SDG&E's state-of-the-art energy storage and microgrid systems



Clean Coalition Webinar – January 29, 2020



San Diego's Utility-Owned Energy Storage





Today's Tour





San Diego Gas & Electric, Co.



- Subsidiary of Sempra Energy
- Service territory of 4,100 square miles with 3.6 million people
- 1.4 million smart electric meters
- 873k natural gas meters
- ~4,000 employees





Speaker



- Kirsten Petersen, P.E.
 - Senior Engineer
 - Distributed Energy Resources Team
 - San Diego Gas & Electric, Co.





California Leading the Way



- September 10, 2018 California sets the ambitious goal to meet 100% zero emission electricity by 2045 for its 40 million residents (SB100)
 - Meeting EV Charging Demand
 - Curbing High Electricity Costs
 - Integrating a Very High
 Penetration of Renewables

Regulatory Drivers



CPUC Mandate AB 2514 - 2010

 Sets initial energy deployment targets in California for utilities split between Transmission, Distribution and Customer domains

Senate Bill 1339,

 Facilitates the commercialization of microgrids for distribution customers of large electrical corporations

Microgrid Order Instituting Rulemaking

 Directs the CPUC, in consultation with the CEC and CAISO, to undertake a number of activities to further develop policies related to microgrids

Distribution Resource Plan/Integrated Distributed Energy Resources

 Provides the foundation for further evaluation and deployment of DER in California. Establishes DER hosting capacity and benefit streams

Energy Storage Benefits





- Support 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

Energy Storage Deployments at SDG&E



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Substation Energy Storage, SES

 deployed adjacent to the substation interconnecting at either distribution or transmission level



Community Energy Storage, CES – deployed on the secondary side of a distribution transformer

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Market Energy Storage Systems – deployed SES that participate in the CAISO marketplace



Distributed Energy Resource Aggregations – collections of SES and CES aggregations bundled for market participation *Stop #1*





Carmel Valley Energy Storage System

- Capable of dispatching 1 MW of power and supplying 3 MWh of energy
- Equipped with smart inverters
- One of the first systems in our service territory with the ability to seamlessly "Island" creating uninterrupted power to critical customers during outages



Site Map





One-Line Diagram





Stop #2





Borrego Springs Microgrid



DOE Microgrid Definition:

 "A microgrid is a group of interconnected loads and distributed energy resources within clearly defined electrical boundaries that acts as a single controllable entity with respect to the grid. A microgrid can connect and disconnect from the grid to enable it to operate in both grid-connected or island-mode."



Site Selection

- Progressive community
- Distant, isolated load pocket surrounded by a state park
- High concentration of solar generation
 - NEM ~4.3MW (2019)
 - Transmission (LGIA) 26 MW (2013)
 - Distribution (WDAT) 6 MW (2014)
- Potential for reliability enhancements
- Opportunity to balance supply and demand to be more self-sufficient



Assets

- Controller Distributed Energy Resources Management System (DERMS)
 - Software that allows an operator to remotely control the microgrid to seamlessly transition to and from the grid.
- Battery Storage:
 - 1 MW / 3 MWh battery system
 - 0.5 MW / 1.5 MWh battery system
 - Three .025 MW CES battery systems
- Borrego Springs Solar:
 - 26 MW solar plant
- Other Assets:
 - Two 1.8 MW diesel generators
 - 0.25 MW Ultracapacitor



One-Line Diagram





Community Energy Storage (CES)









Stop #3





Sumitomo Electric & SDG&E Miguel Vanadium Redox Flow Battery



- Connected feeder line:
 - 12kV, from the nearest substation
 - High PV Penetration (20%), duck curve
 - Increasing load, needs for deferral

- Battery Size:
 - 2MW x 4hr (PCS: 3MVA), two battery banks
- Functions:
 - frequency regulation, voltage regulation, capacity firming, peak shaving, SOC management.





Battery container (40ft) w/ heat exchanger







- Long lifetime (20+ years)
- No limit of cycles @full charge/discharge
- Fast response
- Long duration
- Accurate SoC monitoring
- Non-combustibility
- Suitable for multi use case to integrate renewables
- Over generation
- Fluctuation of generation

Advantages of VRF Batteries

And that's not all...







kpetersen@sdge.com

