

GE Power & Water
Distributed Power

Taste the future of power

Distributed power solutions for
the Food & Beverage industry
save money, are more efficient
and environmentally friendlier



GE imagination at work

The challenges of growth

As demand for food and drink increases, the global Food & Beverage industry must find ways to use our world's natural resources more efficiently. You also realize as a global producer that a more secure and long-term approach to energy use can provide cost savings to you, as well as savings to the environment—including a reduction in CO₂. Most Food & Beverage producers buy electricity for their manufacturing facilities and also burn fuel separately in an onsite boiler to produce heat. Electricity losses occur in transmission and distribution lines during transport from the utility to the facility. It's not an efficient system—especially when you realize just how much power you use, and waste.

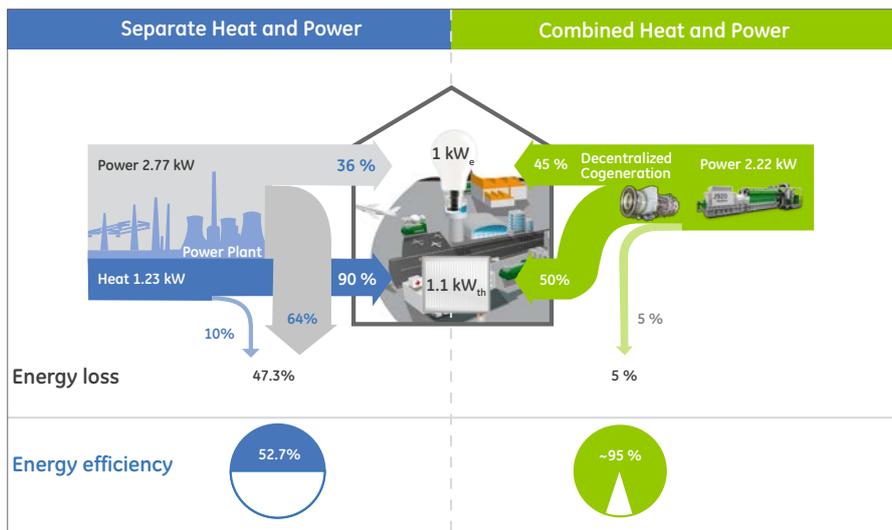


More efficiency with CHP

It's time to consider a more efficient and profitable approach to maintaining the electrical and thermal demands in your facility. GE's Distributed Power combined heat and power (CHP) system, produces electricity and captures waste heat for efficient local consumption.

With CHP, thermal energy released in the combustion process can be used for preheating or generating steam as well as various types of process heat. Since it produces both electrical and thermal energy in one efficient process, CHP—also called cogeneration—can provide significant energy efficiency, profitability and environmental advantages over the separate generation of heat and power.

A number of by-products from food and beverage manufacturing can be transformed into biogas created through anaerobic digestion from bio-digesters. This technique can be combined with heat and power to generate electricity for your internal production processes or sold into the grid, often bringing in additional income.



Combined heat and power can cut your energy use* by over 40 percent.
*naturally occurring energy sources such as e.g. natural gas, crude oil, coal, wood without loss of downstream conversion and transport processes.

Taking it a step further: quadgeneration for the beverage industry

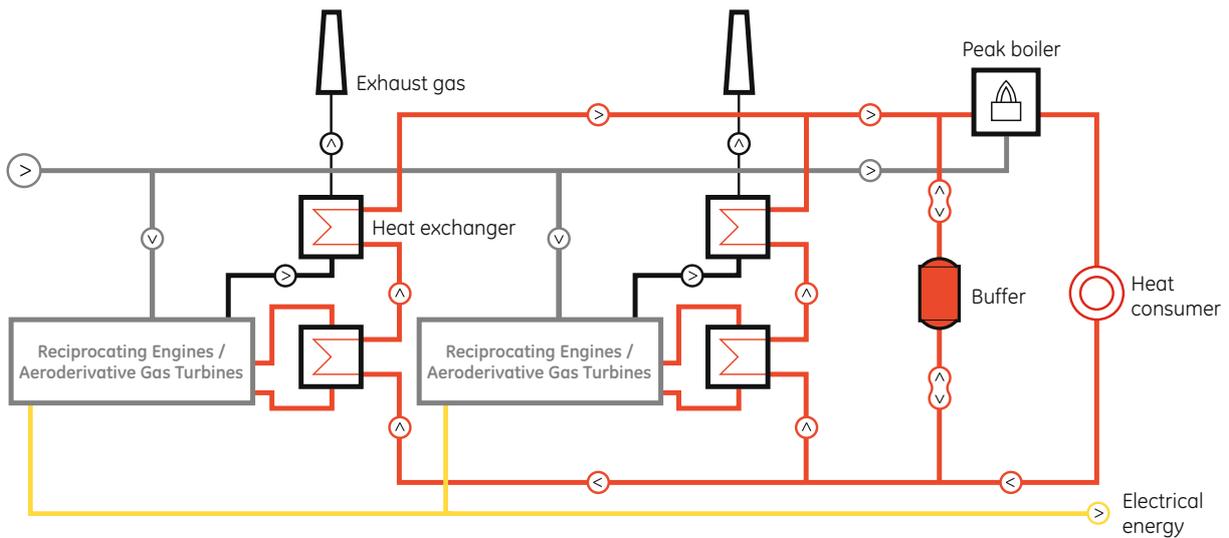
Quadgeneration systems are some of the most advanced gas engine-driven power plants in the world. This technology encompasses the features of a trigeneration system based on natural gas, with combined electricity, heat and cooling, but it also includes the recovery of carbon dioxide from the exhaust gas. The recovered carbon dioxide is filtered and purified to the highest food-grade

