Market Redefinition: Demand Response and Emergency Resources Reforms

Resource Adequacy Subcommittee

RASC-2019-9

February 26, 2025

Purpose & Key Takeaways

Purpose:

Present the final design for Demand Response and Emergency Resources Reforms

Key Takeaways:

- MISO has made two changes to the accreditation design
  - Thermal BTMG may select to participate as an Emergency BTMG or Non-Emergency BTMG
  - A cap will be placed on accreditation based on the availability of an Emergency resource
- MISO will make a separate filing regarding Market Participant testing changes, M&V definitions, and penalties to be effective for the 2026-2027 Planning Year
- MISO is targeting to integrate Load Modifying Resources in the Market systems to be individually committed like other resources

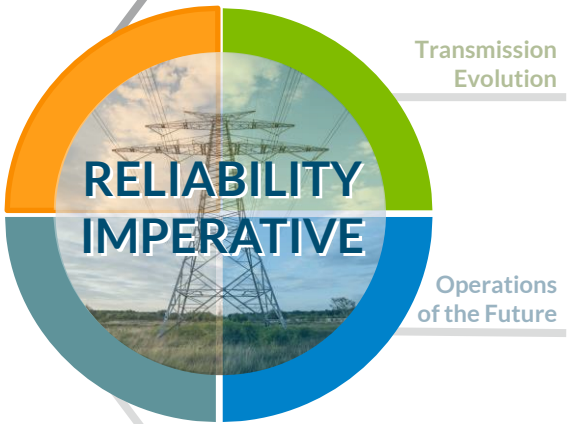
Overview

MISO is currently working on filings to address issues and challenges related to demand side resources in both near-term and long-term

Topic/Effort	Key Objectives of FERC Filing	Anticipated Filing Date	Anticipated Effective Date
Eliminating Gaps and enhancing market rules to address market manipulation			
Demand Response Participation Rules Enhancements	• Address issues identified by FERC Office of Enforcement and IMM with respect to Demand Response Resources (DRRs) and Load Modifying Resources (LMRs) currently participating in MISO's Markets	Feb 28, 2025	April/May 30, 2025
Eliminate dual registration Emergency Demand Response (EDR)	• Eliminate dual registration for EDRs as a LMR and/or DRR to align the incentive signals sent by the participation options	Apr 1, 2025	June 1, 2025
Improve Operational Effectiveness, Verify Performance, Align Accreditation of All MISO Resources Based on Times of Highest Reliability Risk & Need			
Demand Response and Emergency Resources Reforms (formerly known as LMR Reforms)	• Improve availability, operational effectiveness, and accreditation of demand response and emergency only resources to allow earlier access during emergency conditions based on notification times • Key elements: i) Participation Options, ii) Measurement & Verification Baseline methodology, iii) Accreditation, iv) Real-time availability, v) MISO Initiated Testing	Mar 20, 2025	September 1, 2027
LMR Participation Rules Enhancements	• Clarify when and how MPs can replace LMRs during a Planning Year after clearing in the PRA • Update testing provisions to remove mock test and other criteria for self test by MP • Update non-performance penalties* • Other LMR focused changes as needed	Q2 2025	TBD for PY2026-27

* Penalty changes are those that have been discussed as part of the DRERR effort to date and will be excluded from further discussion in the DRERR effort. A final design regarding penalties has not been determined and stakeholders will have time to provide additional feedback on these changes as part of this LMR Participation Rules Enhancements effort.

The increasing risk and complexity MISO faces require significant transformational changes to our grid, markets, operations and technology



Transmission Evolution

Operations of the Future

System Enhancements

Market Redefinition

- Uncertainty & Variability
- Resource Models & Capabilities
- Location
- Coordination

Modernize the Resource Adequacy Construct

Accreditation of resources that reflects resource availability during times of highest need and matches value delivered

Emergency Only and Load Modifying Resources

Crucial for maintaining grid stability during emergencies

The current Demand Response and Emergency Resources framework needs to be updated to manage grid emergencies and integrating renewable energy sources effectively

KEY CHALLENGES AND DRIVERS

Lack of Speed & Reliability

- LMRs require 6 hours notification, AME Resources may have longer response times
- Can clear the Planning Resource Auction without making themselves available
- Real-time availability data indicates far less capacity (~6-7 GW of 9.5 GW participating) than the Planning Resource Auction's cleared quantity (12 GW)

Accreditation Doesn't Reflect Performance Levels

- Accreditation is currently 100% for Demand Resources, regardless of whether actual reliability needs are during the peak conditions or whether the resource ever consumed 100% of its capacity rating
- Accreditation for Emergency Resources does not account for response time or ability to respond during Emergencies

Demand Will Increase Due to Evolving Risk

- Intermittent resources, changing weather patterns and growing electrification drive uncertainty and complexity
- Will be relied on more in the future

DRR: Demand Response Resource; BTMG: Behind-the-Meter Generation

Proposed changes will improve operational effectiveness, appropriately verify performance, and accredit resources based on availability when reliability is crucial

Demand Response

Demand Response encompasses Emergency and non-Emergency resources that can reduce Demand on the Bulk Electric System by reducing energy consumption and turning on Behind-the-Meter Generation

Improve Operational Effectiveness

- Split into LMR Type I (6 hours) and Type II (30 minutes), reserving Type II for higher steps in emergency procedures
- Standardize registration
- Eliminate dual registration as LMR/DRR/EDR**

Verify & Measure Performance

- Introduce new testing requirements*
- LMR Type 1 & DRR: at least 1 test/3 years
- LMR Type 2: 1 test/year (opt out available)
- Improved enforcement of penalty structure for testing and real-time availability*

Accredit Demand Response Based on Availability

- Captures the actual availability of resources during times when reliability is crucial
- Performance-based to ensure resources can reliably respond during critical periods
- Seasonal assessments adjust accreditation based on performance across different times of year

DRR: Demand Response Resource; BTMG: Behind-the-Meter Generation
*These changes are being filed separately for an earlier implementation date
**Removing EDR dual-registration is being filed in a separate effort for an earlier implementation date

Proposed changes will improve operational effectiveness, appropriately verify performance, and accredit resources based on availability when reliability is crucial (contd.)

