Measurement and Verification Standards
Wholesale Electric Demand Response
Recommendation Summary

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Austin, Texas

Eric Winkler Ph.D., ISO-NE

Paul Wattles, ERCOT

Donna Pratt, NYISO

Agenda

- Standards Development Process
- Introduction
- Definition of Terms
- Overview of the Measurement and Verification Standards Criteria
- Demand Response Measurement and Verification Business Practice Standards
- Performance Evaluation Methodology

WHOLESALE SUBGROUP STANDARDS DEVELOPMENT PROCESS

Wholesale Electric Subgroup

IRC
ISO/RTO Council

Goals/Guidelines

- Consolidate standards for existing and proposed Demand Response (DR) products and Performance Evaluation methodologies
- Define Common Terms
- Compliance with tariffs, market rules, operating procedures, protocols and manuals.
- Collaborate with ISO/RTOs, IRC, Retail Leadership and NAESB Stakeholders.

Activities – 07'-08'

- 40 - Conference calls/webex
- 4 - All day work sessions (MA, TX, NY, IN)
- 1 - National Conference in VA (IRC)
- 10 - DSM/EE Subcommittee Meetings
- 5 - WEQ Leadership/NAESB Board Meetings

INTRODUCTION

Standards Framework

Measurement and Verification (M&V) standards are intended to facilitate Demand Response in wholesale electricity markets by providing a common framework for the following:

- Transparency: accessible and understandable M&V requirements for Demand Response products;
- Accountability: criteria that will enable the System Operator to accurately measure performance of Demand Response resources; and
- Consistency: standards applicable across wholesale electricity markets.

Applicability

- These standards do not establish requirements related to the compensation, design, operation, or use of Demand Response services.
- System Operators are not required to offer these Services and may not currently offer each of these Services.
- For purposes of these wholesale Measurement and Verification standards, Demand Response does not include Measurement and Verification of energy efficiency or permanent Load reduction.

Tariff Conflict and NERC Standards

- In the event of a conflict between these business practices and the System Operator's Tariffs, market rules, operating procedures, protocols or manuals, the Tariff, market rules, operating procedures, protocols or manuals shall have precedence.
- Terms defined in the Definition of Terms section are critical to understanding the applicability of these M&V standards, but do not modify or supersede market rule or tariff definitions that apply to the compensation, design, operation, or use of Demand Response services.
- Additionally, all entities supplying Demand Response Services shall comply with NERC reliability standards.

Scope and Impact of M&V Standards

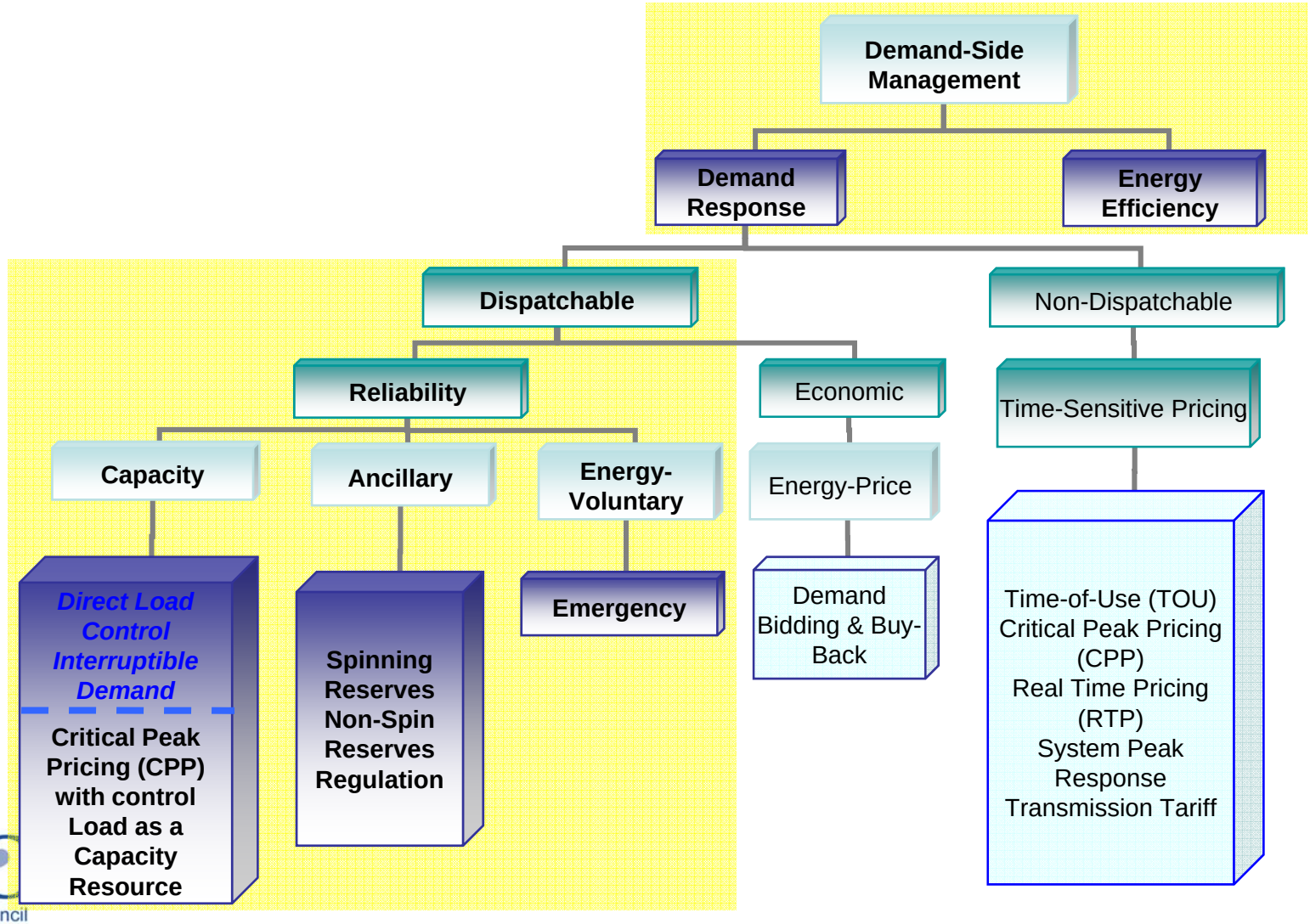
- M&V Scope Limitation
  - The proposal is limited to M&V aspects of Demand Response products
  - No product eligibility characteristics or other participation features are defined in these standards
- Impact on Existing Products
  - All current ISO/RTO demand response products are consistent with the proposed standards
  - Local differences may be covered under clauses such as “System Operator shall specify” or “unless otherwise specified by the System Operator”, so long as transparency requirements are met

