Energy Storage to Increase Hosting Capacity

NEW YORK BATTERY
AND ENERGY STORAGE
TECHNOLOGY CONSORTIUM

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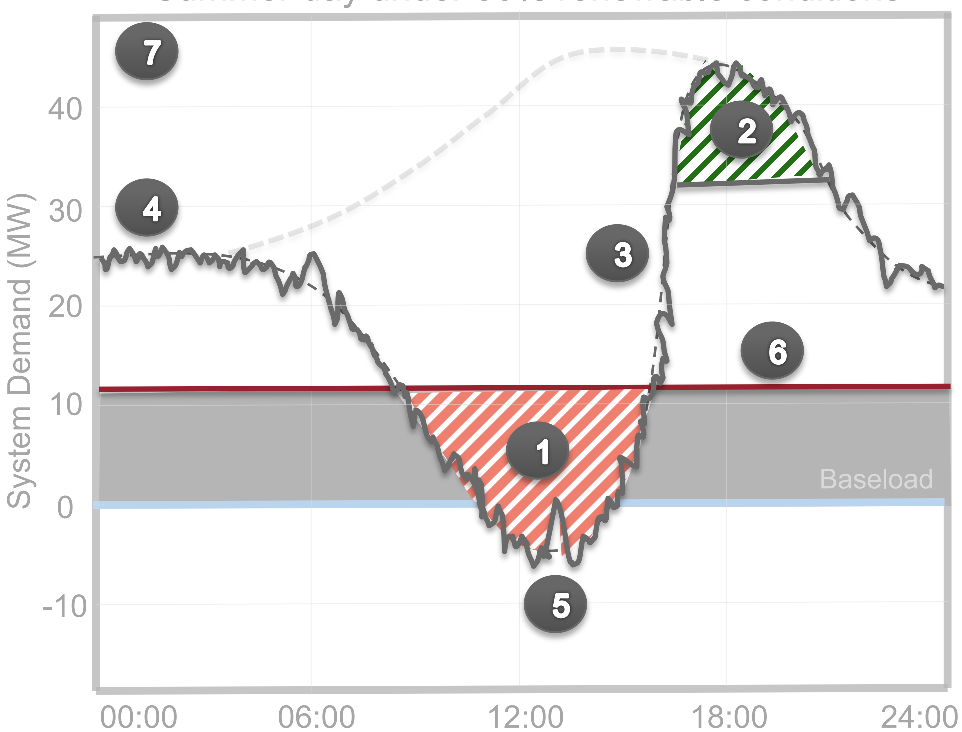
Joint Utilities Stakeholder meeting
August 4th 2016

Energy Storage is a flexible asset that provides **unprecedented flexibility** in grid optimization.

Summer day under 50% renewable conditions



1. **Curtailed Renewables**
   Baseload causes excess solar to be curtailed
2. **Peak Load**
   Short duration peaks after sunset
3. **Fast Ramping**
   Respond to sunset dynamics
4. **Frequency Regulation**
   Real-time frequency control
5. **Spinning Reserve**
   Dynamic response to events (clouds)
6. **Maximize Baseload**
   Enables high capacity factor baseload
7. **Reduce Emissions**
   From peak capacity and ancillary services

ES provides **instantaneous local capacity**, & **continuous ancillary services** with ***no fuel consumption or emissions***.

Source: General Electric – presented at PSC Energy Storage Technical Conference May 26, 2016

Modifying Hosting Capacity

- Addressing reverse power flow by providing load
- Grid stability
  - Voltage control
  - Reactive Power
- Ramp rate control