AME Resources

Emergency Resources are Generation and DRR Resources that have submitted a Commitment Status of Emergency, thus qualifying as Available Max Emergency (AME) Resources

Improve Operational Effectiveness

- AME Resources currently may have response times longer than 6 hours
- Proposed changes incentivize rapid performance enabling these resources to be used during Emergencies

Background FERC Filing

- MISO filed AME Resource participation changes in 2023
- Market Participants indicated a desire to revise accreditation for AME Resources during this filing

Accredit AME Resources

- Incentivizes fast response for AME Resources to improve Emergency operation
- Accreditation accounts for Hours these Resources are usable
- Ensures Resources accredited consistently and transparently

Accurate availability, accreditation and operational effectiveness are the three major focus areas

	CURRENT STATE	FUTURE STATE OF LMRs

Availability	• A single resource may submit real-time availability in one of three different locations when dual-registered
	  ◦ MUI, DSRI, EDR
	• Availability and accreditation are independent – no incentive to provide accurate availability data
		• A resource may submit offers in only one location
		  ◦ MUI
		• Inaccurate availability information will negatively impact accreditation

Accreditation	• Season peak-hour-based accreditation may not reflect risky hours • Different methodologies depending on resource type and participation option chosen	• Emergency resources are accredited based on historic capabilities and offers during Capacity At Risk Hours and RA Hours determine accredited values • Non-Emergency resources are accredited like Schedule 53A resources
Operational Effectiveness	• Deployment only during EEA 2 events, greater uncertainty of coming conditions, and long lead times for resources result in difficulty using LMRs effectively during tight system conditions	• Moving LMR–Type I resources to be deployed during the Maximum Generation Warning stage ensures all LMRs are capable of being used as emergencies unfold • Having fast-acting LMR – Type II resources ensures these types of Load Modifying Resources are available during all EEA 2 events • These changes result in greater certainty and improved reliability during all stages of an emergency

MISO targets to include LMRs in the Real-time commitment process and evaluating options to integrate LMRs in the Market Systems

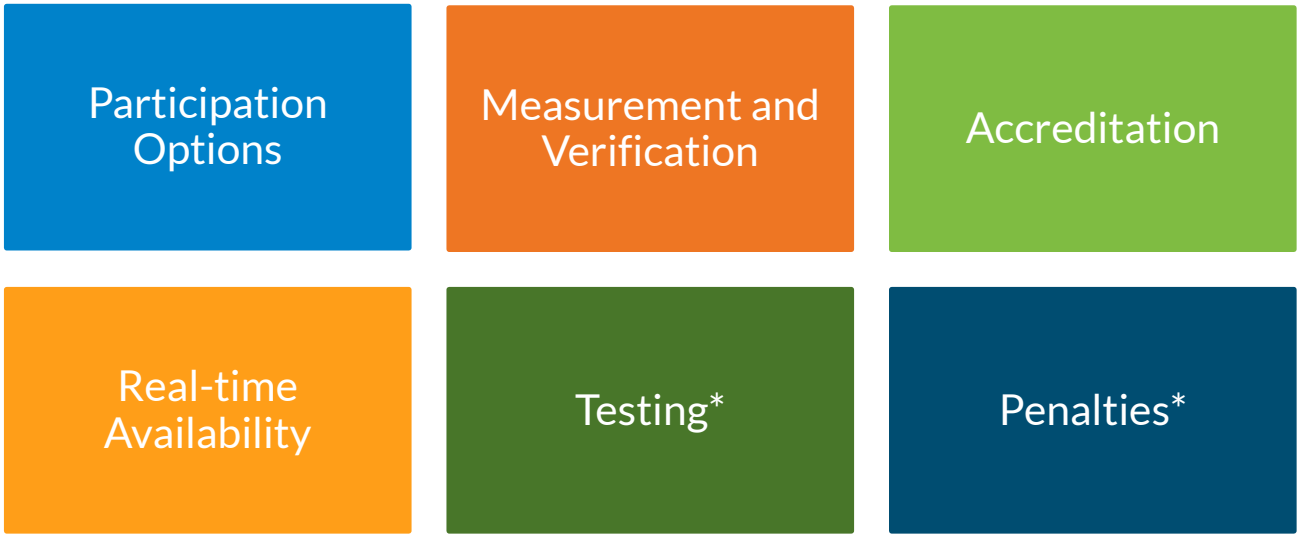
Current State

- Market Participants submit availability information into the DSRI
- Messages are sent out via the Market Communication System
- When LMRs are deployed, Market Participants and LBAs are informed of how many MWs are require
- MPs choose which resources provide the demand reduction

Future State

- Market Participants submit availability information into the Market Systems
- Deployment instructions are made by MISO at a resource level
- Targeted use of LMRs
- Reduction in operator workload during Emergencies
- Efficiently manages the system by integrating LMR deployment with other resources

The Demand Response and Emergency Resource Reforms Effort Contains 6 Primary Elements



*Penalties and non-MISO-Initiated testing changes will be filed separately as indicated on Slide # 4.

