Electrifying the Oil and Gas Industry
GE is helping the oil and gas industry meet the challenges of operating safely and efficiently in an increasingly demanding and regulated environment. Our highly engineered equipment enables you to make well-informed decisions.

We offer a full suite of integrated electrical and power data-management solutions to help you extract, deliver and process oil and gas more effectively.
Electrifying the oil and gas value chain

A century of industry achievements and technology breakthroughs to electrify processes from upstream to downstream

- High-power electrical drives
- Energy Management Systems
- High-speed and integrated compression solutions
- Intelligent control platforms
- Subsea electrification
- Predictive power asset analytics
Electrical solutions portfolio

GE’s expertise in mechanical and electrical design, engineering and execution delivers real value with our advanced solutions for oil and gas applications.

Electrical rotating machines
- Induction and synchronous motors
- Up to 100 MW
- Up to 20,000 rpm
- Gas and steam turbine generators
- High-speed stand-alone or integrated solutions

Variable frequency drives
- Voltage up to 13.8 kV
- Load Commutated Inverter or Voltage Source Inverter
- Air- or water-cooled

Electrification systems
- Protection and control
- Transformers
- Motor Control Centers
- Switchgear
- Data-management
- e-House modules

Services
A full range of services from extended warranty to long-term agreements covering full operations and maintenance
- 2,000-plus service engineers, technicians, fleet managers, and contract managers
- Locally operating from 150 locations worldwide
Subsea Solutions

GE’s comprehensive subsea offering is designed to help ensure very high reliability, lower maintenance and improved power consumption for continued and safer recovery of oil and gas from even the most hostile environments.

Our complete electrical subsea solution is based on more than 30 years of experience. It comprises variable speed drive systems, electrical motors and power management systems that help ensure efficient subsea processing for gas compression, pumping and power requirements.

We engineer and deliver fully integrated electrical power systems including:

- Connectors
- Subsea transformers
- Comprehensive LV/MV distribution
- VSD for compression and pumps
- Switchgear and power distribution
- High-speed motors for subsea compression
- Atmospheric enclosures
- Supporting studies

• High reliability, low maintenance
• Building on pilot project experience, 2,000-plus hours
• Tested and proven technology for extreme, deep offshore environments
• Global field support, reach and response

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Offshore Vessels

GE provides space-saving equipment and safety-enhancing features for exploration and production vessels, and creates solutions to enhance operational flexibility for support and service vessels.

We’re at work on drill ships, FPSO/FLNG and LNG carriers. We provide fully integrated solutions for power, propulsion, and control systems that address the need for significant fuel savings coupled with enhanced overall operational efficiency.

GE’s range of flexible products and systems includes:

• Power generation
• Electric propulsion
• Podded propellers
• Dynamic positioning
• Ship automation
• Drilling drives and control
• Asset management systems

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• Flexible engineering offerings with strong technical credentials
• Single-source approach to significantly relieve much of your technical and commercial risk
• Remote diagnostics and support system for increased availability of assets
GE has unique expertise in electrification and exhaustive knowledge of LNG processes. We offer a complete, single-source solution that helps deliver greater reliability, increased availability and higher efficiency for LNG operators.

Our extended electrical package covers all major LNG applications:

**Starter/Helper**
Increasing the power and efficiency of LNG refrigeration compressors, our converter-fed motors can be used as:
- **Starter** - starting the gas turbine by accelerating the shaft
- **Helper** - providing additional power as required
- **Generator** - regenerating the excess of power (automatic energy management)

**eLNG**
Complete solution to drive the main refrigerant compressors using electrical motors (synchronous and induction):
- Powered by high-power drives based on IGBT technology (for VSI) or thyristor technology (for LCI)
- Advanced shaft-line for higher performance
- Fully tested solutions including compressors, motors and drives to enable easy startup

**Micro LNG**
Complete solution based on integrated motor compressor (ICL) for small-scale LNG applications:
- Well-proven MGV high-speed induction motor
- Structured system based on MV7000/ MV4 series drives
- Easy installation and commissioning
- Emission- and oil-free environmentally friendly solution

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Transportation and Storage

GE’s high-performance solutions for gas transportation and storage provide efficient, safe and reliable operation. This allows for continuously high process availability for oil or gas pipeline applications, even in the harshest environments.

