Price-Responsive Demand (PRD) Overview

Customer Training Webinar

Doug Smith
Technical Manager, Market and Resource Administration
<table>
<thead>
<tr>
<th>Acronym</th>
<th>Definition</th>
<th>Acronym</th>
<th>Description</th>
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<tbody>
<tr>
<td>ADCR</td>
<td>active demand capacity resource</td>
<td>PFP</td>
<td>pay for performance</td>
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<tr>
<td>CAMS</td>
<td>Customer Asset Management System</td>
<td>PRD</td>
<td>price-responsive demand</td>
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<tr>
<td>DDP</td>
<td>desired dispatch point</td>
<td>RDP</td>
<td>retail delivery point</td>
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<tr>
<td>DRA</td>
<td>demand response asset</td>
<td>RTDR</td>
<td>Real-time demand response</td>
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<tr>
<td>DR-ATT</td>
<td>demand response auditing and testing tool</td>
<td>RTEG</td>
<td>Real-time emergency generation</td>
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<tr>
<td>DRR</td>
<td>demand response resource</td>
<td>TMSR</td>
<td>10-minute synchronized reserves</td>
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<tr>
<td>DRMUI</td>
<td>demand response market user interface</td>
<td>TMNSR</td>
<td>10-minute non-synchronized reserves</td>
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<tr>
<td>FCM</td>
<td>Forward Capacity Market</td>
<td>TMOR</td>
<td>30-minute operating reserves</td>
</tr>
<tr>
<td>FI</td>
<td>full integration</td>
<td>UBL</td>
<td>unadjusted baseline</td>
</tr>
<tr>
<td>LMP</td>
<td>locational marginal price</td>
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Goal

Provide a high-level overview of the price-responsive demand full integration project

Need more detailed information?
See Demand Resources Working Group presentation from October 23, 2017
Topics

• Price-Responsive Demand (PRD) Description
• PRD Full Integration (PRD-FI) Project
• PRD-FI Implementation Date
• Systems Affected and Key Changes
• Timeline and Getting More Information
What is Price-Responsive Demand?

Flexible load willing to be dispatched down economically

Today

• FCM resources dispatched in response to a capacity deficiency
• Resources are not differentiated based on economics
• Limited opportunity for individual assets via transitional PRD

After June 1, 2018

• Dispatched economically – just like all other supply resources
• Both load reductions and increments of distributed generation located behind-the-meter can be monetized
Historical Demand Response Participation in ISO-NE

- **2003**
  - Pre-FCM Demand Response
  - Interruptible Load Programs:
    - 30-min
    - 2-hour

- **2010**
  - Full integration of demand response into Forward Capacity Market
  - RTDR & RTEG Dispatched only during a capacity deficiency

- **2012**
  - Transitional PRD Program for RTDR Assets to earn Energy Market revenues

- **June 1, 2018**
  - Full integration of PRD into Energy and Reserves Markets
  - RTEG removed
  - RTDR replaced with ADCR/DRR/DRA construct
PRD-FI Implementation Date

June 1, 2018

Replaces existing Transitional Demand Response program and is effective on the same date as FCM Pay-for-Performance

ER17-2164-000 Revisions to Implement Full Integration of Demand Response
Project Background
DR Participation in FCM Since June 2010

Passive non-dispatchable demand resources:
- Installed energy efficiency measures
- Installed behind-the-meter solar panels

Active dispatchable demand response resources:
- Reduce load for a specific time period
- Start or increment controllable distributed generation
Demand Resources Before PRD-FI

Active (demand response)

- RTDR and RTEG resources
- Resources actively dispatched by ISO to reduce demand during capacity deficiency
  - Resources consist of RTDR assets aggregated within 19 dispatch zones
- Transitional PRD RTDR assets optionally self-dispatch during high energy prices

Passive (demand reduction)

- On-peak and seasonal peak resources
- Not dispatched
  - Resources consist of assets aggregated within 8 load zones
- Reduce demand all the time
- Participate only in FCM, not other wholesale markets

PRD-FI Project impacts active demand resources only
Active demand response becomes price-responsive demand

- Participate in energy market directly via offers
  - May be committed in day-ahead
  - Dispatched in real-time
- Offers may have hourly granularity
- May participate in reserve markets
Full Integration of DR into Energy and Reserves Markets

**Energy Market**
Demand Response Resources (DRR) submit demand reduction offers into the Day-Ahead and Real-Time Energy Markets, and will be committed and dispatched when economic compared to other resources.

