MINIMIZING DISTRIBUTED ENERGY RESOURCES (DER) ACQUISITION COST THROUGH AUCTIONS

34TH PLMA CONFERENCE: DISTRIBUTED ENERGY RESOURCE INTEGRATION INTEREST GROUP

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ABSTRACT

• As part of the Brooklyn Queens Demand Management initiative, Con Edison of New York committed to procure DER to defer investment in distribution system upgrades. CEONY is using an innovative descending clock auction approach to acquire DER to meet the required load reductions.

• To assist the utility, Con Edison retained Navigant for “Implementation of Auction to Create a Competitive Market for Distributed Energy Resource Solutions”

• Auction and market design activities took place earlier this year; four product auctions were conducted at the end of July.

• During this session I will discuss the:
  - Background
  - Applicability of the descending clock auction to acquisition of DER to achieve specific load shape objectives
  - Structuring of contracts to minimize performance risk
  - Design of the auction
  - Results from the auction
  - Lessons of experience
Brooklyn and Queens experienced the largest population growth in almost 100 years. Between 2010 and 2015, these two areas accounted for 57% of the population growth of New York state.

- Electric demand growth began to overload the capabilities of the subtransmission feeders serving Brownsville No. 1 and 2 substations
- Con Edison forecast that by 2018 the subtransmission feeders serving the area will be overloaded by 69 MW above the system’s current capabilities for approximately 40-48 hours during the summer months
- BQDM area is 85% residential accounts and the rest are mostly small commercial

<table>
<thead>
<tr>
<th>Change in Population, U.S. Census Bureau Estimates</th>
<th>April 2010 to July 2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>New York State</td>
<td>19,378,102</td>
</tr>
<tr>
<td>New York City</td>
<td>8,175,133</td>
</tr>
<tr>
<td>Bronx</td>
<td>1,385,108</td>
</tr>
<tr>
<td>Brooklyn</td>
<td>2,504,700</td>
</tr>
<tr>
<td>Manhattan</td>
<td>1,585,873</td>
</tr>
<tr>
<td>Queens</td>
<td>2,230,722</td>
</tr>
<tr>
<td>Staten Island</td>
<td>468,730</td>
</tr>
</tbody>
</table>

NYC as % of NYS: 42.2% to 43.2% (89.8%)

Sources: 2010 Census; U.S. Census Bureau Current Estimates Program
CASE STUDY: CON EDISON BQDM DR AUCTION

THE CHALLENGE: SOLUTIONS MUST ADDRESS 12 HOURS

BQDM networks are challenged by a long, flat peak driven by the residential/small commercial air conditioning load.

Source: Con Edison
CASE STUDY: CON EDISON BQDM DR AUCTION

BQDM DEFERS ~$1 BILLION IN TRADITIONAL SOLUTIONS

“This is the first time that the Commission is requiring a utility to actively and vigorously work to address growth in system demand in a manner other than through traditional utility investment.”

• On December 12, 2014, the Commission approved Con Edison’s BQDM Plan
• Instead, Con Edison planned to use a $200 million incentive program to defer nearly $1 billion in capital upgrades to build a new substation
  - Customer side: 41 MW, $150 million
  - Utility side: 11 MW, $50 million
• Utility expenditures treated as 10-year capital assets with regulated return, includes performance incentives
• “…Commission is making a significant step forward toward a regulatory paradigm where utilities incorporate alternatives to traditional infrastructure investment when considering how to meet their planning and reliability needs.”

CASE 14-E-0302 - Petition of Consolidated Edison Company of New York, Inc. for Approval of Brooklyn Queens Demand Management Program. ORDER ESTABLISHING BROOKLYN / QUEENS DEMAND MANAGEMENT PROGRAM (Issued and Effective December 12, 2014)
CASE STUDY: CON EDISON BQDM DR AUCTION
WHERE DOES DR FIT INTO THE BQDM PROGRAM?

BQDM program consists of a mix of “smaller, cheaper, nontraditional and ideally more environmentally friendly solutions” and includes load reduction to be sourced via competitive auction.

Illustration of how DR provides such critical load relief and how it is an important portion of the BQDM program portfolio of solutions; a portfolio that collectively enables deferral of the substation even while maintaining system reliability.

Sample BQDM 2016 Peak Day Load Curve
DR to be sourced through a competitive market acquisition process that would enable Con Edison to meet its BQDM program objectives.

