Demand Response in New York
Current successes and future direction

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There are nine Independent System Operators (ISO) and Regional Transmission Organizations (RTO) in North America.
Roles of the NYISO

Reliable operation of the bulk electricity grid
- Managing the flow of power on 11,000 circuit-miles of transmission lines from more than 300 generating units

Administration of open and competitive wholesale electricity markets
- Bringing together buyers and sellers of energy and related products and services

Planning for New York’s energy future
- Assessing needs over a 10-year horizon and evaluating projects proposed to meet those needs

Advancing the technological infrastructure of the electric system
- Developing and deploying information technology and tools to make the grid smarter
NYISO Metrics

- New York State population – 19.2 million
- 2013 load – 163,514 GWH
- 2014 Required Installed Capacity – 39,389 MW
- Record peak (*July 19, 2013*) – 33,956 MW
- Generating units – 300+
- High-voltage transmission – 11,000+ circuit-miles
- Average annual market transactions – $7.5 Billion
- Market Participants – 360+
Where We are Today

NYISO’s Current Demand Response Programs

Reliability Programs
- EDRP 198 @ 144 MW
- SCR 4834 @ 1746 MW

Economic Programs
- DADRP 4 @ 37 MW
- DSASP 1 @ 42 MW

Joint Enrollment (Market Overlap)
- DADRP & SCR
- DADRP & EDRP
- DSASP & SCR
- DSASP & EDRP
Shaving the Peak

New York Control Area Hourly Load
July 19, 2013

- In 2013, NYISO deployed Demand Response (SCR/EDRP) in southeastern NY every day during July 15-19 heat wave & statewide on July 18-19
- New record peak load (33,956 MW) set July 19, 2013 (with an estimated 1,070 MW of DR)
Distributed Energy Resources (DER) include

- Solar Photovoltaic (PV)
- Small, Behind-the-Meter generators
- Energy Storage Systems
- Combined Heat & Power
- Microgrid Systems
DER Investment

Numerous Reasons for DER Investment

• Economic Benefits:
  ▪ *Avoided costs, increased efficiencies, and access to new revenue streams.*
    o For customers, benefits are tied to incentive or market payments as well as avoided costs associated with electricity bills.
    o For utilities and regulators, benefits are tied to more efficient use of the grid and deferred investments.

• Deferred or Avoided Network Investments:
  ▪ *Avoided cost of expanding generation, transmission or distribution.*

• Resiliency:
  ▪ *Uninterrupted service in the event of loss of grid service.*

• Power Quality:
  ▪ *Ability to ride through transients and short-term interruptions.*

• Clean Energy:
  ▪ *Social, regulatory, and economic reasons to invest in low or no-emission DERs.*
  ▪ *Many customers are motivated to purchase clean DERs to support clean energy goals. Likewise, many utilities are doing the same (often, motivated by goals or explicit targets).*
  ▪ *The net effect on emissions, however, has to be investigated per system because the displacement of centralized generation can have different effects on total emissions.*
Products bought by DSPP might include:
- Modifications to base load
- Modifications to peak load
- Non-bulk ancillary services
- Contingency planning
- Other products to satisfy public policy requirements

Products bought by customers might include:
- Delivery services
- Pricing and billing services
- Metering and information services
- DER services
- Storage
DER - Impact on Load Profiles*

**Combined Heat & Power**
- Unit Output
- Heat Recovery
- Facility Grid Demand

**Non-Utility PV**
- PV Output

**Electric Vehicles**
- Charger Demand
- Household Demand
- Total Demand

**Non-Bulk Storage**
- PV Output
- Net Total Demand
- Battery Charging & Discharging Profile

* DNV-GL Study Report 2014
DERs can participate on the “supply side” as DR products and on the Demand Side as “price responsive load”

![Graph showing DER - Results in Elastic Demand]

- **Demand - No DER**
- **Supply - No DER**
- **Demand - With DER**
- **Supply - With DER**

**Elastic Demand Curve**

**Supply addition**

**Price ($/MWh)**

**MWh**
DER - Central Generation Displaced

DERs have the potential to “displace” some centralized units

<table>
<thead>
<tr>
<th>Plant Type</th>
<th>Ramp Rate (MW/min)</th>
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<tr>
<td>Coal plant</td>
<td>3</td>
</tr>
<tr>
<td>CCGT</td>
<td>15-25**</td>
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</table>

