EBC New Hampshire Program

Non-wire Alternatives for the Electric Grid
Welcome

Robert Varney

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Welcome to Eversource

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Program Introduction and Overview: What You Will Learn

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TRC

Environmental Business Council of New England
Energy Environment Economy
Getting to the Grid of the Future, Today

Michael Behrmann, MSEL

Director of Business Development
Clean Energy New Hampshire
CENH Introduction:

MISSION:
“To promote clean energy and technologies through education and advocacy for a stronger economic future”

130+ Business Members
Non-Wires Alternatives and Grid Modification
Important Definitions/Concepts:

• **Non-Wires Alternatives (NWA):**
  – An electricity grid investment or project that uses non-traditional solutions, such as distributed generation, energy storage, energy efficiency demand response, and grid software and controls, to defer or replace the need for specific equipment upgrades, such as lines or transformers, by reducing load at a substation or circuit level.

• **Grid Modification (Grid Mod):**
  – Updating the Grid to incorporate the aforementioned NWA's
Definitions/Concepts Continued…

• **Microgrids**
  - A group of interconnected loads and DERs within clearly defined electrical boundaries that acts as a single controllable entity with respect to the grid. A microgrid can connect and disconnect from the grid to enable it to operate in both grid-connected or island modes.
Factors Driving the Need for NWA’s and Grid Mod:

- Aging infrastructure
- Rise in power outages & associated costs
- Shift in the traditional business model
- Shift towards distributed generation
- Rising transmission, supply, & distribution charges
- Growing consumer demand for distributed energy resources
- Flat electricity market with high rates
Recent Changes in Renewable Growth

• ISO-NE Queue
  – 590 MW for NH alone

• 2019 Regional Energy Outlook
  – “...today, there are four times more wind power proposals than natural gas. ...roughly 13,500 MW (nameplate) of wind power being proposed regionally…”
  – Forecast is over 20GW*

*ISO-NE 2019 Regional Electricity Outlook
Energy Mix Changing:

*ISO-NE 2019 Regional Electricity Outlook
NH Recent Grid Mod. Timeline:

- **2015**: NH passed HB614 directing the Public Utilities Commission (PUC) to open an investigatory docket on grid modernization.
- **2016**: PUC established a Grid Mod Working Group composed of utility, consumer, municipal, business, and advocates.
- **2017**: After a 10-month stakeholder process, Working Group filed a final report with the PUC.
- **2019**: PUC staff released a staff report & recommendations for the next phase of grid mod; visit puc.nh.gov & search for IR15-296 for reports & docket history.
NH PUC– Staff Grid Mod Report

*PUC: Staff Recommendation on Grid Modernization 1/31/19*
Key Items in NHPUC Staff Report:

• Development of Integrated Distribution Plans (IDPs)
  • IDPs would include a 5-year implementation plan and 10-year roadmap
  • IDPs would analyze traditional utility investments and non-utility owned resources & review technologies & processes that enable integration of distributed energy resources (solar, wind, hydro, etc)
  • IDPs will be incorporated into the utilities' Least-Cost Integrated Resource Plans
Key Items in NHPUC Staff Report Continued:

- Does not promote specific technologies or solutions
- Largely utility-centric or "central planning" grid modernization model rather than the consumer-centric or "competitive-market" approach
- Proposed timeframe leaves concern on reaching objectives in a timely manner

Written comments on the report are due to the PUC by April 6, 2019
The Market:

- Already implementing and providing NWA's and deploying the infrastructure needed for grid modernization
  - Can bring significant capital to bear if unleashed
  - Need stable approach

- Market is responding and can work effectively and in partnership with utilities to meet least-cost objectives

- Need regulatory stability and forward-thinking
Goals:

- Foster competitive markets for NWA’s
- Reduce generation, transmission, & distribution costs
- Improve reliability & resiliency of the grid
- Reduce NH’s reliance on imported energy resources, protect ratepayers from price volatility, & reduce need for transmission expansions
Goals Continued:

- Provide better-facilitated integration & accessibility of distributed energy resources (DERs)

- Increase amount of decentralized areas (microgrids) able to be isolated & powered by DERs
  - Providing back-up power during outages & security from threat of terrorism

- Initiate partnerships between utilities & DER owners that can direct power to high-demand areas
Not Occurring in a Vacuum:

- Markets continue to push forward with new business models/DER’s
- Neighboring states progressing on NWA’s and Grid Mod
- New technologies constantly changing
THANK YOU!