standard, which can be used in beverage carbonation, providing the fizz in sparkling drinks. These systems provide the additional benefits of lower carbon emissions and reduced operating costs (versus the separate purchase of electricity, heat, cooling and carbon dioxide). All resources from gas utilization are used, creating a wide range of potential applications.

The Distributed Power concept: providing even more value

GE's cogeneration plants generate electricity and thermal energy in a single, integrated system. These plants can create even more value by using other heat sources such as the available engine cooling water, lubricating oil, an air/fuel gas mixture, or exhaust gas. To meet peak heating requirements, cogeneration plant modules also can be combined with a boiler system. Connecting a heat

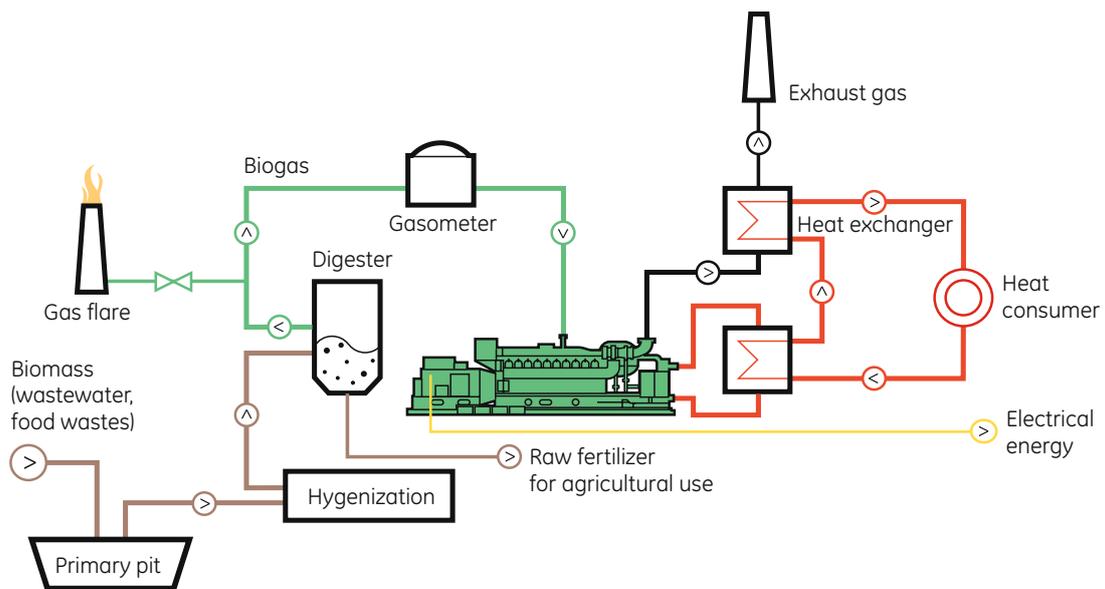
storage medium makes the plant even more flexible and efficient. Food & Beverage producers have a choice to install either a gas engine that uses natural gas or biogas. The biogas results from anaerobic fermentation of organic materials like food waste or brewery residuals.



The greener solution: cogeneration concepts based on biogas

Created as a by-product during the wastewater treatment process following beverage production or as waste from the food production, biogas is a suitable fuel for GE's Jenbacher gas engines to produce electricity and heat. This efficient operation enables food industries and breweries to realize prime energy savings of about 10 percent.