- BQDM program objectives:
  - Provide grid benefits through reliable DER
  - Incent new DR entry and retain existing resources
  - Engage customers to actively manage their energy use
  - Test a competitive market mechanism to forward procure DR resources
  - Give an opportunity to DR resources for earning significant revenues for reliable performance with penalty mechanisms
  - Create incentive structure for DR resources to perform at high levels
CASE STUDY: CON EDISON BQDM DR AUCTION
WHY AN AUCTION?

Applicability of the auction to acquisition of DER to achieve specific load shape objectives

- In its petition for Approval of the BQDM Program, Con Edison acknowledged that per-MW unit costs are generally higher than previous network-oriented programs due to the complicated nature of the network conditions and the demographics of the area.
- Con Edison notes that the network peak is significantly longer than the peak durations of other targeted programs.
- Auction mechanism was therefore a tool to create a market event, drive participation and for price discovery.

Live auction mechanisms contemplated:
- **Descending Clock Auction (Dutch):** The auction starts at a high price and by design descends in pre-set increments until a price is reached that delivers the quantity sought.
- **Reverse Auction:** The auction open for a set period of time, bidders enter bids (or multiple bids) into the auction platform in real-time.

<table>
<thead>
<tr>
<th></th>
<th>Sealed Bid and RFPs</th>
<th>Reverse Auction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Competitive pressure in response to market signal</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Real Time Price Adjustments</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Price Transparency</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Price Discovery</td>
<td>Limited</td>
<td>Significant</td>
</tr>
<tr>
<td>Evaluation Process</td>
<td>Can be complex to evaluate</td>
<td>Complex to structure; simple to evaluate.</td>
</tr>
</tbody>
</table>
In order to participate in the BQDM DR Program there were three (3) categories of requirements:

- **Systems** – DR providers must have systems in place (namely phone, email, and Microsoft Excel) to receive event notifications, notify customers, and submit enrollments electronically.

- **Portfolio** – DR providers must enroll at a minimum 50 kW across their portfolio in order to participate in each product.

- **Financial** – DR providers will have to meet certain financial requirements (these are in place to protect Con Edison) since the program will have financial penalties as a mechanism to achieve the desired MW reductions upon which the communities will rely.
CASE STUDY: CON EDISON BQDM DR AUCTION

BQDM DR AUCTION MILESTONE DATES

Milestone dates from prequalification to capability period in 11 months for the 2017 product auctions

- June 2016 – Prequalification Opens
- July 20, 2016 – Pre-qualification Closes
- July 27, 2016 – 2017 DR Auction held
- February 15, 2017 – Aggregators notify Con Edison of deficiency amounts
- March 1, 2017 – Enrollment opens
- April 2, 2017 – Con Edison communicating interval meter must be installed
- April 3, 2017 – Enrollment closes – all applications and permitting due
- May 1 – Sept 31, 2017 Capability Period
CASE STUDY: CON EDISON BQDM DR AUCTION

DISPATCH

Reliability obligation to Con Edison
• Con Edison dispatch must be the primary obligation

Dispatch criteria
• DR planned events when BQDM networks are expected to peak
• Average: 3-6 events/year/product

Dispatch Mechanics
• Resources will be given 21 hours of notification
• Resources will be notified via email and phone
CASE STUDY: CON EDISON BQDM DR AUCTION
OPEN TO SOLUTIONS

Four Products were designed to balance simplicity and accommodate broader range of solutions.

<table>
<thead>
<tr>
<th>Products</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 2017 4 pm – 8 pm</td>
<td></td>
</tr>
<tr>
<td>2. 2017 8 pm – 12 am</td>
<td></td>
</tr>
<tr>
<td>3. 2018 4 pm – 8 pm</td>
<td></td>
</tr>
<tr>
<td>4. 2018 8 pm – 12 am</td>
<td></td>
</tr>
</tbody>
</table>
CASE STUDY: CON EDISON BQDM DR AUCTION
OPEN TO SOLUTIONS

Open technology philosophy with 20% limit on diesel generating equipment that applied to a DR provider’s total portfolio of DR resources.

