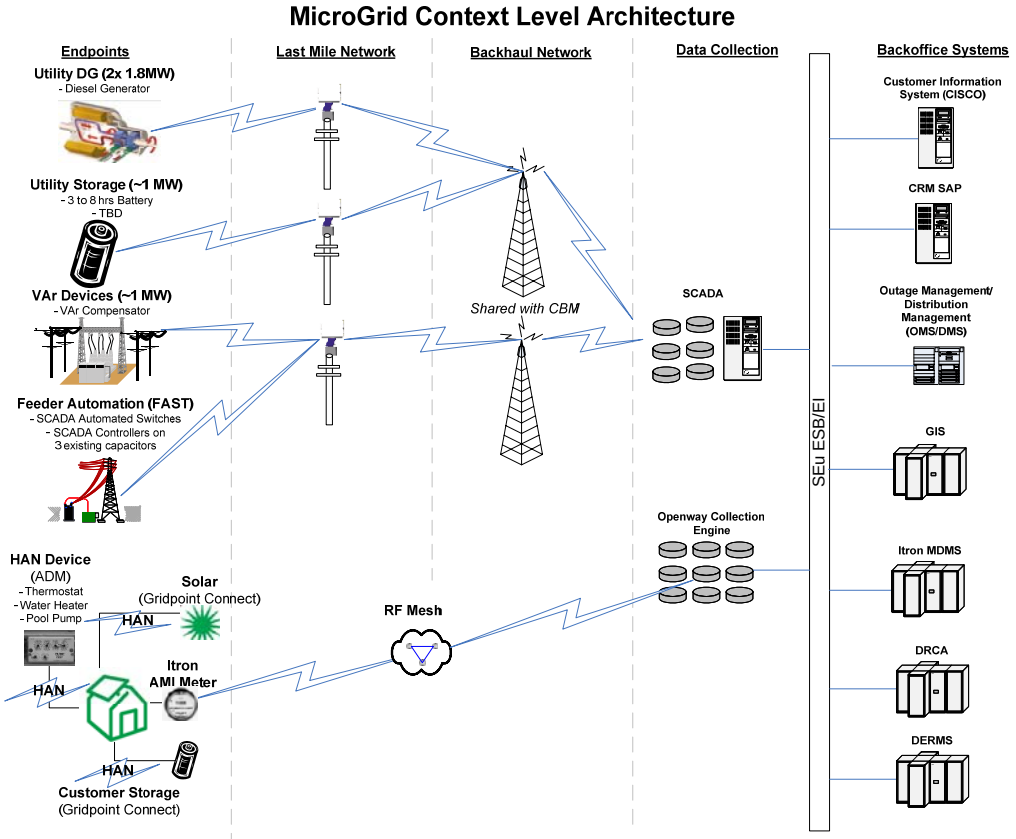
SDG&E RDSI Demonstration Project
"Utility Integration of Distributed Generation"



SDG&E Project Overview

The SDG&E microgrid project integrates a U.S. Department of Energy (DOE) component - focused on utility-side applications, and a California Energy Commission (CEC)portion , which focuses on customer-side applications. Goals of the DOE portion include achieving a greater than 15 percent reduction in feeder peak load, exploring microgrid islanding, and improving system reliability. Borrego Substation, with a peak load of over 10 MW, was selected as the demonstration site since it provides a unique opportunity to explore microgrid islanding of an entire substation service area. The project involves integration of five technologies, including distributed energy resources (DER) and VAR management, feeder automation system technologies (FAST), advanced energy storage, an outage/distribution management system, and price-driven load management. The project team will also perform a cost/benefit analysis for full-scale deployment.

The CEC portion of the project aims to demonstrate the concept of sustainable community microgrids focusing on interoperability, advanced metering infrastructure (AMI), and customer DER. The schedule of this effort will mesh with the larger DOE project and involves the integration of customer-based technologies, including remote-controlled demand response devices (e.g., thermostats), solar panels, battery storage, plug-in hybrid electric vehicles (PHEVs), and grid-friendly appliances.

