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Non-Wires Alternatives

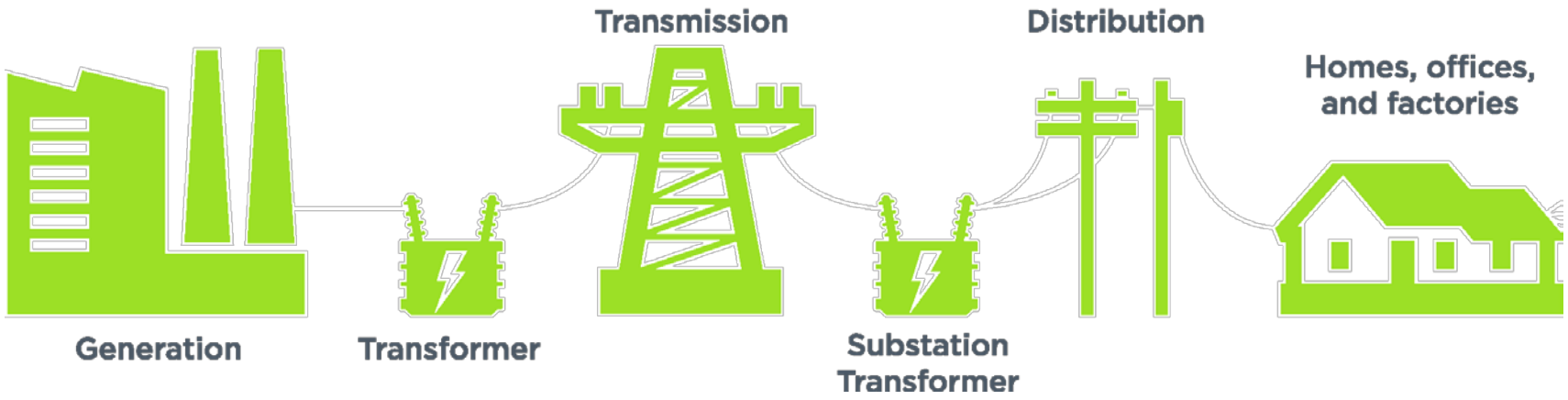
Lessons and Insights from the Front Lines

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.



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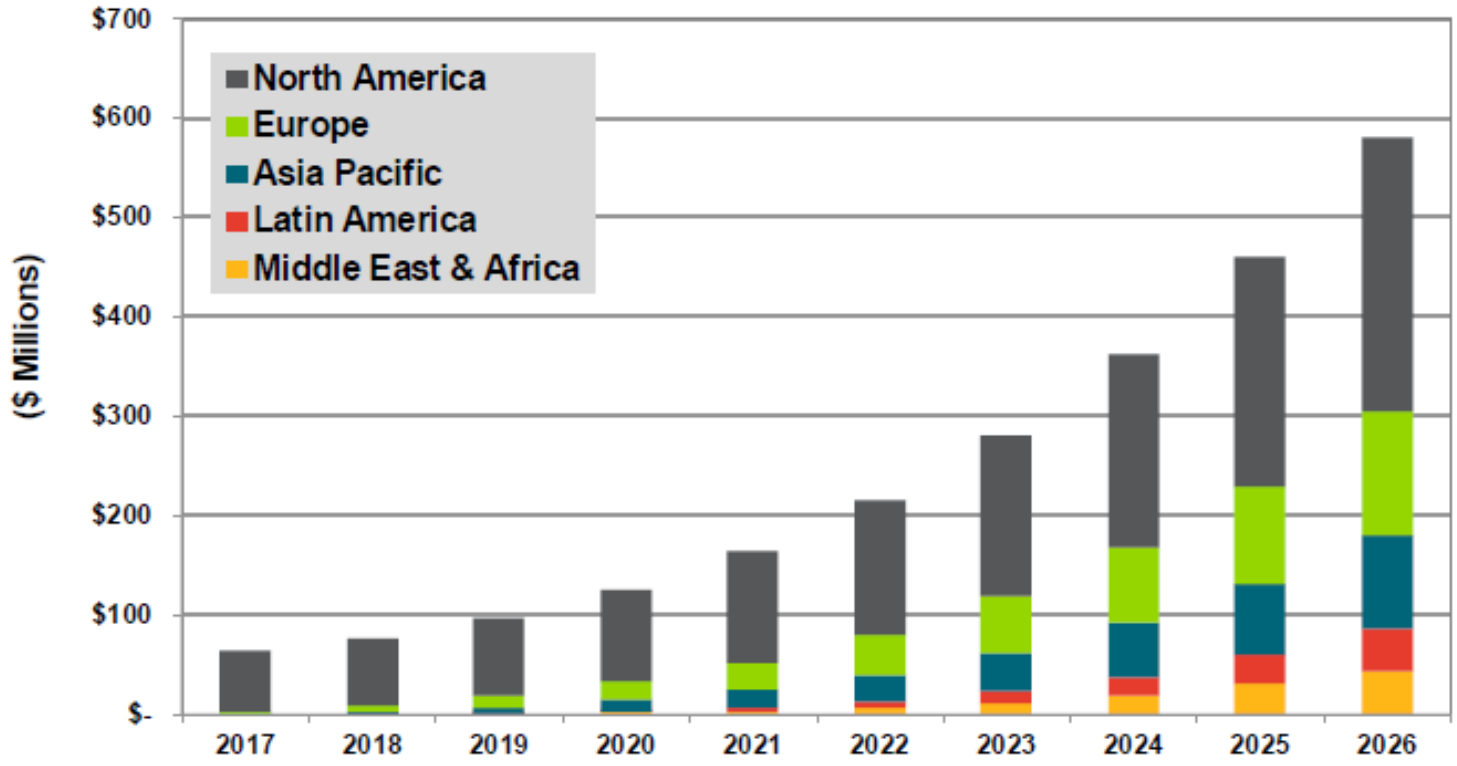
Expected Growth of NWAs

