

GE Energy

Power & Energy

Motors and Generators



imagination at work

Experience Matters



We have manufactured motors and generators for over 125 years. In 1879, GE founder, Thomas Edison constructed the first electric motor for a 110 to 120 volt line at Menlo Park, NJ. This device still exists and is operative! It is located in the Edison Historical Collection in New Jersey.

GE's experience in the power generation industry spans over a century

GE is a global supplier of synchronous and asynchronous motors and generators with over a century of experience in the design and manufacture of rotating machines for multiple applications. Our products are designed for high reliability and efficiency. Our application expertise, combined with a global presence, have made us a leading provider of motor and generator products and services worldwide.

GE Advantages

We are known for designing products with a high mechanical integrity and superior electrical design.

- GE's legendary Global Research Center is committed to the Power Generation industry by developing new products that customers need with more output per frame and increased efficiency.
- GE brings over 125 years of power generation industry experience.
- GE utilizes state-of-the-art design tools such as distribution analysis.
- GE motors are known for high reliability and efficiency.

Our products are produced to meet the most stringent industry standards and customer requirements. GE operates world class facilities that test machines according to NEMA, IEC, IEEE, and other industry standards.



Fossil



Fossil fuels produce approximately 63% of total world electricity production. Coal, oil, and gas are called "fossil fuels" because they have been formed from the organic remains of prehistoric plants and animals. Burning coal produces sulphur dioxide, an acidic gas that contributes to the formation of acid rain. This can be largely avoided using "flue gas desulphurisation" to clean up the gases before they are released into the atmosphere.

The demand for electricity—the most versatile energy available in the world—is ever increasing. Steam and gas turbines are the most common means to meet these growing demands. With the introduction of the modern combined cycle and co-generation plants, the demand for modern, efficient motors and generators has increased.

GE is one of the leading designers and manufacturers of motors and generators used in modern power stations. GE Motor's high inertia motors are used in power plants throughout the world in various fan applications.

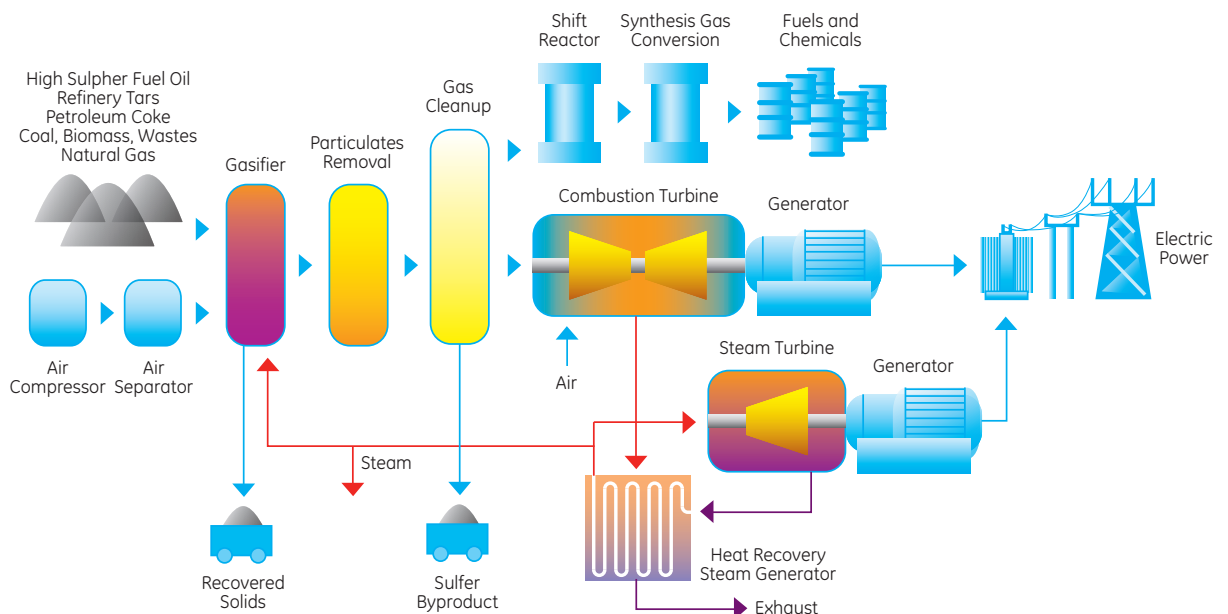
GE is a full range supplier of motors and generators for power plant applications. These include pumps, fans, conveyors, and any other small or large motor application. We also design and manufacture generators for steam and gas turbine applications for independent power producers.



