Energy Storage for Enhancing Grid Reliability

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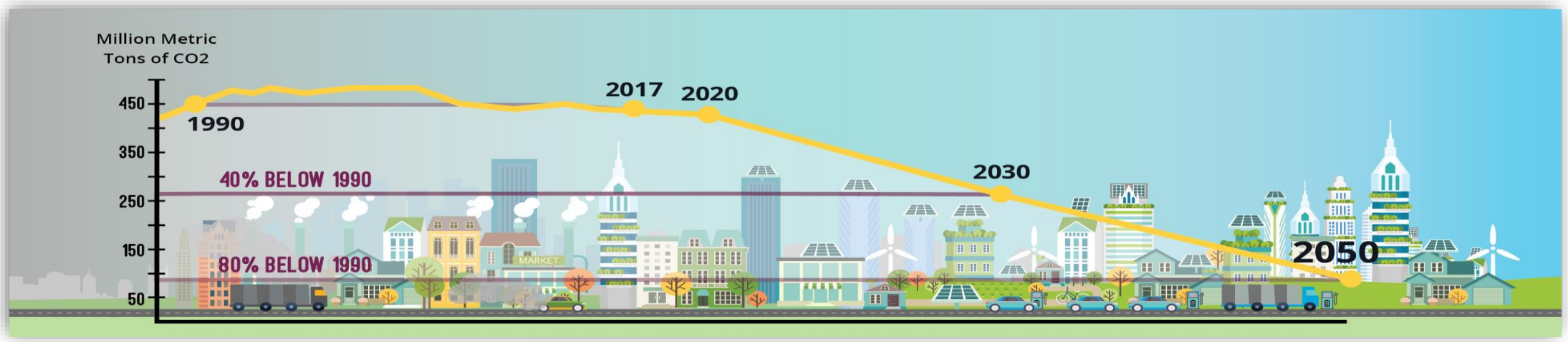
2019 Energy Storage Technologies and Applications Conference

Outline

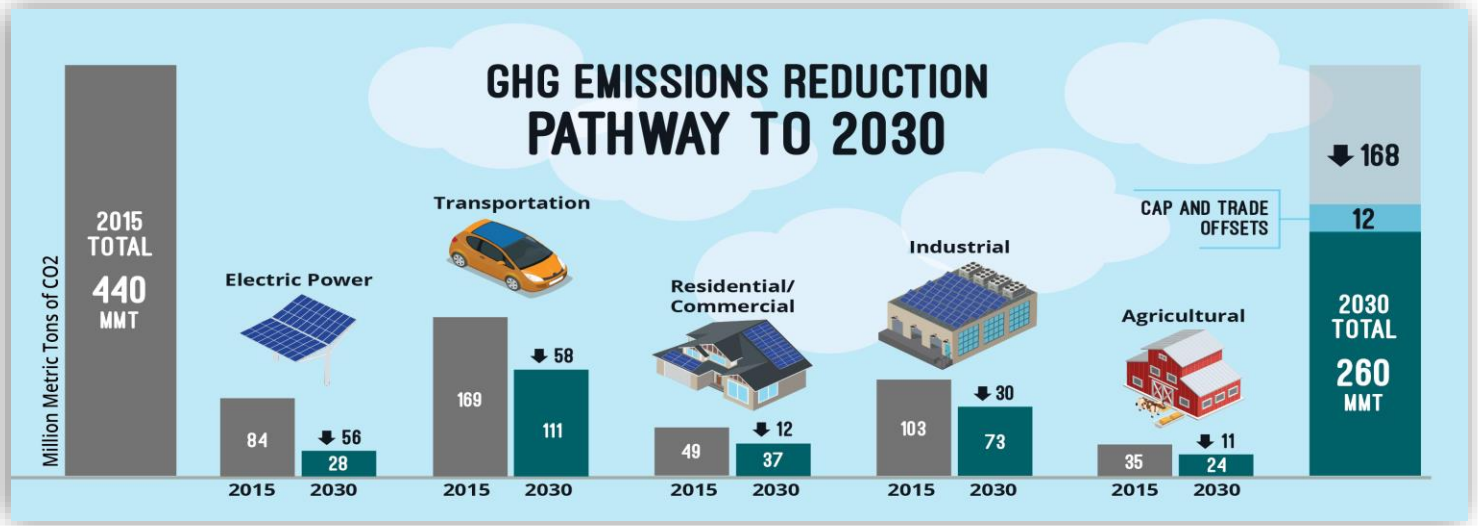
- Part I: Pathway to 2030
- Part II: Energy Storage Integration
- Part III: Energy Storage Pilots for Enhancing Grid Reliability

