GE GT-7E.03
Proven, Reliable, Versatile Power
For more than 120 years, GE innovations have helped bring people and technology together to meet the needs of our customers everywhere. Today, more than 300,000 GE employees in more than 160 countries are continuing the tradition of transforming possibilities into reality, merging our global technological expertise with a diverse portfolio of products and services to help our customers near and far solve their challenges locally.

At GE Power & Water, our equipment and technology are used to generate a quarter of the world’s electricity every day. We work in all areas of the energy industry, including renewable resources such as wind and solar, biogas and alternative fuels, and coal, oil, natural gas and nuclear energy. We also develop advanced technologies to help solve the world’s most complex challenges related to water availability and quality. Operating more than 40 power plants in 17 countries, we provide customers with a broad array of power generation, energy delivery, and water process technologies, combining research, inspiration and foresight to predict—and create—the world of tomorrow.

And, as the world’s energy needs develop and evolve, GE Power & Water will be there—providing continuous improvement and operational excellence, with unyielding quality. This time-tested formula has delivered enhanced value to our customers for more than a century, and promises to keep delivering into the ever-changing energy future.
Energy, Uninterrupted

The global energy landscape is changing rapidly, and the energy needs of today may not be the energy realities of tomorrow. Power producers are seeking ways to respond to this uncertainty while positioning their businesses to adapt quickly to the changes that lie ahead. At GE, we look at the past and the present to help us understand the future, with the goal of providing our customers with the gas turbine technologies that enable them to respond to a wide spectrum of scenarios.

Just a few years ago, the scarcity of natural gas resources led to volatility in pricing and supply. Coal was an answer to this instability in regions with abundant coal resources. Then, shifting energy policies that focused on lowering emissions reduced the viability of coal as a long-term fuel source. Now, new reserves of natural gas have flipped the conversation back to an energy source that is cleaner than coal.

Less than a decade ago, oil and natural gas were viewed as “bridge fuels”—transitional fuels that would lead us to a nuclear-powered future—but recent global economic and environmental events have led to uncertainty surrounding the future of nuclear energy. Advancements in oil and natural gas recovery technology, liquified natural gas production, and gas turbine energy efficiency technologies are changing the status of oil and natural gas. Rather than short-term bridge fuels, these resources are being considered long-term “destination fuels,” and are becoming the major sources of a stable and reliable supply of electricity into the foreseeable future.

GE’s portfolio of gas turbines helps provide a sense of certainty in an uncertain world, delivering the operational flexibility and performance needed to adapt to the rapidly evolving energy environment. Whether you need to respond to volatile fuel prices, meet ever-tightening emissions standards, quickly add capacity to meet demand, make better use of available fuels, or integrate renewable energy sources into the power supply, a gas turbine from GE’s portfolio can help solve your unique and complex energy challenges today—and tomorrow.
Pioneering the World’s Gas Turbine Technology

As a company founded by innovators, GE was an early entrant into turbomachinery products, building upon our aircraft engine expertise to help pioneer the modern, industrial gas turbine. The first commercially sold heavy duty gas turbine used for power generation in the Western Hemisphere entered commercial operation in the United States at Belle Isle Station, Oklahoma, more than 60 years ago. That gas turbine generated electricity to power the industries, homes and critical infrastructure projects of a developing nation—and established an efficient and reliable architecture that would become the basis for today’s global power generation industry.

GE’s early gas turbines produced from 10 to 20 MW of power, and were generally used for peaking duty to supplement steam turbines that produced the bulk of the electricity at that time. And as the world’s population grew, its energy needs evolved, along with our gas turbine technology. Through research and investment, we expanded into a broader range of applications, developing larger units capable of producing increasing amounts of power in support of economic and industrial growth.

Today, GE has the largest installed base of any gas turbine manufacturer in the world. With a heritage of gas turbine engineering and manufacturing that spans more than half a century, and a reputation for anticipating as well as responding to global energy needs, GE can meet the energy demands of the future, just as it has helped shape the world’s power generation capabilities in the past.

