



An EDISON INTERNATIONAL® Company

Smart Grid Development

Enabling a cleaner, smarter energy future

Southern California Edison (SCE) is in the process of modernizing and expanding its electric power delivery systems. In doing so, it is critical that SCE deploy technologies that enable it to provide service in a manner consistent with present and future customer needs, while accommodating changes in market participation. SCE's vision of a Smart Grid is to develop and deploy a more reliable, secure, economic, efficient, safe and environmentally-friendly electric system. This Smart Grid will incorporate high-tech digital devices throughout the transmission, substation and distribution systems and integrate advanced intelligence to provide the information necessary to both optimize electric services and empower customers to make informed energy decisions.

SCE is one of the nation's largest investor-owned utilities serving more than 13 million people in a 50,000 square mile area of Central, Coastal and Southern California for more than 120 years. Electricity is fundamental to almost every aspect of modern life and prosperity. As an industry leader in advanced grid technologies, energy efficiency and environmental stewardship, SCE is dedicated to developing the Smart Grid.

"The adoption of advanced technologies is necessary to enable significant environmental benefits and more efficient use of our grid," said Jim Kelly, senior vice president of SCE's Transmission and Distribution.

The Need for Grid Modernization

The electricity infrastructure delivering power from a variety of generating sources to our homes, businesses and communities is not suitable for today's needs. The challenges that face our nation's energy future simply cannot be met by our aging electric grid. Growing renewable energy capacity requirements, global climate change provisions, and the pressing need for more energy self-determination on behalf of customers all require a smarter, more intelligent grid.

Upon taking office, President Barak Obama made it clear modernizing the nation's infrastructure would be included in his economic renewal and stimulus plan.

"We'll also do more to retrofit America for a global economy by updating the way we get our electricity by starting to build a smart grid that will save us money, protect our power sources from blackout or attack, and deliver clean, alternative forms of energy to every corner of our nation," said the president.

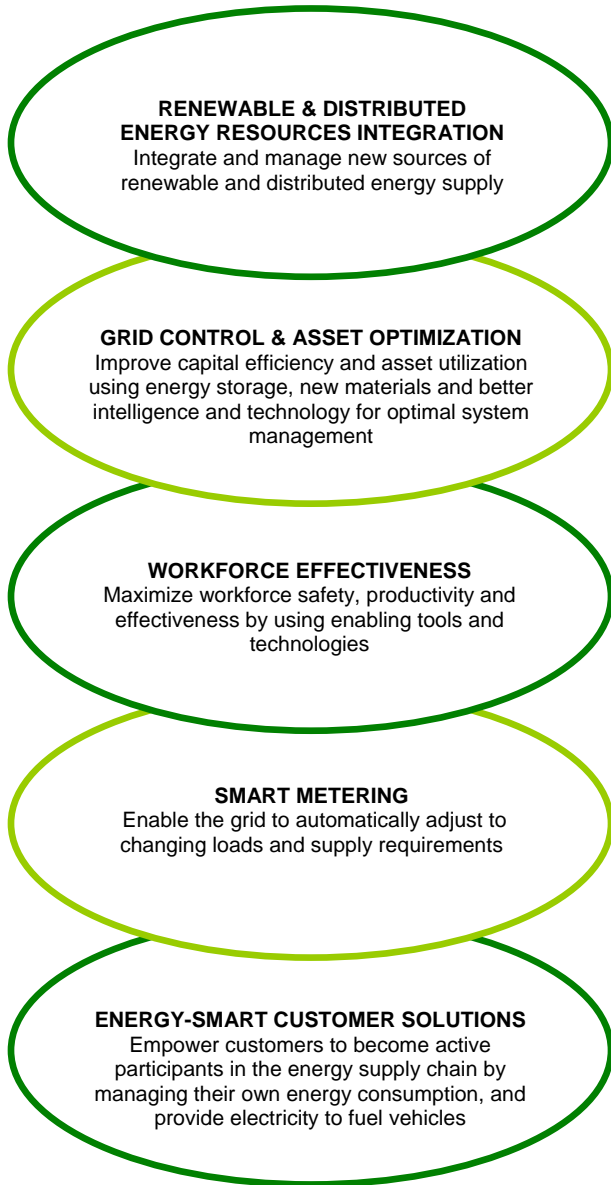
What Is a Smart Grid?

