Non-Wires Alternatives
Lessons and Insights from the Front Lines

Michael DeAngelo: Avangrid
Mark Luoma, Steve Fine: Consumers Energy
Richard Barone: Hawaiian Electric Company
Erik Gilbert: Navigant - Moderator
Non-Wires Alternatives (*Solutions*) Definition

Definition: An electricity grid investment or project that uses non-traditional transmission and distribution (T&D) solutions, such as distributed generation (DG), energy storage, energy efficiency (EE), demand response (DR), and grid software and controls, to defer or replace the need for specific equipment upgrades, such as T&D lines or transformers, by reducing load at a substation or circuit level.

Non wires alternatives are transitioning to non wires solutions. Transmission non wires alternatives fall under FERC Order 1000.
Expected Growth of NWAs

Chart 1.1  NWA Spending by Region, World Markets: 2017-2026

(Source: Navigant Research)
Design Stage- Best Practice: Consider multiple Scenarios

NWA options selected:
✓ Energy efficiency (A)
✓ Demand response (B)
✓ Storage (C)
☐ Customer sided generation

Scenario 1
• 1A_1+1B_2+1C_2

Scenario 2
• 1A_2+3B_1+1C_3

Scenario 3
• 2A_3+2B_2+1C_3
NWA and Traditional SOLUTION TIMELINE

**Traditional and NWA Solution**

### Start Date: NWA Solution
- Write, release, and reward RFP: 3 M +/- 3 M
- Vendor recruits and confirms customers: 6 M +/- 3 M
- 1st year geotargeted pilot project: 9 M +/- 2M
- M&V of 1st year results: 3 M +/- 3 M

### Commitment Date
- NWA Go/No-Go Decision
  - Project initiation: 6 M
  - Permitting: 12 M
  - Engineering: 18 M
  - Procurement: 18 M
  - Construction: 24 M

### In-Service Milestone
- Full implementation of NWA solution: 18 M

### Combined Timeline
- 21 Months
- 48 Months
Mike DeAngelo is the Program Manager of Non-Wires Alternatives for Avangrid. In this role Mike oversees the Non-Wires Alternative programs for New York State Electric and Gas and Rochester Gas and Electric as well as the Non-Transmission Alternatives program for Central Maine Power. Mike has been with Avangrid for 5+ years in which he first started with the company as a buyer in the Electric Supply group. Prior to joining Avangrid Mike worked for 5 years in Power Generation.
Non-Wires Alternatives: Lessons and Insights from the Front Lines

Mike DeAngelo – AVANGRID
Program Manager – Non-Wires Alternatives
November 14, 2017
AVANGRID (NYSEG/RG&E) Non-Wires Alternatives

**Avangrid Networks**
- 8 regulated electric and gas utilities in the Northeast including NYSEG & RGE
- 3.2 million customers
- \( \approx 1 \) million smart meters with 1.8 million pending

**Avangrid Renewables**
- 2nd largest wind energy generator in U.S.
- 53 operating wind farms
- 22 states in U.S.

Utility industry leader in customer engagement and satisfaction
AVANGRID (NYSEG/RG&E) Non-Wires Alternatives

• Strategy
  • Build a portfolio of Non-Wires Alternative (NWA) DER projects which are cost effective for customers, provide reliable alternatives to traditional capital investment projects, and provide full cost recovery and earnings opportunities for our companies, while we comply with regulatory directives and learn from and work cooperatively with other utilities and stakeholders.

