LOWERING ENERGY COSTS WITH NON-WIRES SOLUTIONS

WEDNESDAY, SEPTEMBER 18, 2019
2:00 PM ET / 1:00 PM CT / 12 PM MT / 11:00 AM PT
SPEAKERS

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Consolidated Edison
Lowering energy costs with non-wires solutions

Lisa Schwartz
National Conference of State Legislatures webinar
September 18, 2019
Agenda

- What are non-wires solutions?
- What is the distribution system?
- Why may states be interested in non-wires solutions?
- How do utilities consider them?
- How can they save consumers money?
- What actions have states taken?
What are non-wires solutions (or alternatives)?

- Investments in distributed energy resources (DERs) — energy efficiency, demand response, distributed generation and storage — that provide specific services at specific locations to defer, mitigate or eliminate the need for traditional transmission* and distribution (T&D) infrastructure. Focus today is on distribution.

- **A DER is a resource sited close to customers that can provide all or some of their immediate electric and power needs and can also be used by the system to either reduce demand (such as energy efficiency) or provide supply to satisfy the energy, capacity, or ancillary service needs of the distribution grid. The resources, if providing electricity or thermal energy, are small in scale, connected to the distribution system, and close to load.**

- **Examples include solar photovoltaic, wind, combined heat and power, energy storage, demand response, electric vehicles, microgrids, and energy efficiency.**

NARUC Staff Subcommittee on Rate Design, *Distributed Energy Resources Rate Design and Compensation Manual*

* For transmission, market operations also may serve as non-wires solutions.
What is the distribution system?

- Portion of electric system composed of medium voltage (up to 69 kV) lines, substations, feeders and related equipment
- Transports electricity to and from homes and businesses and links customers to high-voltage transmission system
- Physical infrastructure (transformers, wires, switches and other equipment) and cyber components (information, telecommunication and operational technologies needed to support reliable operation)

See Modern Distribution Grid - Volume III ("Resources" at back of slide deck)
Graphic from https://www.eia.gov/energyexplained/index.cfm?page=electricity_delivery
Why may states be interested in non-wires solutions?

- Utility distribution system investments are large.
- For investor-owned utilities, they account for the largest portion (30%) of capex: $37.5B in 2018

Source: Edison Electric Institute
States are responding to many drivers for improved distribution planning.

- More DERs — cost reductions, policies, new business models, consumer interest
- Resilience and reliability
- More data and better tools to analyze data
- Aging grid infrastructure and utility proposals for grid investments
- Need for greater grid flexibility in areas with high levels of wind and solar
- Interest in conservation voltage reduction and volt/VAR optimization
- Non-wires alternatives to traditional solutions may provide net benefits to customers
How do utilities consider non-wires solutions in electricity system planning processes?

- **Distribution planning** - Assesses needed physical and operational changes to local grid
- **Integrated resource planning** (vertically integrated states) - Identifies future investments to meet bulk power system reliability and public policy objectives at a reasonable cost
  - Can consider scenarios for DERs and impacts on need for, and timing of, utility resource investments
- **Transmission planning** – Identifies future transmission expansion needs and options for meeting those needs
DERs must be in the right place and operate at the right time to meet reliability needs.

- Value of DERs for the distribution system *depends on location*.  
  - Value may be associated with a distribution substation, individual feeder, section of feeder, or a combination of these components.  
  - Avoided distribution costs vary by area. DERs must be targeted to capture the highest value.

- DERs must operate at the *right time* to ensure they will relieve the identified constraint and provide generation or load reduction during the *peak day*.

'E3 study' for California using utility distribution planning information.
Considering non-wires solutions in distribution planning

- **Annual distribution planning process**
  - Identify and define distribution system needs
  - Identify and assess possible solutions
  - Select projects to meet system needs

- **Long-term utility capital plan**
  - Includes T&D solutions and cost estimates, typically over a 5- to 10-year period, updated every 1 to 3 years

- **Non-wires solutions are options for solutions to meet distribution system needs related to load growth, reliability and resilience.**
  - Typically consist of a large DER or a portfolio of DERs that can meet the specified need
  - Screening tools used by CA, NY are publicly available (snapshot in “Extra Slides”)
How can non-wires solutions save energy costs?