Supporting California's GHG Reduction Goals

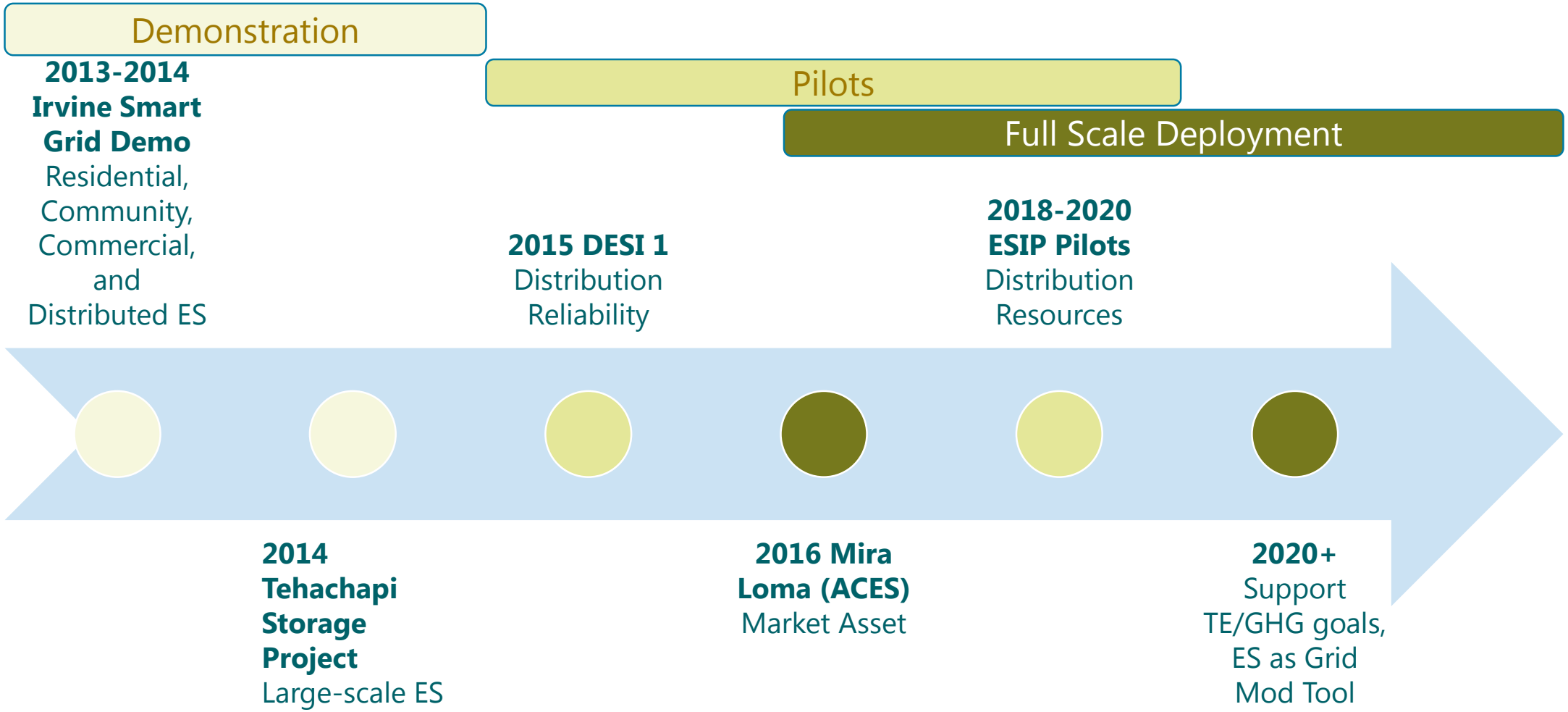


By 2030 SCE's Pathway calls for:

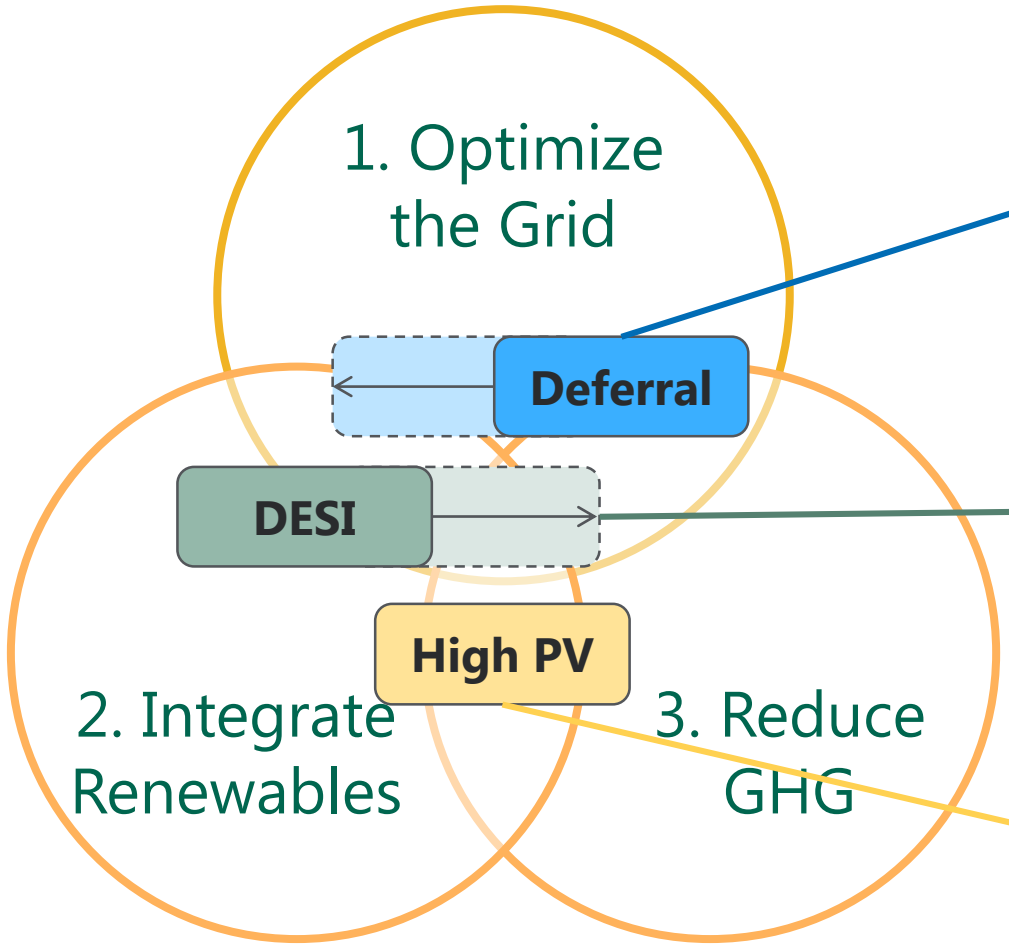
- 80 % carbon-free energy;
- 7 million EVs;
- 1/3 of space and water heaters electrified
- **Up to 10 GW of storage**



Advancing Energy Storage Integration



Energy Storage Integration Value and Use Cases



Deferral pilots defer traditional upgrades and reduce GHG, and may also address voltage concerns and improve circuit integration capacity

