and Reliability Committees

From: ISO New England, Inc.

Date: November 18, 2025

Subject: PDR Seasonal Accreditation under CAR

Executive Summary

This memorandum outlines ISO New England's proposed framework for accrediting Passive Demand Capacity Resources (PDRs) under the Capacity Auction Reforms (CAR). The proposed profile-based design aligns PDR accreditation with non-dispatchable profiled resources and with the broader Marginal Reliability Impact (MRI) framework. This approach ensures that PDRs are accredited based on their expected performance during hours when additional capacity would reduce expected unserved energy (EUE).

The key changes to the current design proposed under seasonal accreditation are grounded in 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-year loss of load expectation (LOLE) resource adequacy standard.

Sustainability: to incent 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.

This memo considers how both the existing and proposed accreditation frameworks for PDRs will help the capacity market to achieve these design objectives. The memo reaches the following conclusions:

- PDRs' current compensation for accredited capacity may not fully reflect their expected performance during hours where resource adequacy is at risk. The current accredited capacity values are based on performance during a limited set of pre-defined hours and do not reflect the different capabilities of different underlying technologies. This leaves room for improving the linkage between PDR compensation and expected performance.

- The proposed MRI accreditation process strengthens the link between PDRs' accreditation values and their expected performance during hours important for reliability. By modeling PDR performance at a class level with technology-specific granularity, the MRI framework allows for evaluating PDR contributions during tight system conditions. This, in turn, will yield more efficient capacity market compensation for PDRs.

Additionally, under CAR, a net load forecast will be used for resource adequacy modeling so PDRs will no longer need to be reconstituted into the gross load forecast. Therefore, the proposed accreditation framework offers a simplified approach to resource adequacy modeling for PDRs, along with improvements to capacity market compensation and longer-term investment signals.

The memo is organized as follows:

- Section 1 provides background information on PDRs.
- Section 2 describes the current process for determining PDRs' accredited capacity, known as their Qualified Capacity (QC), and outlines the associated opportunities for enhancement. This section highlights that the existing framework may not reflect PDRs' expected contributions to system reliability during hours when resource adequacy is at risk and may result in inefficient compensation.
- Section 3 introduces the MRI accreditation framework for PDRs and highlights its benefits. This section details the modeling approach for EE measures and DG assets, including the use of class-level profiles and proxy resources, and describes how these profiles are used to calculate new accredited capacity values.
- Section 4 describes the input data used to develop PDR profiles for accreditation, including third-party NREL end-use load profiles.
- Section 5 explains the proposed accreditation method for recently commercial PDRs, including how the ISO will treat DG assets that lack sufficient historical data.
- Section 6 summarizes the key takeaways of the MRI framework as well as the primary drivers behind PDR accreditation.
- Appendix A defines any new and commonly used terms within this memo.
- Appendix B walks through how to calculate rMRI values for a proxy resource using Example 1.
- Appendix C provides mapping from NREL's end-uses load shapes to the end-use categories used for accreditation modeling.
- Appendix D describes how the ISO developed yearly profiles from the NREL data, including the use of linear regressions to extrapolate load profiles for different years based on weather and temporal patterns.
- Appendix E summarizes the differences between the MRI framework and the previous RCA accreditation framework, highlighting the improvements achieved.
- Appendix F describes how a Transmission & Distribution (T&D) Loss Factor is applied to PDRs' accredited capacity.

Section 1. Overview of PDRs

Passive Demand Capacity Resources (PDRs) receive capacity market compensation for their ability to reduce load from behind the meter. Unlike dispatchable resources, PDRs only participate in the capacity market and not directly in the energy or ancillary services markets. Instead, their impact is observed as a persistent reduction in net load once the measure is installed or the asset becomes operational.

PDRs may participate in the Forward Capacity Market (FCM) as either On-Peak Resources or Seasonal Peak Resources. On-Peak Resources are evaluated based on their expected performance during weekday afternoon hours in the summer (June – August) and weekday evenings in the winter (December – January) seasons. Seasonal Peak Resources are evaluated based on their expected performance during the peak-load hours of each season.

Each resource varies in size and composition. PDRs consist of one or more Demand Assets where an individual asset could be one of the three Demand Capacity Resource (DCR) measure types: Energy Efficiency (EE), Distributed Generation (DG), or Load Management (LM). However, a PDR is unable to aggregate both EE and DG assets in a single resource. EE measures make up the majority (nearly 80 %) of Capacity Supply Obligations (CSO) associated with PDRs.

EE-based resources consist of measures that reduce electricity consumption through improved equipment, controls, or processes. These measures span a wide range of end uses, including lighting, HVAC, refrigeration, and industrial processes. DG-based resources are behind-the-meter generation assets such as photovoltaic (PV) systems, fuel cells, and small gas turbines. While EE measures reduce consumption, DG assets offset load by generating electricity locally. PDRs may additionally include LM measures for passive practices like load shifting. While there has been a load-shifting resource qualified in the past, there are currently no PDRs with LM assets participating in the FCM.

Passive DG and LM assets are required to submit actual performance for all hours. EE measures are required to report average estimated monthly demand reduction during Demand Resource On-Peak or Seasonal Peak Hours. This performance is estimated through studies performed by the Market Participant[1] and all performance assumptions and studies are documented in the resource's measurement and verification plan. EE measures also have a pre-determined measure-life after which their reductions no longer participate in the FCM and are simply assumed in the load.

PDRs have historically cleared much of their qualified capacity in Forward Capacity Auctions (FCAs) and, while all PDRs can receive CSOs, only resources composed of DG and LM assets are evaluated under the capacity market performance incentive structure (i.e., pay for performance), as EE-based resources are exempt.[2]

As of the beginning of Capacity Commitment Period (CCP) 2025/26, PDRs have a total CSO (before applying a T&D loss factor) of 2,569 MW, or 8.23% of the total CSO, based on the 2025-2034

[1] Or a participant's consultant.
[2] Pursuant to the 2021 FERC Order (Docket No. ER21-943-000) accepting revisions that exclude EE measures from pay-for-performance obligations and pay-for-performance settlement.

Forecast Report of Capacity, Energy, Loads, and Transmission (2025 CELT Report). Between CCP 2025/26 and CCP 2027/28, the portion of the total FCM that PDRs account for decreased from 8.23%, to just over 6%, which is largely attributable to measure-life expirations.

Table 1 gives the total overall summer and winter CSOs for each capacity resource type for the 2025/26 through 2027/28 CCPs.[3]

Table 1: PDR CSO Information

Period	2025/26 (FCA 16)		2026/27 (FCA 17)		2027/28 (FCA 18)	
Season	Summer	Winter	Summer	Winter	Summer	Winter
ADCR	438	440	623	625	544	544
PDR[1]	2,569	2,442	2,317	2,099	2,070	1,955
Generation	26,961	27,251	27,864	28,163	28,478	29,315
Imports	1,235	1,235	567	567	465	154
Total CSO	**31,203**	**31,368**	**31,370**	**31,453**	**31,557**	**31,967**
% PDR	**8.23%**	**7.79%**	**7.39%**	**6.67%**	**6.56%**	**6.12%**

[1] Passive demand capacity resources (On-Peak Resources and Seasonal Peak Resources)

[3] Resources that are comprised of co-located generation are included in the generation totals based on their resource type. CSOs for CCPs 2025/26 are based on the third annual reconfiguration auction (ARA 3) results, while CSOs for CCPs 2026/27 and 2027/28 are the results of FCA17 and FCA18, respectively.

Section 2. Existing Accreditation Process: Qualified Capacity (QC)

For both EE measures and DG assets in the existing accreditation framework, seasonal QC is initially determined based on estimated demand reduction information submitted during the new capacity qualification process for an FCA.[4] For EE measures, this seasonal value is estimated through analytical studies during the measurement and verification process.[5] For both EE measures and new DG assets, QC is initially set as the estimated expected performance for the target CCP, and is later updated through the qualification processes for each of the annual reconfiguration auctions, including an adjustment in the third annual reconfiguration auction (ARA3) if the latest audit performance value deviates substantially from this initial estimate.[6]

In the existing FCM framework, load reductions from PDRs are inherently included in the base net load forecast, but PDRs also participate as supply resources. To avoid double counting their contributions, PDRs are 'reconstituted' to create a gross load forecast for use in calculating capacity requirements and demand curves. This way, the region procures resources to meet the one-day-in-ten reliability requirement based on a load forecast that does not include these BTM load reductions.

The existing accreditation process presents an opportunity for three enhancements related to the design objectives of CAR. Note that the three enhancements discussed here are similar to enhancements discussed in the September NEPOOL Markets Committee's (MC) memo on the MRI framework.[7]

Section 2.1. Enhancement 1: PDRs' seasonal QC could be improved to better reflect contributions during hours with tight system conditions beyond a limited set of pre-defined demand resource peak hours

The current rules assume that accrediting PDRs based on their expected output during a fixed set of performance hours will approximate their expected contribution to resource adequacy during tight system conditions where load shed is possible.

Section 2.1.1. Current accreditation framework only accounts for performance during pre-defined hours that do not align well with hours when resource adequacy is at risk

There are two sets of demand capacity resource peak hours used in the current framework:

- Demand Resource On-Peak Hours:

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[4] LM assets will not be discussed in detail further throughout this memo because there are currently none qualified to participate in the market. In general, the treatment that is applied to DG assets is extended to LM assets both in the current and proposed design.
[5] The criteria for these studies are included in the ISO New England Manual for Measurement and Verification of On-Peak Demand Resources and Seasonal Peak Demand Resources (M-MVDR).
[6] Adjustments for significant decreases in capacity are detailed in Section III.13.4.2.1.3. of the Tariff.
[7] ISO New England, NEPOOL Markets Committee, "Marginal Reliability Impact (MRI) Framework for Accrediting Capacity Resources," September 3, 2025.