GE continues to develop industry-leading technology for our 7E.03, 6B.03 and 9E.03 gas turbines. These robust machines are “right-sized,” burn many different fuels, have a competitively low installed cost, and operate with high reliability and availability in simple cycle, combined cycle, cogeneration and mechanical drive applications.

The GE fleet of more than 1,700 B- and E-class turbines has accumulated more than 50 million hours of dependable service around the world. GE consistently brings forth innovations that are focused on emissions control, availability, durability, output, performance and fuel flexibility—factors that are critically important to you.

Recent advancements include low single-digit NOX-emissions capability with the Dry Low NOX (DLN) 1+ combustion system, more durable materials, and feature changes that extend maintenance intervals. Targeted performance improvements have been made in output, heat rate and efficiency to enhance your bottom line and ensure that the machines are available and running when you need them. Still, other enhancements have improved the turbine control system and increased flexibility to process natural gas, low calorific value gaseous fuels, such as blast furnace gas and coke oven gas, and a wide range of liquid fuels, including light distillates and residual-containing oils.

Moreover, GE has taken the experience and lessons learned from our installed base to continually improve the machines’ economics over time, allowing us to reduce the amount and duration of maintenance. B- and E-class gas turbines are specifically engineered for cost-effective operations and maintenance throughout their life cycle.
Engineered for Reliability

Reliable, durable, and versatile, GE’s 7E.03 gas turbine is as integral a player in the energy industry today as it was when the first unit entered service more than 40 years ago. And, that unit is still in service today. With decades of continuing enhancements in output, efficiency and operational flexibility, you can count on GE’s 7E.03 gas turbine to provide the power you need, when you need it.

The gas turbine’s reliability springs from the simplicity of its durable architecture. GE’s 7E.03 gas turbine excels in peaking power applications, making it an excellent fit for the quick addition of supplemental power to compensate for the variability of the increasingly large mix of renewable energy coming online. Widely recognized for its ability to start on the first attempt nearly every time and come to full speed in a matter of minutes, GE’s 7E.03 gas turbine can keep your power and revenue streams flowing—uninterrupted. Plain and simple, the 7E.03 gas turbine is a durable and dependable “workhorse.”

Proven Durability

With more than 12 million hours of operation at reliability levels greater than 98 percent, GE’s 7E.03 gas turbine has proven its durability.

Our latest features include:

- Enhanced coatings that resist oxidation, erosion, and thermal shock for longer life
- Advanced materials in the combustor and power turbine to improve high temperature strength and increase inspection intervals
Industry-Leading Reliability

Gas turbine reliability is measured in two ways: 1) the percentage of time the turbine starts on the first attempt (starting reliability); and 2) the percentage of time the turbine continues running without failure (machine reliability). GE’s 7E.03 gas turbine excels by both measures. In fact, GE’s fleet of 7E.03 gas turbines is consistently 0.2 percent better in machine reliability than the competition. The high reliability is the result of rigorous and thorough testing in the factory and the field, ensuring improvements work before they are installed in your machine.

Improved Output and Efficiency

The latest upgrade, our Performance Improvement Package, includes enhanced sealing, advanced aero and more temperature capable materials. These carefully developed and thoroughly tested improvements have given the 7E.03 gas turbine an approximate 45 percent increase in output along with about a 10 percent increase in efficiency and an approximate 9 percent improvement in heat rate over the original turbine.

Fuel Flexibility

At GE, we recognize that fuel can be the largest cost in the operation of your gas turbine. Fuels that are readily available are not always “clean, natural gas.” That’s why we engineered our 7E.03 gas turbine to operate on more than 50 different fuels—gaseous fuels ranging from traditional natural gas to hydrogen to syngas, and liquid fuels ranging from light distillates to Heavy Fuel Oil (HFO). GE’s 7E.03 gas turbine also has tri- or dual-fuel capability, further enabling you to accommodate changes down the line.

Producing Power around the Globe

GE’s 7E.03 gas turbines operate in climates ranging from desert heat to tropical humidity to arctic cold.