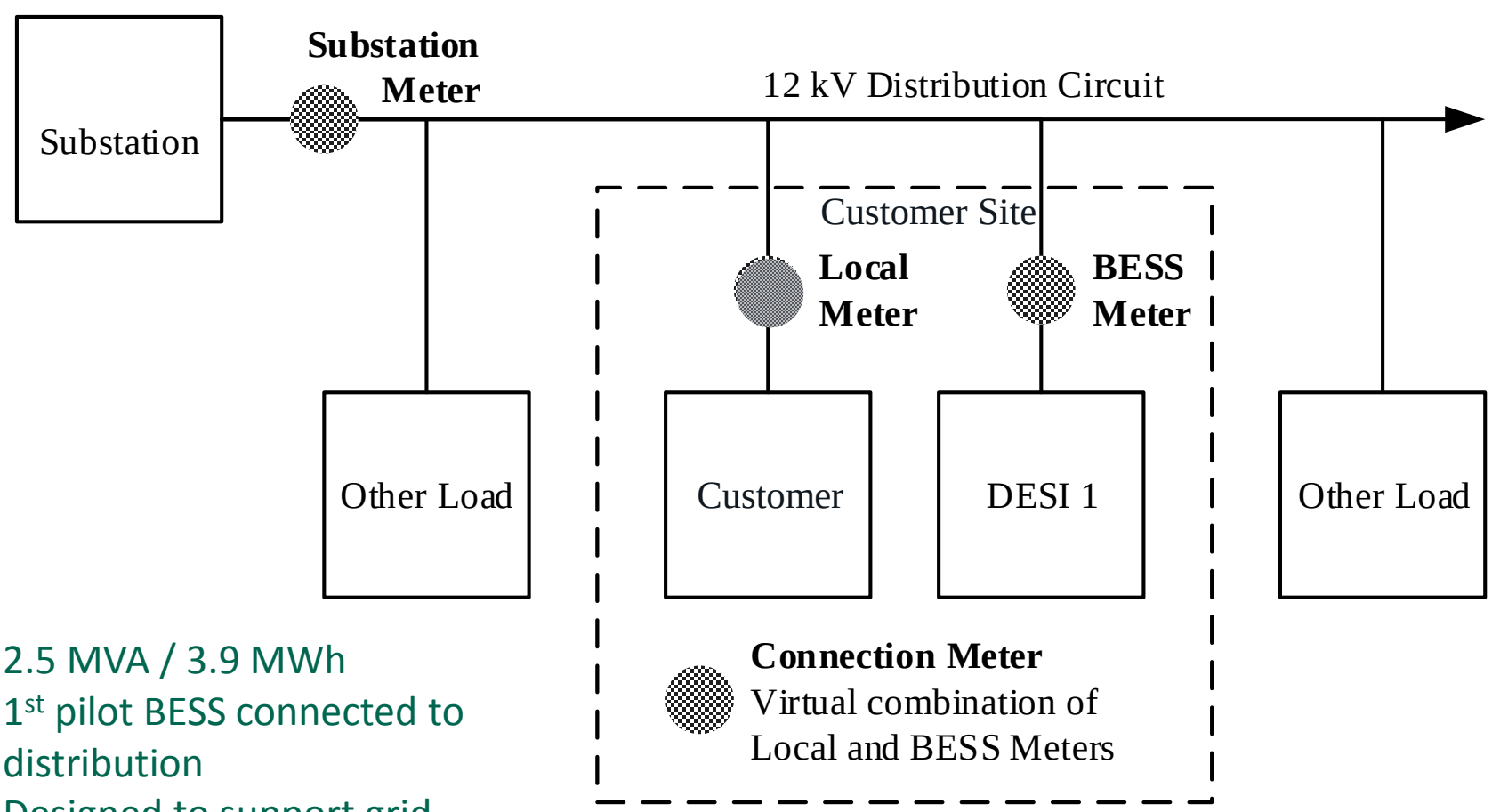
Distributed Energy Storage Integration (DESI) pilots will demonstrate optimized aggregation of storage and help understand the role of a DSO and may also reduce GHG

High PV pilots target circuits with 4MW connected PV and >35% PV penetration level to increase PV dependability, mitigate reverse power flow, and support voltage, which will improve integration capacity