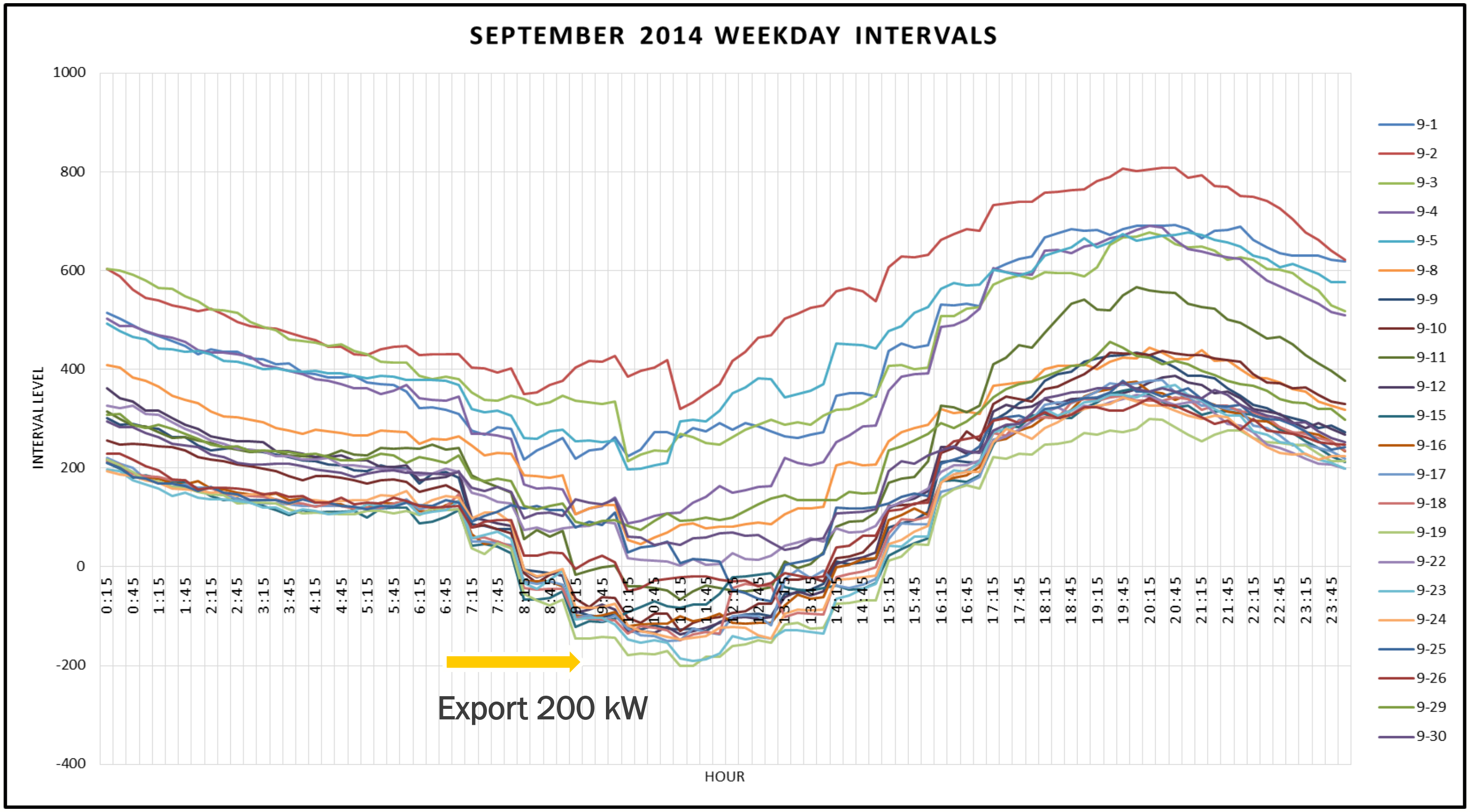
Power Flow Control (From Demand Energy)