Biogas—a mixture of methane and carbon dioxide—is created during anaerobic fermentation and serves as a high-energy, renewable fuel that can be used as a substitute for fossil fuels. Biogas-fueled gas engines improve waste management and create an economical energy supply.



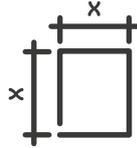
Using GE's ecomagination-qualified Jenbacher gas engines or aeroderivative gas turbines from GE, a plant can convert natural gas or biogas into electricity, steam and hot water to meet a food, beverage or brewery's process requirements. Additional GE technologies can even recover carbon dioxide from the exhaust gas for potential use in industrial processes.

The advantages of cogeneration technologies from GE



Energy cost savings

Through the highly efficient production of steam and electricity, overall efficiencies (electrical and thermal) can reach 95% percent using a wide fuel range of gaseous and liquid fuels. In addition, our CHP solutions can provide a hedge against increasing electricity costs by reducing electricity purchases from the grid.



Standardized design

Our compact modular design creates a small footprint and can be adjusted to your spatial requirements.



Flexible power

Produced thermal energy can be stored for use as needed. Electricity can be fed into the public grid or used for artificial lighting, and we offer an optional full island lighting control system.



Environmentally friendlier

Better efficiency means less fuel burned per megawatt generated and fewer CO₂ emissions. Our CHP solutions are highly efficient, even in partial load conditions and high temperatures. GE's gas turbine uprate can reduce carbon dioxide emissions by up to 6,500 tons over the course of a typical operating year—the same emissions reduction achieved by removing 2,500 cars from the road annually. GE's Dry Low Emissions (DLE) technology allows you to sustain current low-emission levels while eliminating system water requirements. For example, using GE's gas turbine can save you more than 40 million liters of water each year.



The power of biogas

Using biogas in GE's CHP solutions can reduce greenhouse gases and offers up to 95 percent efficiency for combined onsite heat and power generation. The remaining residue from the digester can be used as high-quality agricultural fertilizer. It neutralizes the acid effect with a higher pH-value, keeps nutrients retained, and is nearly odorless.



Resilient and robust

GE's solution means you don't have to rely on the grid alone to ensure your facility has the power it needs 24/7.

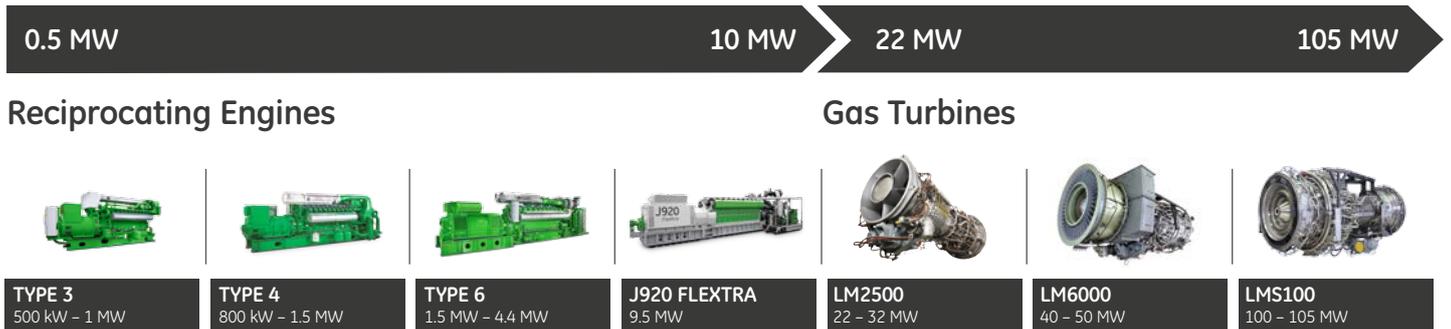
Framework requirements



GE's distributed power CHP solutions can be flexibly adapted to the individual site conditions. However, certain requirements must be met to build and successfully operate such a facility:

- License/permission
- Gas connection/LNG connection
- Electricity link to the grid
- Heat/refrigeration requirements
- Cooling