Synchronous generator driven by a steam turbine

Motor Applications

- Induced Draft Fan
- Forced Draft Fan
- Boiler Feed Water Pump
- Circulating Water Pump
- Condensation Water Pump
- Auxiliary Cooling Water Pump
- Primary Air Fan
- Coal Conveyor
- Cooling Tower Fans
- Fans, Pumps, Blowers, etc.
- Gas/Steam Turbine



Nuclear



Nuclear energy supplies over 16% of the world's electricity. A nuclear reactor is used to generate electricity. This is accomplished in a clean and efficient way by boiling water to make steam which drives turbine generators. Except for the reactor itself, a nuclear power station works like most coal or gas-fired power stations.

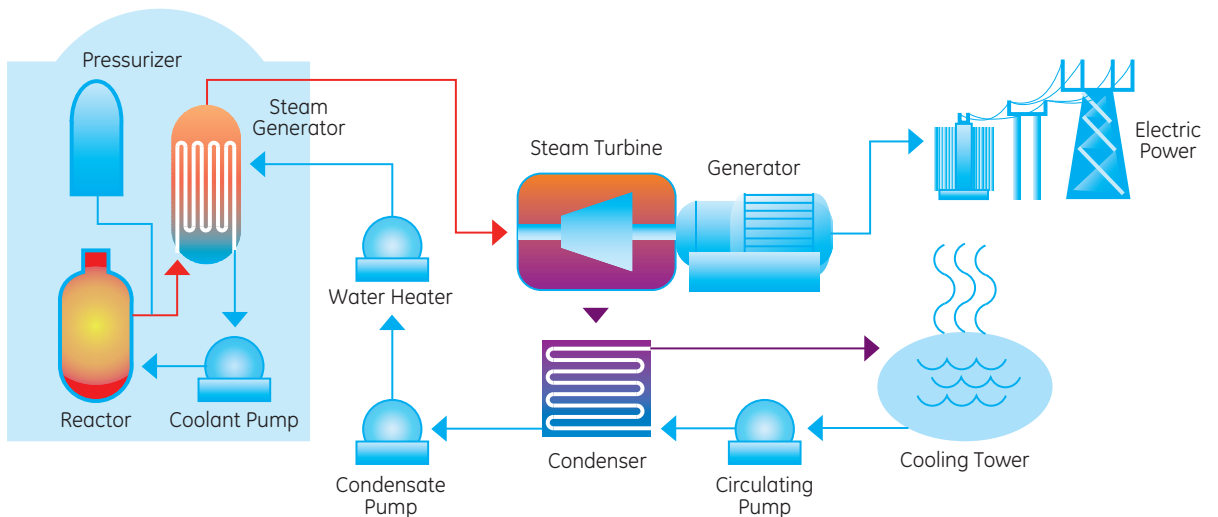
GE motors are installed worldwide in many nuclear power generation stations. We have extensive design, application, and manufacturing experience in safety (1E) and non-safety (non-1E) environment motors. Over 2,000,000 horsepower of GE motors are installed globally in nuclear power stations, including heat transfers (PHT), circulating cooling pumps (CCW), and other applications.



Induction (asynchronous) vertical motor for a heat transfer pump application

Motor Applications

- Boiler Feed Water Pump
- Circulating Water Pump
- Condensation Water Pump
- Auxiliary Cooling Water Pump
- Cooling Tower Fans
- Fans, Pumps, Blowers, etc.
- Steam Turbine



Hydro



We have used running water as an energy source for thousands of years. Hydro power stations produce approximately 17% of total world electricity production. More and more utilities and independent power producers are seeing the advantages of going with small- and medium-size hydro projects—because they need less capital investment—are easier to develop and provide faster pay back. Hydroelectric power stations can increase to full power very quickly, unlike other power stations. Water stored above the dam will be able to help cope with peaks in demand.

