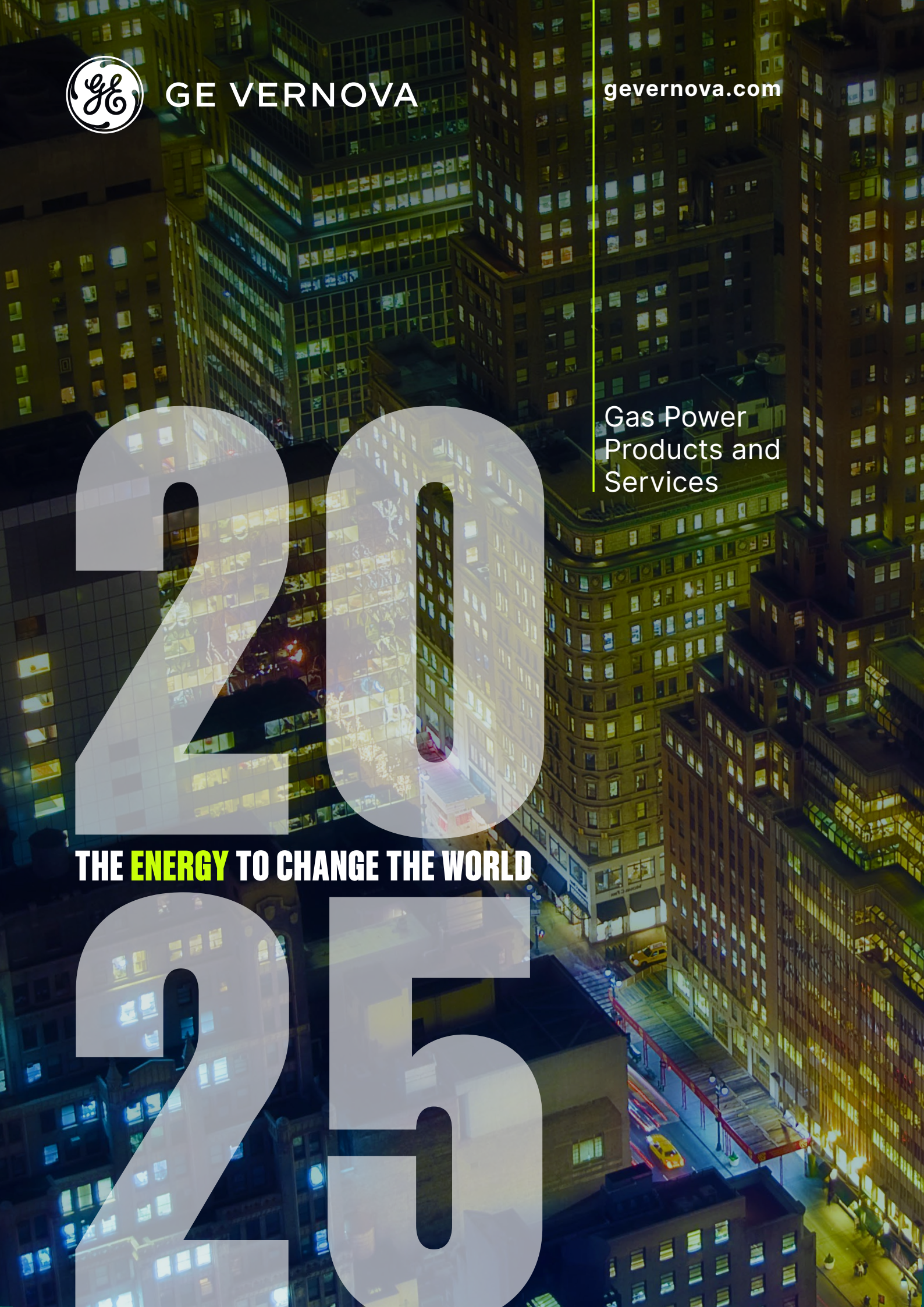

GE VERNOVA
gevernova.com
Gas Power
Products and
Services
2025
THE ENERGY TO CHANGE THE WORLD

THE ENERGY OF CHANGE

In an era of unprecedented energy transformation, GE Vernova's mission to electrify and decarbonize the world is more vital than ever. Our cutting-edge products and services are essential in meeting global electricity demands while also advancing decarbonization goals. Beyond meeting increasing energy demands globally, gas-fired power generation is also integral to stabilizing the grid and further facilitating the integration of renewable energy sources.

At GE Vernova, our Gas Power technology is uniquely positioned to significantly contribute to cleaner power generation through advanced pre- and post-combustion solutions. This catalogue showcases our latest technologies and services, crucial for reducing emissions in the gas fleet and addressing the industry's dynamic challenges, empowering our customers in their energy transition journey.

Safety, **quality** and **delivery** are the pillars of our operations. We strive to be the partner of choice in navigating this transformative era, committed to raising the bar for ourselves and alongside our partners, while building trust and collaboration.

Together, we have the **energy of change**.

Eric Gray
President & CEO
Gas Power
GE Vernova

GE VERNOVA'S COMMITMENT TO TEAM MEMBER SAFETY

At GE Vernova safety is a commitment we share with all our team members and service partners. These Life Saving Rules were developed to help the industry implement stronger safety protocols and protect lives in dynamic, high-risk environments.

MECHANICAL LIFTING

Plan the lift, control the area, and stay clear of moving and lifted loads

WORK AT HEIGHT

Assess, prevent, and protect against falls from height

DRIVING SAFETY

Plan your journey, focus on driving, and stay alert

LINE OF FIRE

Keep yourself and others out of the line of fire

WORK AUTHORIZATION

Assess risk, apply controls, and obtain authorization before starting work

CONFINED SPACE

Assess risk, control hazards, and obtain confined space permit

ENERGY ISOLATION

Isolate and verify zero energy before work begins

LIVE ELECTRICAL

Apply controls and meet boundary access requirements

FIRE AND EXPLOSION

Control ignition sources and eliminate fire and explosion risk

WE START WORK ONLY WHEN IT'S SAFE, AND STOP WHEN IT'S NOT.

CONTENTS

OUR PORTFOLIO OF BUSINESSES

~75K EMPLOYEES IN 100+ COUNTRIES

POWER

GAS POWER

We engineer cleaner, more accessible energy that people depend on, powering growth and prosperity everywhere.

- Heavy Duty Gas Turbines
- Aeroderivative Gas Turbines
- Steam Turbines/ Generators/ HRSGs

STEAM POWER

Helping customers deliver reliable power as an energy transition company.

- US Nuclear, Global Coal
- Steam, Generators, Boilers

HYDRO POWER

Advanced technologies that harness the power of water to help deliver reliable power.

- Hydro Turbines/ Generators
- Pumped Storage

NUCLEAR POWER

Innovative nuclear technologies that can help deliver power with less carbon emissions to the world.

- Boiling Water Reactors
- Fuel
- Small Modular Reactors

ELECTRIFICATION

GRID SOLUTIONS

We electrify the world with advanced grid technologies and enable the energy transition. We help solve electrification challenges critical to energy transition and energy security.

- Transmission
- Transformers
- Grid Automation

ELECTRI-FICATION SOFTWARE

The energy transition cannot happen without software. Only software can solve the complexity, manage interconnected systems, utilize data at exponential scale, and support more sustainable real-time decisions under uncertainty.

- Grid Software: – Opus One Platform
- Manufacturing
- Power and O&G

POWER CONVERSION & STORAGE

As innovators in advanced energy conversion and storage systems, we empower our utility and industrial customers by solving their most challenging electrification problems and accelerating their transition to a sustainable, decarbonized future.

- Power Stability
- Energy Storage
- Industrial Electrification

WIND

ONSHORE WIND

We lead with workhorse products and drive decarbonization‡ through reliable, affordable, sustainable, renewable energy.

- 2 – 3.5 MW Platform
- 5 – 6 MW Platform
- Services & Repowering

OFFSHORE WIND

Focusing on execution excellence, we are committed to help deliver quality, cutting edge technology for our customers. Our strength is the motivated and passionate people working for our business; always with unyielding integrity.

- Haliade-150 (6 MW)
- Haliade-X (14 MW)

WIND TURBINE BLADES

Together, we capture the wind to power a cleaner world.

- ONW Blades
- Haliade X Blades

ACCELERATORS

FINANCIAL SERVICES

Our specialized expertise and access to money enable energy transition projects.

- Third Party Financing Support
- Direct Financing though Equity

ADVANCED RESEARCH

Bringing research to reality ... Energy innovation to change the world.

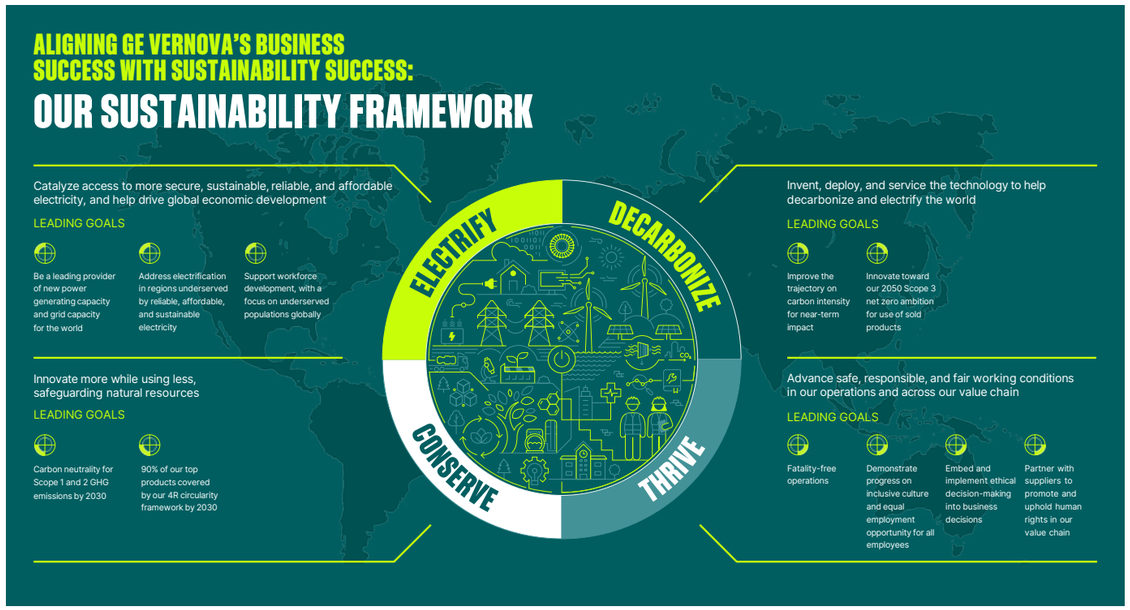
- Differentiated Technologies
- External Collaborations

CONSULTING SERVICES

We enable more reliable, economic and more sustainable energy systems that power the world.

- Power Segment Assessments
- Investment Decision Analysis

SUSTAINABILITY



Building a More Sustainable Electric Power System

As a newly independent global leader in the electric power industry, GE Vernova's purpose and mission to electrify and decarbonize the world has never been clearer or more urgent. Our planet and communities are feeling the increasing effects of a changing climate, geopolitical unrest, and the urgent global need to build a more sustainable electric power system. GE Vernova is well-positioned to play our role as our society responds to these generational imperatives and seeks to fundamentally change the arc of climate change.

GE Vernova's Sustainability Framework comprises four pillars – Electrify, Decarbonize, Conserve, and Thrive – each with leading goals that progress our objectives to electrify and decarbonize the planet, conserve natural resources, and support communities where everyone can thrive.

Gas Power

GE Vernova's Gas Power business develops and services advanced, efficient natural gas power technologies, that aim to help electrify a lower carbon future. It is a global leader in gas turbines and power plant technologies and services with the industry's largest installed base.

Whether generating power for cities, electrifying customer operations, or emergency and temporary power generation, our portfolio of solutions provides a wide range of products and services. From high efficiency heavy-duty gas turbines to aeroderivative gas turbines, our technologies offer expanded fuels capacity and can support system stability by balancing the intermittency of renewables and providing reserve capacity, frequency, and voltage regulation to improve grid reliability. GE Vernova's Gas Power business offers combustion technologies, hardware, and controls to help our customers utilize a broad range of gas turbine fuels – including Hydrogen, and breakthrough solutions, such as Carbon Capture & Storage (CCS).

Guiding Principles

IMPACT

GE Vernova's sustainability programs focus on where we can have the most impact as a company: electrifying and decarbonizing the planet. We prioritize our efforts by focusing on the impact opportunities that align most closely with our mission and purpose.

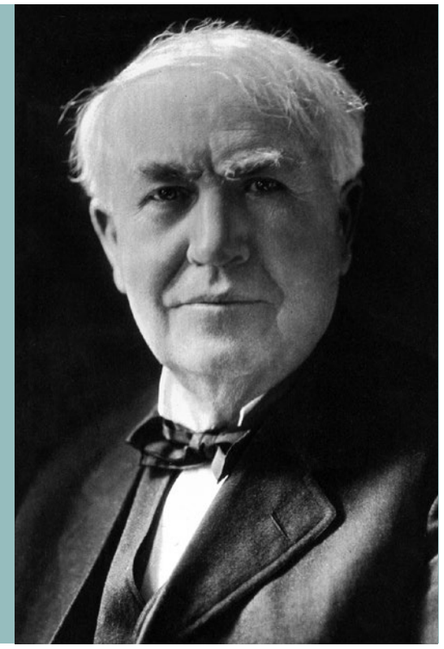
PRAGMATISM

We are relentless in our pursuit of success as a leading sustainability company with a pragmatic approach that prioritizes our purpose and practical long-term strategy improvements. We specifically look to align our business success with success for our Sustainability Framework and its leading goals, knowing that these two things can, and must, complement each other.

