

Demand Response

Mathangi Srinivasan Kumar

Program Administrator, Market Training, NYISO

New York Market Orientation Course (NYMOC)

October 25-28, 2022

White Plains, NY

Demand Response Module Objectives

Upon completion of this module, trainees will be able to:

- **Recognize the purpose of Demand Response at the NYISO**
- **Distinguish between the two categories and the four main programs of Demand Response at the NYISO**
- **Identify the basic features, functions, and participation requirements of each of these programs**
- **Learn about a Demand Response event and how participant performance is measured and settled**

NYISO's Demand Response Programs

Demand Response at the NYISO

- **What do Demand Response resources do?**
 - Reduce their power use for discrete periods of time as directed by the NYISO
- **What are some of the advantages offered by Demand Response Programs?**
 - **Contribute to maintaining system reliability by**
 - **Effectively increasing the supply available to manage peak demand periods**
 - **Allow load to provide ancillary services to the wholesale electricity market**
 - **Maintain price stability in the market by**
 - **Allowing load to respond to wholesale market prices, which can moderate high prices in the NYISO Day-Ahead Market**

Demand Response at the NYISO

- **What are Demand Response resources?**
 - Electricity consumers located in NYS that enroll to take part in a specific DR program
 - Examples:
 - Industrial companies
 - Commercial buildings
 - Big box stores
 - Small retail stores
 - Hospitals
 - Colleges/Universities

Demand Response at the NYISO

- How do resources provide Demand Response?

Resources can provide load reduction by:

- Decreasing power consumption in the facility (Interruptible loads) – Response Type C
- Using a qualified behind-the-meter local generator to supply part of the resource's load – Response Type G
- Using both load curtailment and a local generator – Response Type B

Categories of Demand Response Programs

Reliability-Based Programs – NYISO determines activation

- **Purpose: Provide load reductions in response to NYISO Operations instructions for a discrete period of time, to supplement generation when Operating Reserves are forecast to be short or when there is an actual Operating Reserve Deficiency or other system emergency**
 - Emergency Demand Response Program (EDRP)
 - ICAP-Special Case Resources (SCR)
 - Targeted Demand Response Program (TDRP)

Categories of Demand Response Programs

Economic-Based Programs – Resource determines when to participate (through supply offers)

- Purpose: Load reduction, competing with generation, is scheduled by NYISO based upon economic offers
 - Day-Ahead Demand Response Program (DADRP)
 - Demand-Side Ancillary Service Program (DSASP)

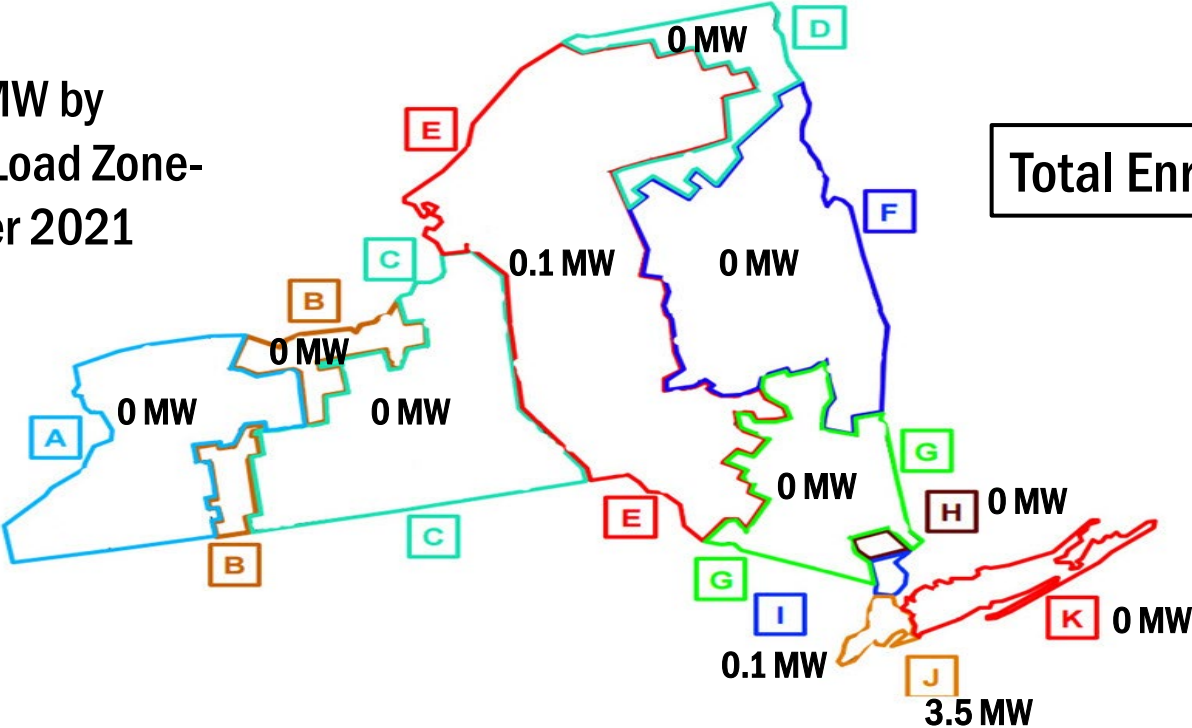
Reliability – Based Programs

Emergency Demand Response Program (EDRP) - Reliability

- Load reduction through interruptible loads or loads with a qualified behind-the-meter Local Generator
- Minimum of 100 kW reduction
- Load reduction during a reliability event is voluntary
- Enrolled by Curtailment Service Providers (CSP)
 - Serves as interface between the NYISO and resource