Source: Image adapted from Dynegy bondholder presentation, 2012

* This does not represent a NYISO bid stack
Effect of Dynamic Pricing

- **NYISO/Brattle Group Study - 2009**
  - Dynamic pricing can encourage shift to off-peak usage
  - Potential 10-14% reduction in system peak
  - Market-based customer cost reductions of 2-5%
  - Dynamic Pricing will help integration of Distributed Resources
Prof. Hogan’s Market Principles for Integrating DERs*

• The Role of a Distribution System Operator (DSO)
  – Any DSO should be independent.
  – The DSO should provide a non-discriminatory and open access structure for different supply and demand side solutions to participate in the distribution space.
  – DSO should facilitate the aggregation of DERs into the ISO run wholesale markets.

• Pricing
  – Customers should be exposed to real-time nodal prices to incentivize rational economic decisions.
  – There should be no compensation unless there was a forward commitment to procure a commodity.
  – Pricing should correspond to the time of the purchase of a quantity of commodity.
  – Capacity charges should be spread over only the peak hours.
  – Settlements should be done at more frequent intervals.
  – Fixed costs and variable costs should be kept separate not be comingled into a consumption based rate.

* Articulated at a meeting with NY Department of Public Service Staff – February 12, 2014
Integrating Distributed Resources into Wholesale Markets

- Wholesale electricity markets evolve with changes in economics, technology and public policy
  - Market designs have changed to integrate wind power, energy storage, grid-scale solar
- DER metering and communications infrastructure development essential to market and operations integration
- DER potential in energy, capacity, ancillary services markets on an aggregated basis
Value of Integration

Best of both worlds -- integrated system balancing centralized and distributed energy resources

ISO/RTO open access and stakeholder governance offer valuable forum for collaboration and cooperation
## Challenges

- Load forecast accuracy must be maintained to ensure market efficiency.
- Need to keep flexible resources with ramp capability in the market to respond to a potentially more dynamic load.
- The vast majority of PV in NY may be installed behind the retail meter and are unlikely to perform in response to market signals or grid conditions.
- DERs independently responding solely to price signals may degrade market or system efficiency or may possibly result in transmission security concerns if not integrated into system dispatch.

## Opportunities

- Potential to minimize demand peaks and the associated cost to meet those peaks.
- Integrate dispatchable DERs into planning and operations.
- Integrate solar forecasting capabilities into operations to facilitate the integration of PV.
- Develop end-to-end information exchange between distribution operators and DERs, and between the NYISO and distribution operators to monitor and control performance.
Evolution of DR in New York

Reliability and Dispatchable Demand Response Resource Types
(End State: A resource may only choose one category)

- EDRP (Voluntary Reliability Demand Resource)
- SCR (Mandatory Reliability Demand Resource)
- Capacity + DAM & RT Energy + Ancillary Services

Dispatchable Demand Resource
(For any combination of Capacity, Energy Market and Ancillary Service Market participation)
Markets & System Operations - Deeper

DER aggregation and Renewable integration

Aggregator

Evolutionary Market Design

Demand Response

Dispatch Instructions & Prices

NYISO Control Center

Wind/Solar Generators
Markets & System Operations - Smarter

Smart Grid Future

• Seamless integration of variable energy resources
  – Wind, solar, hydropower

• Dynamic price signals
  – Coordination between retail and wholesale electricity markets
  – Aggregation of retail loads

• Intelligent load responding to price
  – Plug-in hybrid vehicles
  – Advanced consumer components

• Enhanced control of power grid
What it takes to reach the Promised Land

• **Regulatory Convergence**
  – *Coordination and Integration of Retail and Wholesale regulatory rules and incentives*

• **Market Structure for Retail/Wholesale Integration**
  – *Market Structure*
  – *Business Processes*

• **Data Integration**
  – *Information Technologies*
    • Data Communications
    • Data Management
    • Enterprise Level Integration and Inter-operability
    • Intelligent Applications

![Diagram showing the components of what it takes to reach the Promised Land](image-url)
The New York Independent System Operator (NYISO) is a not-for-profit corporation responsible for operating the state’s bulk electricity grid, administering New York’s competitive wholesale electricity markets, conducting comprehensive long-term planning for the state’s electric power system, and advancing the technological infrastructure of the electric system serving the Empire State.

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