

SCE Smart Grid

Creating a Cleaner, Smarter Energy Future

Percy Haralson

Manager of Field Technologies

Southern California Edison

March, 2010

Southern California Edison

An Edison International Company



- Serve a population of about 14 million people in a 50,000-square-mile service area within central, coastal and Southern California
- 5 million electric meters
- 12,000 circuit miles of transmission lines and more than 111,500 circuit miles of distribution lines
- 5,000 MW of generating capacity from interests in nuclear, hydroelectric, and fossil-fueled power plants
- Award-winning energy efficiency & DR customer programs
- Industry leader in renewable energy, electric transportation, Smart Grid and smart metering

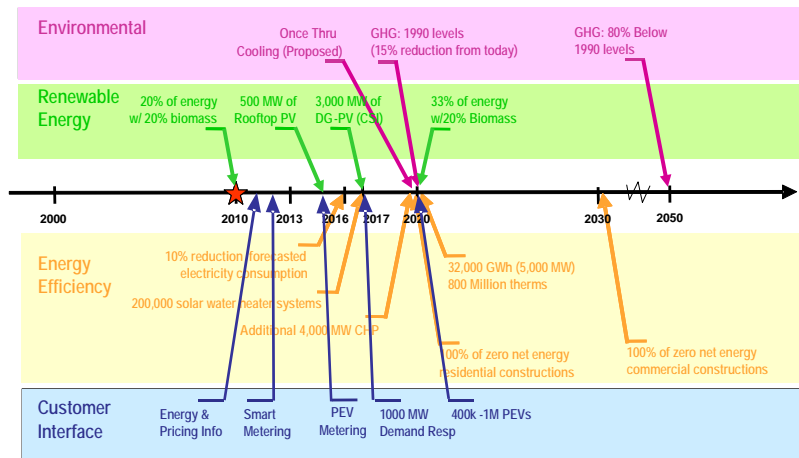
SCE Smart Grid Vision

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.



California Climate & Energy Policies

Most aggressive policies in the United States



Renewable & DER Growth

California is pushing beyond limits of current grid capabilities

CA Renewables Portfolio Standard

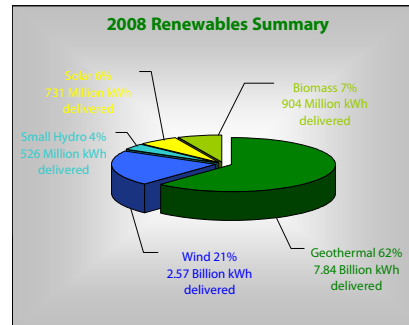
- 20% by 2010
- 33% by 2020 (Governor's Exec Order)

Lg Rooftop Solar PV Program

- 500 MWs by 2015
- 250 MWs by SCE & 250 MWs by IPP
- ~ 350 projects at 1-2 MWs each

California Solar Initiative (CSI)

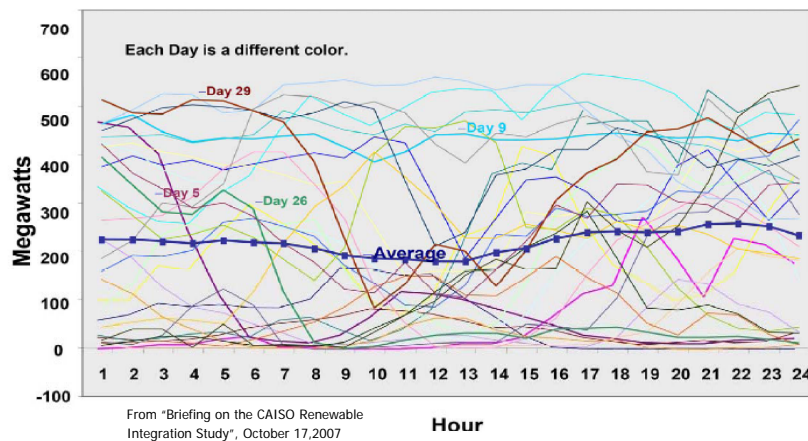
- Goal of install 3,000 megawatts (MW) of new, customer-side solar photovoltaic projects by 2017



