Microgrids—Powering the New Energy Economy

Microgrids are small, self-contained electricity grids with their own sources of power – typically cogeneration, various renewables, and/or batteries. They can operate in cooperation with the main utility grids or can be isolated and operate independently, ideally seamlessly switching between main grid connection and isolation without building occupants noticing the difference.

As Devon Bass at Vault Energy Solutions succinctly pointed out in an EnergyCentral article a few years ago, “Microgrids are indicative of another approach to alternative energy adoption. Distributed electricity generation means decentralizing electricity production and creating the energy closer to where it is used......The traditional centralized approach to electricity production and distribution has long been susceptible to the domino effect where a relatively minor event in one part of the grid can lead to cascading failures effecting large numbers of customers. Microgrids and distributed electricity generation can firewall the grid, creating local independence and enhanced reliability among many other benefits.”

Tecogen was among the first clean energy manufacturers to pioneer microgrid technology for cogeneration. After launching its first microgrid control software package in 2005, the exclusively licensed CERTS-enabled microgrid technology was introduced on Tecogen equipment in 2008. This state-of-the-art algorithm-governed system allows for seamless load transfer among a range of distributed energy resources (DER), ensuring facilities are always powered in the most optimal and cost-effective way.

Why do I need that?

Resiliency. The ability of a microgrid to operate autonomously – in ‘island-mode’ – allows facilities using this sort of technology to continue to power critical infrastructure and services even when the larger utility grid goes down. In a grid outage, the software seamlessly disconnects the building from the utility grid and ‘turns up’ its local power production to meet the entirety of the building’s energy needs.

Efficiency and Savings. A microgrid-governed system can be programmed to prioritize supplying a building’s demand from the cheapest energy source first, switching among a variety of options to ensure the facility’s needs are always being met in the most cost-effective and efficient way.
Microgrids—cont.

For example, an energy system governed by the CERTS microgrid with Tecogen’s InVerde 100 kW CHP unit and a rooftop solar array would prioritize cheap solar power to meet the demand in mid-day. Then, as the sun sets and the solar panels become less productive, the microgrid algorithm turns up the CHP unit to meet the building’s energy needs during peak early evening hours. As the evening draws to a close and building occupant’s energy needs decline, the system may opt to draw power from the local electric grid to take advantage of off-peak electric rate pricing. In this way, throughout the day the microgrid seamlessly met the energy demand of the building while sourcing this energy in the most efficient and cost effective way.

**Demand Response.** Demand-response and load-management programs, typically offered by a local utility, provide often substantial incentives to curtail demand during peak energy use periods in response to system reliability or market conditions. Similar to efficiency benefits, buildings with smart microgrids can participate in demand response programs, peak shaving their loads when required and thus generating additional savings from the local utility via incentive payments.

The real beauty of a microgrid solution is evident in Tecogen’s proprietary CERTS algorithm-driven software. As CERTS describes, “A key feature of a microgrid, is its ability, during a utility grid disturbance, to separate and isolate itself from the utility seamlessly with little or no disruption to the loads within the microgrid (e.g., in the CERTS Microgrid concept, no impacts on power quality). Then, when the utility grid returns to normal, the microgrid automatically resynchronizes and reconnects itself to the grid, in an equally seamless fashion.”

Two key benefits of the CERTs system are the peer-to-peer concept and the plug-and-play concept. With peer-to-peer structure, no single component, like a master controller, is required for operation of the microgrid - each piece of equipment can continue operating even if other elements in the system come offline (either for routine maintenance or due to emergency failure), delivering the most robust and resilient solution possible.

Similarly, the plug-and-play concept means that the various pieces of distributed generation equipment don’t have to be connected to each other to function together - they don’t even have to be in the same building! This means a customer can install cogeneration, then add solar PV, and add battery backup storage all without re-engineering the microgrid controls. This plug-and-play functionality also means that distributed energy resources can be located closest to wherever they might be needed most; allowing more effective use of the energy produced on-site and minimizing installation of complex piping and electrical systems.

To find out if you should be using Tecogen’s cutting-edge CERTS microgrid technology to make your facility’s power systems more resilient, efficient and cost effective contact us for a free Site Assessment.
TTcogen LLC, the 50/50 joint venture corporation between packaged combined heat and power (CHP) experts Tecogen Inc. and TEDOM a.s. continues to render dividends for potential customers with expanded offerings and fully customized energy solutions.

The alliance brings TEDOM’s Quanto Series of CHP systems for large-scale industrial users to the United States. The Quanto series designed for U.S. customers offers packaged CHP solutions from 800 kW up to 4 MW. Fully customizable with a range of options to suit a facility’s unique needs, the Quanto line also offers flexible fuel options and can run on natural gas, LPG or biogas. This biogas capability is especially useful for repurposing landfill waste or powering agricultural and wastewater treatment facilities. (Read more about TEDOM’s biogas offering here).

Speaking about the expertly engineered equipment line, Jiri Jansa, TTcogen’s Managing Director noted, “Many customers in remote locations, or in places where grid-power is either insufficient or unreliable, find the TEDOM Quanto an excellent complete packaged energy solution. Similarly, large-scale CHP units like the efficient Quanto may be used as emergency sources of electricity in places where an uninterrupted supply is necessary.”