Visit Our Website to Find Out More:
www.cleanenergynh.org

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Grid Modernization at Eversource Energy – Enabling a Cleaner Energy Future

Jennifer Schilling

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Grid Modernization at Eversource Energy

Enabling a Cleaner Energy Future

EBC New Hampshire Program:
Non-Wire Alternatives for the Electric Grid

March 12, 2019
Eversource Energy

Eversource is New England’s largest energy delivery company, safely and reliably transmitting and delivering energy and supplying water to approximately 4 million customers in Connecticut, Massachusetts and New Hampshire.

The company operates more than 4,270 circuit miles of transmission lines, 72,000 pole miles of distribution lines, 578 substations, 449,737 distribution transformers and 6,459 miles of natural gas distribution pipelines across our service territory.
Evolution of the Grid

**Historical Distribution System (pre-1990)**
- One-way power flow
- Radial system with few loops
- Primarily mechanical and manual operation
- Control room dispatching crews based on calls with no outage intelligence
- System planning focus on peak load
- Limited T&D interaction

**Current Distribution System (1990-2018)**
- Extensive loop schemes with automated sectionalization
- Two-way power flow
- Visibility of grid increasingly critical
- Control room using more intelligence for outage response and system monitoring
- System planning incorporating PV projects into system impact

**Planned Modernization (potential future path)**
- Optimized deployment of DER
- Improved system, reliability, power quality and efficiency
- Enable widespread customer engagement

**Unmanaged Growth (potential future path)**
- Increasing peak load
- Generator curtailments
- Sub-optimization due to competing value streams
- System protection challenges risk reliability
Solar Variability

Solar output can vary greatly over short periods of time, particularly on cloudy days

Output of 2 MW Eversource MA Solar Farm
Solar PV Load Hiding

27H1 Feeder with 5MW Solar Array

July 19, 2017

“Hidden” Peak

“Hidden” Load area

Feeder Meter KW  Solar Output kW  Real Cust Load
Grid Impact Varies by Location

- Generation tends to be concentrated in areas with available, lower cost land
  - Typically areas with lower loads and less robust distribution infrastructure
- Emerging engineering and system planning challenges to be addressed
  - Maintaining area voltage and reactive power requirements
  - Potential for thermal overloads, including substation transformer
  - Energy storage operational assumptions
  - Transmission system impacts and coordination

Solar and Wind Facilities Over 2 MW

- 34 MW of connected solar at New Bedford Industrial Park substation
- 22 MW of solar in queue
- 9.5 MW of customer owned energy storage in queue
- At 55 MVA firm capacity of substation, solar plus storage would be 117% of firm capacity
- Traditional "wires" solution to upgrade substation capacity estimated at $15-20 million

More dynamic nature of grid flows is prompting need for greater visibility and optimization to ensure synergy of supply
Grid Modernization Vision

To transform the distribution grid of today with the technologies of tomorrow to provide a customer-centric platform that enables the transition to a cleaner energy future while continuously improving customer engagement and the safety, security, reliability, and cost effectiveness of the distribution grid.
Energy Storage Opportunity

Peak remains the same

Smoothing impact of energy storage

Extreme ramp up over short period required to meet peak demand

2016 profile with existing PV capacity of 2 GW

2026 PV capacity projection 4.7 GW

Charging

Injecting

Energy storage Activity
Outer Cape Energy Storage Project

DISTRIBUTION USE CASE HYPOTHESES

1. During a fault at the Wellfleet substation or on Line 96, the battery will operate as a disconnected island - reducing outages by over 50% for customers from Wellfleet to Provincetown, based on historic data.

2. The battery will defer construction of 13 miles of distribution line through the Cape Cod National Seashore.

TRANSMISSION USE CASE HYPOTHESES

1. The battery will improve reliability by mitigating transmission outages of up to 2.5 hours under peak load conditions.

