SCE’s Irvine Smart Grid Demonstration
Southern California Edison Overview

- SCE provides power to:
  - Nearly 14 million people
  - 180 cities in 50,000 miles
  - 11 counties in central, coastal and Southern California
  - Commercial industrial and nonprofit customers, including:
    - 5,000 large businesses
    - 280,000 small businesses

- To deliver that power it takes:
  - 16 utility interconnections
  - 4,990 transmission and distribution circuits
  - 425 transmission and distribution crews
  - The days and nights of more than 17,000 employees
  - More than a century of experience
California Climate & Energy Policies

Most Aggressive Policies in the United States

Environmental
- Once Thru Cooling (Proposed)
- GHC: 1990 levels (15% reduction from today)
- GHC: 80% Below 1990 levels

Renewable Energy
- 3,000 MW of DG-PV (CSI)
- 500 MW of Rooftop PV
- 20% of energy with 20% biomass
- 33% of energy with 20% biomass

Energy Efficiency
- 10% reduction forecasted electricity consumption
- 200,000 solar water heater systems
- 32,000 GWh (5,000 MW) 800 million therms
- 100% of zero net energy commercial constructions
- 100% of zero net energy residential constructions
- Additional 4,000 MW CHP

Customer Interface
- PEV Metering
- Smart Metering
- 400k-1M PEVs
- 1000 MW Demand Resp
SCE’s 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.
Irvine Smart Grid Demonstration (ISGD) Objective

• The ISGD demonstrates a variety of existing and new Smart Grid technologies in the same location with the following demonstration goals:
  – Interconnectivity and interoperability of those technologies
  – Demonstrate the technical and communication capability of smart technologies to shift consumption load to off-peak hours
  – Cost savings and reduced emissions by optimizing circuit voltage and using renewable energy storage

• Identify organizational structure and recommended job training for nationwide implementation of Smart Grid technologies

• SCE expects that most, if not all, of these technologies will be part of the future Smart Grid and essential in meeting or exceeding the goals of various state- and nationwide initiatives regarding Smart Grid deployment and reducing carbon emissions

• The ISGD will yield use cases from successful demonstrations that will be applicable for utilities nationwide
ISGD Scope

- **Subproject I** – Evaluating Zero Net Energy (ZNE) Home
- **Subproject II** – Plug-In Electric Vehicle (PEV) Charging
- **Subproject III** – Distribution Circuit Constraint Management Using Energy Storage
- **Subproject IV** – Advanced Volt/VAR Control (AVVC)
- **Subproject V** – Self-Healing Distribution Circuits
- **Superconducting Transformer** (Waukesha)*
- **Subproject VI** – Deep Grid Situational Awareness
- **Subproject VII** – Interoperability and Cyber Security (SENet)
- **Subproject VIII** – Workforce of the Future

*included in Waukesha award
ISGD Location
ISGD Scope
ISGD Scope

Subproject I – Evaluating Zero Net Energy (ZNE) Home on the Grid

Block 1: ZNE

Smart appliances:
- Refrigerator
- Washer
- Dishwasher

Demand Response equipment:
- Appliance communications module

Energy management system

Custom Photovoltaic (PV) system

Residential Energy Storage Units (RESU)

Energy efficiency:
- A/C upgrade
- Lighting upgrade
- Window replacements
ISGD Scope

Subproject I – Evaluating Zero Net Energy (ZNE) Home on the Grid

Block 2: Home Storage

Smart appliances:
• Refrigerator
• Washer
• Dishwasher

Demand Response equipment:
• Appliance communications module

3 kW Photovoltaic (PV) system

Residential Energy Storage Units (RESU)

In-home displays

Programmable communicating thermostats
ISGD Scope

Block 3: Community Storage

Smart appliances:
- Refrigerator
- Washer
- Dishwasher

Demand Response equipment:
- Appliance communications module

3 kW Photovoltaic (PV) system

In-home displays

Programmable communicating thermostats

Community Energy Storage (50 kVA/100 kWh)
ISGD Scope

Subproject I – Evaluating Zero Net Energy (ZNE) Home on the Grid

Block 4: Control
Serves as baseline and will not include new technology
ISGD Scope

Subproject II – Plug-In Electric Vehicle (PEV) Charging at Home and Work
ISGD Scope

ISGD Scope

Subproject IV – Enhanced Circuit Efficiency and Power Quality through Volt/VAR and Frequency Control
ISGD Scope

Subproject V – Self-Healing Distribution Circuit
ISGD Scope

Superconducting Transformer (Waukesha)
ISGD Scope

Subproject VI – Deep Grid Situational Awareness for Transmission Operators Using Phasor Technology
ISGD Scope

Subproject VII – Demonstrating End-to-End Cyber Security and Interoperability of Three Primary Networks: Inter-Utility, Intra-Utility and Field Area
Proposed Context Diagram
ISGD Scope

Subproject VIII – Identify the Organizational Impacts and Educational Curriculum Development to Produce the Next Generation Utility Worker
ISGD Scope
ISGD Timeline

Overall Project Timing

- Project Start Date: 2/9/10
- Definitization Date: 12/23/10
- Project End Date: 9/30/15

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- Overall Project Management
- Budget, Accountability, and Contract Management
- Regulatory, Reporting, and Governance
- Sub-Recipient and Key Vendor Negotiations
- Engineering Design, Lab Testing, Installation & Field Testing
- Communications and Cyber-security
- Baselining
- Operations
- Study, Measurement, Validation and Valuation

Project Start Date: 2/9/10
Definitization Date: 12/23/10
Project End Date: 9/30/15
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For more information on SCE’s Smart Grid strategy, news, and updates, go to: www.sce.com/smartgrid