Borrego Springs Microgrid

A Sempra Energy utility®

Energizing California's Communities with Renewables

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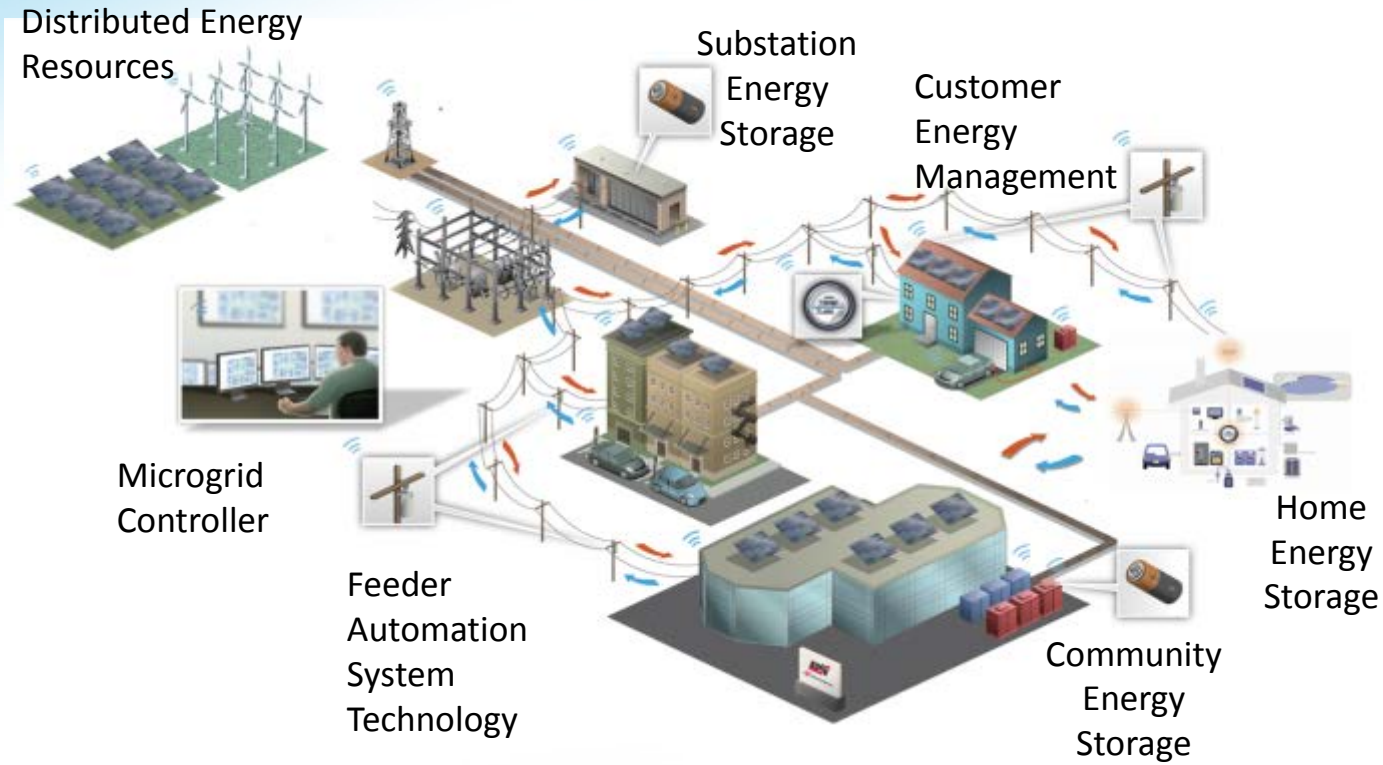
Borrego Springs Microgrid Demonstration Project (2010-2013)

Utilize advanced technologies to integrate and manage distributed resources within the Smart Grid

Budget:	$8.0M DOE and $2.8M CEC plus matching funds from SDG&E and partners
Benefits:	▪ Integrate and leverage various generation and storage configurations ▪ Reduce the peak load of feeders and enhance system reliability ▪ Enable customers to become more active participants in managing their energy use