   - During an outage on Line #125, the battery will offset load at the tip of the Cape and enable load on Circuit #94 and Circuit #96 to be served for longer by closing a normally open switch.
Hosting Capacity Maps

- Maps show customers where it is likely to be easier to locate medium and larger scale solar facilities.
- Information is expected to improve the interconnection experience for customers.
- Future enhancements are under development that will provide more granular information for decision making.
Our health, safety and economic well-being are increasingly tied to a reliable and flexible grid which ensures that *power is always available when and where it is needed.*

The grid is the backbone of even higher reliability and resilience.
Non-Wires Alternative Opportunity

- Dispatchable distributed energy resources can be a cleaner alternative to traditional reliability and capacity “wires” upgrades

- Non-wires alternatives need to be comparable solutions
  - Available when and where they are needed
  - As reliable as the traditional option
  - Cost effective
The Modern Grid’s Value Proposition

- Facilitate delivery of cost effective clean energy
- Ensure high reliability and resilience
- Optimize use of resources
- Enable customer choices
Battery Storage and the Needs of Today’s Grid

Heather Tebbetts

Manager, Rates and Regulatory Affairs
Liberty Utilities
Environmental Business Council of New England
Heather Tebbetts
March 12, 2019
Energy Storage: What are we doing?

**Granite State Electric**
- First in the nation utility owned behind-the-meter (BTM) battery program paired with time of use rates

**CalPeco - Olympic Valley Microgrid**
- 100% Renewables
- CalPeco Micro Grid
Energy Storage: NH Battery Storage Pilot

• **NH Battery Pilot** – first of its kind in US
• **Leading the US in innovation with approval**
• **Press – GreenTech Media, Rocky Mountain Institute, Wood Mackenzie**
  • 500 batteries deployed in 2 phases for the purpose of reducing peak demand and battery backup for power outages
  • Phase 2 is predicated on success in Phase 1
• **Utility owned BTM storage**
  • Residential customers only in Phase 1
  • 2.5 MW
  • Customer pays a contribution of $50/month or $4866 upfront for 2 Tesla Powerwall 2 batteries
  • 10 year pilot
• **Time of use rates** – most innovative around the US & cost based
• **Bring Your Own Device – Aggregator will be chosen through RFP process to also provide 2.5 MW of storage to customers**
  • Customer or aggregator owned
• Approval received January 18, 2019
Tesla Powerwall 2

- **Usable Capacity**: 13.5 kWh
- **Depth of Discharge**: 100%
- **Efficiency**: 90% round-trip
- **Power**: 7kW peak / 5kW continuous
- **Supported Applications**: Solar self-consumption, Back-up power, Time-Based control, Off-grid capabilities (coming soon)
- **Warranty**: 10 years
- **Scalable**: Up to 10 Powerwalls
- **Operating Temperature**: -4°F to 122°F / -20°C to 50°C
- **Dimensions**: L x W x D: 45.3” x 29.7” x 6.1” (1150 mm x 755 mm x 155 mm)
- **Weight**: 276 lbs / 125 kg
- **Installation**: Floor or wall mounted, Indoor or outdoor
- **Certification**: North American and International Standards, Grid code compliant
Home Installation

- **SOLAR INVERTER**: Existing equipment
- **BACKUP GATEWAY**: New equipment being installed
- **UTILITY METER**: Existing equipment
- **POWERWALL**: New equipment being installed
Energy Storage: Liberty CalPeco

• **Olympic Valley Microgrid**
  • 8MW, 32 MWh battery installed at the Gold Coast Funitel at Squaw Valley Resort
  • Battery will provide reliability and resilience to Olympic Valley
  • Opportunity to dispatch during peak periods for additional savings to customers to reduce peak demand
  • Filed with the CPUC on November 30, 2018

• **Future Microgrid Opportunities**
  • California wildfires – required power outages
  • Provides backup power during outages
Tesla Powerpack

**HIGHLY EFFICIENT CELLS**

- Active liquid cooling at the cell level
  - Optimizes operational efficiency through cell temperature management
  - Maximizes the lifetime of the cells
- Operates over the widest temperature range (-13°F to 122°F / -25°C to 50°C)

**SAFETY IN EVERY POD**

- Sealed pod houses a low voltage battery (~50V)
- Isolated DC-DC converter minimizes risk of cascading failure
- Pod architecture creates a parallel system providing overall increased reliability
- Live battery terminals are not accessible
- IP67 rated pods
Battery House
Thank you
Moderated Discussion

Moderator: Alexander Tang, TRC

Panelists:
• Michael Behrmann, *Clean Energy New Hampshire*
• Jennifer Schilling, *Eversource Energy*
• Heather Tebbetts, *Liberty Utilities*
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