• Pilot Projects
  • NYSEG – Java Substation
  • RG&E – Station 43

• Current NWA Projects
  • NYSEG – Stillwater Substation
  • NYSEG – New Gardenville Substation
AVANGRID (NYSEG/RG&E) Non-Wires Alternatives

• NWA Sourcing Process:

  - Identify System Need & Capital Plan
  - NWA Suitability Criteria
  - NWA Opportunity Identification
  - NWA Sourcing Development
  - NWA Solicitation, Evaluation, Negotiation & Award
  - NWA Opportunity Notification
  - NWA RFP Notification
  - Traditional Solution
AVANGRID (NYSEG/RG&E) Non-Wires Alternatives

• Challenges & Lessons Learned:
  • Timing and activities related to the interconnection application process
    • Schedule
    • Costs
  • Engaging with developers to encourage participation in the RFP
  • Lack of available interval load data
  • Developers’ reluctance to execute required data security
Mark Luoma serves as the Residential Pilots Program Manager at Consumers Energy headquartered in Jackson, Michigan. Joining Consumers Energy in 2010, Mark was a member of the Smart Energy Program Project Management Office, where amongst other duties; he supported the build and piloting of customer facing programs that included the Peak TOU Rates and AC Peak Cycling programs. Mark transitioned to his current role in the Energy Efficiency organization in early 2016.

Steve Fine is a Vice President with ICF and leads the Distributed Energy Resources Team. Steve has particular expertise in evaluating the economics of conventional and renewable energy resources—both central station and distributed generation—within the context of developing technologies, market design, and environmental regulations. He works with many major US power companies and developers in evaluating the impact of DER on their system and the implications for their business models and their distribution system planning and operations. This includes ongoing support for the Joint Utilities of New York related to their transformation into Distribution Service Providers.
Energy Savers Club
Non-Wires Alternative Pilot

Mark Luoma—Consumers Energy
Steve Fine--ICF
November 14, 2017
Energy Savers Club - Swartz Creek Project Overview

• Why this pilot
  • NRDC – 2014 Rate Case

• Why this substation
  • Screening criteria
    • Distribution system upgrade driven by load growth
    • Deferrable cost of at least $1 million
    • System need at least 2 to 3 years out

• Size and location
  • Small Suburban/rural
    • <4000 residential and 300 commercial accounts
    • 30 Key small business accounts
Swartz Creek Substation Load

- 1.15% growth rate assumed for forecast
- Forecast w/o contingency event shows no capacity reduction needed through 2020
- When considering the Sept. 2016 contingency event, load reduction is needed to bring the loading to below the 80% threshold suggested by Consumers and defer the investment
Seasonal and Temporal Need
DER Measures and Impact

- 16 Total measures
  - 5 Residential
  - 11 Commercial

- Adoption assumptions
  - Past program participation
  - Uplift in participation based on community-based model
  - On the ground observations

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<th>Program Impact</th>
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<tbody>
<tr>
<td>Net Annual MWh Saved</td>
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<td>Net Annual MW Saved</td>
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<th>Residential</th>
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<td>Time-of-Use (TOU)</td>
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<td>Room Air Conditioning Recycling</td>
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<td>AC/Furnace O&amp;M</td>
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<th>Commercial</th>
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<td>VFD HVAC Fans</td>
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<td>Air Conditioning</td>
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<td>Battery Storage</td>
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Top peak reduction measures: Residential and Commercial

- The implementation team will focus on the most cost effective measures
Implementation - Core Components

• **Energy Ambassador**
  • Responsible for integrating into Swartz Creek
  • Gather intelligence and garner participation via outreach
  • Provide a line-of-sight to Consumers Energy programs and rebates.

• **Energy Task Force**
  • Several local stakeholders, including Consumers Energy Community Affairs.

• **Community Project**
  • Serves as a means to motivate Swartz Creek residents and businesses to participate in the Pilot.