Energy Storage Integration Program – Use Cases

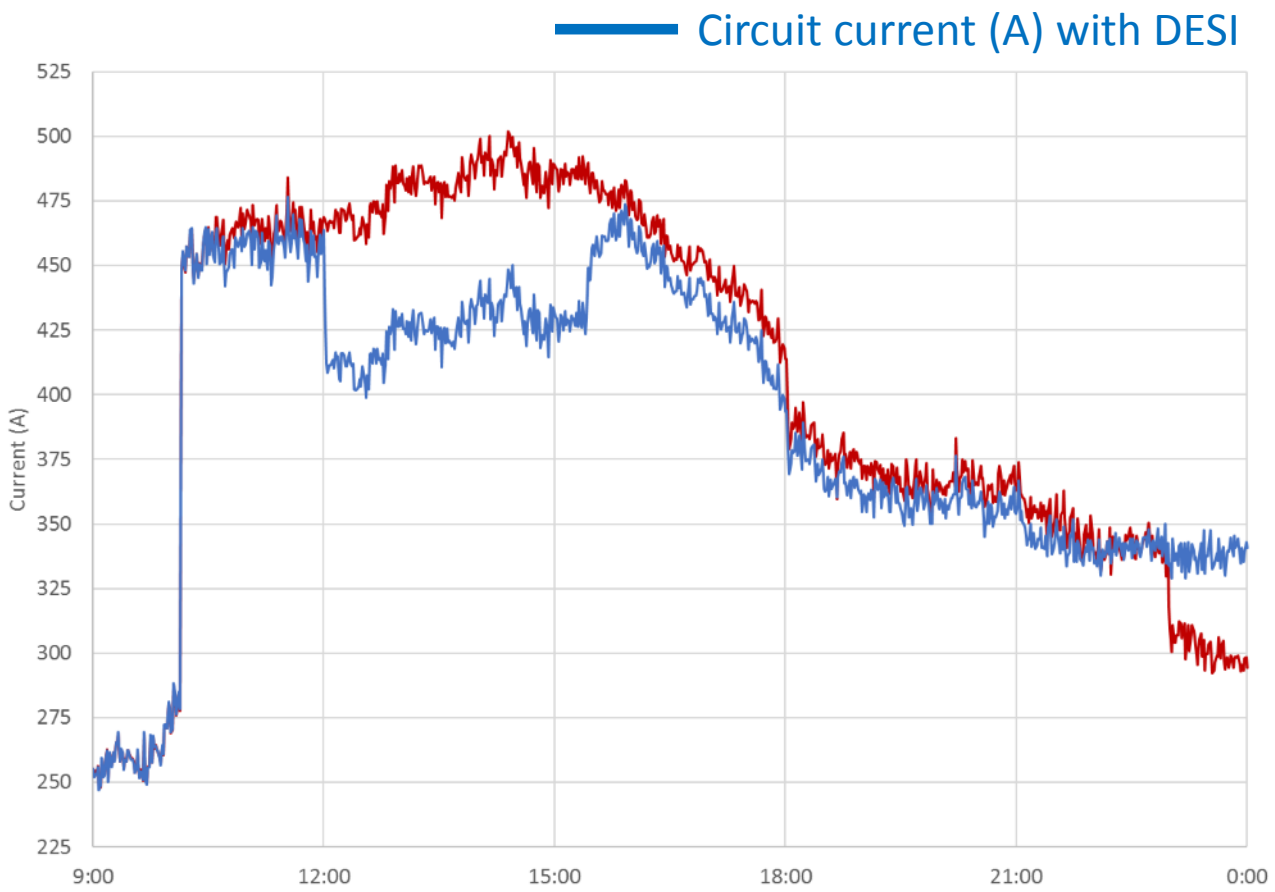
#	Project Size	Online Date	Description
1	1.4 MW / 3.7 MWh	Q4 2018	Support grid operations for reliability purposes and incorporate advanced controls
2	2.8 MW / 5.6 MWh	Q4 2018	Address 11.5 MW of PV and minimize 8 MW back feed during the day from 15 NEM and 6 R21 systems
3	3.5 MW / 8.75 MWh	Q3 2019	Defer the need to reconductor 66 kV lines, addressing an N-1 contingency
4	3.0 MW / 9.0 MWh	Q1 2020	Defer the need to reconductor 66 kV lines, addressing an N-1 contingency
5	3.5 MW / 3.5 MWh	Q4 2019	Optimize existing islanding capabilities at SCE's Poole Hydro plant and help facilitate a microgrid
6	2.5 MW / 4.5 MWh	Q1 2020	Address 4.3 MW of PV (310 NEM and 2 R21) systems causing a high peak past 7 pm and eliminate back feed

Distributed Energy Storage Integration (DESI) Pilot 1

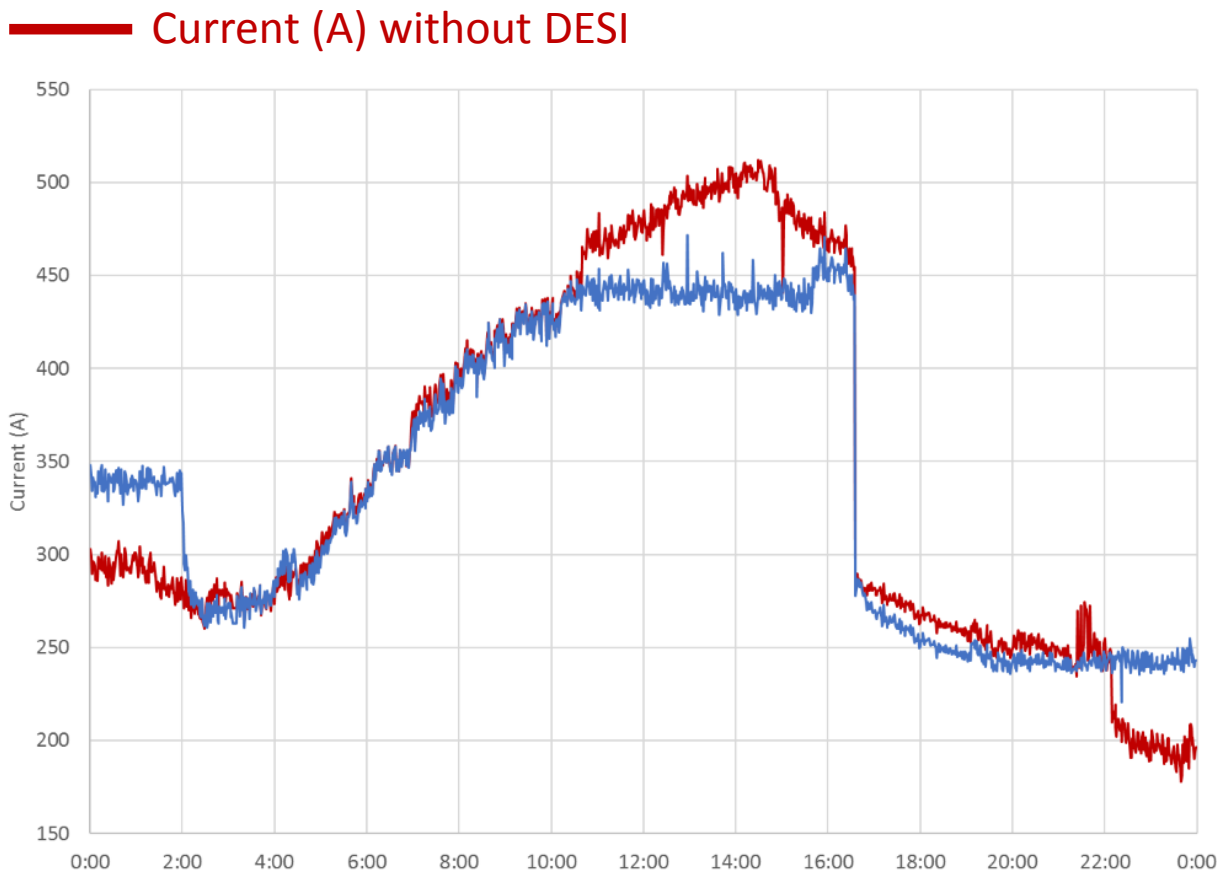


- 2.5 MVA / 3.9 MWh
- 1st pilot BESS connected to distribution
- Designed to support grid operations.