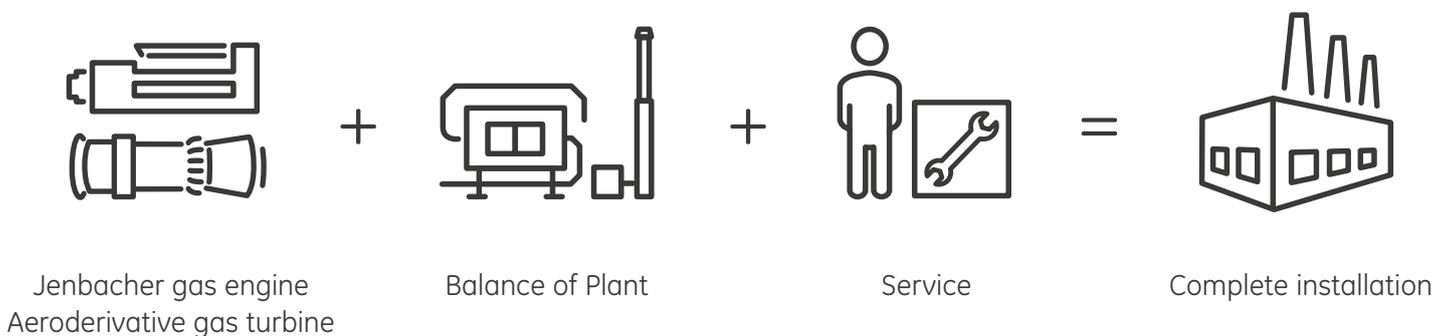
GE's distributed power product range



GE's convenient cogeneration package

Here is what is provided in one convenient cogeneration package: GE's Jenbacher or Waukesha gas engines or aeroderivative gas turbines, the catalytic converter, heat exchanger and all balance of plant equipment and controls. GE's experts can help develop your balance-of-plant specifications as well as perform engineering and site design work to meet your spatial requirements.

Our standardized packages make your service experience easier, too, since the generator and all other installation components can be removed at the same time.



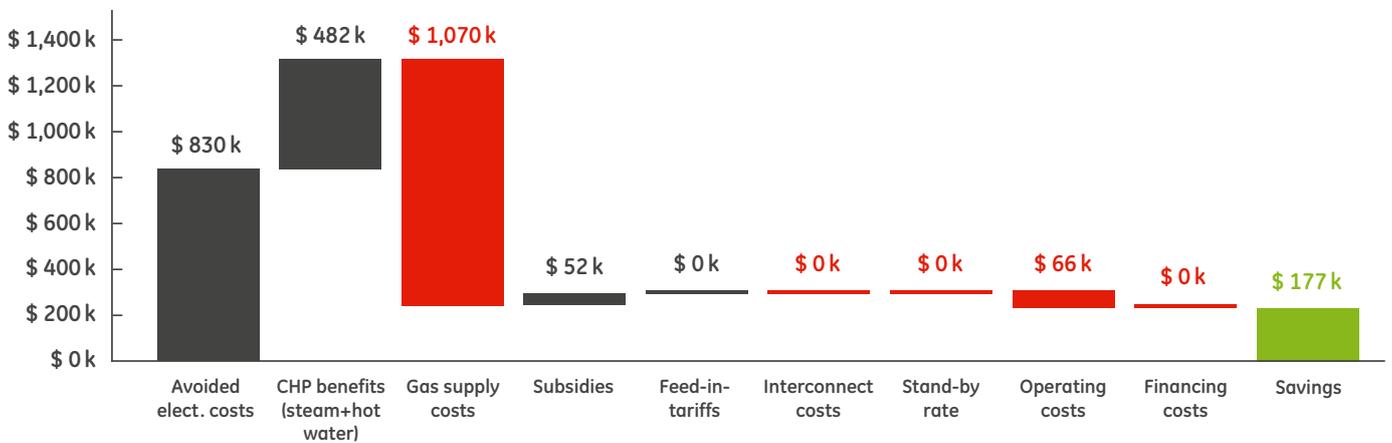
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With Jenbacher CHP solutions, payback is typically in two to five years. Finally, with the option of financing, you may need no up-front capital with the project paid out of savings.