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

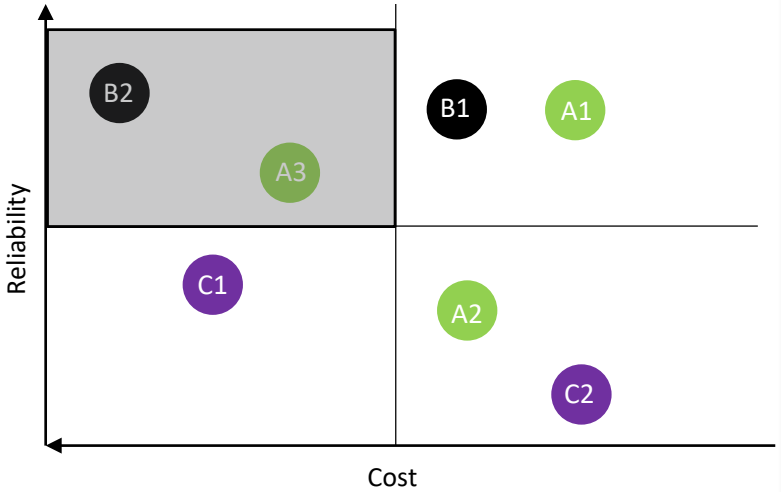


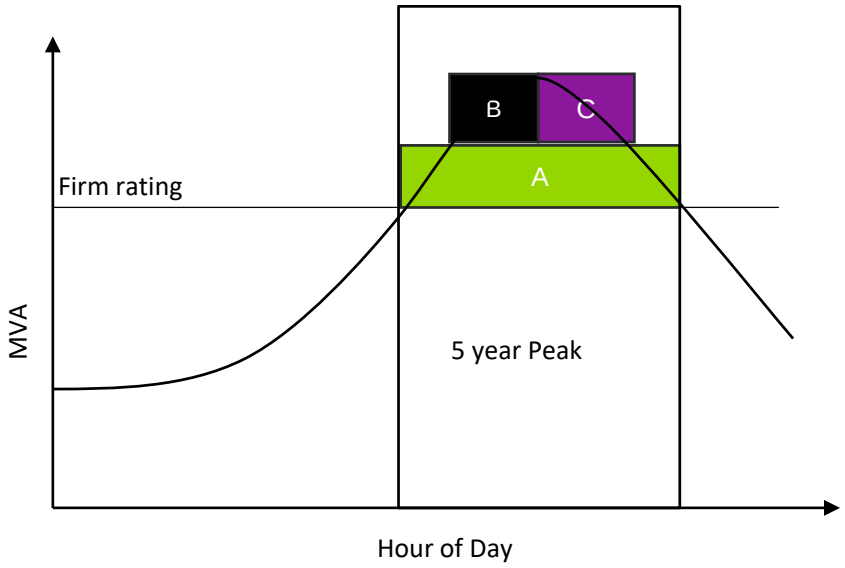
(Source: Navigant Research)

Design Stage- Best Practice: Consider multiple Scenarios

NWA options selected:

- ✓ Energy efficiency (A)
- ✓ Demand response (B)
- ✓ Storage (C)
- ❑ Customer sided generation



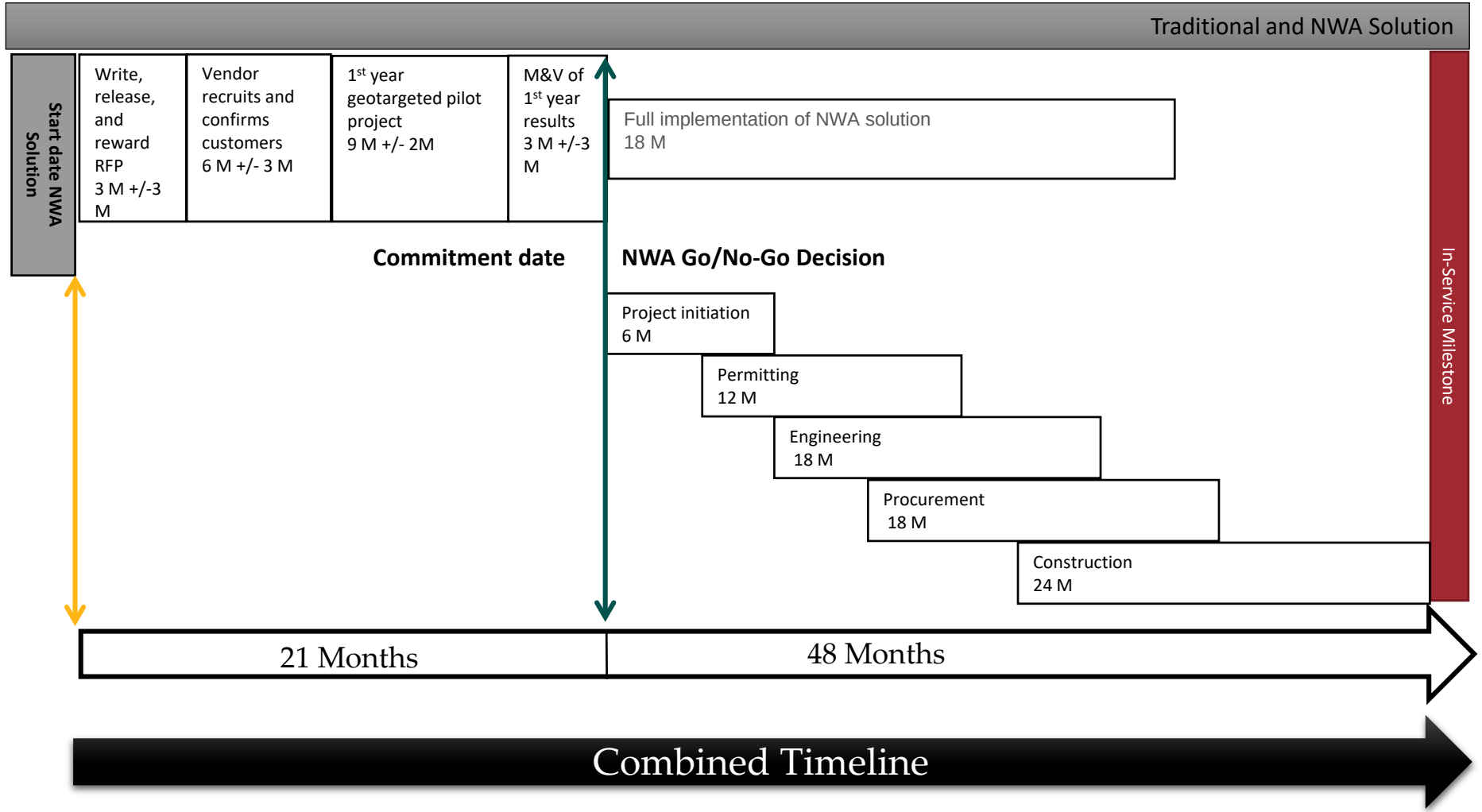


Scenario 1 { • $1A_1+1B_2+1C_2$

Scenario 2 { • $1A_2+3B_1+1C_3$

Scenario 3 { • $2A_3+2B_2+1C_3$

NWA and Traditional SOLUTION TIMELINE



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.

