

Irvine Smart Grid Demonstration Project

OVERVIEW

Irvine Smart Grid Demonstration (ISGD) project was funded by the U.S. DOE by the American Recovery and Reinvestment Act of 2009. UCI APEP was a research partner on the project led by Southern California Edison. It was a comprehensive demonstration that included electricity distribution and delivery, and also went as far as customer homes. The purpose of the project was to test and evaluate various smart grid technologies to effectively operate when deployed in the grid.

The project primarily operated in Irvine, and was carried out on two 12 kV distribution circuits emanating from MacArthur substation- the same substation serving UCI Microgrid/

GOALS

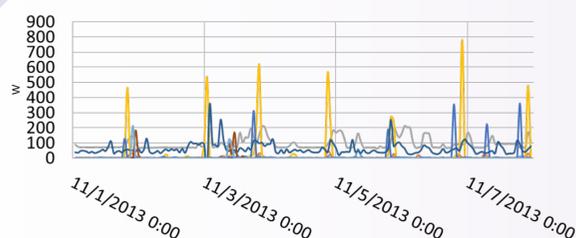
- Interconnectivity and interoperability
- Capability to shift load to off-peak periods
- Improved reliability through looped circuits
- Potential cost savings and reduced emissions by optimizing circuit voltage and using renewables and energy storage
- Identification of organizational structure and recommended job training for nationwide implementation of Smart Grid technologies
- Understand the potential grid impacts of ZNE homes and smart energy customer technologies
- High assurance cybersecurity

PROJECT DESCRIPTION

The project included 8 sub-projects:

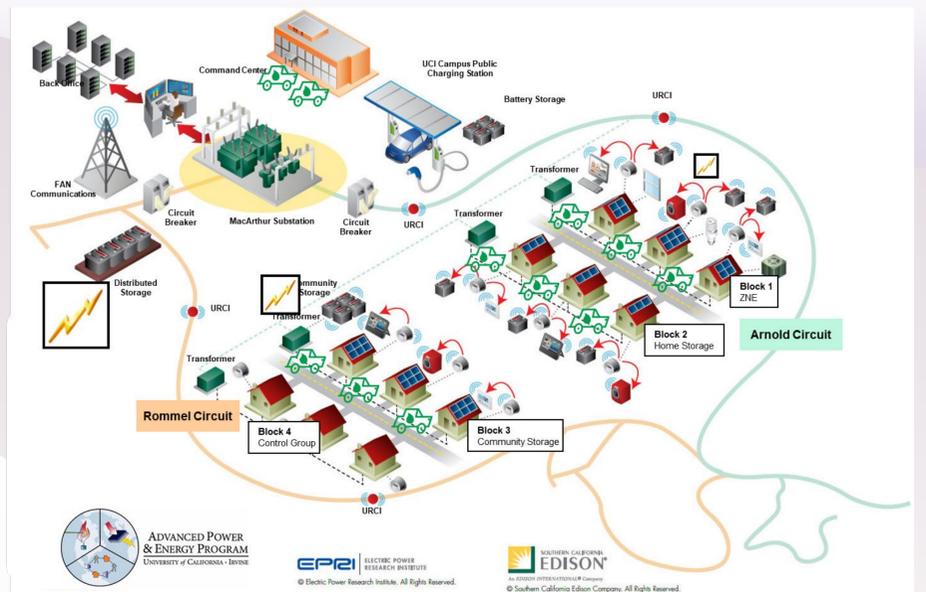
- 1) Zero Net Energy (ZNE) Homes through Smart Grid Technologies
- 2) Solar Shade-enabled Electric Vehicle Charging
- 3) Distribution Circuit Constraint Management with Energy Storage
- 4) Distribution Volt/VAR Control (DVVC)
- 5) Self-Healing Distribution Circuits
- 6) Deep Grid Situational Awareness
- 7) Interoperability and Cybersecurity
- 8) Workforce of the Future

The site of the project included equipped with solar PV, smart appliances, smart meters, community energy storage, and plug-in electric vehicles. These homes were distributed in the following four blocks, each with an individual transformer:



— BathLndryLights — BdrmLights1 — BdrmLights2 — DWasher
— EOven-A — Fridge — GasDryer — Washer

Data Sample



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PROJECT DESCRIPTION (continued)

1. ZNE block. In this block, homes were outfitted with energy efficiency upgrades, devices capable of demand response, a Residential Energy Storage Unit (RESU), a solar array, and a plug-in electric vehicle (PEV).
2. RESU block. The homes in this block were identical to ZNE block except for the energy efficiency upgrades.
3. CES (Community Energy Storage) block. This block was identical to the RESU block, but instead of each home having its own RESU, a community energy storage served the entire block.
4. Control block. These homes served as the control group with no modification.

Various tests were performed from demand response, to testing the energy storage in various modes, to smart charging of electric vehicles in order to assess performance of smart grid technologies.



CarShade



RECENT PUBLICATIONS/PAPERS

Southern California Edison. (2016). Final Technical Report: Irvine Smart Grid Demonstration, a Regional Smart Grid Demonstration Project.

PERSONNEL

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