**Reserve Markets**
DRR can be co-optimized to provide energy and/or reserves to meet both energy and reserve requirements in the most economically-efficient manner.

**Forward Capacity Market**
All dispatchable resources, now called active demand capacity resources (ADCR) which consist of one or more DRRs, may receive fully-comparable obligations and compensation in FCM using Pay-for-Performance construct also effective on June 1, 2018.
Systems Affected and Key Changes
Process Changes

• Modeling changes
  – New: demand-response resource and demand-response asset
  – RTDR → active demand capacity resource
  – No more RTEG

• Registration
• Offers
• Baseline determination
• Performance measurement
• Auditing changes
• Manual and procedure updates
• Metering requirements
Current Demand Response Model

Transitional PRD program allows an RTDR asset to make an energy offer only if asset is mapped to RTDR resource participating in FCM.
PRD-FI: Fully Integrated Resource Structure

- **Active Demand Capacity Response (ADCR)**
  - CSO: 10 MW

- **Demand Response Resource #1**
  - Energy Offer: 6 MW @ $60

- **Demand Response Resource #2**
  - Energy Offer: 4 MW @ $600

- **Demand Response Resource #3**
  - Energy Offer: 7 MW @ $500

- **Facility #1**: Demand Response Asset #1
  - 3 MW

- **Facility #2**: Demand Response Asset #2
  - 4 MW

- **Facility #3**: Demand Response Asset #3
  - 5 MW

- **Facility #4**: Demand Response Asset #4
  - 7 MW

Can have an energy only resource not mapped to ADCR

Maximum of 1 asset per facility; homogeneous facilities with reductions < 10 kW in single DRR aggregation zone may be combined to form assets
Dispatch Zones vs. DRR Aggregation Zones

Active demand capacity resources are one or more DRR in same dispatch zone

DRAs may only be mapped to DRRs in the same dispatch and reserve zones (DRR aggregation zones)

Currently, only the Western CT dispatch zone is split by a reserve zone boundary making 20 total DRR aggregation zones
Registration Changes

• Customer Asset Management System (CAMS) will be updated and continue to be the registration system

• Asset data needed to determine location and capability of providing reserves
  – Physical location within the bulk power system
  – Metering details

• Registration of assets that consist of multiple facilities

• Cutover of existing RTDR assets to DRAs

• Creation of DRR and association of DRA to DRR

• Optionally map DRR to ADCR
DRR Offer Parameters Entered via eMarket System

• Flexibility similar to generating resources
• Offer parameters
  – Available/Unavailable
  – Notification Time
  – Start-up Time
  – Minimum Reduction
  – Maximum Reduction
  – Price/Quantity Pairs
  – Interruption Cost
  – Minimum Reduction Time
  – Min. Time Between Reductions
  – Ramp Rate
  – Offered Claim 10
  – Offered Claim 30

Blue text: These parameters are locked-down after the re-offer period on the day before the operating day

Most of these parameters can be offered with hourly granularity
Fast-Start Resources are Eligible for Offline Reserves

• DRRs are considered to be fast-start capable but must offer as fast-start DRR in order to get fast-start treatment

• DRR can offer as fast-start if:
  – \([\text{Notification time} + \text{start-up time}] \leq 30 \text{ minutes}\)
  – Minimum time between reductions and minimum reduction time \(\leq 1 \text{ hour}\)
  – Offered Claim 30 audit value \(> 0 \text{ MW}\)
  – Has a Claim 30 value \(> 0\) based on past audits and dispatches