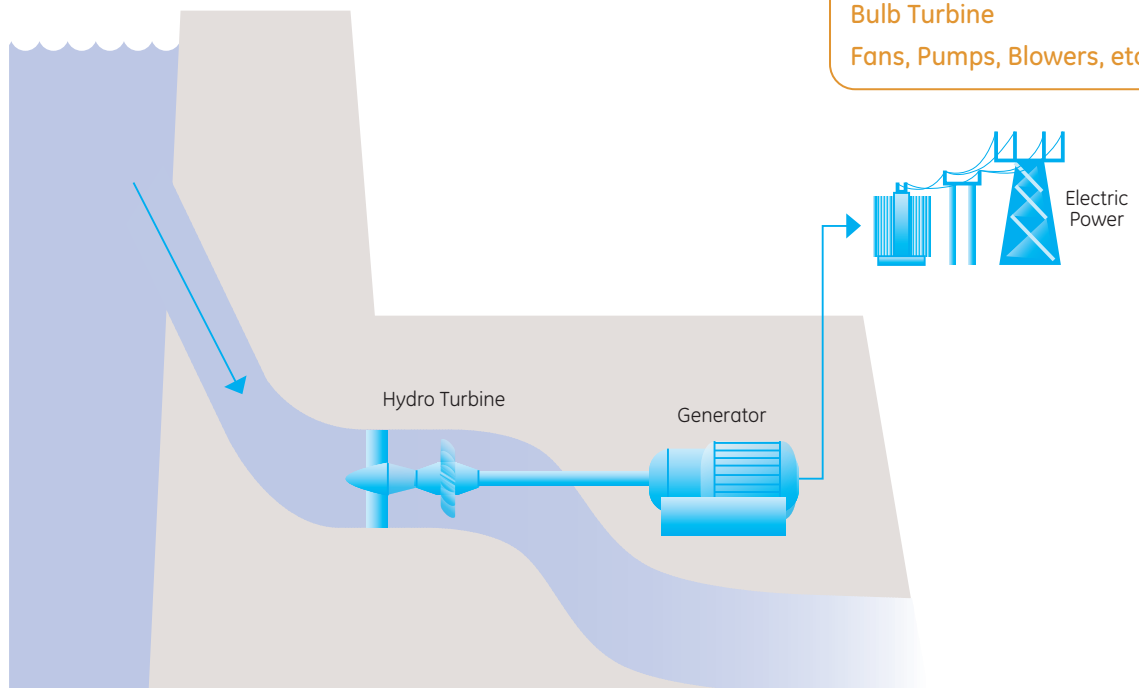
GE is a world leader in the manufacture of hydro generators. When every extra kilowatt generates revenue, it is important to maintain the highest efficiency. GE machine efficiencies are unsurpassed with turbine designs such as Francis, Kaplan, or Pelton.

GE can draw on its century of experience and engineering excellence to provide the most technological and economical solution for your hydropower needs.



Motor Applications

Francis Turbine
Kaplan Turbine
Pelton Turbine
Bulb Turbine
Fans, Pumps, Blowers, etc.