Project Overview

- 489 kW Solar PV
- 400 kW Fuel Cell
- 300 kW/1200 kWh Storage

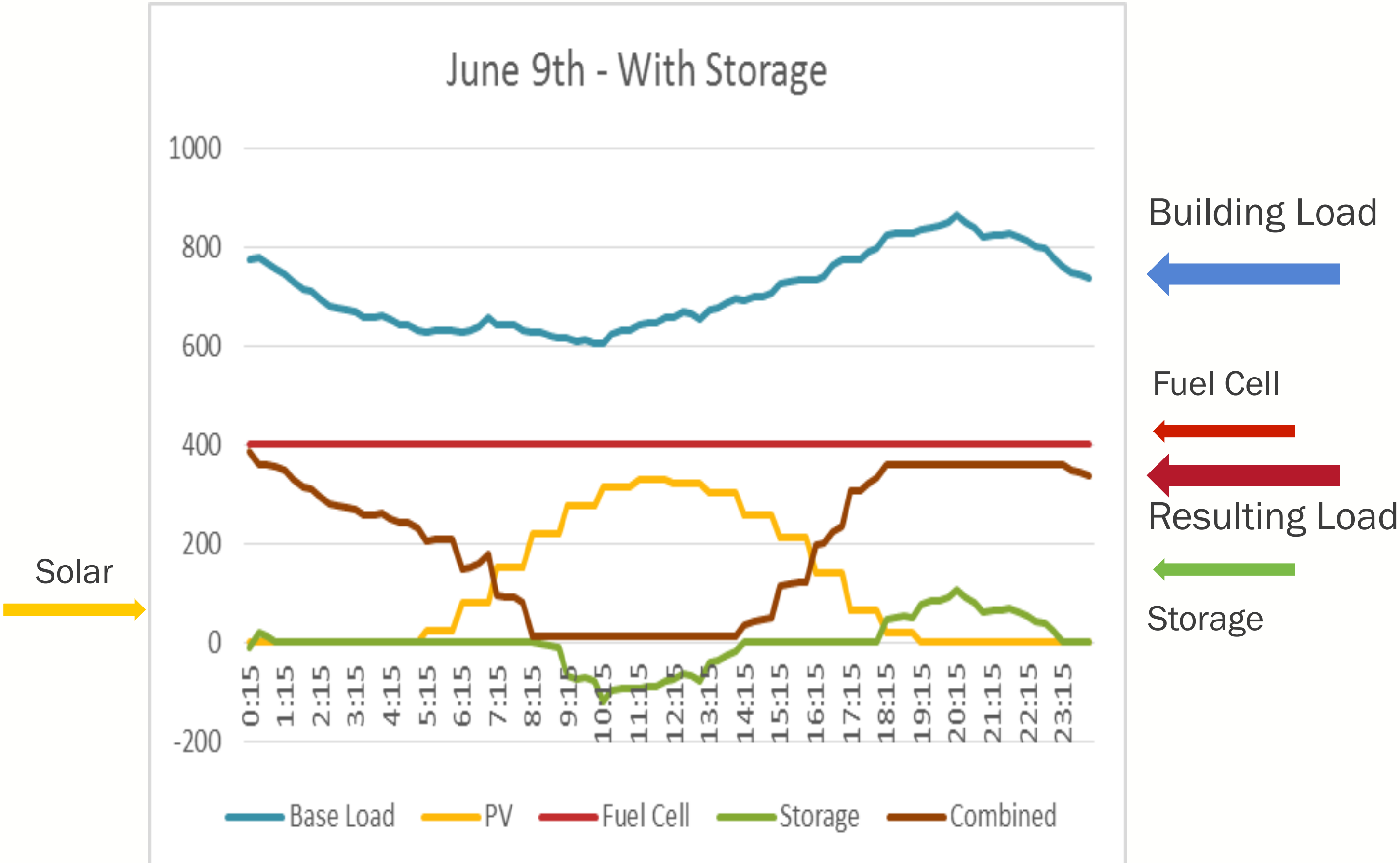
Power Flow Control (From Demand Energy)

September Loads w/FC+PV



Power Flow Control (From Demand Energy)

June Peak Load Day



Hosting and Capacity Contraints

- Important that hosting capacity consider what is being "hosted"

- The same energy storage system that is providing power to address capacity constraints at times of peak load can provide load at times of over-generation.