Enhancing Reliability of Distribution Circuit by Preventing Overloading

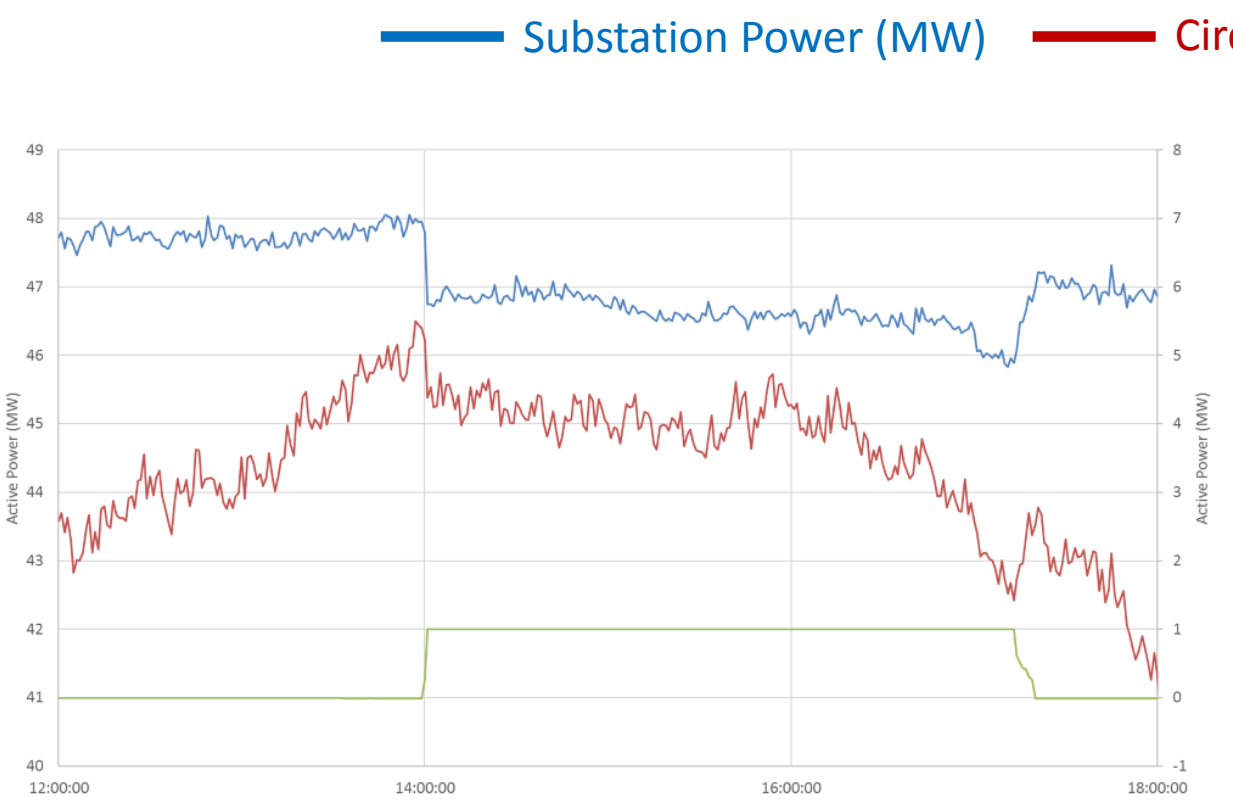


July 19, 2017 DESI 1 Dispatch for Circuit Relief



July 20, 2017 DESI 1 Dispatch for Circuit Relief

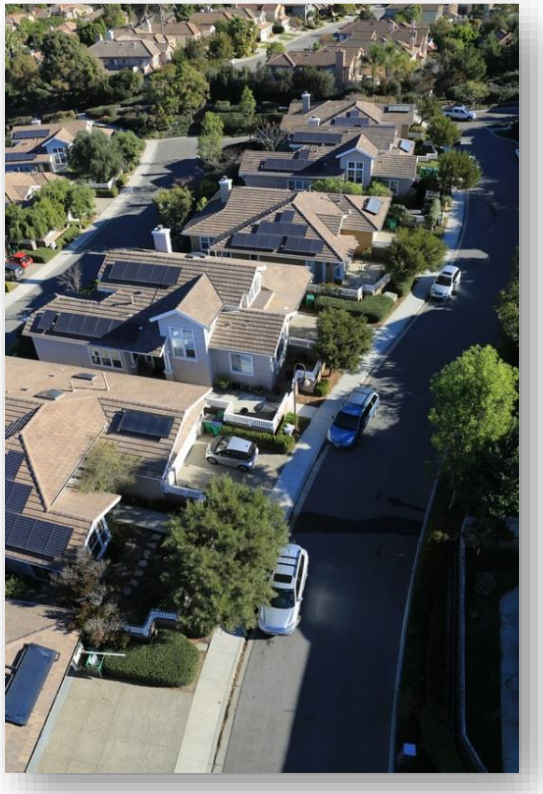
Enhancing Reliability of Distribution Substation by Preventing Overloading