CREDIBILITY

Credibility is our North Star in all our sustainability efforts and communications. While we are passionate about our purpose, we aim to be objective in how we communicate our performance. This includes a commitment to continuous improvement – communicating both what is working well and where we need to do better.

> I FIND OUT WHAT THE WORLD NEEDS. THEN I GO AHEAD AND TRY TO INVENT IT.
>
> *– Thomas Edison*



INDUSTRY OVERVIEW

A Power Industry in Transition

Today's power industry is not only focused on electricity demand growth amidst a transition to cleaner energy but also recognizes that energy security needs are a major theme of both present day and future scenarios. It is a critical component in both national policy and international relations, influencing economic stability, geopolitical strategies, and the transition to sustainable energy systems. Energy security not only encompasses things you would come to expect like reliability, affordability, and sustainability, it also means diversification, or reducing dependency on specific energy sources or suppliers by varying the energy mix. Finally, building capacity to withstand and recover from disruptions caused by natural disasters or market fluctuations also becomes an important element of a secure energy future.

A continued challenge facing the world today is that more affordable, reliable, and sustainable energy is critical to growing economies and is fundamental to the quality of life in the modern world. According to the International Energy Agency (IEA) almost 750 million people lack access to reliable electricity today. To help solve for this, the gas power industry is currently navigating a complex landscape shaped by several key factors:

1. **Energy Transition:** As the global focus shifts towards cleaner energy sources, the gas power sector remains a critical dispatchable energy source. Natural gas is considered a relatively cleaner fossil fuel compared to coal and oil, and it plays a crucial role in balancing intermittent renewable energy sources like wind and solar.
2. **Electricity Demand Growth:** After decades of modest growth, electricity demand is projected to accelerate due to local manufacturing, industrialization, data centers and electric vehicles.
3. **Technological Advancements:** Innovations in gas turbine technologies and efficiency improvements are enhancing the competitiveness of gas power. Advanced technologies are enabling more efficient and flexible gas power plants that can quickly respond to changes in energy demand.
4. **Industry Dynamics:** The demand for natural gas is influenced by regional segment dynamics, including the availability of resources, infrastructure development, and government policies. In many regions, gas is viewed as a critical component of energy security and diversification strategies.
4. **Decarbonization Efforts:** The industry is under pressure to reduce its carbon footprint. This is driving investments in carbon capture, utilization, and storage (CCUS) technologies, as well as efforts to blend hydrogen with natural gas to lower emissions.
5. **Regulatory Environment:** Government policies and regulations aimed at reducing greenhouse gas emissions are informing the future of the gas power industry. Incentives and support for lower-carbon technologies are influencing investment decisions.

Growth of Natural Gas

- **Electricity demand growth due to manufacturing, industrialization, data centers, and electric vehicles**
- **A cleaner alternative to coal**
- **Expansion of liquefied natural gas (LNG) facilities, pipelines, and infrastructure**
- **International trade of LNG has expanded**
- **Government policies aimed at improving grid stability while reducing carbon emissions support natural gas generation**
- **Often favored for its cost-effectiveness and reliability**

Supply and Demand

According to IEA World Energy Outlook 2024, fossil fuels most recently provided 60% of global electricity supply, which was their lowest share of the total in the past 50 years. While coal accounted for 36% of fossil fuels, natural gas was also significantly relevant at 22%. Nuclear power declined to a 9% share, half as much as global nuclear power 30 years ago.

In the IEA's Stated Policies Scenario renewables will likely play a much larger role in electricity supply over the next decade and beyond. Wind and solar PV combined generation nearly triples from 2023 to 2030, accounting for over 90% of electricity growth. This scenario overtakes coal which peaks around 2025 and then starts to decline. By 2035 renewables is expected to provide over 40% of electricity generation, based on assumed factors such as modernized grids and expanded energy storage solutions. From a fossil fuels perspective natural gas is also expected to increase this decade.

From a demand perspective global electricity needs most recently rose by more than 2.5%, a rate similar to the average over the past decade according to IEA. Their Stated Policies Scenario indicates the average annual electricity demand growth accelerates to 3.3% from 2023 to 2030. Most of the demand increase since 2013 has been from China followed by India, the Middle East, and parts of Southeast Asia. In other countries economies the adoption of electric vehicles drives significant electricity demand. Air conditioning, appliances, and the ever-increasing power demands of artificial intelligence and data centers are responsible for increased electricity needs.

A Powerful Combination of Gas Power and Renewables

Although renewables are the fastest growing source of both new capacity and generation, their deployment is simply not occurring at the pace and scale needed to effectively reduce CO_2 emissions from the power sector. More is needed to dramatically reduce the amount of coal generation globally.

New sources of abundant and affordable natural gas have driven the economic shift from coal to gas in several regions. Natural gas-fired combined cycle power plants are the lowest emitting fossil fuel power plants, whether measured based on CO_2, SOx, NOx, particulate matter, or mercury. With less than half the CO_2 emissions of coal, natural gas is already contributing significantly towards decarbonization.

Viewed separately, renewables and gas generation technologies each have merits and challenges as a means to address climate change, and optimum solutions will differ regionally. Such solutions will depend upon factors such as fuel availability and security, land use constraints, renewable resource availability, and the emphasis a particular region places on climate change. Together, their complementary nature offers tremendous potential to help address climate change with the speed and scale the world requires.

	Wind, Solar & Storage	Gas Power
Fuel	Limitless, free fuel that is variable	Flexible, dispatchable power whenever needed, utilizing abundant and affordable natural gas or LNG
CO_2	Carbon-free generation	Less than half the CO_2 of coal generation with a pathway to future conversion to lower or near-zero carbon with hydrogen and Carbon Capture and Sequestration (CCS)
Cost	Competitive Levelized Cost of Electricity (LCOE) with no lifecycle uncertainty (mostly CAPEX)	Competitive LCOE with lowest CAPEX, providing affordable, dependable capacity
Dispatch	Dispatched first in merit order...extremely low variable cost	Most affordable dispatchable technology...fills supply/demand gap
Peaking	Battery storage economical for short duration peaking needs (<8 hour, intraday shifting)	Gas economical for longer-duration peaking needs (day-to-day and weather-related extended periods)
Capacity Factors	25% – 55% capacity factors based on resources (wind and solar often complementary)	Capable of >90% capacity factors when needed, can operate at lower capacity factors depending on variable costs & renewables penetration
Land	Utilizes abundant land with good renewable resources (multi-purpose land use); Offshore wind is not constrained	Very small physical footprint for dense urban areas with space constraints
Hybrid Solutions	Extends renewable energy to align with peak demand	Target less carbon intensive spinning reserve peaking plants using onsite battery storage

Gas Power Enables More Renewables

Natural gas-fired power generation is flexible and dispatchable. Plants can come online quickly, adjust power output level, and turn down to a very low output level to balance supply and demand as needed. They can help deliver more power or less as supply and demand for electricity vary throughout the day, over the course of a week or month, and seasonally—whenever required. This flexibility is especially important to maintain grid stability as more non-dispatchable wind and solar resources are deployed.

Gas-fired power plants are available regardless of the time of day or weather conditions, providing dependable capacity as long as needed, whether for minutes, hours, days or weeks at a time. Wind and solar power are available when the wind is blowing or the sun is shining. The availability of wind and solar resources does not always coincide with demand. Because electricity supply and demand must always be in balance, renewables require dispatchable backup power such as natural gas power plants or batteries to help ensure system reliability.

GE Vernova believes in and promotes additional renewables capacity, augmented where needed with natural gas generation to provide system flexibility and dependable capacity, as the most effective near-term action to help decarbonize the energy sector.

On a global scale, replacing coal with a combination of variable renewables and batteries plus dispatchable gas can yield greater carbon reduction than renewables alone. An analysis done by

GE Vernova and summarized in the following figure considers the real-time balancing of power supply and demand using a hypothetical coal plant as an example.

Because of the variable nature of wind and solar energy, and lower capacity factors for these technologies, a direct replacement of coal with wind and solar would eliminate approximately 25% to 45% of the coal CO_2 emissions. That said, the coal plant would still need to provide energy, and thereby emit CO_2, when wind and solar are not available.

Replacing the coal plant with natural gas alone would reduce CO_2 emissions by approximately 50% to 60% for 100% of the time due to the lower CO_2 intensity of natural gas.

Replacing the coal plant with a complementary mix of wind and solar plus natural gas, however, enables the renewables to provide zero-carbon energy whenever they are available, with combined cycle gas turbine plants making up any remaining energy needs. This results in an approximate 62% to 78% reduction in overall system CO_2.

Replacing the coal plant with a complementary mix of wind, solar, and four-hour batteries, plus natural gas, enables the wind, solar and batteries to provide zero-carbon energy for 35% to 50% of the time, with combined cycle gas turbine plants making up any remaining energy needs. This maximizes the energy from the renewables sources and results in an approximate 68% to 80% reduction in overall system CO_2.

Another key element of the role gas turbines can play in the path towards decarbonization is their ability to move toward lower CO_2 emissions through carbon capture or burning hydrogen as a fuel. Both of these options are possible for new-build power plants or on a retrofit basis for existing plants.

Potential for Reducing Coal Emissions by Using Renewables Plus Gas Power

CO_2 Reduction Potential

Coal → Wind + Solar PV = 25–45%

Reduces 100% of the carbon... 25–45% of the time...
coal must run when wind and sun are not available based on average capacity factors

Coal → Combined Cycle Gas = 50–60%

Reduces 50–60% of the carbon...100% of the time...
gas runs baseload and the coal plant can be shut down

Coal → Wind + Solar PV + Combined Cycle Gas = 62–78%

Renewables reduce 100% of the carbon...25–45% of the time...
and gas reduces 50–60% of the carbon the rest of the time.

Coal → Wind + Solar PV + Battery + Combined Cycle Gas = 68–80%

Renewables plus 4-hr batteries reduce 100% of the carbon...35–50% of the time...
and gas reduces 50–60% of the carbon the rest of the time

Replacing baseload coal with a combination of renewables and gas can yield the quickest carbon reduction at scale.

Note that CAPEX and required land are not addressed in the above analysis.

> ON A GLOBAL SCALE, REPLACING COAL WITH A COMBINATION OF VARIABLE RENEWABLES AND BATTERIES PLUS DISPATCHABLE GAS CAN YIELD GREATER CARBON REDUCTION THAN RENEWABLES ALONE.

Getting the Most From the Global Installed Base of Gas Turbines

The global installed base of power generating capacity currently contains approximately 1200 GW of combined cycle and 300 GW of simple gas turbine-based power plants. The average global capacity factor for this fleet is less than 40%. This underutilized resource can be a tremendous enabler to reduce coal-fired power generation and accelerate the increased deployment of renewables while balancing the often-competing energy trilemma goals of affordability, reliability and sustainability. Ignoring for a moment the specific location of these assets around the world, simply running this global installed fleet of lower carbon emitting natural gas-fueled power plants at a capacity factor closer to 50% could displace approximately 700 million tons of CO_2 emitted annually by the coal-fueled fleet.

Barriers to running some of the installed gas power fleet harder could include degradation due to the age of the assets, relatively lower efficiency associated with older technology, and the lack of flexibility features in the plant because the need for flexibility wasn't evident when the plants were built. However, there are numerous opportunities to service and improve the performance of these assets and enable them to operate more hours, with improved performance and flexibility, thereby enabling a greater contribution towards the decarbonization of the power sector.

Upgrades to existing assets may include improvements in efficiency or heat rate, increased output, reduced emissions, extended life, or enhanced reliability. These improvements may help to preserve or even improve an asset's position in the dispatch stack, enabling it to run economically for more hours each year.

As an example of the magnitude of this potential, over the past three years, upgrades to GE Vernova's fleet have added approximately 2400 MW of additional capacity, reduced CO_2 emissions by roughly 2 million tons, and resulted in annual estimated fuel savings of $125 million for our customers globally†.

Flexibility improvement packages can also be incorporated that provide more value to the overall system in terms of an asset's ability to start faster, ramp power levels more quickly, or turn down to lower power levels while maintaining emissions compliance. All of these improvements become more important as more variable renewables are deployed and existing coal and nuclear power plants are retired.

Gas turbines currently running on natural gas or other fuels can be converted to operate on a wider range of fuels including hydrogen, for lower emissions. Providing this fuel flexibility enables operators to utilize fuels that have a lower delivered cost and/or lower CO_2 emissions. Many of these existing natural gas power plants can also be retrofitted with carbon capture systems capable of reducing carbon emissions by as much as 95%.

GE Vernova offers a wide range of customizable services options that can be tailored to an individual asset and a specific customer's needs to help deliver improved performance, enhanced operational and fuel flexibility, or extended life in order to help ensure gas-fueled generating assets remain relevant contributors to the energy transition. These solutions are available for implementation and can help to reduce greenhouse gas emissions immediately by enabling deployment of more renewables and reducing coal-fired generation while maintaining the security and reliability of the grid.

†Based on F-class AGPs + GT13E2 upgrades in last 3 years and an assumed 5,000 hours of operation per year.

Fundamental Energy Security

According to the IEA, lasting energy security is not just about increasing the supply of power and fuels and ensuring that adequate and resilient infrastructure and systems are in place. It is also about using energy more efficiently. Today's power industry is undergoing a significant transformation driven by a combination of technological advancements, regulatory changes, and shifting consumer demands. Overall, the power industry is evolving towards a relatively cleaner, more resilient, and technologically secure system.

