

Tehachapi Wind Energy Storage (TSP) Project

ADVANCED
TECHNOLOGY
Transmission & Distribution Business Unit



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Outline

- Policy Challenges
 - The challenge/opportunity
- Testing a Solution: Tehachapi Storage Project Overview
 - Description of the project & objectives
 - Operational uses
 - Conceptual layout

CA 2020: Energy Policy Initiatives

Highlighting potential areas for storage applications:

- High penetration of Solar and Wind generation
 - Executive order requiring 33% of generated electricity to come from renewable sources by 2020
- Zero Net Energy (ZNE) residential construction standard
 - “ZNE home” Title 24 in 2020
- Plug-in Electric Vehicle (PEV)
 - Up to 54,000 PEV’s by 2012 & 1 Million by 2020
- Renewable Portfolio Standard (RPS)
 - Distributed PV (1-2 MW PV rooftop): Up to 250 MW of SCE-owned solar photovoltaic capacity and up to 250 MW owned and maintained by Independent Power Producers (IPP)
 - California Solar Initiative (CSI) - 3,000 MW of customer-side solar photovoltaic capacity by 2017
- SCE’s Energy Efficiency Goals
 - Load Control: 1000 MW of Demand Response (DR) by 2017.
 - Conservation: Forecasted 10% of energy consumption reduction using in-home display.

SCE Leadership in Energy Initiatives

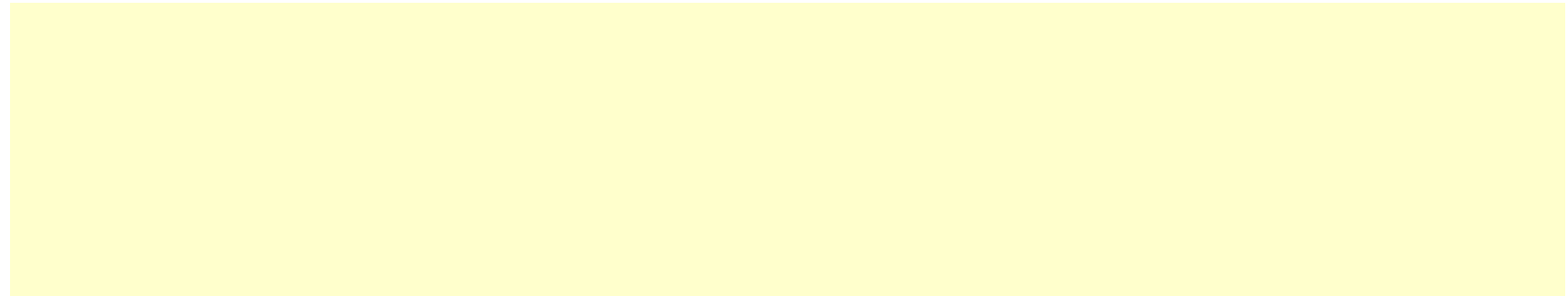
- SCE is a long-time leader in renewable energy:
 - 17% of its 2009 energy portfolio was made of renewable energy¹
 - SCE procures:
 - ~10% of all U.S. renewable energy²
 - Over 65% of U.S. solar energy²
 - Over half of U.S. geothermal energy²
- SCE's EV Technical Center facility is unique among utilities:
 - Industry leading energy storage testing facility
 - BEV/PHEV/FCEV testing, evaluation and maintenance capability
 - ISO 9001:2008 registered
 - Visited by President Barack Obama in 2009
- SCE's Smart Grid vision is helping to shape the discussion on Smart Grid implementation

1 – CPUC RPS Procurement Plan Update, April 2010

2 – Statistics from 2008

California Aggressive Climate and Energy Policies

(Proposed)



Tehachapi Area

- Tehachapi is a uniquely suited location for wind development:
 - California's largest wind resource
 - Massive wind development potential driving grid infrastructure upgrades and expansion
- Facts:
 - Second largest wind park in the world with ~ 5,000 wind turbines
 - 660 MW of installed wind energy, with potential for thousands more¹
 - ~ 350 square miles (Washington DC is ~ 68 square miles)
 - ~ 100 miles from major So-Cal load center (LA basin)



1 - 4,500 MW of generation capacity may be available. California Energy Commission, "Renewable Resources Development Report", November 2003

Project Objective

- Demonstrate the performance of a Lithium-ion energy storage system for 13 specific operational uses, both individually and stacked
- Share data and results with CAISO, DOE, and other interested parties
- Test and demonstrate Smart Inverter technology
- Assess performance and life cycle of large grid-connected Lithium-ion energy storage system
- Potentially resolve key issues with wind-integration and/or remote generating sources
- Expand expertise in energy storage technologies and operations

TSP will test the largest ever grid-connected Lithium-ion Energy Storage System (8MW - 32MWh) coupled with a Smart Inverter