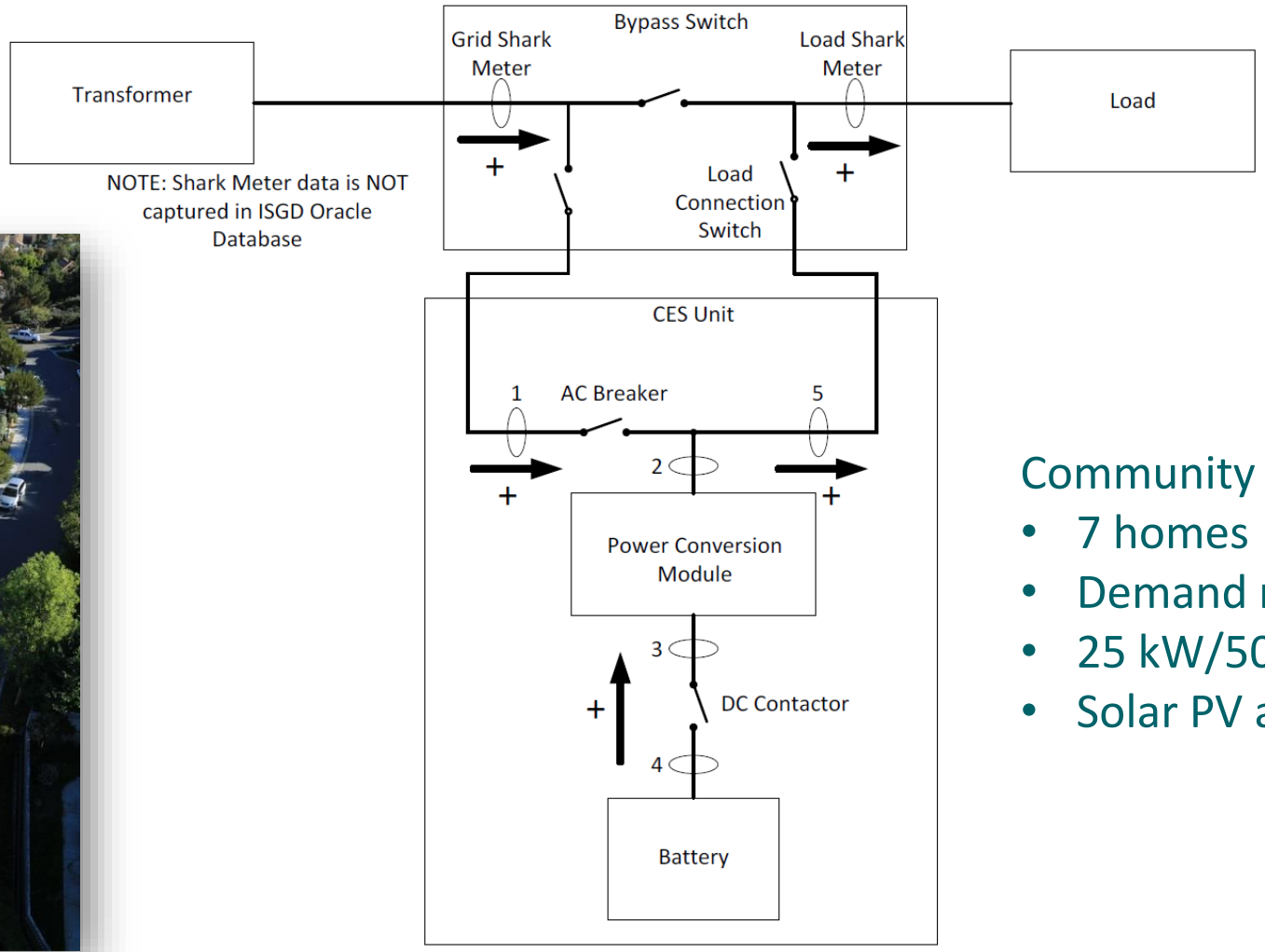


August 30, 2017 DESI 1 Dispatch for Bank Relief

August 31, 2017 DESI 1 Dispatch for Bank Relief

Irvine Smart Grid Demonstration – Community Energy Storage

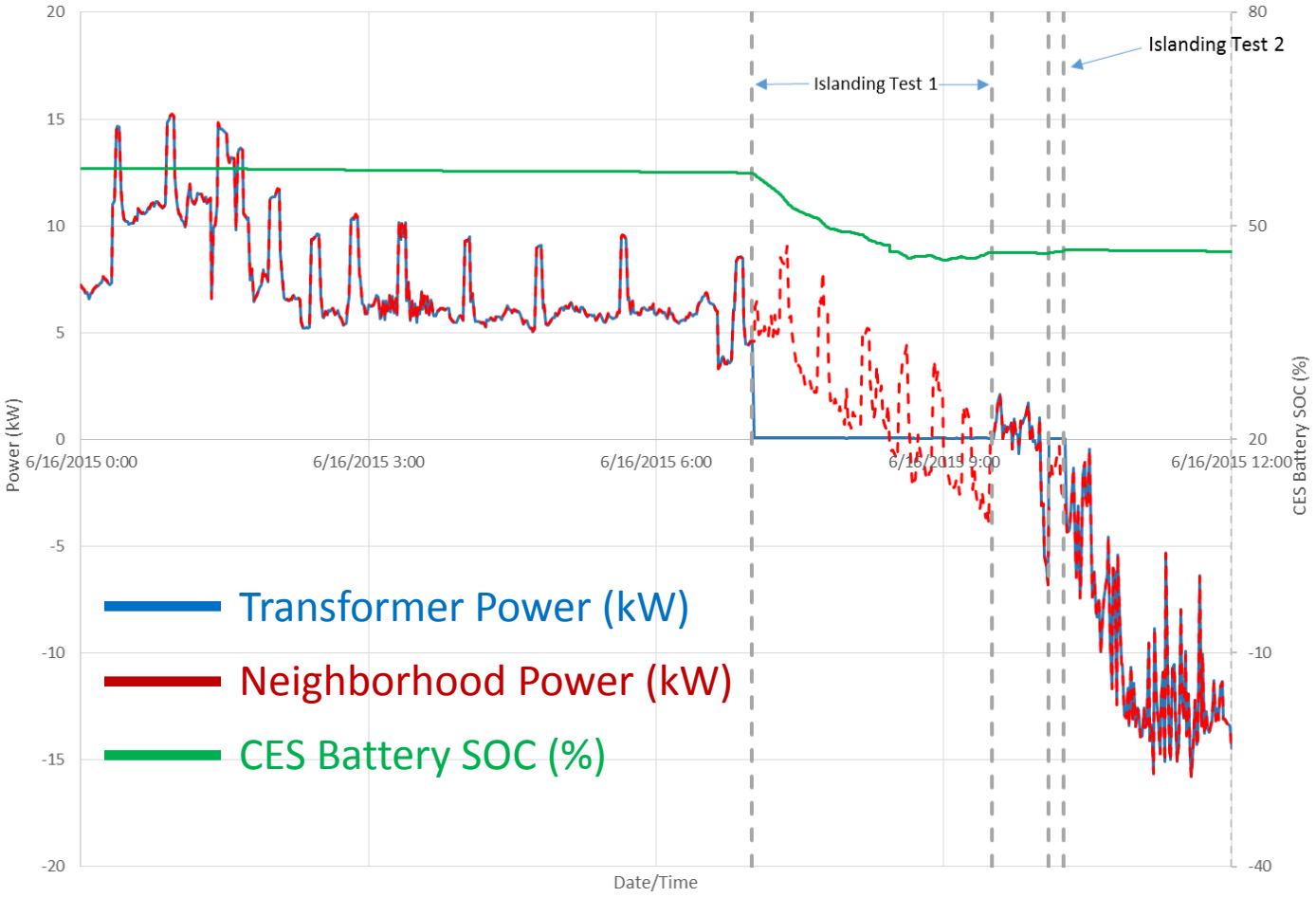




