

Emerging Niche Markets in Distributed Generation

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Key Market

Distributed generation may largely determine the winners and losers in the pending shakeout of the U.S. Electric industry.

- Bryan Lee, "Size, Distribution to Determine Winners in Electric Utility Shakeout," Dow Jones Online News, Jan. 1, 1998.

Background

- Distributed generation generally is defined as any small scale power generation technology that provides electric power at a site closer to customers than central station generation, and is usually connected to the transmission or distribution system.
- During the first part of the 20th century, on-site power generation was commonplace as most electricity was produced and consumed near large end users such as factories. By the mid-1900s, large base-loaded central generating stations were being built to serve the growing industry in the United States. Out of this grew a regulated framework of vertically integrated electric utilities that provided efficient electricity generation with a reliable transmission and distribution network.

Background

- Because of deregulation of the electric power industry, the traditional paradigm of a vertically integrated investor owned utility ("IOU"), owning and operating the means of production and distribution (generation, transmission and distribution), is quickly transforming into separate, horizontally integrated "generation" (gencos) and "transmission and distribution" (T&D) companies.
- Today's deregulated energy market has created significant opportunities for the return of distributed generation. Individual energy users will soon have their choice of energy suppliers, or even the option of on-site generation. In response to this new competitive environment, electric utilities and energy service providers must find a way to retain customers. Partnering in distributed generation projects (an "inside-the-fence" partnership) with existing commercial or industrial customers is a unique service offering for electric utilities or energy service providers.

Recent Developments

- Technological breakthroughs may make new, efficient and clean technologies available to the distributed generation market.
- Available options for distributed generation include diesel engines, internal combustion engines, small combustion turbines, microturbines, fuel cells, wind turbines, and photovoltaic solar panels.

Microturbines

- Of the various distributed generation technologies, small combustion “micro” turbines may be the most attractive for commercial, industrial, or institutional customers.
- The maturity of the technology, the ability to efficiently recover waste heat, and the flexibility to fire different fuels make small combustion turbines a good candidate for these types of applications.
- Small combustion turbines based on jet aircraft engine designs (aeroderivative turbines) and proven heavy-frame (industrial) combustion turbines are now commercially available in sizes ranging 0.5 to 30 MW, and can be deployed in as little as 16 months.

Microturbines

- Although efficiency levels (30%) of microturbines are currently below large combined cycle facilities (50%), some experimental modified microturbines are alleged to have achieved 80% efficiency.
- Also, in contrast to fuel cells (discussed below), microturbine emission levels are greater. However, where standards for NO_x emission levels are less stringent, then the lower cost of microturbines makes them currently more attractive than fuel cells.

Industry Activity Increasing

- The U.S. Department of energy projects that of the 380 gigawatts of new power to be created by 2020, anywhere from 10 to 20 percent of that will be through on-site, microturbine generation.
- Capstone Microturbine sold 528 units in two months between late August 2000 and mid-October 2000. Cinergy Corp itself purchased 53 of those turbines from Capstone.
- GE's \$45 billion acquisition of Honeywell International includes its microturbine unit. Honeywell had represented only one of two major microturbine producers in the country -- the other being Capstone Microturbine. The acquisition places GE Power Systems strategically in the medium-sized generation market -- a market it had largely ignored until now.

Why the Increased Activity?

The Increase in Transmission Constraints and Outage-sensitive Businesses

- The addition of transmission and distribution for centralized generation is becoming increasingly more difficult because of environmental and other regulatory hurdles.
- One means for identifying likely markets for distributed generation based on transmission constraints is to review FERC Form 715. Form 715 is each transmission utility's annual transmission planning and evaluation report. FERC Form 715 must include the utility's projected performance under its reliability standards and its proposed means for achieving those standards.
- Distributed generation may be a credible alternative where significant future transmission enhancements are identified by a utility to reinforce its transmission system.

Outage-sensitive Industries

- High-tech industries, such as those that are highly internet reliant, cannot tolerate power outages.
- Identifying those industries, especially in areas of low quality power (e.g., rural areas, overseas), may produce a likely customer base.

