Maximizing the Value of Advanced Metering Infrastructure

Workshop with the Maryland Public Service Commission

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Smart Grid/Smart Rates
Smart Technology Will Allow Decentralized Consumer Level Solutions: How to Integrate?

Energy companies and consumers will increasingly make energy cost and risk management choices at the consumer and local levels.
What are the Goals for Smart Meter Technology and Data?

Lower prices and bills?

More customer choice and satisfaction?

Higher system reliability?

More resiliency?
DSM: A Measurable Impact on Demand

Including DSM in the forecast reduces peak demand growth by 35% over next 5 years

Source: Rebecca Craft, Consolidated Edison, Con Edison’s Use of Targeted Demand-Side Resource, May 14, 2015.
Grid Value from DER – Differentiate by:

• **Time**
  – Peaks and managing predictable solar, generation and consumption patterns

• **Location**
  – High marginal cost places

• **Attribute**
  – Unbundled energy, capacity, ancillary, RE
Better Load Data is Enabling Traditional Utility Planning to Meet Peak Demands

Source: Integral Analytics
What Customer and Grid Data is Collected, Organized, Maintained and Made Available? - and for What Purpose?

• Adapt to new technologies
• Facilitate change?
• Traditional utility model is to build T&D and generation to meet projected customer demands – modify to DER deployment too?
• Support consumer choice?
• Support competitive markets?
• How can data reduce grid costs?
Grid (or Utility)-Centered Data

1. **Distribution infrastructure data**, particularly data pertaining to distribution feeder characteristics.

2. **Transmission infrastructure data**, including from utilities, regulatory agencies, and grid operators, to identify infrastructure and resource needs.

3. **Aggregated consumer behavior data**, including real-time information on adjustments and devices in the home, to improve the implementation of ratepayer-funded efficiency programs.

4. **Aggregated customer energy data**, including data from multiple customers in key geographic or customer areas to help target energy efficiency policies and customer acquisition and service efforts.

Customer-Centered Data

1. **Utility meter data**, at intervals of _minutes or hourly levels going back _ months, to allow to verify energy savings after an efficiency measure has been completed.

2. **Energy audit data** generated by auditors, ESCOs, others who assessed the on-site assets of each building and its energy efficiency potential.

3. **“Internet” data** from internet-enabled home devices, such as high-tech “smart” thermostats and appliances, which can help a customer to manage energy usage based on real-time patterns, energy pricing, and needs.

4. **Utility tariff data**, which separate a customer’s charges into fixed charges, variable charges, and taxes, in a computer-readable format allow customers and third parties to access and analyze costs and benefits for various measures without the cost of manually decrypting the tariffs.

5. **Energy efficiency policy data** is required to determine measure-based savings based on efficiency projects.

6. Customer segmentation for each utility across usage and zones, would to inform third parties about market potential and lower customer acquisition costs for all sectors.

Source: Id.
Primary Barriers to Accessing Data

1. Lack of incentives for utilities to collect and share data
2. Lack of funding for aggregating and making that data accessible – expense of data management and standardization
3. Concerns about compromising customer privacy
4. Difficulties with Customer Adopt-In
5. Fear of cybersecurity breaches

Source: Id.
Enabling Technology and Services

Real cost rates work best with enabling technology – “Set and Forget”

Role of energy service companies?

Aggregators?
Enabling Technology Improves Price Response
Electric Vehicles

• New Utility Market
  But to encourage efficiency, EVs should be charged off-peak
• Provide multiple ancillary services
• Potential source of on-peak power (V2G)
San Diego’s Off-Peak Charging
The California ISO “Duck Curve”: Increasing Solar Means Steep Afternoon Ramping
Electricity Storage Costs and Capacity Varies by Technology

- Capital cost per unit of energy - $/kWh stored
- Capital cost per unit of power - $/kW Peak

- Distributed / demand-side
- Battery
- Grid-scale
Smart Meters/Distributed Generation

