Distributed Generation: A Tool for Power Reliability and Quality

Regulated utilities, their unregulated subsidiaries, and independent companies are starting to use distributed generation in service offerings for enhanced power reliability and power quality.

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E Source

Distributed generation technologies are entering a changing North American utility landscape that is being shaped on one side of the meter by restructuring and on the other by increasing customer demand for higher-quality, more reliable power. Whatever form restructuring takes, it will likely provide opportunities for more companies, including end users, to develop small-scale generation capabilities. If established utilities can't deliver dependable, high-quality power, the growing number of users that expect better service will either find different suppliers or develop their own generation capabilities.

This changing situation is having two immediate impacts. On one hand, some utilities, their unregulated offspring, and independent energy service providers are beginning to offer distributed generation capabilities at energy users' sites. At the same time, a growing number of energy users are starting to show a preference for generating their own power to improve both power quality and power integrity.

Distributed generation can improve power quality and reliability in several ways: it can serve as a second or redundant source of power; it can isolate sensitive loads by letting them operate independently from the grid; and it can minimize the impact of voltage sags. Overall grid quality can also improve, because the impact on other energy users from harmonics (generated by, say, a nearby industrial user) would be re-

duced.

The types of companies concerned about power quality are no longer just high-tech and information services companies; a broad variety of end users require highly reliable power, including hospitals, schools that cannot abruptly close, commercial office operations that depend on continuously available computing power, and grocery stores that lose valuable product after just a few hours without electricity.

UTILITIES SELL RELIABILITY WITH DISTRIBUTED GENERATION

E SOURCE has identified electric utilities that, largely to improve their standing with customers that are sensitive to power quality issues, are starting to offer distributed generation capabilities to those customers.

Carolina Power & Light

Carolina Power & Light (CP&L) has established Premier Power Service, which envisions the installation of dozens of backup generators at commercial and industrial sites. CP&L says its customers, who wanted help in ensuring reliable power supplies during storm-related outages, requested the program. The North Carolina Utilities Commission and the South Carolina Public Service Commission approved it in 1998 for a five-year experimental period. For North Carolina, the program calls for the installation of up to 250 megawatts of generator capacity, with power at each site ranging from 200 kilowatts to 3.5 megawatts.

CP&L builds, installs, and maintains the generators at no up-front capital cost to the user. Users pay a monthly fee based on the 10-year amortized capital and operating cost of installing the generator and integrating it with existing systems. The rate also includes an upward adjustment for contract terms that expire earlier than 10 years from the in-service date. The generator and transfer switching are located on the utility's side of the meter, so the end user will pay the utility for all electric power, whether generated remotely or locally.

CP&L's first installation was in the fall of 1998—a 1,750-kilowatt diesel generator for Interpath Communications, an Internet service provider. For Interpath, power is so critical that the company asked CP&L to allow space for a second generator—not for more capacity, but for

redundancy. The utility has since signed up other customers and is installing backup generators for them.

Salt River Project

Salt River Project (SRP) in Arizona has launched a pilot program to provide emergency backup generator service for certain customers. The program was suggested by the Phoenix-area school district, Mesa Public Schools, which became the first customer to sign on. The school district educates more than 72,000 students in grades K through 12.

Each summer, two to three power outages affect these desert schools, leading to unbearably high indoor temperatures after about one and a half hours. A power outage can be a particularly serious problem for elementary schools, which cannot send children home early to empty houses.

Mesa Public Schools' contract with SRP stipulates that the utility will provide a backup generator to any elementary school in the district within one and a half hours of being notified. The first actual call for the system came in late August 1998.

SRP rents the generator as needed from a local rental company and passes the cost on to the customer at the time of use. SRP estimates that the cost to the customer for the typical 350-kilowatt diesel generator will be about $1,500 per event. SRP makes no profit on the deal, preferring to offer the program strictly as a customer-relations tool.

Madison Gas & Electric

Madison Gas and Electric (MG&E) has gone a step beyond SRP and CP&L, combining the functions of backup power with dispatchable capacity to meet demand during peak periods. The utility's Backup Generator Service aims to install, monitor, and maintain a diesel or natural gas generator at energy users' sites. In a power outage, the generating system automatically turns on and restores power within 20 seconds. If the utility faces a power shortage, it can switch on the backup generators and drop the energy user's load from normal grid-supplied power.

MG&E provides the service for a monthly fee of $1.50 per kilowatt for a diesel generator and $3.50 per kilowatt for a natural gas generator—a charge based on demand by the user, not on the size of the installed generator. Monthly, the diesel systems cost the utility about $3.50 per kilowatt, so the capacity costs the utility about $2 per kilowatt.

That compares very favorably to the best case of $3 to $4 per kilowatt the utility can get on the open market and $10 to $12 per kilowatt on the spot market. Thus, for less money than it would cost to add new capacity, MG&E gets the extra benefit of pleasing energy users who are concerned about power quality.