Significant Increase in New Wind Resources

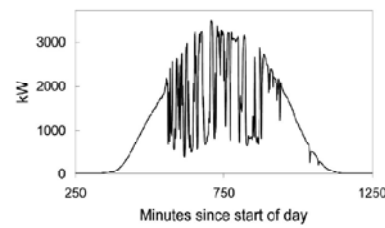
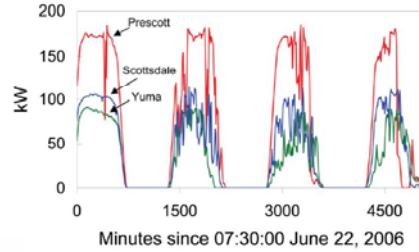
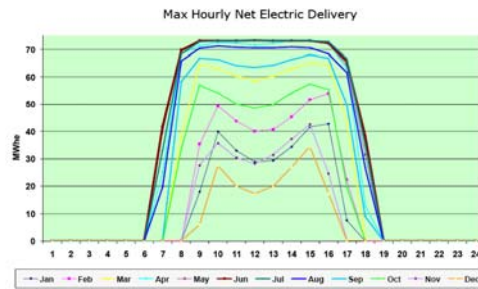
Potential 7x increase in total wind energy to 15 billion kWh

Tehachapi – April 2005



Solar Intermittencies

- Seasonal, Daily, Minute PV Power Fluctuating
- PV Inverter – Grid Interactions
- Low Capacity Factor < 20%
- Inaccurate forecasting
- No cost effective grid storage yet



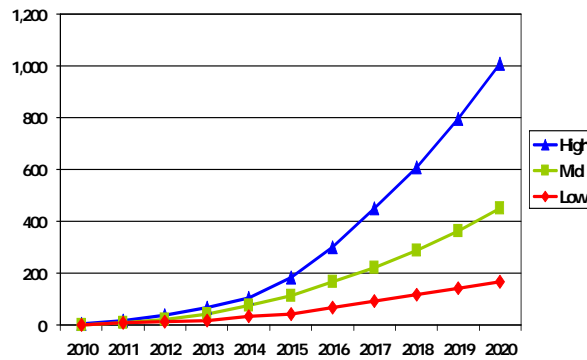
PEV Adoption Forecast for SCE Service Area

Early Market (2010-2014)

- Modest number of PEVs;
- Early adopters with high expectations;
- Uncertainty around market development; and
- New policies and standards developed & implemented.

Growing Market (2015 +)

- Growing number of PEVs;
- Some clarity around customer charging behavior and impacts to electric grid; and
- Growing significance of load management.

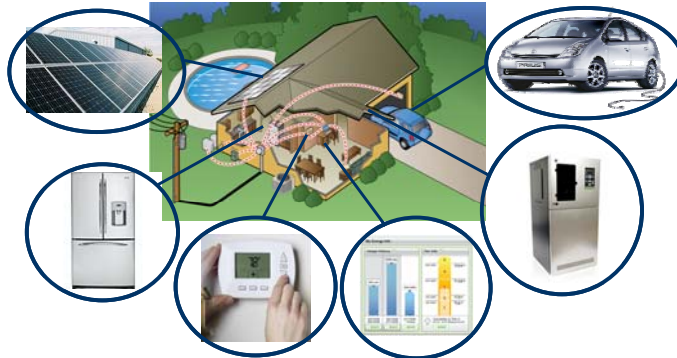


We are in the early days. All of us – policy makers, auto manufacturers, auto dealers, utilities – need to figure it out together.

Engaging Customers in the Supply Chain

By 2020, in SCE's service area there may be as many as 10 million intelligent devices¹ linked to the grid providing sensing information and automatically responding to prices/event signals

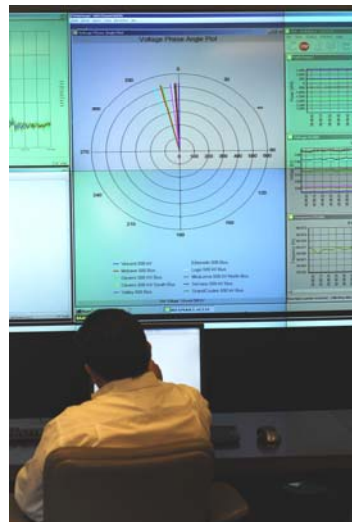
Zero Net Energy Home



1. Includes smart meters, energy smart appliances and customer devices, electric vehicles, DR, inverters and storage technologies

