Utility Role in Microgrids

Thomas Bialek PhD, PE
Chief Engineer

July 9, 2015

© 2015 San Diego Gas & Electric Company.
All trademarks belong to their respective owners. All rights reserved.

Types of Microgrids

- Utility
  - Borrego Springs
- Military Bases
- Campus Environment
  - UCSD
- Greenfield Development
  - Third World Applications
- Homes

Background - Microgrid Opportunities

- Support the integration of renewable resources
- Improve reliability and power quality
- Support emergency operations
- Ability to "ride through" outages
- Optimize energy usage
- Enable participation in new markets for demand response and ancillary services

Microgrid Project Benefits

- Allow more power to be delivered through existing infrastructure and reduce the need to build more in the future
- Increase in the reliability and security of the grid by adding elements that make the grid more stable and reconfigurable.
- Allow Utility to utilize and control customer-owned resources
- Optimize the design of circuit operations for microgrid capabilities given consumer DG, demand response, automated response, and other advanced tools

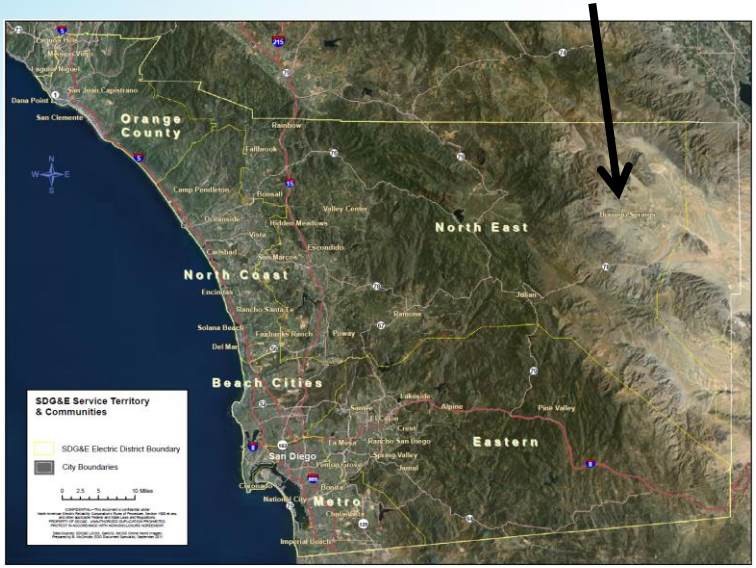
Borrego Springs Microgrid

Project Strategies

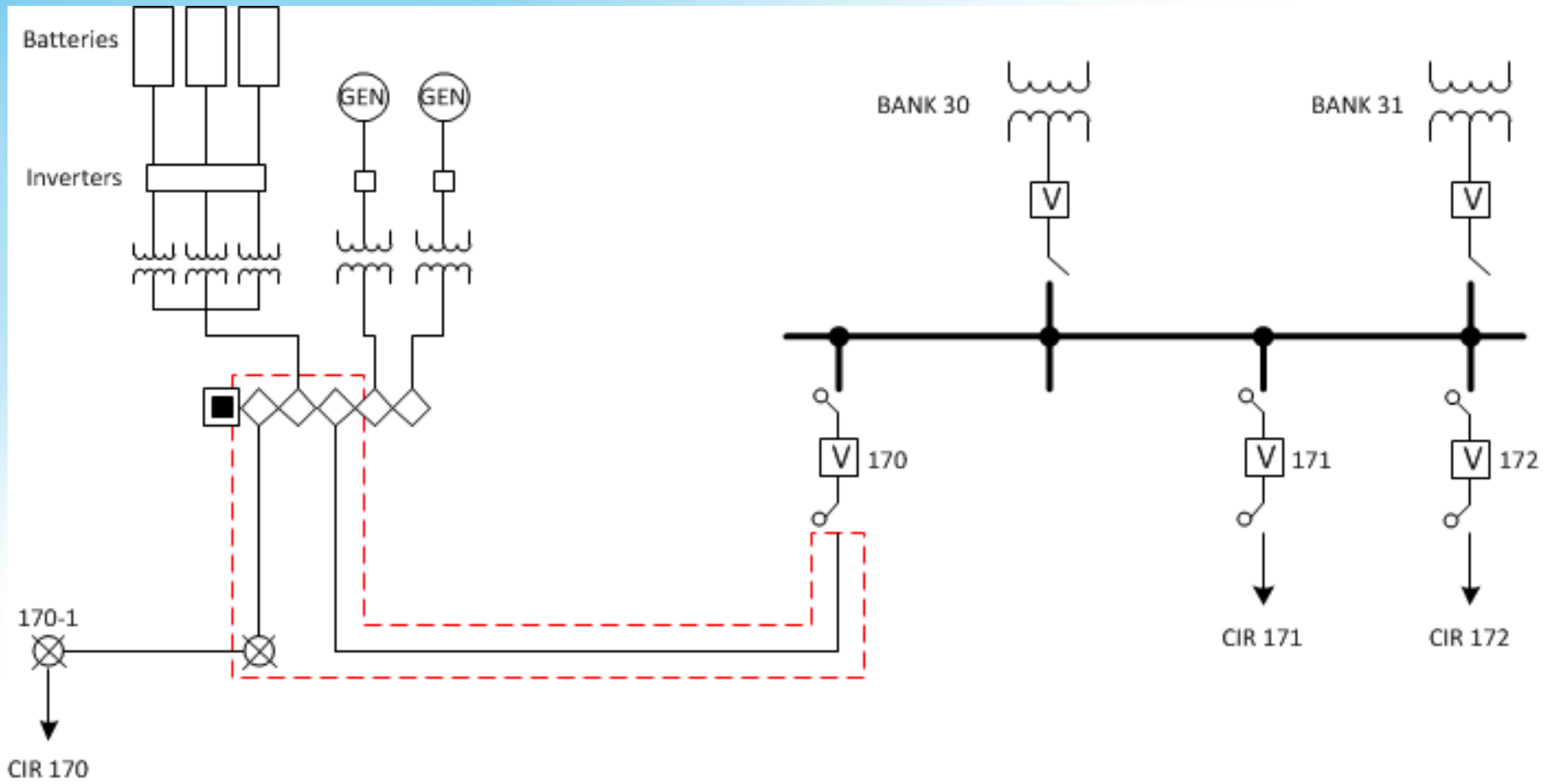
- Design and demonstrate a smart electrical grid that incorporates sophisticated sensors, communications, and controls in the following ways:
  - Intelligently incorporate solar power generators on homes and businesses into the electrical delivery system.
  - Enable coordinated Demand Response (DR) programs whereby heavy electrical use during peak demand periods can be moderated to prevent electrical supply emergencies.
  - Integrate and control multiple distributed generation and electrical energy storage devices to operate the grid in a more cost-effective and reliable manner, benefiting customers and electrical rates.
- This project will proactively identify and apply leading-edge technologies to improve the security and reliability of electricity supply and to lower costs to consumers.