The U.S. Department of Energy (DOE) commissioned the National Energy Technology Laboratory (NETL) to detail what it will take to turn the existing electric system into a smart grid. According to NETL, a smart grid needs to meet six essential goals. A more **reliable** grid must provide power in a manner and of the quality demanded by customers. A more **secure** grid must be more resilient to physical and cyber attacks from both natural and intentional causes. A more **economic** grid must facilitate real-time pricing and adequate supplies. A more **efficient** grid must optimize investments for reduced operating costs, fewer instances of electrical loss and improved asset utilization. A **safer** grid must reduce harm to the public and grid workers. A more **environmentally friendly** grid must reduce the impacts of electricity generation, transmission, distribution, and consumption on the environment.

SCE's Smart Grid Strategy

SCE envisions the Smart Grid as an increasingly intelligent and highly automated electric power system that utilizes advancements in communications, computing, sensing, and control technologies to better meet customer energy demand. Incorporating high-tech, interoperable digital devices throughout the transmission, substation and distribution systems, will result in a Smart Grid capable of integrating and managing vast amounts of data, providing the information necessary to optimize electric services automatically. SCE plans to accomplish this integration of technologies at the customer interface using its award-winning Edison SmartConnect™ advanced meter.

Presently, SCE is undergoing a rigorous company-wide assessment of its operations, processes and initiatives in an effort to determine how the Smart Grid will impact how the utility does business. SCE's Smart Grid strategy encompasses five strategic themes that address a broad set of business requirements to better position SCE to meet current and future power delivery challenges. These themes and their accompanying objectives are closely aligned to those of California's regulatory commissions and the federal government's Smart Grid efforts.



SCE's five themes for a Smart Grid will ensure innovation in electricity delivery and clean technology to enable a significantly cleaner environment by 2020.

Theme 1: Renewable and DER Integration

Strategic Objectives:

- Integrate renewables into bulk power system to meet requirements for a green energy supply
- Enable DER and storage integration to improve grid stability, support customer end-use requirements, and improve power supply options for economic dispatch

Renewable Energy Leader

SCE is the nation's leading purchaser of renewable energy. In 2007, the utility delivered 12.5 billion kilowatt-hours of power from renewable resources, accounting for 16.5 percent of SCE's total power delivery as recommended by California's Renewable Portfolio Standard (RPS) guidelines - more than any other U.S. utility. On March 7, 2008 SCE broke ground on the nation's largest transmission project devoted primarily to renewable energy - the \$1.7 billion 4,500 MW Tehachapi Renewable Transmission Project.

Advancing Renewable Integration

Engineers and researchers at SCE are actively pursuing solutions to the challenges associated with integrating greater amounts of intermittent renewable resources on the grid. The California Energy Commission's (CEC) Public Interest Energy Research (PIER) program awarded SCE's Research, Development and Demonstration (RD&D) division a grant to study the feasibility of energy storage for wind interconnection points on the utility's system. SCE is in the process of establishing a Renewable Integration and Advancement program to further address intermittent renewable resource integration issues.



Edison sees tremendous opportunities in utilizing storage technologies for the effective integration of large-scale intermittent and distributed renewable resources. SCE leads the way in the development and evaluation of battery storage technology, particularly for use in electric transportation. SCE believes the next generation of battery storage technology will be able to power plug-in-vehicles and provide significant value in stationary applications on the distribution grid. RD&D at SCE also includes larger scale storage technologies.

Theme 2: Grid Control and Asset Optimization

Strategic Objectives:

- Prevent catastrophic bulk power system failures
- Minimize service disruptions due to distribution system failures
- Develop timely and accurate information about service issues
- Increase power throughput on transmission and distribution assets
- Improve capital efficiency through condition-based maintenance/replacement
- Use better info on load and grid operating performance to improve system planning

Wide Area Measurement & Control

Since electricity flows across a grid at nearly the speed of light, abnormal conditions can propagate quickly throughout the electric system. SCE's pioneering efforts in the area of Synchronized Phasor Measurement Systems (SPMS) have reached a point where the company can quickly and affordably analyze data from

large transmission grids. SCE's system utilizes hardware and software to capture millions of grid stress-point measurements. It then analyzes the data and synthesizes it into a simple visual representation enabling operators to see where action is needed to avoid widespread electric system collapse. SCE leads the industry in SPMS technology and recently received the "2007 T&D Automation Project of the Year" awarded by *Utility Automation & Engineering T&D* magazine.