Potential Operational Uses

- Transmission
 - Provide Voltage Support/Grid Stabilization
 - Decrease Transmission Losses
 - Diminish Congestion
 - Increased System Reliability
 - Provide Future T&D Investment Opportunity
 - Enhance Value and Effectiveness of Renewable Energy-related Transmission
- System
 - Provide System Capacity/Resource Adequacy
 - Integrated Renewable Energy (smoothing)
 - Shift Wind Generation Output

Additional Potential Uses

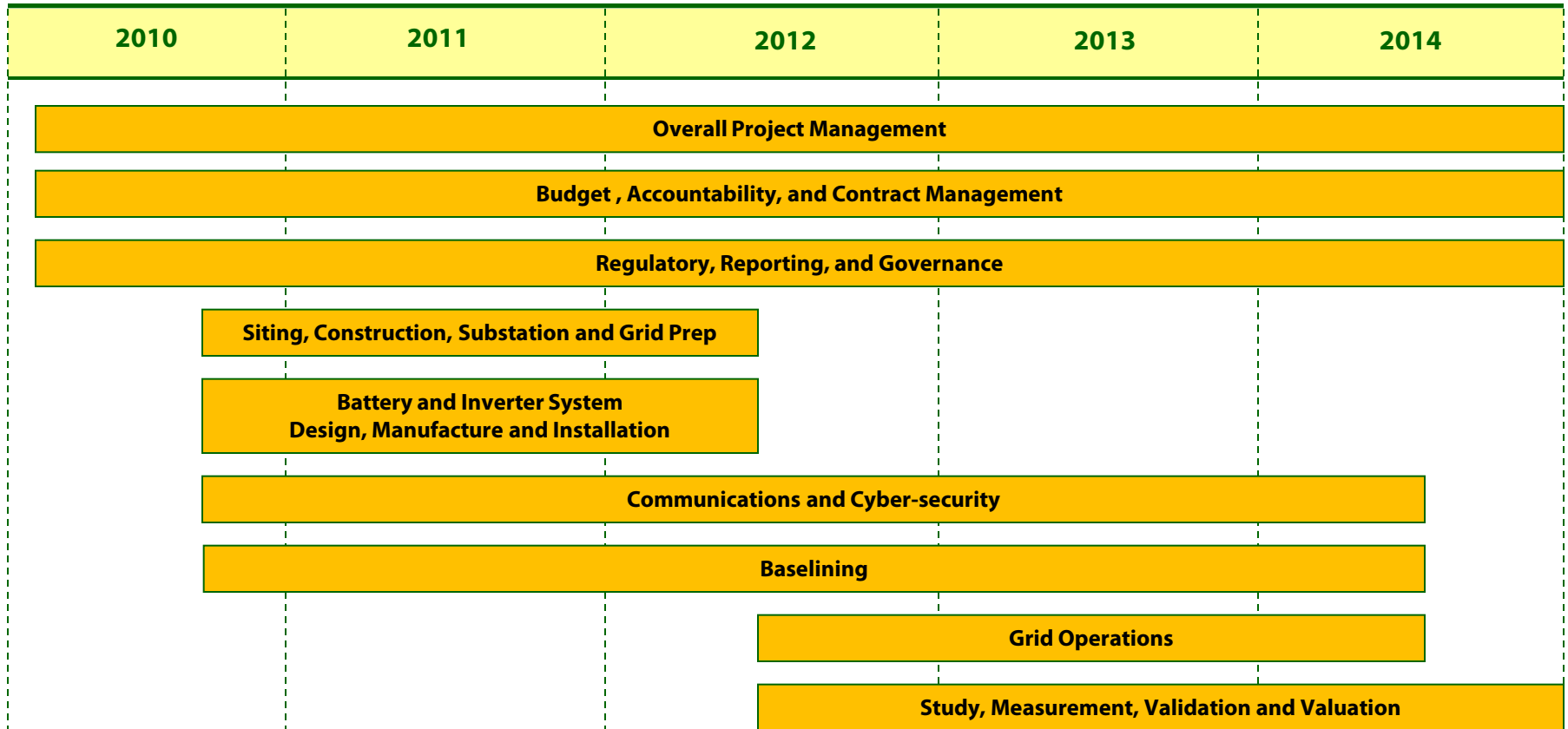
- Large-scale energy storage can also offer additional benefits to the grid
 - Frequency Regulation
 - Spin/Non-Spin/Replacement Reserves
 - Ramp Management
 - Energy Price Arbitrage
 - Black Start and System Restoration (not part of this project)
 - Phasor Measurement System Participation (not part of this project)

Conceptual Layout



Overall Project Timing

The DOE award negotiations are complete and the agreement was accepted by SCE on October 13, 2010



Next Steps

- Starting the design phase
- Battery system will be installed in early 2012
- Testing will take place through the end of 2014
- Project results will be made available in early 2015

Contact Information

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