GE Vernova Gas Power plays a crucial role in enhancing energy security by offering advanced gas turbine technologies and comprehensive power solutions. These contributions include:

1. **Reliable Energy Supply:** Gas power plants provide a consistent and dependable source of electricity, crucial for maintaining grid stability and helping to meet both base-load and peak demand. This reliability is essential for energy security, ensuring that power is available when needed.
2. **Flexibility and Responsiveness:** Gas turbines have the ability to start up and shut down quickly, making them highly adaptable to changes in energy demand and fluctuations in renewable energy generation. This flexibility helps balance the grid and integrates well with variable renewable sources like wind and solar.
3. **Efficiency Improvements:** Continuous advancements in gas turbine technology have led to increased fuel efficiency and lower greenhouse gas emissions. These improvements contribute to sustainable energy practices and help meet environmental regulations, supporting a more secure and more sustainable energy future.
4. **Backup for Renewable Energy:** As the share of renewable energy grows, gas power serves as a critical backup for intermittent renewable sources, ensuring a stable energy supply even when conditions for renewables are not optimal.
5. **Energy Diversification:** By incorporating gas power into the energy mix, countries can diversify their energy sources, reducing dependence on any single type of fuel or energy technology. This diversification can enhance energy security by mitigating risks associated with supply disruptions.
6. **Global Reach and Support:** With a global footprint, GE Vernova Gas Power offers extensive service support and expertise, helping to ensure that energy systems remain operational across diverse geographical locations.

These measures collectively bolster energy security by helping to ensure a more affordable, available, reliable and more sustainable energy supply in an evolving power landscape.

DECARBONIZATION‡

As a company whose technology helps generate ~25% of the world's electricity, GE Vernova has a continued responsibility to further the industry's decarbonization efforts and help meet the rising global demand for more affordable, reliable, and sustainable electricity, especially for the more than 750 million people without access.

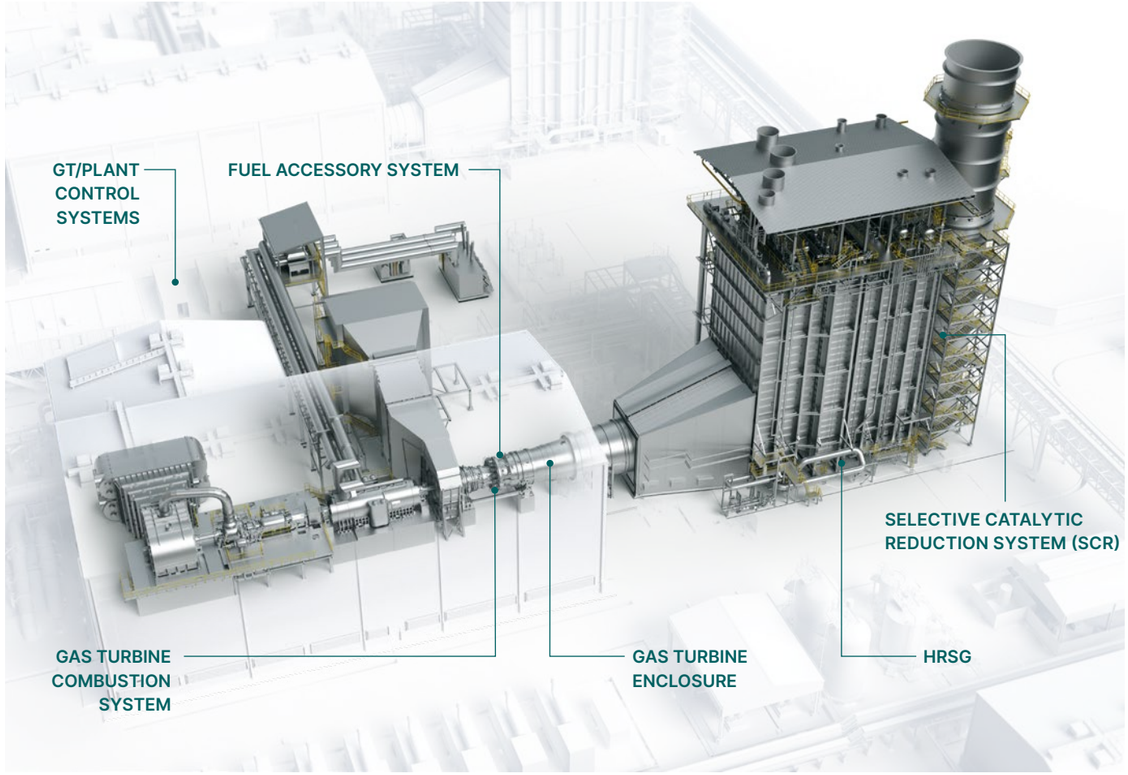
Beyond providing technology the world needs today, GE Vernova is equally focused on the important role of building breakthrough technologies, including the use of lower carbon fuels such as hydrogen for pre-combustion solutions as well as post-combustion carbon capture, utilization, and sequestration (CCUS) systems. GE Vernova's gas turbines remain essential to decarbonization by enabling the rapid transition of baseload generation away from coal-fired technologies. They are also key enablers to increasing renewables by helping to ensure overall system reliability as gas turbines provide physical inertia which helps stabilize grid frequency as renewable power generation continues to grow around the world.

Hydrogen Enabled Power Plants

GE Vernova continues to invest in innovation to decarbonize gas turbines. Decarbonizing a gas turbine requires the supply of a lower carbon fuel (e.g., hydrogen) and/or the capturing of carbon from the exhaust for transport offsite. GE Vernova invests in both decarbonization pathways aiming to ensure we have multiple solutions for the world to fulfill carbon reduction commitments.

GE Vernova understands the unique challenges of using hydrogen and their blends as a gas turbine fuel. We have more experience burning hydrogen than any other OEM, dating back to the 1970s. Building upon this fleet experience GE Vernova is developing technology solutions for 100% hydrogen across the gas turbine portfolio.

Potential Hydrogen Impact on Newer and Existing Power Plants



Pathway Toward **100%** Hydrogen Capacity

THE ENERGY TO CHANGE THE WORLD

Our Committment:

We build the technology that enables a more sustainable tomorrow.

Energy Transition:

~25% of the world's electricity generated with the help of GE Vernova technology

Hydrogen Capabilities in Gas Power Plants

Existing gas power plants can be retrofitted to burn higher volumes of hydrogen than originally contemplated. These upgrades can be scheduled with planned outages to decrease the time the plant is not generating power, and for new units these capabilities can be part of the initial plant configuration or phased in over time as hydrogen becomes available.

In addition to differences in the combustion properties of hydrogen and natural gas, it is important to consider the impact to all gas turbine systems, as well as the overall balance of plant. In a power plant with one or more hydrogen-fueled turbines, changes may be needed to the fuel accessories, bottoming cycle components, and plant safety systems.

Because hydrogen is more flammable than natural gas, critical aspects are considered to help ensure the safe operation of a gas turbine with a natural gas/hydrogen fuel blend. For example, the gas turbine enclosure and ventilation system must be configured to help ensure the concentration of hydrogen is maintained outside of its upper and lower explosive limits.

Furthermore, hazardous gas and flame detection systems configured for typical hydrocarbon fuels may need to be supplemented with systems capable of detecting hydrogen. There are other changes and upgrades that must be considered, in order to safely run a power plant on hydrogen blend.

Newer gas turbine power plants could be "hydrogen enabled," meaning that they are configured to operate on natural gas when they enter commercial operation with provisions put into place to allow hydrogen fuel upgrades more easily in the future. A hydrogen-enabled power plant might require modifications to the plant's configuration that are easier to implement during construction than in the future when the plant is fully operational. Examples include different physical layouts (to allow for the addition of hydrogen fuel systems) and upgrades to safety systems.

Hydrogen Enabled Power Plants

HRSG/SCR	COMBUSTION SYSTEM	FUEL ACCESSORY SYSTEM	GAS TURBINE ENCLOSURE	CONTROL SYSTEMS
Hydrogen flame temperatures may increase NOx emissions, depending on the percentage of hydrogen in the fuel, selected combustion system and site operating conditions. A larger or more efficient SCR may be required†. HRSG duct burner upgrades may be required for safe/ reliable operation	Based on significant differences in methane and hydrogen flame speeds, combustion upgrades with defined flame speed ranges configured for hydrogen may be required. Combustor configuration changes may be needed to operate with high concentrations of hydrogen.	For higher hydrogen concentrations, all piping and fuel accessories must be configured to handle larger volumes of fuel. Hydrogen molecules, which are smaller than molecules of hydrocarbon fuels, have a higher propensity for leakage, requiring better sealing and leakage detection. Welded piping and flanges may be required.	Based on reduced instrument sensitivity newer hazardous gas detection may be required for lower luminosity flames. Installation of sensors and instrumentation specifically configured for hydrogen. Fire protection and ventilation is required to help ensure the hydrogen concentration is within acceptable operating range.	Combustion dynamics (acoustics) differences while burning hydrogen warrant a change in gas turbine controls, startup and shutdown sequences. Emissions controls may be required to stay within allowable NOx limits.

The magnitude of potential plant modifications is a function of the amount of hydrogen in the fuel.

† May also depend on existing permits, local regulations.

HYDROGEN CAPABLE H_2

50 Years of Hydrogen Experience

Helping to Meet Decarbonization Goals with Ammonia

As the world focuses on the transition to lower and zero-carbon power generation, i.e., wind, solar, and nuclear, there are countries, i.e., Japan and South Korea, that will continue to import fuels to help meet their future energy demand. To aim to meet their decarbonization goals these countries are looking to import zero-carbon (when combusted) fuel like hydrogen (H_2) and hydrogen derivatives like ammonia (NH_3).

Why ammonia? It is a commonly produced chemical with an annual production of more than 180 million metric tons. Gaseous ammonia condenses to a liquid at -33 °C (-28 °F) whereas hydrogen condenses at -253 °C (-423 °F). Today, there is only one ship that can carry liquid hydrogen while ammonia is a global commodity; approx. 15-18 million metric tons of ammonia are transported by ship annually, implying significant port and transport infrastructure.

With the interest in ammonia as a potential power generation fuel, GE Vernova's Gas Power business signed an agreement with IHI Corporation to jointly develop a 100% ammonia combustor for GE Vernova's 6F, 7F, and 9F gas turbines. Over the next few years, we will mature the newer combustor configuration through testing as well as developing upgrades needed for the power plant. Based on current status of development, we expect to have this technology ready for commercial offering in 2030.

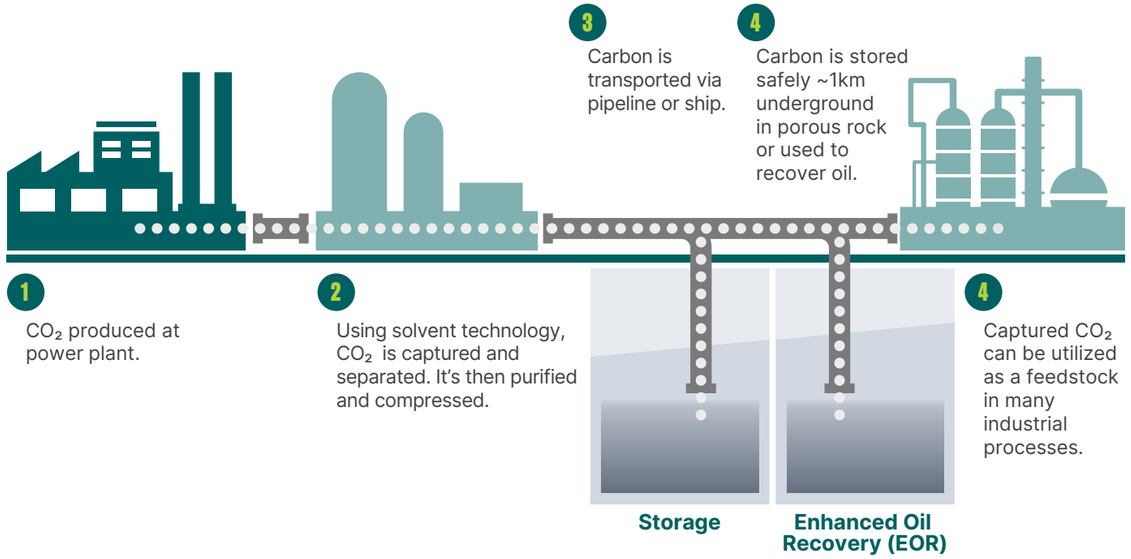
Carbon Capture

20+ PATENTS
Related to NGCC/CCS Integration

>95% CAPTURE
Achievable with existing technology

CCUS is the process of capturing CO_2 formed by fuel combustion in a power plant or industrial facility, and either re-utilizing it or storing it so that it can't enter the atmosphere.

GE Vernova is participating in multiple Front-End Engineering & Design (FEED) studies to integrate carbon capture technology into a flexible gas combined cycle plant. Significant reductions in capital costs, operating costs, and physical space are under development, with the potential to improve carbon capture economics. In addition to investing in the improvement of the technology, GE Vernova continues to educate and inform policymakers to help ensure sensible regulations on CCS are prioritized as part of good decarbonization planning.



It's important to note that adding a carbon capture system to a gas plant would roughly double its capital cost and its footprint. Heat is needed for the carbon capture process, and GE Vernova's integration expertise is focused on providing site-specific solutions to reduce this impact.

Similar to introducing hydrogen to a plant, CCUS can be applied to both newer and existing gas power plants. CO_2 can be extracted from power generation and industrial sites in the post-combustion phase, or even directly from the air. Once it has been captured, the CO_2 is compressed and then transported either by ships or pipelines. Finally, the CO_2 can be stored safely far underground, or the CO_2 can be reused to produce synthetic fuels, chemicals, and building materials. Most of the captured CO_2 will be permanently sequestered.