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<th>60 Hz Simple Cycle Performance</th>
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<td><strong>Power Generation</strong></td>
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Normalized to Gas Turbine World conditions
Proven Power
Whether it's for fast power generation, raw horsepower for industrial and petrochemical processes, or steady, reliable output, customers throughout 60 hertz regions of the globe recognize that GE's 7E.03 gas turbines keep their operations running—so they can focus on running their business.

Simple Cycle
GE's 7E.03 gas turbine excels in peaking, baseload and cyclic duty operation. The unit can achieve up to 100 percent baseload in less than 10 minutes, delivering 89 MW of reliable power. Its low turndown capability allows the unit to stay online at low loads while remaining emissions compliant, enabling quick reaction to grid demands, and reducing fuel consumption and maintenance costs through fewer startups and shutdowns.

Combined Cycle
Although F technology is the predominant choice in today’s power generation industry, there are scenarios where the unique characteristics of the 7E.03 gas turbine can enable efficient and economic combined cycle or cogeneration operation. An example of the former is the ability to run in combined cycle operation on heavy liquids. An example of the latter is a cogeneration application in the Middle East, where the exhaust energy profile and high mass flow from the machine enhance steam production versus the electricity generation, which is the revenue source for the application.

These lower-cost fuels can be challenging, but the 7E.03 gas turbine creates value because it can turn them into revenue-generating kilowatt-hours.

Mechanical Drive
For upstream and midstream oil and gas extraction and processing, the 7E.03 gas turbine delivers more than 100,000 shaft horsepower to power mechanical equipment. Its high reliability and medium size provide the right combination of output and versatility to continuously generate power even in the most inhospitable environments.
Using a 17-stage axial-flow bolted compressor with one row of inlet guide vanes, combined with 10 can annular chambers and three high-efficiency turbine stages, GE’s 7E.03 gas turbine offers the right combination of robust architecture and performance.

**7E.03 Gas Turbine Compressor**
Key improvements over time have made the compressor more durable and extended the operating life of its parts. For instance, replacing the stage 1–8 compressor blades and stator vanes with upgraded material have made those components corrosion-resistant and much stronger.

**GE’s DLN1+ Combustion System**
The 7E.03 gas turbine offers several types of combustion systems depending upon your specific need. There is the standard combustor, predominantly utilized for heavy liquid applications, the Multi-Nozzle Quiet Combustor (MNQC) used for industrial applications, and the suite of DLN combustion systems that provide compliant operation on gas, liquid or dual fuel where emissions regulations dictate low, single-digit levels without abatement by other processes, such as selective catalytic reduction.

**The History of GE’s DLN Technology**
GE invented DLN technology more than 30 years ago when environmental regulations limiting emissions from power generation were first issued. GE was at the forefront of developing the gas turbine combustion technology that brought our customers into compliance.

Our E-class fleet has logged more than 30 million DLN-fired hours, with over 400,000 fired hours at sub-5 ppm (≤10 mg/Nm³) NOx emissions.

GE’s first DLN system was successfully field tested more than 30 years ago. Drawing from field experience, we continued to improve the system’s capability through investment, testing, and refinements and finally introduced the DLN1+ combustion system in 2006. Specifically engineered for E-class gas turbines, GE’s DLN1+ combustion system is one of the most advanced gas turbine combustion systems available, capable of achieving sub-4 ppm NOx emissions, the lowest in the industry today. This capability qualifies this product for GE’s ecomagination® portfolio of products which provides “greener” more sustainable and environmental-friendly solutions and products for customers worldwide.

**DLN1+ Technical Features and Benefits**
- Reengineered transition pieces
- Enhanced fuel nozzles
- Improved materials for durability and strength
- More uniform loading and wear on components
- Improved aerodynamics and lower emissions

**Environmental and Economic Benefits**
- Guaranteed NOx emissions of 4 ppm or lower
- Reduction of annual NOx emissions by 67 percent (compared to a DLN system) —equivalent to the annual NOx emissions of 8,300 cars on U.S. roads
- Single-digit CO emissions on natural gas at baseload
- Eliminates the need for water and steam/water injection costs associated with other NOx control systems

**Power Turbine**
The power turbine translates thermal energy into mechanical work and the 7E.03 gas turbine has proven its “mettle” since its introduction.