**CURTAILMENT TECHNOLOGIES**
- No restrictions on curtailment strategies
- Encourage developing strategies that produce controlled reductions
- Encourage you to innovate

**GENERATION TECHNOLOGIES**
- DR providers’ responsibility to meet all local, state, and federal permitting requirements
- Require air permits for fossil fuel generators
- Will not accept generation exporting to the grid

**ENERGY STORAGE**
- DR providers’ responsibility to meet all local, state, and federal permitting requirements
- Encourage participants to reach out to Con Edison for discussion on baseline

Source: Con Edison
In order to participate in the BQDM DR Auction, DR Providers were required to submit a prequalification form and be approved by Con Edison.

Prior to the auction, bidders prequalified for one or more auctions by signing up to bid one or more quantities of load reduction using a prequalification form.

Prequalification form includes sections on:

1. General information about company / parent company
2. Plan for providing DR resources
   • Customer segment (residential, commercial, etc)
   • Technologies
   • Plan for acquisition
3. Agree to sign program agreement contract if a winner in any of the auctions
4. Credit and Capitalization information
**CASE STUDY: CON EDISON BQDM DR AUCTION**

**SECURITY REQUIREMENTS**

Posting of security was contemporaneous with execution of the program agreement

<table>
<thead>
<tr>
<th>Date Required</th>
<th>Program Milestones</th>
<th>Required Amount of Security*</th>
</tr>
</thead>
<tbody>
<tr>
<td>8/10/2016</td>
<td>2017 Auction</td>
<td>10% x Total 2017 Reservation Incentive</td>
</tr>
<tr>
<td>8/11/2016</td>
<td>2018 Auction</td>
<td>10% x Total 2018 Reservation Incentive</td>
</tr>
<tr>
<td>2/21/2017</td>
<td>2017 Enrollment</td>
<td>Lower of:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1) $150,000 x Total 2017 Portfolio Quantity (MW)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2) 30% x Total 2017 Reservation Incentive ($)</td>
</tr>
<tr>
<td>2/21/2018</td>
<td>2018 Enrollment</td>
<td>Lower of:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1) $150,000 x Total 2018 Portfolio Quantity (MW)</td>
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<td></td>
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</tr>
</tbody>
</table>
CASE STUDY: CON EDISON BQDM DR AUCTION

BQDM DR RESOURCE DEFICIENCY DECLARATION

• DR Providers may not necessarily have their complete portfolio at the time of the auction.
• The DR Resource Deficiency Declaration is a mechanism designed for DR Providers to reduce the size of their portfolio before the DR capability period.
• Allows DR Providers to avoid performance penalties during the capability period if they are unable to sign up customers for the quantity cleared in the auction.
• Early exit fee is incurred if DR Providers make a deficiency declaration.
CASE STUDY: CON EDISON BQDM DR AUCTION
MEASURING PERFORMANCE

BQDM performance measurement and penalties developed to offer flexibility AND encourage conservatism and high reliability.

- Baseline established:
  - Participants cannot use a strategy that increases usage outside of the auction product window without penalty
  - Penalty payments due to under performance are determined by an annual performance factor for performance factors below 85%; lower performance incurs a graduated increasing penalty

Source: Con Edison
CASE STUDY: CON EDISON BQDM DR AUCTION
MEASURING PERFORMANCE

All payment components will be made in a single payment after the capability period for both DR products within a given year.

- **Reservation payment** set by auction and subject to an annual performance factor ($/kW-capability period)
- **20% bonus reservation payments** if provider’s annual performance factor equals 100% ($/kW-capability period)
- **Performance payment** based on performance during events and tests set at $5/kWh
- **Penalty** for not delivering if annual performance factor < 85%

<table>
<thead>
<tr>
<th>Annual Performance Factor</th>
<th>100%</th>
<th>85%</th>
<th>80%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Performance Payment</td>
<td>10,000</td>
<td>10,000</td>
<td>10,000</td>
</tr>
<tr>
<td>Reservation Payment</td>
<td>450,000</td>
<td>450,000</td>
<td>450,000</td>
</tr>
<tr>
<td>Bonus Payment</td>
<td>90,000</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Penalty Payment</td>
<td>0</td>
<td>0</td>
<td>(28,125)</td>
</tr>
<tr>
<td>Net Reservation Payment</td>
<td>540,000</td>
<td>450,000</td>
<td>421,875</td>
</tr>
<tr>
<td>Net Revenue</td>
<td>550,000</td>
<td>450,000</td>
<td>431,875</td>
</tr>
</tbody>
</table>

*Tool posted for all participants to download*
CASE STUDY: CON EDISON BQDM DR AUCTION
SOLE MECHANISM, ALLOW MULTIPLE VALUE STREAMS

Con Edison received approval for a sole mechanism and permitted other value streams—provided requirements were met.

