DR9.08: Irvine Smart Grid Demonstration, a Regional Smart Grid Demonstration Project

OPPORTUNITY

What does this study demonstrate about the potential for smart grids?

This end-to-end demonstration of smart grid technologies is helping SCE address several profound changes impacting the electric grid's operation, including increased use of renewable resources, more intermittent generation connecting to the distribution system, the ability of customers to actively manage the way they use electricity, and policies and mandates focused on improving the environment and promoting energy security.

TECHNOLOGY

What is smart grid technology?

In short, the digital technology that allows for two-way communication between the utility and its customers, as well as detection along the transmission lines, is what makes the grid "smart". Like the Internet, a smart grid consists of controls, computers, automation, and new technologies and equipment working together. But in this case, these technologies work with the electrical grid to respond digitally to quickly changing electric demand.

M&V

Where did Measurement and Verification occur?

The Irvine Smart Grid Demonstration (ISGD) was a deep vertical dive that tested multiple components of an end-to-end smart grid. Thus, the project provided a living laboratory for simultaneously demonstrating and assessing the interoperability of, and interaction between, multiple smart grid technologies and systems. ISGD operated in the City of Irvine (Irvine), a location that typifies some heavily populated areas of Southern California in climate, topography, environmental concerns, and other public policy issues.

RESULTS

How did smart grid technology perform in M&V?

SMART ENERGY CUSTOMER SOLUTIONS

Residential and neighborhood energy storage was helpful in shifting loads, leveling demand, and providing backup power.

Solar PV and LED lighting upgrades had the greatest impact in achieving zero net energy.

NEXT GENERATION DISTRIBUTION SYSTEM

Centralized control of substation and distribution capacitors under DVVC greatly reduced overall system voltage and customer energy use without change in customer behavior.

INTEROPERABILITY & CYBERSECURITY

The project team successfully demonstrated that it could fully configure a substation automation (SA-3) human machine interface (HMI) within minutes instead of weeks. It also demonstrated the viability of the SA-3 substation gateway as a means for configuring substations, performing password management, and retrieving relay fault files.

NEXT STEPS

What does M&V recommend as some next steps for smart grid technology?

Collaboration among industry stakeholders is necessary to improve communications interoperability for key customer loads, such as electric vehicles and air conditioning. A key objective for future demonstrations would be to evaluate methods to monitor and control the growing number of distributed energy resources (DERs) to resolve grid challenges. Additional capabilities worthy of further investigation include control systems that use DERs for volt/VAR control, power flow optimization, and micro-grid support.