  - Summer: Hour ending (HE) 14:00 – 17:00 on weekday non-holidays (June – August)
  - Winter: HE 18:00 – 19:00 on weekday non-holidays (December – January)
- Demand Resource Seasonal Peak Hours:
  - Hours on weekday non-holidays where system load is greater than or equal to 90% of the most recent 50/50 seasonal peak forecast.

The Resource Capacity Accreditation project (RCA) impact analysis suggested that there are many hours outside of these measurement hours that, as system conditions change, may be important for resource adequacy.[8] Accrediting PDRs according to a single seasonal value derived from these pre-defined demand resource peak hours therefore limits seasonal QC's ability to reflect how a resource may perform during these at-risk hours. At-risk resource adequacy hours are called marginal reliability impact (MRI) Hours and are further explained in the MRI Framework memo from September.[9]

For example, the summer Demand Resource On-Peak Hours occur in the afternoon, but the RCA impact analysis system modeling indicated that the hours of greatest reliability risk in the summer are typically later in the day, when the performance of some PDRs may be quite different. Similarly, in the winter, reliability risk can span the entire day, with heightened concern during the evening hours. Because the current framework does not consider performance during all of these hours, it may overstate the reliability contribution of some resources and understate others.

The majority of PDR CSO (~80%) is from On-Peak Resources. For the remaining Seasonal Peak Resources, the Demand Resource Seasonal Peak Hours are flexible and represent hours with very high load. However, these hours have still been shown to not fully capture all hours important for resource adequacy as shown in the RCA impact analysis.

As the resource mix evolves and system conditions change, the hours that matter most for resource adequacy will also shift. The current framework's reliance on limited, pre-defined demand capacity resource peak hours limits its ability to adapt to these changes, which is not consistent with the *Sustainability* design objective, and may result in less efficient compensation, as described in Enhancement 3 below.

Section 2.2. Enhancement 2: PDRs' seasonal QC could better capture differences in performance patterns of different types of PDRs (underlying end-uses and technologies)

By only using a limited set of hours to calculate seasonal QC, the current accreditation framework also overlooks the significant differences in hourly and monthly performance patterns across different resource types (EE vs. DG) as well as different underlying technologies or measure end-uses (gas turbines vs. lighting vs. refrigeration). This can lead to inaccurate estimates of their contributions to reliability.

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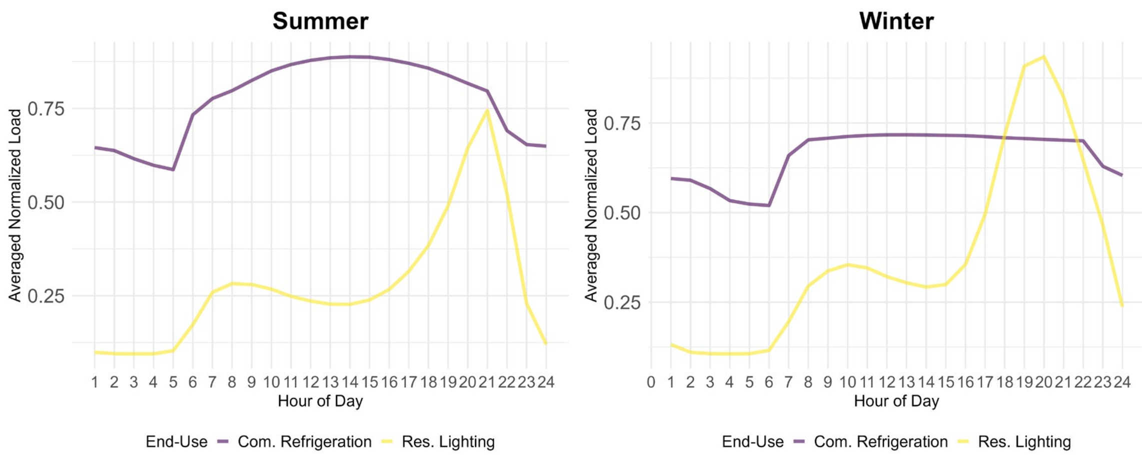
[8] See slide 27 in the [February 2024 RCA Impact Analysis]() for a representative distribution of loss-of-load hours observed under RCA impact analysis.
[9] ISO New England, NEPOOL Markets Committee, "[Marginal Reliability Impact (MRI) Framework for Accrediting Capacity Resources]()," September3, 2025.

EE-based resources consist of measures that reduce consumption across various end-uses, such as lighting, HVAC, and refrigeration for both the residential and commercial sectors. These end-uses exhibit distinct hourly load shapes. For example, residential lighting measures are turned on and typically provide greater reductions during evening hours (i.e., there is more lighting load and thus a greater savings for more efficient lighting installations), while commercial refrigeration measures maintain a relatively flat load profile throughout the day. Figure 1 illustrates this difference for a typical summer and winter day.

Figure 1: Average Load Shape of Residential Lighting vs. Commercial Refrigeration End-Use for a Summer (June – August) and Winter (December – January) Day[10]



Because the current framework bases accreditation on performance during pre-defined demand resource peak hours, it does not capture these variations. A lighting measure may appear less valuable under the current rules because its highest contribution occurs outside the Demand Resource On-Peak Hours, even though those evening hours are increasingly critical for reliability.

DG-based resources also exhibit diverse performance patterns. For instance, a PV asset produces energy only during daylight hours, with output declining sharply after sunset. In contrast, a small gas turbine can operate throughout the day, including during evening hours when reliability risk is highest. If accreditation relies solely on performance during Demand Resource On-Peak Hours, a PV-based resource may receive a seasonal QC that does not reflect its inability to contribute during summer evening hours or its ability to contribute during winter daylight hours, while a gas turbine's consistent availability is relatively undervalued.

Section 2.3. Enhancement 3: PDRs' capacity market compensation could be better aligned with expected performance during hours where resource adequacy is at risk in the model

The current accreditation framework compensates PDRs based on their seasonal QC derived from limited demand capacity resource peak hours, rather than their expected performance during hours when resource adequacy is at risk. This method can lead to misalignment between capacity market payments and expected reliability contributions.

[10] Normalized by maximum yearly load value.

Below is a simple numerical example that demonstrates how accrediting two PDRs with different underlying technologies based on their performance during the demand capacity resource peak hours could result in accreditation that does not align with performance during hours that are important for resource adequacy.

Assuming there are three hours that are important for resource adequacy (i.e., MRI Hours) and only one hour that is a pre-defined peak hour (i.e., Hour 1), Table 2 below summarizes the implications.

- PDR1(Gas) is a small gas turbine with a QC of 5 MW as determined by its performance in HE 1 and an average performance across all three hours of 5 MW.

- PDR2(PV) is a PV that has a QC of 6 MW as determined by its performance HE 1 and an average performance across all three hours of 3 MW.

Table 2: Example of Two PDR Technologies and their Expected Performance

Hour	PDR1(Gas)	PDR2(PV)
1	5 MW	6 MW
2	5 MW	3 MW
3	5 MW	0 MW
E[Performance]	5 MW	3 MW
QC	5 MW	6 MW

In this example, PDR2 with 6 MW of QC would be paid more than PDR1 with 5 MW of QC. However, PDR1 is expected to provide 5 MW during hours when resource adequacy is at risk, whereas PDR2 is only expected to provide 3 MW in these same hours. Additionally, the market is compensating these resources for 11 MW of provided capacity. Accrediting and compensating the resources based on expected performance during hours when resource adequacy is at risk would result in compensation for 8 MW.

This misalignment is not consistent with the *Cost-Effectiveness* design objective of the capacity market. In cases where compensation is not fully linked to expected performance during hours important to resource adequacy, the current framework may not compensate PDRs efficiently.

Section 3. MRI Accreditation Framework for PDRs

This section discusses the proposed MRI-based accreditation framework for PDRs. The proposed framework links accreditation to expected performance during MRI Hours when additional capacity would reduce expected unserved energy (EUE). This approach addresses the enhancements identified in Section 2 and improves alignment between compensation and reliability contributions. The ISO calls accredited capacity under the MRI framework “MRI Capacity.”

Going forward under CAR, PDR performance will no longer be reconstituted into the gross load forecast. Instead, PDR contributions will be embedded in the net load forecast, which is used to determine capacity requirements and demand curves. Because PDRs will still participate as supply in the capacity market, for market clearing, these demand curves must be adjusted to avoid double counting the reliability benefit already reflected in the net load.[11]

The proposed accreditation approach focuses on improving the *Cost-Effectiveness* of PDR compensation and ensuring that market signals support efficient long-term investment decisions across different asset types and end-uses.

As with other resource types, MRI Capacity is based on expected hourly performance during MRI Hours. However, unlike most other resource types, modeling will be done at a class level by end-use or technology type, and these class-level values will be used to then establish resource-specific MRI Capacity. This is required because 1) PDRs are composed of many small assets and measures that, because of the volume, cannot easily be individually reflected in modeling and 2) there is significant diversity in the type of assets and measures that comprise a single PDR.

To estimate PDR capability during hours where resource adequacy is expected to be at risk, the ISO proposes developing class-based hourly profiles for different technologies and end-uses. This approach will be tailored to account for differences in data availability for EE measures and DG assets.[12] The class-level profiles will yield class-level relative MRI (rMRI) values,[13] which may then be adjusted for individual asset performance. Each asset’s or measure’s adjusted rMRI is used to calculate its MRI Capacity, which can be then aggregated to the PDR level for participation in the capacity market.