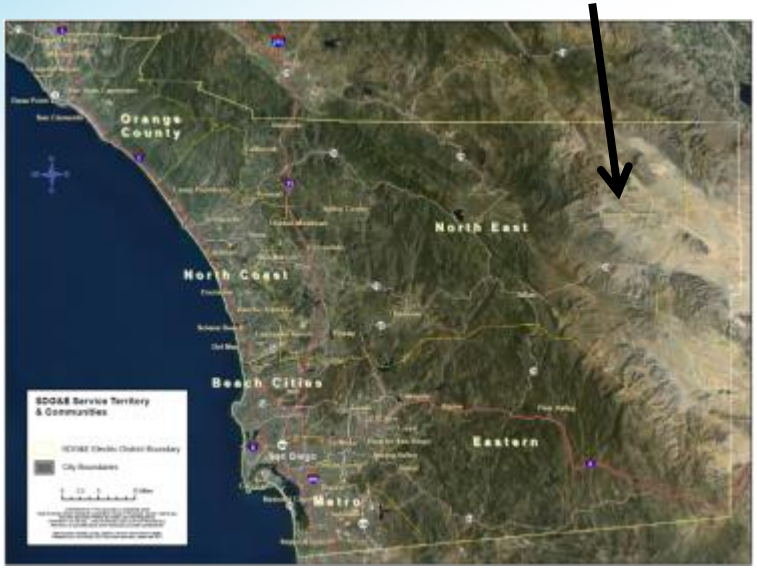


Site Selection – Borrego Springs

Key Strengths:

- Distant and isolated load pocket entirely surrounded by a state park
- High concentration of solar generation
  - NEM (~ 1 MW)
  - Transmission (LGIA) 26 MW (2/13)
  - Distribution (WDAT) 6 MW (9/14)
- Potential for reliability enhancements
- Opportunity to balance supply and demand to be more self-sufficient

Borrego Springs



Utility Owned Distributed Energy Resources (DER) in Borrego Springs

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Distributed Generation

- Two 1.8 MW diesel generators

Substation Energy Storage (SES)

- Energy storage that supports a substation or a significant portion of a circuit, generally 500KW – 1MW so far
- Installed:

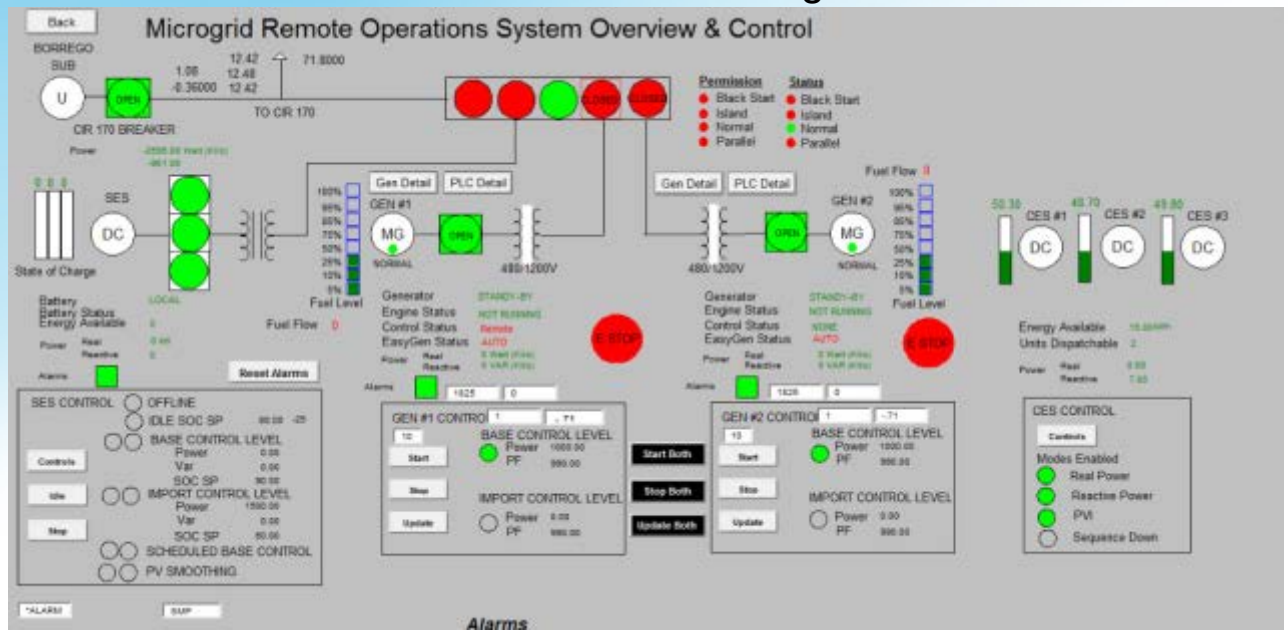
  2 units with 1.5MW/4.5MWh capacity

Community Energy Storage (CES)

- Energy storage that supports a small area, usually up to ~ 100kw
- Installed: 3 units with ~ 75KW/150KWh capacity