- Defer or avoid infrastructure upgrades
- Implement solutions *incrementally*, offering a flexible approach to uncertainty in load growth and potentially avoiding large upfront costs for load that may not show up
- Typically, the utility issues a **competitive solicitation** for non-wires solutions for specific distribution system needs and compares these bids to planned traditional grid investments (e.g., distribution substation transformer) to determine the lowest reasonable cost solution, including implementation and operational risk assessment.

- **Locational net benefits analysis** systematically analyzes costs and benefits of DERs to determine the net benefits DERs can provide for a given area of the distribution system.
Valuation of DERs as non-wires solutions began several decades ago.

- Methods were developed in the 1990s to value DERs for deferring or avoiding distribution capacity. At that time, utilities began to test targeting and deploying DERs as non-wires solutions and conducted evaluations. Transmission providers (e.g., Bonneville Power Administration) also have considered non-wires solutions for some projects.

- Lessons learned
  - **Value.** Value of DERs for avoiding or deferring capital upgrades may not be large for areas with high load growth where significant capacity is needed. *The highest value opportunities for deferral are where low load growth is driving the utility towards large capital investments, and there is significant value per kilowatt of peak load relief.*
  - **Timing.** Sufficient time is required to deploy non-wires solutions, to make sure they are online before the constraint occurs and to verify reliable operation at the time needed — e.g., see New York Joint Utilities suitability criteria:
    - 18-24 mos. for projects $300k* to $1M
    - 36-60 mos. for projects over ≥ $1M

*Transaction costs may be too high for projects smaller than this threshold. DER aggregation can solve that problem.*

Source: Adapted from E3, prepared for Berkeley Lab
State engagement in distribution system planning is increasing.

- For example, requirements for utilities to:
  - Report on poor-performing circuits and improvement plans
  - File distribution system or grid modernization plans with public utility commissions (PUCs)
  - **Consider non-wires alternatives (CA, CO, HI, ME, MN, NV, NY, RI)** – *Examples in next slides*
    - Proceedings, pilots and studies in several *additional* states (e.g., see OR in “Extra Slides”)
AB 327 (2013) requires electric utilities to submit distribution resources plans (DRPs) to “identify optimal locations for the deployment of distributed resources,” including:

“Evaluate locational benefits and costs of distributed resources ... based on reductions or increases in local generation capacity needs, avoided or increased investments in distribution infrastructure, safety benefits, reliability benefits, and any other savings the distributed resources provides to the electric grid or costs to ratepayers....”

PUC order on DRPs (2014) established guidance to utilities

PUC approved a Distribution Investment Deferral Framework (DIDF, 2018) to identify and capture opportunities for DERs to cost-effectively defer or avoid utility investments planned to mitigate forecasted distribution system deficiencies.

- Includes annual Grid Needs Assessments and Distribution Deferral Opportunity Reports that identify distribution upgrades that could be deferred with DERs
- Advisory Group identifies candidate distribution deferral projects for competitive solicitation
- PUC approved 1st requests for offers (RFOs) in February for SCE, PG&E and SDG&E
- Locational Net Benefits Analysis – Avoided Cost Calculator for system-level values, plus location-specific methods

Source: PG&E presentation on 2019 RFO for 10.6 MW support of local distribution capacity relief in three 3 areas in central California
SB 19-236 requires PUC to promulgate rules establishing filing of a distribution system plan (DSP), including:

- Methodology for evaluating costs and net benefits of using DERs as Non-Wires Alternatives (NWAs)
- Threshold for size of new distribution projects
- Requirements for DSP filings, including:
  - Consideration of NWAs for new developments (>10,000 residences)
  - Load forecasts from beneficial electrification programs
  - Forecast of DER growth
  - Planning process for cyber and physical security risks
  - Proposed cost recovery method
  - Anticipated new investments in distribution system expansion
  - Economic impacts of NWAs
  - Estimated year when peak demand growth merits analysis of new NWA projects
- Public interest in approval of NWAs
- Ratepayer benefits from NWAs
- Benchmarks or accountability mechanisms

Xcel Energy hosting capacity map (Denver area)
PUC ordered Hawaiian Electric Companies (HECO) to issue competitive solicitations for grid services from customer-sited DERs.