EDRP Enrollment – Summer 2021

EDRP MW by
NYISO Load Zone-
Summer 2021



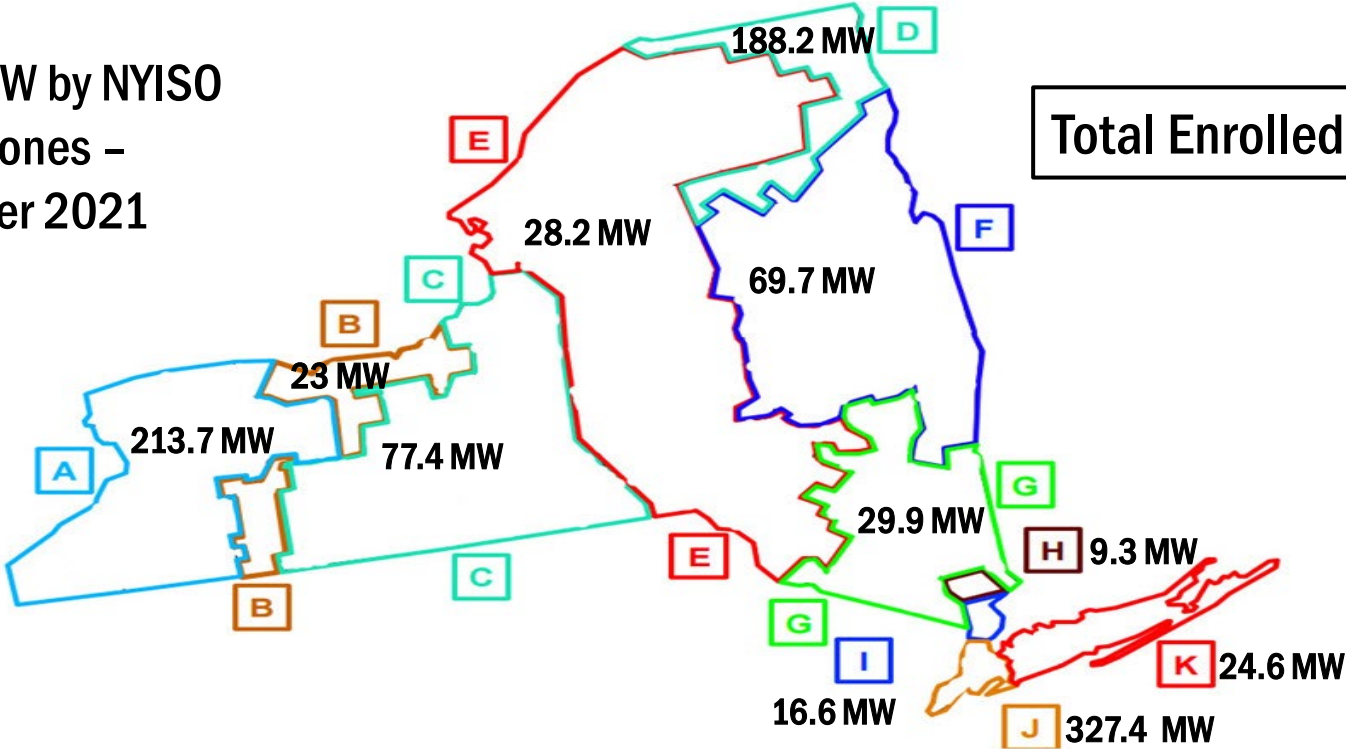
As reported in NYISO 2021 Annual Report on Demand Response Programs

Special Case Resources (SCR) - Reliability

- Load reduction through interruptible loads or loads with a qualified behind-the-meter Local Generator
- Minimum of 100 kW reduction, in aggregate by Load Zone
- Mandatory response during reliability events for a minimum of four hours
- Offer into Installed Capacity (ICAP) auctions, or may sell capacity in bilateral contracts
 - Must demonstrate maximum capacity obligation in each Capability Period
- Enrolled by Responsible Interface Party (RIP)
 - Serves as interface between the NYISO and resource