Site Selection – Borrego Springs, CA

- **Key Strengths:**
- Progressive-minded community
- High concentration of customer-owned solar generation
- Potential for reliability enhancements
- Opportunity to balance supply and demand to be more self-sufficient
- Extendable to service territory



Reconfigure of C170/Borrego - Loop into Yard

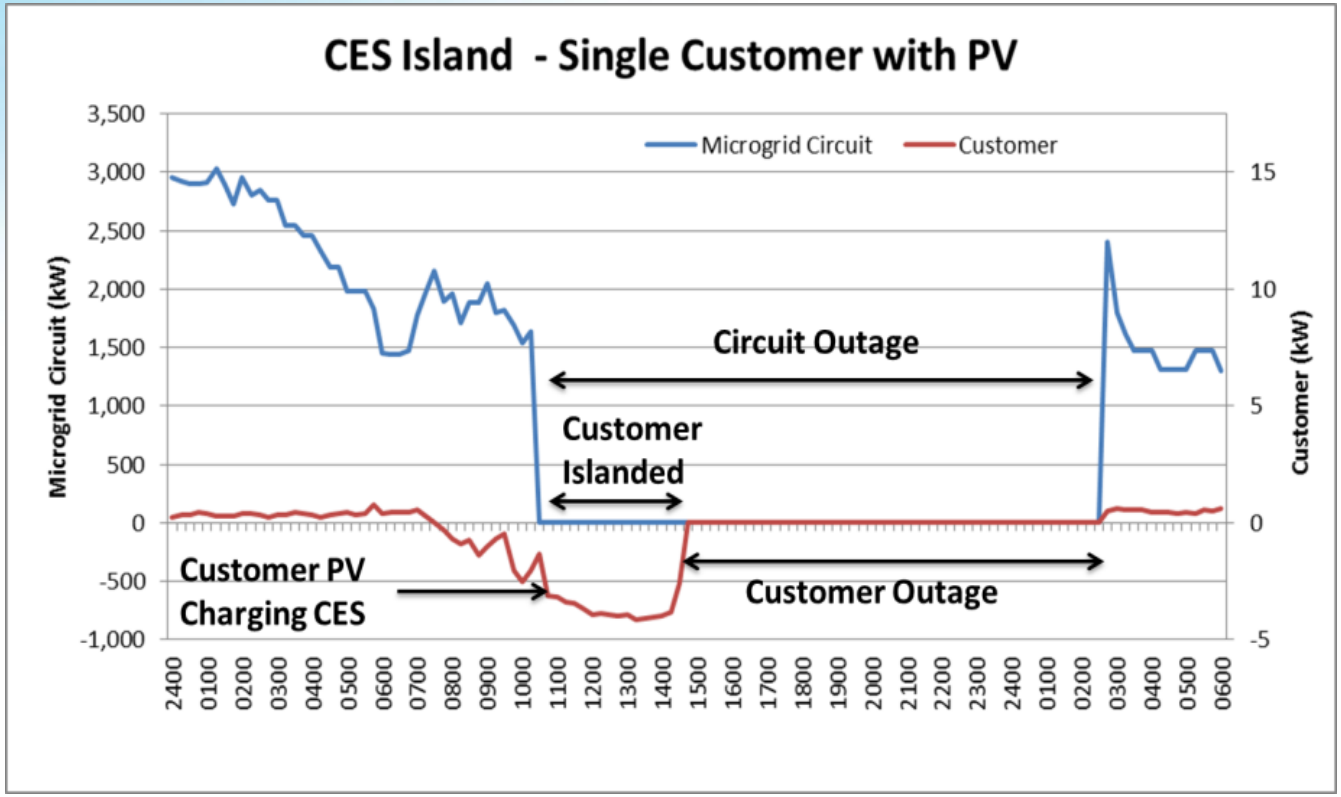


Real World Experience

- 6/23/12 Planned Outage
  - Microgrid provided power to 2,128 customers for ~ 5.5 hrs
- Q1 2013 conducted 7 planned islanding events over 3 days
- 4/8/13 windstorm
  - Microgrid provided power to 1,225 customers for ~ 6hrs
- 8/25/13 flash flood
  - CES units islanded six customers for ~ 5.5 hrs
- 9/6/13 intense thunderstorms
  - Microgrid provided power for up to 1,056 customers for > 20 hrs

CES Islanding Event 4/8

- Residential customer islanded after grid outage
- Customer remained with power for approximately 5 hours after outage occurred



September 6 – 7 Outage

- 9 transmission and 11 distribution poles were down
- All roads into/out of Borrego Springs were closed