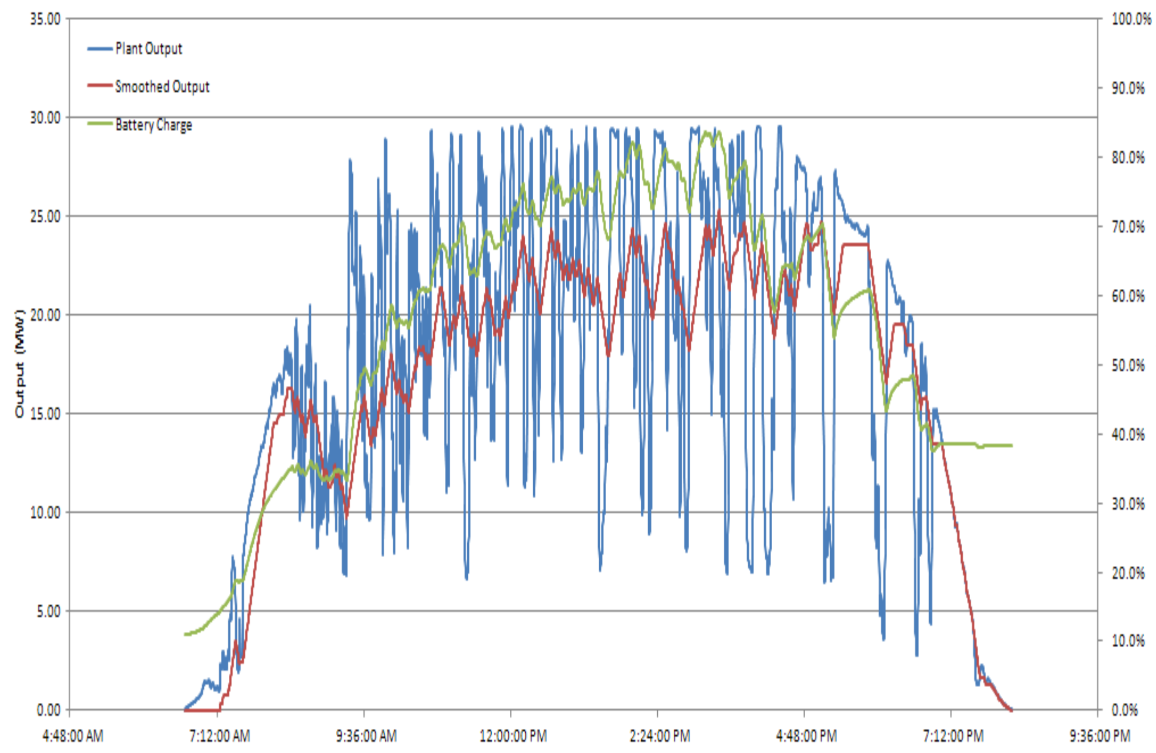
Voltage Support (From RES)

Case Study Background

A New England utility investigated storage to defer/negate the need for a new substation to support a remote and weak feeder with high penetration of distributed PV.

Primary issues:

1. Limitation to load serving ability
2. Voltage flicker caused by PV variability
3. Voltage sags due to large motor starts



Scenario modeled:

1. Sudden cloud cover causes 70% instantaneous drop in PV generation
2. Simultaneous industrial motor start event (150 hp)
3. Events occur during peak demand period

Voltage Support (From RES)