- Instead of developing planning estimates of cost
- To replace capacity, energy and ancillary services (e.g., contingency reserves) from two fossil-fuel generating plants planned for closure

HECO Integrated Grid Planning merges planning processes for generation, T&D

- Integrates procurement of non-wires solutions and grid-scale resources
- Identifies system needs, coordinates solutions, and develops optimized, cost-effective portfolio of assets
- Stakeholder council, technical advisory panel, working groups

Utility evaluates, scores and ranks bids

- 50/50 weighting for price ($/kW) and non-price criteria
- Eight non-price criteria

HECO selects short list of highest ranked proposals, then solicits best and final offers from proposers

Battery storage. Source: Sandia National Laboratories
Minn. Stat. §216B.2425 requires utilities to submit biennial T&D plans to the PUC.

- Xcel Energy must “identify in its report investments that it considers necessary to modernize the transmission and distribution system by enhancing reliability, improving security against cyber and physical threats, and by increasing energy conservation opportunities by facilitating communication between the utility and its customers through the use of two-way meters, control technologies, energy storage and microgrids, technologies to enable demand response, and other innovative technologies.”

- And “conduct a distribution study to identify interconnection points on its distribution system for small-scale distributed generation resources and shall identify necessary distribution upgrades to support the continued development of distributed generation resources”

PUC established Integrated Distribution Planning requirements for Xcel Energy in Docket No. 18-251 and for smaller regulated utilities including:

- For projects >$2M, analyze how non-wires solutions compare with traditional grid solutions in terms of viability, price and long-term value

- Specify distribution system project types (e.g., load relief or reliability) as well as timelines, cost thresholds and screening process for NWS

- Xcel Energy filed its first Integrated Distribution Plan in November 2018
SB 146 (2017) requires utilities to file distributed resource plans (DRPs) to evaluate locational benefits and costs of distributed generation, energy efficiency, storage, electric vehicles and demand response technologies.

- “...based on reductions or increases in local generation capacity needs, avoided or increased investments in distribution infrastructure, safety benefits, reliability benefits and any other savings the distributed resources provide to the electricity grid for this State or costs to customers of the electric utility or utilities.”

- DRP identifies standard tariffs, contracts or other mechanisms for deploying cost-effective distributed resources that satisfy distribution planning objectives.

- DRP filed with integrated resource plan and covers utility’s three-year IRP action plan.


- 6-year forecast of net distribution system load (down to feeder level) and distributed resources.

- Hosting capacity analysis with online maps.

- Grid Needs Assessment compares traditional and DER solutions for forecasted T&D system constraints.

- “A utility may recover all costs it prudently and reasonably incurs in carrying out an approved DRP, in the appropriate separate rate proceeding.”

NV Energy filed 1st DRP in April 2019 as amendment to 2018 IRP.
Contact

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Electricity Markets
and Policy Group

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https://emp.lbl.gov/

Click here to stay up to date on our publications, webinars
and other events and follow us @BerkeleyLabEMP
Resources

U.S. Department of Energy's (DOE) Modern Distribution Grid guides


Regional trainings for PUCs and state energy offices: New England, MISO footprint, West, Mid-Atlantic

Alan Cooke, Juliet Homer, Lisa Schwartz, *Distribution System Planning – State Examples by Topic*, Pacific Northwest National Laboratory and Berkeley Lab, 2018


Berkeley Lab’s *Future Electric Utility Regulation reports*

Berkeley Lab’s *research on time- and locational-sensitive value of DERs*
EXTRA SLIDES
Non-wires Alternatives in Oregon

- **Staff white paper** lays out proposed distribution planning process
- **PUC proceeding** underway
- **Surveyed utilities** and **stakeholders** on distribution planning strategies and practices
- Pacific Power and Energy Trust of Oregon* pilot targeted energy efficiency to defer a substation upgrade.
  - Measure peak demand savings
  - Evaluate ability to replicate strategies in other regions served by utility
  - Develop processes for coordinated implementation
  - Determine needed changes to improve targeted efficiency deployment to defer system upgrades

*Third-party administrator for energy efficiency programs
### Project Applicability
- The nature of the problem and whether DER can solve it
- Whether there is time to implement a targeted DER program in the area
- The potential value for avoiding the investment
- Marginal avoidable cost ($/kilowatt)

### Project Timeline
- Whether there is time to implement a targeted DER program in the area

### Project Cost
- The potential value for avoiding the investment
- Marginal avoidable cost ($/kilowatt)

### Maximum Incentive Levels
- Marginal avoidable cost ($/kilowatt)

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**Capacity Expansion DER Screening Checklist**