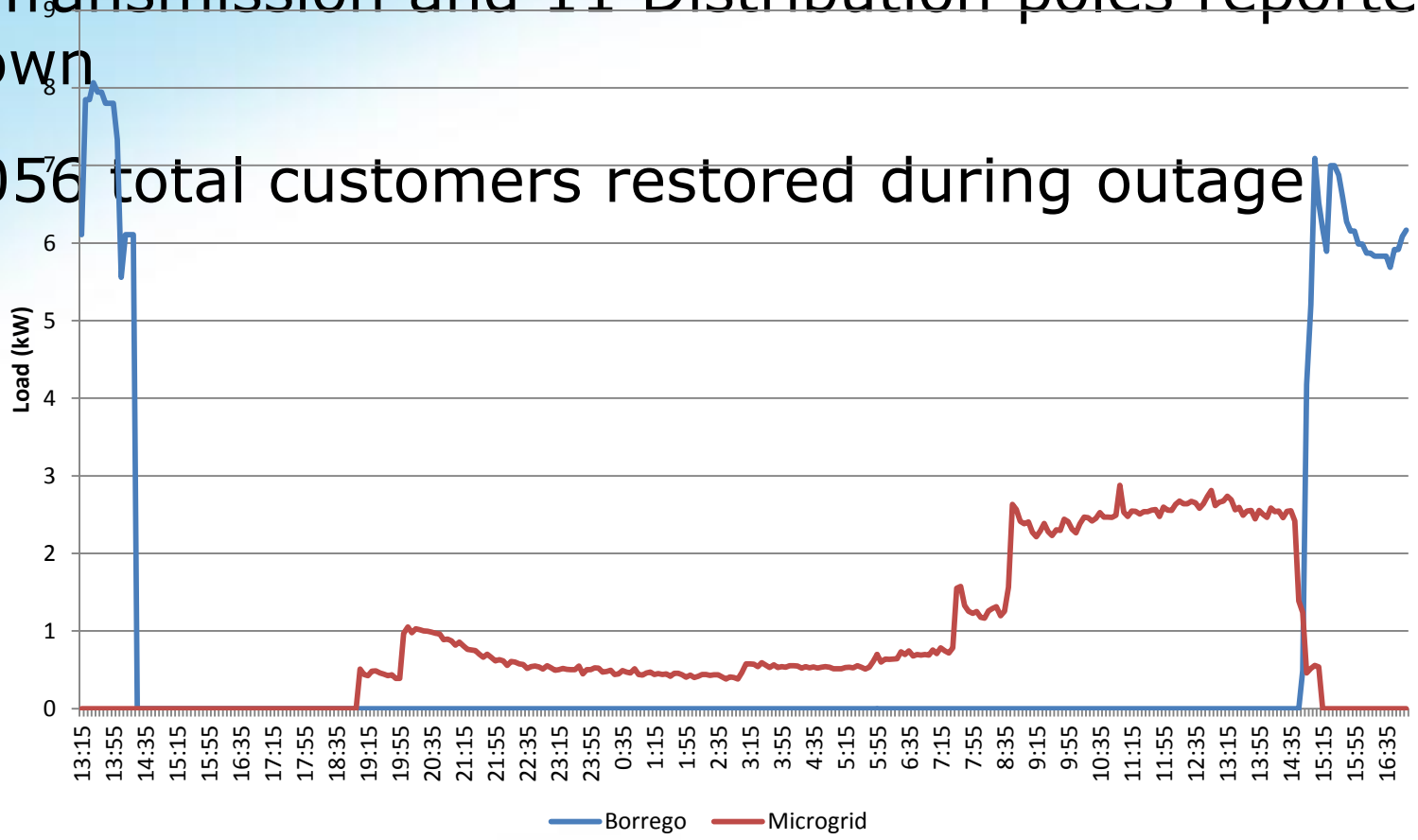
September 6 – 7 Outage

- Restoration efforts took 25 hours
- More than 200 employees involved

September 6 – 7 Outage

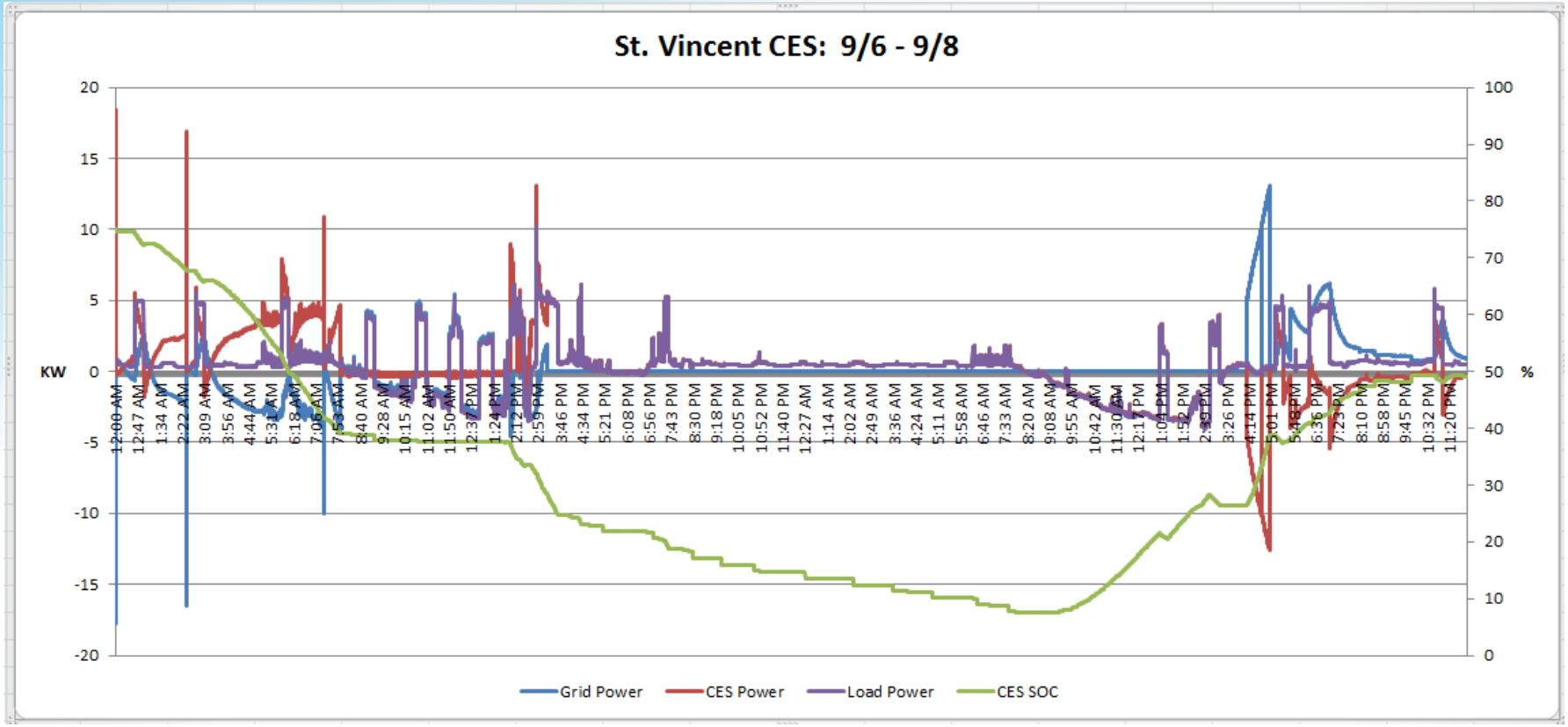
Borrego Outage 9/6-7

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



CES - Borrego Outage 9/6-7

- No outage seen at St. Vincent CES unit site



Significance and Impact

- First large scale utility microgrid
- Actually island real customers
- Alternative service delivery model

- Prove advanced technologies for future applications
- Establish model to be used by other utilities

Key Takeaways

- Microgrids can be utilized for grid resiliency
- Microgrids are cost effective in some applications
- Technology cost reductions will drive new applications
- Regulatory framework evolving

Borrego Microgrid 2.0 – Overview

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.