Microgrid Controls

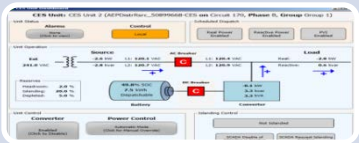
- Provides consolidated view/control of microgrid resources



Controls for generator 1

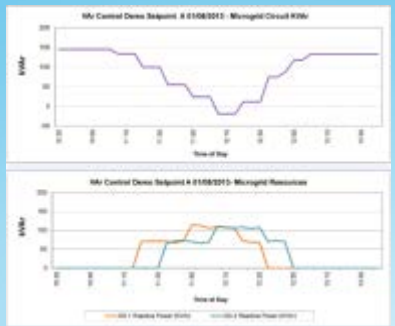
Controls for generator 2

Controls for SES unit

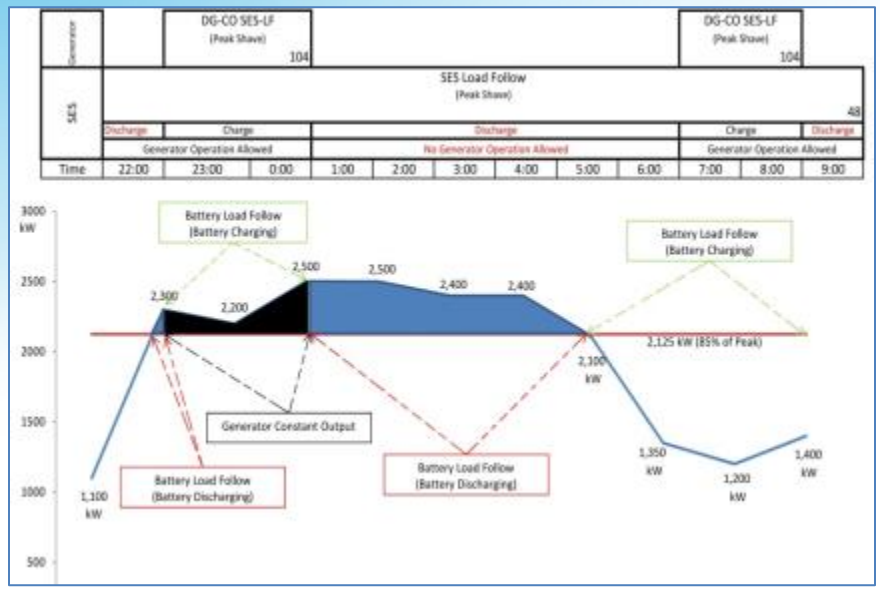


Controls for CES units

Demonstrations

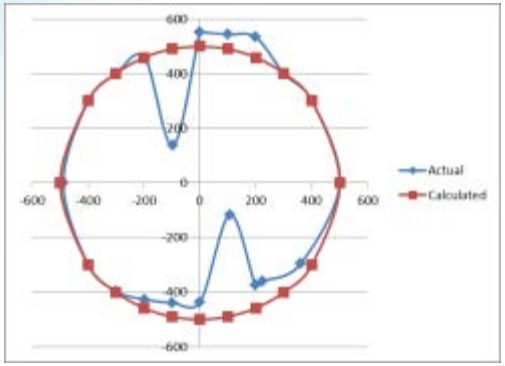


Var Control

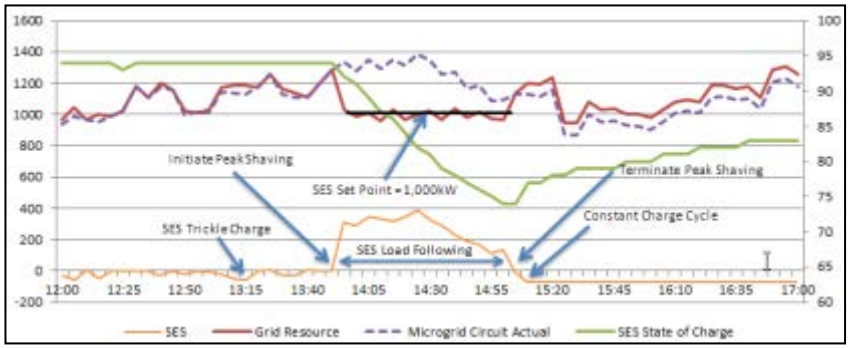


Peak Shave

"Virtual Island"



4-Quadrant Operation



Peak Shave

Energy Resilience Events (2012-2013)

