



Smart Grid Development

April 24, 2009

ADVANCED TECHNOLOGY
Transmission & Distribution Business Unit



SCE Strategy for a Smarter, Cleaner Energy Future

Innovation in Energy Technology will Deliver Environmental Benefits & Customer Value



- Smart metering enabling customer's **energy conservation**, improving customer service, reducing system peaks
- Increase renewable resources helping lower carbon footprint
- Smarter power delivery, managing greater supply diversity, optimizing capacity
- Plug-in electric vehicles that enhance system efficiency and offer future distributed energy storage



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SCE SmartGrid Objectives

- **Enable Large Renewable & Distributed Energy Resources** to support customer choices, improve grid stability, and improve power supply options
- **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
- **Improve Workforce Safety and Asset Efficiency** through smarter tools & worker protective equipment, electrical equipment and wireless telecommunications
- **Enable Customer Energy Management and Carbon Reduction** through smart energy devices and adoption of PEVs & renewable resources at the premise



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SCE SmartGrid Strategy

Five key themes:



Improving reliability, safety, and cost effectiveness while delivering more customized solutions and environmentally-friendly energy supply to meet customer energy management needs



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Increasing Energy Efficiency Programs

In last five years, SCE's energy-efficiency programs have saved enough energy to power **789,000 homes** for an entire year & reduced greenhouse gas emissions equal to removing **400,000 cars** from the road

Over the next three years SCE is proposing to invest more than **\$1.3 billion** to achieve savings in excess of **3.5 billion kilowatt-hours**.



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Increasing Renewables Integration

**SCE leads the nation,
procuring about 1/8 of nation's wind and 80% of
nation's solar**

- Provide real-time voltage support to mitigate volatility associated with intermittent renewable energy resources
- Increase transmission capacity to integrate more bulk renewable energy resources
- Integrate large scale energy storage systems as a parallel power source for Voltage/frequency support with bulk intermittent renewable energy supply



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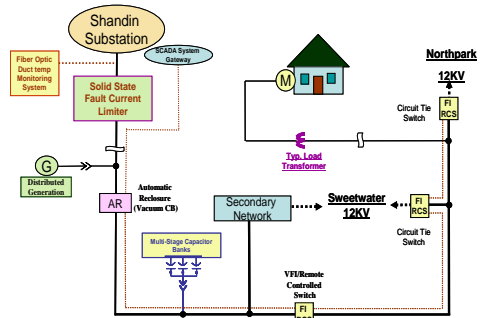
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Building Out T & D Automation

Expand smart technology deployment in the field 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

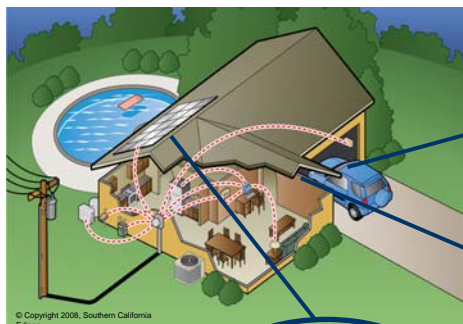


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Increasing Distributed Energy Resources



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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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SCE RD&D Approach

Discover, evaluate, adapt or adopt energy & information technologies to implement SCE's SmartGrid strategy 2012 - 2020

- **Discover:**
 - Scout for emergent technologies that have multiple-X benefits or game changing potential
 - Identify early stage technology that has the promise to become commercially viable within 5 years
 - Collaborate with research universities, national labs, and international & US electric research organizations
- **Evaluate:**
 - Test promising beta technologies that enable the SmartGrid vision and can benefit from SCE's expertise to further development
 - Demonstrate technologies to understand the integration or adaption required for SCE's electric and/or information systems
 - Collaborate with other utilities and industry research organizations on standards based technologies to minimize duplication
- **Adapt or Adopt (Technology Transfer)**
 - Implement technology that is commercially viable and meets SCE's requirements for safety, quality and performance
 - By exception, co-develop leading edge technology to reach commercial viability only when significant customer value can be achieved from SCE's involvement at the early stage



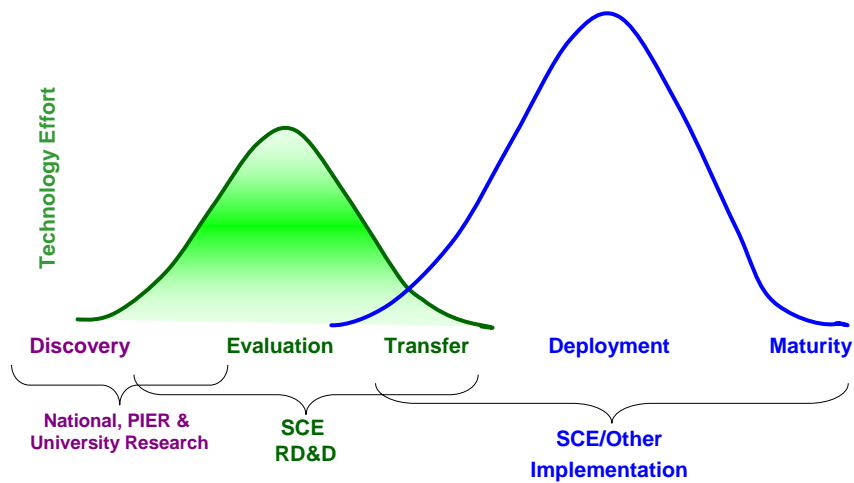
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SCE RD&D Approach

Technology Lifecycle Activities



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Example: DR/PEV/Storage <1MW RD&D

- **Demand Response**
 - Smart Thermostat behavior & field technology assessment
 - Zigbee – Homeplug Alliance: Smart Energy Profile development
 - Smart Appliance lab testing & field trial
- **Smart Metering & SmartGrid Integration**
 - Next generation Communications Architecture
 - Cyber-security advancement with DoE's AMI Security Acceleration Project
 - Complex Data & Event Management research with Caltech
 - Use Case development of smart metering integration with SmartGrid
- **PEV**
 - Ford-EPRI Partnership
 - Integration standards development with SAE & GM
 - PEV Use Case development
 - PEV metrology development
- **Storage <1 MW**
 - Rooftop PV – stationary battery optimization
 - Vehicle to home for load management
 - PEV battery for stationary storage applications



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Thank You

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