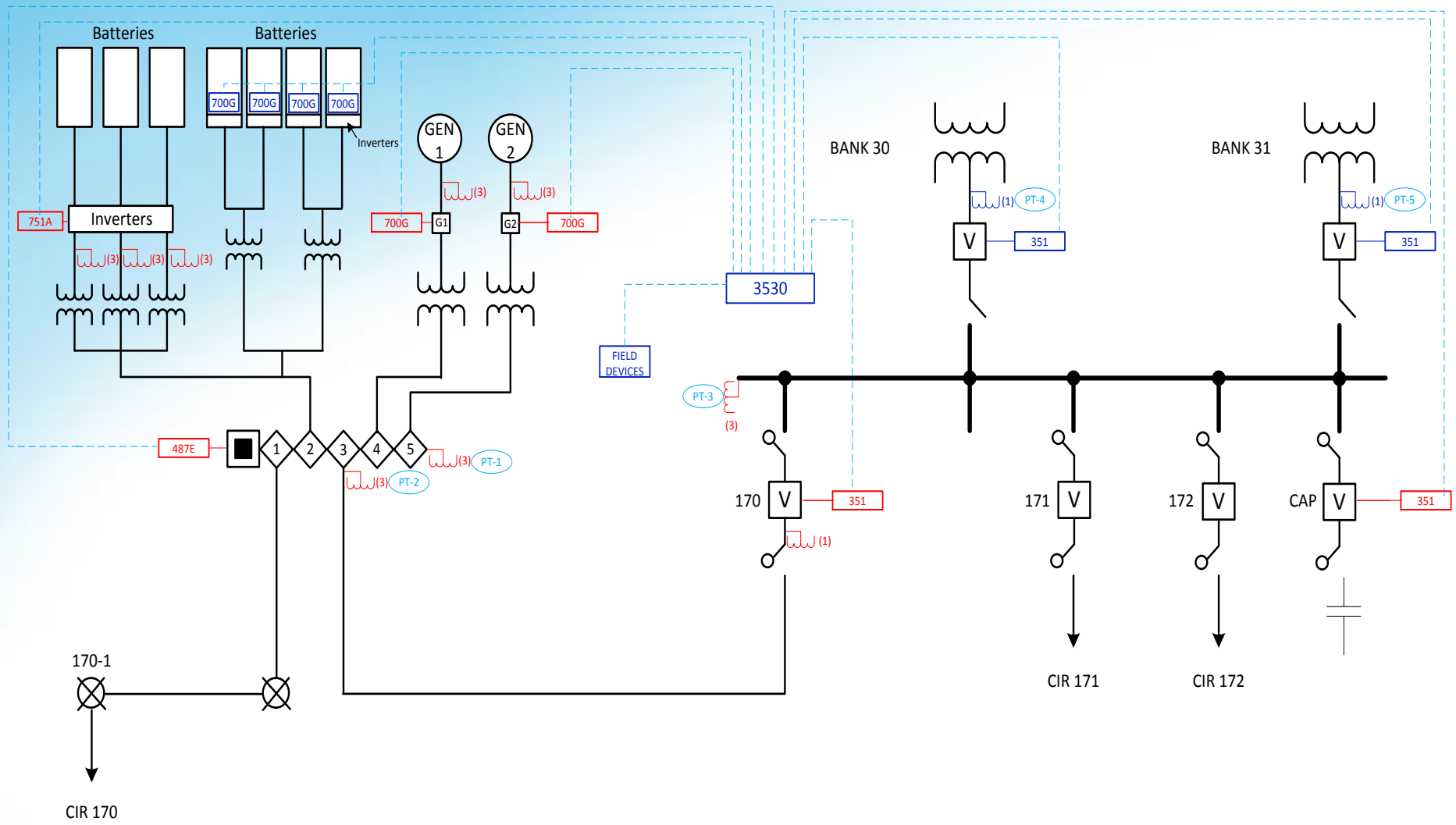
Goals

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