While focusing on performance improvements in output and efficiency, we balance those upgrades with maintaining or improving durability of the components—keeping both sides of the balance sheet healthy. Upgrades are available tailored to the multiple operational profiles of the 7E.03 gas turbine. For example, we have an open stage 1 nozzle for customers utilizing more challenging liquid or low BTU fuels which improves output up to 3 percent.

Our stage 2 bucket is suitable for all operational profiles. Changes from previous versions have improved its output up to 2055°F Tfire and its durability up to 72,000 hours, while honeycomb seals have enhanced its performance. These types of improvements have improved the operation and increased the flexibility of the power turbine.

**Strengthening your Bottom Line**

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**Strengthening your Bottom Line**
Fuel Flexibility Technology

Fluctuating fuel prices, security of supply, and emissions constraints can all affect your ability to generate power, and revenue. Fortunately, technology from GE has been helping customers overcome these obstacles for decades. In fact, GE has been an industry leader in gas turbine fuel flexibility for more than 50 years. GE offers the broadest fuel flexibility portfolio in the industry, and has proven gas turbine operation using more than 50 different fuels that range from heavy fuel oil to waste gases from industrial processes.

GE’s 7E.03 gas turbine is one of the most fuel flexible gas turbines in operation today, enabling you to burn available “fuels of opportunity” with limited or no impact to performance. In addition to natural gas, the 7E.03 gas turbine can operate on:

- Hydrogen
- Ethane
- Propane
- Butane
- Olefins
- Propylene
- Heavy Fuel Oil (HFO)
- Coke Oven Gas (COG)
- Ethane
- Olefins
- Heavy Fuel Oil (HFO)
- Coke Oven Gas (COG)
- Propane
- Ethylene
- Distillate Oil

GE’s fuel flexibility can keep your plant emissions compliant and your bottom line in check, while allowing you to use the fuels that best suit your business priorities.
GE’s OpFlex* Solutions: Empowerment Redefined

Fluctuating industry conditions. Rising fuel costs. Emerging renewables. Fast-changing environmental regulations. With so much out of your control these days, it just makes good economic sense to control the things you can. OpFlex Advanced Control Solutions from GE give you unprecedented control of your 7E.03 gas turbine, empowering you to capitalize on new opportunities, fend off the competition, and improve capacity, all while protecting your current revenue stream. Using advanced control platforms originally developed for GE’s Aviation business, our suite of OpFlex Ready, OpFlex Advantage, OpFlex Balance, and OpFlex Reserve “apps” are configured specifically to enhance the operational flexibility of your 7E.03 gas turbine. From startup to peakload to turndown, OpFlex solutions give you the power to respond to real challenges in real time.

OpFlex Solutions for GE’s 7E.03 Gas Turbine

OpFlex Ready – for fast, reliable, repeatable startups
OpFlex Ready: 7E.03 Fast Start App - enables fast starts up to 100 percent baseload in less than 10 minutes

OpFlex Advantage – for efficient, reliable plant capacity
OpFlex Advantage: 7E.03 Low-NOx Variable Peak App - increases output up to 5 percent with sub-9 ppm NOx on hot, humid days when peak power demand is at a premium, while also providing the flexibility to manage the maintenance impact of peak firing
OpFlex Advantage: 7E.03 HFO Availability App - extends availability and lowers maintenance costs when operating on HFO by automating the water wash system, reducing water wash downtime, and increasing performance between washes by slowing the output degradation rate by up to 25 percent

OpFlex Balance – for efficient, reliable responsiveness
OpFlex Balance: 7E.03 AutoTune App - automates a traditionally costly and time-consuming manual DLN re-tuning process, extending availability while maintaining year-round emissions compliance
OpFlex Balance: 7E.03 AutoRecover App - enables automated recovery from DLN primary re-ignitions (PRIs) without load interruption, significantly reducing emissions levels and maintenance costs while staying online