Summary of Changes to the Design Presented in January

1. **Keeping DRR – Type II as a Capacity Resource**
    - Accreditation will use a 3-year look back using the same weighting of Non Seasonal RA Hours (i.e. Tier 1 Hours) and Seasonal RA Hours (i.e. Tier 2 Hours) as Schedule 53A Resources
2. **Capability has been simplified**
    - Lead time no longer receives additional zeros and no additional zeros for lack of availability
    - Seasonal Capability only applies to Firm Service Level Demand Resources and only during Capacity At Risk Hours
3. **Added a cap to accreditation of DRR – Type I, LMR – Type I, and LMR – Type II resources**
4. **Self Schedule during Capacity At Risk Hours have the following two adjustments**
    - Must Self Schedule to the registered amount or Firm Service Level
    - All Self Schedules permitted that if the Self Schedule is to the registered amount or Firm Service Level
5. **All Non-Intermittent BTMG may select to be Emergency or Non-Emergency**
    - Emergency accreditation remains the same
    - Non-Emergency is the same category that was previously called Intermittent BTMG and is how Intermittent BTMG will participate
    - Non-Emergency accreditation will use 3-year look back using the same weighting of Seasonal Non RA Hours and Seasonal RA Hours as Schedule 53A Resources

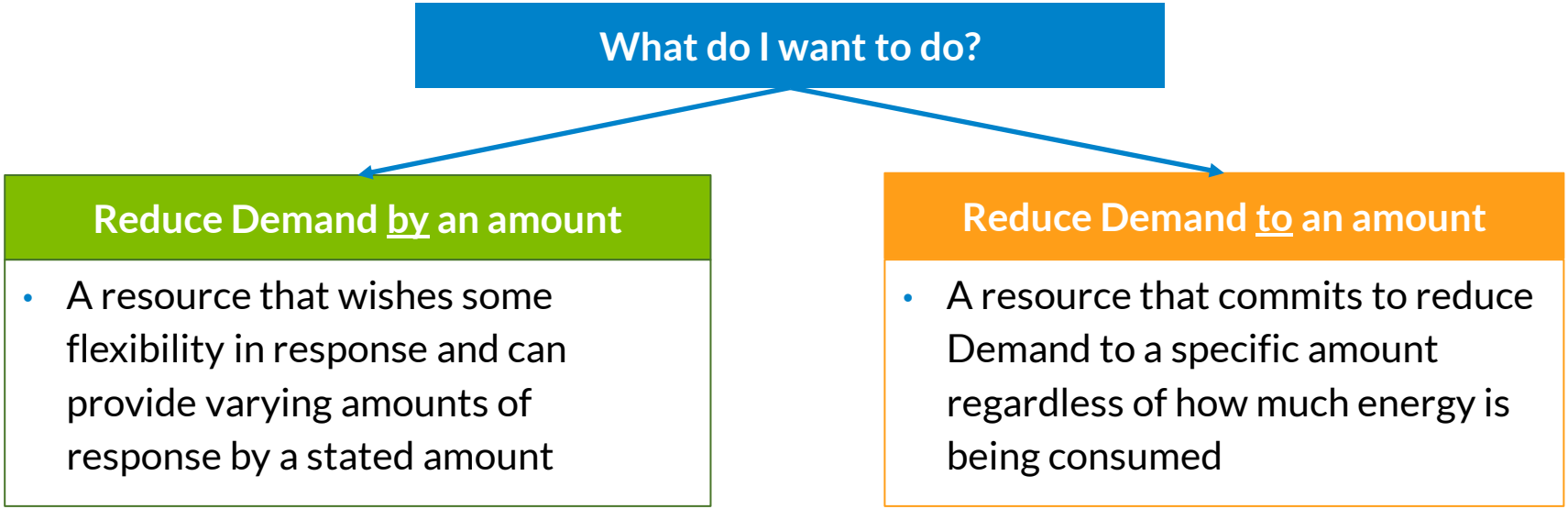
MISO has Incorporated Stakeholder Feedback In the Revised Tariff

- Adopted some stakeholder suggestions regarding definitions and naming conventions
- Added verbiage regarding how resources will be committed based on lead-time
- Inclusion of a Non-Emergency BTMG participation option
- ZRCs may be replaced by a broader set of resource types
- Reordered sections to ease readability and placed all M&V into Attachment TT

Demand Resources

Determining Measurement and Verification Methodology

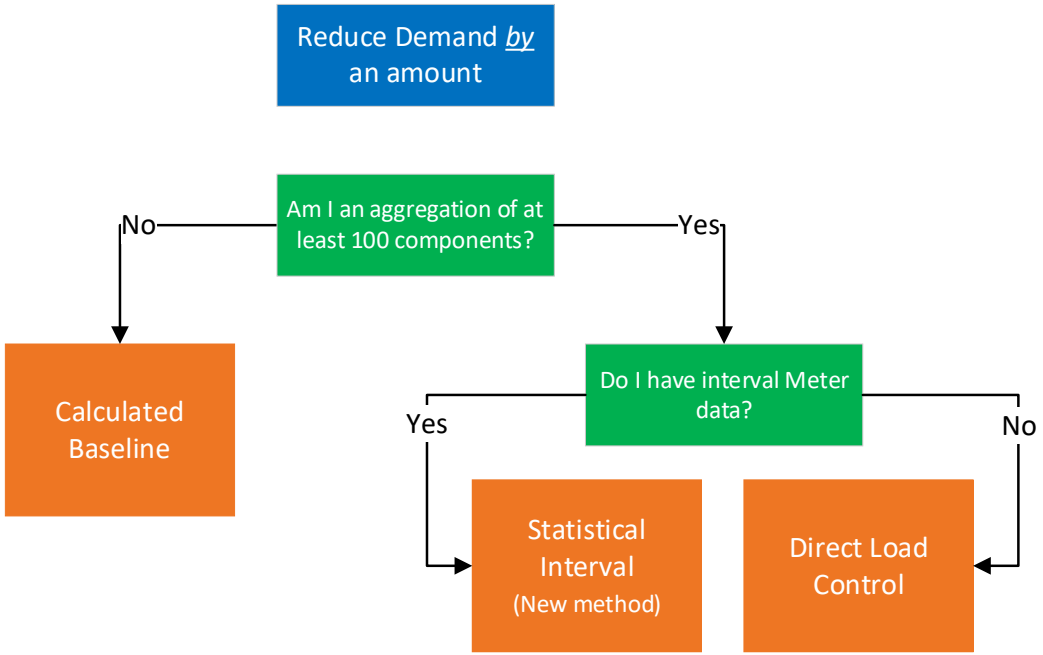
- The first question a resource that controls Load needs to answer is…



Resource That Commits to **Reduce Demand By an Amount**

- Resources that reduce demand by an amount may use one of three Attachment TT defined baselines:

1. **Calculated** – Compares what you did do to what you would have done
2. **Statistical Interval** – Large aggregation with interval meter data, statistical approach to the Calculated Baseline
3. **Direct Load Control** – Most household programs, load reduction is estimated



An MP may always use the Calculated Baseline methodology; however, each component must provide meter data regardless of how many components are in the program.