In June 2007 SCE was the first in the world to successfully implement SPMS technology as part of a coordinated control algorithm for its Rector Static VAR Compensator (SVC) installation. SVCs help maintain and enhance system stability by controlling voltage with fast-acting, continuously variable power electronics. The SPMS interface provides operational information at approximately 30 scans per second, allowing the SVC to provide excellent voltage regulation.



System Automation

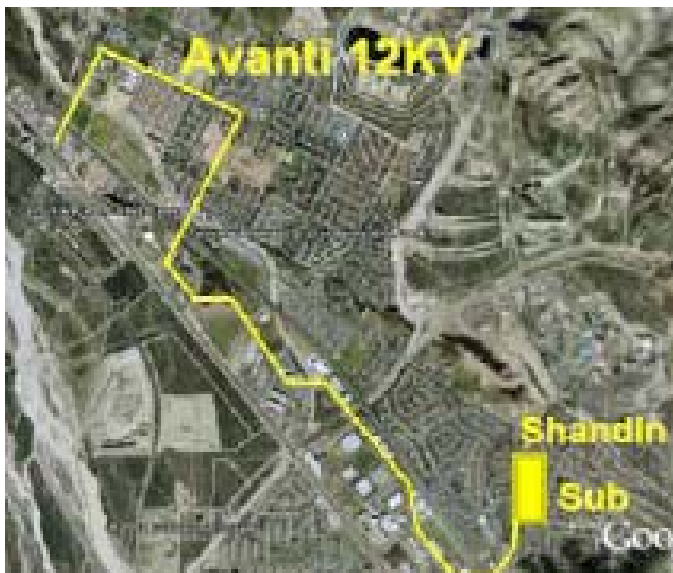
SCE is an industry leader in both substation and distribution system automation technologies. Out of the 900 substations that SCE maintains, over 30 percent are equipped with state-of-the-art microprocessor based systems that operate over local area networks. On the distribution side, approximately 35 percent of SCE's 4,300 distribution circuits are automated using advanced wireless technologies. Edison's automation strategy allows for both remote control/monitoring and autonomous control of critical grid components, which help protect the system during abnormal conditions and maintain reliability. While SCE is ahead of the curve with its current automation strategies, much work needs to be done to fully integrate both distribution and substation automation into one comprehensive, coordinated system automation approach.



Circuit of the Future

SCE has adopted an aggressive distribution infrastructure replacement strategy to satisfy the demands of the tremendous load growth it is experiencing. The driving force behind SCE's "Circuit of the Future" concept is the utility's commitment to reinvestment and its belief that this technology is the answer to modernizing the distribution system for the increased efficiency, utilization and safety of its assets, and improved reliability and power quality for the customer.

The Avanti® circuit made its debut in October 2007. It is the most advanced neighborhood circuit in the nation, delivering power to nearly 2,000 customers in Southern California's Inland Empire. The Avanti® was originally designed as a test bed for advanced distribution technologies. As part of a CEC initiative, a pad and bypass switch were added to the circuit for demonstrating various fault current limiters. A fault current limiter acts like a large surge suppressor reducing the amount of energy monitored by utility and customer equipment during an abnormal operation event.



Avanti's® other key features include: modular composite poles, advanced sensors and communications for coordinated control, an interconnection site for SCE's portable skid-mounted DER and future storage technologies, and fiber optic temperature monitoring to safely optimize the power throughput of the circuit's underground cable portions.

Theme 3: Workforce Effectiveness

Strategic Objectives:

- Use advanced visualization and control systems to support and automate decision-making
- Use emerging field technologies to improve crew safety and efficiency

Field Worker of the Future

SCE recognizes that as it deploys more advanced and feature-rich technologies and systems, its work practices and tools must evolve to successfully operate and maintain a smarter grid. Taking a proactive approach, SCE is meeting this challenge by instituting an "Innovation Lab," that will determine how the next generation workforce will be equipped. SCE envisions the "Field Worker of the Future" to be equipped with a wireless broadband enabled wearable computer, hardhat mounted video camera, voice recognition capability, personal voltage detection device, and fall-protection jacket.