Retrofitting existing plants helps de-risk future carbon regulations that impact the decision to build a gas-fired power plant today. Furthermore, retrofits can significantly extend the lifetime of operating assets, extending economic viability and deferring costly decommissioning expenses.

There are misconceptions of not enough capacity deep below the surface of the earth to house a meaningful amount of carbon and that potential storage reservoirs that do exist are far away and hard to access. According to third-party studies, hundreds of years of suitable storage reservoirs are available at today's global CO_2 emissions rates.

An additional public misconception is that carbon sequestration is unsafe, and there are fears that the carbon may not stay underground. While risks exist, they can be mitigated through proper regulation, monitoring, maintenance, and implementation of current tools. The same non-porous geologic structures that trapped hydrocarbons such as oil and gas for hundreds of millions of years are ideal for permanently trapping CO_2.

Carbon capture using liquid amine solvents is a mature technology. Ample experience exists with capture, utilization, and storage. NGCC with post-combustion CO_2 capture plant impacts can be improved with robust integration of power plant and capture technologies.

GE Vernova is available today to provide support as you continue to investigate decarbonization for your site.

HYDROGEN CAPABLE H_2

Pathway Toward 100% Hydrogen Capacity

50 Years of Hydrogen Experience

DECARBONIZATION SUCCESS STORIES


Image credit: Duke Energy

End-to-End Green Hydrogen System Includes a 7E Gas Turbine at the DeBary Plant

GE Vernova's Gas Power business is supporting Duke Energy in developing a pioneering end-to-end green hydrogen system at the **DeBary plant in Florida**. Set to be operational in 2026, this project will be among the first globally to produce and utilize green hydrogen for powering a gas turbine to help meet peak electricity demand. The system will integrate solar energy to produce hydrogen via electrolyzers, store it on-site, and use it to fuel a modified GE Vernova 7E gas turbine, capable of running on up to 100% hydrogen, and when hydrogen isn't available the gas turbine and its systems are configured to allow operation on 100% natural gas. This initiative aims to demonstrate the potential of hydrogen in decarbonizing gas turbines and enhancing grid reliability amid rising energy demand. GE Vernova is also providing turbine upgrades and integration support for this innovative project, which underscores the synergy between renewable energy and gas-fired technologies in transitioning to more sustainable power generation.


Image credit: Technip Energies

Supporting the Decarbonization of Teesside With Carbon Capture and the 9HA Gas Turbine

Net-Zero Teesside Power (NZT Power) has achieved financial close for its project, which is expected to be the world's first gas-fired power station with carbon capture and storage (CCS), in collaboration with the **GE Vernova/Technip Energies/Balfour Beatty consortium**. This U.K. project aims to capture up to 2 million tons of CO_2 annually and produce up to 742 MW of lower-carbon power. The captured carbon will be permanently stored by the Northern Endurance Partnership. The project features a Technip Energies configured carbon-capture plant, a GE Vernova combined-cycle gas turbine power plant with a 9HA.02 gas turbine, and an exhaust gas recirculation (EGR) system to enhance carbon capture efficiency. The EGR system is expected to reduce the cost and footprint of the carbon-capture facility while improving performance and emissions. Technip Energies, partnered with Shell Catalysts & Technologies, will use their Canopy™ solution, which is a post combustion capture system. This project highlights the importance of collaboration and technological innovation in advancing lower-carbon power generation and the energy transition.


Image credit: OHPSA

100% Hydrogen LM6000VELOX* Package Powers South Australia

The Whyalla project in South Australia marks a significant milestone in the hydrogen economy by planning to construct what is expected to be the world's largest green hydrogen plant. This facility will utilize locally generated wind and solar energy to produce hydrogen, operating with new aeroderivative gas turbines capable of running entirely on hydrogen, thus eliminating greenhouse gas emissions. GE Vernova has developed the LM6000VELOX package, which features a gas turbine capable of using 100% hydrogen, addressing engineering challenges such as hydrogen's high flame speed. The Whyalla plant, expected to begin operations in 2026, will have a capacity of 200 MW using four turbines. It aims to reduce fossil fuel use in steel production and support South Australia's Hydrogen Jobs Plan by creating jobs and maximizing renewable energy use. The project is developed by a consortium including ATCO and BOC Linde and highlights GE Vernova's collaboration with the U.S. Department of Energy to advance hydrogen technology within the broader hydrogen value chain.


Image credit: CS Energy

Brigalow Peaking Plant to Operate on 35% Hydrogen With LM2500XPress* Gas Turbines

GE Vernova's Gas Power business has secured an order from CS Energy, owned by the Queensland Government, for 12 LM2500XPRESS aeroderivative gas tubine packages to be installed at the new **Brigalow Peaking Power Plant** in the **Western Downs Region, Queensland, Australia**. This plant is expected to provide up to 400 MW of reliable energy, supporting grid stability and aligning with the Queensland Energy and Jobs Plan. Initially capable of operating on 35% green hydrogen, the plant aims to transition to 100% hydrogen by the end of the decade. Expected to be operational in 2026, the facility will supply electricity to over 150,000 Queensland homes during peak demand. The project underscores the shift from fossil fuels to green hydrogen, anticipated to generate significant economic and employment benefits. Located at the Kogan Clean Energy Hub, the plant will source hydrogen from the Kogan Renewable Hydrogen Demonstration Plant. This initiative demonstrates a commitment to decarbonization by integrating renewable and gas power, enhancing Queensland's energy transition while providing opportunities for workforce reskilling.

Pathway Toward **100%** Hydrogen Capacity

50 Years of Hydrogen Experience

GAS POWER MILESTONES

1901:
GE Vernova offers the first large steam turbine for sale at 5000 kW.

1949:
GE Vernova's first gas turbine, a 3.5 MW Frame 3 with 17% efficiency, begins delivering power at Oklahoma Gas and Electric Co.'s Belle Isle Station.

1951:
GE Vernova installs the first two-shaft derivatives of the Frame 3 gas turbine in 5 MW power plants in Rutland, VT.

1968:
The J79 turbojet, an aircraft gas turbine, first flown in 1955 is reconfigured as the LM1500, an aeroderivative turbine with industrial and marine uses. The first LM1500 is 13.3 MW.

1970:
The MS7000 Frame 7 is developed, rated at 47.2 MW. The 50Hz Frame 9 soon follows.

1971:
The first E-Class, a 7E, runs at National Grid's Shoreham plant in New York.

1978:
The first 6B is installed at Montana-Dakota Utilities' Glendive Station.

1987:
The first GT13E is commissioned at the UNA Hemweg facility in the Netherlands.

1988:
The LM6000 is launched, derived from the aircraft engine CF6-80C2.

1990:
The first F-Class gas turbine, a 147 MW 7F, begins operating at Virginia Electric & Power Co.'s Chesterfield Power Station.

1991:
The first B/E DLN system upgrade of a 7E was at Anchorage Municipal Light & Power.

1992:
The first 9F begins operating in simple cycle at an EDF site in Paris.

1993:
The first F DLN system upgrade of a 7F was at Florida Power & Light – Martin Station.

1995:
The first 7E was used in mechanical drive LNG application at the Petronas – DUA site.

1996:
GE Vernova's TM2500*, a trailer-mounted portable aeroderivative, is unveiled.

1997:
6B fuels upgrade to operate at 90+% Hydrogen as the primary fuel at the Hanwha Total Petrochemical – Daesan site.

2003:
The first H-Class system, a 50 Hz 480 MW 9H, starts at Baglan Bay Power Station in Wales.

The first F2F† replacement upgrade (7F.01 to 7F.03) at Korea Western Power Company - Seoincheon site.

2005:
The first B/E sub-5ppm DLN system upgrade was a 7E at the Dow Freeport site.

2010:
The first F-class (7F) AGP upgrade was at Iberdrola Tamazunchale.

2013:
The first E-class AGP upgrade was a 9E at Dubal Aluminum.

2014:
GE Vernova launches the 9HA and 7HA air-cooled H-Class gas turbines.

2016:
The HA is recognized with a world record for efficiency (62.22%).

The first 9E Max (9E.04) F2F upgrade was at the TEPCO – Futtsu site.

2022:
GE Vernova's experience incorporating hydrogen and other low-Btu fuels totals more than 120 gas turbines and more than 8.5 million operating hours.

2023:
GE Vernova's HA gas turbine fleet achieves 2 million operating hours.

GE Vernova debuts the first LM6000VELOX* package installed at TVA's Johnsonville Plant.

APRIL 2, 2024:
GE Vernova Day 1.

† flange-to-flange

THE FUTURE OF POWER AROUND THE WORLD

January, 2024

1. Topolobampo III Power Plant – Mexico

The 7HA.01 Topolobampo power plant comes online in Mexico, providing more than 750MW of much needed power to support the equivalent of more than 1.6 million homes on the country's renewable-rich grid and furthering renewable growth.

2. Brigalow Peaking Power Plant – Australia

The Brigalow Peaking power plant powered by twelve LM2500XPRESS gas turbine packages will be able to operate on 35% green hydrogen initially with a pathway to 100% by the end of the decade. This plant marks the first hydrogen-ready power station expected to provide crucial firming capacity to support energy transition.

3. Sabiya Power Plant – Kuwait

Advanced Gas Path (AGP) upgrades for four 9F.03 gas turbines were performed at the Sabiya power plant which are expected to increase output +6% and reduce heat rate by almost 2%, helping to deliver more fuel efficient and reliable power output to Kuwait's power grid to aim to meet increasing demand especially during peak seasons.

February, 2024

4. Tallawarra B Power Station – Australia

The opening of the Tallawarra B power station powered by the 9F.05 gas turbine marks the first hydrogen/natural gas power plant in commercial operation in Australia. It is expected to operate on a blend of 5% green hydrogen and natural gas, subject to the development of a hydrogen manufacturing industry of appropriate size and scale.

5. Mountain Peak Power Plant – USA

Six LM2500XPRESS packages to be installed at Mountain Peak Power plant in Colorado to support the ongoing energy transition in the state. The gas turbines aim to provide rapid, highly modular technology that can help deliver fast power as the state moves away from coal-powered electricity generation and towards peaker power in support of renewables.

April, 2024

6. Gongju-si Power Plant – South Korea

The 7HA.02 gas turbine has been selected to power the Gongju-si power plant which supports coal-fired phase out while enhancing the reliability and stability of the Korean electricity grid. Initially fueled by natural gas, the 7HA's targeted fuel will switch to blends of hydrogen as it becomes available.

7. Mill Creek Generating Station – USA

Two aging coal generation units will be replaced by a 7HA.03 combined cycle plant at the Mill Creek station, where solar energy projects, battery storage, and a suite of energy efficiency programs were also approved. The new plant is an important part of how Kentucky is continuing to plan for an energy future in a responsible, affordable, and reliable way.

May, 2024

8. Kingston Energy Complex – USA

Sixteen LM6000VELOX gas turbine and generator packages are expected to power the Kingston Energy Complex in Tennessee starting in 2028. The new gas turbines aim to deliver a flexible supply of electricity to help enhance the reliability of the energy grid and help ensure consumers have uninterrupted access to reliable power.

9. Anadarko Plant – USA

To expand the Anadarko power plant and replace aging steam turbines two new LM6000VELOX package solutions have been ordered. These aeroderivative gas turbines, well-known in the power generation industry for their quick start time, will be a great complement to the existing portfolio of renewable projects by helping to reduce the risk of electricity shortages.

June, 2024

10. Taiba 1 & Qassim 1 Power Plants – Saudi Arabia

The single largest order to date for the 7HA.03 in the Middle East has been placed for six 7HA.03 and two 7E.03 gas turbines. The Taiba and Qassim facilities are expected to be among the most efficient power plants in the Kingdom, helping to deliver up to 3.8 GW of electricity to the grid and supporting Saudi Arabia's goals to transition to a lower-carbon future.

July, 2024

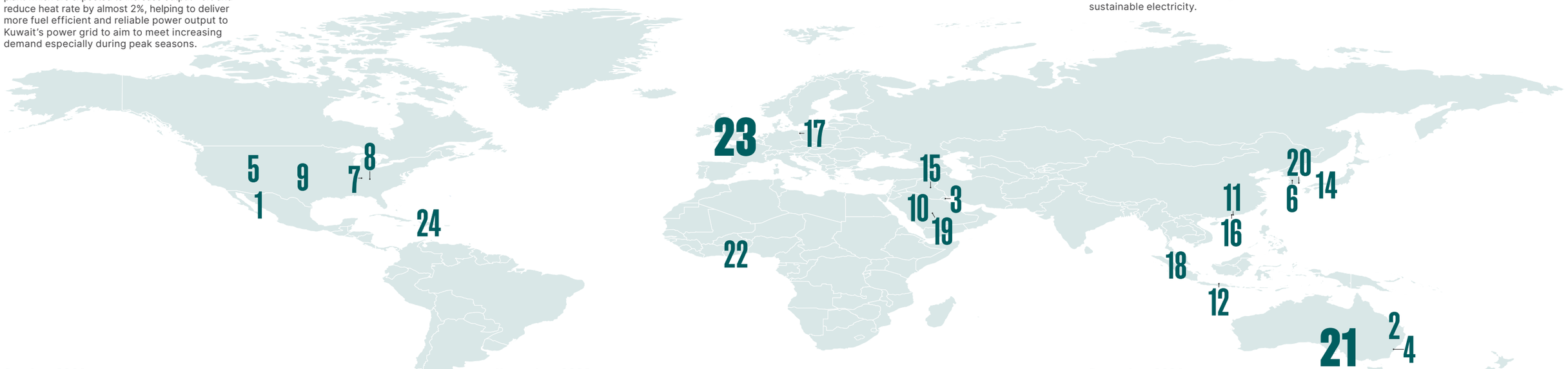
11. Huizhou CHP Plant – China

The Guangdong Huizhou Combined Heat and Power plant powered by two 9HA.01 gas turbines achieves successful commercial operation. These hydrogen-ready turbines are expected to burn up to 10% of blended hydrogen/natural gas within the next two years, promoting low-carbon and sustainable electricity.