Participation Options Available to Resources that Reduce Demand By An Amount

DRR – Type I	DRR – Type II	LMR – Type I	LMR – Type II
• Economic deployment • Supply fixed quantity of Energy • May provide contingency services • 6-hour response • Unavailability results in reduced accreditation • 1-year lookback • MISO-initiated test 1x/3yr	• Economic deployment • Supply a range of Energy • May provide ancillary services • Calculated Baseline only • 3-year lookback • Day-Ahead "must offer" • MISO-initiated tests 1x/3yr	• Max Gen Warning deployment • Supply a fixed quantity of Energy • Response time-based deployment • 6-hour response • Unavailability results in reduced accreditation • MISO-initiated test 1x/3year	• EEA 2 deployment • 30-minute response • Must be available for all events • MISO-initiated test 1x/yr • Test opt-out with higher penalties – 1x/3yr

Selecting the Right Participation Option

DRR – Type I	DRR – Type II	LMR – Type I	LMR – Type II
• You desire Energy payments • You want an Emergency only obligation • This effectuates the current DRR – LMR dual-registration design • You wish to provide contingency services	• You desire Energy payments • You meet FERC Reliability Standards • You are capable of a range of response • You wish to provide Regulation (requires ICCP)	• You want to be deployed during Emergencies only • You require more time to respond • You wish to have flexibility in how often you are deployed	• You only want to be deployed as a last resort • You can respond rapidly • You can respond to all events

Deployment Ordering Visualization

- Deployed in Economic merit order
- May require up to 6-hours to deploy*

- Deployed beginning at the Max Gen Warning stage
- Deployed by lead-time and locational requirements
- May require up to 6-hours to deploy

- Deployed beginning at the EEA 2 stage
- Must be deployable within 30-minutes

* DRR that elect not to participate in the Capacity Market have no restriction on deployment time

Determining the Capacity Value of the Resource

- A primary objective of this effort is to ensure an accreditation value of Demand Resources that reflects availability and capability of these resources during times of highest need
  - Hours of highest need are **Capacity At Risk Hours** and **Resource Adequacy Hours** that do not overlap with a **Capacity At Risk Hour**

- **Capability** is the measure of how much a resource can reduce Demand in each hour

- Each Measurement and Verification type has a specific **Capability** associated with it
  - Specifics can be found in Schedule 53B and are summarized in the appendix

Accrediting Demand Resources

- What could the resource have provided if it was deployed?
  - Each Season will average the Capability across two sets of hours using a one-year lookback, the Intermediate Seasonal Accredited Capacity:
    - All Capacity At Risk Hours
      - Hours that are experiencing Emergencies or near Emergency conditions
    - Seasonal Resource Adequacy Hours that occur outside of a Capacity At Risk Hour
      - Same Seasonal RA Hours used in Schedule 53A

- Was the resource available to be deployed?
  - The ISAC is compared to the proportion of **Events** the resource was available for to the total number of **Events** that occurred

- The minimum of these two values is grossed-up by line losses and the PRM to determine the final Seasonal Accredited Capacity for these resources

Changes to the design indicated in blue. **Event** is a Schedule 53B defined term.

Events and Availability*

- Mismatches between the accredited value of a resource and how often it made itself available
- To address this concern, MISO is introducing a cap on accreditation based on availability during "**Events**"
- An Event is defined as follows:
  - Each LMR deployment is an **Event**
  - When there is no LMR deployment, a set of Capacity At Risk Hours during which Seasonal RA Hours occur
- A resource is deemed available if it is available during all Seasonal RA Hours that occur during the event
  - If a resource is available for all events, it will always use the ISAC to determine the final SAC value

This slide is new material to the design

Events Visualized

One Event

					RA			RA			Capacity At Risk Hours				
Time	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Capacity Rating															
Metered Demand															
Capacity Availability															
Final Capability															

Resource needs to be available during all RA Hours

One Event

One Event

One Event

	LMR Deployment			RA									LMR Deployment			RA													LMR Deployment		
	Capacity At Risk Hours																														
Time	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	Overnight Hours	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Capacity Rating																															
Metered Demand																															
Capacity Availability																															
Capability																															

Lack of availability during these hours will lower ISAC but not availability cap

Resource Adequacy Hours in green, Capacity At Risk Hours in Orange

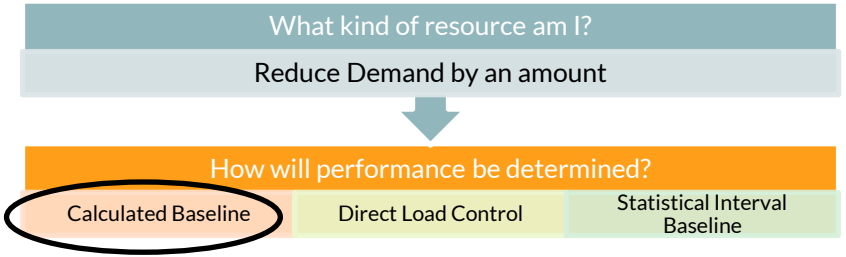
Example of a Small Data Center

Example Small Data Center – Selecting M&V

- Small data center is wishing to participate in the MISO Markets

- This asset is willing to provide load reduction by curtailing its load by 50 MW ("Capacity Rating") and can respond within 20 minutes

- Because this asset is a single resource wishing to have the flexibility to reduce demand by set values based on what's occurring, it will register using the Calculated Baseline Measurement and Verification methodology

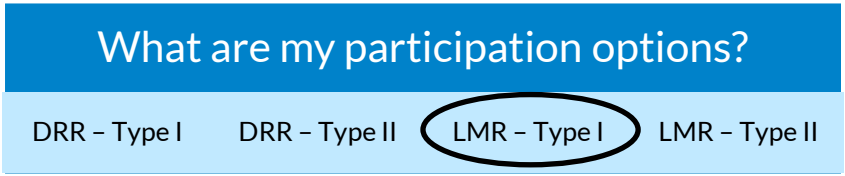


Example Small Data Center – Selecting Participation Options

- After evaluating the options, the data center decides they don't want to be interrupted unless its really needed