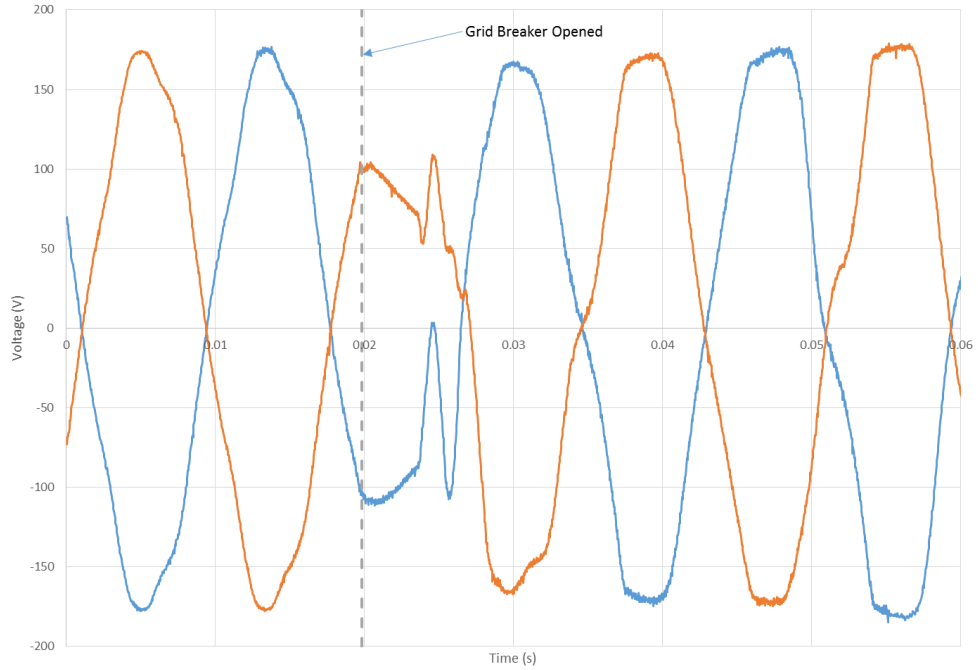
Community Energy Storage (CES):

- 7 homes
- Demand response devices
- 25 kW/50 kWh
- Solar PV arrays (3.2 - 3.8 kW)

Enhancing Reliability of Block of Customers Through Islanding During Grid Outages