August, 2024

12. Tambak Lorok Power Plant – Indonesia

Tambak Lorok Block 3 celebrates the start of commercial operation in Central Java. Powered by the 9HA.02 gas turbine, this power plant provides reliable and more sustainable electricity to the Java grid and is the equivalent capacity needed to power approximately 5 million Indonesian homes.



October, 2024

14. Nanko Power Station – Japan

Three 7HA.03 gas turbines to be installed in Osaka, Japan will replace the existing aging conventional LNG power generation assets and are expected to increase power plant efficiency while reducing carbon dioxide emissions.

15. Besmaya Power Plant – Iraq

As part of a broad strategy by the Ministry of Electricity to modernize power generation infrastructure and help meet growing demand, Phase I of the Advanced Gas Path (AGP) upgrades on four 9F.04 gas turbines has successfully completed while Phase II, four additional 9F.04 AGP upgrades has begun. These help deliver up to 6% more output with improved efficiency and operational flexibility.

16. Ningzhou Power Plant – China

The Ningzhou combined cycle power plant powered by three 9HA.02 gas turbines achieves the start of operations in the Guangdong province. The plant, one of the largest gas power plants in China, is expected to inject up to 2.4 GW of power into the grid.

17. Dolna Odra Power Plant - Poland

Equipped with the 9HA.01 gas turbine, the Dolna Odra combined cycle power plant reaches commercial operation in Poland. This state-of-the-art largest gas-fired power plant in the country replaces old and inefficient coal units, this aligning with the strategy to decarbonize generation assets.

18. Pulau Seraya Power Station – Singapore

The 9HA.01 gas turbine is expected to power a new hydrogen-capable combined cycle power plant in Singapore, expected to help deliver up to 600 MWs to the national grid in 2027. This project is a crucial step in advancing Singapore's energy transition, laying the groundwork for a lower-carbon future.

November, 2024

19. Carbon Emissions FEED Study – Saudi Arabia

A first of its kind Front-End Engineering Design (FEED) study analyzing the possibility to lower the net carbon emissions of three cogeneration plants located in the Kingdom of Saudi Arabia has been performed. The study focused on 7E and 7F gas turbines and targeted up to 32% hydrogen blending with natural gas.

20. Tongyeong Power Plant – South Korea

The new 1 GW Tongyeong 7HA.02 combined cycle power plant announces commercial operation in South Korea. The country's biggest utilities are turning from coal-burning power plants to liquified natural gas, helping to deliver power on demand and supporting the development of renewable energy resources.

21. Whyalla Hydrogen Power Plant – Australia

The LM6000VELOX gas turbine package at Whyalla power plant is projected to mark the first time, at commercial scale, this aeroderivative gas turbine is planned to operate on 100% renewable hydrogen. The site will include one of the world's largest hydrogen production and storage plants and will utilize surplus renewable energy to produce the renewable hydrogen.

22. Ghana Bridge Power Project – West Africa

In a major advancement for Ghana's energy infrastructure, five TM2500 gas turbines at the Ghana Bridge Power Project were commissioned, expanding the country's power generation capacity while improving fuel efficiency and environmental sustainability.

December, 2024

23. Net Zero Teesside Power Project – United Kingdom

Notice to Proceed has been granted for the Net Zero Teesside Power project. This landmark project, powered by the 9HA.02 gas turbine, aims to be the world's first gas-fired power station with carbon capture and storage. Up to 2 million tonnes of CO_2 per year will be captured at the plant and transported and permanently stored.

24. San Felipe Power Station – Dominican Republic

This 7HA.02 order marks the first H-Class order in the Caribbean. It will contribute to the implementation of the country's climate ambitions and more sustainable development goals by supporting the rapid expansion of renewable energy through its dispatchable power profile.

POWER PLANTS

Technology, experience, and people—this combination is what allows GE Vernova to aim to deliver the highest value simple cycle and combined cycle power plants anywhere in the world. Our technology provides low life-cycle cost of converting fuel to electricity; our experience spans 130+ years and includes countless impactful innovations and technology improvements; and our people work every day to create and aim to deliver ground breaking solutions for customers, partners, and communities around the world.

Our simple and combined cycle power plants are flexible in their operation and include features such as fast start and load ramping, low turndown, and high full- and part-load efficiencies. This flexibility, associated with key component engineering and construction features such as turbine packaging and power island systems modularization, help to deliver improved plant economics, including:

- Reduced capital costs
- Reduced operation and maintenance costs
- Shorter installation times, reduced installation costs, and fast revenue production
- Improved reliability and availability

Equipment Only to Full Turnkey

With decades of experience and component know-how, GE Vernova extracts maximum value out of every piece of equipment we deploy. Whether we work directly with you or through an engineering, procurement, and construction (EPC) contractor, our scopes of supply are configured to help meet individual procurement strategies and risk profiles. GE Vernova's integrated approach to plant development means that, from planning through commissioning, we consider individual components as well as balance-of-plant systems in each decision we make with our customers.

GE Vernova offers as little or as much as you need—from equipment only to full turnkey solutions. Moving beyond equipment only solutions enables more comprehensive performance and operability guarantees and reduces the risk of gaps in scope between suppliers and contractors. With a turnkey solution, customers may be able to obtain more favorable financing and insurance terms.

Extended Scope of Supply

Equipment Only (EO)

- **GE Vernova Supplies:** Any combination of gas turbines, steam turbines, generators, HRSGs + accessories + controls
- **GE Vernova Guarantees:** Equipment performance and equipment delivery

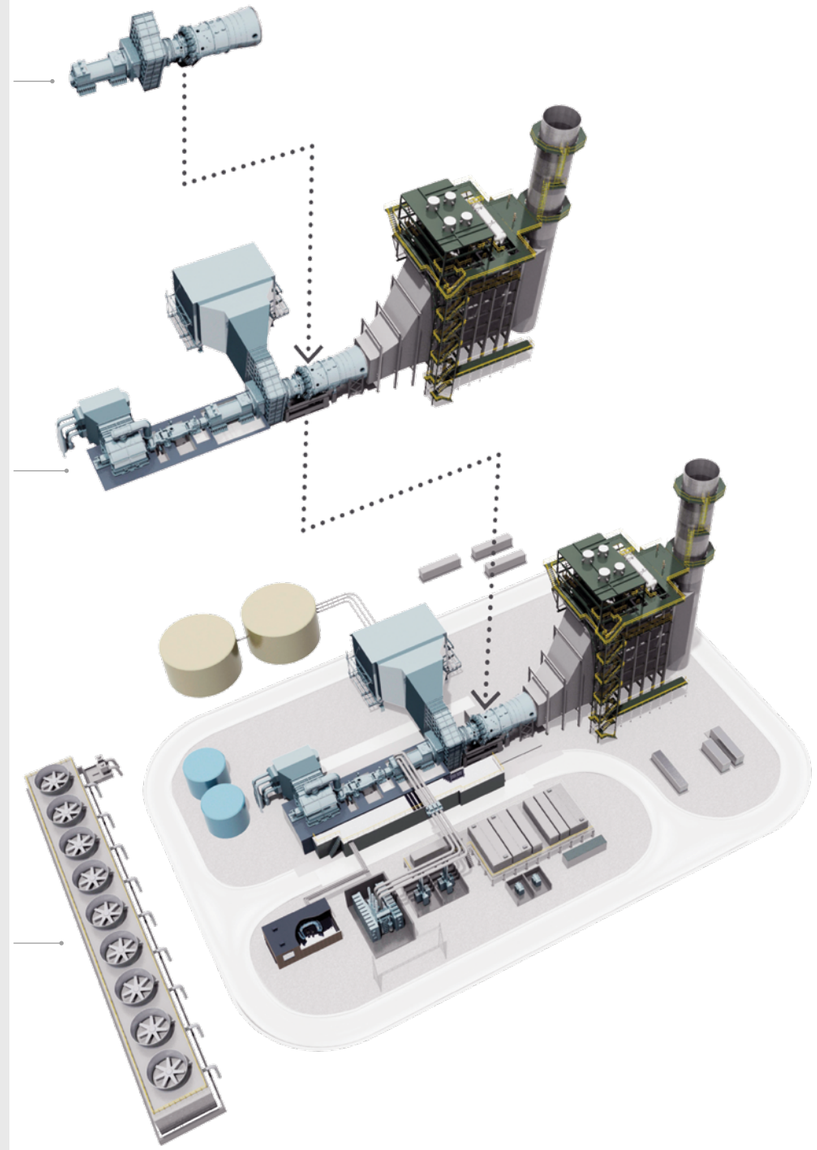
Engineered Equipment Package (EEP)

- **GE Vernova Supplies:** Gas turbine + steam turbine + generator + HRSG + controls + emissions monitoring + critical control valves + condenser
- **GE Vernova Guarantees:** Combined cycle performance, operability, power island emissions, near-field acoustics, equipment delivery

Turnkey Plant (TK)

With partner or self-implement

- **GE Vernova Supplies:** Various scope from EEP to total plant solution
- **GE Vernova Guarantees:** (depending on partner scope split): Combined cycle performance, operability, plant emissions, far-field acoustics, commercial operation date



Solutions Tailored to Your Needs

You'll find GE Vernova working hand-in-hand with customers to develop and build engineered solutions to match unique business and operational needs. Whether the project requires a single gas turbine generator set or a multi-unit turnkey solution, GE Vernova has readily available product configurations to help meet critical power needs quickly.

GE Vernova also has a team of experienced application engineers around the world to support economic analysis and off-specification performance of our products to satisfy any special application, operational, or environmental need. We are committed to defining the best solution with our customers from the foundation of our product performance to other levels of support, whether through customized long-term service agreements, financing solutions, or additional product solutions and services.

Configurations That Perform

Every power plant is unique and depends on numerous customer-specific requirements such as land availability, grid access constraints, funds availability, grid access constraints, and expected operating profile. The following table lists the three gas plant configurations and their respective attributes to guide your choice of simple cycle or combined cycle single-shaft or multi-shaft that best fit your project specific wants and needs.

	Simple Cycle	Combined Cycle Single Shaft	Combined Cycle Multi -Shaft
Applications	• Peaking power • Emergent power demands (can later be converted to combined cycle) • Mechanical drive	• Mid-merit to baseload • Grid connected, utility scale • Combined Heat and Power (CHP)	• Mid-merit to baseload • Grid connected, utility scale • Combined Heat and Power (CHP)
Advantages	• Lowest CAPEX • Shortest construction cycle • Easily scalable for growth	• Smallest footprint/highest power density (MW/m^2) • Easily scalable for growth • Lower CAPEX and lower $/kW compared to multi-shaft	• Redundancy • Phased construction flexibility • Can accommodate large steam extractions
Disadvantages	• Lower efficiency compared to combined-cycle • Higher specific emissions	• Longer construction time than simple cycle	• Higher CAPEX and higher $/kW compared to single shaft

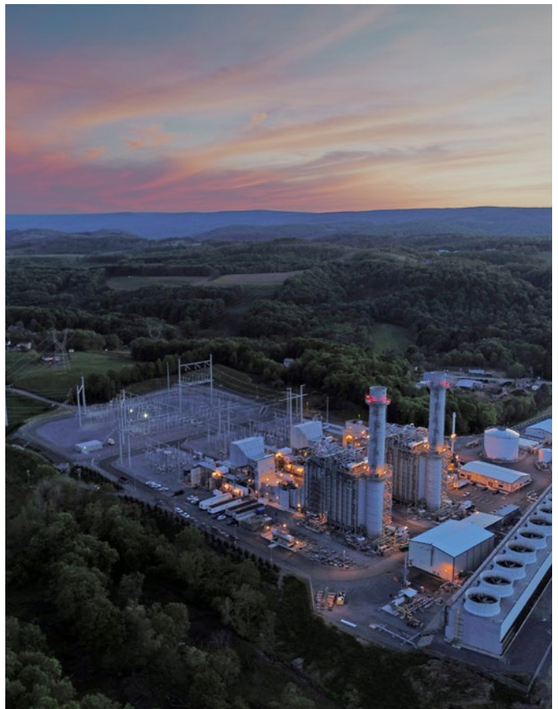
Less Site Time, Less Risk

Time is precious, so meeting plant construction milestones is critical to project success. To help promote ease of constructability in all our projects, we have infused our offerings with features that support less on-site work, driving process efficiency and alleviating associated risk.

The main focus is how we assemble the gas turbine and accessories onsite. GE Vernova's HA gas turbine enclosures feature a modular architecture with valves, piping, and electrical systems packaged into stackable modules with segregated work zones. These zones allow for simultaneous installation of electrical, piping, and mechanical systems and reduce safety concerns and delays due to interfering tasks. With significantly more room for maintenance than the previous F-Class, this enclosure—called our prime package—reduces installation time and cost while offering simpler and faster serviceability.

Plant Modularization

For our customers looking for shorter construction schedules (notice to proceed to commissioning date) with less risk, increased quality and flexibility, enabling reduced total installed cost, GE Vernova offers a full set of plant modularized packages. These shop prefabricated and transportable modules are configured to facilitate site construction and easy installation with packages such as HRSG auxiliary modules (i.e. HP drum module), condenser modules, mechanical BoP and electrical BoP modules.