• DRR offering as fast-start
  – Day-ahead commitment is financially binding but is not a dispatch order
    • Real-time dispatch algorithm will be the same whether it clears day-ahead or not

Will be designated for reserves even if not dispatched subject to meeting all conditions
DRR Not Offering as Fast-Start

• Can only provide reserves when dispatched and has begun to reduce load based on its offer
  – Will not be designated for reserves unless dispatched below maximum reduction
• Day-ahead clearing (or Reserve Adequacy Analysis [RAA]) becomes a real-time commitment and dispatch
  – Physical offer parameters are locked-down at time of commitment
  – Real time dispatch will be between offered minimum and maximum reduction
• If not cleared day-ahead and not committed during RAA, it can only be committed as a result of manual control room action (phone call)
Reserve Designations for DRRs

DRR may be designated for reserves based on registration and offer parameters, as well as past performance

• DRR may be designated to provide 30-minute operating reserves (TMOR) if offering as fast-start or dispatched below max reduction
• All DRAs associated with the DRR must provide ≤ 1 minute telemetry to provide 10-minute synchronized or 10-minute non-synchronized reserves (TMSR or TMNSR)
• If any DRA associated with a DRR has controllable generation, the DRR cannot be designated to provide TMSR
• Audits and past performance may limit DRR reserve designations
• TMSR will not be designated for a DRR not dispatched
Reserve Designations for DRRs, continued

• Dispatched DRR is assumed to be following desired dispatch point (DDP) for real time designation of any remaining reserves
• DRR can meet forward reserve obligations in same manner as generators
• Real time reserve designations may be reduced based on final meter data if data shows a portion of reserves were unavailable
  – DRA cannot provide more reserves than load plus any potential they have to provide net supply

Market Rule 1, III.9
DRA Metering Requirements

• DRA must be metered at retail delivery point (RDP)
  – Must provide 5 minute interval meter data in real time
  – If DRA is an aggregation of RDPs, aggregated meter data must be submitted in real time

• Totalized 5 minute interval metering required for any controllable synchronized generators at DRA
  – Can be submitted in real time and/or prior to correction deadlines
  – Used for analysis, not used for performance calculations

• For a DRR to be eligible for 10-minute reserves, additional metering requirement (≤ 1 minute telemetry at RDP) is required of associated DRAs
  – Providing 10-minute reserves is optional
DRA Baselines

• Unadjusted baseline (UBL) is calculated for each DRA everyday

• Current methodology continues for non-holiday weekdays
  – Ten day average taken from past 30 non-holiday weekdays
  – Most recent non-performance days used first, then dispatch days, then curtailment days if needed

• Baseline methodology extended to two additional day types, Saturday and Sunday/Holiday
  – 5 day average, maximum lookback of 42 calendar days
  – Non-performance days prioritized over performance or curtailment days

• Baseline adjustment period shortened to 3 intervals that ended prior to dispatch instruction, unless part of a prior dispatch

Market participants shall not take any action to create or maintain a Demand Response Baseline that exceeds the typical electricity consumption levels of its end-use metered customers expected in the normal course of business.
Dispatch instruction received at 10:29 with a 0 minute notification and 30 minute start-up time

Adjustment period
10:10 to 10:25

Actual load is much higher than the unadjusted baseline during the adjustment period

Baseline adjustment will increase the baseline to accurately calculate the demand reduction MW

Note: At the 30 minute point in this example (10:59), load = adjusted baseline. Based on this dispatch, this asset was not capable of providing 30-minute reserves.
Demand Response Market User Interface (DRMUI) Changes

• Asset-level baseline and performance information will be made available via DRMUI
  – Asset-level information will not be part of settlement reports
• DRR performance will also be made available via DRMUI
Audits

• Used for:
  – Commercial capacity and significant decrease determinations
  – Evaluation of reserves
  – Evaluating performance vs. offer parameters

• Performed at DRR level:
  – DR seasonal audits
  – Claim 10/30
  – Offer parameter
  – In some cases, a single audit or dispatch event will be able to be used for multiple audit types

