

Propane-Fueled Micro-CHP System

Freewatt Plus provides clean, efficient, reliable heat and power for homes

Combined heat and power (CHP) systems provide heat and generate electricity with higher efficiency and lower emissions levels than conventional heating and power generation alternatives. CHP systems have been available for large-scale industrial, commercial, and institutional applications for decades. However, their size, noise levels, and cost have prevented them from being adopted for smaller applications.

The quiet, compact Freewatt Plus micro-CHP system brings the benefits of propane-fueled CHP to homes and small businesses. The Freewatt Plus system integrates a high-efficiency, Energy Star-rated warm-air furnace with a propane-fueled internal combustion engine-driven generator and a heat exchanger module. The engine-driven generator produces about 12,000 British thermal units per hour of heat and 1.2 kilowatts of power. High-efficiency auxiliary burners in the furnace supplement this heating capacity to meet additional demand. As a prime power generator with backup capabilities, the Freewatt Plus system can provide about 50 percent of a typical home's annual electricity needs while reducing carbon dioxide emissions by up to 30 percent, as compared to using only grid power. If the system generates excess electricity, consumers can sell this power back to the grid and earn a credit on their electric bill (where regulations permit).

Commercialization of micro-CHP systems like the Freewatt Plus will help propane gain a growing share of the market for residential and commercial prime power generators with backup capabilities. If 250 Freewatt Plus systems operate for a normal 10-year life (consuming 1,500 gallons of propane per unit per year), they would consume approximately 3.75 million gallons of propane. With more consumers and businesses turning to micro-CHP to reduce electricity costs and emissions while increasing reliability, highly efficient Freewatt Plus systems are a competitive, clean, and reliable solution.

Project Description

To capitalize on the growth potential of micro-CHP systems, the Propane Education & Research Council (PERC) first supported field testing of the Freewatt Plus through *Climate Energy Propane Warm Air Micro-CHP System (Docket 12199)*. After testing showed that the Freewatt Plus system's environmental performance and energy efficiency were competitive with conventional systems, PERC funded *Commercialization of Freewatt Micro-CHP System (Docket 15625)*.

In this project, partners ECR International, Gas Technology Institute, and Yankee Scientific will pursue the commercialization and market introduction of the Freewatt Plus micro-CHP system through three main activities:

- Completing laboratory testing to validate the energy use, performance, and reliability of the system.
- Conducting a comprehensive demonstration and field test of 10 units.
- Developing and executing a coordinated marketing and outreach plan to consumers, home builders, and propane marketers.

Homes Benefit from Freewatt Plus Micro-CHP

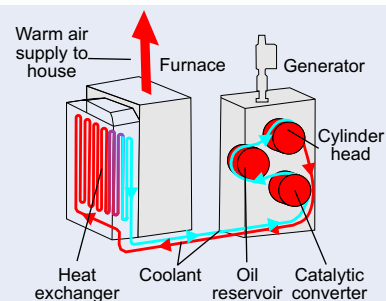
Compared with conventional heating and grid electricity systems, Freewatt Plus offers the following advantages:

- **Increased generation efficiency.** It converts a greater percentage of fuel energy to electricity (about 90 percent, versus about 35 percent for grid-based generation).
- **Reduced fuel use.** It consumes 60 percent less fuel for similar generation output.
- **Smaller carbon footprint.** It reduces carbon dioxide emissions by up to 30 percent, as compared to using only grid power.
- **Increased comfort.** A constant low stream of heat is available to improve home comfort and air quality during winter months.
- **Energy reliability.** Operation is not affected by interruptions in grid electricity supply.
- **Compatibility.** The system will be available for both warm air and forced hot water options and can be installed in new or existing homes.



The Freewatt Plus System: A Closer Look

- The Freewatt Plus micro-CHP system combines a high-efficiency warm-air furnace, a propane-fueled internal combustion engine-driven generator, and a heat exchanger module to produce heat and power.
- As the generator produces power, coolant pulls heat away from engine components, preheating the air entering the furnace.
- The engine-generator provides continuous low-level heat during the heating season, improving indoor air quality and comfort. Auxiliary burners in the furnace supplement the heating capacity of the engine-generator when needed.



Project Implementation

The comprehensive demonstration and field testing of the Freewatt Plus system will include the following:

- Conducting lab-based validation testing to confirm performance levels and provide a baseline for the performance of field demonstration units.
- Conducting a one-year field evaluation of 10 propane-fueled Freewatt Plus units with backup generator capabilities. This includes evaluating the systems; supporting site selection and unit installation; and collecting and monitoring performance data.
- Evaluating market and infrastructure issues such as customer cost-benefit analysis, customer satisfaction, and building codes.

The effort to fully commercialize the Freewatt Plus system will include the following steps:

- Identify key influencers and early adopters who can help support market introduction.
- Screen, select, and train Freewatt Plus distributors and dealers.
- Train and certify dealers who have the experience required to market, sell, and service Freewatt Plus systems.
- Develop marketing and outreach materials, including sales DVDs, product brochures, and a traveling trade show display, to introduce Freewatt Plus systems to the home heating and generation market and to build market demand.

Project Status: In Progress

Site selection for field test sites is under way, and data protocols are being developed. Outreach efforts have already begun.

The Freewatt system was featured at the 65th International Builders' Show (IBS) in January 2009. The IBS is the largest

residential trade show in the world, bringing together builders, distributors, associates, press, and exhibitors from more than 100 countries. This demonstration helped to showcase the innovative system to consumers who are seeking clean, energy-efficient home heating and power generation.

Future outreach efforts will include webinars (featuring ECR International and PERC presenters) to introduce propane marketers and state association leadership to Freewatt Plus technology.

Next Steps

The installation of demonstration units is expected to be completed in 2009, and field testing is expected to be completed in 2010.

Over the next two years, ECR International will bring the Freewatt Plus system to market to compete for a share of the 3.7 million furnace and boiler sales that occur annually. Each Freewatt Plus system sold will use approximately 1,500 gallons of propane per year. Sales will gradually increase as consumers and small businesses recognize Freewatt Plus systems as a competitive, more energy-efficient alternative to conventional heating appliances.

Increasing Home Values with Freewatt

According to the National Residential Appraisers Institute, installing a Freewatt system can increase the value of an average home by \$5,000 to \$20,000.* And installation of a Freewatt unit can qualify the residence owner for an energy efficiency tax credit (see www.freewatt.com for more details).



Photo courtesy of ECR International

* ECR International, "Benefits for the Homeowner," <http://www.freewatt.com/homeowner.pdf>.

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For More Information:

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