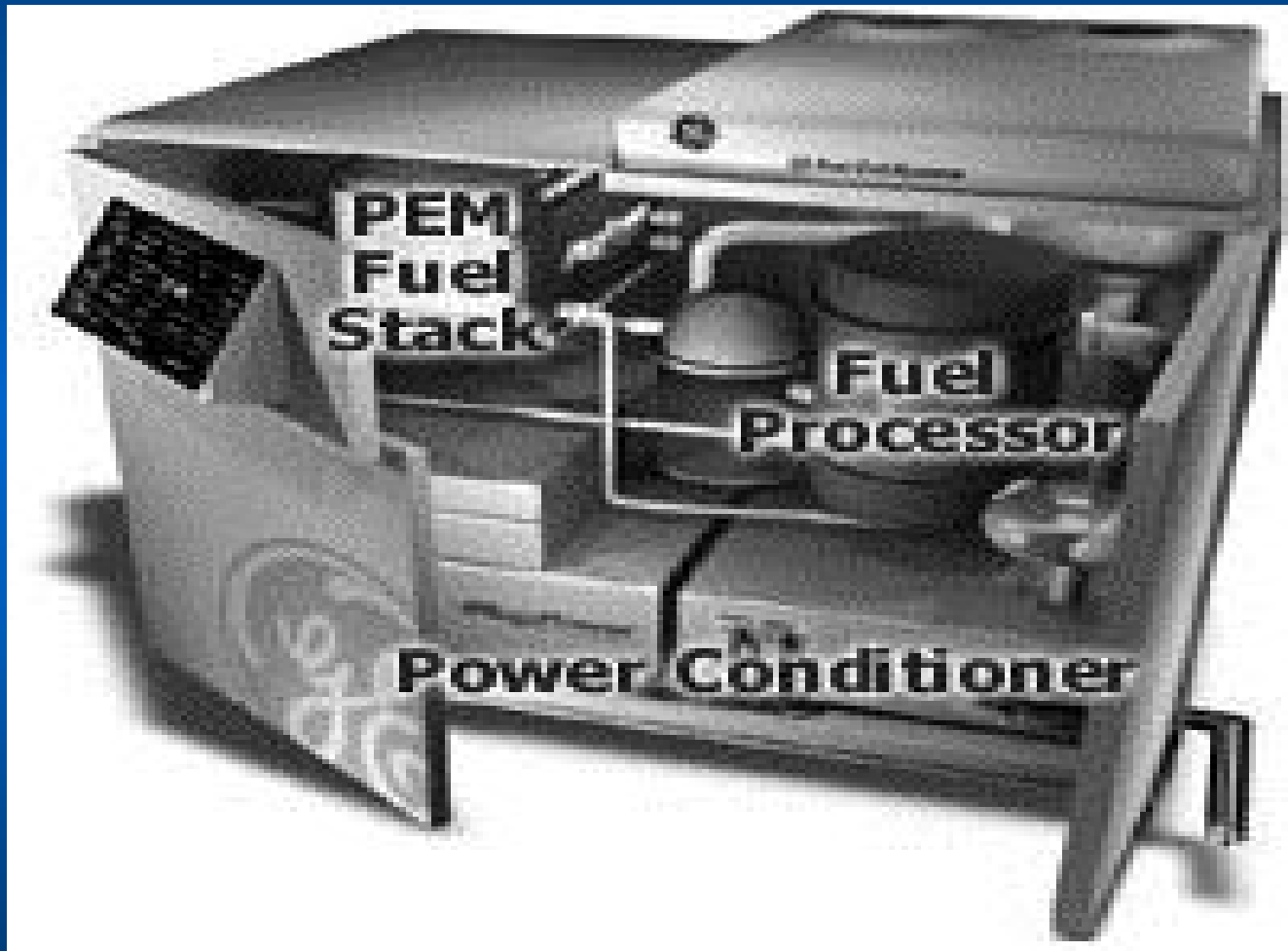
Fuel Cells

- Recent announcements by GE Power Systems, DTE, Southern Company and the Bonneville Power Authority ("BPA") indicate that PEM (proton-exchange-membrane) fuel cell systems may decentralize electric service to an extent previously thought improbable.
- Indeed, these companies intend to take the concept of "distributed generation" to its logical extreme: Each homeowner will own and operate his own generating station, which will obviate the need for any transmission and distribution service.
- Should fuel cells represent the next cellular telephone, personal computer or internet technology, the successful fuel cell participant will be the company that positioned itself to capture the largest share of the market within the first five years that the fuel cell technology first became commercially available.