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Non-Wires Alternatives: Lessons

and Insights from the Front Lines

Mike DeAngelo – AVANGRID

Program Manager – Non-Wires Alternatives

November 14, 2017

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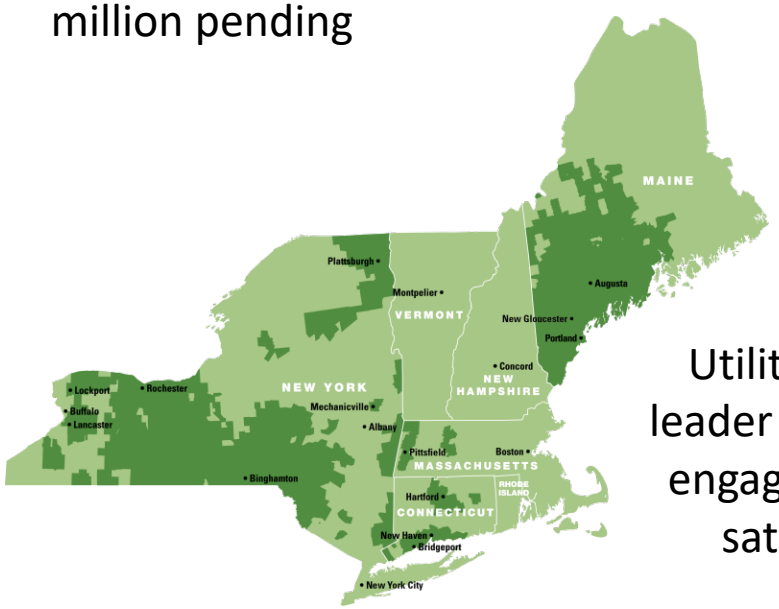
AVANGRID (NYSEG/RG&E) Non-Wires Alternatives

Avangrid Networks

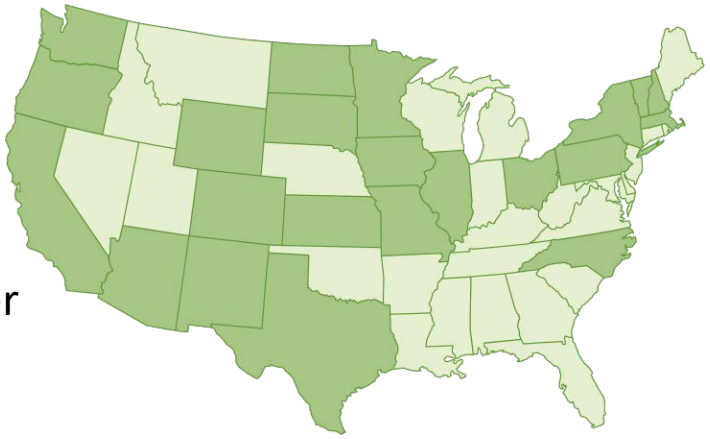
- 8 regulated electric and gas utilities in the Northeast including NYSEG & RGE
- 3.2 million customers
- ≈ 1 million smart meters with 1.8 million pending

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



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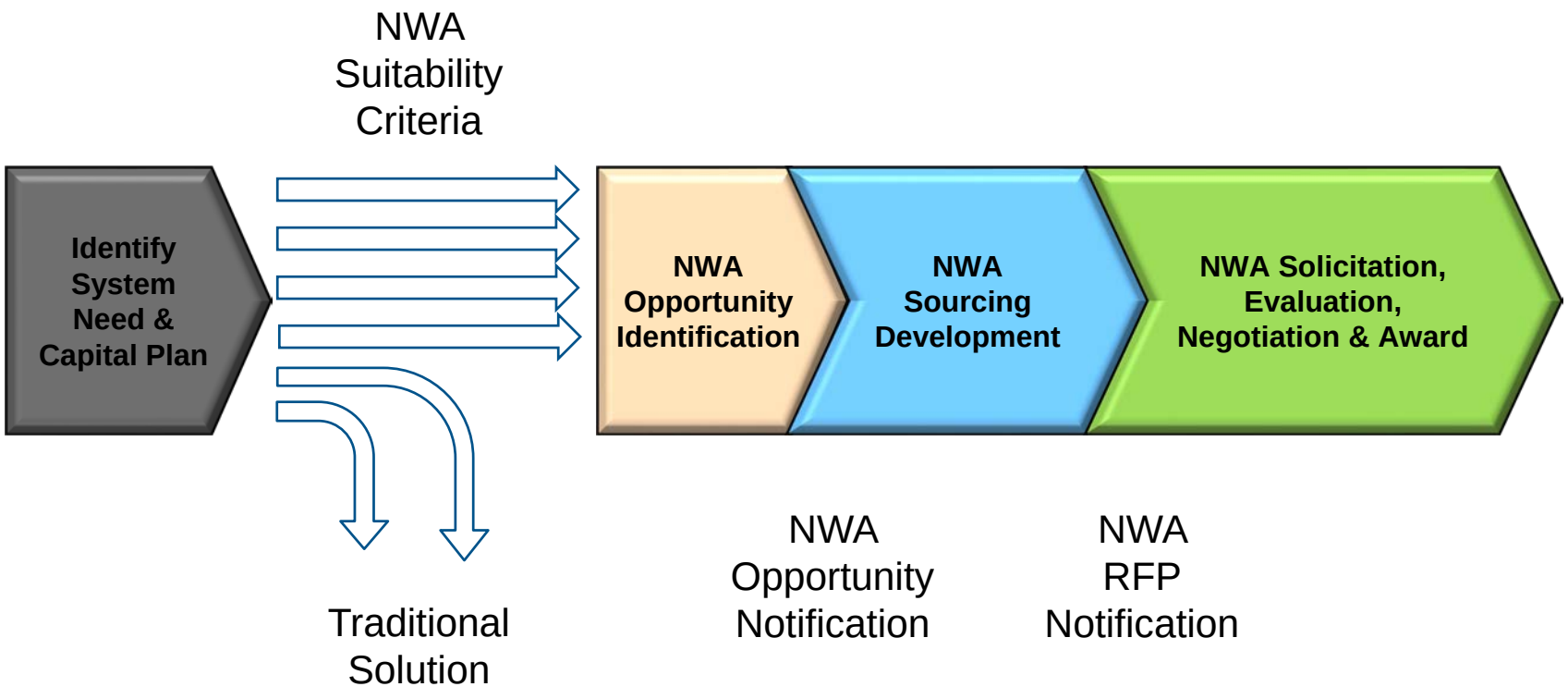
AVANGRID (NYSEG/RG&E) Non-Wires Alternatives

- 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:



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.