Product Categories

The standards reflect business practices applicable to measurement and verification of wholesale market Demand Response services including the following four product categories:

- Energy Service
- Capacity Service
- Reserve Service
- Regulation Service

NERC Areas of Interest



Performance Evaluation

A performance evaluation methodology is used to determine the Demand Reduction Value provided by a Demand Resource. The standards include descriptions of acceptable Baselines and alternative performance measurements.

- Maximum Base Load
- Meter Before / Meter After
- Baseline Type-I
- Baseline Type-II
- Metering Generator Output

DEFINITION OF TERMS

Definitions of Terms

- Definition of Terms was developed to clarify specific meanings of terms while providing consistency and conformance to:
  - ISO/RTO Standard Reference
  - FERC
  - NERC
- Terms Areas
  - Demand Response Event Timing
  - General Terms

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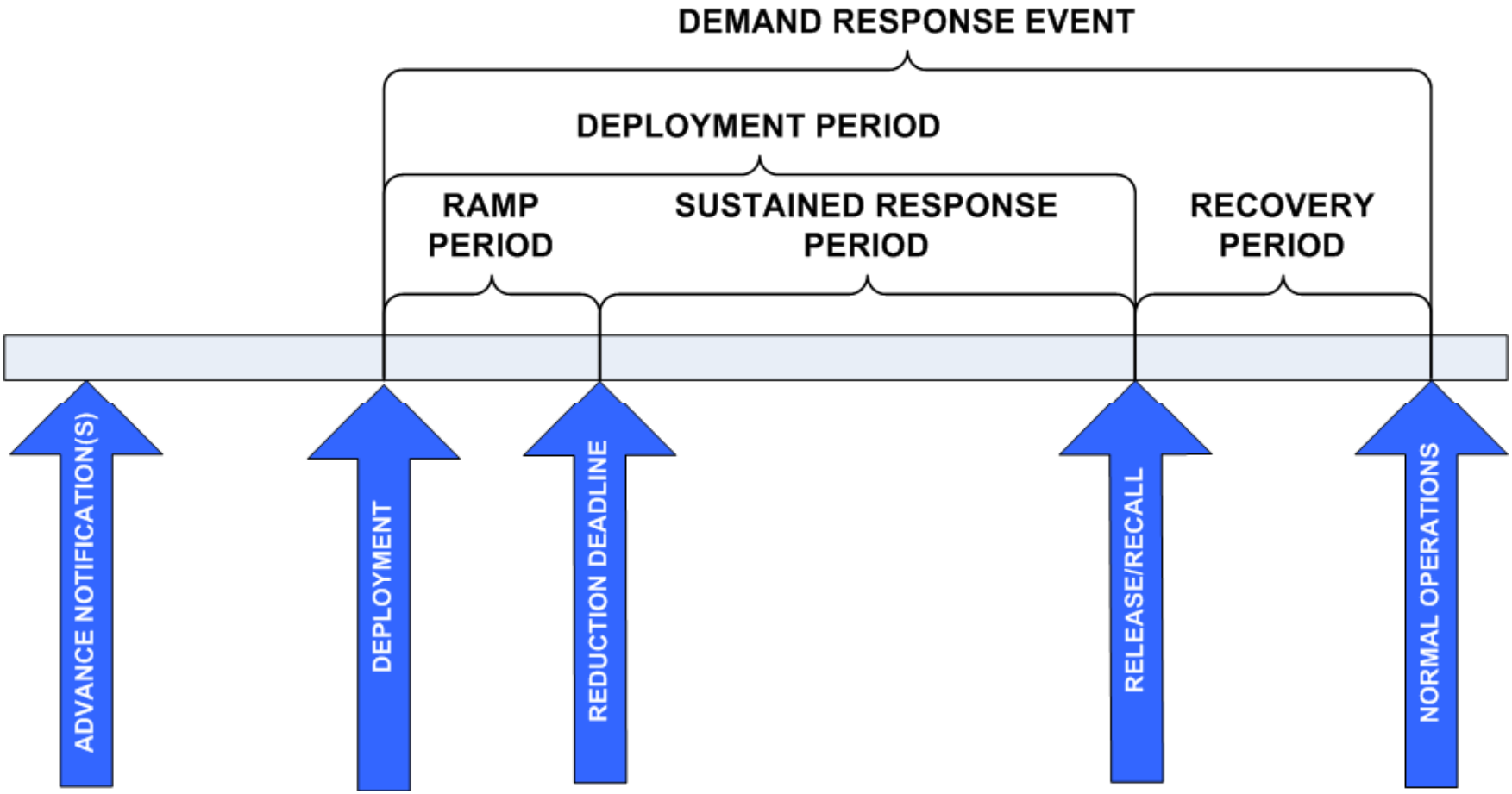
Demand Response Event Timing



General Terms

Adjustment Window
After-the-Fact Metering
Aggregated Demand Resource
Baseline [#]
Baseline Adjustment
Baseline Type-I (Interval Metered)[‡]
Baseline Type-II (Non-Interval Metered)[‡]
Baseline Window
Capacity Service*
Demand Response Provider
Demand
Demand Reduction Value
Demand Resource[#]
Demand Response [#]
Energy Service*
Highly-Variable Load
Load
Maximum Base Load [‡]
Meter Before / Meter After [‡]
Meter Data Recording Interval
Meter Data Reporting Deadline
Metering Generator Output[‡]
Performance Window
Ramp Rate
Regulation Service*
Reserve Service *
System Operator [#]
Telemetry
Telemetry Interval
Validation, Editing and Estimation

* Product Types, [‡] Performance Methodologies, [#] Key Terms

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Key Definitions

- **Demand Resource**
  - A Load or aggregation of Loads capable of measurably and verifiably providing Demand Response.
- **Demand Response**
  - A temporary change in electricity consumption by a Demand Resource in response to market or reliability conditions. For purposes of these standards, Demand Response does not include energy efficiency or permanent Load reduction.

