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## From The Top The Power of Micro-CHP

by Dick Topping, director of Appliance Research , TIAX, LLC

### There's a new buzzword floating around the industry - Micro-CHP.

While definitions vary, Micro-CHP is generally considered to be Combined Heat and Power (CHP) systems on a scale suitable for single-family residences. Micro-CHP systems use small engines (or "prime movers") to generate electricity and then utilize the rejected heat for useful household purposes. Why should you care? Because Micro-CHP represents a potentially significant market opportunity as customers look for more reliable electric power, as well as household energy cost savings. If you've typically dismissed CHP systems as suited only to industrial and institutional applications, with no hope of even cracking the market for commercial-building applications - let alone residential - things are changing. Here are some points to consider.

**The growing need for emergency power in the home.** More than 800,000 small generators (less than 15 kW) are sold in the U.S. annually, and that number is growing. The first reason is the country's dependence on a reliable electric supply is growing. As consumers use more and more electronic devices, the need for advanced electronic control systems is soaring. Second, people are increasingly concerned about the reliability of the U.S. electric power infrastructure.

**Current products don't meet market needs.** So, how does the specter of looming blackouts and the ensuing demand for emergency generators create a market opportunity for Micro-CHP? A major benefit of Micro-CHP systems is the provision of reliable and automatic emergency power. The low-cost emergency generators on the market today don't come close to meeting the needs of a typical U.S. household. These products miss the mark on several fronts:

- Setup and operation require considerable physical strength - often beyond the capabilities of many elderly, handicapped, or otherwise physically limited individuals - and technical know-how.
- Emergency power is not available when the occupants are not at home.



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- Gasoline storage is typically required and may present a safety concern.
- The need for extension cords to connect the system to a generator means that only plug loads can be accommodated. Critical hard-wired loads, such as the furnace, furnace blower, and well pump are not easily powered.
- Regular service is needed to ensure operability.

**Aren't current emergency power generators able to be redesigned to address market needs, without employing CHP?** Yes. Some manufacturers are already doing this. But the products they're developing are just as expensive as full-blown Micro-CHP systems.

**What about importing Micro-CHP products from overseas?** Micro-CHP systems are currently being launched in Europe and Japan. These systems are generally designed to follow the household thermal load and generate electricity opportunistically. In many cases, the excess electricity can be sold back to the grid (net metering). But these foreign imports are unlikely to meet the demands of the U.S. market. They typically aren't designed for use in homes with forced hot-air heating, which is the nation's dominant heating system. Nor can they generally operate and provide emergency power when grid power is lost - a critical feature to U.S. market success.

**What's being done about this potential market?** The Gas Appliance Manufacturers Association (GAMA) and several of its members have recognized this opportunity. GAMA has formed a Power Generation Division to specifically address this market. The U.S. Department of Energy has also recognized the potential national benefits of Micro-CHP - both for energy savings and electric power reliability - and recently solicited bids for Micro-CHP system development and commercialization.

**What role can appliance makers play?** Internal-combustion engines that meet the needs for Micro-CHP are currently available, but more development is needed to bring other prime movers to the market. Stirling engines and Rankine cycle systems are close, and fuel cells will follow. Sophisticated controls, including whole-home load-management systems, are needed to minimize first costs (i.e., minimize generation capacity requirements), while still providing power for critical loads in an emergency. Energy storage systems (batteries, flywheels, etc.) may also be needed.

Appliance makers should take the lead in integrating engines, generators, and controls with furnaces, boilers, water heaters, storage devices, and air-conditioning components to commercialize the attractive, safe, reliable, efficient products that the customer will buy. First and foremost, Micro-CHP systems are appliances; the reputation and branding of OEMs will go a long way toward building consumer acceptance and confidence. After all, who's better suited to introduce Micro-CHP systems to residential customers than the appliance industry?

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