Wind



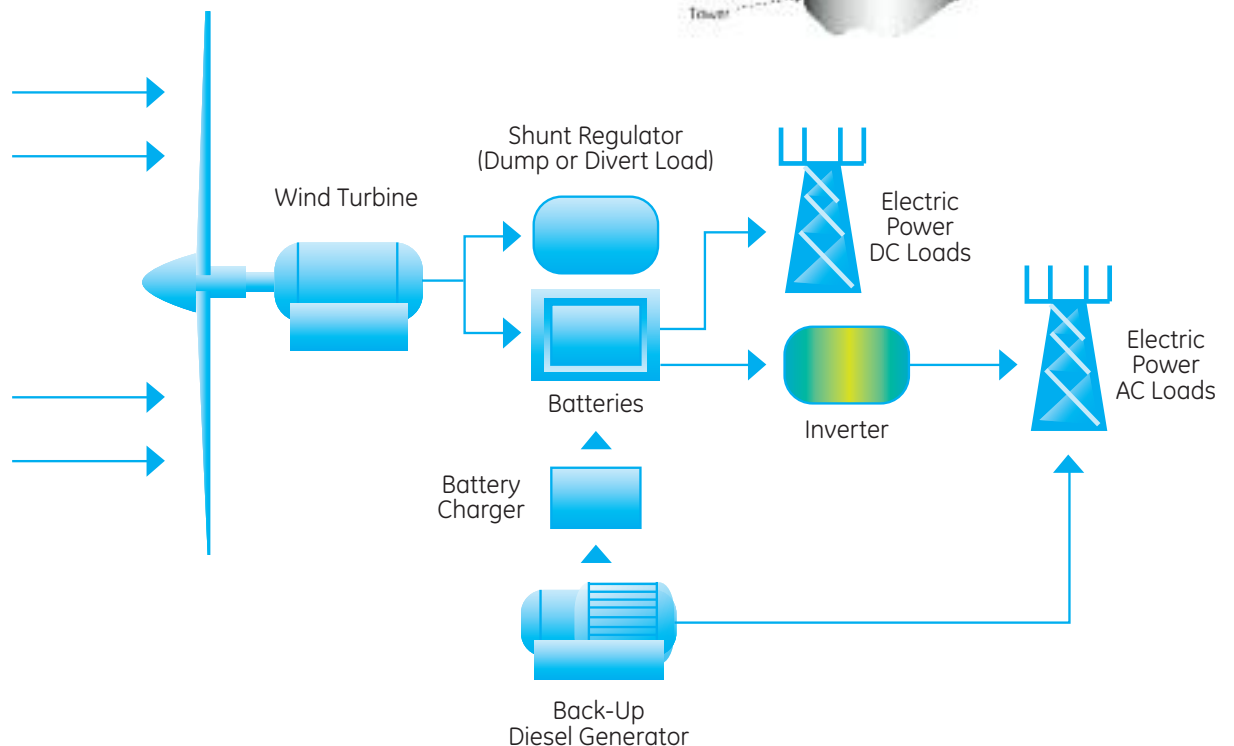
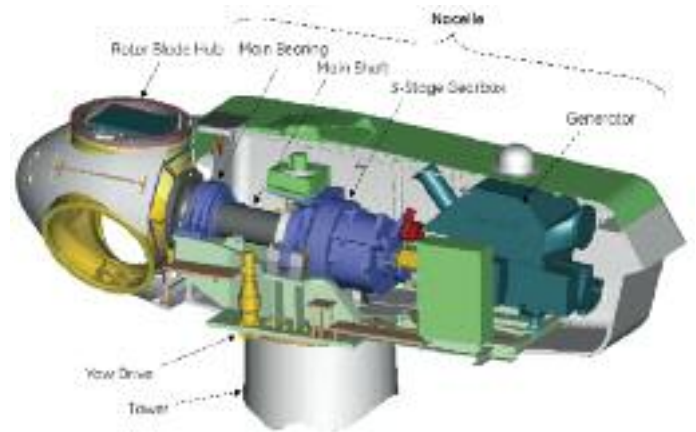
Modern wind turbines operate together on farms to capture the energy in shifting air currents to produce electricity for large and small utilities. Wind energy is environmentally clean, with no fuel cost, and can be applied in remote locations.

As the requirement of green energy is increasing rapidly to comply with the Kyoto Protocol and governmental regulations worldwide, more utilities and Independent Power Producers (IPP) are looking toward wind power generation. Because of this, wind power generation has a very high growth potential.

GE is continuously working to develop bigger and better generators in this application, which can provide the best technological and economical solutions for customers in this ever-growing industry.

Motor Applications

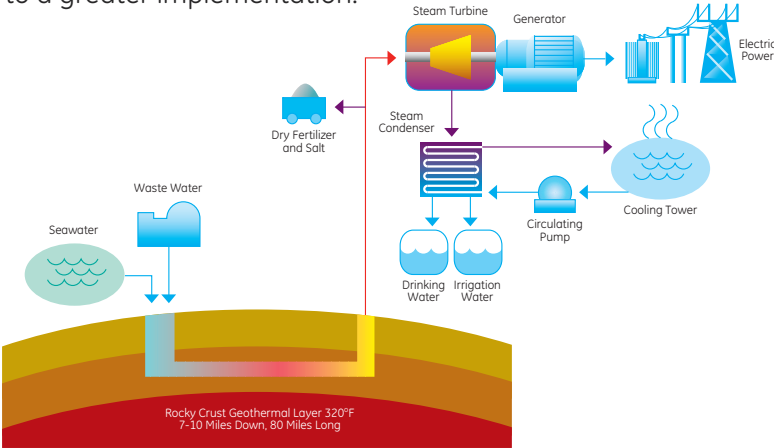
- Blade Pitch
- Turbine Yaw
- Wind Turbine



Geothermal



Heat from the earth is an ever-present and mostly untapped energy source. Today, geothermal plants channel water deep underground to heat it sufficiently to produce steam. This drives a steam turbine to produce electricity. This type of process has significant environmental and economic advantages over other sources of electricity production. Only a small fraction of our available geothermal resources are being used today. A widening recognition of geothermal energy will only lead to a greater implementation.