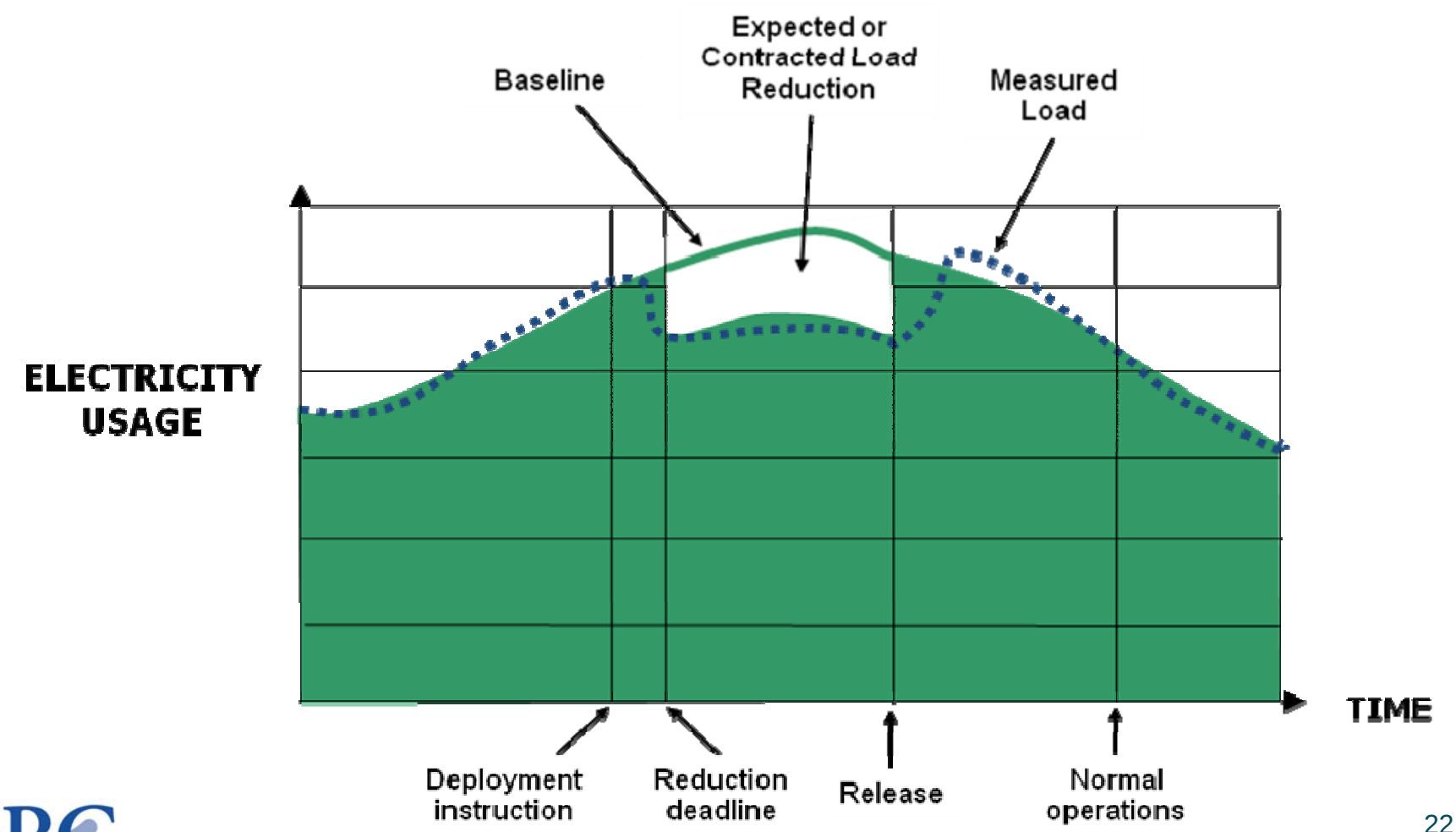
Key Definitions

- **System Operator**
  - A System Operator is a Balancing Authority, Transmission Operator, or Reliability Coordinator whose responsibility is to monitor and control an electric system in real time. (based on NERC definition)
  - The System Operator is responsible for initiating Advance Notifications, Deployment, and Release/Recall instructions.

Key Definitions

- **Baseline**
  - A Baseline is a method of estimating the electricity that would have been consumed by a Demand Resource in the absence of a Demand Response Event.
  - The Baseline is compared to the actual metered electricity consumption during the Demand Response Event to determine the Demand Reduction Value. Depending on the type of Demand Response product or service, Baseline calculations may be performed in real-time or after-the-fact.