- But it needs to have some flexibility in response because there may be times the data center cannot be deployed because it is being used in an uninterruptable way
  - It recognizes there may be a substantial accreditation penalty if it is unavailable, but the economics of the plant cannot permit the resource to always respond when deployed

- After looking at the options, it decides the LMR – Type I participation option is the best fit balancing infrequency of deployment with flexibility in response
  - Even though this plant only needs 20 minutes to respond, it sets its response time to 1 hour



Accreditation of an Example Small Data Center – Part I

- Calculated Baseline M&V
  - Capability is the minimum of:
    - Capacity Availability;
    - Metered Demand; or
    - Capacity Rating
- In this example, the resource has 100% availability, and the Capability is always equal to its Capacity Rating

					RA			RA			Capacity At Risk Hours				
Time	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Capacity Rating	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
Metered Demand	125.1	125.0	125.6	125.7	124.9	125.4	124.9	125.2	125.4	124.8	124.7	124.7	124.2	124.8	125.2
Capacity Availability	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
Final Capability	-	-	-	-	50	-	-	50	-	-	50	50	50	50	50

- One Event
- The resource was available during all 3 Resource Adequacy Hours
  - Fully available for the Event

Assuming this reflects the remainder of the Season, this resource would receive 50 MW of Intermediate Seasonal Accredited Capacity that would be grossed-up by line losses and the PRM

RA Hours in Green - Capacity At Risk Hours in Orange

Accreditation of the Example Small Data Center – Part II

- Calculated Baseline M&V
  - Capability is the minimum of:
    - Capacity Availability;
    - Metered Demand; or
    - Capacity Rating
- In this example, the resource has several hours of zero availability

					RA			RA			Capacity At Risk Hours				
Time	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Capacity Rating	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
Metered Demand	125.1	125.0	125.6	125.7	124.9	125.4	124.9	125.2	125.4	124.8	124.7	124.7	124.2	124.8	125.2
Capacity Availability	50	50	50	50	50	50	50	50	0	0	0	0	50	50	50
Final Capability	-	-	-	-	50	-	-	50	-	-	0	0	50	50	50

- One Event with Resource Adequacy Hours
- The resource was not available for all 3 Resource Adequacy Hours
  - Not available for the Event

Because this was the only Event during the Season, the resource receives 0 accreditation
Had there been a second Event during the Season and the resource was available during that Event, the resource may have received 50% accreditation

RA Hours in Green - Capacity At Risk Hours in Orange

Accreditation of the Example Small Data Center – Part III

						RA Hours																RA Hours									
	Capacity At Risk Hours																														
Time	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	Overnight Hours	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Capacity Rating	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
Metered Demand	125.1	125.0	125.6	125.7	124.9	124.9	125.4	124.9	125.2	125.4	124.8	124.7	124.7	124.8	125.2	Varies around 125	125.1	125.0	125.6	125.7	124.9	124.9	125.4	124.9	125.2	125.4	124.8	124.7	124.7	124.8	125.2
Capacity Availability	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	0	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
Capability	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	0	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50

- In this example, an Event lasts from 0800 on Day 1 through 2200 on Day 2
- No LMR deployment occurs and there is at least one Seasonal RA Hour

  This counts as a single Event

- The resource is available for all Seasonal RA Hour during the Event
  - Receives credit for being available for one event
- Being unavailable for any hour outside of the Seasonal RA Hours within the Event does not make the resource unavailable
- If the resource became unavailable for even 1 hour that was a Seasonal RA Hour during this Event, it would be considered unavailable for the entire Event

Accreditation of the Example Small Data Center – Part IV

	LMR Deployment			RA									LMR Deployment			RA												LMR Deployment		
																Capacity At Risk Hours														
Time	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	Overnight Hours	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Capacity Rating	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
Metered Demand	125.1	125.0	125.6	125.7	124.9	124.9	125.4	124.9	125.2	125.4	124.8	124.7	124.7	124.8	125.2	Varies around 125	125.1	125.0	125.6	125.7	124.9	124.9	125.4	124.9	125.2	125.4	124.8	124.7	124.7	124.8	125.2
Capacity Availability	50	50	50	50	0	0	0	0	0	0	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	0	0	0	50	50
Capability	50	50	50	50	0	0	0	0	0	0	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	0	0	0	50	50

- This is the same example as in Part III, except now 3 LMR deployments have occurred
- Instead of being one event, this is now 3 Events and only availability during the LMR deployment is considered
- The resource made itself available for the entirety of the first event, second event, but was unavailable for the first hour of the third event
  - It therefore will see its accreditation capped at $\frac{2}{3} * 50 = 33.3\ MW$ assuming there are no other events during this Season
- Capability is still calculated across all Capacity At Risk Hours and Seasonal RA Hours not occurring during a Capacity At Risk Hour
  - The Capability calculation from this event results in accreditation equal to $\frac{30}{38} * 50 = 39.5\ MWs$
- The minimum of 39.5 MW (ISAC) and 33.3 MW (Available for 2 out of 3 events, 50 MW Capacity Rating) is used to accredit this resource
- Final accreditation of 33.3 MW grossed-up for PRM and line losses

MISO-initiated Testing of Controllable Load

- Why?
  - LMRs may go years between deployments
- How Often?
  - Upon initial registration in the PRA
  - A deployment counts as a MISO-initiated test
  - A DRR/LMR – Type I resource will be tested once per three years
  - An LMR – Type II will be tested yearly
    - These resources may opt-out and receive higher penalties for failures to perform to be tested once per three years
  - A Demand Resource using a Direct Load Control or Statistical Interval Baseline will be tested yearly
- What is being tested?
  - A test is a type of deployment, subject to the same rules and obligations of an actual deployment
  - MISO will verify the resource can respond within its registered time, that it can hold the response for the full four hours required, and that the resource can achieve its stated Capacity Availability (not Capacity Rating) or Firm Service Level
- What notice will a resource receive?
  - MISO will provide at least 24 hours notice before the test, a resource may opt out of the test once