Service Tailored to Your Needs

Through our innovative technology we are increasing the lifetime and competitiveness of your power plant assets with newer and refurbished parts, spares, upgrades, and software solutions. Our technologies can boost reliability and flexibility, reduce the environmental footprint and cut cost of production by increasing efficiency, and the intervals between inspections.

You can benefit from working closely with a single service provider that analyzes your plant's entire operation to fully harness the performance of all power plant equipment: GT/HRSG/ST/generator and balance-of-plant; a provider that can forecast the impacts even the most advanced technologies—and unpredictable operating demands—can have on your overall plant profile.

Working with the original equipment manufacturer can be invaluable in a dynamic industry environment. The team that originally built and installed the machine can provide unique insights and access to the latest innovations. With our worldwide team of experts, their in-depth knowledge, engineering and operational capabilities, we are committed to our customers' success, working to help them stay competitive in our industry today and in the future.

Our services team can install upgrades that can improve plant flexibility with faster ramp-up, better turn-down, or increased efficiency to help ensure that power generating assets are in a competitive position to improve life-cycle value and utilization. Moving beyond our abilities to serve you today, we are committed to preparing you for a future with lower carbon power generation by combining pre-and post-combustion solutions: upgrading existing fuel systems for Hydrogen, and adding Carbon Capture systems.

With the world's largest installed base of +7,000 gas turbines and 16,000 combined-cycle power generation assets, we offer advanced technology and a level of experience to build, operate, and maintain gas power plants. We are committed to working alongside you by providing services throughout your plant's full lifetime to keep you competitive today, while preparing your assets for a future with less carbon emissions.

APPLICATIONS

Electric power is a fundamental necessity for utilities and independent power providers, cooperatives and municipalities, industrial operators (like chemical, mining, and steel production) and commercial buildings and facilities (like data centers and airports).

DATACENTERS

GE Vernova's gas turbines and power generation systems can play an important role in supporting data centers by providing a dependable and consistent power supply for maintaining continuous operations. This is vital for data centers, which require high reliability to prevent downtime and data loss. With a focus on efficiency, GE Vernova's technologies help data centers improve energy use, reducing operational costs and minimizing environmental impact. GE Vernova gas turbines are capable of quickly ramping up output to help meet peak power demands, which helps maintain operational stability without relying solely on the grid. By utilizing these capabilities, GE Vernova can help data centers achieve a balance between operational excellence and more sustainable practices, supporting long-term success in the rapidly evolving digital landscape.

UTILITY POWER GENERATION

Utilities, independent power providers, municipalities, and cooperatives around the world develop and run power plants to meet consumer electricity needs. Operators seek the most cost-effective and reliable plant offerings to serve their local grid and service territory demands. Whether it's base-load power, cyclic generation, or peaking power, GE Vernova as the manufacturer of one of the leading gas turbine portfolios—from a 24 MW LM2500 to a 1600+ MW 2×1 9HA.02—generates the high-performing power that helps your power equipment operate dependably and efficiently.

INDUSTRIAL POWER GENERATION

Industrial power generation refers to applications where customers are seeking to reduce utility expenses by locally generating electricity (and sometimes heat) for their operations. Equally important to remote installations is the requirement that power sources be of ultra-high reliability, as a loss of power to certain processes (such as aluminum smelting) can cause disruptions, and other operation issues. GE Vernova's vast portfolio offers tested solutions to keep electrical infrastructures strong and predictable for industries like food processing, cement, mining, chemicals, and more.

COMMERCIAL BUILDINGS & FACILITIES

It's a simple idea: If you can't get to the power source, bring the power source to where you need it the most—on site. With GE Vernova's power-generation products, you benefit from intelligent on-site combined heat and power (CHP) generation anywhere you need it, like municipal districts, manufacturing plants, hospitals, airports, malls, data centers, arenas, universities, hotels, office buildings, and many more commercial facilities in need of such energy agility.

COMBINED HEAT & POWER

From manufacturers to universities and hospitals, facilities using combined heat and power (CHP) can derive electricity and thermal energy from a common fuel. Captured thermal energy (steam or hot water) can be channeled for high-efficiency heating, cooling, and industrial power. With combustion and steam turbines, GE Vernova is uniquely positioned to complement a CHP approach, helping to reduce energy costs, increasing reliability, and decreasing carbon emissions.

EMERGENCY POWER

Whether power suppliers across the globe are dealing with natural disasters, health emergencies, plant shutdowns, or cyberincidents, GE Vernova can provide emergency temporary power when getting the lights back on is essential. Proven with over 6 million hours of operating experience, GE Vernova's TM2500 aeroderivative mobile gas package features up to 36 MW of power potential. With a turnkey, fuel-flexible configuration, the TM2500 can ramp up to full production within just five minutes—providing quick power when you need it most.

FAST POWER

Unlike emergency power for short-term needs, GE Vernova fast power provides baseload bridge-to-permanent installations for a more reliable and efficient grid. Power production can be rife with pitfalls like failing infrastructure, extreme weather conditions, and rapid urbanization. But, GE Vernova's mobile power plants are configured with modular, turnkey efficiency, making it possible to ramp up to full power in 5-15 minutes once installed. The portable, compact units feature dual-fuel capability without water consumption—and added peace of mind through our oncall advisory service for performance and maintenance support.

GRID FIRMING

While renewable resources' benefits include the lowest operational costs and fewest greenhouse gas emissions, they can cause potential challenges when integrated into the grid. It's a game of balance between traditional and renewable resources, and GE Vernova's grid firming helps keep that balance. Grid firming—also known as nameplate capacity firming, capacity firming, or renewable firming—is widely used to keep the grid stable in the face of potential wind, solar, and hydro variability. GE Vernova's aeroderivative gas turbines bridge the variability of renewables, helping you meet power supply and demand—and adding the system reliability that helps avoid power outages and disruptions.

SERVICE SOLUTIONS

SERVICE AGREEMENTS

GE Vernova's customizable power plant services options provide better access to technology that will keep gas plants relevant in the future. Whether you're seeking advisory services to enhance your own operation or are looking for a full-service operator to perform all the daily activities associated with operating your site, GE Vernova can create an operational and planned gas plant maintenance contract with solutions to help meet your business goals.

By combining an operation and maintenance plan with GE Vernova's contractual service agreement (CSA) or multi-year maintenance program (MMP) programs, you'll be able to increase gas plant productivity, enhance profitability, and maintain the flexibility to adapt your operation over time as organizational needs and goals evolve. Best of all, you'll be able to take advantage of long-term financial predictability to realize the full potential of your gas plant.

Contractual Service Agreements (CSA)

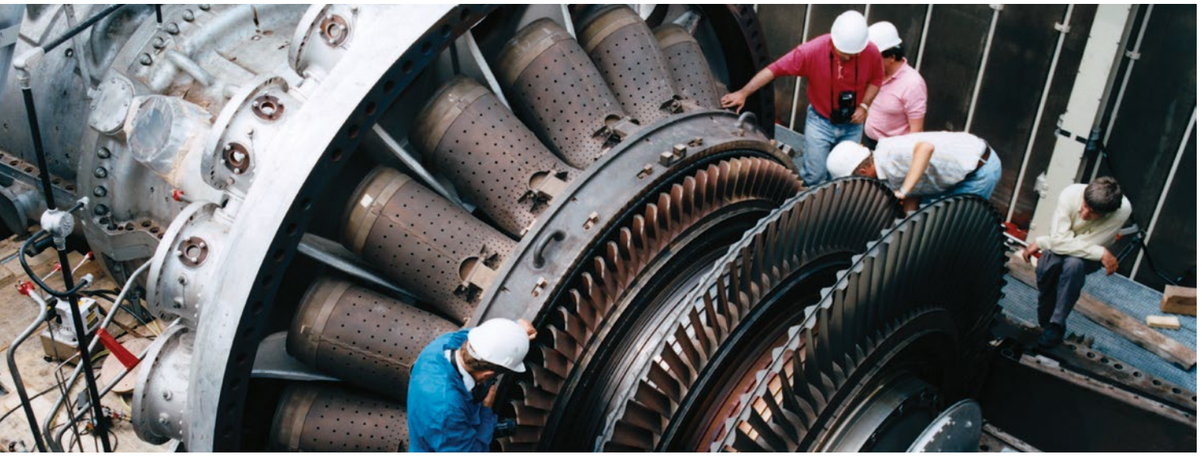
Equipment must perform when called upon while operating in dynamic industry segments. GE Vernova's CSA for gas plants and turbines is configured to address these challenges by taking care of planned and unplanned maintenance. With a power plant CSA, GE Vernova shares the business risk and is devoted to helping you achieve your business goals.

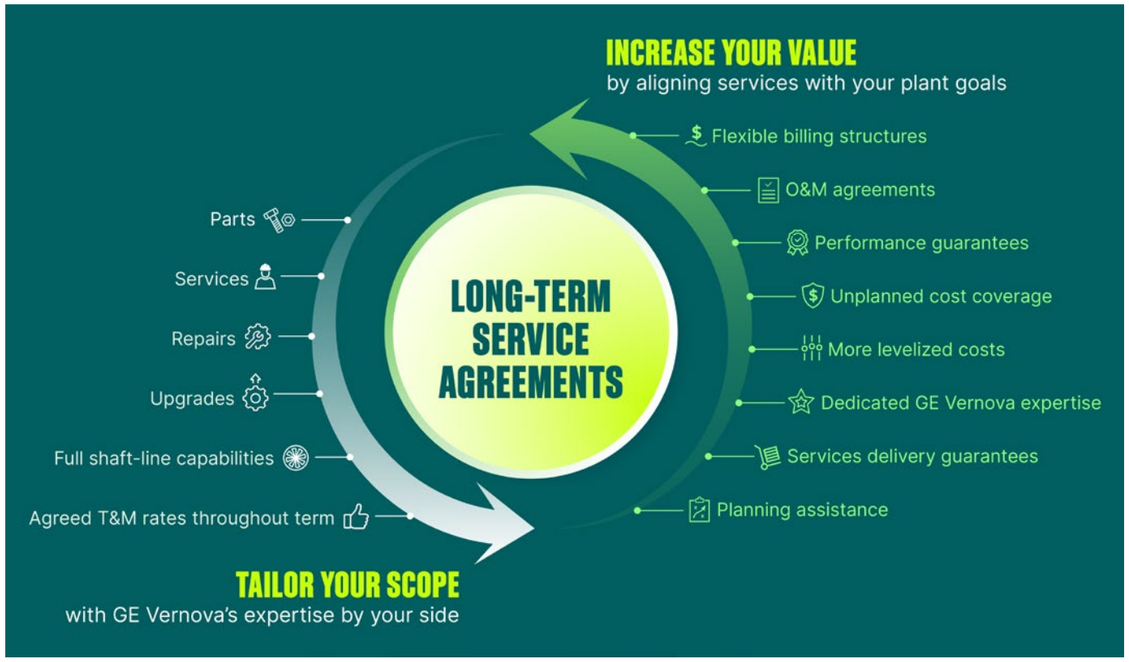
Multi-Year Maintenance Program (MMP)

An MMP is a long-term power plant service agreement that gives you the flexibility to determine your maintenance scope while relying on GE Vernova to help deliver high-quality gas turbine parts and services at preferential conditions, reducing administrative efforts and simplifying planning.

Operation And Maintenance Agreements

Our O&M gas plant agreements can give you the opportunity to let the experts behind your plant technology handle the operations of your gas plant. With over 1600 plant O&M specialists, GE Vernova has the capabilities and skills of a full-service operator to perform all the daily activities associated with operating your site and help you define and run your maintenance strategy throughout the assets' operating lifecycle. By combining an O&M agreement with our CSA or MMP programs, you'll be able to increase your gas plant's performance, enhance your profitability and improve long-term financial predictability.





Flexible Gas Plant Long-Term Service Agreements

Balance performance and risk while getting the most out of your gas plant assets—along with predictable costs and flexible billing. With a long-term service agreement from GE Vernova, you will have access to our experts for maintenance support to help improve your availability and reliability, including parts and outage planning. Our wide range of guarantees include outage duration, availability, reliability, emissions, monitoring and diagnostics, and maintenance performance.

OPERATIONAL PERFORMANCE

Access to the latest technology to help ensure the best plant performance

MAINTENANCE PERFORMANCE

~10000 experts with extensive experience available to you

OUTCOME GUARANTEES

A variety of guarantee options available to best match your business need

RISK TRANSFER

A risk-sharing arrangement that helps meet your operational goals

FLEXIBLE PAYMENT STRUCTURES

A tailored agreement for more predictable cost management

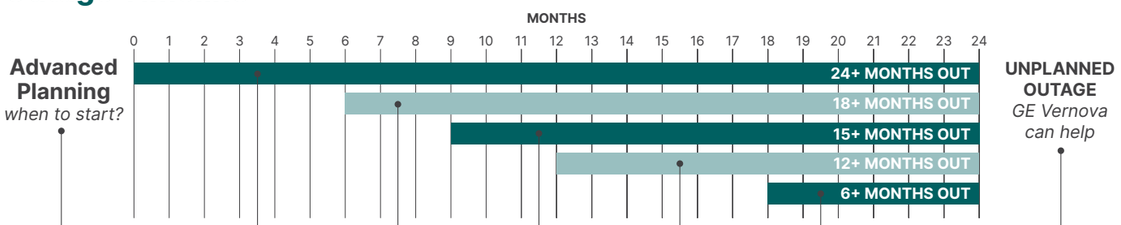
DIGITAL CAPABILITIES

24/7 unit performance assessment to prevent potential issues

OUTAGE SERVICES

Outage operations require years of focused planning and are a vital part of ensuring power plant efficiency, longevity, and stability. Outage events are one of our closest partnerships with our customers. It's crucial to get it right the first time and GE Vernova understands that.