Since PDRs are no longer modelled as explicit supply resources in the resource adequacy simulations, the ISO uses proxy resources in GE’s Multi-Area Reliability Simulation Program (GE MARS) to evaluate performance in MRI Hours. A proxy resource is a modeling construct with 0 MW capacity in the resource adequacy simulations, ensuring it does not affect the system’s reliability outcomes. In the accreditation simulations, this proxy’s capacity is incremented (or perturbed) to 0.5 MW to estimate how a marginal increase in capacity – shaped by a performance profile – would

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[11] Discussion of the capacity requirement and demand curve adjustment will be included in the upcoming Seasonal Demand Curve Estimation discussion.

[12] EE measures report only a single seasonal demand reduction value (DRV), while DG assets must provide hourly meter data to the ISO (Reference Manual M-MVDR Section 5.2).

[13] As defined in the October Non-Energy Limited Thermal Modeling and Accreditation memo.

reduce EUE. This change is used to calculate the class-level MRI, rMRI and ultimately the resources' MRI Capacity.

- Section 3.1 walks through the proposed process for modeling PDRs, providing detail on how this method is applied for EE-based resources (Section 3.1.1), and DG-based resources (Section 3.1.2) with simple numerical examples.
- Section 3.1.3 presents the unique profile development methodology for DG assets with PV technology.
- Section 3.2 describes how this proposed modeling framework will address Enhancements 1, 2, and 3.

Section 3.1. Class-Based Hourly Profile Development

The class-level PDR profiles represent the performance of an individual sector and end-use or technology during all hours of the year, enabling GE MARS to estimate performance during MRI Hours. This method preserves the granularity needed to capture differences in performance shapes even though it is infeasible to model each measure or asset individually.

In Sections 3.1.1 and 3.1.2 below, profile development is therefore divided into steps to first develop class-level profiles and rMRIs, and then use the rMRIs to calculate resource-specific MRI Capacity (MRIC).

Section 3.1.1. Profile Development and MRI Capacity Calculation for PDRs Containing EE Measures

To estimate the expected performance of PDRs composed of EE measures, the ISO proposes developing distinct hourly performance profiles by sector and end-use. There is some evidence available that total EE savings from measures across New England correlate with system load.[14] These profiles therefore assume that normalized EE performance (savings) follow the same shape as the corresponding end-use load. For example, the *savings* profile for lighting measures is assumed to mirror the shape of the lighting *load* profile. To capture load shapes by end-use and sector (commercial, residential), the ISO uses ResStock™ and ComStock™ End-Use Load Profiles for the U.S. Building Stock developed by the National Renewable Energy Laboratory ("NREL Profiles") for the ISO New England area.[15] Because only the shape of the NREL profiles is used, not their magnitude, each profile is normalized to ensure consistency across end-uses.

The profile development and MRI Capacity calculation steps are below, followed by examples that walk through these calculations step-by-step.

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[14] Assessing Energy Efficiency Resource Performance in All Hours - *Final Report of the Demand Resources Working Group to the NEPOOL Markets Committee 2019*.

[15] The demand profiles represent all major end-uses and building types in the U.S. commercial and residential building stock and were modeled using a robust hybrid of empirical electric load data and physics-based building stock models. https://www.nrel.gov/buildings/end-use-load-profiles

Activity 1: Develop class-level hourly profiles and calculate rMRI

Step 1: Aggregate NREL Profiles by sector and end-use
Aggregate the 15-minute end-use load profiles into hourly profiles for each of the six EE measure end-use categories – lighting, HVAC, motors and drives, process measures, refrigeration, and custom measures – and two sectors, commercial and residential. The profiles are also extrapolated to different years for modeling based on temporal and weather conditions. Further details on adjusting profiles by year are in Appendix D.

Step 2: Determine maximum-to-average load ratio
For each sector/end-use profile, calculate the maximum hourly load observed in the season and the average load during the Demand Resource On-Peak Hours. Then compute the ratio of maximum to average load.

Step 3: Normalize load profiles and assume shape equivalence for demand reduction
Normalize each sector/end-use profile by its seasonal maximum value so that all hourly values fall between 0 and 1. Assume that the shape of the normalized load profile is representative of the expected shape of demand reduction (i.e., EE performance) for that sector/end-use.

Step 4: Calculate rMRI
Use normalized profiles multiplied by the small increment associated with the proxy resource (to covert the normalized profile to an hourly MW profile) in GE MARS to simulate the performance of a proxy resource during MRI Hours to yield an rMRI for each sector/end-use.

Activity 2: Use class rMRI to calculate resource MRI Capacity

Step 5: Derive resource MCap
For each measure within a resource, estimate its Maximum Capability (MCap) by scaling its Demand Reduction Value (DRV) – which reflects average performance during demand resource peak hours – using the maximum-to-average load ratio calculated in Step 2 for the corresponding sector and end-use. Sum the scaled MCap values of all associated measures to yield a resource-specific MCap for that sector/end-use.

Step 6: Calculate MRI Capacity
Multiply the class-level rMRI by the resource-level MCap for each sector/end-use to calculate MRI Capacity.

Step 7: Aggregate all sector/end-uses in a resource
Sum the MRI Capacity values across all sector/end-use categories within the PDR to determine the total MRI Capacity for the resource.

The two examples that follow illustrate this process. The first uses a fabricated NREL Profile to derive a class-level sector/end-use profile and rMRI, then calculates MRI Capacity for a PDR composed of EE measures from a single sector and end-use. The second example extends this to a PDR with measures from two distinct sector/end-use combinations.

Section 3.1.1.1. Example 1: A single PDR contains EE measures of one sector and end-use type

Activity 1: Develop class-level hourly profiles and calculate rMRI

- The example period consists of three hours during one season. These hours are also MRI Hours.
- Hour 1 is also the only Demand Resource On-Peak Hour.
- The hourly load values are derived using the NREL Profiles for lighting end use and residential building stock and are a proxy for the expected profile for how the demand reduction would impact each hour.

Table 3: NREL Profile for Residential Lighting in New England in Example 1

Hour	Residential Lighting Load Profile
1*	400 MW
2	800 MW
3	600 MW
Average On-Peak	400 MW
Maximum	800 MW
MaxRatio (Max/Avg)	200% (800 MW / 400 MW)

* Demand Resource On-Peak Hour.

Step 1 uses NREL's residential lighting load shape to yield an hourly profile. Then Step 2 calculates a ratio of the maximum load over all hours to the average load during the Demand Resource On-Peak Hour (just the single Hour 1 in this example). This MaxRatio will be used in later calculations.

Table 4: Normalized Residential Lighting Profile in Example 1

Hour	Normalized Residential Lighting Profile
1	(400/800) = 0.50
2	(800/800) = 1.00
3	(600/800) = 0.75

Step 3 normalizes the profile by the maximum value such that all normalized values are between 0 and 1. The ISO now assumes that the normalized shape of the residential lighting *load* is equivalent to the expected normalized shape of a residential lighting measure's *performance (i.e., demand reduction)*.

Step 4 calculates rMRI of residential lighting. The normalized hourly performance profile from Table 4 is applied to a 0.5 MW proxy resource in GE MARS. The simulation estimates how this proxy resource reduces EUE during MRI Hours, and compares it to the reduction from perfect capacity as outlined in Appendix A of the October Non-Energy Limited Thermal Modeling and Accreditation memo.[16] The resulting rMRI is the ratio of the proxy resource's MRI value to that of perfect capacity. See Appendix B for a demonstration of how a rMRI is calculated using a proxy resource.

[16] October Non-Energy Limited Thermal Modeling and Accreditation memo

In practice, the rMRI can be thought of as the average normalized performance of the residential lighting profile during MRI Hours. Using the normalized profile, the rMRI is then (0.50 + 1.00 + 0.75)/3 = 0.75 or 75%. This indicates that the ISO expects residential lighting EE measures will perform at 75% of their maximum capability during MRI Hours which becomes the class level rMRI for this sector and end-use.

Activity 2: Use class rMRI to calculate resource-specific MRI Capacity

- PDR1 consists of EE measures that reduce residential lighting end-use consumption.
- The EE measures in PDR1 have a cumulative estimated DRV of 4 MW during the Demand Resource On-Peak Hours as reported to the ISO.

Next, the ISO must determine the Maximum Capability of PDR1. Since only the estimated demand reduction during Demand Resource On-Peak Hours is reported to the ISO, the ISO again uses the NREL Profile to adjust the average performance represented in the Demand Resource On-Peak Hours to the maximum performance.

Step 5 adjusts the DRV of PDR1 by the MaxRatio of the residential lighting end-use profile (Table 3).

$$MCap_{PDR1} = DRV_{PDR1} \times MaxRatio_{Res.Light.} = 4\,MW \times 200\% = 8\,MW$$ [17]

Step 6 uses PDR1 MCap and class-level rMRI to calculate MRI Capacity for PDR1. Since PDR1 only contains residential lighting EE measures, this is the final resource-specific MRI Capacity.

$$MRI\ Capacity_{PDR1} = rMRI_{Res.Light.} \times MCap_{PDR1} = 75\% \times 8\,MW = 6\,MW$$

In this case, PDR1 receives more MRI Capacity than its reported DRV because residential lighting performance is higher during MRI Hours outside of the Demand Resource On-Peak Hours.

Section 3.1.1.2. Example 2: A single PDR contains EE measures of two distinct end-uses and sectors

Activity 1: Develop class-level hourly profiles and calculate rMRI

- Using the same example period set up, PDR2 consists of EE measures that serve both the residential lighting end-use and the commercial refrigeration end-use.
- The residential lighting measures in PDR2 have a cumulative estimated DRV of 4 MW during the On-Peak Demand Resource Hours. The commercial refrigeration measures in PDR2 have a cumulative estimated DRV of 3 MW during the On-Peak Demand Resource Hours.