Track power flows of DG (PV’s) in both directions on interval basis to determine accurate billing (and value transactions)
Brooklyn Queens Demand Management (BQDM) Program

• Subtransmission feeders serving two networks in Brooklyn and one network in Queens overloaded
• Company developed multi-faceted solution to address forecasted overloads including:
  – Traditional utility solutions (e.g. load transfers)
  – Non-traditional customer and utility solutions (BQDM)
• BQDM filing on July 15, 2014 Order received on December 12, 2014
  – Commission approved $200m
    • Customer Sided 41 MW ($150m) and Utility Sided 11 MW ($50m)
    • Expenditures treated as 10 year capital assets with regulated return
    • Includes a 100 basis points bonus incentive per 3 performance metrics

Source: Rebecca Craft, Consolidated Edison, Con Edison’s Use of Targeted Demand-Side Resource, May 14, 2015.
Basic Customer Method:

ONLY Customer-Specific Facilities Classified as Customer-Related
Minimum System Method:

~50% of Distribution System Classified as Customer-Related
Straight Fixed/Variable:

100% of Distribution System Classified as Customer-Related
Comparing Methods

<table>
<thead>
<tr>
<th>Cost Category</th>
<th>Straight Fixed/Variable</th>
<th>Minimum System Method</th>
<th>Basic Customer Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poles</td>
<td>$10</td>
<td>$5</td>
<td>$-</td>
</tr>
<tr>
<td>Wires</td>
<td>$20</td>
<td>$10</td>
<td>$-</td>
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<tr>
<td>Transformers</td>
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<tr>
<td>Services</td>
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<td>Meters</td>
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<tr>
<td>Billing</td>
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<td>$2</td>
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</tr>
<tr>
<td>Customer Service</td>
<td>$2</td>
<td>$2</td>
<td>$1</td>
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<tr>
<td><strong>Totals</strong></td>
<td><strong>$46</strong></td>
<td><strong>$26</strong></td>
<td><strong>$4</strong></td>
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</tbody>
</table>
Principle #1

A customer should be allowed to connect to the grid for no more than the cost of connecting to the grid.
Principle #2

Customers should pay for the grid in proportion to how much they use the grid, and when they use the grid.
Principle #2

Customers should pay for power supply in proportion to how much they use and when they use it.
Principle #3

Customers delivering power to the grid should receive full and fair value – no more and no less.
Dynamic Pricing

• **Time of Use:** Set rates that include an off-peak, on-peak and sometimes a shoulder rate

• **Real Time Pricing:** Rates that may vary as frequently as hourly based on a price signal that is provided to the user on an advanced or forward basis, reflecting the utility’s cost of generating and/or purchasing electricity at the wholesale level. When used, usually applies to large customers. Requires Advanced Metering Infrastructure (AMI).

• **Critical Peak Pricing:** A TOU price that has a much higher price for a limited number of peak hours. (Requires AMI)
Dynamic Pricing

• **Variable Peak Pricing:** A hybrid of time-of-use and real-time pricing where the different periods for pricing are defined in advance, however, the price established for the on-peak period varies by utility and market conditions. (Requires AMI)

• **Peak Time Rebates:** Where customers are compensated on an incident by incident basis for reducing their load – voluntary program, no penalty for not participating

• **Industrial Interruptible Contracts:** Customer receives a reduced rate in exchange for providing the utility the opportunity to call on the customer to reduce load during system emergencies
Is Data for Peak Load Reduction?
Contrast Direct Demand Response with Dynamic Pricing

• **Dynamic pricing** can result in a steady, fairly reliable reduction in peak demand, thereby altering the daily load curve, but it cannot impact the need to reduce demand as a result of a specific event.

