



# Tehachapi Wind Energy Storage Project (TSP)

## *Peer Review*

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# Outline

- Policy Challenges
- SCE's Position
- SCE Smart Grid Vision
- Project Description & Objectives
- Operational Uses
- Layout Design
- Timing & Status



# Policy & Technology Drivers for Energy Storage

- **Expanding Penetration of Solar and Wind generation**
  - **33% Renewables Portfolio Standard** - legislation requiring 33% of electricity sales from renewable sources by 2020
  - **Distributed PV (1-2 MW arrays)** - up to 250 MW of SCE-owned solar photovoltaic capacity and up to 250 MW owned and maintained by Independent Power Producers (IPP)
  - **Self-Generation Incentive Program (SGIP)** - a CPUC directed program linked with distributed generation deployments that now incentivizes storage projects
  - **California Solar Initiative (CSI)** - 3,000 MW of customer-side solar photovoltaic capacity by 2017
- **Regulatory Change for non-renewable generation**
  - **Once-Through Cooling (OTC)** - changes to rules for power plant water-based cooling may impact or shutter 19 coastal plants
  - **Greenhouse Gas, AB 32** - capping and trading CO2 will likely impact the value and mix of generation sources and change behaviors
- **Changes in homeowner load profile**
  - **ZNE homes and Title 24** - likely to involve distributed generation and potentially storage ideas, due by 2020
  - **Plug-in Electric Vehicles (PEVs)** - PEV incentives, the ZEV mandate, and other factors may help put up to 1 Million by 2020



# SCE Leadership in Energy Initiatives

- SCE is a long-time leader in renewable energy
  - 19.4% of SCE's 2010 energy portfolio was made of renewable energy<sup>1</sup>
  - SCE procures:
    - Over 50% of U.S. solar energy
    - About half of U.S. geothermal energy
    - Enough renewable energy to power more than 2.2 million homes
- SCE's EV Technical Center facility is unique among utilities
  - Industry leading energy storage testing facility
  - Visited by President Barack Obama in 2009
- SCE's Smart Grid Vision is helping to shape the discussion on Smart Grid implementation
- SCE authored a white paper entitled "Moving Storage from Concept to Reality"

1 – <http://www.sce.com/PowerandEnvironment/Renewables/default.htm>



# SCE Smart Grid Vision

SCE's vision of a smart grid is to develop and deploy a more reliable, secure, economic, efficient, safe and environmentally-friendly electric system covering all facets of electricity from production through transmission, distribution, and its smart use in homes, businesses and vehicles.



**Customer  
Empowerment**

**Workforce  
Safety &  
Effectiveness**

**Renewable & Distributed  
Energy  
Resource Integration**

**Grid Efficiency  
& Resiliency**

**Information &  
Connectivity**

# 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 stakeholders and other interested parties
  - Potentially resolve key issues with wind-integration and/or remote generating sources, e.g., variability, transmission availability, congestion, curtailment
- Reliably integrate energy storage system 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

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



# Operational Uses

## Transmission

1. Provide voltage support/grid stabilization
2. Decrease transmission losses
3. Diminish congestion
4. Increase system reliability
5. Defer transmission investment
6. Enhance value and effectiveness of renewable energy-related transmission

## System

7. Provide system capacity/resource adequacy
8. Integrate renewable energy (smoothing)
9. Shift wind generation output

## Grid

10. Frequency regulation
11. Spin/non-spin/replacement reserves
12. Ramp management
13. Energy price arbitrage



# Tehachapi Area

- System will be installed at an existing SCE substation
- Tehachapi is a uniquely suited location for wind development
  - California's largest wind resource
  - Massive wind development potential driving grid infrastructure upgrades and expansion
- Area Potential
  - One of the largest wind resource areas in the world with ~5,000 wind turbines
  - 1396 MW of installed wind energy (under SCE contract), with potential for thousands more
  - ~350 square miles
  - ~100 miles from major Southern California load center (LA basin)



