ONCOR VISION FOR ENERGY STORAGE

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For North Texas Renewable Energy Group

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OUR ROLE IN THE MARKET

- Competitive ERCOT wholesale and retail electric energy market since 2002 for investor-owned players

- Regulated delivery utilities – do not generate, own, or sell electricity

Reliable delivery through the application of technology
TEXAS’ CHALLENGE: POWERING OUR FUTURE GROWTH

26M PEOPLE
2014

50M PEOPLE
2050

INCREASED INVESTMENTS

INCOME GROWTH

7 OF THE FASTEST GROWING AREAS IN THE U.S

AUSTIN
DFW
HOUSTON
SAN ANTONIO
MIDLAND
ODESSA
LONGVIEW

FORBES FASTEST GROWING CITIES (FEB. 2014); FORBES FASTEST GROWING SMALL CITIES (SEPT. 2014)

TEXAS LEADS:

COMPETITION 1999
ENERGY INFRASTRUCTURE 2005
ADVANCED METERS 2005
ENERGY STORAGE NEXT STEP

ENERGY STORAGE WILL BRING

- RELIABILITY
- AFFORDABILITY
- FLEXIBILITY
- EFFICIENCY
- INDEPENDENCE
- SECURITY

ONCOR
Grid integrated energy storage is the only technology that allows utilities to accomplish all of the following:

- Improve reliability by providing backup power during short-term outages
- Defer transmission and distribution investment through extending grid element life and optimization of system
- More efficiently and flexibly use existing power resources
- Improve voltage regulation
- Address renewable integration and grid stability
Based on PUC-approved plans, utilities would install energy storage throughout the grid, resulting in improved reliability. Customers' costs would be offset by an auction of this capacity to the competitive market, which could then provide power to customers when they need it the most.
INDIVIDUAL VALUE STREAMS CREATED BY STORAGE

**MARKET**
Renewable generation smoothing and dispatch
Demand and time-of-use energy management
Electric supply reserve capacity
Peak shaving/load following
Fast response ancillary services
Capacity firming
Frequency regulation
Energy arbitrage
Phase balancing
Carbon reduction

**RELIABILITY**
Support local grid during outages
Reduce SAIDI, MAIFI, SAIFI
Volt/VAR support – manage voltage & correct power factor to unity
Reduce cold-load pickup after grid outage
Transmission congestion relief
T&D asset investment deferral
Renewables grid integration

**CUSTOMER**
Increased reliability
Increased grid efficiency and flexibility
Technologically advanced grid infrastructure
Lower customer bills
UTILITY EXPERIENCE WITH ENERGY STORAGE

ONCOR’S INITIAL INSTALLATION

SAMPLE OF UTILITY PROJECTS

- Department of Energy
- Detroit Edison
- Duke Energy
- Pacific Gas & Electric
- San Diego Gas & Electric
- Southern Cal Edison
- United Kingdom
- Italy
NEIGHBORHOOD STORAGE RELIABILITY INITIATIVE

Our Goal
Oncor has a goal to implement technologies, facilities, and operating procedures that improve distribution reliability, safety, efficiency, and the customer experience.

Purpose
The Neighborhood Storage Reliability Initiative will evaluate the effectiveness of deploying small-scale battery storage for the purpose of bridging short duration outages and improving local power quality.

Project Details
Six 25 kW Lithium Ion batteries have been installed, tested and monitored.

Capacity
These batteries are capable of bridging outages up to a few hours duration.

Project Timeline
Installations occurred Q2, Q3 and Q4 2014.

*Source: S&C Electric Company*
BENEFITS OF NEIGHBORHOOD STORAGE RELIABILITY INITIATIVE

Neighborhood storage is a localized means of:

1. Keeping the lights on during short-term outages.
2. Closing the gaps and smoothing the variations between local household loads and renewable power sources.
3. Enhancing the quality of power delivered to customers.
4. No on-peak or EEA event recharging.

The Neighborhood Storage Initiative is one element of Oncor’s efforts to improve distribution reliability.
Questions before we proceed?
MICROGRID

• A microgrid is a group of interconnected loads and distributed energy resources within clearly defined electrical boundaries that acts as a single controllable entity with respect to the grid. If desired, a microgrid can connect and disconnect from the grid to enable it to operate in both grid-connected or island-mode.

• Microgrid Key Attributes (Defining Characteristics):
  • Grouping of interconnected loads and distributed energy resources
  • Can operate in island mode or grid-connected if desired
  • Can connect and disconnect from the grid if desired
  • Acts as a single controllable entity to the grid
**ORIGINAL SITE – Early 2014**

**Existing Components:**

1. TOC
2. Transformer Shop
3. Meter Services
4. Planned New Environmental Lab

**Functions at the Site:**

1. TOC
2. Transformer Shop
3. Meter Services
4. Planned New Environmental Lab

**Existing Components:**

- 2 – 175 kW Diesel Backup Generators
- 1 – 50 kVA UPS
- 1 – 25 kW/25kWh NSRI Battery
- 1 – 45 kW Propane Backup Generator
## Legacy Grid Becomes Microgrid

<table>
<thead>
<tr>
<th>Legacy</th>
<th>Revised to Microgrid</th>
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<tbody>
<tr>
<td>• Utility service to each facility</td>
<td>• Single point of service to the entire site</td>
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<td>• Only the most critical loads served with traditional UPS and emergency generator</td>
<td>• Utility-grade distribution system on-site</td>
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<td>• Can be split into 3 distinct microgrids</td>
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<td>• Additional generation</td>
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<td>• Prioritize critical functions for operation during grid outages</td>
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<td>• Test the integration of solar PV, microturbine, and energy storage on a distribution system</td>
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Site:
- IntelliTeam on Grid Source Primary Meter Point
- 2 – Switchgear

Meter Services (1):
- 1 – 45 kW Propane Backup Generator
- 1 – 200 kW Diesel Backup Generator

Transformer Shop (2):
- 1 – 25 kW/25kWh Battery

TOC (3):
- 2 – 150 kW Diesel Backup Generators
- 1 – 50 kVA UPS
- Microgrid Control System

Environmental Lab (4):
- Microgrid Demonstration/Education Center
  - Solar
  - Battery
  - Microturbine
Contact

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References

- ERCOT
  - www.ercot.com

- ERCOT Quick Facts

- ERCOT Power Forward – Annual State of the Grid Report

- Brattle Report –

- Brattle Press Release – a nice summary of the report

- Full-length technical report to be released in 2015

- Website about Oncor Storage Concept
  - www.foundationgrid.org
PROPOSED REGULATORY FRAMEWORK

• A targeted utility-based deployment will allow the system to realize both T&D and wholesale market benefits

• Brattle consultants found that a utility-based deployment can simultaneously capture these benefits without T&D utilities transacting in wholesale market:
  • TDUs would “auction” off wholesale market participation to unregulated third parties who would then bid the storage assets into the market
  • Auction proceeds would be used to offset TDU storage costs, thereby further reducing costs to customers
PROPOSED LEGISLATIVE CHANGES

New Section 35.153

• PURA language clarifies that wholesale market participants can rent grid integrated energy storage capacity from TDUs for competitive purposes (rental fees to be credited to the customers)

• Before TDUs can deploy more than a *de minimis* amount of storage, but they must submit a deployment plan to the PUC for approval that among other things shows economic benefit.