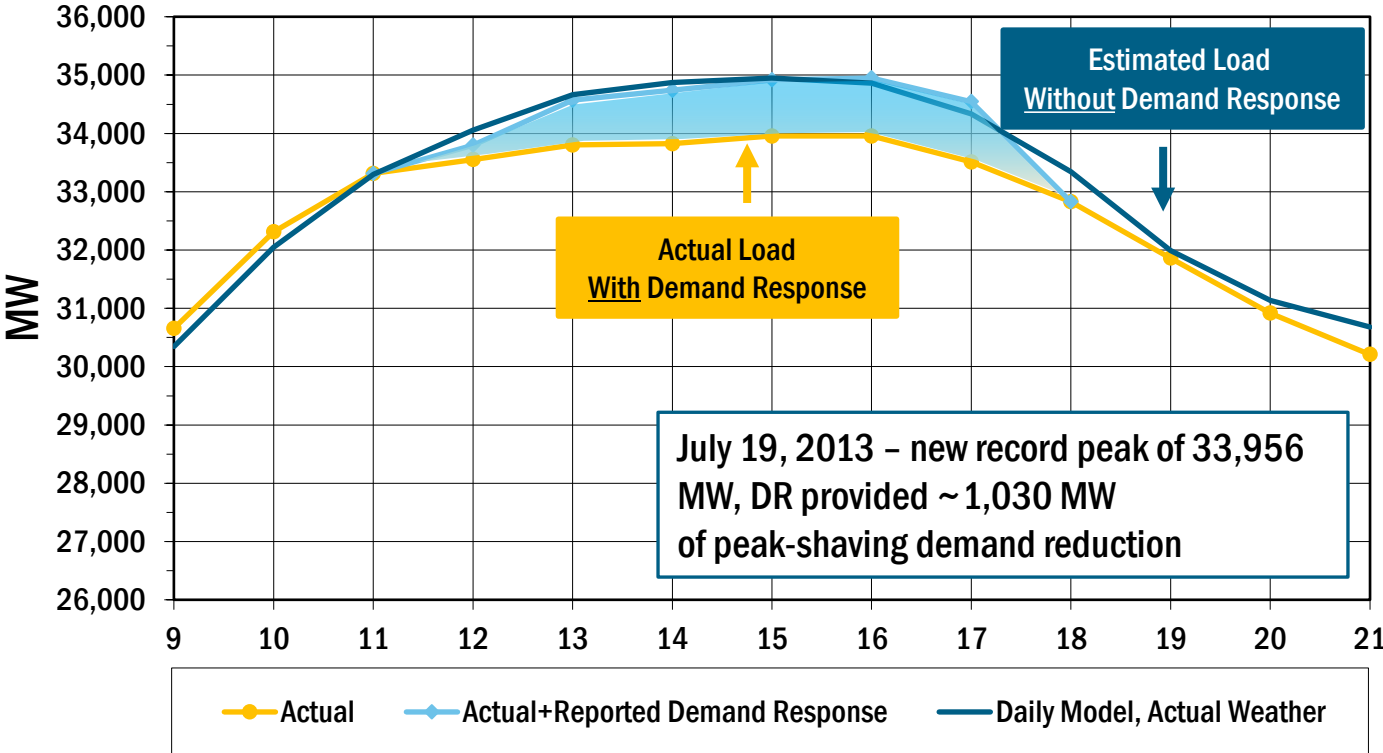
SCR Enrollment – Summer 2021

SCR MW by NYISO
 Load Zones –
 Summer 2021



As reported in NYISO 2021 Annual Report on Demand Response Programs

Demand Response for Reliability



Targeted Demand Response Program (TDRP) - Reliability

- Effective July 1, 2007
- Con Edison can request NYISO to activate Demand Response for local reliability issues
- Participation
 - SCR and EDRP resources in specific locations in Load Zone J (NYC)
 - Voluntary for both SCR and EDRP
- Payments
 - Energy: Based on the payment calculation of the program in which the resource is enrolled
- Cannot set real-time market price

Economic – Based Programs

Day-Ahead Demand Response Program (DADRP) - Economic

- Offer to curtail load in the Day-Ahead Market
 - Economic evaluation and price setting capabilities identical to generation
- Load reduction through interruptible loads, or loads with a qualified behind-the-meter Local Generator
- Response is mandatory when scheduled
- Minimum Reduction: 1 MW, in aggregate by Load Zone and LSE
- Monthly Net Benefit Offer Floor
- Accepted offers are notified by 11:00 a.m. of scheduled commitment for the next day (midnight-midnight)
- DADRP resources enrolled with the NYISO by the DADRP provider

Demand Side Ancillary Service Program (DSASP) - Economic

- Participate in Ancillary Service Market to provide
 - Operating Reserves and/or
 - Regulation Service and Frequency Response
 - Economic evaluation and price setting capabilities identical to generation
- Participation is mandatory when scheduled
- Only Interruptible loads for Spinning Reserves or Regulation
 - Loads with a qualified behind-the-meter Local Generator may provide Non-Synchronous Reserves
- Minimum Reduction: 1 MW, in aggregate by Load Zone
- Minimum Energy Offer: Monthly Net Benefit Offer Floor
- DSASP resources enrolled with the NYISO by DSASP Provider

Demand Response Program Participation Considerations

Key Program Components

- Curtailment Type
- Aggregations
- Baselines
- Metering Requirements
- How Program Participants Enroll
- Managing Program Enrollments

Curtailment Type

- **Interruptible load and qualified behind-the-meter Local Generators (may be subject to DEC and/or local regulations)**
 - Emergency Demand Response Program (EDRP) minimum 100 kW
 - Special Case Resources Program (ICAP/SCR) minimum 100 kW, in aggregate
 - Day-Ahead Demand Response Program (DADRP) minimum 1 MW, in aggregate

Curtailement Type

- **Flexible operations and automated controls**
 - Demand-Side Ancillary Service Program (DSASP) minimum 1 MW, in aggregate
 - **Must respond to 5 minute RTD signals for Reserves and 6 second signals for Regulation**
 - **Can offer Real-time Reserves and/or Real-time Regulation and Frequency Response**
 - **Local Generators may participate as non-synchronized Reserve suppliers**

