UNLV RDSI Demonstration Project
"Dramatic Residential Demand Reduction in the Desert Southwest"

UNLV Project Overview

The UNLV project is unique among RDSI projects in its highly aggressive goal for reduction in peak electricity demand. The 65% reduction goal[1] at the feeder/substation level is more than four times higher than the minimum goal set by DOE for these projects.

To achieve this ambitious objective, UNLV and its partners plan to design and build a new housing development of approximately 180 homes that are designed from the ground up for energy efficiency and incorporation of advanced energy technology. In the planned "Villa Trieste" community in Las Vegas, the homes will feature roof-integrated 1.76-2.43 kW photovoltaic (PV) systems, tankless water heaters, Energy Star appliances, low-E windows, advanced meters, advanced automated appliances and thermostat controls, and advanced in-home displays of energy use. Outside the home, the project will also incorporate demonstrations to overcome electricity grid integration, control, and communications issues. This includes advanced wireless mesh network technology, battery energy storage at the substation, and a research component on how customers interact with in-home energy technologies. The RDSI project complements a larger project recently awarded funding by DOE under the Smart Grid Investment Grant program.

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.

[1] Compared to similar housing that is built to code conventionally.

Project Criteria 6 Critical Elements

UNLV's Smart Grid project can be aligned with the six critical elements that EPRI has identified as key criteria to achieve the goals of its 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 advanced programmable communicating thermostats, roof-integrated PV systems, and demand response (e.g., active load control). The development will feature new single-family homes that incorporate all of these distributed resource components, combined with home area networks and advanced metering, in highly energy efficient residences. At the system level, the project will integrate substation-based battery storage.

Application of critical integration technologies and standards

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

This project will implement standards-based equipment and systems on both the customer and utility side of the meter. Interconnection of the PV arrays and substation battery storage will demonstrate compliance with IEEE 1547. The demand response component will demonstrate compliance with the Open Automated Demand Response (OpenADR). In the homes, the project will consider use of the Zigbee protocol. The secure mesh advanced metering infrastructure will use IEEE 802.15.4.

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.

NV Energy (nee Nevada Power Company), which is partnering with UNLV in this project, is examining dynamic rate programs such as peak time rebate (PTR), critical peak pricing (CPP), and advanced time-of-use (TOU) to propose to the Public Utilities Commission of Nevada in mid 2010. Some combination and design of these rate programs will help facilitate the goals of this project.

Integration into system planning and operations

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

This project integrates with power system operations in two ways. First, the project team will work with NV Energy's Resource Procurement Group, which develops day-ahead and hour-ahead forecasts, to characterize in predictable fashion the dispatchable components of this project (e.g., the battery storage and the curtailable load). Second, the project team will work with NV Energy's Balancing Authority to characterize the relative certainty of storage and demand response resource availability for use during emergency operations or to offset spinning reserves. In both cases, NV Energy plans to test these potential capabilities. With regard to power system planning, the project team is working with NV Energy's Distribution Planning group to provide information on how this new

housing development may affect power system planning in the future (e.g., lower capacity distribution equipment).

Compatibility with initiative goals and approach

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

This project can provide a blueprint for development of new, energy-efficient, Smart Grid-ready residential communities around the country. These communities can represent the next generation of demand reduction using Smart Grid technologies and approaches. On a regional level, lessons learned from addressing equipment issues related to the severe desert climate can be transferred to other utilities and stakeholders in the southwestern U.S.

Leverage of additional funding sources

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

The University of Nevada, Las Vegas is the prime contractor on this RDSI project and leads the research component of the project. NV Energy is contributing a significant cost share to the project and will implement the energy efficiency and demand response programs, as well as the distribution upgrades. Pulte Homes is also contributing a cost share. Equipment and system vendors include SunPower for the PV system and Trilliant for the advanced networks. While the demonstration portion of the project is a 50/50 cost share with DOE/participants, the research component is an 80/20 cost share with DOE/participants.

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