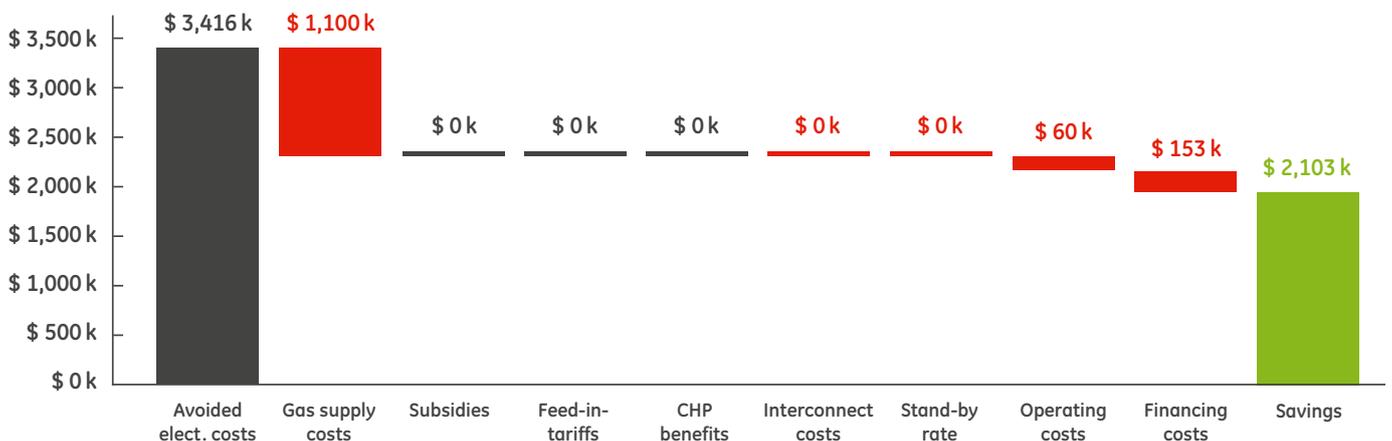
Economics from a brewery based in China

- 150,000 KL beer production per year
- 1,067 kW gas engine for CHP, all electricity and thermal are consumed in plant
- 7,665 operating hours (21 hours x 365 days)
- There is a one-time subsidy on CAPEX by government. Annual values averaged over 10 years of operation.



Economics from a food & beverage company in Nigeria

- 2.6 MW gas engine
- 8,000 operating hours per year
- Annual values averaged over 10 years of operation.



Cases in point - Solving our customers' challenges

At GE, our tradition is innovation. We have seven global research centers at our disposal. Plus, more than 400 engineers continuously work on the technological development of our reciprocating engines and turbines. Their task is to develop more flexible, efficient, powerful and reliable energy solutions—always with your needs in mind. The efficient energy generation of combined heat and power

is increasingly attractive in an era of growing energy use and costs, along with heightened awareness of climate change. GE's innovative Jenbacher cogeneration plants place GE among the world's technological leaders in CHP. More than 500 engines and turbines have been delivered to Food & Beverage companies worldwide with more than 1 GW power mostly as cogeneration mode.



GE's Jenbacher J620 gas engines installed at Guinness' brewery in Ogba, Nigeria.

Ogba and Benin City, Nigeria

U.K.-based Diageo plc, a leading global alcohol beverage company, has worked with Clarke Energy, a distributor of GE's Jenbacher gas engines, to install turnkey combined heat and power plants at its Guinness breweries in Ogba and Benin City, Nigeria to lower their energy costs and increase production.

The two, 3.3 MW CHP plants feature a natural gas-powered Jenbacher J620 gas engine and a backup diesel engine from a different supplier. In 2008, Diageo first installed a Jenbacher J620 cogeneration unit at its Guinness Ogba brewery, where the system was connected to a waste-heat boiler to produce steam for the brewing process. The second installation in 2010 was configured to use the exhaust heat directly into an absorption chiller to provide a source of cooling for the plant.

Also in 2008, Diageo installed its first two Jenbacher J620 cogeneration systems at its Guinness Benin City brewery. In addition to producing steam, the Benin City brewery's Jenbacher unit was connected to an absorption chiller to create chilled water from the engine's exhaust heat.



One of GE's Jenbacher J420 biogas engines generates 1.4 MW of renewable electricity at the Synergy Dairy.

Synergy Dairy, Covington, United States

The Synergy Biogas LLC plant, which is located at Synergy Dairy, a 2,000-head dairy farm in Covington, Wyoming County, southwest of Rochester, is the state's first biogas project specifically designed for the co-digestion, or processing, of animal and food wastes. The biogas created in the 120,000-gallon co-digester is fueling a GE ecomagination-qualified, Jenbacher J420 biogas engine generating 1.4 MW of renewable electricity.



By anaerobically digesting waste from local food processors in addition to the dairy's cow manure, the 425 ton per day, mixed-waste facility is more cost-effective. The facility has created about a half dozen jobs while enhancing the efficiency of the 30-employee farm's operations and sustaining area food manufacturers and haulers.