#### Project Name
Example Substation

#### In Service Date:
2018

#### Description
Analysis - Avoid distribution ties and New Example sub

#### Author

#### Date of Review:

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### Project Applicability
1. Can load reduction or generation solve this problem?
   - Yes
   - If no, please identify the main project driver(s) below:
     - Replace obsolete / aging equipment
     - Correct poor reliability problem
     - Improve reliability through secondary source etc.
     - Comply with PSC standards
     - Work at the request of others
     - Safety
     - Add operational flexibility
     - Other:

2. Is the project entirely within ISO or FERC jurisdiction?
   - No
   - If yes, stop

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### Project Timeline
- Current Date
- Project Commitment Date
- Project in-Service Date

#### 2/1/2016

#### RFP Lead Time (months)
- 2/1/2017
- Construction Lead time
- 5/1/2018

<table>
<thead>
<tr>
<th>Year</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energized Year</td>
<td>1,162</td>
<td>1,340</td>
<td>960</td>
</tr>
<tr>
<td>Total Cost ($000)</td>
<td>2,393</td>
<td>2,359</td>
<td>960</td>
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<tr>
<td>Excluded cost ($000)</td>
<td>1,162</td>
<td>1,340</td>
<td>960</td>
</tr>
<tr>
<td>Net Cost ($000)</td>
<td>1,231</td>
<td>1,019</td>
<td>0</td>
</tr>
</tbody>
</table>

#### Exclude land costs, if there are risks of land cost increases or loss of parcel availability

### Project Cost
- All costs in constant dollars

<table>
<thead>
<tr>
<th>Expense</th>
<th>Year</th>
<th>Energized Year</th>
<th>Total Cost ($000)</th>
<th>Excluded cost ($000)</th>
<th>Net Cost ($000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equipment (Select)</td>
<td>2016</td>
<td>2018</td>
<td>1,162</td>
<td>1,162</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>2017</td>
<td>2018</td>
<td>1,340</td>
<td>1,340</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>2017</td>
<td>2018</td>
<td>960</td>
<td>960</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>2018</td>
<td>2018</td>
<td>6,337</td>
<td>-</td>
<td>6,337</td>
</tr>
</tbody>
</table>

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### Avoidable Cost Levels - Contract

#### DER Peak Load reduction (MW) needed to defer the project

<table>
<thead>
<tr>
<th>Year</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
<th>2022</th>
<th>2023</th>
<th>2024</th>
<th>2025</th>
<th>2026</th>
<th>2027</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum Total MW</td>
<td>5.0</td>
<td>5.5</td>
<td>5.9</td>
<td>6.4</td>
<td>6.8</td>
<td>7.3</td>
<td>7.7</td>
<td>8.2</td>
<td>8.6</td>
<td>9.1</td>
</tr>
</tbody>
</table>

#### Avoidable Costs

<table>
<thead>
<tr>
<th>Year</th>
<th>1 Year</th>
<th>2 Year</th>
<th>3 Year</th>
<th>4 Year</th>
<th>5 Year</th>
<th>6 Year</th>
<th>7 Year</th>
<th>8 Year</th>
<th>9 Year</th>
<th>10 Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>$/kW (contract)</td>
<td>$97.72</td>
<td>$173.99</td>
<td>$234.00</td>
<td>$281.47</td>
<td>$319.10</td>
<td>$348.94</td>
<td>$372.52</td>
<td>$391.03</td>
<td>$405.40</td>
<td>$416.38</td>
</tr>
<tr>
<td>$/kW-yr (level)</td>
<td>$97.72</td>
<td>$89.65</td>
<td>$82.81</td>
<td>$76.95</td>
<td>$71.85</td>
<td>$67.39</td>
<td>$63.46</td>
<td>$59.95</td>
<td>$56.81</td>
<td>$53.99</td>
</tr>
<tr>
<td>Maximum Incentive</td>
<td>$488,605</td>
<td>$948,230</td>
<td>$1,380,595</td>
<td>$1,787,316</td>
<td>$2,169,914</td>
<td>$2,529,620</td>
<td>$2,868,380</td>
<td>$3,186,860</td>
<td>$3,486,451</td>
<td>$3,768,273</td>
</tr>
</tbody>
</table>

6. Is the total avoidable cost in any year greater than $___ /kW
7. Is the project sum of avoidable cost over all years greater than $___ / kW
8. Are either or both questions "yes"?