• Have capability adjusted based on audit approval and asset mapping changes

• Use DR Audit and Test Tool (DR-ATT) that is being updated for PRD changes
## Major Manuals and Operating Procedure Changes

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<th>Manual Code</th>
<th>Title</th>
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<td>Market Operations</td>
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<td>M-28</td>
<td>Market Rule 1 Accounting</td>
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<td>M-36</td>
<td>Forward Reserve and Real-Time Reserve</td>
</tr>
<tr>
<td>M-MVDR</td>
<td>Measurement and Verification of Demand Reduction</td>
</tr>
<tr>
<td>M-RPA</td>
<td>Registration and Performance Auditing</td>
</tr>
<tr>
<td>OP-4</td>
<td>Action During a Capacity Deficiency</td>
</tr>
<tr>
<td>OP-14</td>
<td>Technical Requirements</td>
</tr>
<tr>
<td>OP-18</td>
<td>Metering and Telemetering Criteria</td>
</tr>
<tr>
<td>OP-23</td>
<td>Generator Resource Auditing</td>
</tr>
</tbody>
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Updates will be released prior to June 1, 2018
Performance During a Scarcity Condition

ADCR performance is:
• Measured just like generators
• Evaluated by determining actual energy and reserves underlying DRR delivered during scarcity condition
  – DRR performance is based on each underlying asset

Pay-for-performance during scarcity event:
• Over-performance – incentive payment
• Under-performance – penalty charge

FCM Performance Incentives whitepaper contains an in-depth description of the pay-for-performance mechanism
Timeline and Getting More Information
PRD Project Timeline
As of October 16, 2017

Dates are subject to change
Customer Readiness 12-Month Outlook

Last update: 11/03/2017

ISO New England undertakes many projects and initiatives in collaboration with stakeholders for the continued development of the region’s wholesale electricity markets. Listed below are upcoming major projects that may affect your organization over the next 12 months. Projects are added as they are scheduled; in some cases projects are scheduled and implemented in a shorter timeframe and may be added to the list close to their target launch. This page is generally updated on a monthly basis, though more frequent updates may be made in response to a significant change in the project plan.

- Click the names of near-term projects to see details on the project and actions required, as well as links to training materials and other resources.

- Click here to subscribe to the Customer Readiness mailing list to receive notifications when this page or the near-term project pages are updated. Hit send when the subscription email opens up.

- To follow the course of proposed projects and initiatives from introduction to implementation, see the Wholesale Markets Project Plan page and Key Project pages.