We offer a comprehensive motor and variable frequency drive portfolio associated with pumps or compressors, available with either fixed speed or variable speed configuration. Our solutions provide the complete flexibility required for process parameters (flow and pressure), with a consistent global efficiency rate upward of 90 percent.

Our range of motors includes high-speed motors up to 20,000 rpm, either integrated in compressor (ICL) or stand-alone configurations, providing high-efficiency with no gearbox, to more conventional solutions based on two-pole machines suitable for larger pipelines.

Complete equipment offering for transportation and storage including:

- Extensive range of electrical motors tailored for your application
- Complete range of MV variable frequency drives for high-efficiency, tailored to your specific configuration (air- or water-cooled, transformerless)
- Integrated e-House with MCC, transformer, switchgears and UPS, allowing local and remote control of the station
- Higher efficiency: transformerless solutions
- High speed: smaller weight and footprint
- Environmentally friendly and low emissions
- High reliability and low maintenance
- Local and remote control
Refinery and Petrochemical

To meet the harshest requirements of industrial processes, GE’s extended portfolio of downstream application products helps ensure high reliability and operational efficiency. We can offer the right solution of motors and drives to power all types of downstream processes, such as medium voltage motors for pump and compressor applications in refineries and petrochemical facilities.

Our solutions include:

- Smooth operation and low starting current
- Single supplier and broad solution ranges
- High reliability and low maintenance
- Low starting current allowing smooth startup with no power electronics, helping to ensure very reliable solutions
- Variable speed drives with simple, robust and well-proven design, based on advanced and reliable components. Different levels of redundancy are possible for significantly increasing uptime
- High torque induction machines to power hypercompressors for LDPE and HDPE applications that provide an integrated platform, achieving the highest compressor reliability and availability
- Complete solutions to replace aging steam turbines with electrical solutions. Our high-speed, no gearbox technology allows for easy replacement, even when faced with challenging constraints such as footprint

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Technology for tomorrow’s challenges
High-Speed Motor Technology

GE is a pioneer in developing high-speed, direct-drive technology. We offer a complete range of solutions to meet the most demanding speed, performance and capacity requirements for direct drives of pump and compressor systems in oil and gas applications including offshore, transportation and storage, LNG and turbine replacement.

Our high-speed motor design features greater overall drive system efficiency, offering significant energy savings due to removal of the gearbox and associated losses. Direct compressor coupling with the motor also makes the system more flexible and reliable, producing the same amount of power with less equipment than more conventional technologies.

Another key benefit is the reduced weight and footprint that allows easier integration into diverse environments. The motor is provided with either oil or active magnetic bearings. Magnetic bearings eliminate the need for lubrication, which further reduces the footprint and decreases the need for system maintenance.

Our motors can also be paired with GE’s centrifugal compressors as part of an integrated compressor line (ICL) package for exceptional reliability and availability, in a power range up to 20 MW, up to 15,000 rpm. This compact configuration allows reduced installation schedules and a more environmentally friendly approach with no gas emissions.

Our compact, high-speed solution has several important advantages specifically for offshore application:

- The absence of a gearbox cuts the total size of the motor drive train in half, saving critical space on an offshore platform.
- Active magnetic bearings allow operation without oil, improving safety by reducing the risks linked to fire exposure in platform operation.