Behind the Meter Generation

To Be or Not To Be, Emergency

- Market Participants with behind the meter generation need to select whether they are Emergency or Non-Emergency resources
  - Behind the Meter Generation (BTMG) definition remains unchanged
    - Has obligation to be available during Emergencies
  - Non-Emergency BTMG definition added in Module A
    - This is a type of LMR separate from LMR – Type I and LMR – Type II; defined in Module E 69A.3.7
- Choice is locked in for three years
  - Non-Emergency BTMG may switch to DRR – Type II or DEAR without waiting
- Intermittent BTMG must always be Non-Emergency BTMG

Non-Emergency Behind The Meter Generation

- Any behind the meter generation resource may opt to participate as a Non-Emergency BTMG
  - This removes the Emergency obligation
- Accreditation is like Schedule 53A Resources, without outage exemptions
  - 3-year look back, Non Seasonal RA Hours and Seasonal RA Hours, weighted at 20% and 80% respectively
- No outage exemptions are provided because these resources do not participate in outage coordination
- Metered Energy will be used – if the resource is not operating for any reason, it receives 0 for that hour
  - These resources do not submit Offers
- Selecting this option locks a resource in for three years
  - Accreditation of a DRR – Type II or DEAR will be done identically as this participation option, so these resources may select to be a DRR – Type II or DEAR at any time

This is identical to the Intermittent BTMG participation option previously presented.

Accreditation of Non-Emergency BTMG

- $ISAC = 20\%\ Tier\ 1\ Hours\ Metered\ Energy + 80\%$ Tier 2 Hours Metered Energy
- Three-year lookback
- $SAC = (Resource\ Class{-}level\ UCAP * \frac{Resource\ ISAC}{Resource\ Class{-}level\ ISAC})$
- Resource Class-level values use the same class-level values as Schedule 53A Resources
- BTMG may be grossed-up for line losses

Behind the Meter Generation

- Obligation to respond during Emergencies
  - Participate as DRR – Type I, LMR – Type I, or LMR – Type II
- One-year lookback
  - Capacity At Risk Hours and Resource Adequacy Hours
  - This simultaneously incentives availability and avoids overly penalizing a resource
- Capability is the amount of MWs submitted as available by the MP or the amount Self Scheduled
- Resources will be assigned a resource class (from Schedule 53A), no outage exemptions

Behind the Meter Generation is Tariff defined currently, and will remain, an Emergency only option.

Accreditation of BTMG

- *ISAC* = *Average Capability*, augmented by the Emergency Deficiency Hour calculation described previously

pre-grossed-up SAC value

- $SAC = min(Resource\ Class{-}level\ UCAP * \frac{Resource\ ISAC}{Resource\ Class{-}level\ ISAC}, availability\ cap)$

- BTMG will be grossed-up for line losses

Accreditation of an Emergency BTMG – Part I

- BTMG resource
  - Capability is the sum of:
    - Metered Energy
    - Capacity Availability;
    - Capped at GVTC
- In this example, the resource has 100% availability and output during all Capacity At Risk Hours and Resource Adequacy Hours

					RA			RA			Capacity At Risk Hours				
Time	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
ICAP	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Metered Energy	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0	5.0	5.0	6.0	4.0	7.0
Capacity Availability	10	10	10	10	10	10	10	10	10	7	5	5	4	6	3
Final Capability	-	-	-	-	10	-	-	10	-	-	10	10	10	10	10

- One Event
- The resource was available during all 3 Resource Adequacy Hours
  - Fully available for the Event

Assuming this reflects the remainder of the Season, this resource would receive 10 MW of Seasonal Accredited Capacity that would be grossed-up by line losses

RA Hours in Green - Capacity At Risk Hours in Orange

Accreditation of an Emergency BTMG – Part II

- BTMG resource
  - Capability is the sum of:
    - Metered Energy
    - Capacity Availability;
    - Capped at GVTC

- In this example, the resource has experienced an outage (or is otherwise not available) during a day during which an Event occurs

					RA			RA			Capacity At Risk Hours				
Time	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
ICAP	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Metered Energy	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Capacity Availability	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Final Capability	-	-	-	-	0	-	-	0	-	-	0	0	0	0	0

- One Event

- The resource was unavailable for any of the three Resource Adequacy Hours
  - Not available for the event

If this was the only Event during the Season, the resource would receive final accreditation equal to 0 MWs
Emergency resources must be available to deploy during Events to receive accreditation

RA Hours in Green - Capacity At Risk Hours in Orange

Accreditation of an Emergency BTMG – Part III

						RA Hours																RA Hours									
						Capacity At Risk Hours																									
Time	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	Overnight Hours	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
ICAP	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Metered Energy	0	0	0	0	0	7.3	6.7	7.2	6.8	6.7	7.2	7.9	6.1	7.0	7.7	0	0	0	0	0	0	7.9	7.9	7.2	5.8	7.9	8.0	6.0	8.8	6.7	0
Capacity Availability	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Capability	0	0	0	0	0	7.3	6.7	7.2	6.8	6.7	7.2	7.9	6.1	7.0	7.7	0	0	0	0	0	0	7.9	7.9	7.2	5.8	7.9	8.0	6.0	8.8	6.7	0

- In this example, an Event lasts from 0800 on Day 1 through 2200 on Day 2
- No LMR deployment occurs; at least one Seasonal RA Hour, this counts as one Event
- The resource was not available or operating, but when the Emergency was declared the BTMG ensured it could operate by starting up and operating for the entire declared Emergency
- Even though the BTMG was unavailable for additional MW and producing at less than its Registered ICAP, it receives credit for what it was producing
- The resource counts as being available for the Event
- The ISAC is calculated as $19 * 0 + 7.2 * 19^{*} = 3.6\ MW$ this value is multiplied by the appropriate Resource Class-level values to arrive at the pre-grossed-up SAC