[17] A ratio of maximum profile value to average profile value during Demand Resource Seasonal Peak Hours is used to calculate MCap for Seasonal Peak resources.

Since the normalized profiles are used at the class-level, the residential lighting measures will use the same normalized profile as derived above from NREL. The normalized profile for commercial refrigeration is derived the same way (Steps 1-3):

Table 5: NREL Profile for Commercial Refrigeration Load in New England in Example 2

Hour	Commercial Refrigeration Load Profile
1*	100 MW
2	50 MW
3	50 MW
Average On-Peak	100 MW
Maximum	100 MW
MaxRatio (Max/Avg)	100%

* Demand Resource On-Peak Hour.

Table 6: Normalized Commercial Refrigeration Profile in Example 2

Hour	Normalized Commercial Refrigeration Profile
1	(100/100) = 1.00
2	(50/100) = 0.50
3	(50/100) = 0.50

The ISO now assumes that the normalized shape of the residential lighting *load* is equivalent to the expected normalized shape of a residential lighting measure's *performance (i.e., demand reduction)*.

Step 4 calculates rMRI using a 0.5 MW proxy resource with the hourly performance profile from Table 6 in GE MARS. The average normalized performance of the commercial refrigeration profile during MRI Hours is (1.00 + 0.50 + 0.50)/3 = 0.667 so the rMRI is 66.7%. This indicates that the ISO expects commercial refrigeration measures will perform at 66.7% of their maximum capability during MRI Hours.

Activity 2: Use class rMRI to calculate resource MRI Capacity

Since PDR2 contains measures of two end-uses, the ISO must determine the maximum capability of the residential lighting measures in PDR2 as well as the commercial refrigeration measures in PDR2. The ISO uses the corresponding NREL profiles to adjust their On-Peak performance to their maximum performance.

Step 5 adjusts:

- the DRV of residential lighting measures in PDR2 by the MaxRatio of the residential lighting end-use (Table 3)

$$\begin{aligned} MCap_{PDR2,Res.Light.} &= DRV_{PDR2,Res.Light} \times MaxRatio_{Res.Light.} \\ &= 4\ MW \times 200\% \\ &= 8\ MW \end{aligned}$$

- the DRV of commercial refrigeration measures in PDR2 by the MaxRatio for the commercial refrigeration end-use (Table 5)

$$\begin{aligned} MCap_{PDR2,Com.Ref.} &= DRV_{PDR2,Com.Ref.} \times MaxRatio_{Com.Ref.} \\ &= 3\ MW \times 100\% \\ &= 3\ MW \end{aligned}$$

Step 6 uses MCap and rMRI to calculate MRI Capacity for PDR2's residential lighting and commercial refrigeration measures:

- $MRI\ Capacity_{PDR2,Res.Light.} = rMRI_{Res.Light.} \times MCap_{PDR2,Res.Light.}$
  $= 75\% \times 8\ MW = 6\ MW$
- $MRI\ Capacity_{PDR2,Com.Ref.} = rMRI_{Com.Ref.} \times MCap_{PDR2,Com.Ref}$
  $= 66.7\% \times 3\ MW = 2\ MW.$

Finally, step 7 sums the MRI Capacity of all of the end-uses within PDR2 to yield a final resource-level MRI Capacity:

$$\begin{aligned} MRI\ Capacity_{PDR2} &= MRI\ Capacity_{PDR2,Res.Light.} + MRI\ Capacity_{PDR2,Com.Ref.} \\ &= 6\ MW + 2\ MW \\ &= 8\ MW \end{aligned}$$

Section 3.1.2. Profile Development and MRI Capacity Calculation for PDRs Containing DG Assets other than PV Assets

Unlike EE measures, DG assets are individually metered and thus provide hourly energy output data to the ISO. This data is collected at the asset level and reflects the performance of technologies such as PV, fuel cells, and small gas turbines. DG-based resources often include multiple assets of different technologies, each with distinct operating characteristics.

To capture these differences while maintaining a practical modeling approach, the ISO proposes using class averages with resource-specific adjustments. This follows the same approach used for EE discussed above for Activity 1; however, unlike with EE, there is resource-specific hourly performance data. Therefore, Activity 2 includes an additional step to adjust the technology-specific class average for the resource-specific performance.

This Activity 1 of this approach applies to all DG asset technologies except for PV, which is described in Section 3.1.3 below. Activity 2 applies to all DG asset technologies including PV. The steps for DG asset accreditation are as follows.

The profile development and MRI Capacity calculation steps are below, followed by examples that walk through these calculations step-by-step.

Activity 1: Develop class-level hourly profiles and calculate rMRI

Step 1: Aggregate asset metered output profiles by technology
Aggregate the hourly meter data for each DG asset based on its technology (e.g., energy storage, fuel cell, gas turbine, steam turbine) to create aggregate technology profiles.

Step 2: Calculate maximum and dependable capability

Using each asset's hourly meter data, calculate its Maximum Capability (MCap) and Dependable Capability (DCap), which are defined in Section 4 below. Aggregate to derive resource and technology MCap and DCap, as well as the DCap to MCap ratio.

Step 3: Normalize technology profiles
Normalize each technology profile by the technology MCap such that normalized performance is between 0 and 1.

Step 4: Calculate rMRI
Use normalized profiles multiplied by the small increment associated with the proxy resource (to covert the normalized profile to an hourly MW profile) in GE MARS to simulate the performance of a proxy resource during MRI Hours to yield an rMRI for each technology.

Activity 2: Use class rMRI to calculate resource MRI Capacity

Step 5: Derive resource rMRI
Adjust technology rMRI by ratio of a resource's performance to the technology's performance. PerformanceFactor (DCap/MCap) is used for adjustment.

Step 6: Calculate MRI Capacity
Multiply the adjusted rMRI value by the resource-level MCap for each technology to calculate MRI Capacity. Resource-technology MRI Capacity cannot exceed the aggregate MCap of that resource-technology.

Step 7: Aggregate all technologies in a resource
Sum the performance during MRI Hours for all technologies in a resource.

The two examples that follow illustrate this process. The first uses DG meter data to derive a class-level technology profile and rMRI, then calculates MRI Capacity for a PDR composed of one DG asset. The second example extends this to a PDR composed of two DG assets of different technologies.

Section 3.1.2.1. Example 3: A single PDR contains one DG asset
Activity 1: Develop class-level hourly profiles and calculate rMRI

- The example period consists of three hours during one season. These hours are also MRI hours.
- There are two DG fuel cell assets, FC1 and FC2, that submit hourly meter data to the ISO.

Table 7: Performance, MCap, and DCap of Two DG Assets and Fuel Cell Technology in Example 3

Hour	FC1 Meter Data	FC2 Meter Data	Fuel Cell Profile[1]
1	2 MWh	8 MWh	2 + 8 = 10 MW
2	2 MWh	6 MWh	2 + 6 = 8 MW
3	2 MWh	4 MWh	2 + 4 = 6 MW
MCap	2 MW	8 MW	2 + 8 = 10 MW
DCap	2 MW	6 MW	2 + 6 = 8 MW

PerformanceFactor (DCap/MCap)	(2/2) = 100%	(6/8) = 75%	(8/10) = 80%

[1] Hourly metered energy output (MWh) is converted to hourly capacity performance (MW).

Step 1 adds the two metered outputs to construct an aggregate fuel cell profile to be used for modeling and then Step 2 uses the hourly metered output from FC1 and FC2 to calculate the MCap and DCap of each asset and the technology. Step 2 also calculates the PerformanceFactor for both assets and fuel cells in aggregate as DCap/MCap.

Table 8: Normalized Fuel Cell Technology Profile in Example 3

Hour	Normalized Fuel Cell Profile
1	(10/10) = 1.00
2	(8/10) = 0.80
3	(6/10) = 0.60

Step 3 normalizes the fuel cell profile by the fuel cell MCap.

Step 4 calculates rMRI using a 0.5 MW proxy resource with the hourly performance profile from Table 8 in GE MARS. The average normalized performance of fuel cells during MRI Hours is (1.00 + 0.80 + 0.60)/3 = 0.80 so the rMRI is 80%. This indicates that the ISO expects fuel cell assets will perform at 80% of their maximum capability during MRI Hours.

Activity 2: Use class rMRI to calculate resource MRI Capacity

- PDR3 consists of only one asset, FC2. Therefore, the DCap of PDR3 is 6 MW.
- The DCap of fuel cells in aggregate is 8 MW.

Step 5 converts this class total rMRI of 80% to a resource specific rMRI. Consider the PerformanceFactor (DCap/MCap) as a measure of per MW dependable performance. If, per MW, the resource has a higher dependable performance than the technology on average, the rMRI adjusts upwards, and if the resource has a lower dependable performance than the technology on average, the rMRI adjusts downwards.

$$rMRI_{PDR3} = rMRI_{FuelCell} \times \frac{PerformanceFactor_{PDR3,FuelCell}}{PerformanceFactor_{FuelCell}}$$
$$= 80\% \times \frac{75\%}{80\%} = 75\%$$

This indicates that the ISO expects the fuel cell asset in PDR3 to perform at 75% of its maximum capability during MRI Hours.