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New York's Largest
On-Farm Biogas
Press release with
video



Coca Cola Case
Study Europe



Bitburger Germany
Press Release



Russian
Vegetable Producer
Press Release



Guinness Nigeria
Press Release



Coca Cola Brazil
Press Release

We are at your service

With a full range of product offerings and a global network of service providers, Distributed Power from GE can help ensure your reciprocating engines or gas turbines run reliably—anywhere and anytime. As a user of GE's Distributed Power products, you can benefit from a comprehensive portfolio of service offerings that can reduce your maintenance costs and help ensure the availability of your equipment.

Higher asset availability with advanced technology

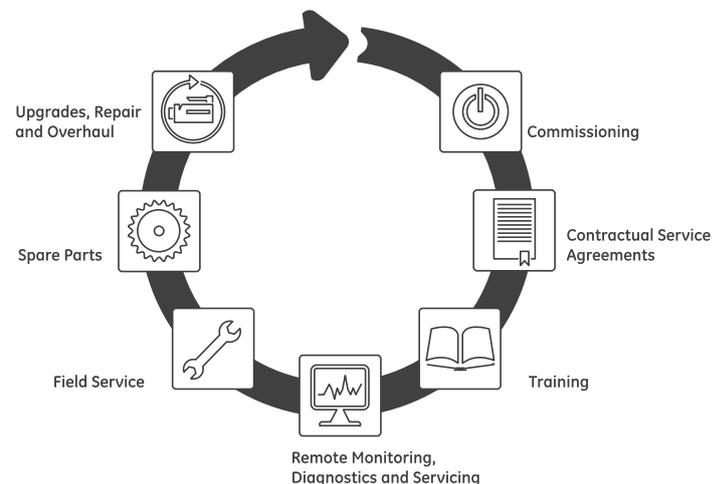
Our Conversion, Modification and Upgrade (CM&U) offerings provide improvements in reliability, availability, maintainability, efficiency, performance, emissions reduction, and safety. Additionally, GE Predictivity* solutions harness the power of the Industrial Internet to lift existing assets to new levels of performance and profitability. The collection of Predictivity assets provides real-time information to forecast service events, analyze issues, and take proactive steps to achieve your desired operating, compliance and safety outcomes.

Versatile service agreements fit maintenance to your needs

GE's contractual service agreements (CSAs) help distribute the costs of major maintenance events across the life of your equipment while reducing risk with customizable performance guarantees. Our CSAs cost-effectively integrate the latest OEM technical knowledge, a full range of remote monitoring and diagnostics solutions, field service, original spare parts and repairs. In addition, we can protect your investment by improving operational productivity through guaranteed availability and reduced costs.

Lower costs, less downtime, and 24/7 global service

You operate your equipment around the clock and around the world, and GE is right at your service. Our Remote Monitoring & Diagnostic (RM&D) technology cuts costs and boosts equipment availability with immediate intervention whenever and wherever you need our help. Additionally, GE's services network is supported by our authorized service providers in more than 170 countries. And when your reciprocating engine or gas turbine reaches the end of its life cycle, we can replace it onsite with a new or overhauled engine or gas turbine, or repower your asset with an original GE unit.

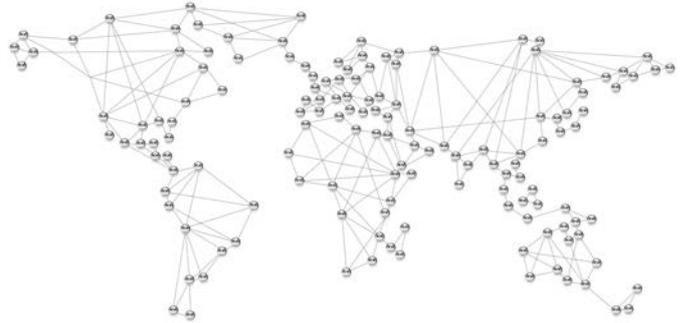


Full range of service offerings ... once it starts, we never stop.

*Trademark of General Electric Company

GE Power & Water Distributed Power

GE Power & Water's Distributed Power business is a leading provider of power equipment, engines and services focused on power generation at or near the point of use. Distributed Power's product portfolio includes highly efficient industrial reciprocating engines and aeroderivative gas turbines that generate 100 kW to 100 MW of power for numerous industries globally. Headquartered in Cincinnati, Ohio, Distributed Power from GE employs about 5,000 people around the world.



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For more information on GE Power & Water's Distributed Power solutions, go to:

www.ge-distributedpower.com



GE imagination at work