Our ICL up to 20 MW, up to 15,000 rpm
- Stand-alone configuration up to 80 MW, up to 20,000 rpm
- Suitable for onshore and offshore applications

- Direct compressor coupling (no gearbox)
- Active Magnetic Bearings (oil-free solution)
- Up to 50 percent weight and 60 percent footprint reduction
- More reliable and flexible, with easier maintenance
- Environmentally friendly solution – no emissions
Turbine Replacement

Replacing existing gas or steam turbines in compression trains with an electrical motor can deliver more reliable and efficient operation with a wider operating range, lower maintenance and zero gas emissions.

GE can provide a complete electrical turnkey solution for all compressor OEM types that includes a global guarantee of the motor compressor shaft due to adequate torsional analysis.

Our proven experience in turbine replacement enables simple adoption to existing installations with no modifications needed for the compressor, and our compact, high-speed configuration is suitable for existing foundations with very limited modification to the lube oil or cooling auxiliaries.

Complete electrical turnkey solution including:

- Mechanical engineering study with global train guarantee
- Complete electrical engineering from network to shaft end
- Turnkey installation including removal of existing turbine and installation and commission of electrical drive
- Complete electrical scope with high-speed motor, variable frequency drive, e-House, cables and transformers
High-Power Electrical Capabilities

To drive the development of highly reliable technologies to meet more demanding requirements, GE is continually investing in high-power electrical drive technology.

Last year saw GE’s highest power installation with our 61 MW electrical motor and associated Variable Frequency Drive at the GE test bench facility in Massa, Italy. The combined electro-mechanical system design activity achieved smooth full power test execution and validation of both the Variable Speed Drive System and centrifugal compressor.

GE’s Variable-Speed Drive System has been specifically designed to test LNG train centrifugal gas compressor units at full load and under extreme speed, torque and dynamic response conditions. It is comprised of three step-down transformers connected to the electrical network and linked to three MV7000 VSI frequency converters in parallel (81 MW = 3x27 MW), feeding a 61 MW two-pole synchronous motor with two shaft ends.

Best-in-class technology

With our VSI frequency converter technology now successfully selected in global LNG projects, we are working on developing future technology for the LNG industry with the introduction of GE’s 80 MW two-pole induction motor. The 80 MW motor will complement the Massa testing facility, setting a new standard for large electrical drives with VSI frequency drive and induction motor.

Drive Technology

Building on GE’s extensive medium voltage drive family, offering a wide power range at various voltages, GE’s newest advanced air-cooled medium voltage drives offer efficient motor control that enables increased efficiency, accuracy and flexibility across a variety of oil and gas applications.

MV6 Series 500 kw to 5500 kw, 6/6.6 kv

The MV6 Series drive provides a flexible and effective approach using a simple power architecture to achieve low cost of ownership.

- **Flexibility, with simple power architecture**
  Our flexible, general purpose drive allows for a choice of input rectifier, either 36 pulse rectifier or active front-end input, to meet the most stringent harmonic distortion requirements.

- **Plug & play technology**
  The motor-friendly sinusoidal output makes it compatible with motor and cable standard insulation systems with three wire in and out cable connections, suitable for both new and retrofit applications.

- **Quick and easy to service**
  Multilevel medium voltage topology uses standard low-voltage IGBTs and modular building blocks for high availability, low maintenance costs, and quick and easy service.

MV4 Series 250 - 4000 kW, 2.4/3.3/4.16 kV

The MV4 Series variable frequency drive is a general purpose, multilevel PWM, voltage source inverter that offers a transformerless solution for higher-efficiency and low heat losses in a smaller size and weight.

- **Simpler, smaller and lighter with high performance**
  Our high-efficiency drive offers unity power factor, low heat losses, and low harmonics at VFD input and output in a small footprint without need of a transformer and external filters.

- **Modular ratings and a common building block with a la carte option packaging**
  Less spare parts and common building blocks for all frame sizes provide low cost of ownership, quick maintenance and power scalability in the field.