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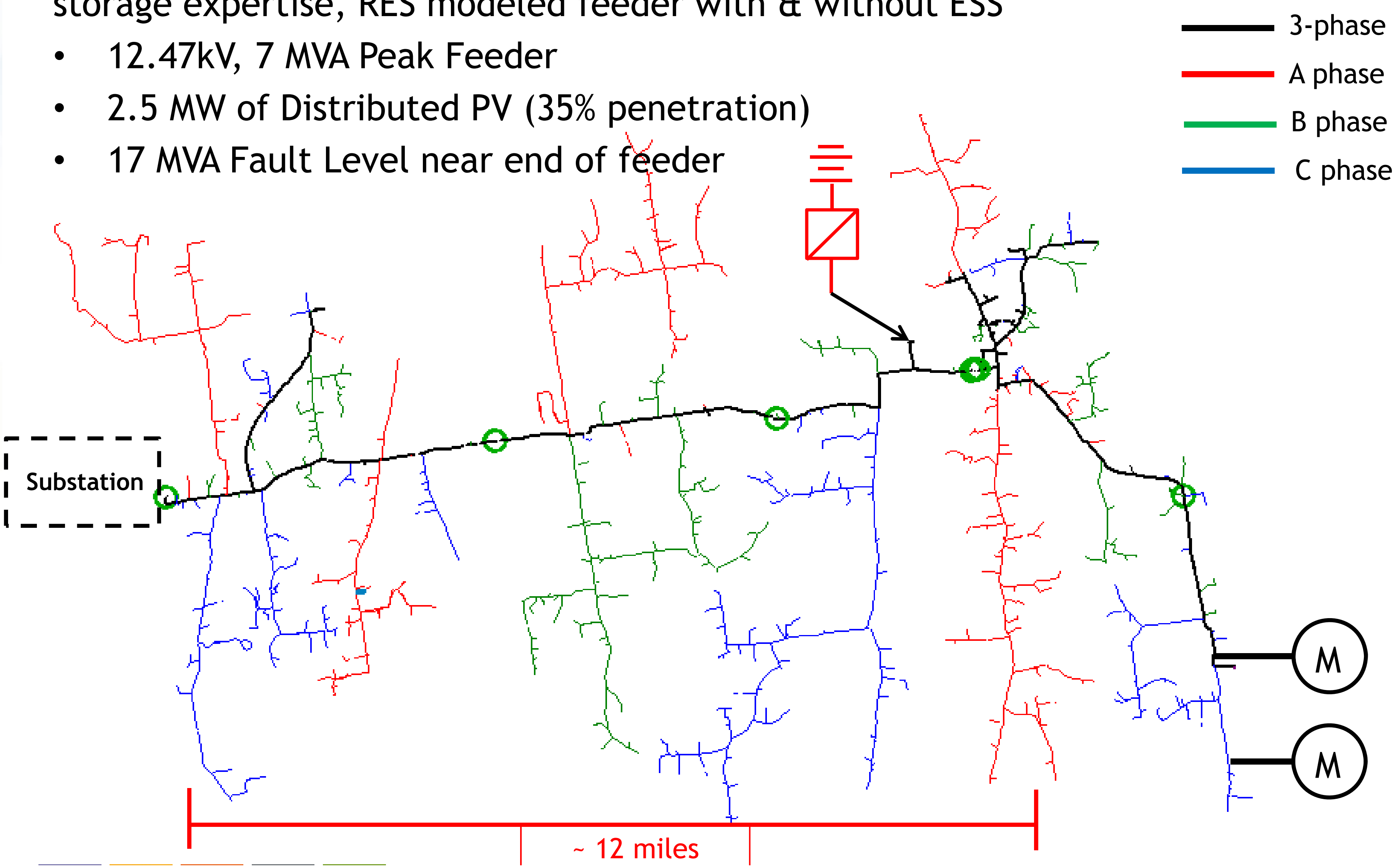
Case Study Approach

res

Using industry-standard distribution network analysis tools and leveraging its storage expertise, RES modeled feeder with & without ESS

- 12.47kV, 7 MVA Peak Feeder
- 2.5 MW of Distributed PV (35% penetration)
- 17 MVA Fault Level near end of feeder

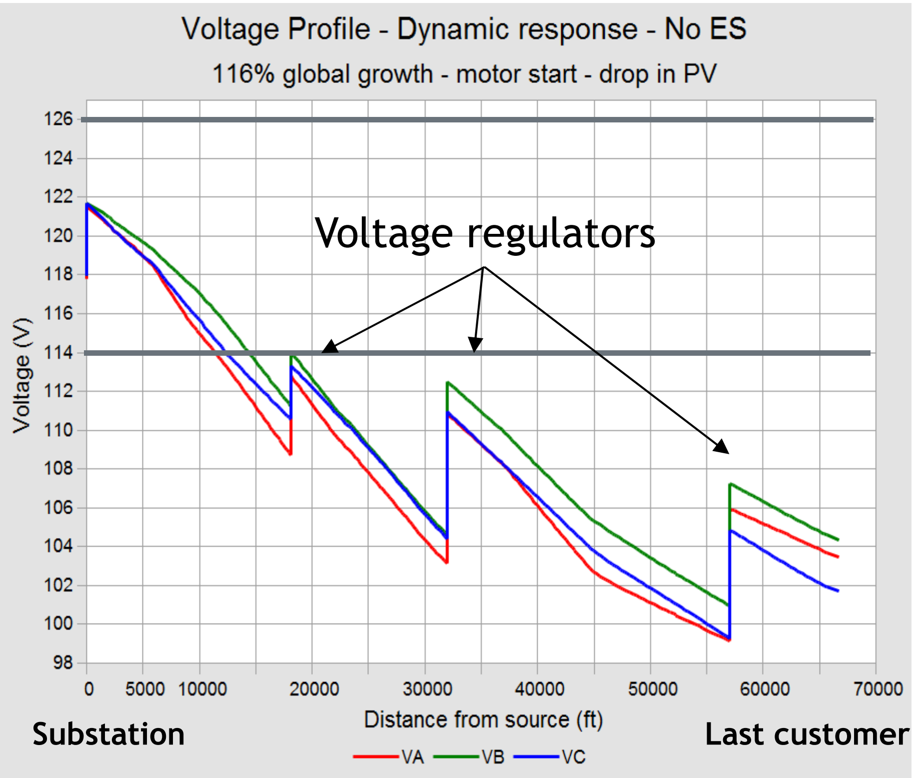


Voltage Support (From RES)