Baseline Conceptualization

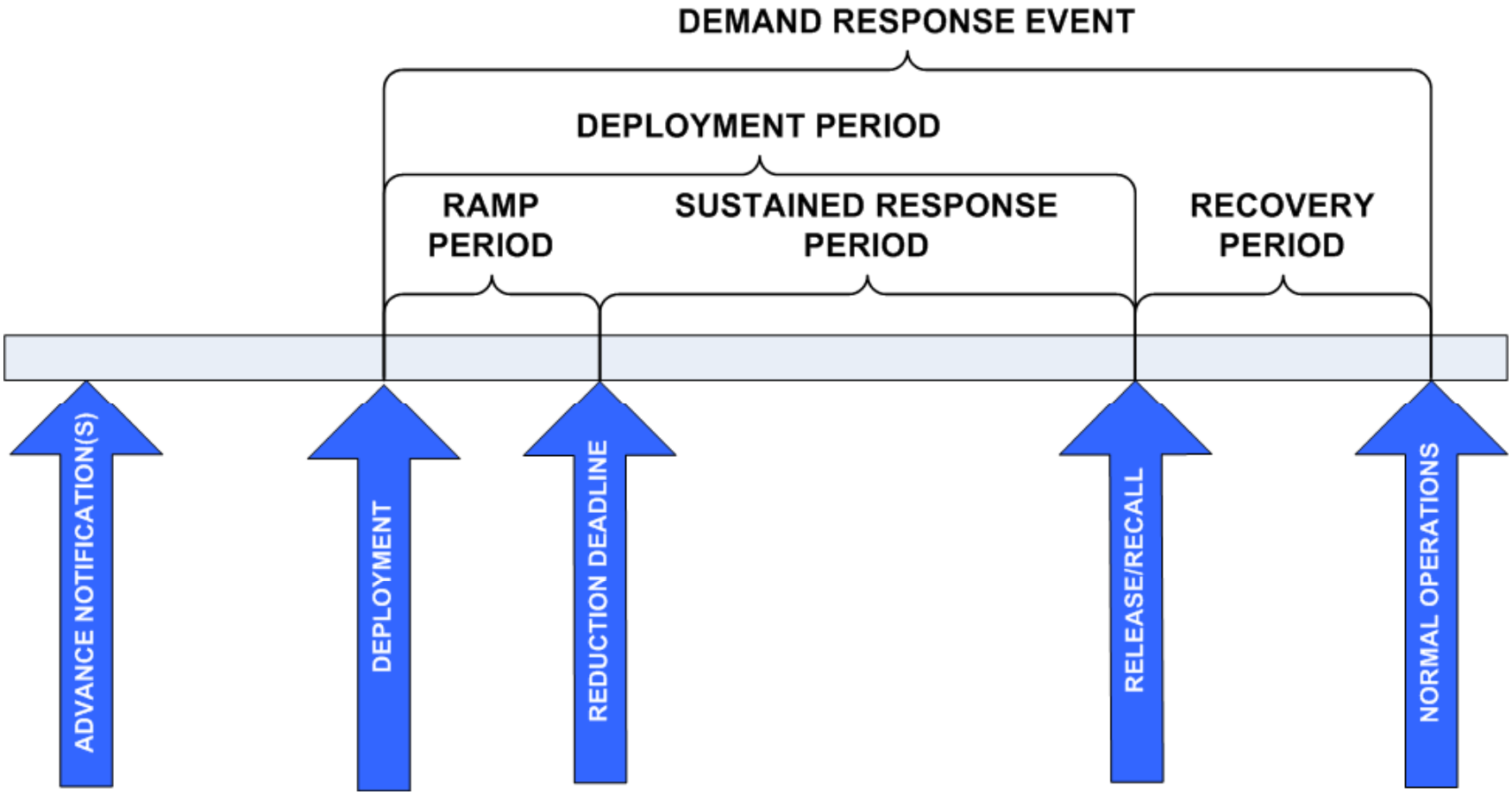


OVERVIEW OF THE MEASUREMENT AND VERIFICATION STANDARDS CRITERIA

General Criteria

- Advance Notification
- Deployment Time
- Reduction Deadline
- Release/Recall
- Normal Operations
- Demand Resource Availability Measurement
- Aggregation
- Transparency of Requirements

Demand Response Event Timing



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Telemetry Criteria

- Telemetry Requirement
- Telemetry Accuracy
- Telemetry Reporting Interval
- Other Telemetry Measurements
- Communication Protocol
- Governor Control Equivalent
- On-Site Generation Telemetry Requirement

After-The-Fact Criteria

- After-the-Fact Metering Requirement
- Meter Accuracy
- Details of Meter/Equipment Standards
- Meter Data Reporting Deadline
- Meter Data Reporting Interval
- Clock / Time Accuracy
- Validating, Editing & Estimating (VEE) Method
- On-Site Generation Meter Requirement

Performance Evaluation Criteria

- Rules for Performance Evaluation
  - Applicable Performance Evaluation methodologies

Performance Evaluation Type	Service Type			
	Energy	Capacity	Reserves	Regulation
Maximum Base Load	✓	✓		
Meter Before / Meter After	✓	✓	✓	✓
Baseline Type-I	✓	✓	✓	
Baseline Type-II	✓	✓	✓	
Metering Generator Output	✓	✓	✓	✓

DEMAND RESPONSE MEASUREMENT AND VERIFICATION BUSINESS PRACTICE STANDARDS

Demand Response Products

- **Energy Service**
  - A type of Demand Response service in which Demand Resources are compensated based solely on Demand reduction performance.
- **Capacity Service**
  - A type of Demand Response service in which Demand Resources are obligated over a defined period of time to be available to provide Demand Response upon deployment by the System Operator.
- **Reserve Service**
  - A type of Demand Response service in which Demand Resources are obligated to be available to provide Demand reduction upon deployment by the System Operator, based on reserve capacity requirements that are established to meet applicable reliability standards.
- **Regulation Service**
  - A type of Demand Response service in which a Demand Resource increases and decreases Load in response to real-time signals from the System Operator. Demand Resources providing Regulation Service are subject to dispatch continuously during a commitment period. Provision of Regulation Service does not correlate to Demand Response Event timelines, deadlines and durations.