OpFlex Reserve – for low emission, reduced fuel-use turndown
OpFlex Reserve: 7E.03 Turndown App - enables operation at lower load levels while maintaining low emissions, reducing fuel costs to stay online, and reducing maintenance costs through fewer startups and shutdowns
GE's Greenville Manufacturing Facility

The World's Largest Gas Turbine Manufacturing Facility

Established more than 40 years ago, GE's heavy-duty gas turbine manufacturing plant, located in the United States in Greenville, South Carolina, is the largest and one of the most technologically advanced gas turbine engineering and production facilities in the world. Taking gas turbine production to the next level, the 413-acre site houses more than 1.5 million square feet of manufacturing space, as well as GE's Gas Turbine Test Facility—one of the world's leading turbine combustion laboratories. With continual site expansion and investment in the latest engineering and production techniques, the Greenville site has become an industry leader in core turbine technology development, including blades, rotors, buckets, nozzles, combustion hardware, and materials. The Greenville site employs more than 3,400 people, including some of the world's leading experts in high-temperature materials, aerodynamics, compressor technology, and advanced engineering analytics.

The Greenville site is also home to GE's full-speed, full-load test stand facility, currently the largest, most comprehensive gas turbine validation system in the world. The sophisticated facility can test a production gas turbine under "real-world" conditions prior to shipment, validating its performance and reliability.

- Full speed, full load testing
- Full characterization under replicated plant conditions
- Full compressor mapping and validation
- Gas and liquid fuel capable

GE Global Research

GE Global Research centers are one of the largest and most diversified industrial research organizations in the world. GE Global Research includes two Nobel laureates in its history and has been a cornerstone of GE technology for more than a century. The best and the brightest develop breakthrough innovations in energy generation, jet engines, nanotechnology, medical imaging, and diagnostics, advanced propulsion, electronic systems, and alternative energies. Employing experts from virtually every scientific and technical discipline, GE Global Research applies cross-discipline expertise to provide innovative technologies to our customers across the world.

Headquartered in the United States in Niskayuna, N.Y., GE Global Research also has facilities in Bangalore, India; Shanghai, China; Munich, Germany; and soon to come in Rio de Janeiro, Brazil.

- GE Global Research Headquarters - The 525-acre site in Niskayuna, N.Y., is home to more than 2,800 scientists, researchers, and engineers specializing in alternative energies, nanotechnology, biosciences, and electronic systems.
- GE Global Research – Europe - Located in Munich, Germany, focuses on automated manufacturing of composite parts, waste heat recovery for industrial and power applications, grid integration of renewable energies, molecular imaging and diagnostics, high-power electronics, and advanced compressor technologies.
- GE Global Research – Latin America - Rio de Janeiro, Brazil
- The John F. Welch Technology Center – Located in Bangalore, India, GE's largest research facility outside the U.S. focuses on electromagnetic analytics, composite materials, non-destructive evaluation, corrosion technology, molecular modeling, computational fluid dynamics, and engineering analysis.
- GE China Technology Center (CTC) – CTC focuses on power electronics, advanced manufacturing techniques, process sensing and control, medical imaging technologies, materials science, chemicals science, and materials characterization and analysis. The center is located in Shanghai, China.
- GE Global Research – Europe - With approximately 200 employees, GE Global Research – Europe, located in Munich, Germany, focuses on automated manufacturing of composite parts, waste heat recovery for industrial and power applications, grid integration of renewable energies, molecular imaging and diagnostics, high-power electronics, and advanced compressor technologies.

A fifth GE Global Research site, scheduled to open in Rio de Janeiro, Brazil, will focus on innovations in biofuels for aviation and natural gas-powered locomotives, as well as intelligent systems to provide advanced automation and diagnostics for the power industry.

GE Fuel Research Center: Dhahran, Saudi Arabia

GE is focused on improving the use of alternative fuels to help increase fuel efficiency and decrease consumption in power plant and refinery applications. This research center supports the Kingdom's initiative to develop a sustainable energy future.
Putting All The Pieces Together

GE’s Global Projects Operation (GPO) delivers flexible project solutions based upon our unsurpassed domain expertise to more than 3,000 customers with complex energy and water projects in more than 100 countries on six continents. GPO pulls together project management, project engineering, system integration, planning, logistics, construction management commissioning and startup teams to manage project-specific regional, operational and site conditions.