Step 6 uses MCap and rMRI to calculate MRI Capacity for PDR3. Since PDR3 only contains one fuel cell asset, this is the final resource-specific MRI Capacity.

$$MRI\ Capacity_{PDR3} = rMRI_{PDR3} \times MCap_{PDR3} = 75\% \times 8\ MW = 6\ MW$$

In this case, MRI Capacity of PDR3 is the same as the expected performance during MRI Hours (8 + 6 + 4)/3 = 6 MW as if the ISO had modeled PDR3 individually. While the two values are not always exactly equal under a class-based approach, this method of technology profiles with resource-specific adjustments is a good approximation of modeling each resource individually; thus aligning with treatment of other profiled resources under CAR.

Section 3.1.2.2. Example 4: A single PDR contains two DG assets of different technologies

Activity 1: Develop class-level hourly profiles and calculate rMRI

- Building upon Example 3, there are two further DG assets, GT1 and GT2, that use gas turbine technology.

Table 9: Performance, MCap, and DCap of Two DG Assets and Gas Turbine Technology in Example 4

Hour	GT1 Meter Data	GT2 Meter Data	Gas Turbine Profile[1]
1	3 MWh	1 MWh	3 + 1 = 4 MW
2	5 MWh	1 MWh	5 + 1 = 6 MW
3	3 MWh	3 MWh	3 + 3 = 6 MW
MCap	5 MW	3 MW	5 + 3 = 8 MW
DCap	3 MW	1 MW	3 + 1= 4 MW
PerformanceFactor (DCap/MCap)	(3/5) = 60%	(1/3) = 33.3%	(4/8) = 50%

[1] Hourly metered energy output (MWh) is converted to hourly capacity performance (MW).

Step 1 adds the two metered outputs to construct an aggregate gas turbine profile to be used for modeling and then Step 2 uses the hourly metered output from GT1 and GT2 to calculate the MCap and DCap of each asset and the technology. Step 2 also calculates the PerformanceFactor for both assets and gas turbine assets in aggregate as DCap/MCap.

Table 10: Normalized Gas Turbine Technology Profile in Example 5

Hour	Normalized Gas Turbine Profile
1	(4/8) = 0.50
2	(6/8) = 0.75
3	(6.8) = 0.75

Step 3 normalizes the fuel cell profile by the fuel cell MCap.

Step 4 calculates rMRI using a 0.5 MW proxy resource with the hourly performance profile from Table 10 in GE MARS. The average normalized performance of gas turbine asset during MRI Hours is (0.50 + 0.75 + 0.75)/3 = 0.667 so the rMRI is 66.7%. This indicates that the ISO expects gas turbine assets will perform at 66.7% of their maximum capability during MRI Hours.

Activity 2: Use class rMRI to calculate resource MRI Capacity

- PDR4 consists of two assets: FC1 from Example 3 and GT1. The MCap andDCap of the fuel cell assets in PDR4 is 2 MW and 2 MW. The MCap and DCap of the gas turbine assets in PDR4 is 5 MW and 3 MW.

- The DCap of fuel cells in aggregate is 8 MW. The DCap of gas turbine assets in aggregate is 4 MW.

Since PDR4 contains assets of two technologies, Step 5 converts the technology rMRIs to resource-technology specific rMRIs using the PerformanceFactors of the resource's assets of each technology.

First for fuel cell assets using Table 7:

$$rMRI_{PDR4,FuelCell} = rMRI_{FuelCell} \times \frac{PerformanceFactor_{PDR4,FuelCell}}{PerformanceFactor_{FuelCell}}$$
$$= 80\% \times \frac{100\%}{80\%} = 100\%$$

Then for gas turbine assets using Table 8:

$$rMRI_{PDR4,GasTurb.} = rMRI_{GasTurb.} \times \frac{PerformanceFactor_{PDR4,GasTurb.}}{PerformanceFactor_{GasTurb.}}$$
$$= 66.7\% \times \frac{60\%}{50\%} = 80\%$$

Step 6 uses MCap and rMRI to calculate MRI Capacity for both technologies in PDR4.

- $MRI\ Capacity_{PDR4,FuelCell} = rMRI_{PDR4,FuelCell} \times MCap_{PDR4,FuelCell}$
  $= 1.0 \times 2\ MW = 2\ MW$
- $MRI\ Capacity_{PDR4,GasTurb.} = rMRI_{PDR4,GasTurb.} \times MCap_{PDR4,GasTurb.}$
  $= 0.80 \times 5\ MW = 4\ MW$

In both cases the MRI Capacity < MCap for that resource-technology.

Finally, step 7 sums the MRI Capacity of all of the technologies within PDR4 to yield a final resource-level MRI Capacity:

$$MRI\ Capacity_{PDR4} = MRI\ Capacity_{PDR4,FuelCell} + MRI\ Capacity_{PDR4,GasTurb.}$$
$$= 2\ MW + 4\ MW$$
$$= 6\ MW$$

Section 3.1.3. Profile Creation for DG PV Assets

Unlike other technologies, PV assets' performance is highly sensitive to weather conditions, particularly solar irradiance and temperature. As a result, the ISO plans to model all PV performance (utility scale PV, behind the meter [BTM] PV) using weather-dependent simulations within GE MARS during the summer. These simulations span historical weather years from 2007 to 2023, allowing the ISO to capture a wide range of seasonal and hourly variability in PV output. This also means that submitted DG PV meter data would be insufficient for comprehensive modeling.

Because DG PV assets are behind-the-meter, the ISO relies on its maintained hourly BTM PV profiles, which are normalized by nameplate capacity and reflect system-wide PV behavior across New England. Analysis has shown that DG PV assets exhibit similar performance characteristics and temporal patterns to BTM PV, making these profiles a suitable proxy for accreditation purposes.

The normalized BTM PV profiles are used to calculate a technology relative MRI in the same way as in Section 3.1.2 above. Once $rMRI_{PV}$ is established, the ISO applies the same resource-technology-specific adjustment and aggregation steps (Activity 2: steps 4 - 7) as outlined in the DG accreditation framework. This includes adjusting $rMRI_{PV}$ based on the resource-technology's dependable performance (DCap) relative to its maximum capability (MCap), calculating MRI Capacity, and limiting it by the MCap.

Section 3.2.1. Feature 1: Modeling PDRs based on their expected performance during the MRI Hours ensures accreditation captures performance during hours with tight system conditions beyond a limited set of pre-defined demand resource peak hours

Enhancement 1 above notes that the current accreditation framework does not directly account for PDRs' expected performance during hours when resource adequacy is at risk. The proposed MRI framework addresses this by accrediting PDRs based on their expected performance during the hours when additional capacity would mitigate or reduce load shed. This approach ensures that PDRs are evaluated, not on a limited set of pre-defined hours, but on their expected contributions to system reliability during the most critical periods.

To support this, class average sector/end-use and technology profiles will be developed and then used to calculate relative MRI that represent how a small increase in MCap impacts expected unserved energy (EUE). The resulting accreditation value from this process, MRI Capacity, will thus reflect performance during MRI Hours when resource adequacy is at risk.

Section 3.2.2. Feature 2: The MRI framework captures differences in performance patterns of different types of PDRs, allowing the capacity market to incentivize investment into specific end-uses and technologies

Enhancement 2 above notes that the current seasonal QC does not capture differences in performance patterns and capability of different types of PDRs. The MRI framework addresses this by modeling PDRs using sector/end-use and technology-specific profiles, allowing the ISO to capture the distinct performance shapes of different PDR types. Although the MRI values are calculated at a class rather than resource level, differentiating the profiles in this way provides valuable granularity and helps ensure that accreditation reflects the expected reliability contributions of each DCR type in all hours.

This granularity also enables the capacity market to send more targeted investment signals. Because each end-use and technology receives a distinct relative MRI value, resources that contribute more during MRI Hours will receive higher accreditation. This approach incentivizes the development of PDR assets and measures that provide the greatest value to system reliability.

Section 3.2.3. Feature 3: PDRs' compensation is more closely aligned with expected performance during hours where resource adequacy is at risk in the model

Enhancement 3 above notes that the current accreditation framework may misalign capacity market compensation with PDRs' expected contributions to system reliability. Specifically, compensation is based on performance during a limited set of predefined hours, rather than the hours when resource adequacy is truly at risk. This can result in overcompensating resources that perform well during those predefined hours but contribute less during MRI Hours, and undercompensating resources that provide consistent reliability when it matters most.

The MRI framework addresses this by linking compensation directly to expected performance during MRI Hours. Each PDR's accreditation value is calculated using class-level rMRI values that reflect performance during MRI Hours, adjusted for resource-specific capability. As a result, resources that contribute more during stressed system conditions will receive higher accreditation and compensation.

This approach ensures that capacity market payments more accurately reflect the reliability value of each resource, improving cost-effectiveness and better aligning incentives with system needs.

Section 4. Input Data for PDR Profile Development

Section 4.1. Demand reduction value (DRV)

For EE-based PDRs, the ISO receives estimated seasonal DRVs for each new measure during the new capacity qualification process for an FCA. DRVs represent the mean demand reduction that a measure can provide during either the Demand Resource On-Peak Hours or the Demand Resource Seasonal Peak Hours. These values are calculated and submitted by market participants based on engineering studies and measurement and verification plans.

Once reported in the Energy Efficiency Measures Database, the DRV associated with a measure remains constant for the duration of the measure's life. The DRV for a resource or specific sector/end-use is the sum of the DRV for all unexpired measures associated with that resource or sector/end-use. For EE measures, DRV is then used to calculate to MCap.

Section 4.2. NREL End-Use Load Profiles

To model EE performance across all hours of the year, the ISO uses End-Use Load Profiles for the U.S. Building Stock developed by the National Renewable Energy Laboratory (NREL) through its ResStock™ and ComStock™ datasets. These profiles are derived from a hybrid modeling approach that combines empirical data from over 2 million meters with physics-based simulations of U.S. building stock. The profiles are at the 15-minute level for the year 2018.