Wholesale Products – Energy

ISO/RTO Product/Service Name & Features						*Service*
Region	**Acronym**	**Name**	**Primary Driver**	**Performance**	**NERC Mapping**	**Type**
AESO	DOS	Demand Opportunity Service	Reliability	Mandatory	Energy	Energy
AESO	VLCP	Voluntary Load Curtailment Program	Reliability	Mandatory	Energy	Energy
CAISO	PLP	Participating Load Program	Economic	Mandatory	Energy	Energy
IESO	ELRP	Emergency Load Reduction Program	Reliability	Voluntary	Energy	Energy
IESO	EDRP	Emergency Demand Response Program	Reliability	Voluntary	Energy	Energy
IESO	DL	Dispatchable Load	Economic	Mandatory	Energy	Energy
IESO	HADL	Hour Ahead Dispatchable Load	Economic	Voluntary	Energy	Energy
ISO-NE	RTDRP	Real Time Demand Response Program [Energy Component]	Reliability	Mandatory	Energy	Energy
ISO-NE	DALRP	Day Ahead Load Response Program	Economic	Mandatory	Energy	Energy
ISO-NE	RTPR	Real Time Price Response Program	Economic	Voluntary	Energy	Energy

Wholesale Products – Energy

ISO/RTO Product/Service Name & Features						*Service*
Region	**Acronym**	**Name**	**Primary Driver**	**Performance**	**NERC Mapping**	**Type**
MISO	DRR Type I	Demand Response Resource Type I	Economic	Voluntary	Energy	Energy
MISO	DRR Type II	Demand Response Resource Type II	Economic	Voluntary	Energy	Energy
MISO	EDR	Emergency Demand Response	Reliability	Voluntary	Energy	Energy
NBSO	BBDR	Bid-Based Demand Response	Economic	Mandatory	Energy	Energy
NYISO	DADRP	Day-Ahead Demand Response Program	Economic	Mandatory	Energy	Energy
NYISO	EDRP	Emergency Demand Response Program	Reliability	Voluntary	Energy	Energy
NYISO	SCR	Installed Capacity Special Case Resources (Energy Component)	Reliability	Mandatory	Energy	Energy
PJM		Economic Load Response	Economic	Voluntary	Energy	Energy
PJM		Emergency Load Response	Reliability	Voluntary	Energy	Energy
PJM		Emergency Load Response	Reliability	Mandatory	Energy	Energy

Wholesale Products – Capacity

ISO/RTO Product/Service Name & Features						*Service*
Region	**Acronym**	**Name**	**Primary Driver**	**Performance**	**NERC Mapping**	**Type**
ERCOT	EILS	Emergency Interruptible Load Service	Reliability	Mandatory	Capacity	Capacity
ISO-NE	RTDRP	Real Time Demand Response Program [Capacity Component]	Reliability	Mandatory	Capacity	Capacity
ISO-NE	RTDR	Real Time Demand Response Resource	Reliability	Mandatory	Capacity	Capacity
ISO-NE		FCM: On-Peak, Seasonal Peak, Critical Peak Resources	Reliability	Mandatory	Capacity	Capacity
ISO-NE	RTEG	Real Time Emergency Generation Resource	Reliability	Mandatory	Capacity	Capacity
MISO	LMR	Load Modifying Resource	Reliability	Voluntary	Capacity	Capacity
NBSO	IL	Interruptible Load	Reliability	Mandatory	Capacity	Capacity
NYISO	SCR	Installed Capacity Special Case Resources (Capacity Component)	Reliability	Mandatory	Capacity	Capacity
PJM		Emergency Load Response	Reliability	Mandatory	Capacity	Capacity

Wholesale Products – Reserve

ISO/RTO Product/Service Name & Features						*Service*
Region	**Acronym**	**Name**	**Primary Driver**	**Performance**	**NERC Mapping**	**Type**
AESO	SUP	Supplemental Operating Reserves	Reliability	Mandatory	AS: Non-Spin	Reserve
CAISO	PLP	Participating Load Program	Economic	Mandatory	AS: Non-Spin	Reserve
ERCOT	LaaR/RRS/ UFR	Loads Acting as a Resource providing Responsive Reserve Service -- Under Frequency Relay Type	Reliability	Mandatory	AS: Spin	Reserve
ERCOT	LaaR/RRS/ CLR	Loads Acting as a Resource providing Responsive Reserve Service -- Controllable Load Resource Type	Reliability	Mandatory	AS: Spin	Reserve
ERCOT	LaaR/NSRS	Loads Acting as a Resource providing Non-Spinning Reserve Service	Reliability	Mandatory	AS: Non-Spin	Reserve
IESO	DL	Dispatchable Load (Spinning Component)	Reliability	Mandatory	AS: Spin	Reserve
IESO	DL	Dispatchable Load (Non-Spinning Component)	Reliability	Mandatory	AS: Non-Spin	Reserve
ISO-NE	DRR	Demand Response Reserves Pilot	Reliability	Mandatory	AS: Non-Spin	Reserve

Wholesale Products – Reserve

ISO/RTO Product/Service Name & Features						*Service*
Region	**Acronym**	**Name**	**Primary Driver**	**Performance**	**NERC Mapping**	**Type**
MISO	DRR Type I	Demand Response Resource Type I	Reliability	Voluntary	AS: Contingency Reserves	Reserve
MISO	DRR Type II	Demand Response Resource Type II	Reliability	Voluntary	AS: Contingency Reserves	Reserve
NBSO	30NSR	30 Minute Non-Spinning Reserves	Reliability	Mandatory	AS: Non-Spin	Reserve
NBSO	10NSR	10 Minute Non-Spinning Reserves	Reliability	Mandatory	AS: Non-Spin	Reserve
NBSO	10SR	10 Minute Spinning Reserve	Reliability	Mandatory	AS: Spin	Reserve
NYISO	DSASP	Demand Side Ancillary Services Program	Economic	Mandatory	AS: Spin	Reserve
NYISO	DSASP	Demand Side Ancillary Services Program	Economic	Mandatory	AS: Non-Spin	Reserve
PJM		Economic Load Response	Economic	Mandatory	AS: Spin	Reserve

Wholesale Products – Regulation

ISO/RTO Product/Service Name & Features						*Service*
Region	**Acronym**	**Name**	**Primary Driver**	**Performance**	**NERC Mapping**	**Type**
AESO	FLSS	Frequency Load Shed Service	Reliability	Mandatory	AS: Regulation	Regulation
ERCOT	CLR	Controllable Load Resources providing Regulation Service	Reliability	Mandatory	AS: Regulation	Regulation
MISO	DRR Type II	Demand Response Resource Type II	Reliability	Voluntary	AS: Regulation	Regulation
NBSO	LF	Load Following	Economic	Mandatory	AS: Regulation	Regulation
NBSO	REG	Regulation	Economic	Mandatory	AS: Regulation	Regulation
NYISO	DSASP	Demand Side Ancillary Services Program	Economic	Mandatory	AS: Regulation	Regulation
PJM		Economic Load Response	Economic	Mandatory	AS: Regulation	Regulation

General Standards for Energy/Capacity/Reserves

- **Advance Notification**

  The System Operator shall specify requirements for the Advance Notification instruction.