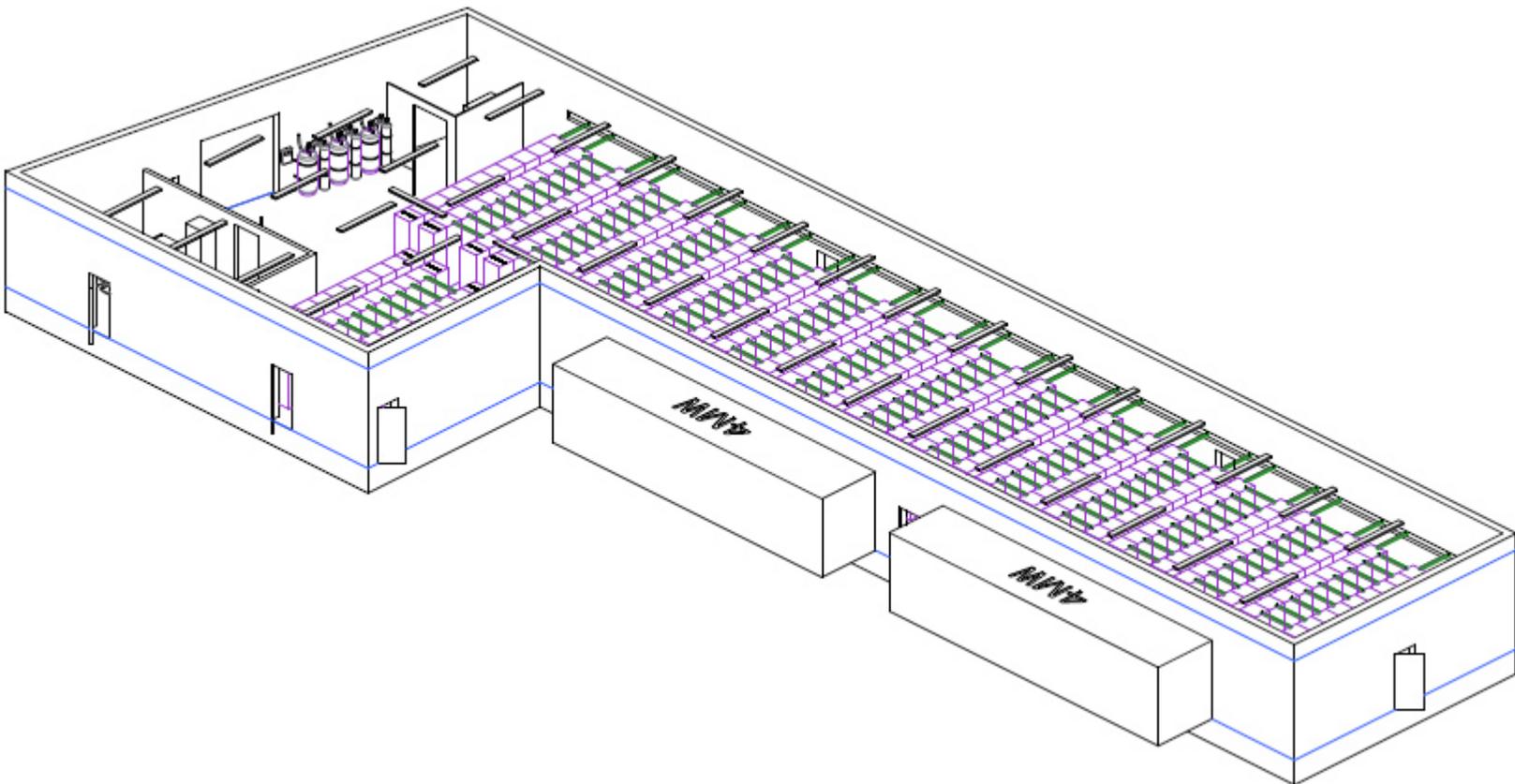
# BESS Facility & Substation Modifications

The BESS layout and facility have been successfully designed to accommodate substation configuration requirements

- ~6,300 square-foot unmanned facility to enclose the BESS
- BESS includes 480V-12kV transformer
- Substation requires 12-66kV transformer
- Configuration includes:
  - Energy Storage System
  - Power Conversion System
  - Substation Transformer
  - Communication & Interface