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### Recommendation

#### Candidate for RFP? (Y/N):

#### If no, reason:

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### Source:
Adapted from E3, prepared for Berkeley Lab; table from Orange & Rockland (NY)
Non-Wires Solutions

Lori Lybolt
Utility of Future Team
September 18, 2109
Today’s focus

Consolidated Edison, Inc. (ED)

Assets: $54B
Market Cap: $24.5B
Revenue: $12B

Utilities
A$43.2B (90%), R$11.3B (94%)

Consolidated Edison Company of New York, Inc. (CECONY)
A$40.5B (84%), R$10.47B (87%)

Orange and Rockland Utilities, Inc. (O&R)
A$2.8B (6%), R$0.9B (7%)

Rockland Electric Company (RECO)

Clean Energy Businesses
A$2.7B (6%), R$0.7B (6%)

Con Edison Clean Energy Businesses, Inc.

Con Edison Transmission
A$1.2B (2%), R$3M (0.02%)

Con Edison Transmission, Inc.

Con Edison Gas Pipeline and Storage, LLC

Consolidated Edison Development, Inc.

Consolidated Edison Solutions, Inc.

Consolidated Edison Energy, Inc.

Consolidated Edison Transmission, LLC
NYC Area Energy Transmission & Distribution

- ~9.1M population; ~1.9K-square-mile area

Electric
- 3.7M customers
- 97.5K miles underground cable
- 38.8K miles overhead cable
- 40% of NYS peak

Steam
- 1,650 customers
- 105 miles of pipes
- 23B pounds per year
- Largest district in US

Natural Gas
- 1.2M customers
- 9.9K miles of pipes

Total
- 4.9M+ customers
- 136.3K miles of cable
- 10K miles of pipes
• The NYC metro area creates about 9% of the U.S. GDP – home to 10% of the Fortune 500

• Peak demand of 13,320 MW – 215 MW per square mile in Manhattan

• Average monthly residential electricity use in our service territory is a third of the national average (at 300 kWh/month)

• New York State spends less on energy and generates fewer greenhouse gases per capita than any state in the nation (EIA)
New York State has ambitious 2030 goals with three focus areas.

- **40%** Reduction in GHG Emissions from 1990 Levels
- **50%** of Electricity Generation from Renewable Energy Resources
- **23%** Increase in Statewide Energy Efficiency in Buildings
NEW YORK STATE ADVANCING CLEAN ENERGY
50x30 State’s Clean Energy Standard

Requires all electricity suppliers to buy a portion of their power from renewable and qualified nuclear resources.

<table>
<thead>
<tr>
<th>Renewable Energy Credits</th>
<th>Zero Emissions Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>• NYSERDA to procure RECs via 20-year REC-only contracts; resale to LSEs</td>
<td>• First-of-its-kind solution to prevent premature nuclear retirements</td>
</tr>
<tr>
<td>• Wind, solar, biomass, and distributed renewables built since Jan. 1, 2015</td>
<td>• Upstate nuclear units, with future eligibility for Indian Point</td>
</tr>
<tr>
<td>• Out-of-state eligible if deliverable to NY</td>
<td>• Price based on Social Cost of Carbon</td>
</tr>
</tbody>
</table>
NEW YORK STATE ADVANCING CLEAN ENERGY
What does 50x30 really mean?

**Solar Only**
- 25,000 MW of solar installed capacity
- Would cover all of the 5 boroughs with solar panels

**Wind Only**
- 15,000 MW of wind installed capacity
- Would cover all of Long Island plus NYC with wind projects

**Hydro Only**
- 4,000 MW of hydro
- Roughly the size of two Hoover Dams
**NEW YORK STATE ADVANCING CLEAN ENERGY**

**Offshore Wind**

New York State announced ambitious goals for Offshore Wind, 9,000MWs by 2030

<table>
<thead>
<tr>
<th>2018-2020</th>
<th>2021-2023</th>
<th>2024-2026</th>
<th>2027-2030</th>
<th>2030-2035</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase I – 800+ MW</td>
<td>NYSERDA RFPs</td>
<td>OSW online</td>
<td>OSW developer responsible for transmission connection to shore</td>
<td></td>
</tr>
</tbody>
</table>

Phase II – 1,600+ MW (2,400 total MW)

- NYSERDA RFPs
- OSW online
- Opportunity to consider transmission options

Phase III – up to 6,600 MW (9,000 total MW)

Will be impacted in part by transmission solutions in Phases I and II
A competitive process for Phase II transmission can improve feasibility of achieving goals while reducing costs and environmental impacts.
**Utility Business Model**

Economic incentives for Utilities that are aligned with clean energy policy objectives.