- **Deployment Time**

  The System Operator shall specify the time at which Demand Resources must begin reducing Demand on the system.

- **Reduction Deadline**

  The System Operator shall specify the Reduction Deadline.

- **Release/Recall**

  The System Operator shall specify the time at which Demand Resources shall be instructed to begin restoring Load.

- **Normal Operations**

  The System Operator shall specify Normal Operations.

- **Demand Resource Availability Measurement**

  The System Operator shall specify any requirements for measuring the capability of a Demand Resource to meet its obligation. Not applicable to Energy Service unless otherwise specified by the System Operator.

- **Aggregation**

  The System Operator shall specify if aggregated Demand Resources are allowed to participate.

- **Transparency of Requirements**

  Any specific requirements shall be defined in a System Operator's tariff, market rules, operating procedures, protocols or manuals and shall be posted in a publicly accessible location.

Telemetry Standards for Energy/Capacity/Reserves

- **Telemetry Requirement**

  The System Operator shall specify any requirements for real-time Telemetry, including, but not limited to: the use of real-time Telemetry, the entity responsible for installing and maintaining Telemetry equipment and collecting and communicating Telemetry data.

- **On-Site Generation Telemetry**

  If on-site generation is present behind the primary Telemetry point, real-time Telemetry data shall be required to measure performance of the generator unless otherwise specified by the System Operator.

- **Telemetry Accuracy**

  The accuracy of the real-time Demand measurement shall be represented as a percentage of full scale, up to a maximum of 3.0% unless otherwise specified by the System Operator.

- **Telemetry Reporting Interval**

  The Telemetry Reporting Interval shall be up to a maximum of 5 minutes unless otherwise specified by the System Operator.

- **Other Telemetry Measurements**

  The System Operator shall specify any additional Telemetry data requirements.

- **Communication Protocol**

  The System Operator shall specify the Telemetry communication protocol.

- **Governor Control Equivalent**

  Not applicable to Energy or Capacity Service unless otherwise specified by the System Operator.

After-the-Fact Metering Standards for Energy/Capacity/Reserves

- **After-the-Fact Metering Requirement**

  After-the-fact Metering is required unless otherwise specified by the System Operator.

- **Meter Accuracy**

  The accuracy of the after-the-fact metering shall be represented as a percentage of full scale, up to a maximum of 3.0% unless otherwise specified by the System Operator.

- **Details of Meter/Equipment Standards**

  Meter/Equipment standards shall meet or exceed industry standards equivalent to ANSI C12 unless otherwise specified by the System Operator.

- **Meter Data Reporting Deadline**

  The System Operator shall specify the Meter Data Reporting Deadline.

- **Meter Data Reporting Interval**

  The Meter Data Reporting Interval shall be a maximum of 1 hour unless otherwise specified by the System Operator.

- **Clock / Time Accuracy**

  The System Operator shall specify the clock and time accuracy. Clock and time meter/equipment standards shall meet or exceed industry standards equivalent to ANSI C12 unless otherwise specified by the System Operator.

- **Validating, Editing & Estimating (VEE) Method**

  The System Operator shall specify VEE requirements.

- **On-Site Generation Meter Requirement**

  The System Operator shall specify additional metering requirements if on-site generation is present behind the primary metering point.

Performance Evaluation Standards for Energy/Capacity/Reserves

- **Rules for Performance Evaluation**
  - Performance shall be evaluated through the use of one of the following methods unless otherwise specified by the System Operator:
    - Maximum Base Load (not applicable to Reserves)
    - Meter Before / Meter After
    - Baseline Type-I
    - Baseline Type-II
    - Metering Generator Output

General Standards for Regulation

- **Advance Notification**

  Not applicable to Regulation Service unless otherwise specified by the System Operator.
- **Deployment Time**

  Not applicable to Regulation Service unless otherwise specified by the System Operator.
- **Reduction Deadline**

  Not applicable to Regulation Service unless otherwise specified by the System Operator.
- **Release/Recall**

  Not applicable to Regulation Service unless otherwise specified by the System Operator.
- **Normal Operations**

  Not applicable to Regulation Service unless otherwise specified by the System Operator.
- **Demand Resource Availability Measurement**

  Not applicable to Regulation Service unless otherwise specified by the System Operator.
- **Aggregation**

  The System Operator shall specify if aggregated Demand Resources are allowed to participate.
- **Transparency of Requirements**

  Any specific requirements shall be defined in a System Operator's tariff, market rules, operating procedures, protocols or manuals and shall be posted in a publicly accessible location.

Telemetry Standards for Regulation

- **Telemetry Requirement**

  The System Operator shall specify any requirements for real-time Telemetry, including, but not limited to: the use of real-time Telemetry, the entity responsible for installing and maintaining Telemetry equipment and collecting and communicating Telemetry data.

- **On-Site Generation Telemetry**

  If on-site generation is present behind the primary Telemetry point, real-time Telemetry data shall be required to measure performance of the generator unless otherwise specified by the System Operator.

- **Telemetry Accuracy**

  The accuracy of the real-time Demand measurement shall be represented as a percentage of full scale, up to a maximum of 3.0% unless otherwise specified by the System Operator.