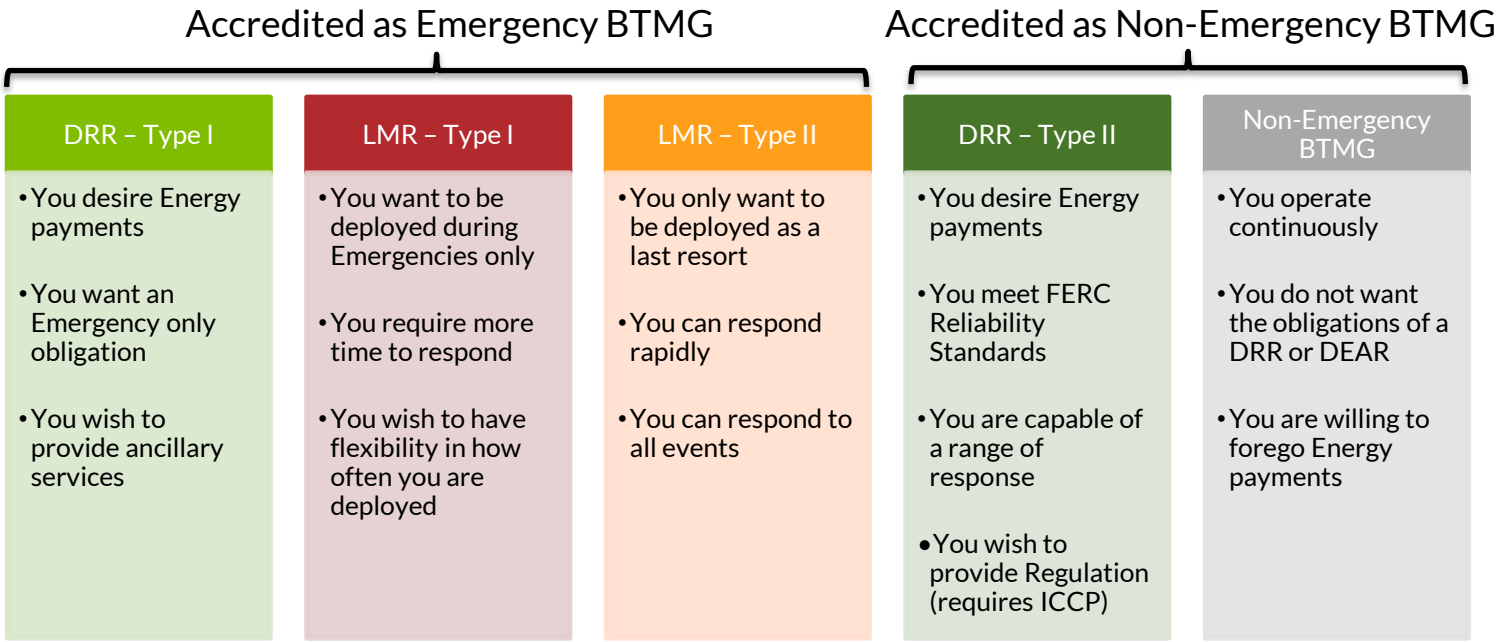
The average over the 19 hours it is operating is 7.2 per hour.

Accreditation of an Emergency BTMG – Part IV

	LMR Deployment			RA									LMR Deployment			RA												LMR Deployment		
																Capacity At Risk Hours														
Time	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	Overnight Hours	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
ICAP	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Metered Energy	0.0	0.0	0.0	0.0	0.0	7.3	6.7	7.2	6.8	6.7	7.2	7.9	6.1	7.0	7.7	0.0	0.0	0.0	0.0	0.0	0.0	7.9	7.9	7.2	5.8	7.9	8.0	6.0	8.8	6.7	7.8
Capacity Availability	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Capability	0	0	0	0	0	7.3	6.7	7.2	6.8	6.7	7.2	7.9	6.1	7.0	7.7	0	0	0	0	0	0	7.9	7.9	7.2	5.8	7.9	8.0	6.0	8.8	6.7	7.8

- This is the same example as in Part III, except now 3 LMR deployments have occurred
- Instead of being one Event, this is now 3 Events and only availability during the LMR deployment is considered
- The resource was unavailable for the first Event, and operating for the other two Events
- The resource has a pre-grossed-up SAC for this event calculated as 3.8 MW
- The resource was available for 2 out of 3 Events, which multiplied by the ICAP is 6.67 MW
- The pre-grossed-up SAC is lower, so the resource receives the pre-grossed-up value of 3.8 MW that will be grossed-up by line losses

Selecting the Right Participation Option



Testing and Penalties

This material will be filed separately later this year

Self Test

- Attachment TT contains the proposed self testing language
  - Must test in each Season unless documentation shows no significant change in operating characteristics to provide demand relief
  - If only testing annually, the test must correspond to the Season with the highest Registered Capability
- Resources must provide a real power test to the registered value
  - Three exemptions for this:
    - Increase in size, no larger than 10%
    - Adjustment for Coincident Peak, no more than 20%
    - Firm Service Level must test to at least 80% of their Seasonal peak Demand during the Season tested
- No opt out permitted
  - A deferral may be submitted, but a real power test must be completed by the last day of the Season prior to participating
  - Lack of a real power test will result in significant penalties
- Self tests look like normal deployments
  - The resource will only be required to reduce demand for 1 hour

Penalties

- Module E, 69A.3.9 contain penalties
- Complete failure defined as achieving less than 25% reduction or providing less than 25% of the total Energy
  - Three penalties for a complete failure
    - Real Time LMP
    - ACP for the entire Season clawed back, if a resource successfully responds the charge will stop
    - Resources suffering a complete failure two times in a Season will be disqualified for the remainder of the Planning Year and charged daily CONE + ACP for the remainder of the Planning Year
- Partial Failure penalties remain unchanged
- A resource that was unavailable for all events in a Season will receive 0 accreditation for the next Planning Year, per the accreditation rules, and be charged the ACP for the entire Season for the current Planning Year