<table>
<thead>
<tr>
<th>Traditional rate base opportunities</th>
<th>New rate base opportunities</th>
<th>Earnings adjustment mechanisms</th>
<th>Platform service revenues (PSRs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Pipes &amp; wires</td>
<td>• Regulatory assets</td>
<td>• System efficiency</td>
<td>• Marketplace transaction fees</td>
</tr>
<tr>
<td>• Regulated return on hard assets</td>
<td>• DSP and software</td>
<td>• Energy intensity</td>
<td>• AMI network use</td>
</tr>
<tr>
<td></td>
<td>• Energy storage</td>
<td>• Interconnection</td>
<td>• Other</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Carbon reduction</td>
<td></td>
</tr>
</tbody>
</table>

*Non-wires alternatives and demonstration projects*
**REFORMING THE ENERGY VISION (REV)**

**Utility Distribution System Platform (DSP)**

REV’s main theme focused on integration of distributed energy resources.

| 1 | Integrate individual resources |
| 2 | Integrate resource portfolios |
| 3 | Integrate markets |

**Customer resources & behavior**

**Utility business & operations**

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*Image: conEdison, inc.*
We expedited the interconnection process to integrate individual resources.

- Launched June 2016
- PV up to 25kW
- Approval to build in < 1 hr
RE FORMING THE ENERGY VISION (REV)
Utility dispatches portfolio to meet distribution system needs

We integrated distributed energy resources into our planning process to defer traditional infrastructure.
REFORMING THE ENERGY VISION (REV)

REV demonstration projects testing innovative ideas

We are integrating markets and testing new business models to enable distributed energy resources.

- Connected Homes
- Beyond ‘Behind the Meter’
- Storage on Demand
- Building Efficiency Marketplace
- Smart Home Rates
- EnergyFit
- EV Fast Charging
- Vehicle to Grid (V2G)
- Electric Buses
Vehicle-to-grid (V2G) school bus

We are testing innovative ways to provide grid services by using batteries in school buses.

- Five Lion Electric Type D electric school buses serving White Plains School District
- Con Edison will cycle bus batteries for grid services and observe viability of vehicle-to-grid model including impacts on battery
- 95% bus uptime during 2018-2019 school year
- Key technology partner replaced
  - Modification from off-board to on-board inverters.
  - V2G delay from summer to fall 2019
- Project a collaboration with: Lion Bus, Nuvve, National Express, and First Priority

Lion bus in Manhattan
We integrated distributed energy resources into our planning process to defer traditional infrastructure.
NON-WIRES SOLUTIONS CASE STUDY

Brooklyn Queens Load Relief Need

The BQDM challenge: solution must meet 12 hour distribution capacity shortfall.

### BQDM Feeder Capability vs Forecasted Customer Demand

- **Feeder Capability**
- **Shortfall**
- **2018 Forecasted Peak Demand Curve**
- **2023 Forecasted Peak Demand Curve**

### System Load Relief Need

- **52 MW Demand Reduction**
  - 12 MW Load Reduction by May 2016
  - 31 MW Load Reduction by May 2017
  - 9 MW Load Reduction by May 2018

**1 MW can power 1,000 homes**
We deferred $1.2 billion investment in traditional network upgrades with distributed solutions.

- Peak growth in 3 networks in Brooklyn-Queens
- In 2014 started $200 MM DER incentive program, 52 MWs
  - Customer-sided (41 MW, $150 MM)
  - Utility-sided (11 MW, $50 MM)
- In 2017 extended program timeline, program continues today
We engaged customers to develop the portfolio of behind the meter assets.

- Energy Efficiency
- Battery storage
- Thermal storage
- Solar
- Fuel cells
- Combined heat and power generators
- Demand Response
Customer sited resources located in low income apartment building.

- Lowers customer bills
- Meets system need during defined time
- Certainty via load reduction guarantees in contract
NON-WIRES SOLUTIONS CASE STUDY

BQDM Utility Resource Example: Battery Storage

Utility owns and operates 2MW, 12MWh Lithium Ion battery storage project.
NON-WIRES SOLUTIONS CASE STUDY

Process for Non-Wires Solutions

We developed a standardized framework to meet objectives and drive least cost for customers.