- **Telemetry Reporting Interval**

  The Telemetry Reporting Interval shall be up to a maximum of 5 minutes unless otherwise specified by the System Operator.

- **Other Telemetry Measurements**

  The System Operator shall specify any additional Telemetry data requirements.

- **Communication Protocol**

  The System Operator shall specify the Telemetry communication protocol.

- **Governor Control Equivalent**

  Demand Resources providing Regulation Service shall automatically respond to grid frequency deviations, similar to governor action provided by generation resources, unless otherwise specified by the System Operator.

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After-the-Fact Metering Standards for Regulation

- **After-the-Fact Metering Requirement**

  After-the-fact Metering is required unless otherwise specified by the System Operator.

- **Meter Accuracy**

  The accuracy of the after-the-fact metering shall be represented as a percentage of full scale, up to a maximum of 3.0% unless otherwise specified by the System Operator.

- **Details of Meter/Equipment Standards**

  Meter/Equipment standards shall meet or exceed industry standards equivalent to ANSI C12 unless otherwise specified by the System Operator.

- **Meter Data Reporting Deadline**

  The System Operator shall specify the Meter Data Reporting Deadline.

- **Meter Data Reporting Interval**

  The Meter Data Reporting Interval shall be a maximum of 1 hour unless otherwise specified by the System Operator.

- **Clock / Time Accuracy**

  The System Operator shall specify the clock and time accuracy. Clock and time meter/equipment standards shall meet or exceed industry standards equivalent to ANSI C12 unless otherwise specified by the System Operator.

- **Validating, Editing & Estimating (VEE) Method**

  The System Operator shall specify VEE requirements.

- **On-Site Generation Meter Requirement**

  The System Operator shall specify additional metering requirements if on-site generation is present behind the primary metering point.

Performance Evaluation Standards for Regulation

- **Rules for Performance Evaluation**
  - Performance shall be evaluated through the use of one of the following methods unless otherwise specified by the System Operator:
    - Meter Before / Meter After
    - Metering Generator Output

PERFORMANCE EVALUATION METHODOLOGIES

Performance Evaluation Methodologies

- Maximum Base Load
  - A performance evaluation methodology based solely on a Demand Resource's ability to reduce to a specific level of electricity consumption or demand, regardless of its electricity consumption or demand at Deployment.
- Meter Before / Meter After
  - Metering Before Deployment vs. Metering After Reduction Deadline is a performance evaluation methodology where electricity consumption or demand over a prescribed period of time prior to Deployment is compared to similar readings during the Sustained Response Period.

Performance Evaluation Methodologies

- Baseline Type 1 (Interval Metered)
  - A Baseline model based on a Demand Resource's historical interval meter data which may also include but is not limited to other variables such as weather and calendar data.
- Baseline Type 2 (Non-interval Metered)
  - A Baseline model that uses statistical sampling to estimate the electricity consumption of an Aggregated Demand Resource where interval metering is not available on the entire population.
- Behind-The-Meter Generation
  - A performance evaluation methodology, used when a generation asset is located behind the Demand Resource's revenue meter, in which the Demand Reduction Value is based on the output of the generation asset.

Performance Evaluation Criteria

- BASELINE INFORMATION
  - Baseline Window
  - Calculation Type
  - Exclusion Rules
  - Baseline Adjustments
  - Adjustment Window

Performance Evaluation Criteria

- EVENT INFORMATION
  - Use of real-time Telemetry
  - Use of After-The-Fact Metering
  - Performance Window
  - Measurement Type

Performance Evaluation Criteria

- SPECIAL PROCESSING
  - Highly-Variable Load Logic
  - On-Site Generation Requirements

Performance Measurement
Maximum Base Load

- **BASELINE INFORMATION**

  There are no Baseline calculations defined for Maximum Base Load evaluations. The Maximum Base Load Evaluation methodology shall be associated with a demand reduction obligation compared to the Demand Resource's average Load or as specified by the System Operator.

- **EVENT INFORMATION**
  - **Use of Real-Time Telemetry**

    The System Operator shall specify if real-time Telemetry data is to be used to measure performance.
  - **Use of After-The-Fact Metering**

    After-the-fact metering shall be used to measure performance, unless otherwise specified by the System Operator.
  - **Performance Window**

    The Performance Window shall be the Sustained Response Period (Reduction Deadline through Release/Recall) unless otherwise specified by the System Operator.
  - **Measurement Type**

    During the Performance Window, the Demand Resource must maintain its electricity consumption at or below the Maximum Base Load. The criteria used to evaluate performance shall be one of the following unless otherwise specified by the System Operator:
    - Peak consumption or Demand
    - Average consumption or Demand

- **SPECIAL PROCESSING**

  The System Operator shall specify any special processing rules.

Performance Measurement
Meter Before / Meter After

- **BASELINE INFORMATION**
  - **Baseline Window**

    The System Operator shall specify the Baseline Window.
  - **Calculation Type**

    During the Baseline Window, the energy consumption or Demand of the Demand Resource shall be evaluated using one of the following measurements unless otherwise specified by the System Operator:
    - Instantaneous
    - Maximum
    - Average
  - **Sampling Precision and Accuracy**

    Sampling is not permitted for this performance evaluation type, unless otherwise specified by the System Operator.
  - **Exclusion Rules**

    The System Operator shall specify any exclusion rules.
  - **Baseline Adjustments**

    The System Operator shall specify any event-day adjustments.
  - **Adjustment Window**

    No Adjustment Window is used for this model unless otherwise specified by the System Operator.