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Energy Savers Club
Non-Wires Alternative Pilot

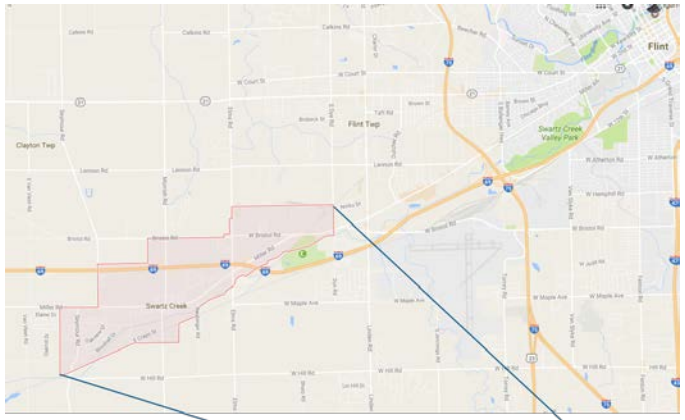
Mark Luoma– Consumers Energy
Steve Fine--ICF
November 14, 2017

Consumers Energy
Count on Us

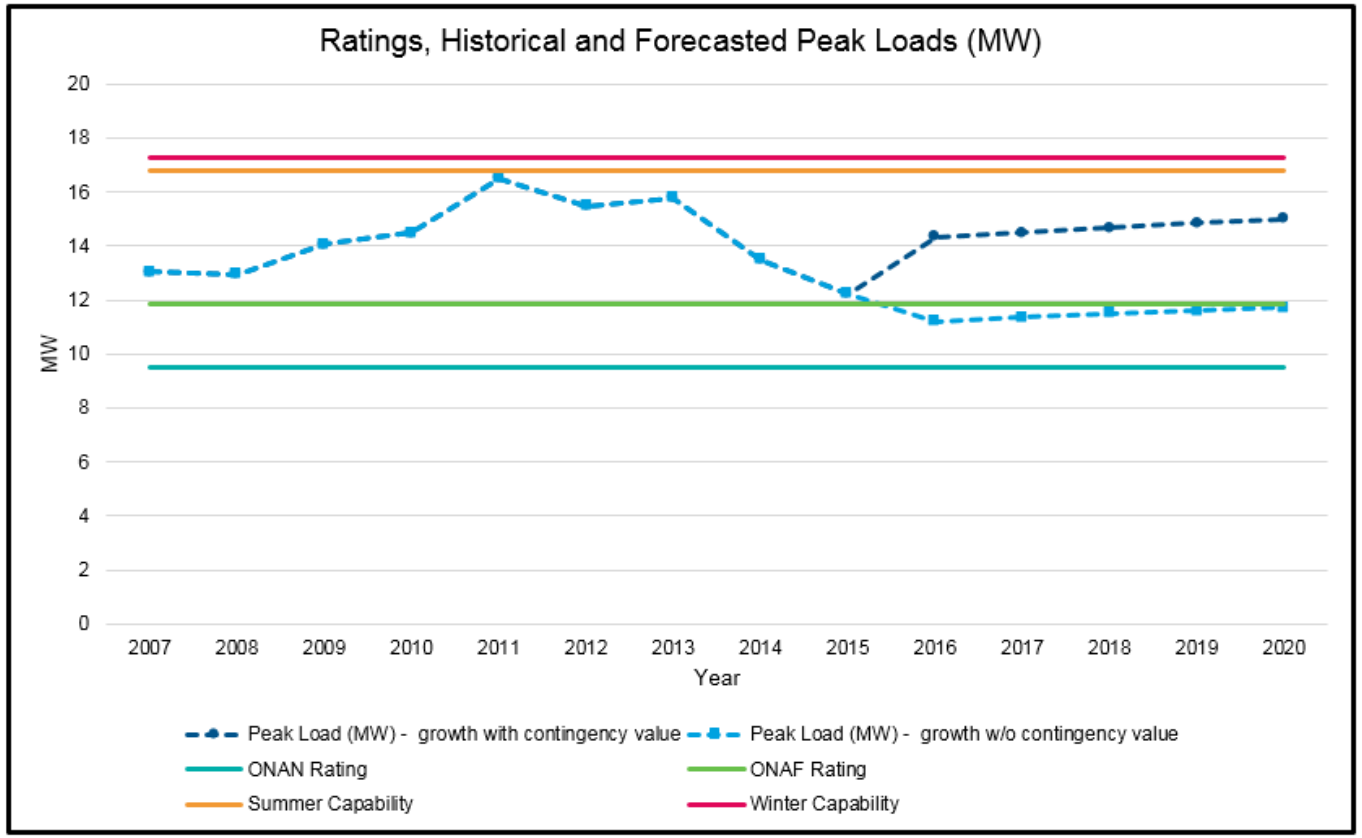
ICF

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

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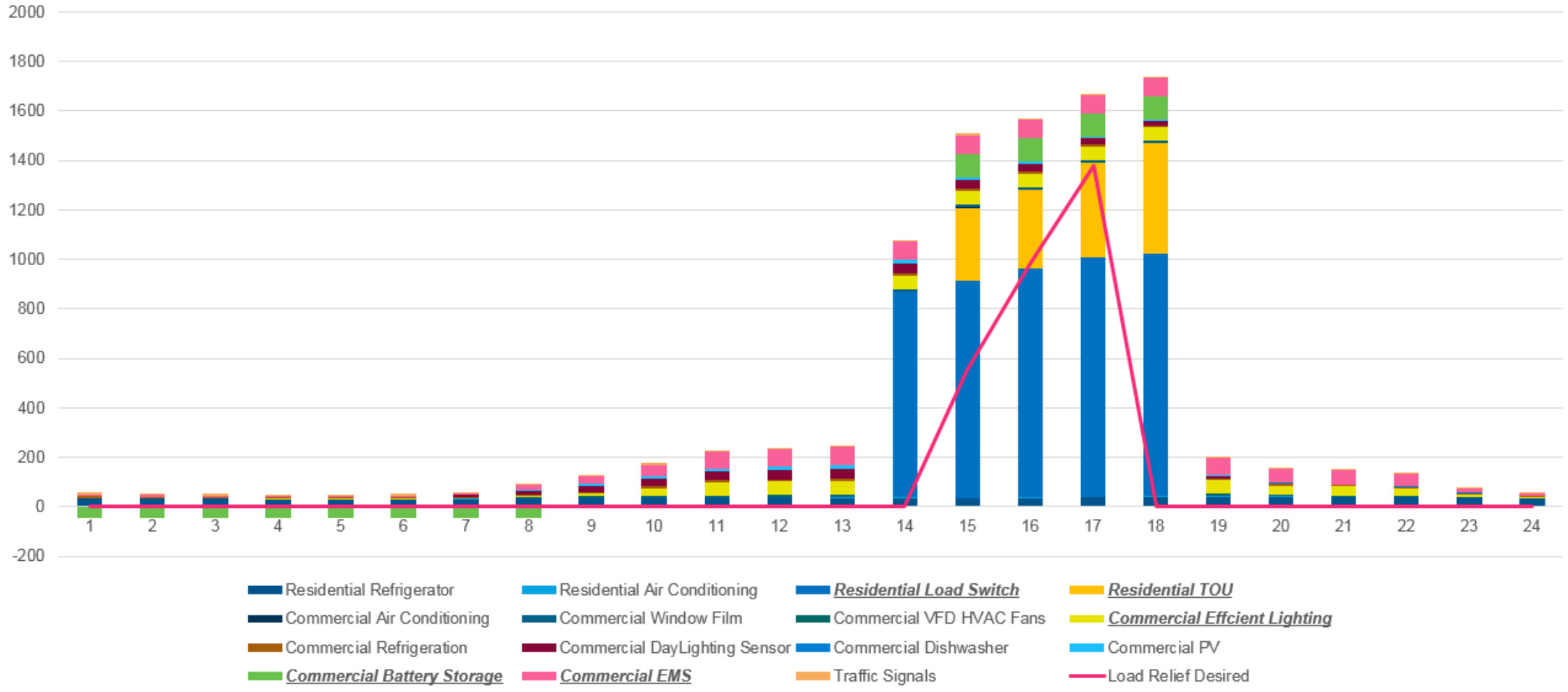
Seasonal and Temporal Need