GPO is the coordinator and communicator of GE’s project activities with all the project stakeholders—customers, Engineering, Procurement, and Construction (EPC) companies, architects, engineers, and suppliers. The big-picture view that GPO brings to the project integrates many facets—including risk management, project structuring, plant architecture and project execution—so the whole is more than the sum of these parts, and results in project success.
Realize the Full Value of Your Investment

To fully realize the return on your investment, you need support services that are as versatile and powerful as your new turbine. From planning and installation through ongoing operation, maintenance, and upgrades, GE provides professional services backed by expert engineering, OEM knowledge and operational know-how. With more than 60 years of experience in gas turbine engineering and maintenance, GE can help you protect your investment and increase your turbine’s long and productive life cycle. No one knows your 7E.03 gas turbine better than we do, and no one is better equipped to provide all the services you need to achieve your operational goals.

- Financial risk modeling
- Power economics
- Power systems engineering
- Installation advisory services
- Site mobilization
- Performance testing
- Spare parts inventory management
- Operations & Maintenance (O&M) advisory services
- Training and personnel development
- Maintenance and outage agreements
- Performance agreements
- Asset upgrades
- Control systems integration and optimization
- Asset repurposing/retirements

Extend Availability and Output with GE’s Asset Life Management

With multiple offerings that can be tailored to meet your specific needs, GE provides one of the broadest and most flexible asset life management programs in the industry. Our gas turbine specialists will help you pinpoint the asset life solutions best suited to strengthen your site’s operational reliability while expanding output. Turbine, compressor and unit rotors can be replaced or rebuilt, depending on your needs, business strategy and operating budget. Coupled with parts upgrades including stator blades, our solutions are engineered to extend the life of your assets whether you need starts-based or hours-based durability.

Rotor Life Extension

GE’s Rotor Life Extensions program can help ensure that your 7E.03 gas turbine’s rotor performs effectively throughout its life. Drawing on millions of hours of fleet experience along with the engineering knowledge that only the OEM possesses, GE can help you plan and schedule rotor inspections with the flexibility to meet your operational and budgetary requirements. Through a comprehensive program of ultrasonic testing and eddy current, dimensional, and magnetic/fluorescent penetrant inspections, we can tailor unit-specific life extension solutions based on your particular needs. This includes single interval life extension solutions for starts-based operation or single or multiple life extension solutions for hours-based operation.

Customized Turbine Upgrades for Improved Performance and Value

As industry dynamics shift, GE can help you respond to a variety of changing conditions with a set of comprehensive gas turbine upgrades tailored to your operational needs. A Valpak solution enables you to architect the GE innovations that better position you to respond to distinctive industry demands while maintaining high-performance operation. By blending technology and component upgrades, Valpak solutions can help you achieve your business goals while meeting operational demands, including:

- Output increase
- Efficiency improvement
- Emissions reduction
- Flexibility expansion
- Cost reduction
- Revenue enhancement
- Reliability extension
GE’s 7E.03 Gas Turbine: Reliable, Durable, Engineered to Evolve

GE’s 7E.03 gas turbine has been supplying customers around the world with reliable power in a wide range of applications for more than 40 years. Its uncomplicated yet durable architecture allows it to continually evolve alongside the rapidly changing energy demands of a rapidly changing global economy. With its medium size and combination of fuel flexibility, low emissions, high exhaust energy-to-power ratio, and more than 12 million hours of industry-leading availability, GE’s 7E.03 gas turbine is still the “go to” machine for your power generation needs.

Our Commitment

At GE, solving your toughest challenges is the central focus of our business. With our constant commitment to quality and innovation, we will continue providing the most advanced products and services to power the world responsibly. From our ecomagination-qualified DLN+ combustion system to our fleet of gas turbines, we are developing and investing in breakthrough ideas to help you grow your bottom line—and power a cleaner and more productive world.
To find out more about this offering, contact your GE Power & Water sales representative or visit www.ge-energy.com