Outage Timeline



Early planning provides access to GE Vernova's most experienced FieldCore engineering crews and parts availability. GE Vernova offers holistic planning and support of your outage with services, parts, repairs, and upgrades to help ensure everything runs smoothly from start to finish.

Upgrades and Uprates
Whether it's flexibility, output, efficiency, operational reliability—or all four, timing upgrade opportunities with planned outages provides a great opportunity to return units to full service and make sure they are enhanced for today's marketplace.

Parts, the Big Stuff
New capital parts should be ordered in advance of scheduled outages.

Repairs Made Easier
Repairs can be performed directly at site or shipped to technology centers for agile responsiveness, tapping into regional compliance and regulatory expertise.

The Smaller Stuff
Help ensure all your consumable parts are accounted for.

It's Almost Here...
A huge inventory of refurbished parts is available for last minute needs. Tracking all aspects of parts delivery and services is available in real time.

Not every outage can be planned. GE Vernova is here to help mitigate the risk of unplanned outages and restore power production.

Parts

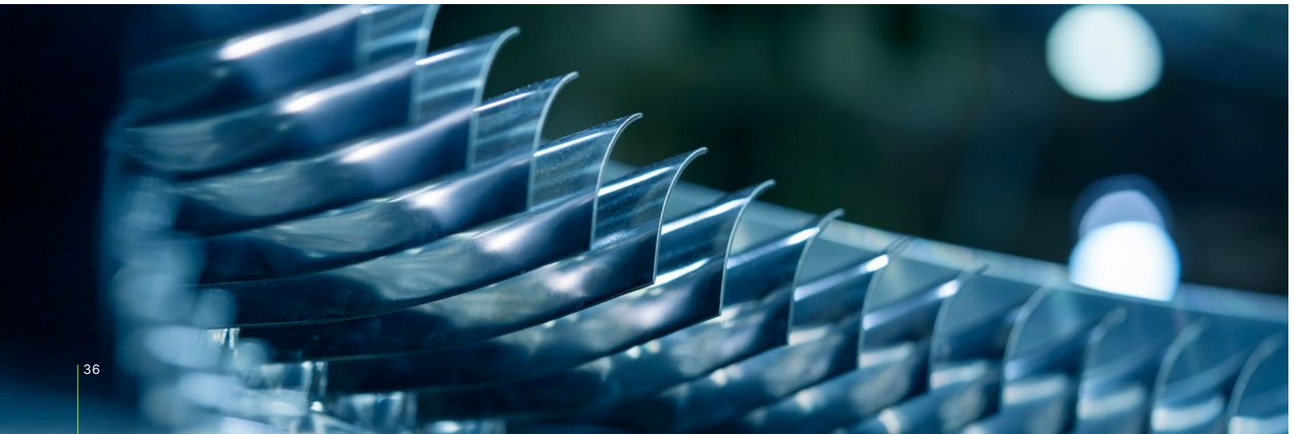
GE Vernova uses advanced engineering techniques and high-quality materials to manufacture spare parts that help you get more out of your assets. Every part is thoroughly tested and backed by our OEM warranty, leading to improved output, increased efficiency and extended maintenance intervals.

Repairs

Our advanced repair solutions are cost-effective, properly scoped to your operational needs and enhanced to reduce your downtime. Our vision is to support one of the world's best-running fleets, and we do this by helping deliver new capabilities and programs, all of which are driven by a culture of accountability and a commitment to your organization's desired outcomes.

Maintenance

Make the right decisions about repairs, replacement and appropriate upgrades for performance improvements with help from GE Vernova's outage services team. Proper planning and expert support are essential to slashing the length of your outages and decreasing downtime.



A DIGITAL TRANSFORMATION WITH LIVE OUTAGE

Live Outage, the latest evolution of GE Vernova's outage services, is a touchscreen-based, digitized platform that replaces our traditional paper-based approach. This platform, part of our continuous improvement and outage transformation efforts, reduces the risk of mistakes and rework while speeding up the outage process, so you can reduce outage durations.

Live Outage was first piloted for select gas turbines during the 2021 Fall outage season. Today, Live Outage has been performed on the 7F, 7E, 9F, 9E, 6B and 6F gas turbines and D11 steam turbines. 900+ Digital Outages have been successfully completed at power plants to help ensure flawless operation with 400+ Live Outages planned for 2025.

The system is cloud-based and secure. Protecting outage data in the cloud was a critical development pillar.

Live Outage provides you access to outage related information: real-time schedule status, customer-related stop work events, suggested improvements, and approved data sheets.

Live Outage isn't connected to the customer's HMI or the operating system of the power plant, but it can help GE Vernova understand the quality and safety issues that occur during an outage. Fewer outage related failures will improve plant startup and running reliability.

The tool allows us to know the person who performed a specific task, the time of day an event occurred, and the specific step in the work method when something occurred. Armed with better information, we increase our ability to help prevent mistakes and rework from happening in the future.

This newer approach includes 14 hardened, weatherproof tablets and two large kiosks at each site. This hardware allows access to stored drawings, videos, and step-by-step checklists for the crew performing the outage. Immediate feedback and updates are available online.

Before Live Outage, outage execution relied on paper procedures and drawings found in the outage trailer or on the Field Engineer's laptop. Now, this information is fully digitized, enabling real-time access and progress tracking.

The Live Outage platform brings Lean techniques to our onsite execution teams by creating an integrated and scaled standard work practice, simplifying the complexity of the tasks at hand, and improving the safety, quality, and efficiency of the outage process.

Customer Story: Born From Lean – Live Outage

Four 7FA.03 gas turbines operating as peakers for a customer providing electricity to nearly 7 million residents went back online after a complex hot gas path (HGP) outage 6 days faster than traditional methods all with the help of Live Outage.

Heavy Duty Gas Turbines

Customizable Outage Solutions

Our outage solutions offer the following key benefits:

- Shorter gas turbine outages: Detailed planning helps ensure that parts, upgrades, repairs, and experts are in place when you need them.
- Reduced costs: By limiting emergent maintenance needs, our outage services keep your costs down.
- Increased performance: We help you increase overall value and performance by focusing on upgrades that work with your whole system.
- Increased safety: Our services help ensure the safety of your people, your plant, and the environment.

On-Site Services, Testing and Repair Offerings

Transporting turbine components off-site for repair can increase your outage time by days or weeks, while the additional handling required exposes the equipment to risk of further damage.

GE Vernova's On-site Services (OSS) offers highly technical onsite inspections and premium repairs globally. We help ensure adherence to strict environment, health and safety (EHS), quality, technical, and operational standards while meeting and exceeding your scheduling and budgeting requirements. We bring the inspection and repairs directly to your location to help you reduce outage time and achieve substantial cost savings. Our On-Site Inspection and Repair teams offer:

- **Comprehensive services:** We provide a full range of services—from typical inspections, repair, and machining to highly specialized services only offered by GE Vernova.
- **Extensive tooling:** GE Vernova's OSS is one of the largest onsite service organizations, with more than 500 pieces of portable equipment and an extensive tooling inventory.
- **Experience:** Our team of qualified GE Vernova specialists includes machining supervisors, engineers, and technicians with an average experience level of more than 20 years.
- **Global responsiveness:** All equipment is completely mobile and can be enroute to required destinations around the world within hours of notification.

Major Inspections Without Rotor Removal

Save time, reduce costs and alleviate safety concerns with GE Vernova's rotor-in major inspection. Specialized tooling and techniques allow B/E/F-class major inspections to be performed without removing the turbine's rotor. Benefit from:

- **Decreased outage durations**—up to seven days shorter.
- **Reduced costs** due to eliminating the crane, platform, and trucks required for loading and unloading parts, and the scaffolding needed for accessing bolted flanges.
- **Reduced labor** and reworks that can occur during dismantling and installation.
- **Lower EHS risk** due to fewer exposure opportunities associated with reduced work scope.
- **Simpler logistics** due to fewer interfaces with other contractors, and a smaller footprint to store parts.

Reconditioning and Repairs

Reduce costs by extending the lifetime and recovering the performance of your gas turbine components through our innovative reconditioning services. The reconditioning portfolio covers the full range of parts:

- **Turbine components:** Nozzles, blades, buckets, and shrouds.
- **Compressor components:** Blades and vanes.
- **Structural parts:** Shells, casings, and bearings.
- **Combustion components:** Fuel nozzles, burners, liners, and transition pieces

Standardized repair processes help make every customer specific job efficient and well-suited to help meet your operational needs. Backed by our Repair Development Centers and our Repair Technology Center of Excellence, GE Vernova invests $40 million annually to draw upon our engineering experience and the world's largest fleet and inspection database to continuously improve our repairs technology and lower your total cost of ownership.

Flexibility and Expertise to Help Meet Your Repair Needs:

- SMART repairs for customizable light/medium/heavy repair scopes
- Repair capability to service non-GE Vernova turbines, non-GE Vernova parts, and GE Vernova components previously repaired by a third party
- Global repair network

Zero Cycle Repair Options:

- Reduce repair cycle time to zero with refurbished parts
- Eliminate inventory costs
- Backed by GE Vernova's warranty for peace of mind

Technical Data

- More than 60% cost reduction through reconditioning, compared with newer parts
- More than 30 years of reconditioning experience on well over 50,000 parts
- Delivery of full sets including replacement of fallout parts and assembly material
- Emergency stock for fast responses component history tracking.

Aeroderivative Gas Turbines

GE Vernova's aeroderivative asset management solutions provide you with fast turnaround and true fixed-price maintenance with GE Vernova warranty. By helping deliver asset flexibility, speed, efficiency, and improvement, GE Vernova helps you benefit from improved outcomes: better output and performance, cost saving, and enhanced maintenance and availability.

Benefits of Repair by Engine Exchange

- Newer, fully refurbished and partial-life engines to help meet your diverse operation cycle requirements
- Reduced engine downtime with one 2–3 day outage
- Buyback value offered on exchanged unit
- Elimination of spare engine and lease engine

Benefits of Fast Turnaround Depot Repair by Module Exchange

- 50-day major overhaul and quick turnaround repair by exchange modules
- Fast return to service
- No change to engine serial number
- GE Vernova assumes cost risk for large engine parts and flow path airfoil replacement

Benefits of Onsite Repair by Module Exchange

- Enables onsite repair for your hot section, high pressure turbine (HPT) rotor, HPT S1 and S2 nozzle, combustor and turbine mid-frame modules
- Eliminates the need for a depot visit
- Reduces your engine downtime to one 1–3 day outage
- Eliminates the need to stock spare module assembly

Benefits of Flexible Lease Program

- Lease membership: Use of lease assets during major repair and unplanned outages
- Backup lease membership: Use of lease assets as a stand-in for spare engines
- Long-term lease: Long-term use of lease assets with option to buy at the end of the lease
- Benefits of a spare or operating engine without the capital investment
- Reduced engine downtime with two 2–3 day outages
- Payment tailored to your operations: Fired-hour-based lease-asset usage fees.

Steam Turbines

Steam Turbine Repairs

To save the cost and lead times associated with replacement parts, GE Vernova offers a range of complex repair techniques. Many of these relate to weld repairs, as follows:

- **Rotor repairs:** With more than 80 years of welded rotor technology experience, GE Vernova provides joining of newer forged sections, shaft buttering, disc repair, and disc head buildup with newer material. We also offer a number of techniques for straightening rotors.
- **Blading repairs:** With experience across the range of impulse and reaction blading, GE Vernova provides dressing and weld repairs for all types of fixed and moving blades, including impulse and reaction technology. For last stage blades (LSBs), we also offer leading edge hardening and shielding options.
- **Casing repair:** GE Vernova can correct minor cracking and change the geometry of highly stressed areas. We can also re-round distorted casings and add newer weld material.

Part Stocking Program

To help meet the needs of a growing generation industry, GE Vernova is focused on quickly responding to your demands. Our part stocking program is one example. It employs a cross-departmental process to support emergent requests for the following parts:

- L-0 and L-1 blades for a broad range of sizes, including D11 blades
- Valve internals for common main stop and control valves
- Valve parts that support GE Vernova's next gen ST valves
- Refurbished D11 diaphragms
- Refurbished D11 rotors
- Refurbished bearings

Onsite Services

Transporting turbine components off site for repair can increase your outage time by days or weeks, while the additional handling requirements can expose the equipment to risk of further damage.

GE Vernova's On-site Services (OSS) offers highly technical onsite inspections and premium repairs for global power generation customers through our EHS, quality, technical, and operational excellence. We work hard to help you meet and exceed your expectations, on budget. We bring the inspection and repairs directly to your location to help you reduce outage time and achieve substantial cost savings. Our On-site Inspection and Repair teams offer:

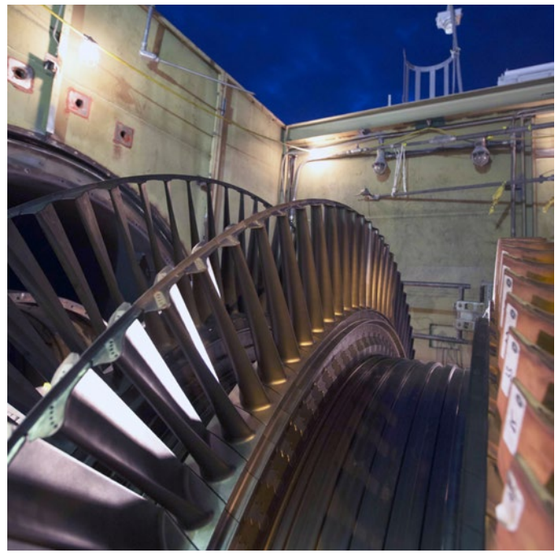
- **Comprehensive services:** We provide a full range of services—from typical inspections, repair and machining to highly specialized services offered by GE Vernova.
- **Extensive tooling:** GE Vernova's OSS is one of the largest onsite service organizations, with more than 500 pieces of portable equipment and an extensive tooling inventory.
- **Experience:** Our team of qualified GE Vernova specialists includes machining supervisors, engineers and technicians with an average experience level of more than 20 years.
- **Global responsiveness:** All equipment is completely mobile and can be transported to any required destination around the world within hours of notification.