Quanto may be new to the USA but they have been meeting the needs of facilities worldwide for over a decade now. Powering the Quantas Airways terminal at Sydney Airport, oil fields in Kazakhstan, climate controlled greenhouses in Russia, the SKODA auto plant in the Czech Republic, a hospital in Italy, or a food processing plant in Moldova – the reliable Quanto series offers an efficient energy solution for commercial and industrial customers not well served by traditional grid-power or for those wishing to move toward more affordable and environmentally friendly clean energy technology.

Electricity generated by a CHP unit can be used for consumption by the facility in which the machine is situated, or in some cases it can be supplied to the grid. In this way the units allow a facility to function in parallel with the traditional utility, or disconnect and operate in island-mode – independently powering the building while offering backup power in case of emergency – important for bolstering a site’s resiliency. The free recovered waste heat from the CHP unit can be used to heat the facility, to prepare hot water or for industrial process heating.

Tecogen is a next-generation manufacturer of natural-gas-fueled, engine-driven, combined heat and power (CHP) products that aim to reduce energy costs, reduce greenhouse gas emissions, and alleviate congestion on the national power grid. The TTcogen partnership with TEDOM, one of Europe’s largest combined heat and power (CHP) manufacturers, utilizes Tecogen’s sales and service network to bring TEDOM’s efficient cogeneration equipment to the United States market. Through TTcogen, the partnership offers a complete package of 27 cutting-edge CHP modules that are fully capable of running on a variety of fuel feedstocks, including natural gas, propane, and renewable natural gas (biofuel).

To find out if large-scale CHP is right for your facility please visit www.ttcogen.com or contact us for a free Site Assessment.
Although paying your electric bill every month is a near universal experience, very few people can actually tell you what their electric rate is or how it is calculated. What exactly are you being charged for? Generally we assume the majority of our electric bill is related to actual usage – that’s not always the case.

A typical electric bill contains two categories of charges – for energy usage and energy delivery.

The generation rate, sometimes called the supply rate, is what most users think about when they consider their electric bill – this is energy usage. This rate (or charge) is related to the amount of electricity a customer actually uses, typically measured and billed per kilowatt-hour (kWh), and is sometimes also labeled as a ‘consumption’ charge.

The delivery rate is more complex as it tends to include several items depending on your electricity provider and state but in general this represents the fees association with delivering the electricity from the power plant to your building. In their most basic form, delivery rates include transmission fees and distribution fees. Transmission fees are set by regulators and bill customers for the cost to deliver electricity over high-voltage lines running from the power-generating plant to electric substations. From these substations, the electricity enters the distribution system and travels over local power lines to the end users. Distribution rates are fees for the delivery of electricity to an end-user’s building via these local power lines.

Those fees all seem easy enough to understand – however, there are a range of other less straightforward fees that also end up on the bill including demand management, renewable energy, transition rates, riders, and other state or utility specific fees. Sometimes these fees are difficult to segregate as utilities often bundle them into a single charge – and some are more controllable than others.

Chief among the “controllable” fees are demand charges. These charges are related to the highest capacity you required during a given billing period in kilowatts (kW), and often this is measured in 15-minute intervals. To use an analogy given by energy expert EnerNOC, think about consumption as the number that registers on your car’s odometer – to tell you how far you’ve driven – and demand as what is captured on your speedometer at the moment when you hit your max speed. Consumption is
Understanding your Electric Bill—cont.

**Building A:**
500 kW load runs continuously for 100 hours = 50,000 kWh

- Consumption: 500kW x 100 hours = 50,000kWh
- Demand: 500 kW
- Consumption Charge: 50,000kWh x $0.12 = $6,000
- Demand Charge: 500kW x $20.00 = $10,000

**TOTAL:** $16,000

**Building B:**
50 kW load runs continuously for 1000 hours = 50,000 kWh

- Consumption: 500kW x 1,000 hours = 50,000kWh
- Demand: 50kW
- Consumption Charge: 50,000kWh x $0.12 = $6,000
- Demand Charge: 50kW x $20.00 = $1000

**TOTAL:** $7,000

your overall electricity use, and demand is your peak intensity, or maximum “speed.” Utilities place a heavy fee burden on users hitting high peak-demand levels, with demand charges representing sometimes upwards of half of the total bill for these unfortunate customers (in the example, over 60% of Building A’s bill is from demand charges despite both buildings using the same total amount of energy in kWh). The real pain comes when your utility takes that peak demand rate and applies it to the entirety of your usage, even if you only hit that peak for one 15-minute period in the entire billing cycle. Even worse, some utilities use your highest attained peak usage in a prior trailing-12 month period and apply that demand charge rate until it rolls off – a very costly approach for the end user.

Energy efficiency initiatives, especially installation of combined heat and power (“CHP or “cogeneration”) equipment, help to shave consumption and particularly peak demand. By producing electricity on-site, customers avoid these hefty demand tariffs while enjoying reliable and affordable electricity that meets a building’s consistent base-load consumption. For a free site assessment to see if cogeneration can help you lower your electric bill and avoid demand charges please visit: [http://www.tecogen.com/products-request-a-free-economic-analysis.htm](http://www.tecogen.com/products-request-a-free-economic-analysis.htm)