The profiles are segmented by building type within the commercial and residential sectors, and cover a wide range of granular end-uses. The granular end-use profiles are aggregated into eleven sector/end-use categories for modeling in the accreditation process:

- Commercial Lighting
- Commercial HVAC
- Commercial Process Measures
- Commercial Refrigeration
- Commercial Custom Measures
- Commercial Motors and Drives
- Residential Lighting
- Residential HVAC
- Residential Process Measures
- Residential Refrigeration
- Residential Custom Measures

The mapping of NREL end-use and building type to modeled sector/end-use category is in Appendix C.

The 15-minute load data were aggregated into hourly values. Additionally, to extrapolate the 2018 sector/end-use load profiles to years 2000 to 2023 for modeling, the ISO used a linear regression based on weather patterns, day type (weekday vs. weekend/holiday), month, and hour. The detailed description of this modeling is in Appendix D.

Section 4.3. DG Asset Metered Output

DG-based PDRs consist of individually metered assets that report hourly energy output to the ISO. Participants are required to submit initial meter data within 2.5 business days after the operating month and finalized data within 70 days. This data is used for settling Pay-for-Performance obligations and for accreditation modeling.

While individual assets may occasionally have missing or erroneous data, the ISO mitigates these issues by aggregating performance across all assets of the same technology type. This aggregation smooths out anomalies and provides a robust basis for developing technology-level profiles. For accreditation, the ISO uses data from the most recent full calendar year to construct hourly performance profiles for each DG technology (e.g., fuel cells, gas turbines, steam turbines, energy storage).

Section 4.4. Maximum and Dependable Capability (MCap and DCap)

For EE resources, DRV is the sum of the average seasonal performance, for all installed measures that will not have expired by the start of each season of the relevant CCP, as reported in the Energy Efficiency Measures Database (EEM). MCap is the DRV scaled up by the MaxRatio based on the sector/end-use of the measures. DCap is not defined for EE measures.

For DG assets, MCap is defined as the highest observed output during the most recent three years of the relevant season.[18] DCap is calculated as the median output during the top 500 highest system load hours in the most recent season.[19] These values are calculated at the asset level using submitted meter data.

Once calculated, MCap and DCap values are aggregated to:

- The resource level (all assets within a single PDR),
- The technology level (all assets of the same technology across the market), and
- The resource-technology level (all assets of a given technology within a single PDR).

These aggregated values are used to normalize performance and adjust class-level rMRI values to reflect resource-specific reliability contributions. This ensures that MRI Capacity reflects both the technology's expected performance and the individual resource's demonstrated capability.

Note that although DG assets that use PV technology use separate normalized BTM PV profiles for modeling, all MCaps and DCaps for PV assets are calculated using actual meter data as described above.

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[18] See the presentation on Maximum Capability in Capacity Auction Reforms from the October Markets Committee for additional details.
[19] See the presentation on Dependable Capability in Capacity Auction Reforms from the October Reliability Committee for additional details.

Section 4.5. ISO New England Behind-the Meter Photovoltaic Profiles

The ISO has identified a correlation between load and PV generation. Because GE MARS uses load shapes from 2007 to 2023 for summer modeling, the ISO uses modeled yearly profiles for Small Utility-Scale PV (UPV), and ISO New England Behind the Meter PV (BTM PV) for simulations. The modeled profiles use historical weather and irradiance data to extrapolate the current fleet's performance during each year from 2007 to 2023.

In order to draw on the significant work already done for PV modeling and to ensure alignment between yearly weather patterns and PV performance patterns, the ISO use normalized BTM PV profiles to represent DG assets that use PV technology for modeling instead of actual metered output. The BTM PV profiles are created and maintained by the ISO at the load-zone level.[20] For PDR accreditation, the ISO creates one system-wide average profile by weighing each BTM PV load zone profile by the zone's share of DG MCap.

[20] For years 2014 to present, BTM PV profiles were created by the ISO's forecasting team using actual vendor-provided data. For years 2000-2013, the profiles were developed using ISO data by EPRI as part of the "Extreme Weather" operational analysis project. Further detail on BTM PV modeling can be found on slides 57 – 66 in this Load Forecast Committee Presentation.

Section 5. Recently Commercial Resources

The proposed accreditation methodology under CAR is sensitive to the timing of profile creation and data availability, particularly in a prompt-seasonal framework. Resources must be commercial prior to the capacity auction to be eligible for accreditation, but newly commercial PDRs may lack sufficient historical data to support full profile development. This section outlines how the ISO proposes to treat newly commercial EE measures and DG assets to ensure consistent and fair accreditation.

Section 5.1. New EE Measures

Under the prompt-seasonal design, EE measures must be commercial to participate in the capacity market. Each measure's seasonal DRV is submitted to the ISO during the new capacity qualification process and remains fixed for the duration of the measure's life. The exact DRV/MCap of a resource is based on the non-expired measures at the time of the capacity demonstration deadline. Because DRVs are available at the time of the auction and the ISO uses third-party NREL end-use load profiles for modeling, accreditation values can be calculated directly using the submitted DRV and the relevant end-use profile. Therefore, no additional qualification steps are required to accommodate newly commercial EE measures.

Section 5.2. New DG Assets

For DG assets, accreditation relies on asset-level hourly meter data submitted to the ISO to calculate MCap and DCap. In a prompt-seasonal setting, any new commercial asset will have some available meter data, and thus an MCap can be calculated as the maximum demand reduction given the available data.

In practice, this means newly commercial assets may have sufficient data to estimate an MCap but may not have operated during any of the top 500 load hours, resulting in missing DCap values. To address this, the ISO proposes assigning DCap to such assets using a technology-specific average ratio of DCap to MCap. This adjustment is performed as follows:

- Calculate MCap and DCap for each asset using the most recently available meter data,
- Calculate the average seasonal DCAP/MCAP ratio for each technology based on assets with non-zero MCAP and non-zero DCAP,

$$Technology\ DCap\ to\ MCap = mean\left(\left\{\frac{DCap_a}{MCap_a}:\ a \in tech,\ MCap_a \neq 0, DCap_a \neq 0\right\}\right)$$

- Assign DCap to assets missing a DCap using the asset MCap and technology average DCap/MCap ratio,

$$DCap_a = (Technology\ DCap\ to\ MCap) \times MCap_a \quad ,\ if\ DCap_a\ is\ missing$$

- Aggregate assets to the resource, technology, and resource-technology level.

This approach ensures that newly commercial DG assets can be accredited in a manner consistent with existing resources, even when limited historical data is available.

Section 6. Key Takeaways and Primary Drivers of PDR Accreditation

The proposed MRI accreditation framework for PDRs ensures that capacity market compensation reflects expected performance during MRI Hours. The primary factors that will determine accredited capacity values for PDRs under this framework are their 1) size, 2) end-use (for EE measures), and 3) dependable performance within their technology class (for DG assets).

Sections 6.1, 6.2, and 6.3 below discuss the corresponding key takeaways.

Section 6.1. Key Takeaway 1: Larger EE and DG resources will receive more accredited capacity, all else equal

Resource size is an important driver within the MRI accreditation framework. Larger EE resources and larger DG resources will generally receive more accredited capacity than smaller resources holding factors like end-use and technology equal.

For EE resources, rMRI values are determined at the class level using NREL end-use profiles. Therefore, for two EE resource with measures of the same sector/end-use, size (DRV) directly scales the final accredited capacity.

For DG resources, size also matters because resources with higher MCap values tend to have higher DCap values and the DCap of a resource is used to establish the final accredited capacity (as explained in Section 6.3). However, a higher MCap does not guarantee a high DCap if a resource performs infrequently or inconsistently during high-load conditions.

In general, larger resources will receive more accredited capacity, but dependable performance remains a critical determinant for DG resources.

Section 6.2. Key Takeaway 2: EE resources serving end-uses that provide savings consistently during MRI Hours will receive more accredited capacity, all else equal

While an EE resource's MCap sets the upper bound on its accredited capacity, the fraction of that capacity received as accredited capacity depends on the rMRI value. The rMRI is calculated using class-level profiles and reflects the average normalized performance of a particular end-use during MRI Hours. End-uses that exhibit consistent high savings during hours where resource adequacy is expected to be at risk will have higher rMRI values.

Therefore, for two EE resources with the same MCap, differences in MRI Capacity will be determined solely by end-use. The resource with expected measure performance that aligns better with MRI Hours will receive more accredited capacity.

Section 6.3. Key Takeaway 3: DG resources with better dependable performance within their technology class will receive more accredited capacity, all else equal

For DG resources, MRI Capacity is directly driven by the DCap of the resource's technology relative to the technology class average through the PerformanceFactors. When the formula for MRI

Capacity is expressed in terms of relative PerformanceFactors, it shows that MCap of a resource does not impact MRI Capacity.

Continuing Example 3 (from Section 3.1.2.1) above, the equation for MRI Capacity can be rewritten by substituting the resource-specific rMRI value with the ratio of DCap to MCap for both PDR3 and the aggregate fuel cell technology. PDR3's MCap is canceled out by the PDR3 MCap in the denominator of PDR3's PerformanceFactor.

$$
\begin{aligned}
MRI\ Capacity_{PDR3} &= rMRI_{PDR3} \times MCap_{PDR3} \\
&= rMRI_{FuelCell} \times \frac{PerformanceFactor_{PDR3,FuelCell}}{PerformanceFactor_{FuelCell}} \times MCap_{PDR3} \\
&= rMRI_{FuelCell} \times \frac{\frac{DCap_{PDR3}}{\cancel{MCap_{PDR3}}}}{\frac{DCap_{FuelCell}}{MCap_{FuelCell}}} \times \cancel{MCap_{PDR3}} \\
&= rMRI_{FuelCell} \times MCap_{FuelCell} \times \frac{DCap_{PDR3}}{DCap_{FuelCell}}
\end{aligned}
$$

This shows that the MRI Capacity of a DG resource is driven by its dependable performance, as reflected by its DCap. DG resource's that have a DCap that is higher than the average DCap for the corresponding technology class will have an rMRI greater than the class rMRI while those with a DCap that is lower than the average DCap for the technology class will have an rMRI lower than the class rMRI.