ISGD SP1 Community Energy Storage (CES) Islanding



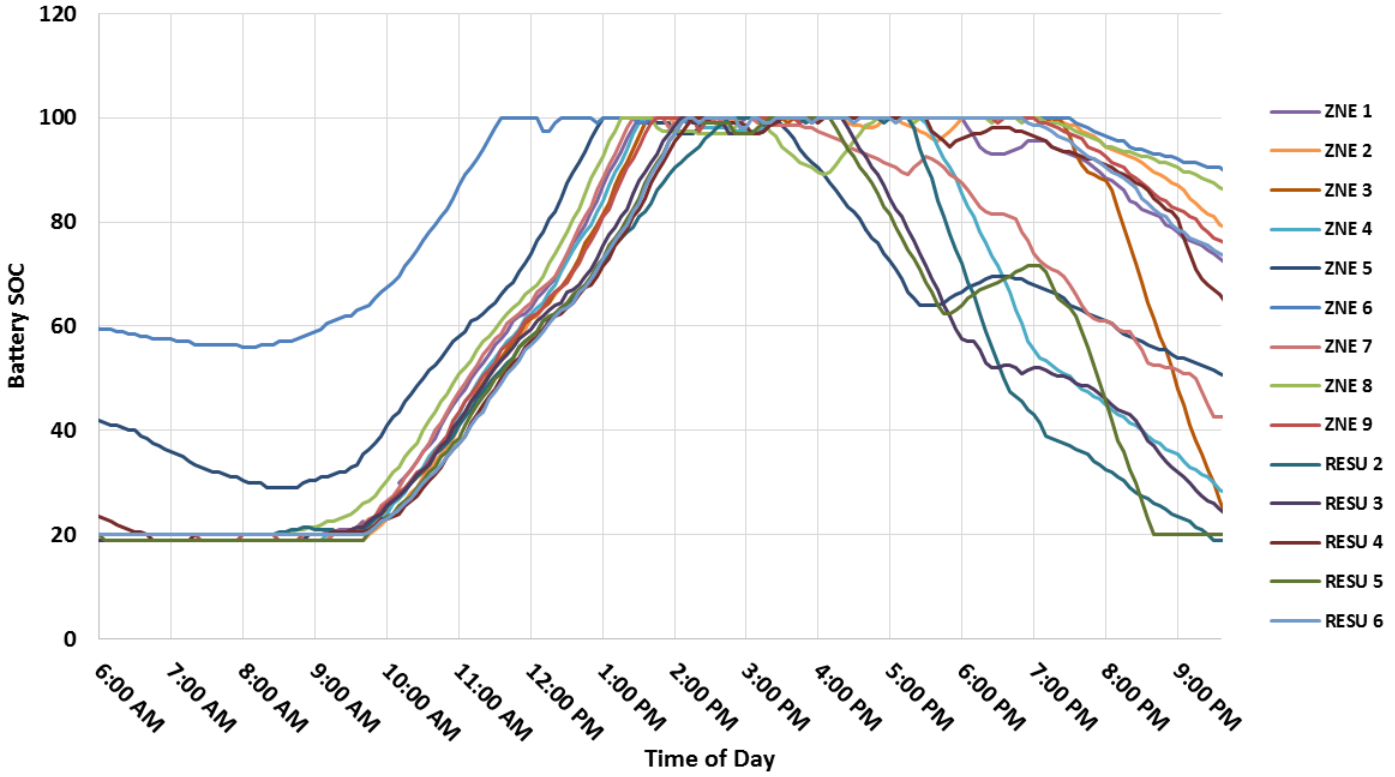
Voltage transients

Irvine Smart Grid Demonstration – Residential Energy Storage Unit

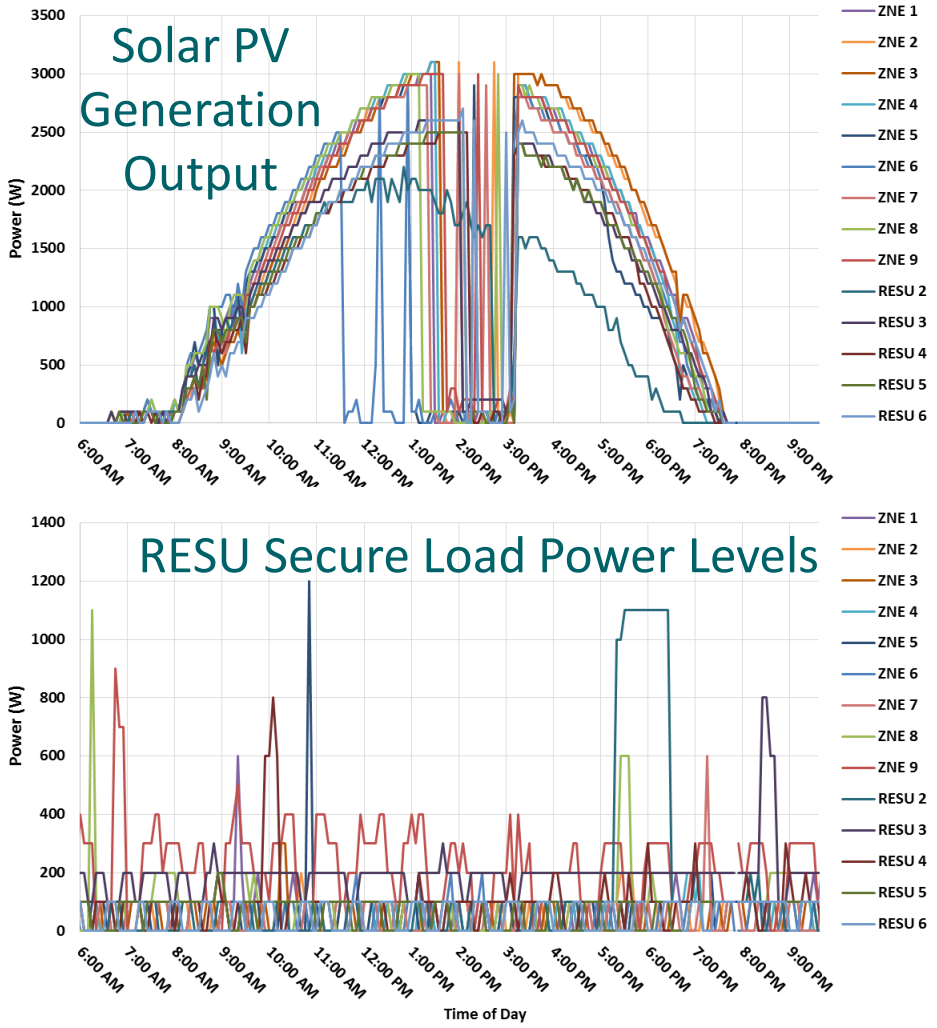
Residential Energy Storage Unit (RESU) block:

- 14 homes including ZNE
- Demand response devices
- 4 kW/10 kWh
- Solar PV arrays (3.2 - 3.8 kW)

Enhancing Customer Reliability Through Secure Load Backup



Scheduled power outage - RESU States of Charge



Looking Ahead – EPIC Technology Demonstration Projects (2018 – 2020)

- Storage-Based Distribution DC Link
  - Demonstrate a storage system supporting 2 circuits, individually or simultaneously, and providing a means of dynamically exchanging power between them (DC link)
- Distributed Plug-in Electric Vehicles Charging Resources
  - Demonstrate PEV EVSE + storage to mitigate the EV charging impact
- Service and Distribution Centers of the Future
  - Demonstrate an advanced SCE service center, housing electrified utility crew trucks, together with employee workplace charging, connected to a local service area with high penetration of distributed solar generation and PEVs
- Distributed Energy Resources Protection and Control of Distribution Networks
  - Demonstrate control interaction between DERs and power system

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