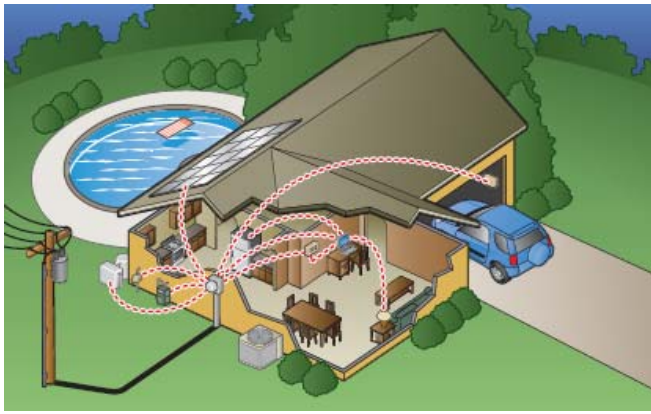
Theme 4: Smart Metering

Strategic Objectives:

- Provide real-time information and response capabilities to enable customers to adjust and manage their energy use to changing grid conditions
- Enable the grid to automatically adjust to changing customer loads and supply requirements

Edison SmartConnect

Edison SmartConnect, SCE's Advanced Metering Infrastructure (AMI) program, will replace over 5 million of its existing electric meters with next-generation electronic metering technologies to improve customer service and empower the ratepayer to proactively manage their energy use. The customer saves money by participating in new programs with time-differentiated rates and demand response options. These devices have the potential to reduce day-to-day utility operation costs by streamlining processes and automating the process of matching resources with demand.



SCE leads the nation in energy efficiency programs. Over the past five years the utility's energy efficiency programs have saved more than 4 billion kilowatt-hours. The Edison SmartConnect system is expected to provide customers with interactive, energy-smart thermostats and appliances that automatically respond during critical peak pricing periods and grid reliability events. This system will reduce the overall peak power consumption by an estimated 1,000 megawatts – the entire output of a major power plant.

SCE envisions an advanced metering system that acts as the information backbone enabling dynamic pricing, demand response, energy conservation, efficient customer service, and rapid outage response times. Edison SmartConnect is an important piece of SCE's broader Smart Grid vision.

Theme 5: Energy-Smart Customer Solutions

Strategic Objectives:

- Integration of smart appliances and consumer devices
- Wide spectrum of communications systems for greater customer interaction with the grid.

Integration of Smart Appliances and Consumer Devices

Edison SmartConnect will make it possible to integrate a wide spectrum of smart, programmable, consumer-friendly, wireless communications devices and appliances using the Home Area Network (HAN) interface. HAN functionality will give customers the option to purchase, connect, and partially manage a variety of systems and devices in their homes and businesses. Technologies showing great promise for smart grid application are: smart appliances, programmable communicating thermostats (PCT), home energy management systems, distributed energy

resources (home energy storage, rooftop solar), and Plug-In Electric Vehicles (PEV).

Plug-In Electric Vehicles

As one of the world's most progressive electric utilities, Southern California Edison takes a leadership role in supporting a safe, reliable, efficient and cost-effective electric supply for use by electric drive cars and trucks. As regulations and rising fuel costs spur ever-increasing growth in the use of grid-connected transportation technologies, SCE remains dedicated to serving as Southern California's premier 21st-century alternative-fuel provider...and carrying on our long tradition of environmental leadership as part of our commitment to customer and community service.

SCE is leading efforts to understand and help minimize potential impacts of increasing quantities of transportation connecting to the grid. We are evaluating various alternative fuel technologies to meet state environmental goals. Engineers are testing pure electric vehicle, hybrid, plug-in hybrid and fuel cell propulsion systems. SCE also provides education and outreach to our customers on the safe, reliable and energy-efficient use of electric drive vehicles, and to help customers shift charging to off-peak (low-energy-use) periods.

SCE is also evaluating and testing advanced battery storage technology and battery management systems. Work on projects enable the development of more energy-efficient battery charging systems. Testing includes assessments of advanced energy storage systems for stationary applications.

Advanced Telecommunications

Communications infrastructure is in many ways the most critical component to consider when developing the Smart Grid. SCE currently has one of the most comprehensive telecommunications portfolios in the industry. It is comprised of 5,250 circuit miles of fiber optic communications, over 30,000 900MHz Netcomm radios, and a proprietary satellite communications system to monitor and control the electric system.

The data capacity requirements of the Smart Grid are expected to exceed some of SCE's existing IT network capabilities. A smart grid must include the communications architecture and infrastructure strategy necessary to handle the vast amounts of data it receives. SCE is evaluating and monitoring a number of next-generation communications technologies such as: 4G Wireless Broadband, WiMAX, ZigBee, HomePlug, and a variety of new satellite technologies to ensure it develops a truly Smart Grid.