For two DG resources containing assets of the same technology class, the resource with a higher DCap will have a higher MRI Capacity. In general, higher DCap indicates larger contributions to reliability during peak load conditions and results in higher accredited capacity.

Appendix A. New Terms

The following terms are not tariff defined terms, but are treated as defined terms within this memo. The definitions of these terms are included below.

MRI – Marginal Reliability Impact. The MRI of a resource is how much expected unserved energy is reduced from a marginal increase in the resource's Maximum Capability.

rMRI – Relative MRI. The proportion of a resource's MRI Capacity to their Maximum Capability; also the ratio of a resource's MRI value to perfect capacity's MRI value.

MRI Hours – Hours identified probabilistically during simulations that either have expected unserved energy or are important for avoiding expected unserved energy in a later hour.

MRI Capacity – Accredited capacity under the MRI framework. A resource's MRI Capacity is their expected performance during the simulated MRI Hours where resource adequacy is expected to be at risk.

Maximum Capability (MCap) – Maximum hourly demonstrated performance. For EE measures, MCap is the DRV scaled up by the MaxRatio based on the sector/end-use of the measures. For DG assets, MCap is defined as the highest observed output during the most recent three years of the relevant season.[21]

Dependable Capability (DCap) – Estimate of expected availability during peak load conditions in each season. DCap is not defined for EE measures. For DG assets, DCap is defined as the median output during the top 500 highest system load hours in the most recent season.[22]

[21] See the presentation on Maximum Capability in Capacity Auction Reforms from the October Markets Committee for additional details.
[22] See the presentation on Dependable Capability in Capacity Auction Reforms from the October Reliability Committee for additional details.

Appendix B. MRI Calculation for Accreditation Examples

Example 1: A single PDR contains EE measures of one end-use and sector type

In the MRI accreditation framework, distinct EE sector/end-uses will be modeled using a proxy resource in GE MARS. A proxy resource is modeled with a baseline maximum capability of 0 MW, ensuring it does not affect system reliability in the resource adequacy simulations. Then, in order to measure the resource's contribution during hours when resource adequacy is at risk for accreditation, the proxy resource is assumed to increase its maximum capability by 0.5 MW, following the shape of the normalized profile provided.

In Example 1, the ISO assigns a proxy resource to residential lighting by multiplying the normalized profile shape by size of the perturbation used for the perfect capacity resource (e.g., 0.5 MW).

Table B1: Residential Lighting Proxy Resource Profile in Example 1

Hour	Normalized Residential Lighting Shape	Residential Lighting Proxy Resource
0	0.00	(0.00 x 0.50) = 0.000 MW
1	0.50	(0.50 x 0.50) = 0.250 MW
2	1.00	(1.00 x 0.50) = 0.500 MW
3	0.75	(0.75 x 0.50) = 0.375 MW
4	1.00	(1.00 x 0.50) = 0.500 MW

The MRI calculation for a proxy resource therefore directly mirrors that of other profiled resources as outlined in Appendix A of the October Non-Energy Limited Thermal Modeling and Accreditation memo.[23] The ISO will use Step 1 and Step 2 to calculate rMRI.

Step 1: The ISO will estimate how a small increase (from 0 MW to 0.5 MW) in a proxy resource's maximum capability would impact EUE as measured by GE MARS. This is a proxy resource's MRI value.

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

Following Step 1, Table B2 below shows that the small increase in the proxy resource's maximum capability decreases EUE by 1.125 MWh. As a result, $MRI_{Res.Light.} = 1.125\ MWh/MW$.

Table B2: MRI Calculation for Residential Lighting Proxy Resource in Example 1

Hour	Res. Light. Proxy	Other Capacity	Total Capacity	Load	Unserved Energy
0	0 MW	990 MW	990 MW	950 MW	0 MWh

[23] October Non-Energy Limited Thermal Modeling and Accreditation memo

1	0 MW + 0.25 MW	990 MW	990 MW + 0.25 MW	1000 MW	10 MWh - 0.25 MW
2	0 MW + 0.50 MW	990 MW	990 MW + 0.50 MW	1000 MW	10 MWh - 0.50 MW
3	0 MW + 0.375 MW	990 MW	990 MW + 0.375 MW	1000 MW	10 MWh - 0.375 MW
4	0 MW + 0.50 MW	990 MW	990 MW + 0.50 MW	980 MW	0 MWh
					Change in EUE = 1.125 MWh

Next in Step 2, perfect capacity's MRI is calculated by adding 0.50 MW of perfect capacity to each hour. Table B3 shows that an increase in perfect capacity of the same size (0.5 MW) decreases the EUE by 1.5 MWh. As a result, $MRI_{PC} = 1.50\ MWh/MW$.

Table B3: MRI Calculation for Perfect Capacity in Example 1

Hour	Res. Light. Proxy	Perfect Capacity	Other Capacity	Total Capacity	Load	Unserved Energy
0	0 MW	+ 0.5 MW	990 MW	990 MW + 0.5 MW	950 MW	0 MWh
1	0 MW	+ 0.5 MW	990 MW	990 MW + 0.5 MW	1000 MW	10 MWh - 0.5 MW
2	0 MW	+ 0.5 MW	990 MW	990 MW + 0.5 MW	1000 MW	10 MWh - 0.5 MW
3	0 MW	+ 0.5 MW	990 MW	990 MW + 0.5 MW	1000 MW	10 MWh - 0.5 MW
4	0 MW	+ 0.5 MW	990 MW	990 MW + 0.5 MW	980 MW	0 MWh
						Change in EUE = 1.50 MWh

Finally, the relative MRI is the ratio of residential lighting's MRI to perfect capacity's MRI,

$$rMRI_{Res.Light.} = \frac{rMRI_{Res.Light.}}{MRI_{PC}} = \frac{1.125\ MWh/MW}{1.50\ MWh/MW} = 75\%$$

As noted above, this is equivalent to the average normalized performance of the residential lighting profile during MRI Hours as shown in Example 1 above.

Appendix C. NREL End-Use and Building Type Mapping

NREL End-Use	EE End-Use Profile
ceiling_fan	HVAC
clothes_dryer	Process
clothes_washer	Process
cooling	HVAC
cooling_fans_pumps	Motors/Drives
dishwasher	Process
freezer	Refrigeration
heating	HVAC
heating_fans_pumps	Motors/Drives
heating_hp_bkup	HVAC
heating_hp_bkup_fa	Motors/Drives
hot_water	Process
lighting_exterior	Lighting
lighting_garage	Lighting
lighting_interior	Lighting
mech_vent	HVAC
net	-
refrigeration	Refrigeration
water_systems	Motors/Drives

NREL End-Use	EE End-Use Profile
permanent_spa_heat	HVAC
permanent_spa_pump	Motors/Drives
plug_loads	Process
pool_heater	Process
pool_pump	Motors/Drives
pv	-
range_oven	Process
refrigerator	Refrigeration
total	-
well_pump	Motors/Drives
exterior_lighting	Lighting
fans	HVAC
heat_recovery	Process
heat_rejection	Process
interior_equipment	Process
interior_lighting	Lighting
pumps	HVAC

Table 2: NREL granular end-use to accreditation profile end-use mapping.

Building Type	Commercial vs. Residential
MobileHome	Residential
MultiFamilywith2-4Units	Residential
MultiFamilywith5+Units	Residential
SingleFamilyAttached	Residential
SingleFamilyDetached	Residential
FullServiceRestaurant	Commercial
Hospital	Commercial
LargeHotel	Commercial
LargeOffice	Commercial
MediumOffice	Commercial
Outpatient	Commercial

Building Type	Commercial vs. Residential
PrimarySchool	Commercial
QuickServiceRestaurant	Commercial
RetailStandalone	Commercial
RetailStripmall	Commercial
SecondarySchool	Commercial
SmallHotel	Commercial
SmallOffice	Commercial
Warehouse	Commercial

Table 3: NREL ResStock and ComStock building types to profile sector mapping.

Appendix D. Adjusting NREL Profiles by Year

As described in Section 4.2, the NREL End-Use Load Profiles are used to develop hourly shapes for each sector and end-use relevant to our EE measure mix - but only for the year 2018. In GE MARS, however, the ISO uses load shapes from 2007 to 2023 for summer and from 2000 to 2023 for winter to capture a wide range of weather patterns during modeling.

Load shapes are largely driven by two primary mechanisms:

1. **Timing and calendar effects**: For example, time-of-day, day-of-week, holiday, and month-of-year impacts on electricity use arising from different human behavior patterns.

2. **Weather/temperature patterns**: For example, HVAC load increasing during hotter summer months.

Because the ISO assumes EE savings are directly correlated to load, the ISO must also align EE profile shapes with the load year in each simulation to more accurately capture these patterns. This requires extrapolating the one year of profile data the ISO has from NREL (2018), to all years from 2000 to 2023.

To do this, the ISO applied two regression formulations based on the mechanisms above:

1. **For non-weather-sensitive end-uses (Lighting (Res/Com), Motors/Drives (Com only), Process (Res/Com), and Refrigeration (Res/Com))**:
   For each sector, the ISO fit a regression of each end-use load using only fixed effects for month, hour, and day type (i.e., weekday vs. weekend/holiday), and all interactions of these three variables (576 regressors total).