What Are Fuel Cells?

- Fuel cells use an electro-chemical process, rather than combustion, to produce power. Hydrogen -- either pure, or made from fossil fuels such as natural gas, propane or gasoline -- is mixed with oxygen from air to produce electricity, pure water and heat.
- A residential fuel cell system has three major components. First, the reformer, or fuel processor, extracts hydrogen from an available fuel, such as natural gas or propane, and passes it along to the second stage, the fuel cell stack, where electricity is generated in DC form. This electricity is then converted to AC by the third component, a power conditioner, so it can be used for normal household service.
- A commercial fuel cell system for residential use will be about the size of a dishwasher, and can be designed to easily fit through a standard doorway. Residential users can install the unit either inside or outside their homes.

Fuel Cell



Fuel Cell Benefits

- Fuel cell systems can provide an attractive alternative to grid-supplied power.
- According to GE Microgen, users may expect to see up to a 30% savings in their electric bill. For rural applications, fuel cell systems offer an alternative to the extension of power distribution lines that cost \$15,000-\$40,000 per mile.
- By eliminating vulnerable transmission and distribution lines, onsite fuel cell systems may offer greater reliability than a typical power grid. However, whether the consumer will be able to enjoy the full economic benefit from fuel cells depends, in part, on whether the customer is willing to cut the distribution "umbilical cord" to the grid. Some distribution utilities discourage self-generation by imposing cost-prohibitive charges for "back-up" power.

Fuel Cell Benefits

- Fuel cells also produce power with virtually no voltage variation which can be damaging to electrically sensitive household equipment.
- Fuel cells produce no NO_x or SO_x, and emit only one-half of the carbon dioxide given off in traditional generation.
- Because power is generated through an electro-chemical -- rather than a combustion (burning) -- process, fuel cells are environmentally sound.
- With electrical efficiencies of about 40%, PEM fuel cell systems conserve more fossil fuels than traditional power generation sources.
- Additionally, it is reported that the heat produced by the fuel cell system can be recaptured and utilized in water or space heating applications in the home, increasing the efficiency to near 80%.

Fuel Cell Economics

- According to GE Microgen, it expects to market the GE Homegen 7000 at an initial price of approximately \$7,500. However, GE Microgen projects that by 2003 mass production will reduce that price to \$4,000 a unit.
- The BPA currently expects its fuel cell technology to cost \$10,000 per unit, with unspecified reductions in price once mass marketing has commenced.
- GE Microgen expects to commence commercial marketing by January 2001, while BPA's fuel cells will not become commercially available until 2002.
- It should be noted that there exist several other companies developing similar technologies and marketing plans, but GE Microgen and BPA appear to be the furthest along in development and implementation.

Fuel Cell Marketing

- Through the use of a joint venture and distributorships, GE Microgen and Plug Power intend to acquire a significant market share of fuel cell customers.
- GE Microgen's initial U.S. foray will be into New Jersey and Georgia.
- Other marketing options may include the use of municipalization and municipalities' tax exempt status to penetrate the residential markets.

Summary

- Two or three years ago, utility executives would not have feared losing business to on-site/distributed generation. Not so anymore.
- According to Philip R. Vanhorne, president and chief operating officer of Niagara Mohawk Energy Marketing, Inc., as much as 50% of New York's total electricity supply may some day come from distributed generation.
- In Texas, the chairman of the Public Utility Commission characterizes distributed generation as the "silver bullet" for that state's future power needs.
- There appears to be no question that distributed generation will occupy a significant portion of the future power market.