• **Active Load Control** can be employed to respond to specific emergency events to maintain reliability.
Contrast Direct Demand Response with Dynamic Pricing

In determining whether to use a dynamic pricing rate design or a direct demand response program, the question is whether you want to lower the peak demand curve and shift load, in which case changes are incorporated through the rate design, or whether you want to create a product that can be used to reduce demand when system peaks are getting too high.
Big Questions for States

• Who will pay and how?
• Who will benefit and how?
• What to do?
  o Work with utilities to re-engineer their power sector for the future
    • CA, NY REV, MN e21, Ontario, British Columbia
    • Issue: state jurisdiction and ability to work regionally
  o Set policy/regulation/incentives in the right direction and get out of the way
    • EE/RE/DER leadership today => competitive advantage tomorrow (lower costs, lower emissions, fewer risks, greater scalability, less infrastructure, multiple co-benefits, etc.)
About RAP

The Regulatory Assistance Project (RAP) is a global, non-profit team of experts that focuses on the long-term economic and environmental sustainability of the power sector. RAP has deep expertise in regulatory and market policies that:

- Promote economic efficiency
- Protect the environment
- Ensure system reliability
- Allocate system benefits fairly among all consumers

Learn more about RAP at www.raponline.org

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Transmission versus Decentralized Load Solutions

• Transmission solutions built to bring power, often from outside a local area, zone or node to local circuits
  – Increase utility rate base
  – Raise revenue to support utility revenue requirements
  – Reliability: T&D failure risk defined by load and peak projections
  – Price risk of unnecessary infrastructure borne by ratepayers
  – No Price signal for ratepayer/customer response

• NTA solutions build DER capacity to manage load within a local area, zone or node
  – Scaleable if load and peak projections are wrong
  – Reliability: T&D failure risk defined by DER adequacy and failure
  – Support for DERs often characterized as subsidy to specific technology and threat to utility revenue recovery
  – Resiliency benefits
Three Major Changes Being Considered to the Utility Business Model in NY

**Near term**

- **Modified “Clawback” Mechanism**
  - Allows utility to keep earnings from avoided CAPEX if can show DER was used instead
  - Allows ROE to be earned on OPEX related to DER
  - Resets at next rate case

**Long term**

- **Earnings Impact Mechanisms (EIMs)**
  - Performance-based incentives
  - Mostly to the upside
  - Focused on outcomes from enabling DER market

- **Market-Based Earnings (MBEs)**
  - Platform services revenue (monopoly functions)
  - Value-added services
  - Replace lost revenues from shrinking rate base

**These changes are all designed to encourage DER**

Establishes guidelines for earnings adjustment mechanisms (EAM) that look like Performance Incentives for:

- System efficiency (peak reduction and load factor improvement targets) to be proposed by each utility and may include complementary strategies to build load, improve load factor, reduce carbon emissions (including EVs, geothermal heat pumps, etc.)
- EE to be set by NY’s Clean Energy Advisory Council and allow positive earnings opportunities for utilities that exceed the developed EE targets
- Customer engagement
- Interconnection earning opportunity based on satisfaction surveys of DER providers and baseline interconnection timing requirements
- Affordability metrics and scorecards (not EAMs) with financial incentives to be established in each rate case. (p. 25)
CA DER Approaches I

• CA NEM revisions align NEM customers more with non-NEM
  – Pay interconnection fee of $75 to $150
  – Non-bypassable charge for energy consumers of 2-3¢/kWh
  – Must be on a time of use (TOU) rate

• Identifying location value for DERs
  – DRP proceeding (R.14-08-003) is focused on identifying optimal locations for DERs
  – Location net benefits analysis
  – Integrated capacity analysis for “hosting capacity”
  – Demonstration pilots (high DER penetrations, microgrids, storage)
CA DER Approaches II

Using nodal bidding model for DERs:

- DRP proceeding (R.14-10-003) is focused on procuring cost effective DERs
- “Sourcing” of cost-effective DERs initially through competitive solicitation
- Would allow ROR on DER contracts if cost less than the alternative
Distribution-ISO (D-ISO)?

- Consider independent entity to procure and control DER resources to provide for grid reliability at the distribution level.
- Similar RTO function at wholesale market level in procuring Demand Response but would operate at retail/distribution level.
- Ownership of NTA resources?
- Utility may could procure and control of resources – but how to deal with utility preference for rate base and higher ROR?