Aggregations

- Smaller resources with interval meters may be grouped within a zone in order to meet the minimum program participation requirements; individual resource performance still applies
 - Applicable for SCR, DADRP and DSASP resources

- The Small Customer Aggregation program allows for other validation methods such as statistical sampling to claim performance on a portfolio basis
 - Applicable for the EDRP and the SCR resources

- Settlements are paid by the NYISO to the aggregators
 - Payments to individual DR resources enrolled by aggregators are managed between the aggregator and resource based on terms agreed between them

NYISO DR Program Baselines

NYISO uses three types of Baselines between the four Demand Response programs:

- Average Coincident Load (ACL)
- Customer Baseline Load (CBL)
- Real-time Baseline

NYISO DR Program Baselines

- Average Coincident Load (ACL)
 - Program: SCR for capacity auctions
 - Reference period used: Prior Equivalent Capability Period
 - Average of highest twenty resource loads during top forty NYCA peak load hours in same season (Summer/Winter) of previous year

NYISO DR Program Baselines

- **Customer Baseline Load (CBL)**
 - Programs: EDRP, DADRP and SCR Energy
 - Reference period used: Highest five consumption days of last ten “like” days where DR event or schedule did not occur
 - Weather-sensitive adjustment option (in-day)

NYISO DR Program Baselines

- **Real-time Baseline**
 - Program: DSASP for Reserve and Regulation resources
 - Reference period used: Actual load just prior to the beginning of a real-time schedule

Overall Metering Requirements

- **Revenue-grade (interval billing meter)**
 - A meter that meets regulatory requirements for accuracy and has been certified for billing
 - Meter authorities have access to the data stored in the revenue meter
- **Shadow meter**
 - An additional metering device installed next to the existing revenue meter so that other entities may have access to the meter data
 - May be a revenue-grade meter that is not used for billing
 - May be another type of recording device using pulse outputs from the revenue meter
 - Installed by a meter authority or a Professional Engineer

Program Specific Metering Requirements

- **Reliability and Economic Day-Ahead Programs (EDRP, SCR, DADRP)**
 - Generally, interval meters are required for participation
 - Some programs accept data from interval data recorders or “shadow” meters (2% error or better)
 - Small Customer Aggregation program may use sampling methods in lieu of individual interval meters

Program Specific Metering Requirements

- **Demand-Side Ancillary Services**
 - Requires 6-second metering and two-way communication (telemetry)
 - May communicate through the Transmission Owner or have Direct Communication with the NYISO
 - Also requires a revenue grade interval billing meter
 - Instantaneous total load meter
 - DSASP supplier will
 - Receive RTD (5-minute), AGC (6-second) MW schedules (Reserve and Regulation)
 - Transmit response MW and total actual load consumption
 - Meter authority to submit total load MW-hr data
 - Validate instantaneous data

How Program Participants Enroll

Retail
Consumer

Participates in NYISO
Wholesale Markets through



Registered NYISO Market
Participant

Retail Consumers may be:

- *Industrial companies*
- *Big box stores*
- *Commercial buildings*
- *Hospitals*
- *Colleges/Universities*

Market Participants include:

- *Transmission Owner – local distribution utility*
- *Load-Serving Entity – competitive energy supplier*
- *Aggregator – company that transacts with NYISO on behalf of retail consumers*

Managing Program Enrollments

- **Demand Response Information System (DRIS)**
 - NYISO's automated system for enrollment and management of demand response resources
 - Accessible by Market Participants to enroll and manage the following data for their resources
 - Enrollment information
 - Aggregations
 - Performance
 - Event responses
 - Settlement

Demand Response Events, Performance Measurement, and Settlements

Demand Response Event

- For reliability programs
 - Notification to NYISO's Market Participants is done through an automated system with a variety of message receipt options (e.g., e-mail, phone, etc.)
 - The period when demand response resources reduce load pursuant to NYISO instruction
 - Zonal or sub-load pocket basis
 - Events may be extended beyond initial time period or terminated early

Demand Response Event

- For economic programs
 - DADRP
 - Resources submit bids in the Day Ahead Market
 - Resources scheduled in the Day Ahead market provide a Real Time Response
 - DSASP
 - A Real-Time dispatch
 - Reserve Pickup and Regulation base-point communication

Data Submission for Verifying Load Reduction

- **ACL (Average Coincident Load)**
 - For SCR resources- Capacity
 - Meter data for ACL is provided to NYISO by wholesale Market Participant (utility, aggregator, etc.) at the time of the retail consumer enrollment into the SCR program
 - Meter data from event/test is provided within 75 days of the event/test

Data Submission for Verifying Load Reduction

- **CBL (Customer Baseline load)**
 - For SCR Energy, EDRP and DADRP programs
 - Meter data for CBL and event/test period is provided to NYISO by wholesale Market Participant
 - **Within 75 days of reliability event/test**
 - **Within 55 days of economic schedule**

Data Submission for Verifying Load Reduction

- Real-time Baseline
 - For DSASP resources
 - Meter data is transmitted every 6-seconds via continuous two-way metering and incorporated into system operations
 - Real-time meter data compared to revenue-grade meter after the fact for verification

Sample Load Reduction Plan

A sample load reduction plan is shown below for a resource with a Declared Value of 300 kW:

Time with respect to SCR Event	Action	Load Reduction Achieved (kW)
2 hours prior	Pre-cool the office area from 70 degrees to 65 degrees	
15 minutes prior	Turn off the HVAC	150 kW
15 minutes prior	Transfer critical load to backup generator	100 kW
At the start	Dim the office lights	50 kW
15 minutes post	Return to normal operations	

Measuring Participant Load Reduction

Step 1:

- Requires each resource establish a baseline load
 - Estimates the amount of energy use expected if a load reduction had not occurred in response to the NYISO instruction or schedule, determines measurement interval

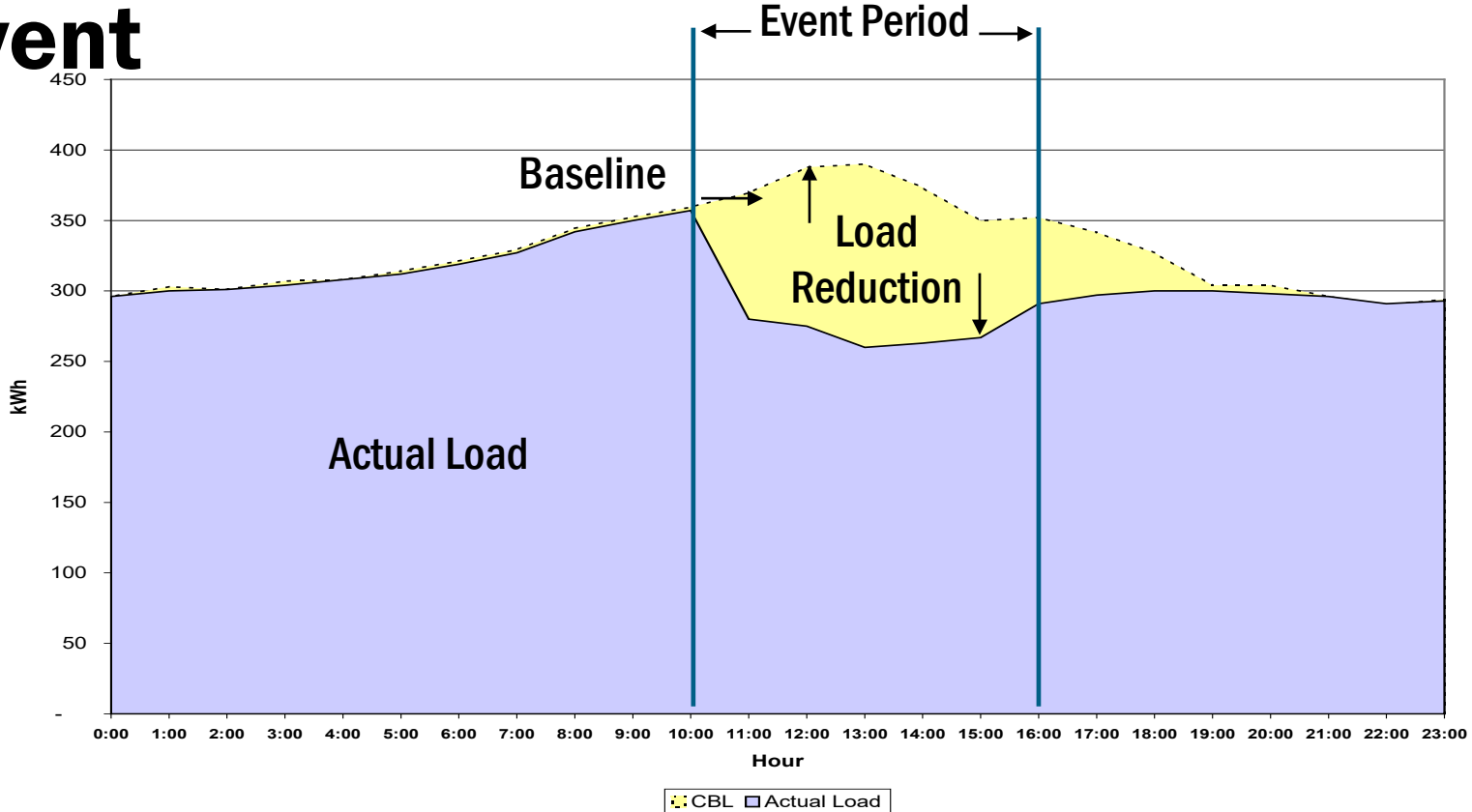
Step 2:

- Measure the Actual Meter Demand (AMD) for each interval

Step 3:

- Reduction for each interval = Baseline Load – AMD for each interval

Example: Load Reduction during an Event



DR Program Specific Settlements

Settlement for EDRP

- Paid for reducing energy consumption when called upon by the NYISO
- Energy: Based on measured energy reduction during an event, with a minimum rate of \$500/MWh or the actual LBMP, if higher
- As participation is voluntary, penalties do not apply

DR Program Specific Settlements

Settlement for SCR

- **Monthly Capacity:** Based on capacity awarded through ICAP auctions as ICAP Supplier
 - UCAP payments calculated based on performance factors
 - All SCRs will have a 4 hour duration requirement and will be compensated commensurate with other four hour Resources
- **Energy:** Based on performance in events & tests
 - LBMP with daily guarantee of strike price recovery (Bid Cost Guarantee)
- **Failure to respond to mandatory Demand Response events called by NYISO may lead to reduced future UCAP payments**

