Vermont Regional Partnership: Facilitating the Effective Expansion of Distributed Energy Resources

GRID MODERNIZATION INITIATIVE
U.S. Department of Energy

GMLC 1.3.10 PI: Robert Broderick (SANDIA); Plus 1: Mark Ruth (NREL)

Utility Partners

Green Mountain Power; Vermont Electric Co-op Inc; Vermont Electric Power Company VELCO

University Partners

The University of Vermont; Georgia Tech

Project Description & Objective

Develop an optimal and replicable approach to distributed energy resource (DER) integration at the distribution level to meet the state's goal of 90% renewable energy penetration by 2050. Key insights from what we learn in Vermont can be applied to the rest of the nation.

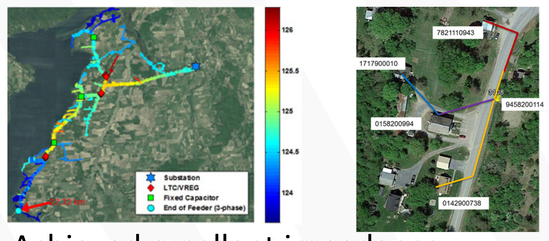
Expected Outcomes

1. Achieve high levels of DER integration without causing negative impacts to the distribution system
2. Develop a replicable approach for DER integration at the distribution level in each of the three task areas
3. Disseminate the results and replicate methodology for other stakeholders

Significant Milestones Completed	Date
Task 1 – DER integration Received Seven models, AMI data and controller data. Begin conversion and data cleaning. Data integrated into models for running analysis and visualization	3/30/2017
Task 2– DER control Formulate network model and develop preliminary optimization algorithms. Grid LAB-D models, populated with residential ES system models, running in IESM. Update algorithms after analysis and simulation. Ability to control residential ES systems from aggregator module within IESM demonstrated.	3/30/2017

Task #1: DER Integration and Modeling

Goal: Improve distribution system models through innovative parameter estimation methods and use them to determine optimal amount and placement of photovoltaic (PV) solar and battery storage

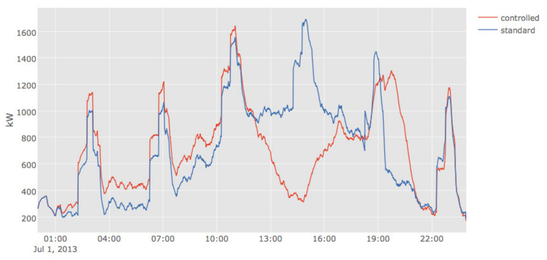


Achieved excellent impedance estimates on Panton – 9G2 Feeder

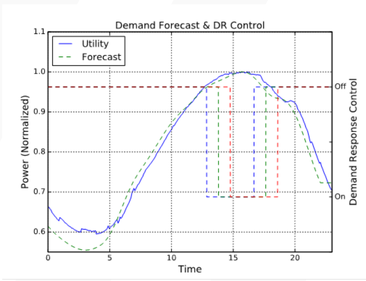
Developed circuit reduction methods for energy storage optimization

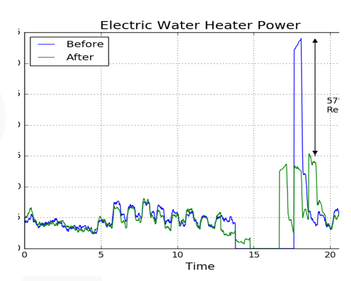
Task #2: DER Control & Optimization

Develop and validate new control strategies for managing demand response rebound effects



Developed & populated model of Green Mountain Power ER-G51 feeder with aggregator control and showed peak shaving



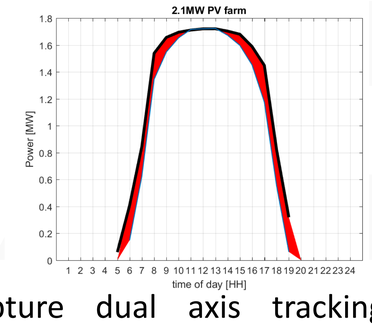


Developed multiple bin control approach that shaves water heater peak load and reduces rebound. Initial estimate of 57% reduction in rebound peak

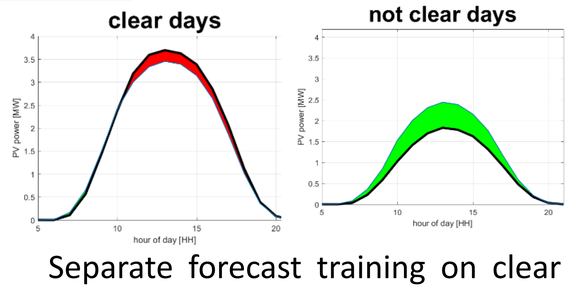
Task #3: DER Forecasting

Improvements to the solar forecasting to improve generation predictions and system management. Identified three:

- Account for azimuth of PV modules
- Faster adjustments to changes in distributed PV capacity
- Separate forecast training on clear vs. cloudy days



Capture dual axis tracking and module azimuth



Separate forecast training on clear and cloudy days