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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

Program Impact	
Net Annual MWh Saved	1,006
Net Annual MW Saved	1.67
Net Annual MCF Saved	7.15

Residential

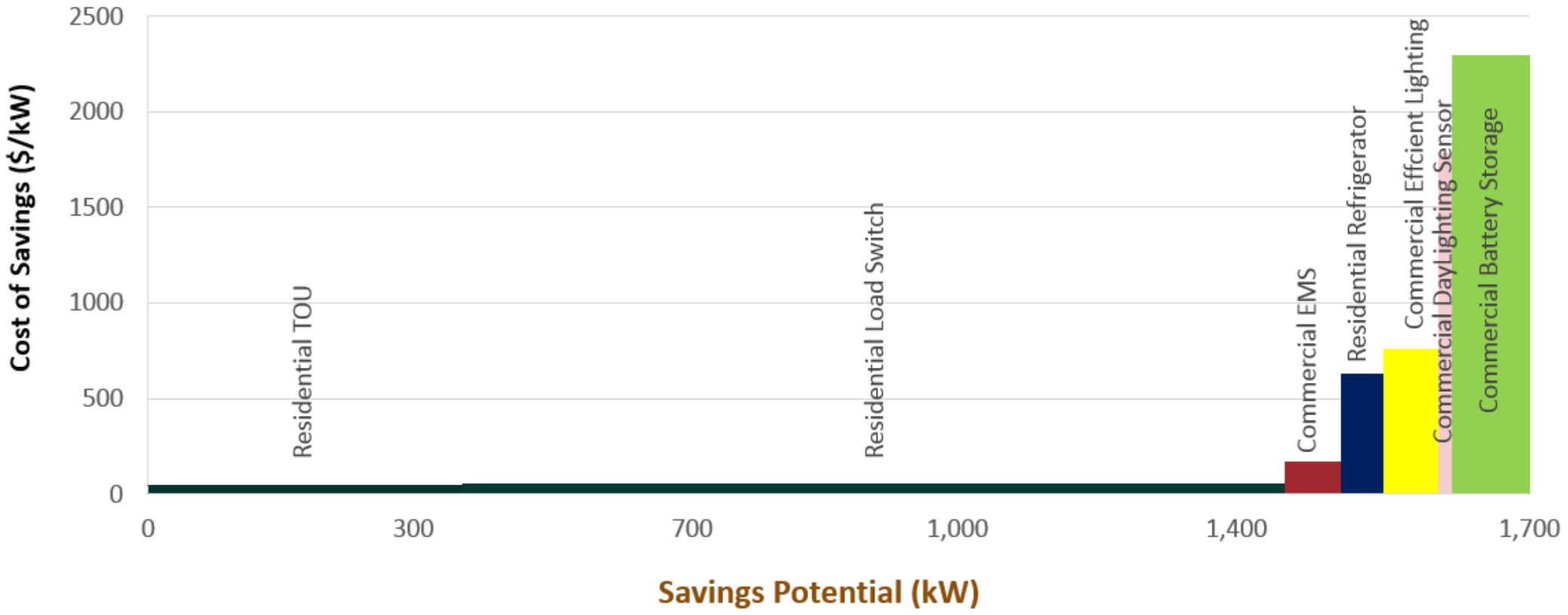
Measure	Annual kWh Savings	Peak kW Savings	Annual MCF Savings	$/kW
Load Switch	-	971	-	57
Refrigerator	312,567	36	-	628
Time-of-Use (TOU)	-	379	-	48
Room Air Conditioning Recycling	1,636	2	-	298
AC/Furnace O&M	351	1	50.1	357

Commercial

Measure	Annual kWh Savings	Peak kW Savings	Annual MCF Savings	$/kW
EMS	213,226	74	7285	167
Efficient Lighting	249,251	54	-	756
Daylighting Sensor	115,657	32	-	1786
Refrigeration	56,255	6	-	473
Window Film	10,261	11	-438	749
Solar PV	21,810	7	-	8,451
Traffic Signals	4,889	2	-	667
Dishwasher	9,322	1	42	2,014
VFD HVAC Fans	8,549	1	-	1,600
Air Conditioning	2,133	1	-4.1	7,882
Battery Storage	-	94	-	2,294

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

richard.barone@hawaiianelectric.com

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

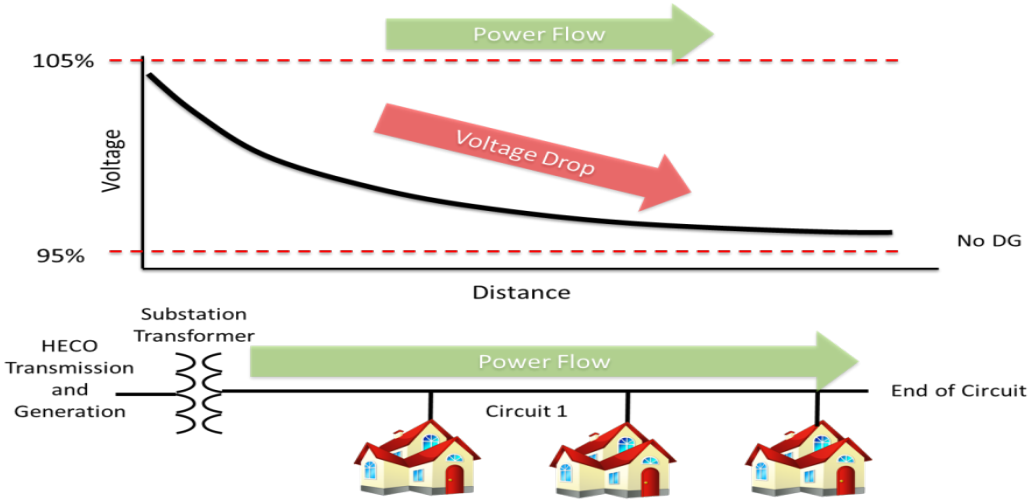
100% RPS + Limited Transmission Drives Fundamental challenges