DR Program Specific Settlements

Settlement for DADRP

- Incentive and reduction payment (product of Day-Ahead LBMP and the lesser of actual or Day-Ahead scheduled load reduction)
- If applicable, paid Curtailment Initiation Cost on a daily basis
 - Similar to generators
- Penalties may apply when NYISO schedules curtailable load in DAM; however, scheduled load reduction does not physically occur

DR Program Specific Settlements

Settlement for DSASP

- Settlement is calculated according to the response measured in each interval during conversion of reserves or regulation to energy, and the compliance of resources to the NYISO provided base-points.
- Paid marginal clearing prices for the Ancillary Service product scheduled
 - Clearing price based on location and product
 - Not paid for energy reductions

Let's Review

NYISO can deploy SCR and EDRP events:

NYCA wide

At a zonal level

Both

Let's Review

Which program also requires Real Time 6s metering, along with Hourly interval metering?

EDRP

SCR

DADRP

DSASP

Let's Review

In order to validate load curtailment response when must SCR metered data be submitted

Within 15 days of
event/test

Within 30 days of
event/test

Within 50 days of
event/test

Within 75 days of
event/test

Reliability Program Features

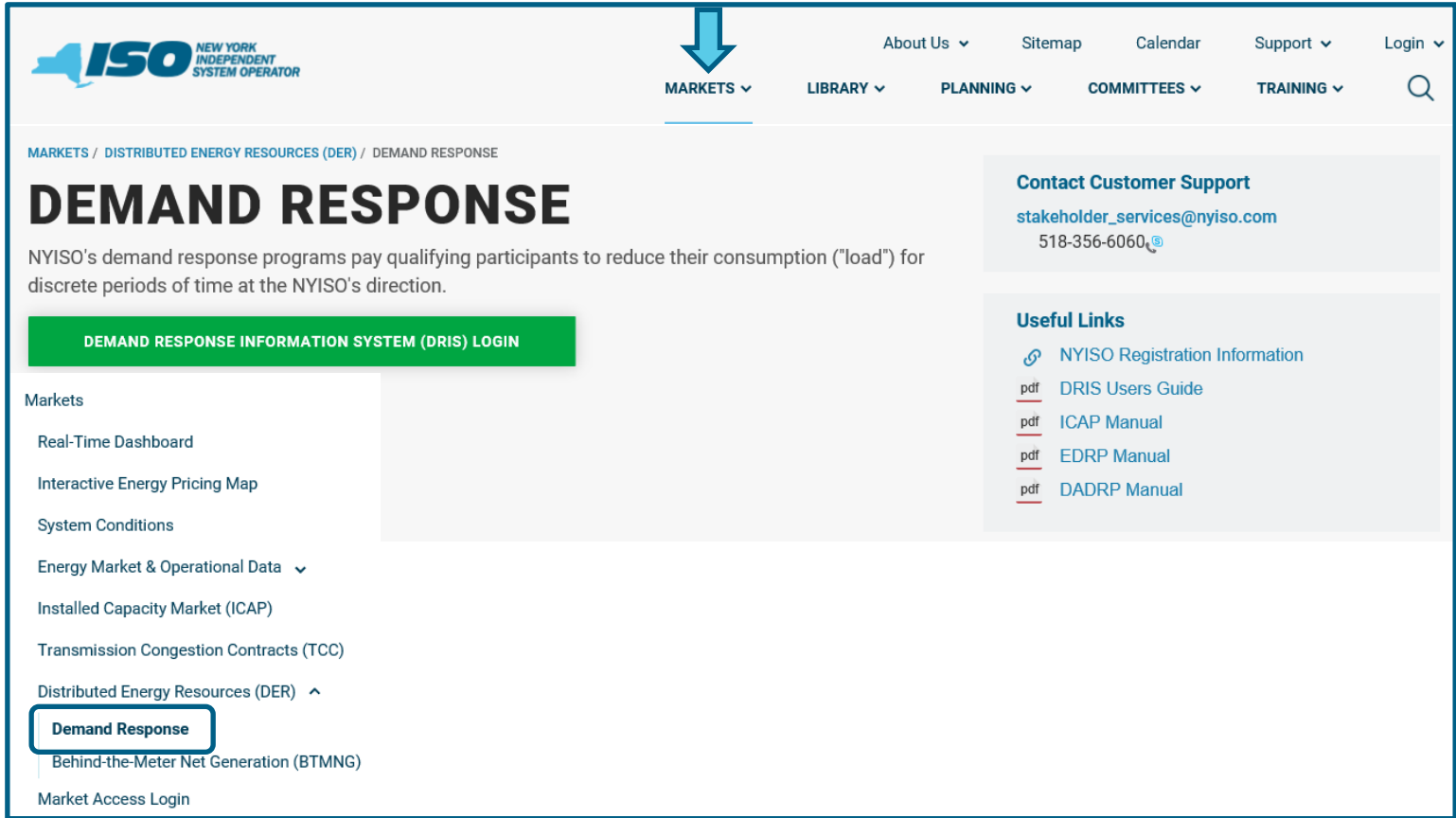
	EDRP	SCR
NYISO Market Participant	Curtailement Service Provider (CSP)	Responsible Interface Party (RIP)
Minimum Reduction	100 kW	100 kW, in aggregate
Performance Obligation	none	Minimum four hours for a mandatory event
Types of reduction	Load reduction through Curtailement Load and/or Local Generator	Load reduction through Curtailement Load and/or Local Generator
Event Notification	2-hour in-day notice	Day-ahead advisory and 2-hour in-day notice
Activation Priority	After SCR resources	Prior to EDRP resources
Capacity Payment	none	Monthly Based on ICAP auction
Energy Payment	Greater of real-time LBMP or \$500/MWh and guaranteed 4-hour minimum	LBMP with a daily guarantee of Minimum Payment Nomination (strike price) recovery and guaranteed 4-hour minimum
Penalty for Non-compliance	none	Penalties and derated for non-compliance