Stakeholder Feedback Request

- MISO is requesting feedback about the final design regarding the following:
  - Cap on accreditation based on availability
  - Non-Emergency BTMG participation option

- Feedback is due March 12, 2025

- MISO Dashboard ID#: *RASC-2019-9*
- Feedback requests and responses are managed through the Feedback Tool on the MISO website: misoenergy.org/stakeholder-engagement/stakeholder-feedback/

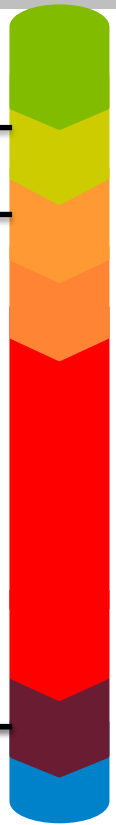
Christopher Delk
cdelk@misoenergy.org

Joshua Schabla
jschabla@misoenergy.org

Neil Shah
nshah@misoenergy.org

Appendix

MARKET CAPACITY EMERGENCY PROCEDURE STEPS



CAPACITY AT RISK HOURS

MAXIMUM GENERATION

Normal Operations		Normal Pricing
Capacity Advisory	Advance notice of forecasted capacity shortage, requests Stakeholders update offer data	
Alert	Define boundaries/suspend maintenance	Emergency Pricing Tier 0
Warning	Schedule in external resources, curtail export transactions, activate reconfiguration, implement Load Modifying Resources (LMRs) Type – I resources, Commit Emergency Resources	Emergency Pricing Tier I Offer Floor
Event Step 1	~~Commit emergency resources~~, declare NERC (Energy Emergency Alert) EEA 1, activate emergency limits	
Event Step 2	Declare NERC EEA 2, implement LMR – Type II, Load Management Measures (LMMs) Stage 1, commit Emergency Demand Response (EDR) resources, emergency energy purchases, public appeals	Emergency Pricing Tier II Offer Floor
Event Step 3	Utilize operating reserves and LMM Stage 2	
Event Step 4	Reserve call and emergency reserve purchases	
Event Step 5	Declare NERC EEA 3, firm load shed, and set Locational Marginal Prices (LMPs) and Market Clearing Prices (MCPs) to the VOLL	Value of Lost Load (VOLL) Pricing
Termination	Terminate Max Gen and possibly Capacity Advisory	Normal Pricing

Emergency Procedure Steps are currently being reviewed by MISO and this chart may change.

Demand Resource Capability Specifics

Calculated Baseline

- Minimum of:
  - Availability
  - Demand
  - Capacity Rating
- Self Schedule
  - Must be to Capacity Rating during Capacity At Risk Hours
- Capability during first hour of Scheduling Instruction for hours deploying, hours deployed, and one hour after

Statistical* Baseline

- Minimum of:
  - Availability
  - Load Curve
  - Capacity Rating
- Self Schedule
  - Must be to Load Curve during Capacity At Risk Hours
- Capability during first hour of Scheduling Instruction for hours deploying, hours deployed, and one hour after

Firm Service Level

- Demand Less Firm Service Level
- Zero if unavailable
- Seasonal Capability
  - During Capacity At Risk Hours when Demand less than Firm Service Level
- Self Schedule
  - Must be at or below Firm Service Level during Capacity At Risk Hours
- Seasonal Capability when deploying, deployed, and for one hour after being

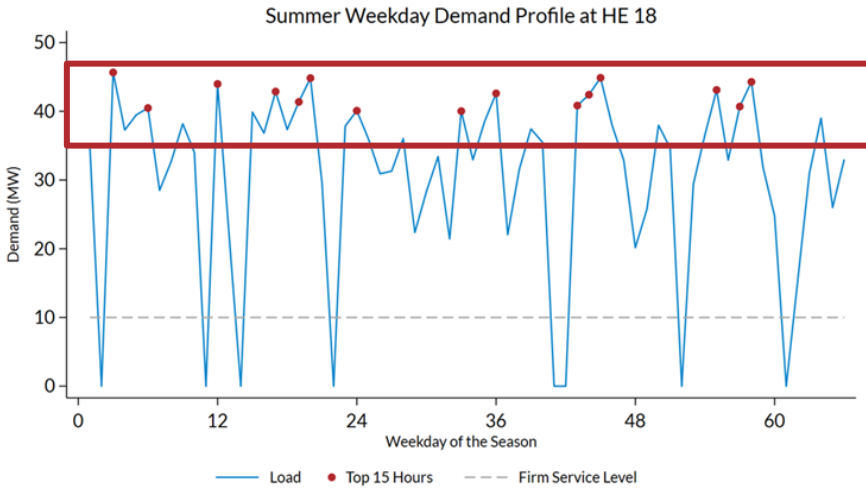
All DR will use a one-year look back
Capacity At Risk Hours and Resource Adequacy Hours
See Schedule 53B for full details

*Statistical Baseline is Direct Load Control and Statistical Interval Baseline

Seasonal Capability

- Resources using the Firm Service Level can be very large, having hundreds of MWs come onto the system during a Capacity At Risk Hour presents a reliability risk
- Seasonal Capability provides a strong incentive for these resources to reduce their Demand or not raise it
- This is achieved by calculating a value for each hour of the day, with weekdays and weekends receiving different values, that is equal to the average of the top ~25% of hours during a Season
    - 25% was selected because fewer hours raises the risk of artificial load increases to improve accreditation while more hours reduces the strength of the signal being sent
- Calculating this value for each Hour of the day ensures that if a resource is never operating at night or on weekends, an accurate measure of its performance is calculated

Seasonal Capability Example



- Demand corresponding to every day at 5pm (Hour Ending 18) is evaluated

Of the 66 hours, the top 15 are chosen

- The average value of these 15 hours becomes the Seasonal Capability for Hour Ending 18, in this case resulting in a Seasonal Capability of 32.5 MW for a resource with a 10 MW Firm Service Level

- Each Hour of the day will have a separate value calculated, and a value will be calculated for weekdays and weekends