Demand Response

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New York Market Orientation Course (NYMOC)

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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
NYISO Demand Response Program

History

- Demand Response programs since NYISO inception
- December 1999
  - Special Case Resource Program (ICAP/SCR)
- May 2001
  - Emergency Demand Response Program (EDRP)
  - Day-Ahead Demand Response Program (DADRP)
- 2003
  - Automated notification system for EDRP & SCR
- June 2008
  - Demand Side Ancillary Services Program (DSASP)
    - For Reserve and Regulation
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 2017

EDRP MW by NYISO Load Zone - Summer 2017

Total Enrolled: 71 MW

As reported in NYISO’s semi-annual report to FERC (June 1, 2017: Docket # ER01-3001-000).
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
As reported in NYISO’s semi-annual report to FERC (June 1, 2017: Docket # ER01-3001-000).
When a new record peak of 33,956 MW was set on July 19, 2013 Demand Response provided approximately 1,030 MW of peak-shaving demand reduction.

Equivalent to the output of two medium-sized generating plants or the electricity needs of 300,000 - 400,000 households.
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
- $75/MWh 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: $75/MWh
- DSASP resources enrolled with the NYISO by DSASP Provider
Let’s Review

Participation in the NYISO demand response programs involves

a) Demanding a neighboring Control Area to respond to a need for electricity
b) Demanding additional electricity be produced from generators
c) Curtailing the use of electricity
d) None of the above
Let’s Review

In which Demand Response program are participants eligible for Capacity Market payments?

a) SCR
b) EDRP
c) TDRP
d) SCR and EDRP
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
Curtailment 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

- The aggregators are regulated by the NYS Public Service Commission
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

Retail Consumers may be:
- Industrial companies
- Big box stores
- Commercial buildings
- Hospitals
- Colleges/Universities

Registered NYISO Market Participant

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
- Direct Customer – handles own supply requirements in NYISO market
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
Let’s Review

Which Demand Response program allows both aggregations and small customer aggregations?

a) SCR
b) EDRP
c) DADRP
d) DSASP
Let’s Review

When does load reduction occur for resources in an Economic Demand Response program?

a) When the NYISO calls on the resources

b) When the resources decide to use less electricity

c) When the resources make an offer of load reduction and are scheduled

d) Every Monday during summer months
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:

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

![Diagram showing load reductions and event period.](image)

- **Baseline**
- **Actual Load**
- **Load Reduction**
- **Event Period**

### Load Reduction during an Event

- **0:00 - 1:00:** Actual Load
- **1:00 - 2:00:** Load Reduction
- **2:00 - 3:00:** Actual Load
- **3:00 - 4:00:** Load Reduction
- **4:00 - 5:00:** Actual Load
- **5:00 - 6:00:** Load Reduction
- **6:00 - 7:00:** Actual Load
- **7:00 - 8:00:** Load Reduction
- **8:00 - 9:00:** Actual Load
- **9:00 - 10:00:** Load Reduction
- **10:00 - 11:00:** Actual Load
- **11:00 - 12:00:** Load Reduction
- **12:00 - 13:00:** Actual Load
- **13:00 - 14:00:** Load Reduction
- **14:00 - 15:00:** Actual Load
- **15:00 - 16:00:** Load Reduction
- **16:00 - 17:00:** Actual Load
- **17:00 - 18:00:** Load Reduction
- **18:00 - 19:00:** Actual Load
- **19:00 - 20:00:** Load Reduction
- **20:00 - 21:00:** Actual Load
- **21:00 - 22:00:** Load Reduction
- **22:00 - 23:00:** Actual Load

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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 sales made through ICAP auctions or bilateral contracts
  - UCAP payments calculated based on performance factors
- 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

How many baseline types does the NYISO use?

a) There is only 1 type of baseline and it is used for all 4 DR programs
b) There are 4 different types of baselines – 1 for each program
c) There are 3 types of baselines used among the 4 DR programs
# Reliability Program Features

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

<table>
<thead>
<tr>
<th></th>
<th>DADRP</th>
<th>DSASP</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NYISO Market Participant</strong></td>
<td>Demand Reduction Provider (DRP)</td>
<td>Demand Side Ancillary Service Program Provider (DSASP Provider)</td>
</tr>
<tr>
<td><strong>Minimum Reduction</strong></td>
<td>1 MW, in aggregate</td>
<td>1 MW, in aggregate</td>
</tr>
<tr>
<td><strong>Performance Obligation</strong></td>
<td>Mandatory, if scheduled</td>
<td>Mandatory, if scheduled</td>
</tr>
<tr>
<td><strong>Types of reduction</strong></td>
<td>Curtailable Load and Local Generator</td>
<td>Curtailable Load and Local Generator</td>
</tr>
<tr>
<td><strong>Event Notification</strong></td>
<td>Notified by 11:00 a.m. of scheduled commitment for the next day (midnight to midnight)</td>
<td>Notified by 11:00 a.m. of scheduled commitment for the next day. Real-Time telemetered energy schedule</td>
</tr>
<tr>
<td><strong>Activation Priority</strong></td>
<td>Scheduled Day-Ahead if economic, no Real-Time schedule</td>
<td>Scheduled Day-Ahead and/or Real-Time if economic</td>
</tr>
<tr>
<td><strong>Capacity Payment</strong></td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td><strong>Performance Payment</strong></td>
<td>LBMP, w/daily curtailment initiation cost guarantee</td>
<td>Reserve or Regulation market clearing price</td>
</tr>
<tr>
<td><strong>Penalty for Non-compliance</strong></td>
<td>May apply</td>
<td>May apply</td>
</tr>
</tbody>
</table>
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
- Demand Response Documents & Resources Webpage
  - FAQs for Prospective Resources
  - FAQs for Requesting Demand Response Participation Data from the NYISO

- Committee Section
  - Price Responsive Load Working Group
  - ICAP Working Group