North Carolina State University, Campus Box 7401, Raleigh, NC 27695-7401 | 1-800.33.NCSUN | www.ncsc.ncsu.edu

MICRO-CHP AND SOLAR DEMONSTRATION PROJECT

Project Overview

The North Carolina Solar Center, in partnership with the Propane Education and Research Council (PERC) and B.J. Williamson LP Gas, has developed a project to demonstrate the technical and economic feasibility of incorporating Photovoltaic (PV), Solar Thermal, and Propane-fired Combined Heat and Power (CHP) systems into an integrated Distributed Generation (DG) system at the North Carolina Solar Center's testing facility on the campus of NC State University. Propane for the project is provided by the North Carolina Propane Gas Association.

The DG system takes advantage of technologies that use both renewable energy sources and propane fired sources that can support building loads independent of weather conditions and access to the electric grid, and showcases the potential of integrating these technologies in a sustainable, reliable, and marketable energy generation system.

Collaborative Business Arrangement

The project is a partnership between the North Carolina Solar Center, the Propane Education and Research Council (PERC), and B.J. Williamson LP Gas. The NC Solar Center provided the major system components, facilities, and technical expertise for this project. The Solar Center is also responsible for installing, operating, monitoring, and maintaining the systems.

PERC provided major funding and technical input, making the project possible. B.J. Williamson LP Gas Company provided technical expertise and project development and coordination assistance. Propane for the project is provided by the North Carolina Propane Gas Association.

Quick Facts

LOCATION: North Carolina Solar House, Raleigh, North Carolina
MARKET SECTOR: Demonstration/University
EQUIPMENT: micro-CHP, Photovoltaic, Solar Thermal
FUEL: Propane, Solar Energy
RATED OUTPUT:
CHP: 4.7 kW, 47,000 BTU/hr
PV: 5.4 kW
Solar Thermal: 14,000 BTU/hr
CHP RATED EFFICIENCY: >90%
IN OPERATION SINCE: 2010
USE OF ELECTRICAL ENERGY: Grid-tied
JOINT PROJECT BY: NC Solar Center, B.J. Williamson LP Gas, Propane Education and Research Council
ENVIRONMENTAL BENEFITS:
SOLAR POLLUTION: Zero
CHP POLLUTION: <250 ppm CO, <30 ppm NOx

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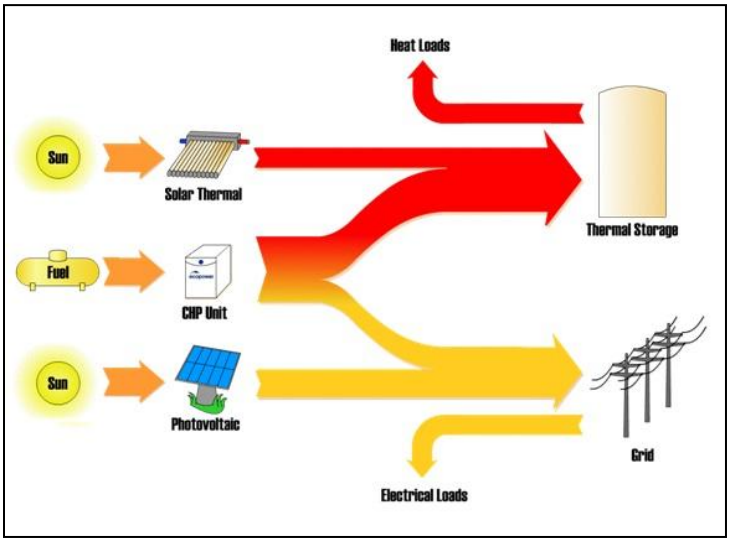

Partners

NORTH CAROLINA SOLAR CENTER

PROPANE education & research COUNCIL

WILLIAMSON GAS

Equipment Overview

The DG system consists of a solar thermal system, a PV array, and micro-CHP unit powered by propane. These systems work in parallel to produce electric and thermal energy. By integrating the CHP unit with the two solar powered systems, an efficient, clean and consistent supply of heat and electric power can be achieved. These core components can provide the energy for many applications such as large residential, small commercial and industrial sites.

The thermal energy produced by this system can be used for space-heating, domestic hot water, process heating, dehumidification, and absorption cooling. In this demonstration setup, the thermal loads are hydronic heating and dehumidification. An experimental outdoor heat dump is also used to control the setup for application specific modeling. This DG system is completely grid-tied making it an efficient means to trade electric energy.

Lessons to Share

The project uses a combination of existing technologies to provide an educational demonstration of a low-carbon-footprint high-efficiency hybrid solar and propane system. With the advent of Renewable Energy Portfolio Standards in 27 states providing incentives for the installation of renewable generation resources, appropriately sized propane-fired micro-CHP backup to solar may prove to be a new and growing market opportunity.

This project will demonstrate the technical viability of incorporating propane-fueled micro-CHP with renewable energy technologies. It will also provide a firsthand opportunity for the public to learn about the technology and evaluate it as a here-and-now, feasible alternative to business as usual, and for the propane industry to learn valuable “early adopter” lessons.

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