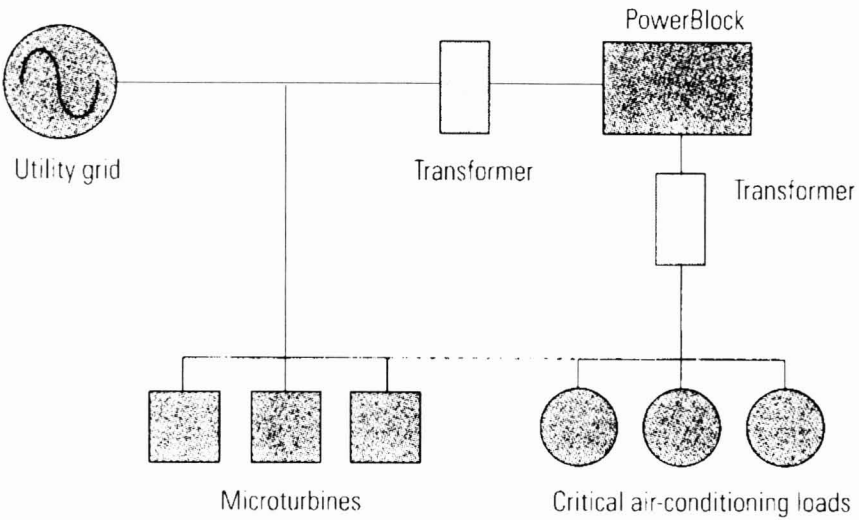
INDEPENDENT ENERGY SERVICE PROVIDERS ADOPT EMERGING TECHNOLOGIES

A key niche for emerging distributed generation technologies is using them to improve power quality and reliability in a way that brings additional value to corporate energy users. Principal among these opportunities is the ability not just to ensure that the lights stay on or production lines continue operating, but also to reduce energy costs through the ability to dispatch standby generators at times of peak prices. Emerging technologies create the opportunity to alter the conventional approach to improving power reliability and power quality, as illustrated by Williams' and Sure Power's approaches.

Williams Distributed Power Services

Williams, which transports the largest volume of natural gas in the United States, is developing a range of distributed power services that includes improved power reliability and quality. Williams Distributed Power Services intends to employ technologies for generation, storage, and control. These include microturbines from Capstone Turbine, medium-sized turbines from Solar Turbines, premium power systems incorporating large-scale advanced battery and ultracapacitor modules from Powercell, advanced soft switches from Cutler-Hammer, and software from Encorp (see figure below).

Williams makes the equipment available for sale to utilities and energy service providers and through a leasing arrangement to large industrial and commercial users. Fees for the service will include a fixed component based on the equipment installed and a variable component based on the benefits, including energy saved and outages avoided. Through remote monitoring and dispatch, Williams also plans to remotely dispatch the generators to peak shave when market prices are favorable. Williams' goal is to have 50 to 200 sites on line in the United States and abroad by the end of 1999.



William Energy premium power offer

Williams Distributed Power Services plans to use a range of technologies for generation, storage, and control in its premium power program. These include microturbines from Capstone, medium-sized turbines from Solar Turbines, premium power electronics incorporating large-scale advanced battery and ultracapacitor modules from Powercell, and advanced soft switches from Cutler-Hammer. This schematic illustrates a system that is operating at Williams' Tulsa Technology Demonstration Center.

Sure Power Corp.

Sure Power Corp. has created a proprietary, on-site, high-availability power system that combines on-site fuel cell power plants, rotary storage, reciprocating engines for backup, and other hardware. The system works in parallel with the grid or completely independently of the grid. To back up its promise of high reliability, Sure Power's offer includes a $5 million business-interruption insurance policy to its users that is underwritten by American International Group.

Sure Power signed its first deal with the First National Bank of Omaha, Nebraska, in July 1998. Sure Power will install four 200-kilowatt PC25 C fuel cells made by ONSI as part of an uninterruptible power system for a new data center the bank is building in downtown Omaha.

The fuel cells will be the primary power source for the data center, which has a critical load of 320 kilowatts. The redundancy built into the electric generating capacity is one reason the overall reliability of the

system is "greater than seven 9s" (99.999997 percent availability)—which surpasses the "five 9s" overall reliability of mainframe computers now being sold. For comparison, Sure Power estimates that most on-site power conditioning and generating equipment only reaches "three 9s" reliability—meaning that over the course of the year, these less dependable systems are likely to be nonfunctional for nearly nine hours.

This article summarizes the recent report from the E SOURCE *Distributed Energy Series* and *Power Quality Series*, "Distributed Generation: A Tool for Power Reliability and Quality," by Ira Krepchin.

The *Distributed Energy Series* and *Power Quality Series* are subscription-based information services offering a customer-focused understanding of technologies, service options, and strategic issues related to the evolving markets for distributed generation and power quality.

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