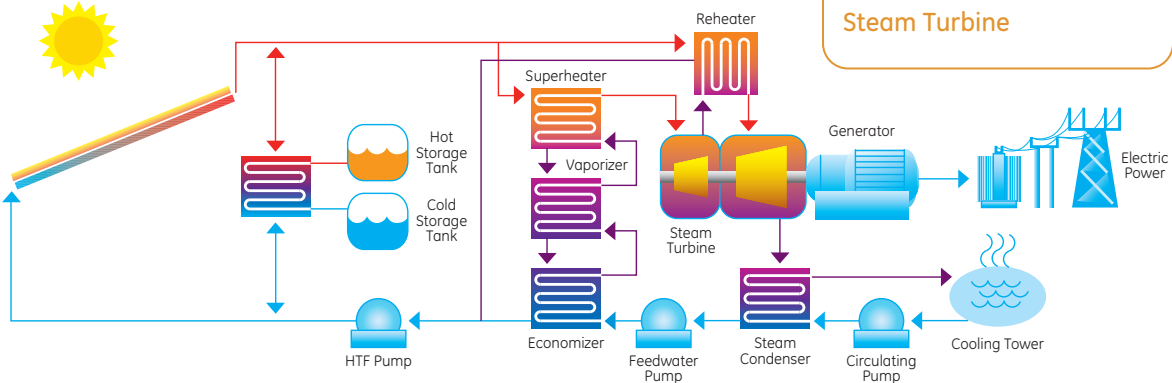
Motor Applications

- Boiler Feed Water Pump
- Circulating Water Pump
- Intake Water Pump
- Condensation Water Pump
- Auxiliary Cooling Water Pump
- Cooling Tower Fans
- Fans, Pumps, Blowers, etc.
- Steam Turbine

Solar



We have used the sun for drying clothes and food for centuries. However, only recently have we been able to use it for generating power. Although it is not a big part of today's electricity production, it is gaining popularity as the technology to generate electricity is becoming readily available.



Motor Applications

- Boiler Feed Water Pump
- Circulating Water Pump
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Applications

Motor Applications	Requirements	GE Products	Standards
Induced draft fan Forced draft fan	High inertia Starting conditions and frequency Vibration restrictions	Pegasus™ Custom 8000™ Series 9000™	IEC, IEEE, NEMA, and ANSI
Boiler feed water pump	Low noise Starting conditions Vibration restrictions	Pegasus™ Custom 8000™	IEC, IEEE, NEMA, and ANSI
Circulating water pump	Vertical or horizontal construction Induction or synchronous Slow speed	Custom 8000™ Series 9000™	IEC, IEEE, NEMA, and ANSI
Condensation water pump	Vertical construction Starting conditions Various thrust loads	Custom 8000™ Eng. 500 Frame Quantum™ LMV	IEC, IEEE, NEMA, and ANSI
Auxiliary cooling water pump	Vertical and horizontal Low noise TEFC VFD compatible Vibration restrictions	X\$D Ultra® Vertical Quantum™ LMV	IEEE, NEMA, and ANSI
Primary air fan	High inertia Starting conditions and frequency Vibration restrictions	Custom 8000™ Quantum™ LMV	IEC, IEEE, NEMA, and ANSI
Coal conveyor	High inertia Starting conditions and frequency Harsh environment	X\$D Ultra® Eng. 500 Frame Quantum™ LMV	IEC, IEEE, NEMA, and ANSI IEEE, NEMA, and ANSI
Cooling tower fans	Vertical orientation Belt driven Harsh environment	X\$D Ultra® 661	IEEE, NEMA, and ANSI
Fans, pumps, blowers, etc.	Inverter duty Harsh environment Vibration restrictions	X\$D Ultra® X\$D Ultra® 841 Energy Saver™ Quantum™ LMV	IEEE, NEMA, and ANSI
Intake water pump	Vertical construction Starting conditions Various thrust loads	Custom 8000™ Series 9000™ Quantum™ LMV	CSA, IEC, IEEE, NEMA, and ANSI
Gas/steam turbine	Turbine stress curve Ambient temperature Altitude conditions Service factor	Series 9000™	APL, CSA, IEC, IEEE, NEMA, and ANSI
Hydro turbine - Francis - Kaplan - Pelton - Bulb	Vertical or horizontal construction Turbine type Runaway speed Inertia requirement	Custom 8000™ Series 9000™	CSA, IEC, IEEE, NEMA, and ANSI
Wind blade pitch	High inertia VFD compatible Vibration restrictions	Kinematic II™ X\$D Ultra® E\$P	IEEE, NEMA, and ANSI
Wind turbine yaw	High inertia VFD compatible Vibration restrictions	Custom 8000™ Eng. 500 Frame	IEC, IEEE, NEMA, and ANSI IEEE, NEMA, and ANSI
Wind turbine	Turbine stress curve Altitude conditions Service factor Runaway speed	Custom 8000™ Series 9000™	CSA, IEC, IEEE, NEMA, and ANSI