DOE Renewable and Distributed Systems Integration (RDSI) Demonstration Projects

In 2008, DOE selected nine microgrid projects for federal funding, totaling $55 million over five years. The objective of these Renewable and Distributed Systems Integration (RDSI) Demonstration Projects is to increase the use of renewable and distributed generation and decrease peak loads on a distribution feeder by 15%. The systems can operate in both grid parallel and islanded modes. The projects are aligned with RDSI goals of increasing reliability, reducing emissions, using fuel more efficiently, resolving cyber system vulnerabilities and allowing consumers to manage their energy costs. Five of the projects are in the western half of the continental U.S., three are in the eastern half, and one is in Hawaii.

Project Criteria 6 Critical Elements

SDG&E's Smart Grid project can be aligned with the six critical elements that EPRI has identified as key criteria to achieve the goals of EPRI's five-year Smart Grid Initiative.

Integration of multiple distributed resource types

To further expose issues that need to be addressed and enable widespread integration of DER.

At the customer level, this project will integrate remote-controlled demand response devices (e.g., thermostats), grid-friendly appliances such as smart water heaters and pool pumps, distributed generation (solar panels), distributed battery storage, and plug-in hybrid electric vehicles (PHEVs). At the system level, the project will integrate utility distributed generation (e.g., two 1.8-MW diesel generators), utility storage (3-8 hour, ~1-MW batteries), and VAR devices (~1-MW VAR compensators). The utility storage devices will enable substation peak load shaving and support transitions to/from islanded operation.

Application of critical integration technologies and standards

To identify gaps associated with standards, harden critical integration technologies, and advance adoption.

This project attempts to integrate a large number of distribution system side and customer side technologies and capabilities (see Figure 1). The project will use a service oriented architecture; enterprise messaging framework; EDIX, FTP, and adapter-based integration architecture; SQL/ETL communications; and communications using ICCP/Multi-Speak/SOAP, HTTP, SMTP, and legacy protocols.

Incorporation of dynamic rates or other approaches to link wholesale conditions to customers

To evaluate integration issues and incentives associated with customer response and linking supply with demand.

Phase 2 of the project will include integration of price-driven load management (PDLM). Various grid-friendly appliances such as smart water heaters and pool pumps, as well as remote-controlled demand response devices, such as thermostats, will be integrated on

home area networks (HANs) with customer solar generation and battery storage. These HANs will communicate with the utility through an Itron AMI meter via a radio frequency (RF) mesh. A PDLM event management system will send and receive device operation signals from the HANs.

Integration into system planning and operations

Demonstrate integration tools and techniques to achieve full integration into system planning and operations.

The DOE portion of the project heavily emphasizes distribution system operation. The technical objectives of the project include achieving greater than 15 percent reduction in feeder peak load through the aggregation/interoperability of multiple, integrated DER; Volt-Amps-Reactive (VAR) management; and automated distribution control to intentionally island customers in response to system circumstances. Completion of this project will provide a firm foundation for development of recommendations for future distribution network operations (entire network), extrapolated from this real distribution network, in an integrated DER environment where price-driven and reliability-driven customer decisions and utility decisions co-exist.

Compatibility with initiative goals and approach

Enable high-penetration of DER and advance interoperability and integration for the electric power industry.

Successful completion of this project will demonstrate that application of technologies in an integrated fashion has the potential to allow more power to be delivered through existing infrastructure, reduce the need to build more in the future, and increase the reliability of the grid by adding elements that make the grid more stable and reconfigurable. The project will document lessons learned from observing real interdependencies between distribution system operations, distributed generation, energy storage, volt/VAR compensation, and utility-driven and customer-driven load management.

Leverage of additional funding sources

Secure required participation, commitment, and funding for a successful project.

This SDG&E led project will receive approximately $7.4 million in DOE funds over three years, and leverages $2.8 million from a parallel CEC effort. Project partners such as Advanced Control Systems, Horizon Energy Group, IBM, Lockheed Martin, Motorola, Oracle and the University of San Diego will also contribute nearly $5 million in cost share.

Technical Contacts

Matt Wakefield at 865.218.8087 (mwakefield@epri.com)
Thomas Bialek - tbialek@semprautilities.com
Mario Sciulli – Mario.sciulli@netl.doe.gov