# BESS Layout



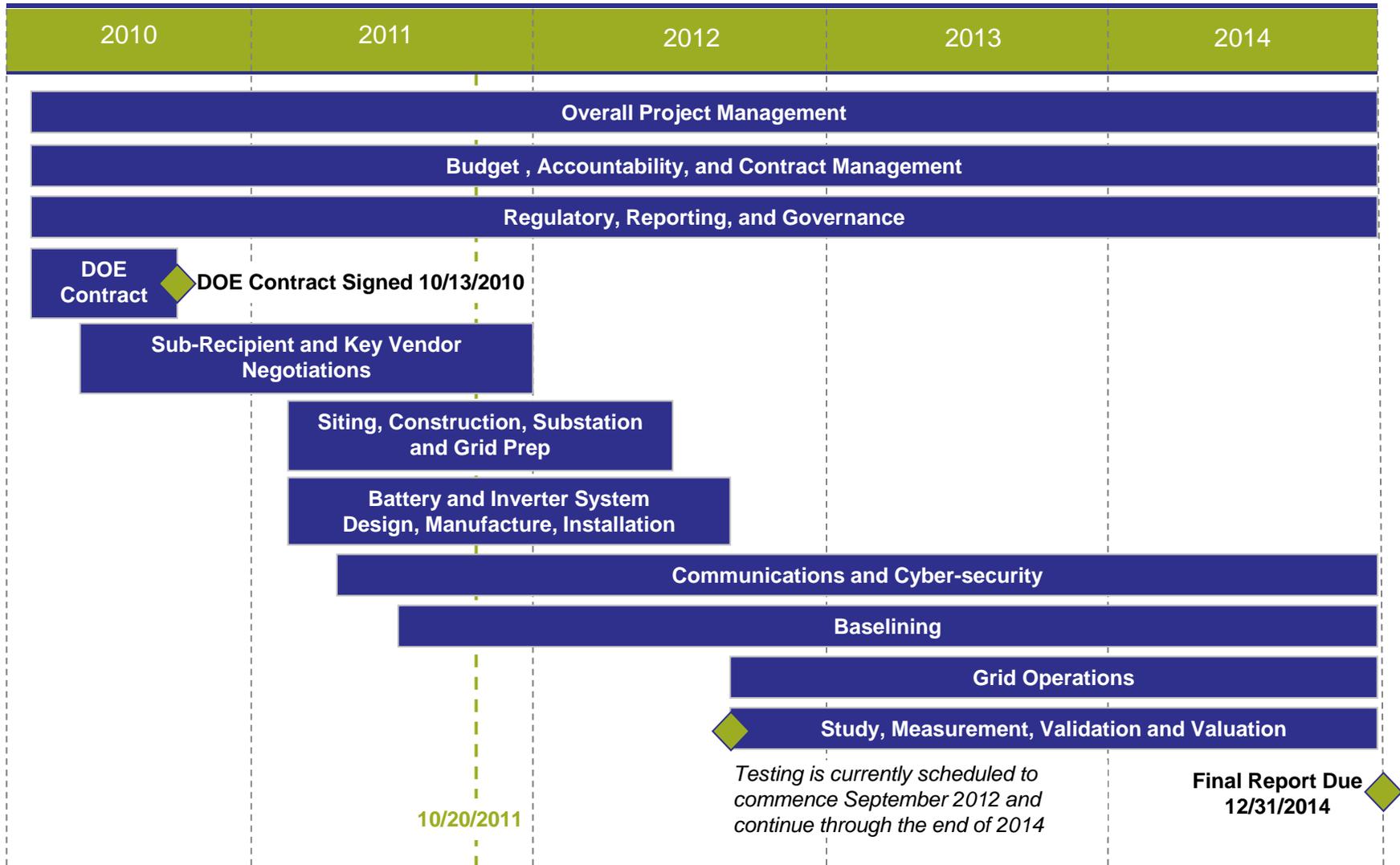
# Key Milestones To Date

- Successfully **definitized contract** between DOE and SCE on 10/13/2010
- DOE-NETL authorized SCE to work on **all project tasks** 1/14/2011
- **Task 1.1: Updated Project Management Plan** accepted by DOE-NETL on 1/6/2011
- **Task 1.2: National Environmental Protection Act (NEPA) Compliance** Categorical Exclusion received on 3/24/2010
- **Task 1.3: Interoperability & Cyber Security Plan** submitted on 11/2/2010 (reviewed by PNNL and accepted on 11/29/2010 by DOE-NETL with no revisions required)
- **Task 1.4: Metrics and Benefits Reporting Plan** draft submitted on 1/6/2011, accepted by DOE-NETL on 5/23/2011
- **Task 1.6: Finalize Plan for Baseline Measurements** draft completed on 4/4/2011
- **Baseline data** collection and analysis began on 7/1/2011
- **CAISO Interconnection** request accepted into Queue Cluster 4 Study on 9/1/2011
- Initial **Test Procedures** completed on 9/30/2011



# Overall Project Timing

The project is moving from the Design phase to the Manufacturing phase in Q4 2011



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# CONTACT INFORMATION