• **Multi-channel marketing campaign**

• **Unique Brand and Website**
  • Learn about Consumers Energy programs.
  • Join Energy Savers Club for prize entry
  • Vote for a community project
Rich Barone

Non-Wires Alternatives

Hawaiian Electric Company

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Lessons Learned

• Data availability
  • Load forecast at substation level
  • AMI

• Time and Timing
  • Expect delays
  • DR Event Season
Non Wires Alternative Options
A Glimpse Into the Future

Richard Barone

Date: November 14, 2017
100% RPS + Limited Transmission Drives Fundamental challenges

Key Technical Issues

1. Bulk System Level
   - System stability
   - Inflexible conventional generation
   - Oversupply of renewable energy during low load periods

2. Circuit Level
   - Thermal capacity overload
   - Voltage flicker
   - Voltage regulation impacts
   - Islanding
   - Load rejection overvoltage
   - Ground fault overvoltage

3. Overvoltage issues
   - Primary
   - Secondary
   - Imbalance across phases
Transmission constraints relative to utility-scale renewable potential
We are already moving a lot of generation to the distribution network.

Hawaiian Electric Companies RPS of 23.2% for 2015

- 31% Customer-Sited, Grid-Connected Renewables
- 29% Wind
- 20% Biomass (including municipal solid waste)
- 11% Geothermal
- 9% Utility-scale PV and Solar Thermal
- 3% Biofuels
- 2% Hydro
- 4% Thermal
PV generation can pose frequency stability challenges
PV systems can also cause overvoltage

Load Voltage

Normal Voltage at night

High Voltage

Reverse Power at PV peak times

Reverse Power

High Voltage at PV peak times (Noon)
Hawaiian Electric Companies Distribution Feeder PV Penetration

- Maui Electric: 63% (63% ≤ 100% of DML), 33% (250% ≥ PV Penetration >100%), 4% (PV Penetration > 250% of Daytime Minimum Load)
- Hawai‘i Electric Light: 53% (63% ≤ 100% of DML), 39% (250% ≥ PV Penetration >100%), 7% (PV Penetration > 250% of Daytime Minimum Load)
- Hawaiian Electric: 53% (63% ≤ 100% of DML), 33% (250% ≥ PV Penetration >100%), 14% (PV Penetration > 250% of Daytime Minimum Load)

Approaching the point where 50% of circuits backfeed at the substation.
Solutions

• Bulk System
  ➢ DR Portfolio (pending decision)
  ➢ Interconnection screening - System Hosting Capacity (in operation)
  ➢ CBRE

• Distribution
  ➢ New DER Programs (evolving)
    ➢ Interconnection screening - Circuit-hosting capacity
    ➢ Advanced Inverter Requirements (recent decision issued)
  ➢ Extend DR portfolio to circuit-level services (2018)
    ➢ Identify, quantify and value circuit-level services
    ➢ Extent existing DR portfolio to incorporate these services
  ➢ Power Electronics (ongoing R&D)
  ➢ Substation storage (exploring)
3 keys to a more effective interconnection process

**System Level Hosting Capacity**
System level screens for each unique island grid balancing system level reliability, safety, and cost-effective service to all customers

**Circuit Level Hosting Capacity**
Conduct circuit level hosting capacity unique to each circuit to enable efficient interconnection process and proactively mitigate impacts

**Advanced Inverters**
Establish advanced inverter standards (power factor, volt-watt, frequency-watt, communications, etc.) to cost-effectively and safely integrate distributed energy resources
Regulating Reserve Grid Service
Regulating Reserves are maintained to respond to supply/demand imbalances over much shorter time frames, typically on the order of one to several seconds.

Fast Frequency Response
Fast Frequency Response is needed to reduce the rate of change of frequency (RoCoF) to help stabilize system frequency immediately following a sudden loss of generation or load, proportional to the loss.

Capacity Grid Service
Capacity: for dispatchable resources - the rating of the unit; for variable resources - the capacity that can be assured in the next 4 hours; for controlled load - the minimum of load under control during the 24-hour day.

Replacement Reserve Grid Service
Replacement reserves replace the output of faster responding reserves (or restoration of shed loads) enabling their redeployment; meet sustained ramps and forecast errors beyond Regulating Reserve duration.

Four Grid Service Tariffs
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