Smart grid microgrid

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The future promises dramatic transformations in the way people make and consume energy. Many experts are turning to microgrids-- small-scale, self-sustaining power networks unburdened by ties to a centralized power plant-- as key agents of this transformation.

Microgrids provide everything from greater reliability and resilience to cleaner power and economic development. They"re designed to work in unison with distributed energy resources (DERs) that include solar panels, fuel cells, and battery storage. DERs are more reliable and potentially much cleaner than traditional methods.

As they grow in number and complexity, microgrids will require sophisticated digital automation and smart management in order to become reliable alternatives to the conventional grid. Today"s high proliferation of DERs often makes microgrids more complex than in the past.

Fortunately, advancements in information technology such as the Internet of Things (IoT) enable automated energy management. This can manage multiple components and changing conditions. A smart system makes full use of the IoT by embedding energy sources with sensors and electronics that connect it to both the microgrid and a cloud-based repository of real-time data. Based on these available parameters, the system can make decisions that optimize price, reliability, and the use of clean energy.

Biogas comes from any organic material found in landfills, sewage treatment, or bio-digesters. It"s known as a renewable natural gas, which can be used to create electricity. Biogas production turns existing raw products into usable energy resources.

Several companies are incorporating biogas as a means of fueling their on-site microgrids in order to help reduce their carbon footprint as well as cut back on their energy costs.

Bloom Energy, located in San Jose, California, is working with The Southern Company to power a biogas pilot at a landfill. Its 50-kilowatt Bloom Energy Server began delivering renewable baseload power into the local grid in February 2019.

eBay, also based in San Jose, installed about five Bloom Boxes on its main campus. The company says it"s now using 15% less electricity, which saves thousands of dollars in energy costs.

Another example is II-VI Incorporated, a maker of 3D sensing technologies. When II-VI set out to reduce its carbon footprint by installing a microgrid at its New Jersey manufacturing facility, Bloom Energy built a 2.5-megawatt power system for the company in nine months. Bloom"s solid oxide fuel cell technology can take natural gas or a biogas and converts it into electricity.

"We are converting the chemical energy from methane in a single step to electricity," says Bloom Vice President of Commercial Strategy, Asim Hussain. "When you do it in a single step, it is far more efficient. This is not a traditional combustion system. We emit a lot less CO2 and compared to the U.S. grid mix of energy resources, we reduce emissions by 50%."

Of course, there"s a cost for converting organic material to biogas. Renewable natural gas is more expensive than natural gas. However, using cleaner energy can provide both environmental and economic benefits as the technology becomes more widespread and the associated cost falls over time.

Nearly 2,000 microgrids are currently operating in the United States alone. According to Navigant Research, about 500 new microgrid projects have been deployed around the world within the last six months. Microgrids are shaping up to be the next frontier in electrical engineering.

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