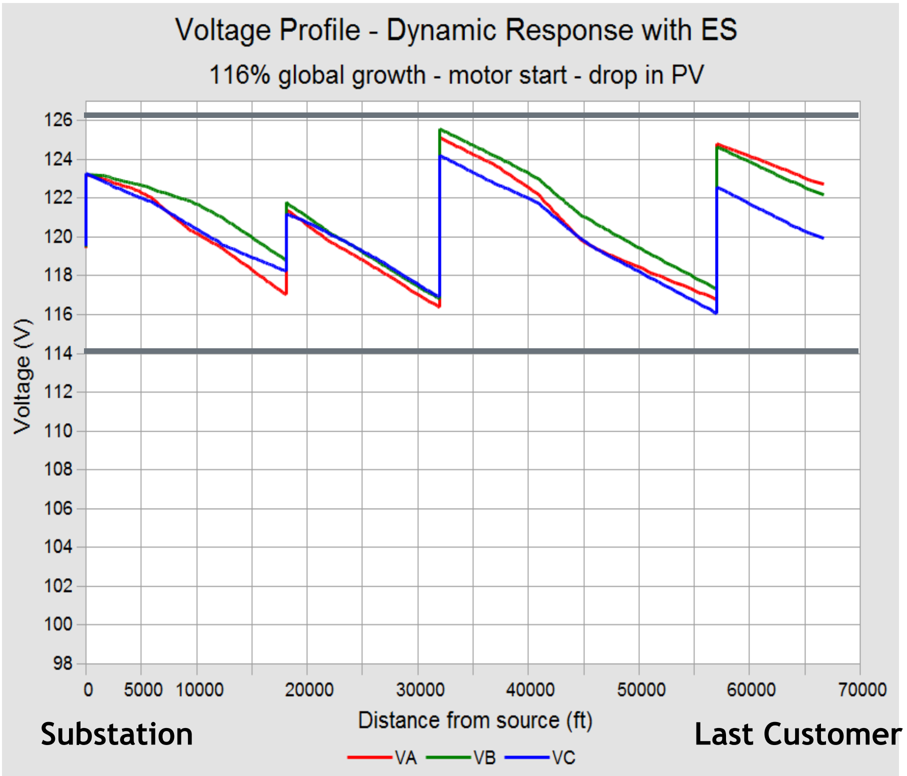
Case Study Findings

3.2 MVA of battery + inverter demonstrated to mitigate voltage impacts of a simultaneous drop in PV generation and 150 HP motor start

No Storage
Dynamic response condition of circuit



With Storage
Dynamic response condition of circuit



Voltage Support (From RES)

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Project Use Case

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	SERVICE	VALUE
PRIMARY	Substation Upgrade Deferral	Use ESS to control feeder voltage in order to 1) defer need for new $10 million substation, 2) allows reconnection of 2MW from other utility, 3) add new industrial customers with large inductive loads.
SECONDARY	Supply Capacity	Reserve ESS capacity for top 40 ISO-NE load hours per year to reduce utility load during ISO coincident peaks. Reduces need to acquire additional capacity from ISO capacity markets.
	Transmission Charges	Reserve ESS capacity for designed # hours per month to reduce utility load during regional system peaks. Reduces transmission charges from provider.
TERTIARY	Frequency Regulation	ESS bids into ISO regulation markets and is paid based on market clearing prices.
	Energy Arbitrage	ESS charges during low-price hours and discharges during high-priced hours if price spreads can overcome losses, degradation, and O&M costs.

Concluding Points

Hosting Capacity should be thought of as Hosting Management

- Numerous methods to modify hosting capacity
- Behind-the-meter and on-grid assets can contribute
- Distribution grid assets will be important in achieving Clean Energy Standard requirement.

Opportunity with NWA projects

- Solutions for capacity constraints can increase hosting capacity
- Should develop means to to consider these multiple benefits