2. **For weather-sensitive end-uses (HVAC (Res/Com), Custom (Res/Com), and Motors/Drives (Res only)):**
   For each sector, the ISO fit a regression for each end-use load using the same fixed effects for month, hour, day type, but also added dry bulb temperature. All interactions across these four variables were used (1,152 regressors total).

The modeling was based on a single year of hourly data associated with the 2018 weather/calendar year, which is less data than typical load modeling exercises. Having fewer data points did limit the number of variables that could be used (e.g., additional weather variables in the weather-sensitive modeling). For all end-uses, the ISO used mean absolute percent error (MAPE) to select the variables to include in the regression. The selected models described above exhibited the lowest MAPE after testing an array of model specifications. The final regressions for each EE end-use had a corresponding overall MAPE of 4.4% (3.0% for non-holiday weekdays only) for the aggregate EE profile based on Leave-One-Out Cross-Validation (LOOCV).

Figure E1 (a) and (b) below illustrate a comparison of the hourly modeled versus actual EE measure level profiles on a cold day (January 2, 2018) and hot day (August 29, 2018), respectively. The modeled load for the weather sensitive end-uses tend to show some deviation from the actual load during weather extremes.

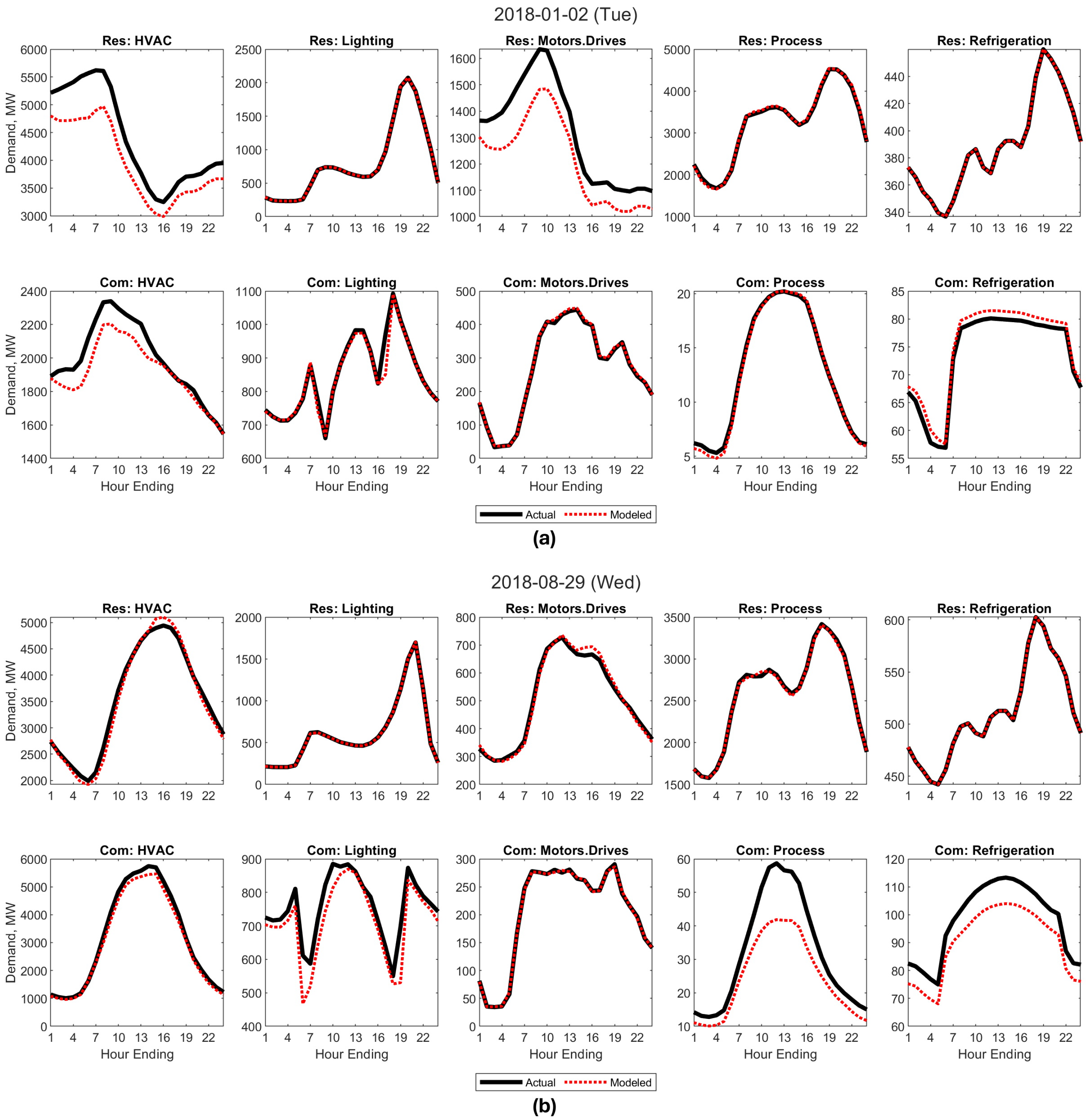

Figure E1: Modeled end-use profile as compared with the actual NREL profile data for 24 hours on (a) a cold day (January 2, 2018) and (b) a hot day (August 29, 2018).

Figure E2 below illustrates a comparison of modeled versus actual normalized, capacity-weighted residential EE, commercial EE, and total EE profiles for all hours during non-holiday weekdays. For ease of reference, the red lines in each plot reflect the line at which model outputs would perfectly match the actual outputs.

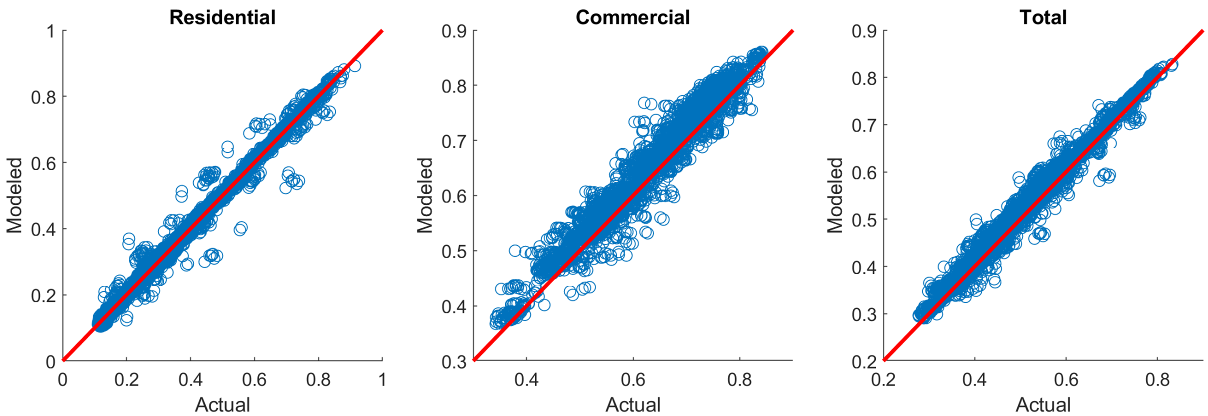

Figure E2: Modeled versus actual results for EE sector types.

Appendix E. Comparison of PDR Accreditation under CAR to RCA

The proposed accreditation approach builds on the accreditation approach that was proposed under Resource Capacity Accreditation (RCA) and presented to stakeholders at the Reliability Committee in January 2024.[24] Several key elements from the RCA proposal have been retained in the CAR proposal, including the use of hourly profiles to capture hourly PDR demand reductions throughout the year and including PDR contributions within the net load.

Key improvements in the CAR proposal include:

1. **Better reflects the marginal reliability contributions of each type of PDR.** Unlike RCA, which modeled all PDRs as EE resources, the proposed accreditation methodology creates separate profiles for each DG technology type (e.g., PV) and EE end-use (e.g., lighting and HVAC). These profiles will better represent the varied performance patterns of each type of PDR and will consequently provide insight into which PDR end-uses/technologies provide the greatest reliability to the region.

2. **Allows for alignment when using multiple weather/load years in modeling.** Performance of assets/measures with technologies like HVAC or PV are dependent on weather conditions. Using one static EE reconstitution profile did not account for changing performance during years with different weather conditions.

3. **Eliminates the need for reconstitution or explicit PDR accounting in the RAA runs.** Shifting to a fully proxy resource framework simplifies MARS modeling and ensures ICR is not impacted.

4. **Enhances transparency of profiling and accreditation.** Using actual performance data (DG) and publicly available profiles (EE) provides participants with greater visibility into profile construction as compared to RCA's reconstitution profiles.

[24] https://www.iso-ne.com/static-assets/documents/100007/a02_a_rca_raa_adcrs_colocated_ders.pdf

Appendix F. Applying Transmission & Distribution Loss Factor

This appendix outlines how average avoided peak transmission and distribution (T&D) losses are applied when accrediting PDRs. The profiles developed following the steps outlined in Section 3 are used to determine the sector/end-use or technology rMRI. Then, the rMRI values are multiplied by the resource specific MCap to yield MRI Capacity.[25] For PDRs, MCap will then be adjusted upward for this process to account for average avoided peak distribution and transmission losses (8%) in the capacity market. This adjustment reflects the benefit to the system of the avoided losses associated with not needing to transmit power over the transmission and distribution network to serve load. These adjustments are only applicable to demand reduction and thus to all PDRs.

[25] See material from October 2025 Markets Committee for more detail on MCap and MRIC.