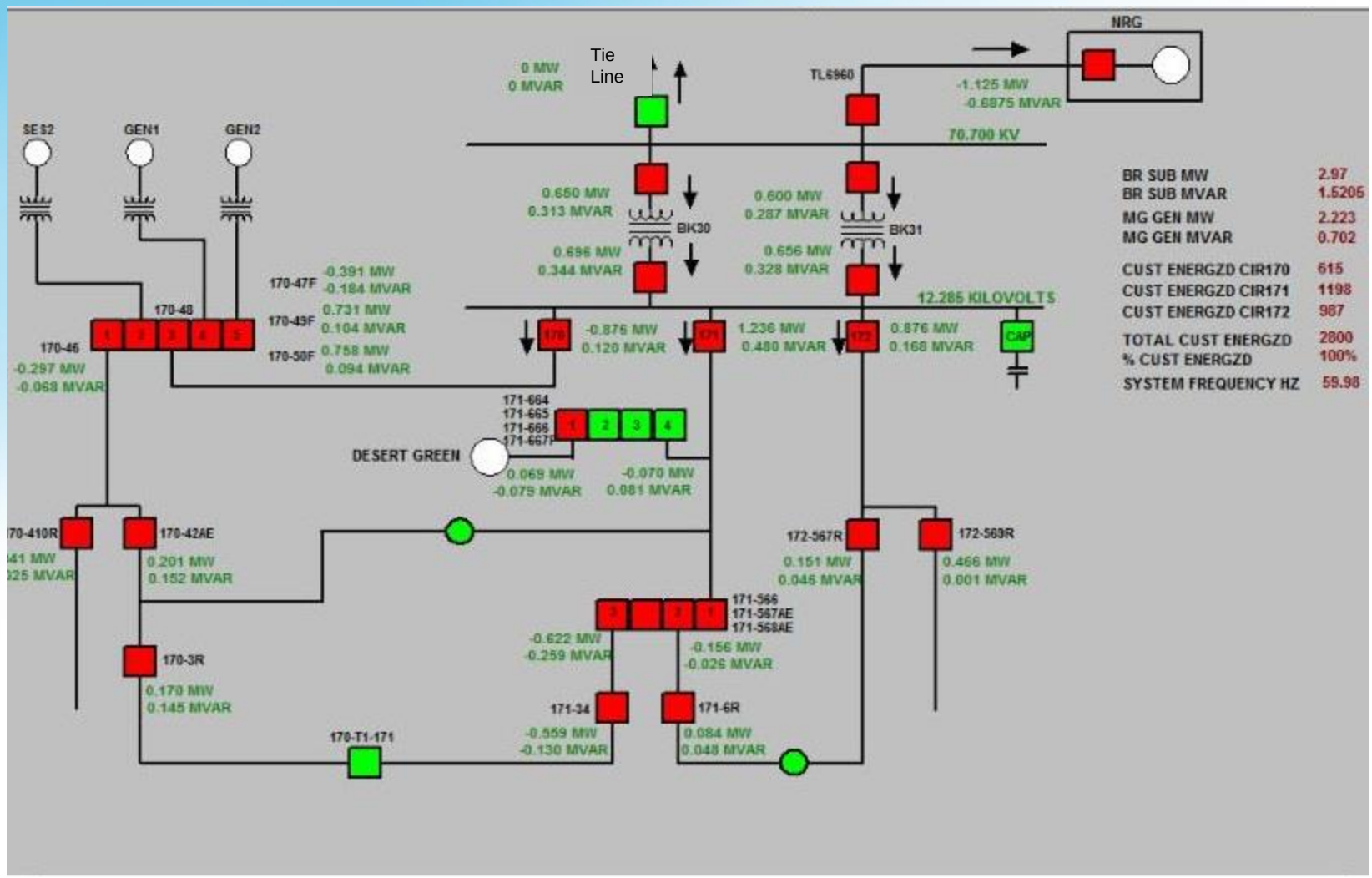
Borrego Microgrid 2.0 – Local PV Integration