People, Service, and Systems



GE Motors has teams of highly motivated and technically skilled application engineers, sales, and project support staff that help to ensure you have an optimal and cost-efficient solution for your needs.

Pre-Order and Product Application Support

- Experienced inside and outside sales force
- Application engineering available to optimize your solution (factory and field)
- Web-based tools customized for each user's needs
 - Pre-order product information
 - Order and project management
- Spare parts program
 - Minimize downtime with an adequate spare parts inventory plan for your GE motors
 - Performance Enhancement Program (PEP) – GE can evaluate your existing machines (GE or otherwise) to find efficiency or power output opportunities within the existing frames

Order and Project Management Support

- Design, application, and specification reviews
- Documentation for approval and as built
- Project coordination
- Inspection plans
- Test scheduling
- Shipping coordination
- Start-up and commissioning support
- Worldwide service capabilities



Technology



GE Motors' continuous product development allows us to bring new solutions for oil and gas applications. We have a proven design process utilizing the latest three-dimensional modeling tools. These allow us to custom build the machine on a computer to meet or exceed customer expectations as well as conforming as requested to the latest standards. Among the tools used are:

- **Electromagnetic Finite Element Analysis**
 - Flux distribution analysis
 - Computational fluid dynamics
- **3D Solid Modeling**
 - Stress analysis
 - Four pole rotor
 - Wound stator
 - Dynamic modal analysis



Product Development



The **Pegasus™ MHV** Horizontal AC Induction motor is a result of a significant investment in design, engineering, and manufacturing equipment. Pegasus™ MHV yields more horsepower per frame size, and has an improved efficiency and

power factor with a more compact design. It is offered in a range from 500-22,000 HP (300-16,000 kW) in NEMA or IEC.



The **X\$D Ultra® 841** motor is a TEFC (totally enclosed fan cooled) Industrial AC Motor ranging from 1-300 horsepower. It meets or exceeds NEMA Premium® Nominal Efficiency Standards and exceeds the minimum guarantee. Therefore, improved energy consumption and usage are dramatically realized, leading to its certification as a GE product of ecomagination. It also complies with the IEEE-841 specification.



The **Quantum™ LMV** TEFC Induction motor was designed by a global engineering team yielding a motor for worldwide applications. This motor uses an innovative D-Duct heat transfer

technology (patent pending). This unique internal structure allows for maximum airflow. This more compact design yields more horsepower per frame size and has an improved efficiency and power factor. The Quantum LMV is offered from 350-2,000 HP (200-1,500 kW) per NEMA or IEC up to 6,600 volts.



The **Series 9000-RCM** is a synchronous single-bearing reciprocating compressor motor. A self-contained enclosure will now be a standard offering for certain frames which will allow a simple design for Ex-p (purge and pressurization) when required. It has easy access for air gap inspection that may be done by one person—which significantly reduces the time and equipment required for maintenance. As an option, these machines can be shipped fully assembled which allows for a quicker installation time.



For more information, please contact your GE sales representative.

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