Economic Program Features

	DADRP	DSASP
NYISO Market Participant	Demand Reduction Provider (DRP)	Demand Side Ancillary Service Program Provider (DSASP Provider)
Minimum Reduction	1 MW, in aggregate	1 MW, in aggregate
Performance Obligation	Mandatory, if scheduled	Mandatory, if scheduled
Types of reduction	Curtaillable Load and Local Generator	Curtaillable Load and Local Generator
Event Notification	Notified by 11:00 a.m. of scheduled commitment for the next day (midnight to midnight)	Notified by 11:00 a.m. of scheduled commitment for the next day. Real-Time telemetered energy schedule
Activation Priority	Scheduled Day-Ahead if economic, no Real-Time schedule	Scheduled Day-Ahead and/or Real-Time if economic
Capacity Payment	None	None
Performance Payment	LBMP, w/daily curtailment initiation cost guarantee	Reserve or Regulation market clearing price
Penalty for Non-compliance	May apply	May apply

Demand Response NYISO Website Data

Demand Response – Main Page



ISO NEW YORK INDEPENDENT SYSTEM OPERATOR

MARKETS ▾ LIBRARY ▾ PLANNING ▾ COMMITTEES ▾ TRAINING ▾

About Us ▾ Sitemap Calendar Support ▾ Login ▾

MARKETS / DISTRIBUTED ENERGY RESOURCES (DER) / DEMAND RESPONSE

DEMAND RESPONSE

NYISO's demand response programs pay qualifying participants to reduce their consumption ("load") for discrete periods of time at the NYISO's direction.

DEMAND RESPONSE INFORMATION SYSTEM (DRIS) LOGIN

Markets

- Real-Time Dashboard
- Interactive Energy Pricing Map
- System Conditions
- Energy Market & Operational Data ▾
- Installed Capacity Market (ICAP)
- Transmission Congestion Contracts (TCC)
- Distributed Energy Resources (DER) ^
 - Demand Response**
 - Behind-the-Meter Net Generation (BTMNG)
- Market Access Login

Contact Customer Support
 stakeholder_services@nyiso.com
 518-356-6060

Useful Links

- [NYISO Registration Information](#)
- [pdf DRIS Users Guide](#)
- [pdf ICAP Manual](#)
- [pdf EDRP Manual](#)
- [pdf DADRP Manual](#)

Demand Response - Documents



MARKETS ▾

About Us ▾

Sitemap

Calendar

Support ▾

Login ▾

LIBRARY ▾

PLANNING ▾

COMMITTEES ▾

TRAINING ▾



Markets

Real-Time Dashboard

Interactive Energy Pricing Map

System Conditions

Energy Market & Operational Data ▾

Installed Capacity Market (ICAP)

Transmission Congestion Contracts (TCC)