Performance Measurement
Meter Before / Meter After

- **EVENT INFORMATION**
  - **Use of real-time Telemetry**

    The System Operator shall specify if real-time Telemetry data is to be used to measure performance.
  - **Use of After-The-Fact Metering**

    After-the-fact metering shall be used to measure performance, unless otherwise specified by the System Operator.
  - **Performance Window**

    The Performance Window shall be the Sustained Response Period (Reduction Deadline through Release/Recall) unless otherwise specified by the System Operator.
  - **Measurement Type**

    During the Performance Window, the Demand Resource shall be evaluated using one of the following measurements unless otherwise specified by the System Operator:
    - Instantaneous
    - Maximum
    - Average
- **SPECIAL PROCESSING**
  - **Highly-Variable Load Logic**

    The System Operator shall specify any performance evaluation requirements for Highly-Variable Loads.
  - **On-Site Generation Requirements**

    The System Operator shall specify any performance evaluation requirements for on-site generation.

Performance Measurement
Baseline Type 1 (Interval Metered)

- **BASELINE INFORMATION**
  - **Baseline Window**

    The System Operator shall specify the Baseline Window.
  - **Calculation Type**

    The System Operator shall specify the method of developing the Baseline value using, but not limited to, the following calculation types:
    - Maximum
    - Average
    - Regression
  - **Sampling Precision and Accuracy**

    Sampling is not permitted for this Performance Evaluation type, unless otherwise specified by the System Operator.
  - **Exclusion Rules**

    The System Operator shall specify any rules for excluding data from the Baseline Window. Exclusion rules may be based on, but are not limited to the following:
    - Historical Demand Response Events
    - Testing/Audit Periods
    - Calendar data
    - Outages
    - Weather emergencies or force majeure events
    - Usage threshold

Performance Measurement
Baseline Type 1 (Interval Metered)

- **BASELINE INFORMATION (CONT)**
  - **Baseline Adjustments**

    The System Operator shall specify any rules for Baseline Adjustments. Adjustment rules may be based on, but are not limited to the following:
    - Temperature
    - Humidity
    - Calendar data
    - Sunrise/Sunset time
    - Event day operating conditions
  - **Adjustment Window**

    The System Operator shall specify the Adjustment Window.
- **EVENT INFORMATION**
  - **Use of Real-Time Telemetry**

    The System Operator shall specify if real-time Telemetry data is to be used to measure performance.
  - **Use of After-The-Fact Metering**

    After-the-fact metering shall be used to measure performance, unless otherwise specified by the System Operator.
  - **Performance Window**

    The System Operator shall specify the Performance Window.

Performance Measurement
Baseline Type 1 (Interval Metered)

- **EVENT INFORMATION (CONT)**
  - **Measurement Type**

    During the Performance Window, the Demand Resource shall be evaluated using one of the following measurements unless otherwise specified by the System Operator:
    - Maximum
    - Average
    - Regression
- **SPECIAL PROCESSING**
  - **Highly-Variable Load Logic**

    The System Operator may specify performance evaluation requirements for Highly-Variable Loads.
  - **On-Site Generation Requirements**

    The System Operator may specify performance evaluation requirements for on-site generation.

Performance Measurement
Baseline Type 2 (Non-interval Metered)

- **BASELINE INFORMATION**
  - **Baseline Window**

    The System Operator shall specify the Baseline Window.
  - **Calculation Type**

    The System Operator shall specify the method of developing the Baseline value using, but not limited to, the following calculation types:
    - Maximum
    - Average
    - Regression
  - **Sampling Precision and Accuracy**

    The System Operator shall specify sampling precision and accuracy requirements.
  - **Exclusion Rules**

    The System Operator shall specify any rules for excluding data from the Baseline Window. Exclusion rules may be based on, but are not limited to the following:
    - Historical Demand Response Events
    - Testing/Audit Periods
    - Calendar data
    - Outages
    - Weather emergencies or force majeure events
    - Usage threshold

Performance Measurement
Baseline Type 2 (Non-interval Metered)

- **BASELINE INFORMATION (CONT)**
  - **Baseline Adjustments**

    The System Operator shall specify any rules for Baseline Adjustments. Adjustment rules may be based on, but are not limited to the following:
    - Temperature
    - Humidity
    - Calendar data
    - Sunrise/Sunset time
    - Event day operating conditions
  - **Adjustment Window**

    The System Operator shall specify the Adjustment Window.
- **EVENT INFORMATION**
  - **Use of Real-Time Telemetry**

    The System Operator shall specify if real-time Telemetry data is to be used to measure performance.
  - **Use of After-The-Fact Metering**

    After-the-fact metering or other energy measurement technology shall be used to measure performance, as a supplement to real-time Telemetry unless otherwise specified by the System Operator.

Performance Measurement
Baseline Type 2 (Non-interval Metered)

- **EVENT INFORMATION (CONT)**
  - **Performance Window**

    The System Operator shall specify the Performance Window.
  - **Measurement Type**

    During the Performance Window, the Demand Resource shall be evaluated using one of the following measurements unless otherwise specified by the System Operator:
    - Maximum
    - Average
    - Regression
- **SPECIAL PROCESSING**

  The System Operator shall specify any special processing rules.

Performance Measurement
Behind-The-Meter Generation

- **BASELINE INFORMATION**

  The System Operator shall specify Baseline calculations for Metering Generator Output.

- **EVENT INFORMATION**
  - **Use of Real-Time Telemetry**

    The System Operator shall specify if real-time Telemetry data is to be used to measure performance.

  - **Use of After-The-Fact Metering**

    After-the-fact metering on the generator and optionally on the associated Load shall be used to measure performance unless otherwise specified by the System Operator.

  - **Performance Window**

    The System Operator shall specify the Performance Window.

  - **Measurement Type**

    During the Performance Window, the Demand Resource shall be evaluated using the total measured generation output unless otherwise specified by the System Operator.

- **SPECIAL PROCESSING**

  The System Operator shall specify any special processing rules.

Performance Evaluation Applicability

Performance Evaluation Type	Service Type			
	Energy	Capacity	Reserves	Regulation
Maximum Base Load	✓	✓		
Meter Before / Meter After	✓	✓	✓	✓
Baseline Type-I	✓	✓	✓	
Baseline Type-II	✓	✓	✓	
Metering Generator Output	✓	✓	✓	✓

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QUESTIONS