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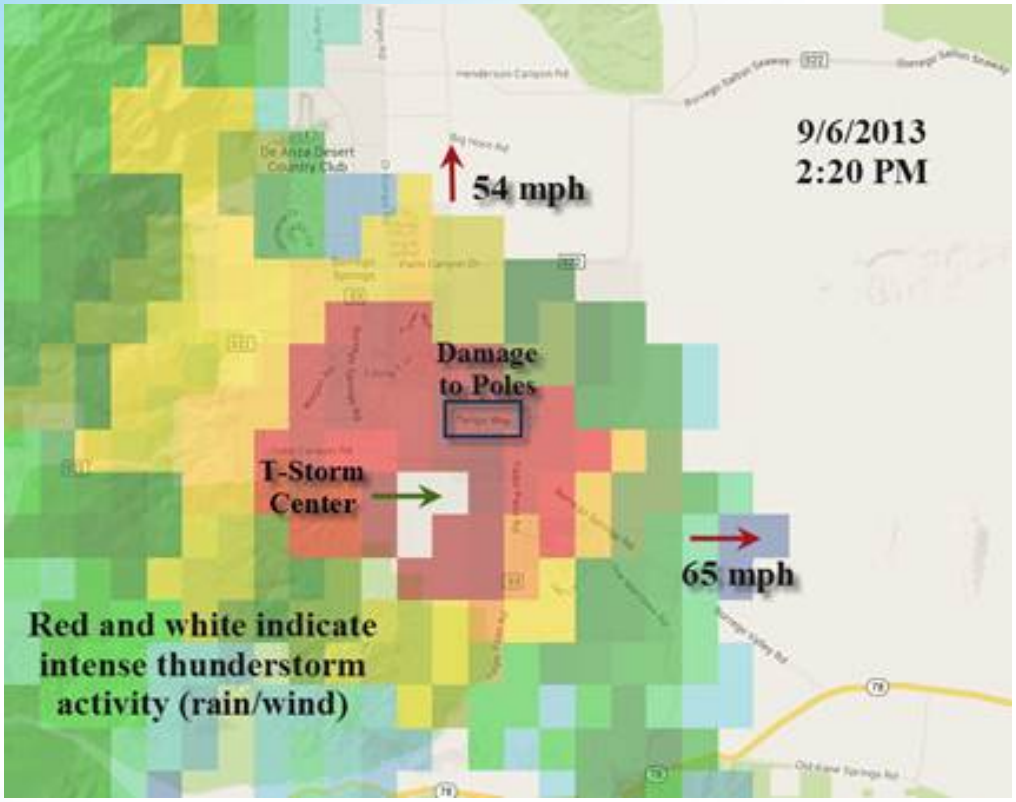
Planned Outage	• June 23rd, 2012 • Microgrid provided power to 2,128 customers for ~ 5.5 hrs
Planned Islanding	• Q1 2013 • Conducted 7 islanding events over 3 days
Windstorm	• April 8th, 2013 • Microgrid provided power to 1,225 customers for ~ 6hrs
Flashflood	• August 25th, 2013 • CES units islanded six customers for ~ 5.5 hrs
Intense Thunderstorms	• September 6th, 2013 • Microgrid provided power for up to 1,056 customers for > 20 hrs

Intense Thunderstorms 9/6/2013

- 100 degrees by 1000 and peaked at 107 degrees at 1320
- Thunderstorms began to form between 1200 and 1300
- Produced rainfall totals of 1.3” at Warners by 1400, with similar amounts along the desert slopes west of Borrego



- Gusty outflow winds from the thunderstorms began to reach the Borrego area at 1400.
- Peak gusts of 54-65 mph were measured between 1420 and 1430, though evidence supports that a microburst likely occurred near the center of the storm, producing gusts as high as 70 mph.
- ~ 167 lightning strikes occurred in the Borrego area