Distributed Energy Resources (DER) ^

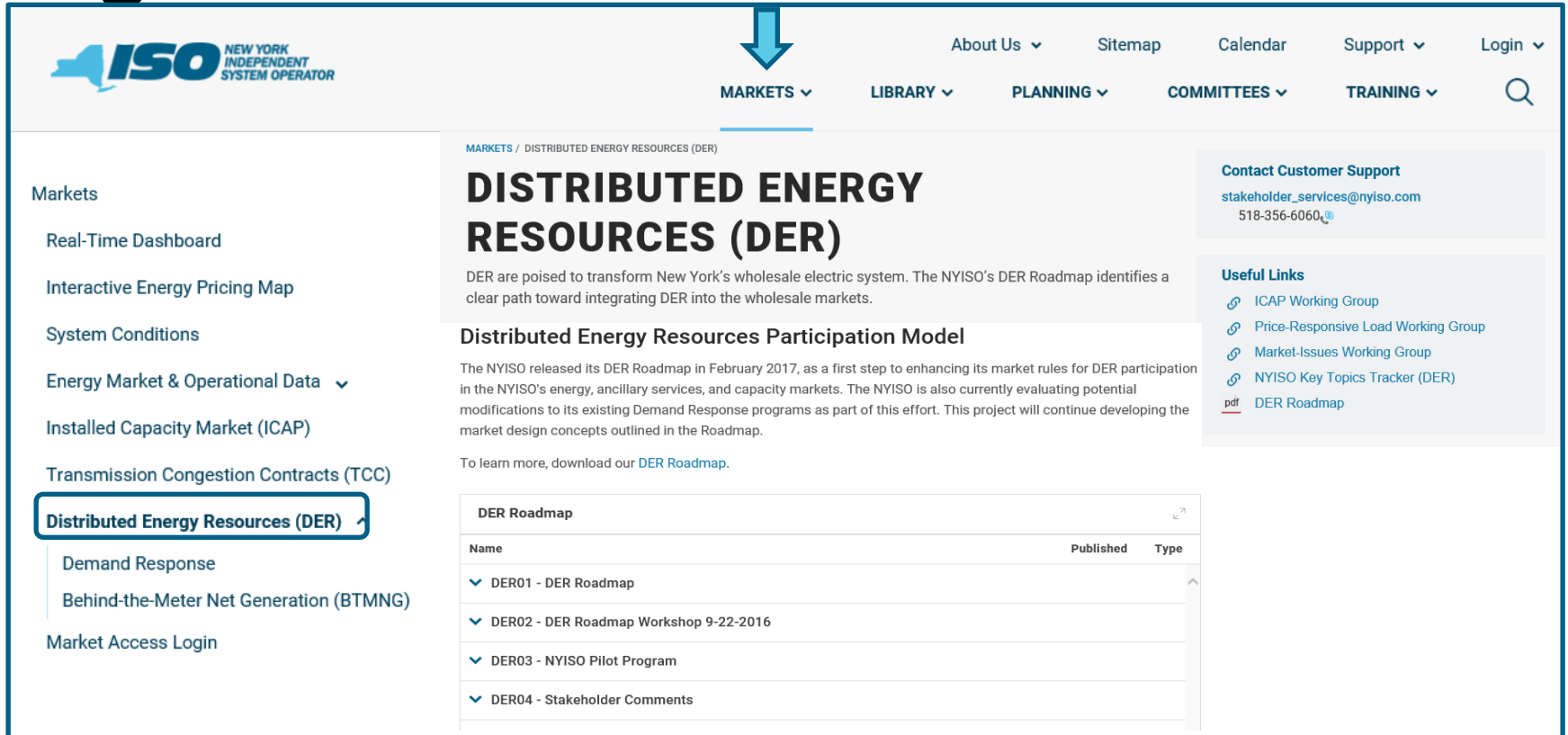
Demand Response

Behind-the-Meter Net Generation (BTMNG)

Market Access Login

Demand Response

Name	Published	Type
^ DR01 - General Information		
FAQs for Prospective Resources	2018/09/12	pdf
FAQs for requesting Demand Response participation data from the NYISO	2018/09/12	pdf
List of Demand Response Providers	2018/06/08	pdf
Small Customer Aggregation Guideline	2017/12/28	pdf
▾ DR02 - Special Case Resource ICAP Program		
▾ DR03 - Emergency Demand Response Program		
▾ DR04 - Demand Side Ancillary Service Program		
▾ DR05 - Day Ahead Demand Response Program		
▾ DR06 - Demand Response Activations		
▾ DR07 - Monthly Net Benefit Offer Floor		
▾ DR08 - Reports to FERC		
▾ DR09 - DRIS Training Materials		
▾ DR10 - Archives		



NYISO NEW YORK INDEPENDENT SYSTEM OPERATOR

MARKETS ▾ LIBRARY ▾ PLANNING ▾ COMMITTEES ▾ TRAINING ▾

MARKETS / DISTRIBUTED ENERGY RESOURCES (DER)

DISTRIBUTED ENERGY RESOURCES (DER)

DER are poised to transform New York's wholesale electric system. The NYISO's DER Roadmap identifies a clear path toward integrating DER into the wholesale markets.

Distributed Energy Resources Participation Model

The NYISO released its DER Roadmap in February 2017, as a first step to enhancing its market rules for DER participation in the NYISO's energy, ancillary services, and capacity markets. The NYISO is also currently evaluating potential modifications to its existing Demand Response programs as part of this effort. This project will continue developing the market design concepts outlined in the Roadmap.

To learn more, download our [DER Roadmap](#).

DER Roadmap		
Name	Published	Type
DER01 - DER Roadmap		
DER02 - DER Roadmap Workshop 9-22-2016		
DER03 - NYISO Pilot Program		
DER04 - Stakeholder Comments		

Contact Customer Support
stakeholder_services@nyiso.com
518-356-6060

Useful Links

- ICAP Working Group
- Price-Responsive Load Working Group
- Market-Issues Working Group
- NYISO Key Topics Tracker (DER)
- DER Roadmap

Markets

- Real-Time Dashboard
- Interactive Energy Pricing Map
- System Conditions
- Energy Market & Operational Data ▾
- Installed Capacity Market (ICAP)
- Transmission Congestion Contracts (TCC)
- Distributed Energy Resources (DER) ▾**
- Demand Response
- Behind-the-Meter Net Generation (BTMNG)
- Market Access Login

Demand Response Module

Objectives:

- **Recognize the purpose of Demand Response at the NYISO**
- **Distinguish between Reliability-based and Economic programs of Demand Response at the NYISO**
- **Identify the basic features, functions, and participation requirements of each program**
- **Learn about a Demand Response event and how participant performance is measured and settled**

Additional Resources

- **Tariffs –MST and OATT**
- **Day Ahead Demand Response Program Manual**
- **Emergency Demand Response Program Manual**
- **Installed Capacity Manual**
- **DRIS Users Guide**