Tehachapi Storage Project (TSP)

American Recovery and Reinvestment Act Funded Project

Christopher R. Clarke - Southern California Edison (SCE)

christopher.r.clarke@sce.com

SOUTHERN CALIFORNIA EDISON®
An EDISON INTERNATIONAL® Company

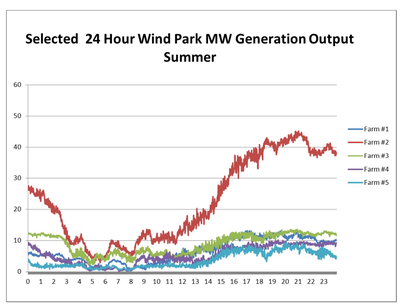
A123 SYSTEMS

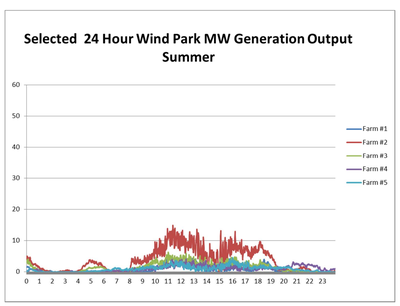
TSP Project Objective

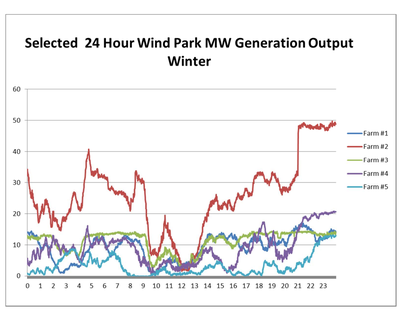
- Test battery storage as a system reliability and/or market driven device
  - Demonstrate the performance of a lithium-ion Battery Energy Storage System (BESS) for 13 specific operational uses, both individually and bundled
  - Share data and results with CAISO, CEC, CPUC, DOE, and other interested parties
  - Potentially resolve key issues with wind-integration and/or remote generating sources, e.g. variability, transmission availability, congestion and curtailment
- Reliably integrate battery technology into SCE's grid
  - Test and demonstrate smart inverter technology
  - Assess performance and life cycle of large grid-connected lithium-ion BESS
  - Expand expertise in energy storage technologies and operations

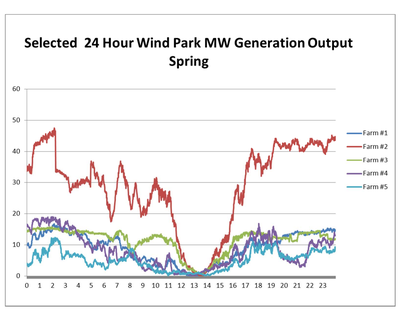
	Operational Use		Test 1	2	3	4	5	6	7	8	BESS Mode
1	Voltage support	Transmission	X	X							VS
2	Decreased losses	Transmission			X						DISP
3	Diminished congestion	Transmission			X						DISP
4	Increased system reliability	Transmission			X						DISP
5	Deferred transmission investment	Transmission			X		X				DISP
6	Optimized renewable-related transmission	Transmission			X		X				DISP
7	System capacity/resource adequacy	System				X		X			DISP
8	Renewable integration (firming & shaping)	System					X				DISP
9	Output shifting	System				X					DISP
10	Frequency regulation	ISO Market						X			FS
11	Spin/non-spin reserves	ISO Market							X		DISP
12	Deliver ramp rate	ISO Market						X	X		FS/DISP
13	Energy price arbitrage	ISO Market								X	DISP