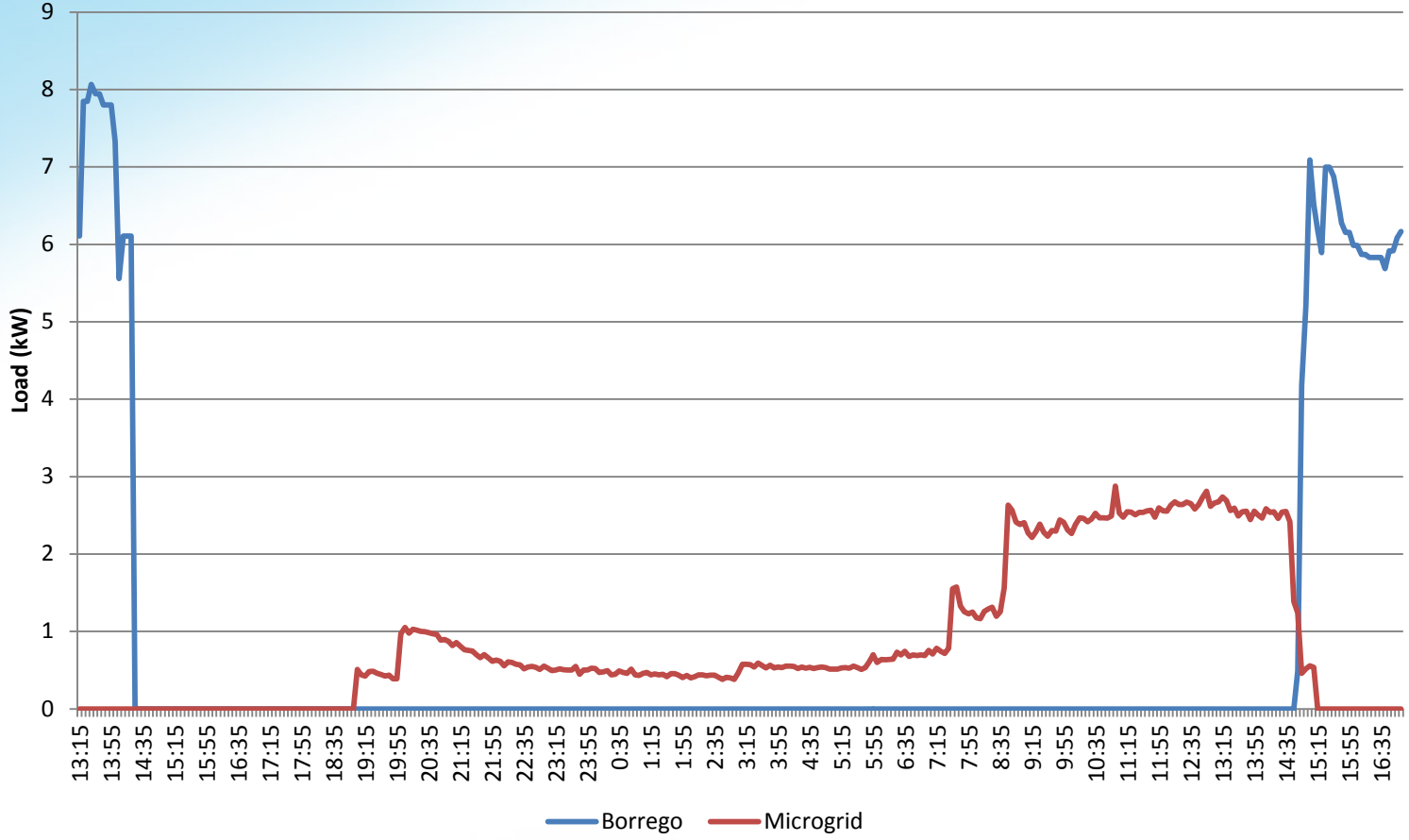
Intense Thunderstorms 9/6/2013 (cont'd)

- 9 transmission and 11 distribution poles were down
- All roads into/out of Borrego Springs were closed
- Restoration efforts took 25 hours
- More than 200 employees involved

Intense Thunderstorms 9/6/2013 (cont'd)

Intense Thunderstorms 9/6/2013 (cont'd)

- At 1420, single transmission line to Borrego trips out
- 9 Transmission and 11 Distribution poles reported down
- 1056 total customers restored during outage



Borrego Microgrid 2.0 (2014-2017)

Enhance the Borrego Springs Microgrid to be more flexible and automated in responding to a variety of potential outage situations, and leverage various new technologies and Distributed Energy Resources for increased Microgrid capabilities.

Goals

- Enhance Emergency Readiness
- Increase Operational Flexibility
- Decrease Outage Response Times
- Increase Grid Resiliency
- Demonstrate New Microgrid Technologies
- Increase Microgrid Load Capacity

Borrego Microgrid 2.0 – Local PV Integration

- Solar facilities can provide additional generation source
- Potential of islanding all of Borrego Springs during the daytime

Increased Grid Resilience – 5/21/15 Operation of Borrego Springs Microgrid

- 10 hour outage to entire community required to perform compliance-driven transmission maintenance and to replace 2 suspect transmission poles
- Utilized Borrego Springs Microgrid to keep all 2800 customers energized during transmission outage
- Base load was fed by the solar facility, using the batteries and distributed generation to "follow the load"
- Customers experienced a brief 10 minute planned outage to reconnect to the transmission grid

Acknowledgements

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Questions?

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