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

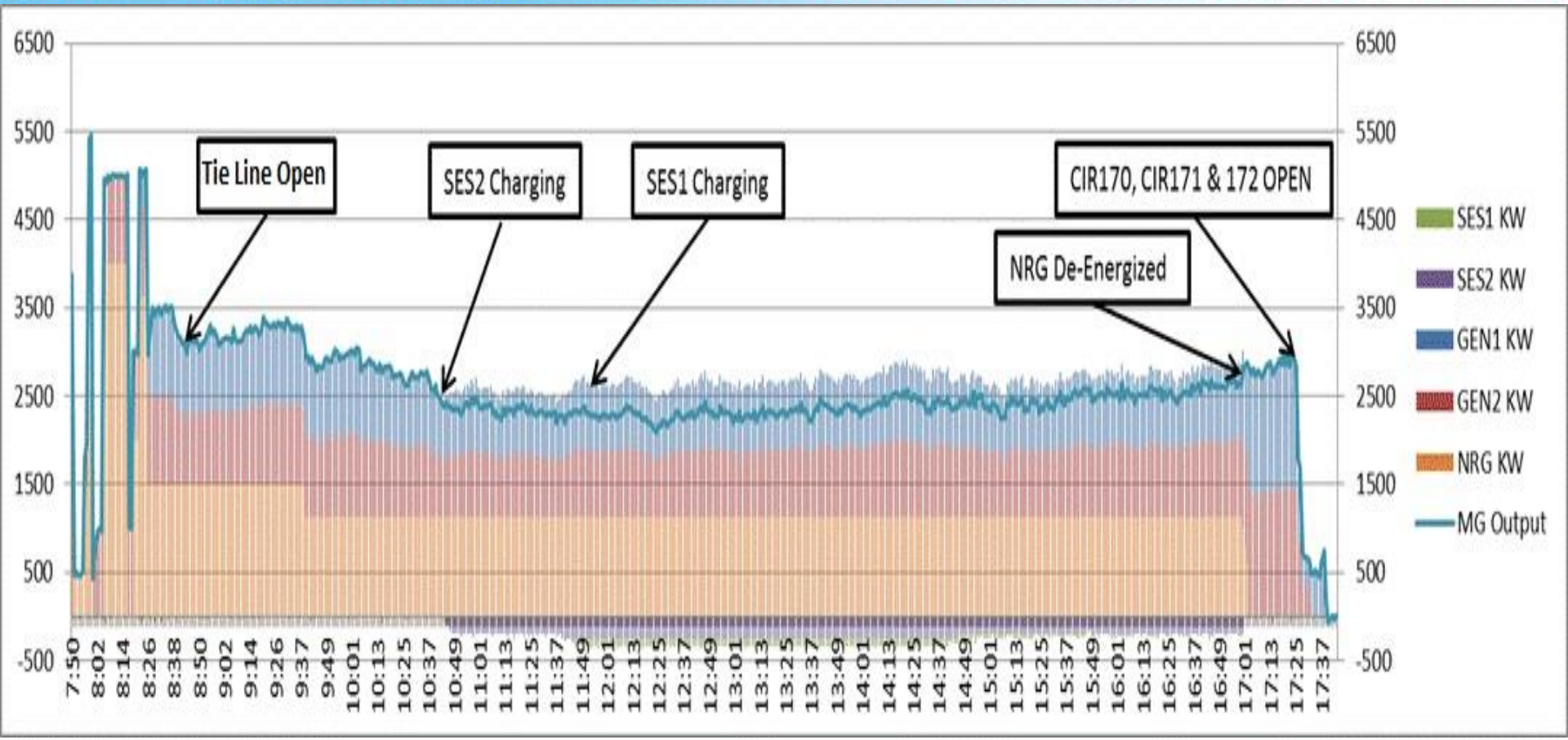
Upgrade Protection and Permissions



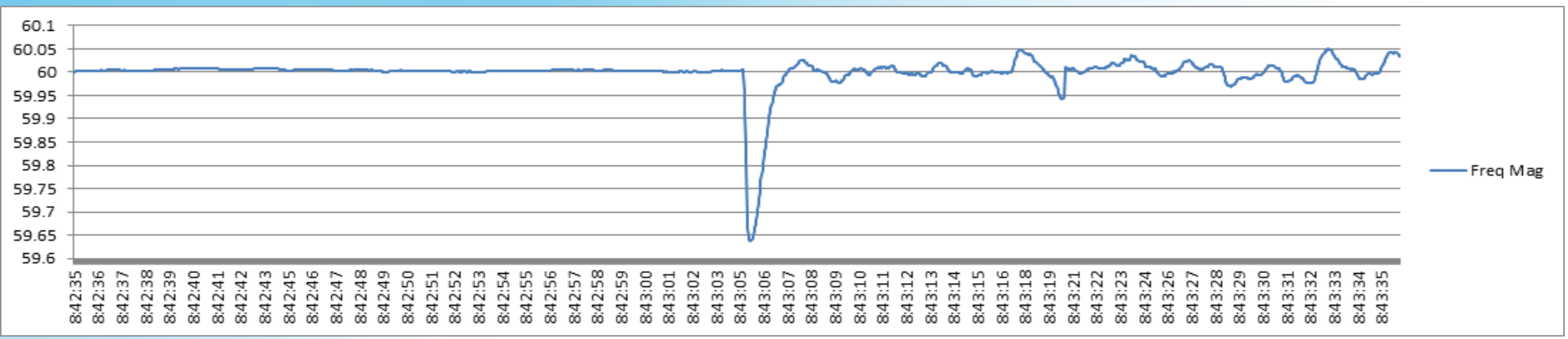
May 21, 2015 Islanding Event