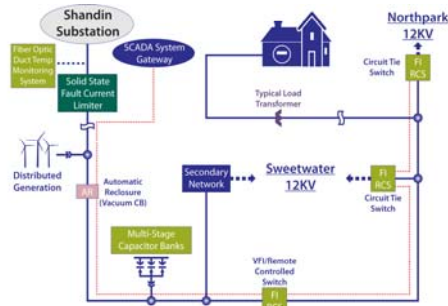
Transmission: Renewables Integration

- Increase transmission capacity to integrate more bulk renewable energy resources
- Implement Synchrophasors & Wide Area Controls to enable enhanced grid monitoring and controls
- Provide real-time Voltage, VAR & frequency support to mitigate volatility
- RD&D on advanced inverter technology to significantly improve integration
- RD&D on large scale energy storage systems



Distribution Automation

- Enable distributed energy resources and storage to support customer choice and improve grid stability
- Develop new technology for dynamic Volt/VAR and harmonics control to provide quality service and enable voltage conservation
- Minimize customer outages due to distribution system failures through expansive automation
- Development of superconducting devices such as fault current limiters and transformers



Avanti - Circuit of the Future

Edison SmartConnect™: Empowering Customers

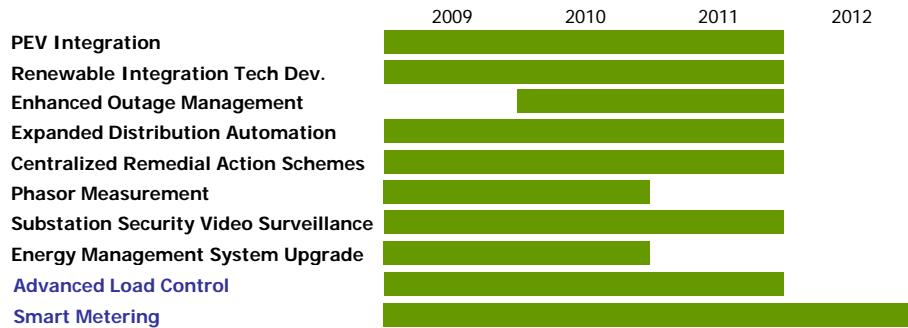


- Choice to Manage Cost & Peak Demand
 - Rates
 - Time of Use and Tiered Rates
 - Critical Peak Pricing (CPP)
 - Peak Time Rebate (PTR)
 - Programs
 - Smart Communicating Thermostats
 - Outcome
 - Reduce Peak Load by 1,000 MWs
- Energy Information Drives Conservation
 - Reduce Residential Energy Consumption by 1% (minimum)
 - Reduce GHG by 365,000 tons/yr
- Automated Self-Service
 - Remote Service Switch
 - Payment and Billing Options

SCE Smart Grid Development

Building on smart foundation built over the past decade

~\$1.5 Billion Capital* Smart Grid Development



* Project capital approved by CPUC in SCE's 2009 GRC & SmartConnect program

What is Needed to Realize a Smarter Grid?

- Intelligent and communicating PEVs that integrate gracefully with the grid
- Cost effective energy storage at bulk transmission and distribution
- Commercial products based on open, non-proprietary standards that are secure
- Seamless and secure telecommunications infrastructure that integrates millions of intelligent devices to produce actionable information that is used to control the electric system
- Workforce with the skills and knowledge to engineer, build, operate and maintain an electric grid with pervasive information technology embedded

Observations

- Smart Grid is a journey that will be 20+ years in the making
 - Personal computing was introduced 30 years ago
 - Portable cell phones were introduced 25 years ago
 - Public Internet was launched 20 years ago
- Pace of technology adoption will need to consider policy, customer impact, utility operations and asset obsolescence
- A smarter electric grid will become more interactive with our customers' lives thru the home, transportation and workplace



sce.com/careers