Micro-CHP Systems for Agricultural Use

Technology Fact Sheet

Residential | Agriculture | Industrial/ Commercial | Engine Fuel | R&D

Combined heat and power (CHP) systems have been available for large-scale industrial and commercial applications for decades. CHP systems can also meet the energy demands of the agriculture industry, providing reliable heat and power in remote areas that may not have consistent access to the electric grid or natural gas main.

CHP systems provide heat and generate electricity with higher efficiency and lower emissions levels than conventional heating and power generation alternatives. Potential agricultural applications for CHP include crop processing, dairy and animal farming, horticulture, water heating, and space heating.

Combined heat and power systems can reduce emissions of carbon dioxide, methane, and pollutants, including nitrogen oxides, sulfur dioxide, carbon monoxide, particulate matter, ammonia, and total hydrocarbons.

– Environmental Protection Agency, Environmental Technology Verification Program

Current Status: Commercialization Phase

Research | Development and Testing | **Demonstration** | Commercialization

- Expected date of completion for demonstration testing: 2010.
- Testing results will be used to demonstrate that CHP systems can reduce life-cycle energy costs and enhance air quality when used for agricultural applications.

Technology Features

- Liquid-cooled propane-fueled internal combustion engine.
- Selective catalytic reducer.
- Water-buffer tank and closed-loop pipes.
- Ceiling-suspended hydronic fan coil unit.

Agricultural Benefits of CHP

- Converts up to 90 percent of fuel energy to heat and power.
- Allows farmers to sell excess power produced by the system back to the electric grid where permitted.
- Recovers waste heat from power generation to heat air or water.
- Saves 10 kilowatts per hour of operation in comparison with grid-supplied electric heat and power.
- Provides reliable power in remote areas without access to the electric grid or natural gas main.
- Reduces greenhouse gas emissions while providing a direct use for carbon dioxide as a plant fertilizer.

For more information on this and other research projects, go to www.agpropane.com.

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A Closer Look

Combined Heat and Power System: How It Works

Propane-fueled CHP systems can generate electricity and use waste heat from this process to heat air or water for agricultural needs. In a CHP demonstration in Pennsylvania, a liquid-cooled propane-fueled internal combustion engine generates power for the greenhouse. Using waste heat from this process, water is heated in an insulated water tank and then piped to a ceiling-suspended hydronic space heater. Though not part of the demonstration unit in Pennsylvania, a selective catalytic reducer can treat the engine exhaust gas, allowing any carbon dioxide emissions to be used as plant fertilizer in the greenhouse.

A Marathon Ecopower propane-fueled CHP system is being demonstrated in a Pennsylvania greenhouse.

Project:	90% Energy Efficient Cogeneration at a Pennsylvania Hydroponic Greenhouse **(Docket 12340)**
Partner:	Allegheny County Extension, Pennsylvania State University

Research Process (✔ = completed; ➤ = in progress; ★ = upcoming)

Testing and Demonstration ➤

- Acquire and install a Marathon Ecopower propane-fueled CHP system in a 3,000-square-foot hydroponic greenhouse in Pennsylvania. The unit has a generation capacity of 5 kilowatts of electricity and 14 kilowatts of thermal power.
- Monitor system performance and collect data on system-generated electricity and heat for two heating seasons.
- Compare the cost of CHP with conventional heating and power costs at the greenhouse.
- Calculate air pollutant and greenhouse gas emissions reductions from the CHP system in comparison with grid-supplied heat and power.
- Document Pennsylvania jurisdictional codes, permitting requirements, and interconnection procedures for installation and maintenance of the CHP system as a guide to help streamline the adoption of CHP by other agricultural producers.
- Pursue local, statewide, and federal CHP incentives from the local utility and the Pennsylvania Public Utility Commission.

What's Next?

The results of the CHP system demonstration will be used to accelerate the commercial transfer of micro-CHP technology throughout Pennsylvania.

FOR MORE INFORMATION:

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