SCE Strategy for a Clean Energy Future

Innovation in Energy & Information Technologies will Deliver Environmental Benefits & Customer Value

- SCE is doing its part to reduce greenhouse gas emissions by providing its customers with energy from renewable resources
- Smart power delivery is needed to manage greater diversity of supply and to optimize existing capacity
- Smart metering enables customers to increase energy conservation and reduce peaks while improving customer service and operational efficiency
- Plug-in electric vehicles will achieve transportation sustainability and enable distributed energy storage systems
SCE Smart Grid Vision
A Smarter Grid will provide environmental benefits associated with improved asset, system, and energy efficiency

- **Renewable, DER & Storage Integration**: Integrate and manage new sources of renewable and distributed energy supply and storage
- **Grid Control & Asset Optimization**: Improve capital efficiency and assets using better intelligence and technology for optimal system planning
- **Workforce Effectiveness**: Maximize workforce productivity, effectiveness, and safety by using enabling tools
- **Smart Metering**: Enable the grid to automatically adjust to changing loads and supply requirements
- **Smart Customer Solutions & PEVs**: Empower customers to become “active” participants in the energy supply chain managing their own energy consumption
Key Energy Policy Goals 2010 - 2020

- **RPS Bulk Power Integration**
  - 20% Renewable Generation

- **RPS Distributed Power Integration**
  - ~3500 gWh of EE Savings (2009 – 2011)
  - 50% of new homes are 35% more efficient than T24

- **Transportation Electrification**
  - ~7300 gWh of EE Savings (2012 – 2020)

- **Energy Efficiency & Demand Resp**
  - 1 Million PEV’s*

- **MRTU**
  - Commence operations for MRTU markets
  - SmartConnect DR Goals (~800 MW)

- **2010**
  - 20% Renewable Generation

- **2012**
  - 250 MW of Large Scale Solar Rooftop Generation

- **2014**
  - 1 Million Solar Roofs statewide

- **2016**
  - 33% Renewable Generation (Proposed)

- **2018**
  - 1 Million PEV’s*

- **2020**
  - Zero Energy Homes 100%

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www.sce.com/smartgrid
SCE Smart Grid Development

*Information technologies and control systems*

Stage 4: Micro-control (2020-2030)
Stage 3: Distributed Intelligence & Automation (2012-2019)
Stage 1: Foundation (1995-2008)
SCE Smart Grid Development (Stage 2)
Building on smart foundation established over the past decade

~$1.5 Billion Smart Grid Development Projects

- PEV Integration
- Renewable Integration Tech Dev.
- Advanced Load Control
- Enhanced Outage Management
- Expanded Distribution Automation
- Centralized Remedial Action Schemes
- Phasor Measurement
- Substation Security Video Surveillance
- Energy Management System Upgrade
- Smart Metering

* Includes CPUC approved SCE GRC project funding +
SCE’s $1.25b smart metering program was approved by CPUC in Sept. 2008
Synchronized Phasor Measurement System

Phasor technology enables real-time system monitoring and reduces the probability of major disturbances

- The growing complexity of interconnected electric grids increases the threat of blackouts and other operational challenges, facilitating the need for a smarter electric grid equipped with wide-area measurement units to monitor large grids.

- Phasor measurement units (PMUs) help identify remote system disturbances in advance to prevent wide-scale power outages.

- Power System Outlook (PSO) is a real-time tool that enables operators and engineers to quickly and affordably analyze phasor measurement system data.
Energy Storage

- Identify storage technologies to enhance integration of wind on the transmission system.

- Evaluate storage solutions that will help us address frequency, voltage and stability problems, as well as path-congestion issues.

- Evaluate distributed storage as a means to improve system effectiveness of premise PV and distribution system performance.

- Bulk-storage technologies being evaluated include pumped storage and compressed air energy storage.

- Distributed storage technologies include flow and auto-derivative battery technologies.
Transmission & Distribution Automation

Expand smart technology deployment building on investments over the past decade

- Enable distributed energy resources and storage to support customer choice and improve grid stability

- Prevent catastrophic system failures through innovative real time power system analytics and grid technologies

- Minimize customer power disruptions due to distribution system failures through expansive automation

Avanti - Circuit of the Future
Reduce Energy Consumption & Demand

Customer Enabled Automated Response through Energy-Smart Appliances

Improved Load Management through Edison Smart Connect™ Technologies

Energy Information Drives Energy Conservation and GHG Reductions
Distributed Energy Resources

Enable Net Metering, Discrete metering and Integrated Energy Management w/Solar Panel

Discrete Metering, Incentive Programs, and Demand Response for PEVs

Home Energy Storage Creates Opportunities for Increased Renewables

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Smart Grid Communication Networks

• Clearly articulated business uses, value and requirements

• Regional & enterprise telecommunications architectures needed
  – Bridging diverse communication protocols
  – Various network component technology lifecycles
  – Designing networks prior to all uses being known

• Funding, given that benefits often don’t accrue to a single party

• Development of a graceful transition plan between “as is” state and “to be” architecture.
Federal, State and Regional Integration

• Coordinated efforts of regulators and lawmakers on smart grid development and implementation
  – Crucial that these various efforts proceed on an informed and coordinated basis, to avoid duplicative or contrary standards and policies

• Coordinate jurisdictional intersections in order to implement a comprehensive smart grid across the state and region, which includes municipal electric utilities and non-California WECC utilities

• Support interoperability & cyber security on a system-wide basis from the generator to the customer
  – Support NIST efforts to develop consensus, and make Smart Grid standards recommendations
  – Support national/international open collaborative efforts to encourage industry engagement through a variety of associations, forums, and standards groups