Near-Term Projects
## Longer-Term Projects

### (7-12 Months)

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<thead>
<tr>
<th>PROJECT</th>
<th>TARGET LAUNCH</th>
<th>CUSTOMERS AFFECTED</th>
<th>SYSTEM AFFECTED</th>
<th>SCOPE OF CHANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Update Enhanced Energy Scheduling (EES) Technical Architecture</strong></td>
<td>Q1 2018</td>
<td>All <em>Enhanced Energy Scheduling</em> (EES) software users</td>
<td>Enhanced Energy Scheduling (EES)</td>
<td>The new customer interface will be named New England External Transaction Tool and will be referred to using the acronym “NEXTTT.” Retire the use of EES Java Applet architecture and replace the current EES user interface with a new customer submittal platform.</td>
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<td>WebServices New file formats for data uploads and downloads will be available.</td>
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<td>CAMS Subaccounts Subaccounts created in CAMS will be available for assignment in the NEXTTT user interface. (See the Divisional Accounting project for more information on subaccounts).</td>
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<td></td>
<td>MIS Participants will be able to utilize existing informational Market Information Server (MIS) reporting by subaccount. (See the Divisional Accounting project for more information on subaccounts).</td>
</tr>
<tr>
<td><strong>Price Responsive Demand (PRD) Project</strong></td>
<td>Q2 2018</td>
<td>Market participants and demand-designated entities (DDEs) with <em>demand response (DR) assets</em></td>
<td>Customer and Asset Management System (CAMS)</td>
<td>DR entities will be assigned new asset and resource IDs to be converted to the three-level PRD entity model:</td>
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</table>
| Fully integrate demand response resources (DRRs) to participate in the energy and reserve markets and to be eligible for Forward Capacity Market (FCM) shortage event penalties or credits, as well as peak energy rents | | | |  ▪ Demand response assets (DRAs)  
▪ Demand response resources (DRRs)  
▪ Active-demand capacity resources (ADCRs) |
|  | | The concept of DRR aggregation zone nodes will be introduced. | | The concept of DRR aggregation zone nodes will be introduced. |
|  | | New user roles will be available for assignment in CAMS. | | New user roles will be available for assignment in CAMS. |
|  | | The new DRR IDs and the converted DRA IDs will automatically be assigned to the default subaccount. Participants that choose to use subaccount reporting for these entities will assign subaccounts at go-live. | | The new DRR IDs and the converted DRA IDs will automatically be assigned to the default subaccount. Participants that choose to use subaccount reporting for these entities will assign subaccounts at go-live. |
| **eMarket** | | | eMarket | New displays specific to DRRs will be available in the user interface (UI). |
|  | | | | Using the eMarket UI, DR market participants will:  
▪ Create portfolios, day-ahead (DA) schedules and real-time (RT) schedules  
▪ Submit DA and RT transactions |
|  | | | | Using the eMarket UI, DR market participants will:  
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<th>Description</th>
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<tr>
<td>Remote terminal unit (RTU)</td>
<td>RTUs will be upgraded and tested prior to go-live. The desired dispatch point (DDP) for each DRR will be included in the data to convey the requested consumption reduction below the DRR's adjusted baseline.</td>
</tr>
<tr>
<td>DR Audit and Testing Tool (DRATT)</td>
<td>Beginning in early May 2018, DR audits will be put on hold but requests will continue to be accepted for audits commencing June 1, 2018, or later.</td>
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<tr>
<td>ISO New England SMD Applications</td>
<td>Real-time demand response (RTDR) and real-time emergency generation (RTEG) will be removed from the Meter Reader UI.</td>
</tr>
<tr>
<td>Demand Response Market User Interface (DRMUI)</td>
<td>The DRMUI will allow download of three baseline types (weekday, Saturday, Sunday/Holiday), baselines for prior days, interval performance data by asset, and interval performance data by resource.</td>
</tr>
<tr>
<td>Baseline calculations</td>
<td>Baseline calculations for Saturdays and Sunday/DR holidays will use the five most recent uninterrupted like-days during the past 42 days rather than non-holiday weekdays as implemented June 1, 2017.</td>
</tr>
<tr>
<td>Forward Capacity Tracking System (FCTS)</td>
<td>Existing DR field labels in the UI will be updated to new PRD terms which will also display in historical views with the old DR data model.</td>
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ISO New England offers several email lists to help market participants and other stakeholders keep up with ISO and industry developments. To subscribe, click on a mailing list name, and hit send when the subscription email opens up.

General ISO and Industry Information

ISO Newswire
A monthly list of the most recent articles from the ISO's news blog, ISO Newswire

ISO Training
Announcements of training courses offered by the ISO

Customer Readiness
Notification of updates to the Customer Readiness 12-Month Outlook webpage or the near-term project pages listed therein, which discuss major upcoming ISO projects that require action from affected market participants

Notices
Subscribe to All Notices to receive all of the following mailing lists. Or, select only the

Questions?
Customer Support Information

**Ask ISO** (preferred)

- Self-service interface for submitting inquiries
- Accessible through the SMD Applications Homepage
- Requires a valid digital certificate with the role of Ask ISO/External User (Contact your security administrator for assistance)

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<th>Other Methods of Contacting Customer Support</th>
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<tr>
<td><strong>Method</strong></td>
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<tr>
<td>Email</td>
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<tr>
<td>Phone*</td>
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<tr>
<td>Pager</td>
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<tr>
<td>(emergency inquiries)</td>
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* Recorded/monitored conversations*