



E SOURCE Distributed Energy Multi-Client Study Microturbines: Lessons Learned from Early Adopters

One of the few truly new distributed energy technologies to become commercially competitive in the marketplace, microturbines have promised to change the way power is generated. Therefore, they are drawing strong interest from both utilities and commercial and industrial end users. The big question is whether the unique attributes of microturbines offer enough value for buyers to compete with low-cost central power.

Listening to Early Adopters

As microturbines started to enter the marketplace, E SOURCE began to objectively document the experiences of early adopters. Our goal was to raise and clarify energy company awareness of the technology's strengths and weaknesses and to help them understand the attributes of microturbines that were likely to motivate market growth and create new opportunities. The 52 user interviews we conducted over the first two years of substantial commercial sales of microturbines reflect field experiences with equipment from all the major manufacturers. We talked with actual operators of these early microturbines, assessing their successes and failures with different installations and applications. Our analysis of that data identified common themes among those experiences.

Microturbines Are Here to Stay

Microturbines shine in applications where their attributes give them advantages over competing technologies. Producing lots of clean, hot exhaust gas compared to other distributed generators, microturbines can supply heat for a huge variety of applications, ranging from directly heating greenhouses out of the tailpipe (and, yes, the plants thrive) to cooling buildings via heat-driven absorption chillers. Microturbines have also allowed users to economically exploit previously wasted free or low-cost fuels available at many smaller landfills, sewage treatment plants, and oil and gas wellheads. And although most early microturbines had to be financially supported for tests and demonstration projects, more recently microturbines have begun to make their own way. They have even created new markets for other businesses to grow in—a strong sign that they are here to stay.

Direct use of microturbine exhaust at a greenhouse

Mariah Energy has installed microturbines to provide heat, electricity, and carbon dioxide to greenhouses in Medicine Hat, Alberta, Canada. The photo on the left shows the power-plant module at the greenhouses. The photo on the right shows four Capstone microturbine “cores” that power the application.



Courtesy: Mariah Energy Corp.

Comparative costs of small CCHP chillers

Survey Methodology and Deliverables

We used a standard set of interview questions to guide discussions and ensure that similar information was gathered from all participants. In addition, interviewers tried to determine which characteristics of each installation were important and unique, what motivated decision-makers to install the microturbines, and what lessons from each installation might be of value to others. Because this E SOURCE research extended over two years, we updated most of the early interviews in 2002 to find out how those installations were faring and to add new information or perspectives that time might have offered.

When we analyzed the collected data, we were able to identify general market trends and pinpoint the most intriguing developments surrounding this technology. These results helped us choose specific topics to more fully explore through five in-depth case studies.

Study subscribers receive an Interview Notebook containing all 52 microturbine user interviews plus a final report that presents the five in-depth case studies and our analysis of trend data.

The Future of Microturbines

The five case studies in the final report highlight some aspects of the new microturbine business that we consider very significant for the future. They include the following:

- Combined heat and power (CHP). Mariah Energy Corp. has pioneered a successful energy services business model based on placing microturbine CHP systems in commercial buildings. In the report, we document this business model and review some representative projects that Mariah has installed.
- Combined cooling, heating, and power (CCHP). Although still in its infancy and relatively expensive, CCHP promises to extend the value of microturbine waste heat from heating-only applications to cooling uses. That development will greatly increase the range of viable building applications and extend the hours of operation for these power plants.
- Direct use of exhaust gases. Another market-pleaser

Small absorption chillers, less than about 100 tons, are likely to be the more common capacities for integration into microturbine projects. These units are, however, relatively expensive compared to compression refrigeration technology.



will be the very low emissions from most microturbines' exhaust. In theory, anywhere that direct-fired natural gas heating is used—and it is widely used in industry—a microturbine could be generating power while performing the same heating task. Greenhouses are one application where microturbines are already creating new markets.

- Landfill and digester gas. Microturbines are gaining market share in these applications against the incumbent technology—reciprocating engines—because they can run on lower-Btu gas, they generally have lower emissions and maintenance costs, and they are available in sizes better suited to small landfill and digester gas sites.
- Resource recovery. Free is a good price for fuel, and at many oil and gas extraction sites there is free (or very low-cost) gas for the taking; microturbines can turn that wasted resource into useful power. In fact, many such sites' power requirements could often be met by one or a few microturbines, and grid power isn't always available at these typically remote sites. In addition, newer environmental regulations also prohibit gas flaring, a common means of gas disposal in past years; microturbines offer a productive alternative.

For pricing information or to purchase, contact:

Gary Sunshine
Vice President, Sales and Marketing
E SOURCE

tel 303-444-7788 ext 133

e-mail gary_sunshine@esource.com