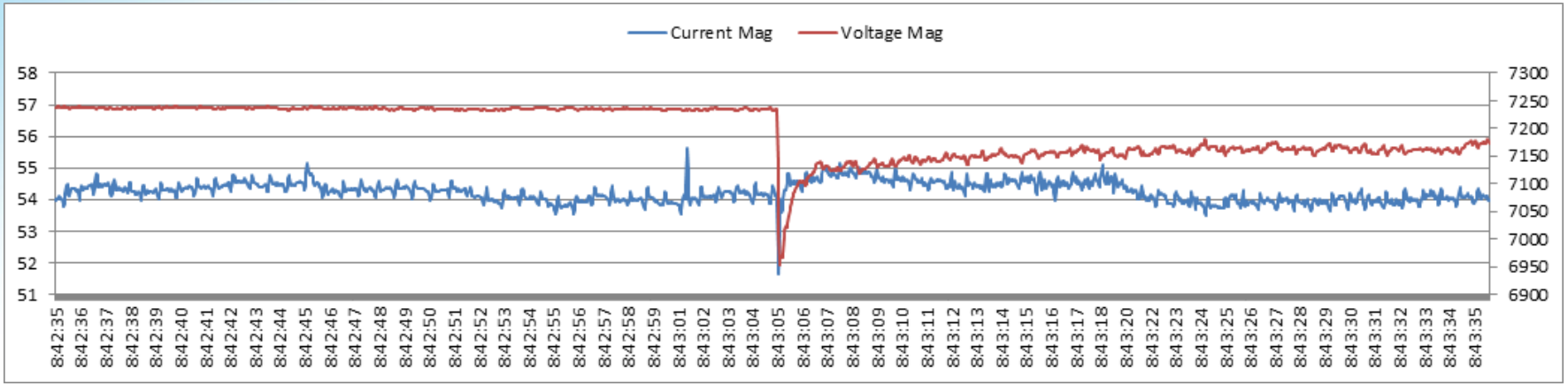


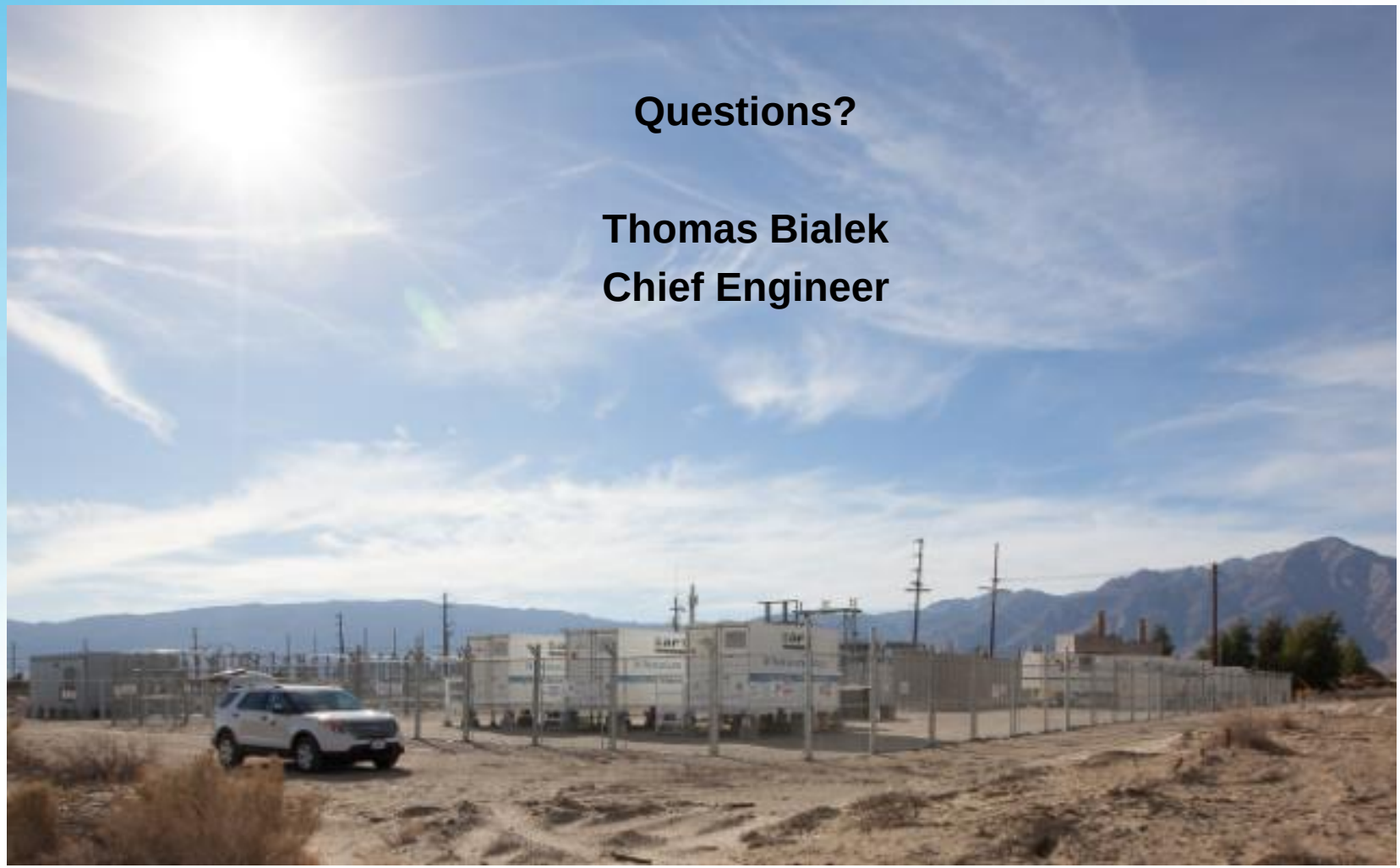
May 21, 2015 Islanding Event



May 21, 2015 Islanding Event







Questions?

Thomas Bialek
Chief Engineer

tbialek@semprautilities.com
www.sdge.com/smartgrid/