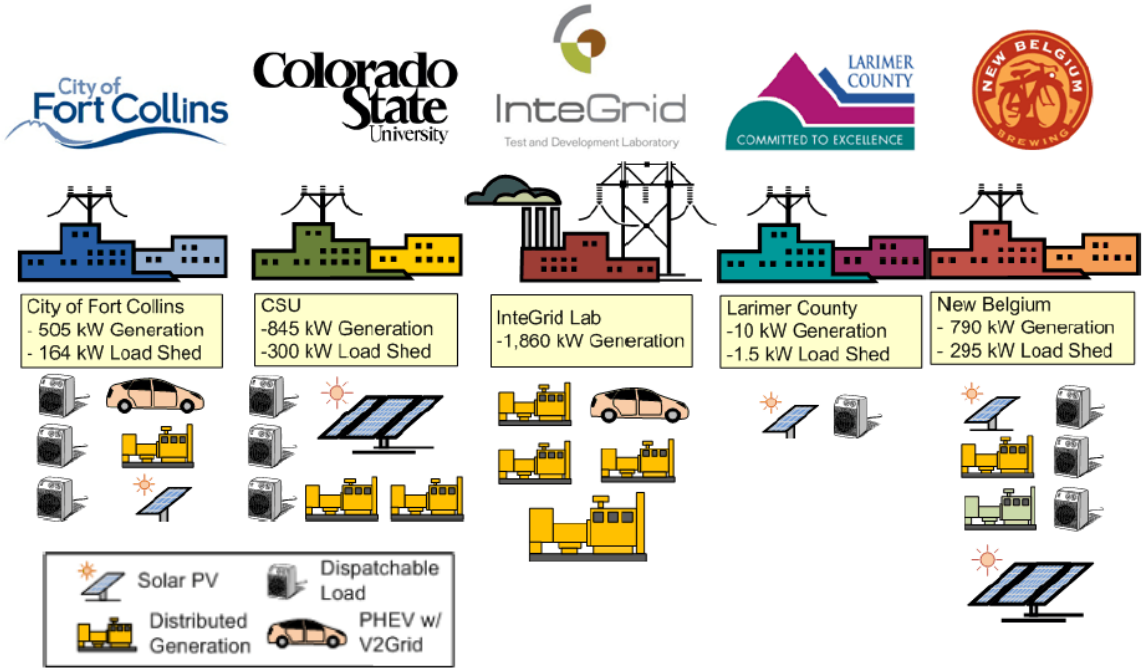
Ft. Collins RDSI Demonstration Project
"RD&D of Peak Load Reduction on Distribution Feeders Using DER"



Ft. Collins Project Overview

The project will address the research, development, and demonstration of a coordinated and integrated system of 3.5 MW of mixed distributed resources in Fort Collins, Colorado to achieve a 20-30 percent peak load reduction on two distribution feeders. These two feeders serve the planned FortZED Jump Start Zone (Ft. Collins Zero Energy District, in which the district creates as much thermal and electrical energy locally as it uses). This project will modernize and transform the electrical distribution system of the City of Fort Collins by reducing distribution feeder peak loads, increasing the penetration of renewables, and delivering improved efficiency and reliability to the grid and resource asset owners. Fort Collins is well positioned to successfully complete this project due to 1) the unique combination of world-class research facilities at Colorado State University, 2) participation of global industry leaders and local entrepreneurs able to commercialize the technology, 3) the City of Fort Collins' focus on and investments in clean energy as a key pillar of future growth, and 4) the presence of a city-owned utility and extensive community support.

The methods used in this project involve the monitoring, aggregation, distribution system integration, dispatch, and verification of distributed generation, renewable energy, and demand response resources for reducing peak loading within Fort Collins Utilities' electric distribution network. The project will be carried out in the Fort Collins' UniverCity Connections District, which includes the Colorado State University (CSU) campus, downtown, and the Poudre River corridor, with Distributed Energy Resources (DER) located at various customer locations. The selected locations are fed by two distribution feeders from the Linden substation owned and operated by Fort Collins Utilities (FCU). FCU is a municipal utility—a division of the City of Fort Collins.

Customer locations that will be part of the demonstration include city buildings, county (Larimer) buildings, New Belgium Brewing (NBB) facilities, CSU main campus facilities, InteGrid Test and Development Laboratory, and City of Fort Collins facilities buildings.

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

Ft. Collins' 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.

The project will aggregate more than 3.5 MW of DER from five participant locations with a mix of distributed generation sources, including renewable generation, rotary- and inverter-based generation. Existing and proposed DER primarily are at widely dispersed locations within customer sites. Six photovoltaic arrays will total 345 kW, two thermal storage systems will total 227 kW, and ten conventional distributed generation systems will total 2720 kW. The project will also include 700 kW of combined heat and power systems, 60 kW of microturbines, a 100-kW wind turbine simulator, 5 kW of fuel cells, 10 kW of plug-in hybrid electric vehicles (PHEVs), and 590 kW of mixed fuel generation. Load shedding, variable speed drives, water fountain controls and HVAC DSM are planned. The demand response capabilities will be aggregated from a mix of heating, cooling, and ventilation loads; process loads; and thermal storage.

Application of critical integration technologies and standards

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

In SCADA systems, the project will leverage existing utility/substation metering capabilities via open connectivity for one-way interoperability. For DER communications protocols, the project will use industry standards such as Modbus, Distributed Network Protocol DNP3 protocols, and IEC 61850. The project will also interface with existing Johnson Controls and Trane building automation systems and use either Modbus or BACnet information exchange to access DSM assets.

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.

All customers participating in the project are currently on a distribution rate that includes an energy component (that maps to the wholesale rate), a facilities noncoincident peak component that covers distribution system operating costs, and a sizable coincident peak component (that can be as high as one-half of the total bill for some commercial customers). The project has no plans to propose or incorporate new dynamic rate programs. However, the project is designed to lower peak loads on two feeders that serve predominantly commercial customers.

Integration into system planning and operations

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

Three operational objectives of the project include active management of peak loads on a substation using DER; dynamic control of active and reactive power exchange at interconnection points using DER; and balancing of intermittent renewable production with demand management, conventional generation, and fast-acting loads/generation. The project includes processes to actually dispatch the new resources based on the timing of peak load. One unique aspect of the project is implementation of a distributed control architecture in which optimization can occur at both the customer level and the system level. The project will also demonstrate intentional islanding at one or more locations on one of the feeders. On the planning side, the addition of DER will not impact system planning in the short term because of the underlying robustness of the Ft. Collins power system.

Compatibility with initiative goals and approach

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

This project will demonstrate what a relatively small municipally-owned utility can do when integrating a diverse set of DER. Lessons learned will be transferrable in various subject areas in this project, including technical aspects (communication and control, parallel customer/utility control), use of mixed fuels, ability to firm-up renewables locally, import/export control at customer sites and feeders, and marketplace marketability (how to motivate customers to participate in projects like this one).

Leverage of additional funding sources

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

Led by the City of Fort Collins, this project leverages $6.3 million in Federal funds and $4.7 million in industry funds over three years. Project partners (aka local and industry participants) are contributing matching dollars (in the form of hardware and/or staff time in some cases). In addition to the City of Fort Collins, Project Partners are Colorado State University, Advanced Energy, Brendle Group, Eaton Corporation, InteGrid Laboratory, Larimer County, New Belgium Brewing, Spirae, Inc., VanDyne SuperTurbo Inc.and Woodward Governor Company.

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