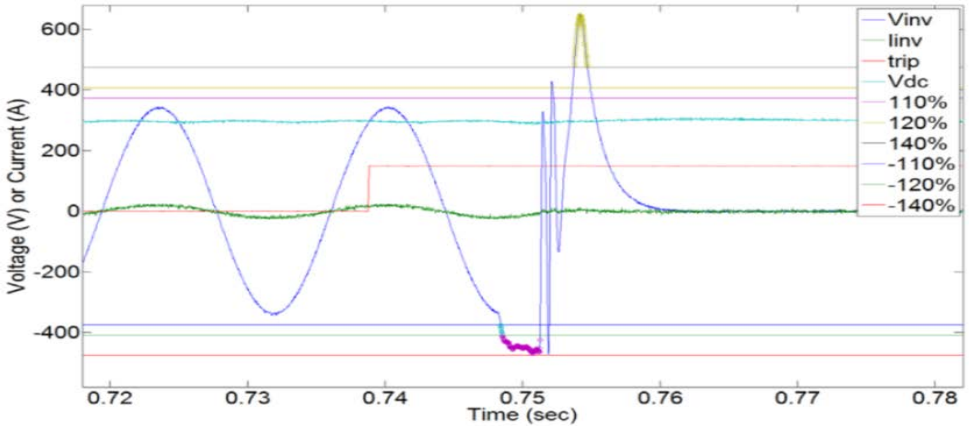
Key Technical Issues

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

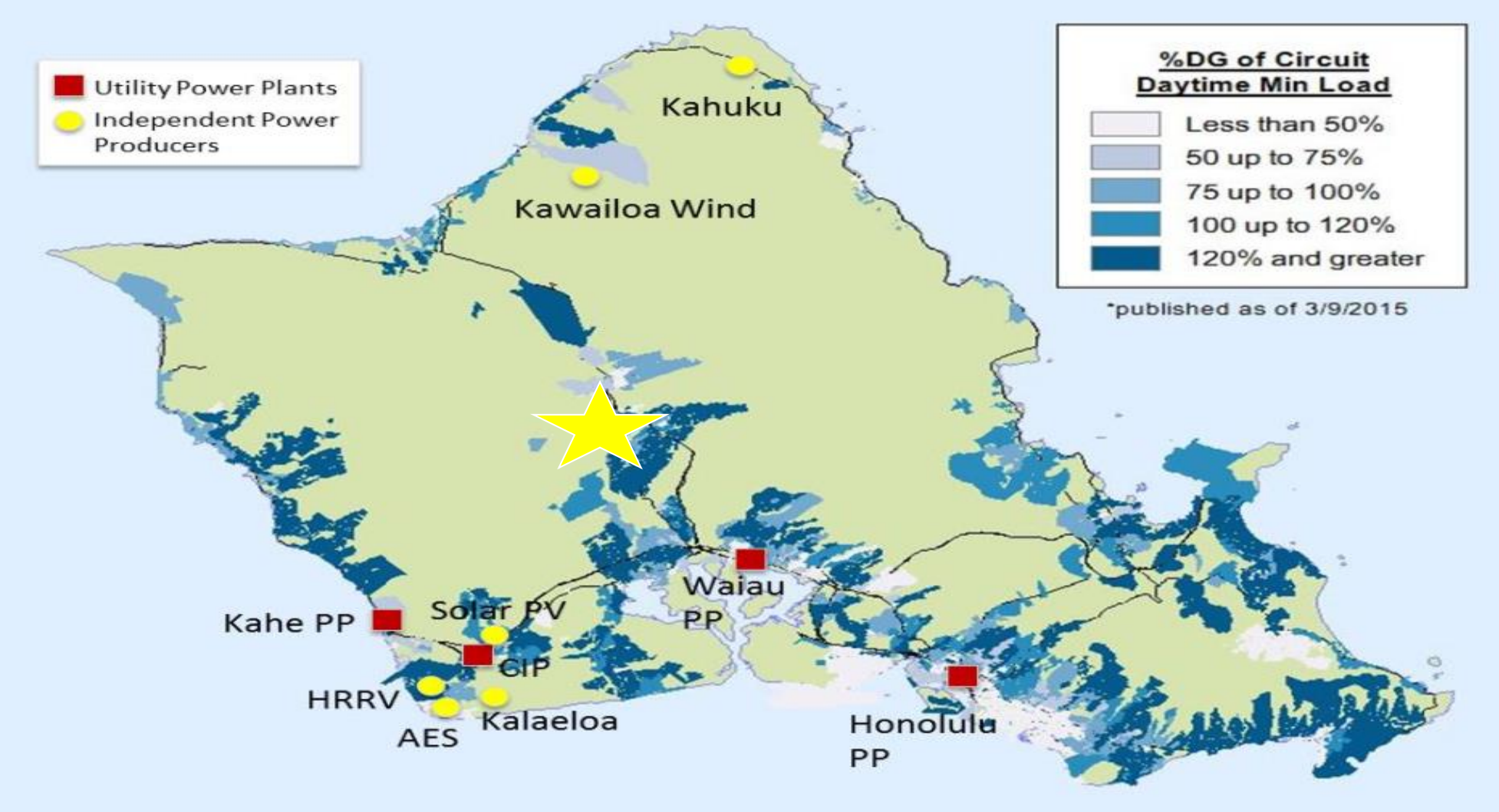
2. **Circuit Level**
   - Thermal capacity overload
   - Voltage flicker
   - Voltage regulation impacts
   - Islanding
   - Load rejection overvoltage
   - Ground fault overvoltage

3. **Overvoltage issues**
   - Primary
   - Secondary
   - Imbalance across phases