- **High availability and four-quadrant operation**
  Power channel bypass provides higher availability for critical processes, and four-quadrant operation offers regenerative braking and extra energy savings.
GE’s Energy Management System (EMS) provides real-time automation to manage the electrical power availability of industrial plants and eliminate production losses and safety concerns. Acting as an ‘antiblackout’ system for islanded plants (FLNG, FPSO, platform) and plants connected to non-reliable grids, GE’s Energy Management System helps to ensure excellent optimal load balancing at any time and under any circumstances.

**EMS is a hot redundant and integrated system for the full management of:**

- Power generation coordination, with load sharing between running generators, even if heterogeneous (gas turbine, diesel, waste heat recovery unit)
- Power distribution and control, with high-speed load shedding response time regardless of load number and location
- Supervision and data logging, with real-time handling for troubleshooting analysis efficiency
- Communication gateway between all external interface devices

**e-House**

GE’s e-House solution allows for a single-source supplier for the main electrical and auxiliary equipment for applications including offshore platforms, FPSO, onshore LNG and high-speed applications.

The GE solution for e-House combines proven knowledge with our solid and reliable experience. With full GE equipment installed and tested, and a single point of contact during project execution and aftermarket services, we offer complete support throughout the life of your operation.

**GE offers integrated modular e-Houses comprising of:**

- Full design, 3D modeling, structure analysis and fabrication
- Blast and fire resistance
- Lifting and transport design calculations
- Low- and medium-voltage panels and switchgears
- UPS, batteries and chargers
- Power and auxiliary transformers
- Variable Frequency Drives
- HVAC design and supply
- Redundant systems if required for UPS, batteries and HVAC units
- Fire and gas detection/extinction systems
- Normal/emergency lighting and power circuits
- Internal cabling, trays and termination of external cabling
- Air-tight doors and pressurization system
- Internal telecommunications
- Anti-blackout Energy Management Systems (EMS)
Dynamic Positioning

By applying our engineering intelligence, and understanding your maritime operations, we have evolved DP to the next level. The result: a new range of DP systems developed to deliver the reliability, efficiency and effectiveness you demand.

GE’s latest range of DP systems is a mariner-focused solution, enhancing situational awareness and rebalancing attention from system management to true seamanship. The DP system delivers unprecedented flexibility for effective maritime operations, with an energy-efficient nautical system to reduce operational costs and emissions.

Visor helps to improve productivity and availability through:

- Situational awareness
- Continuous logging and online expert support
- Advanced decision-making support
- Intelligent alarm and incident response
- Predictive maintenance
- Remote access capability

Remote Monitoring & Diagnostics

Visor Connect, GE’s remote diagnostic and support system, is based on highly secure satellite communications links. It enables our experts, regardless of their geographical location, to look over the shoulder of your onsite equipment operator or technician and advise and assist you on fault finding and resolution.

Additional features and benefits of GE’s DP system include:

- Modular approach allows flexibility and the ability to use the workstation as a stand-alone unit or to integrate within third-party consoles, saving space and complementing various bridge designs.
- Application-specific software provides individually tailored solutions designed to meet the exact operational requirements of each ship.
- Intuitive, easier and faster system navigation improves decision-making in routine, pressurized, and adverse operating conditions.
- Clear hardware and software upgrade path between old and new to guards against obsolescence of current DP models and helps to ensure access the latest features and facilities when required.

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We understand the vital importance of process availability - and our focus on service keeps us actively engaged, both when things are going right, and when they are going wrong.

Our Global Customer Service and Support Center is available 24/7, 365 days a year. Our spare management analysis allows us to work with you to define the best strategy according to the specificity of your application.

With a comprehensive global network of service field offices and repair shops, GE is uniquely positioned to provide the knowledge, experience and skills to take care of your equipment in a location close to you and help ensure a quick turnaround to your site.

We also provide managed system upgrade paths for our legacy systems and have significant experience in replacing systems from other manufacturers with low disruption to the existing infrastructure.

www.gepowerconversion.com