Examples of Wind Generation in the Tehachapi Wind Resource Area









February 2012

April 2012

May 2012

June 2012

August 2012

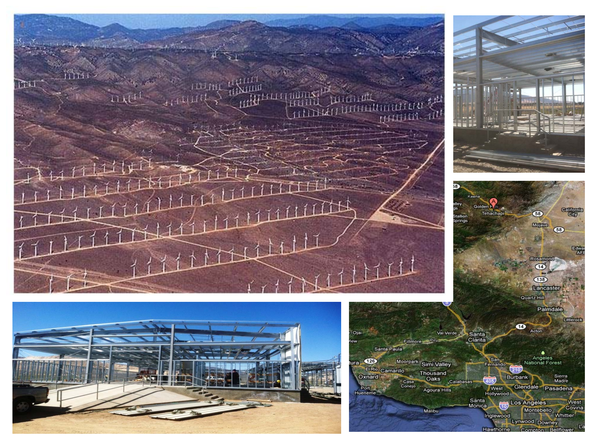
September 2012

Progress To Date

- Facility construction expected to complete in September 2012
- First Power Conversion System installed September 13, 2012
- A123 to ship initial battery equipment for delivery week of September 24, 2012

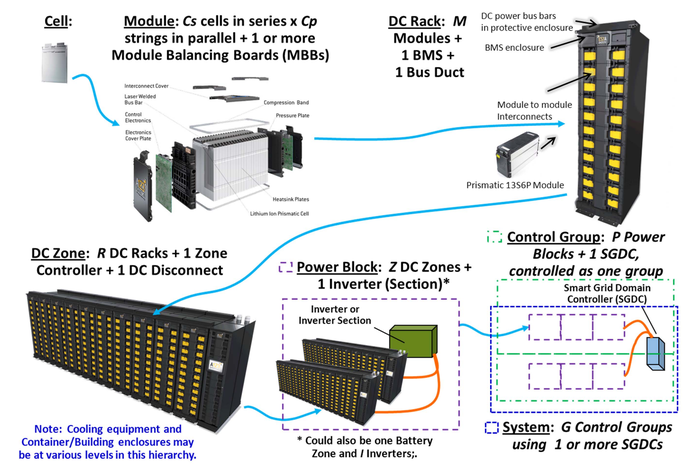
Future Major Milestones

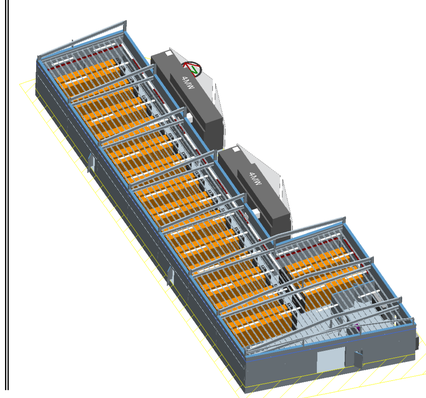
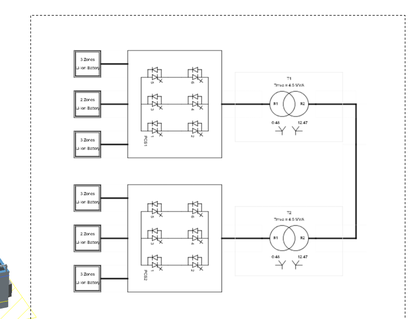
- September 2012 - Completion of BESS facility
- October 2012 - Initial installation
- November 2012 - Installation of second Power Conversion Subsystem
- Q1 2013 - Install balance of equipment and commissioning
- Q2 2013 - Start of 2 year M&V testing and reporting
- Q3 2015 - Final report due to DOE



Lithium Ion Battery Cell and Module

- Manufactured by A123 Systems
- Nanophaosphate 19.5 Ahr battery cell
- 78 cells per module for 62.4 Wh per module
- These modules provide the building blocks for the TSP



BESS Technical Details

- 9 MVA converter system capacity with 2 second 100% overload capability
- 8 MW and 32MWh total storage capacity
  - 2 power conversion systems (PCS)
  - 6 converter modules (3 per PCS)
  - 16 battery zones
  - 20 prismatic battery racks in each zone