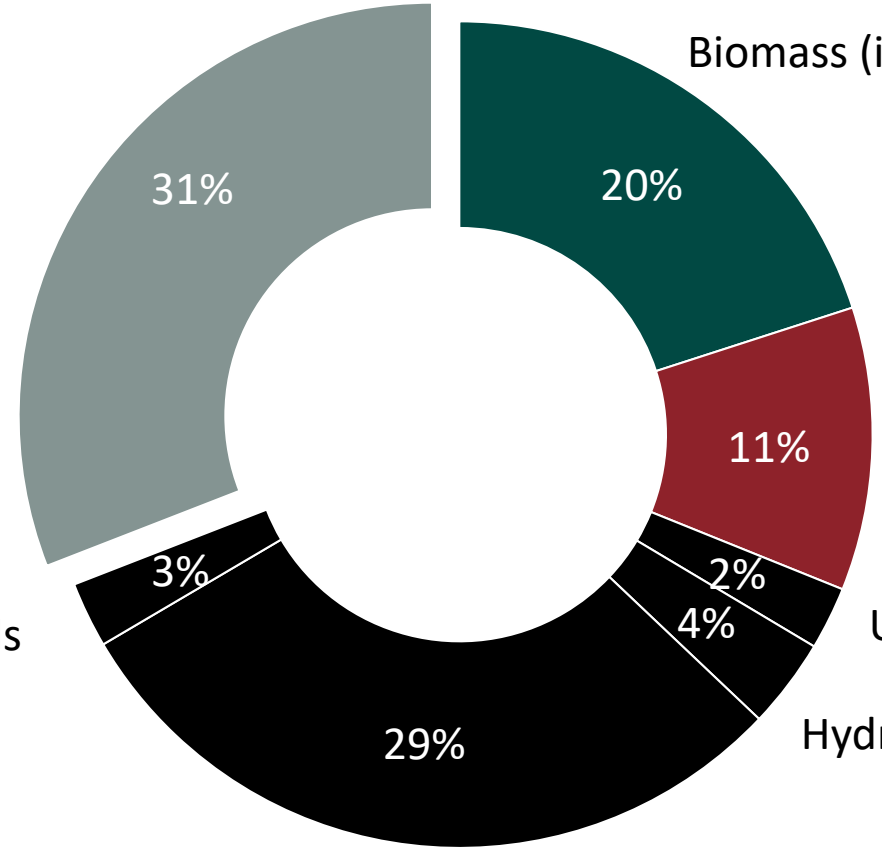




Transmission constraints relative to utility-scale renewable potential

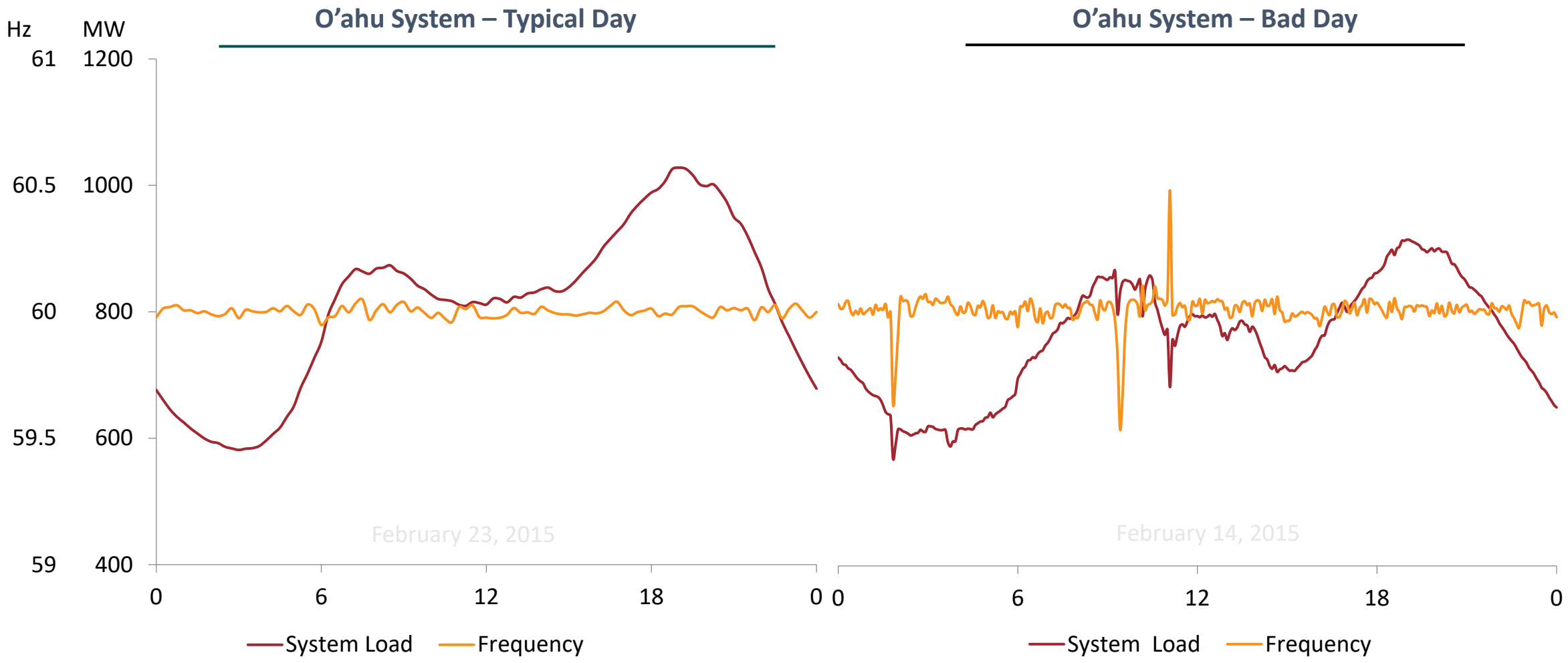


We are already moving a lot of generation to the distribution network

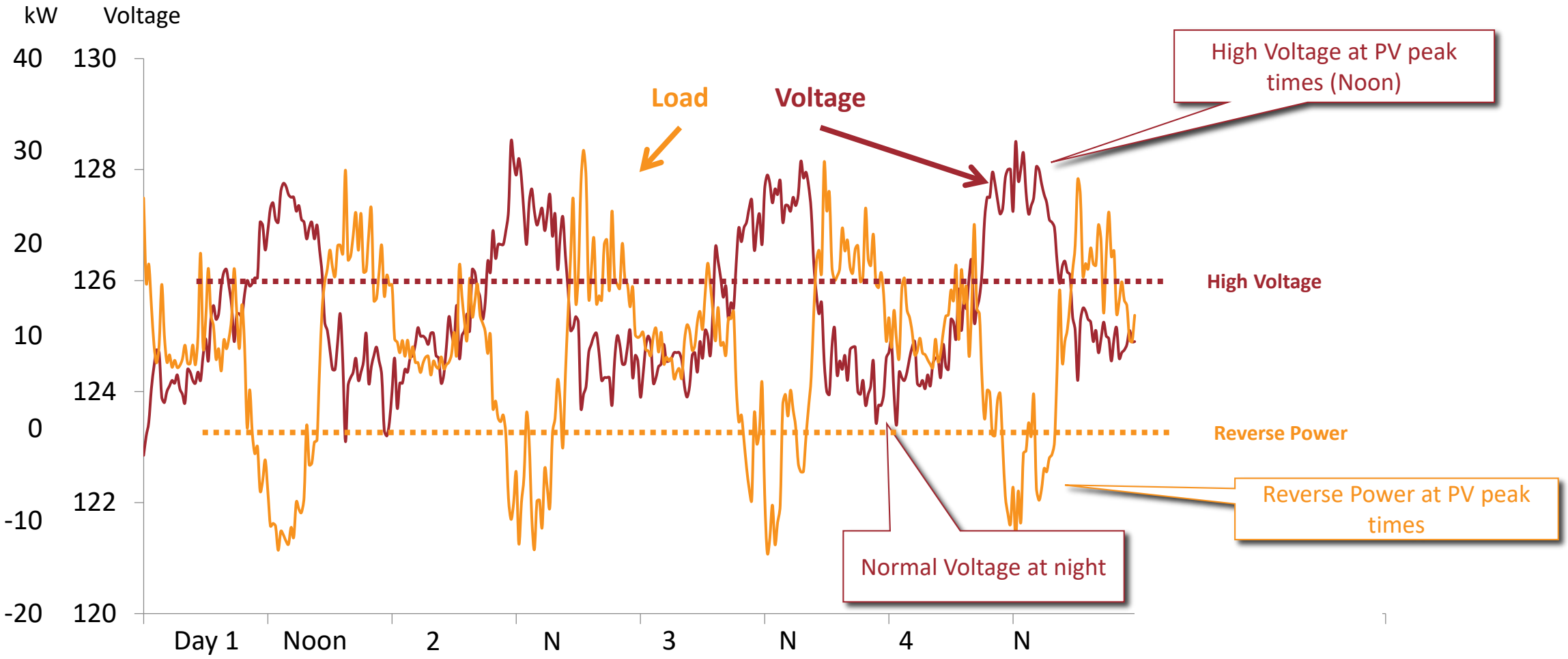


Hawaiian Electric Companies RPS of 23.2% for 2015

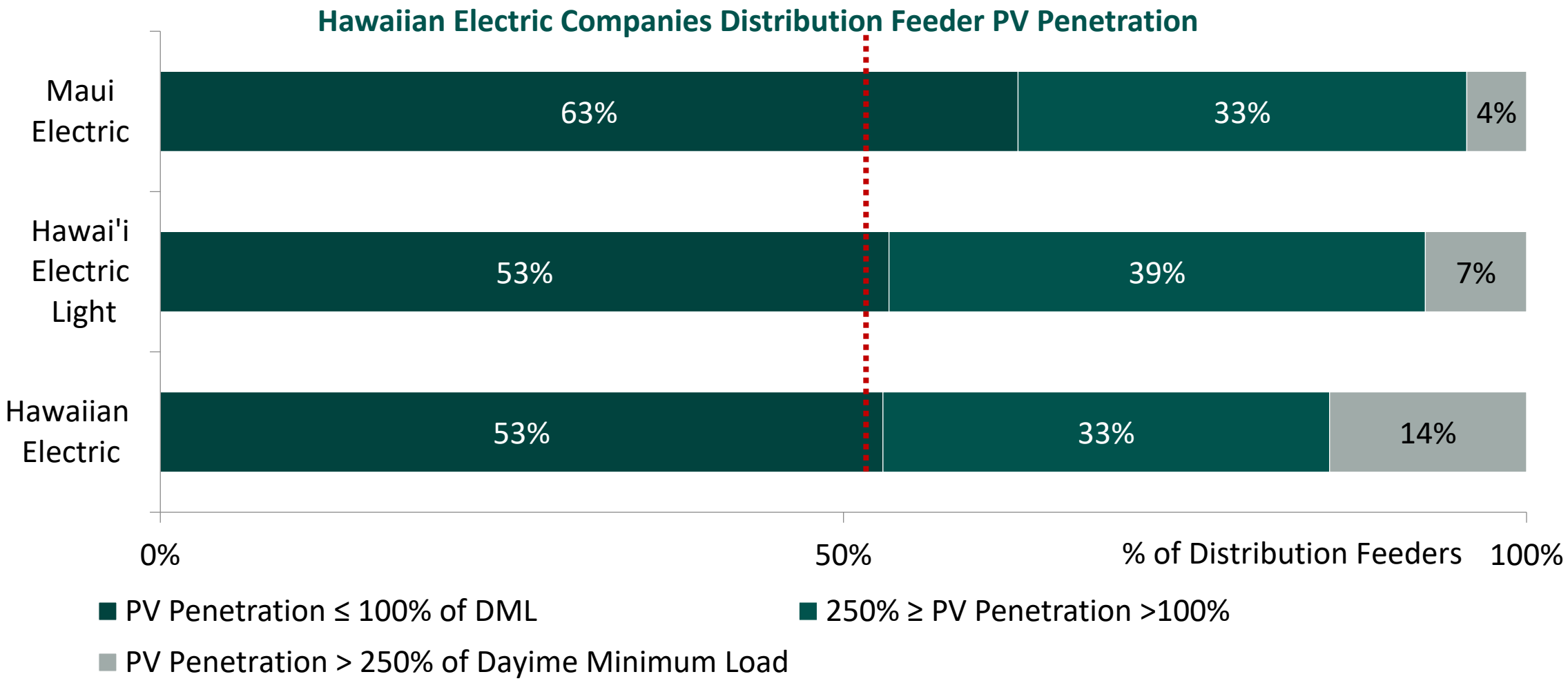
PV generation can pose frequency stability challenges



PV systems can also cause overvoltage



Back-feeding



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)

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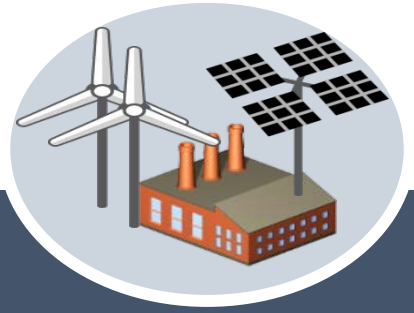
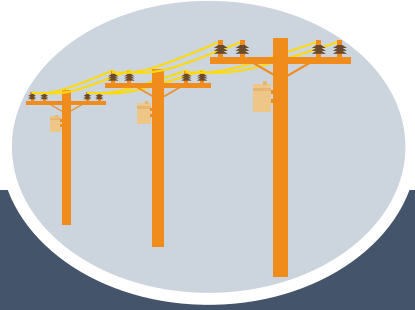
3 keys to a more effective interconnection process



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

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Four Grid Service Tariffs

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.

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.

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.

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.

Mahalo!

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Contacts

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MJDeAngelo@nyseg.com

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Steve.Fine@icf.com

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erik.gilbert@Navigant.com

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