• Sole mechanism:
  - For 2017 and 2018, Con Edison received approval from the NY Public Service Commission to replace the CSRP in the BQDM area with the BQDM DR program

• Other value streams:
  - Con Edison did not restrict anyone from participating in another DR program as long as participants meet all the requirements of the BQDM DR program

https://www2.dps.ny.gov/ETS/search/searchSubmissionID.cfm?sub_id=2786385
CASE STUDY: CON EDISON BQDM DR AUCTION
AUCTION DESIGN

Reverse auction mechanism designed to reservation payment price only (bid quantities were established prior to the auction)

- **Auction**: An online auction controlled by a countdown clock. When the auction opens, the clock shows the time remaining until the end time. The end time will change if any late bids are placed.

- **Starting price**: Ceiling price.

- **Minimum bid decrement**: Each bid must be lower than the previous bid by the set decrement. Shown as “Min Dec” on Procurex auction platform bidding window.

- **Price vs. rank**: Each bidder is competing on price to improve their rank—the higher your rank (1 being the highest rank), the better chance you have of being selected for an award.

<table>
<thead>
<tr>
<th>Products</th>
<th>Ceiling Prices ($/kW-year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 2017: 8 p.m. - 12 a.m.</td>
<td>$1,250</td>
</tr>
<tr>
<td>2. 2017: 4 p.m. - 8 p.m.</td>
<td>$250</td>
</tr>
<tr>
<td>3. 2018: 8 p.m. - 12 a.m.</td>
<td>$1,000</td>
</tr>
<tr>
<td>4. 2018: 4 p.m. - 8 p.m.</td>
<td>$775</td>
</tr>
</tbody>
</table>
The auction mechanics included a straight price bid on prequalified capacity as well as alternative bid types

• Each bid quantity was constrained by a minimum of 50 kW and a maximum of 2,000 kW.
• Multiple bids were required to be structured in a way that, should all bids be selected the supplier would need to be capable of delivering the total quantity offered.
  - The only exception to the foregoing was mutually exclusive bids or all-or-nothing bids.
  - These two exceptions provided optional flexibility to bidders such that they could tie the results of the two auctions for a particular year (2017 or 2018) together
• Alternate bid types included:
  - Mutually Exclusive: they would either be awarded the higher clearing price of the two products for the particular year if they cleared both auctions for that year
  - All-or-Nothing: they would only be awarded for any year only if their bids cleared both auctions for that year.
• Bidders registered their bid types during prequalification.
Establishing a clearing price

- At the conclusion of the auctions for 2017 and 2018 we performed an analysis of the bids to establish a clearing price.
- Each Auction was awarded separately from the other auctions but after accounting for any linked bids (mutually exclusive or all-or-nothing).
- All suppliers who were awarded in a particular auction were awarded at the clearing price for that auction regardless of their actual final bids.

Hypothetical simplified clearing price example (Navigant example)
CASE STUDY: CON EDISON BQDM DR AUCTION
RESULTS

ConEd awards 22 MW of DR contracts in Brooklyn-Queens project (Utility Dive, Bloomberg).

- ConEd accepted offers for 22 MW of peak hour DR from 10 providers
- Payments ranged from $215/kW/year to $988/kW/year depending on the amount of power reduction and the demand management technology used
- “About 75% of the reductions are slated for the later [8 PM – 12 AM] period”

It now falls to those companies to sign up ConEd customers willing to reduce their usage during peak hours or deploy distributed technologies like solar or storage to cut their consumption.
CASE STUDY: CON EDISON BQDM DR AUCTION
LESSONS LEARNED

**Keep technology open.** Using a technology agnostic approach was a success factor as judged by the strong participation of energy storage system providers.

**Open, market facing, incentive-oriented frameworks** can support innovation and modernization as well as operations investments.

Utilities can **adapt to DER trends** and incorporate them into integrated resource planning and operations **without disrupting current model** (safe, reliable, affordable power).
Which distributed energy resource will be the most useful to utility operations by 2025?

- Solar PV
- Generator sets (e.g., diesel or natural gas-fueled)
- Energy storage
- Microgrids
- Vehicle electrification & charging services
- Demand response
- Energy efficiency

Sources: Navigant, Public Utilities Fortnightly
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