Steam Turbine Inspections

GE Vernova's inspection services help prevent major high-speed rotor issues. Each configuration requires the following rotor-specific tests and analysis:

- Boresonic inspection of older bored rotors looks for indications of deterioration from the inside to the outside.
- Periphery ultrasonic testing for solid rotors examines the outside of the rotor for indications of potential issues.
- Phased array wheel dovetail testing looks for indications of stress corrosion cracking (SCC) in time to repair the wheel and prevent bucket liberation.
- Wheelsonic inspections employ a series of tests to evaluate the integrity of wheels on a built-up, low-pressure rotor.

- Finger bucket dovetail inspections provide a comprehensive look that includes:
  - — Non-destructive Testing (NDT)
    - ○ Boresonic inspection system
    - ○ Ultrasonic testing (UT) blade attachments (STG wheel dovetails)
    - ○ Magnetic particle testing (MT) blade attachments (STG wheel dovetails)
    - ○ Wheelbore
    - ○ Solid rotor volumetric
  - — Electromagnetic Testing (EMT)
    - ○ Rotor/bucket instrumentation
  - — Borescope
    - ○ Hot borescope Steam Turbine Repairs
  - — Machining
    - ○ Collector ring grinding
    - ○ Stud drilling and tapping
    - ○ Bore plug removal/installation
    - ○ Valve bore and chest repair
  - — Welding
    - ○ Diaphragm repairs
    - ○ Faro arm inspections
    - ○ Shell and joint repairs
    - ○ Valve seat replacements
  - — Bucket Repair
    - ○ Bucket replacement/repair
    - ○ Cover installation and machining
    - ○ Finger-dovetail pin replacements
    - ○ Tie wire brazing and repair
    - ○ Tenon welding and cover foxholing
  - — On-site Machining
    - ○ Diaphragm fit machining
    - ○ Computer numerical control (CNC) dovetail/longshank machining
    - ○ Dense pack upgrades
    - ○ Coupling line and mirror boring
    - ○ Horizontal joint machining
    - ○ Large rotor machining
    - ○ Journal machining
    - ○ Low-speed balance



Steam Turbine Maintenance

GE Vernova performs a comprehensive range of overhaul and field services, and has a wealth of experience covering all GE Vernova and non-GE Vernova machine types, including impulse and reaction.

With a global network and mobile workshops in a variety of strategic areas, GE Vernova is able to provide quick and effective engineering services at any location. These services include manufacturing and specialist repair of any part, from individual blades to a newer rotor.

We also provide a full range of outage planning, management and execution activities. Unplanned work is significantly reduced, thanks to our extensive fleet management experience. We achieve this by working with you to help ensure that maintenance is properly targeted and spare parts are always ready.

Generators

Generator Health Monitoring

GE Vernova's remote Generator Health Monitoring provides a comprehensive service to any operator to assess the health of the generator by supplying key information for condition-based maintenance and to help prevent unplanned downtime and losses.

For the highest level of assurance, opt for remote continuous online monitoring and benefit from weekly checks and in-depth reports from our experts. GE Vernova's Generator Health Monitoring provides the following benefits:

- Early fault identification
- Extended outage intervals
- Fewer unplanned outages
- More accurate planning and execution of outage work

Available Technical Data Modules

- Partial Discharge
- Rotor Flux
- Rotor Shaft Voltage
- End Winding Vibration
- Stand-alone Boxes
- Collector Health Monitor
- Stator Leakage Monitoring System.

GOLD* Service

Our periodic online monitoring service allows you to cost-effectively assess the condition of your generator, for any original equipment manufacturer (OEM). It involves the installation of permanent sensors, followed by twice-yearly measurements and an expert report, allowing you to make informed decisions about your planned maintenance.

GOLD Service benefits include:

- Extended outage intervals
- Fewer unplanned outages
- More accurate planning and execution of outage work

Generator Inspection, Rotor In-Situ (Air-Gap)

GE Vernova's inspection solutions include the latest robotic tool technology that can perform a complete air gap inspection program with the rotor installed.

Combining GE Vernova's robotic inspection technology and field service expertise, we can help provide an increased level of operational confidence between major outages. In-situ inspections are fully embedded in GE Vernova's modular condition assessment portfolio, and can enhance outage duration and reduce risks related to rotor removal. Combine the air gap inspection with an in-situ retaining ring inspection to get even more from your outage time.

Benefit from:

- Reduced downtime
- Reduced risk—rotor stays in place
- Lower workforce costs due to reduced disassembly requirements

Generator Inspection, Retaining Ring Scan

GE Vernova's retaining ring scanner is a robotic inspection tool made for detecting stress corrosion cracks without the need to remove the retaining rings. The disassembly requirements are reduced and the inspection can be carried out with the rotor in-situ or removed. Enhance your outage time and increase the level of assurance between major outages by carrying out an air gap inspection in parallel with your retaining ring inspection.

Benefit from:

- Reduced downtime
- Lower workforce costs due to reduced disassembly requirements
- Enhanced accuracy related to characterization and location of issues.

Generator Test and Inspection Program

GE Vernova's Test and Inspection Program is a set of modular solutions to thoroughly assess the condition of your generator during a major outage. Based on decades of experience across one of the largest installed fleets, our diagnostic experts will provide you with a detailed analysis and recommendations for reliable operation.

Example tests include:

- **Generator endwinding vibration testing (Bump Test):** Determines if you have high magnitude frequency response within exclusion zone. Modification to shift or dampen frequency response.
- **Generator stator cooling water flow test (UT Flow):** Pinpoints individual bars with rates that are lower than average low flow that can lead to higher stator bar temperature and accelerated ground wall insulation aging and an eventual forced outage. This test is performed during a major outage.

CUPROPLEX*

CUPROPLEX is a proven service to remove copper oxide buildup from stator bars and the cooling water system to restore cooling efficiency and avoid overheating damage. It is the only process that can be applied while the generator is online and in normal operation. For heavily flow restricted bars we have developed CUPROPLEX-S.

Benefits of this service include:

- No disassembly requirements
- Controlled process
- Reduced environmental impact—no hazardous liquid waste
- Return to full output in as little as two days

Onsite Repairs – A Repair Portfolio Built Around Your Critical Needs

By drawing on decades of configuration and repair experience, we developed a wide range of onsite repair solutions to increase the reliability of your generator asset.

GE Vernova's onsite repair solutions include:

- APLETEC* – Stator water box leakage repair. Seal leaking water boxes by exposed coating, with only disconnecting the hydraulic hoses (no bar removal)
- Metal spraying
  - — Onsite rotor repair
  - — Rotor seal oil journals repair
  - — Low coefficient of friction of the sprayed metal, reducing rubbing effects between rotor shaft and oil seal rings

TRUEpart

WHAT IT IS:
A **TRUEpart** is a refurbished GE Vernova part, not a brand new component, that's been reconditioned in an authorized GE Vernova shop to aim to meet or exceed original equipment specifications.

WHY CHOOSE IT?
TRUEparts are a cost-effective option compared to purchasing newer parts, potentially saving time and money for customers.

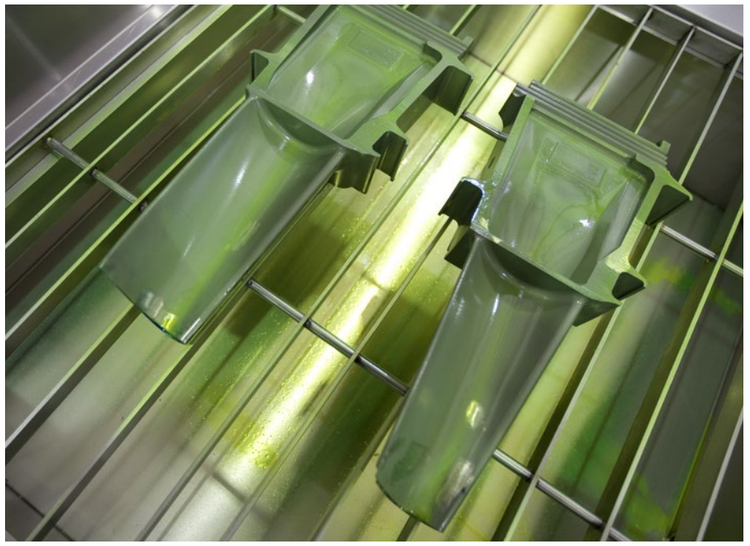
WARRANTY:
GE Vernova backs **TRUEparts** with a warranty that is one of the best standard warranty in the industry: newer-part equivalent or full-interval, providing peace of mind no other part can bring.

GE VERNOVA'S EXPERTISE:
GE Vernova has 130 years of expertise, engineering and performance in gas turbine components.

GE VERNOVA OFFERS:
Refurbished heavy-duty gas turbine hardware and parts.

EXCHANGE MODEL:
GE Vernova provides an exchange model where you can trade in used parts for newer or refurbished **TRUEparts**.

HOW IT WORKS:
You receive a quote for your used part, pay only the price difference for the replacement, and GE Vernova handles logistics and compliance.



GAS TURBINE PARTS AND REPAIRS

When It Comes to Replacement Parts, Customers May Have Many Choices. Here's Why You Should Choose GE Vernova:

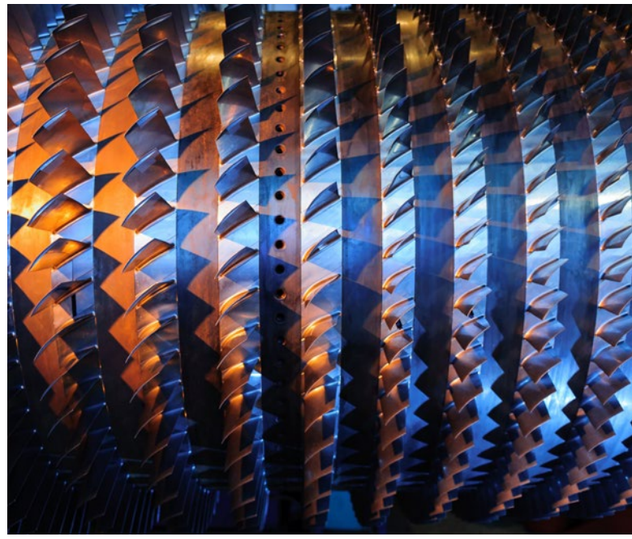
- Genuine OEM-engineered and manufactured parts. We supply top quality parts at a competitive price and delivery cycle. Current production parts are manufactured to our exacting OEM standards for installation into either new equipment or your existing equipment. We incorporate technology developments and improvements into each component, focusing our engineering efforts so that each part fits into and functions integrally with existing GE Vernova equipment. We meet our own OEM standards through extensive analysis and testing, and by the continuous monitoring of raw materials, components, processes and systems.
- Continuous innovation. As the industry changes, so do our parts. We develop and help deliver innovative solutions and upgrades that preserve or enhance the integrity of your asset. Every day, we work to develop newer materials, coatings, controls, and technologies engineered to improve asset life and performance.
- Expert knowledge and service. Stay focused on your business objectives while our dedicated customer service professionals attend to your needs. With more than 100 years of technical expertise and fleet operability knowledge—including 8600 installations—we know your equipment inside and out. And we maintain the component engineering drawings to prove it!
- World-class support, everywhere. Whether it's planned maintenance or an unplanned event, GE Vernova's trained professionals located nearby are ready to respond to your needs. Our global field service and engineering network can quickly access drawings, bills of material, and service records specific to your unit. Our experts can assist you with outage planning and recommend ways to improve reliability, availability, performance, and emissions. And, we offer customized solutions that help you manage your operation and maintenance costs in a predictable, effective manner.
- The part you need, when you need it. Global facilities, a continuously replenished inventory of more than 10,000 individual parts, and a highly reliable supply chain mean GE Vernova can help meet your demand to the highest standard. Using the latest logistics and information technologies, our service operations aim to fulfill parts orders that are accurate, meet applicable requirements, and are delivered on-time.

With GE Vernova, you get the advantage and benefits of an OEM part. We can help improve your plant's performance, reliability, safety, and emissions and better control your operating and maintenance costs as your asset ages. Plus, you can incorporate technology improvements as we make them commercially available.

Gas Turbine Repairs

With a vision of supporting one of the world's best running fleets, GE Vernova can keep your assets up and running with its standard repairs or, alternatively, you may choose our advanced repair technologies to extend component life or to improve maintenance intervals or efficiency.

GE Vernova's global network of repair shops is strategically located for agile responsiveness, tapping into regional compliance and regulatory expertise. Whether you are planning a major overhaul or simply need a minor replacement, GE Vernova's OEM advantage and expertise can help you more efficiently and effectively manage your repairs and inventory.



Heavy Duty Gas Turbine Offerings

Program	What It Does	Why GE Vernova?
Parts Exchange With an Option for Refurbished Parts	Exchange used GE Vernova parts for credit towards current or future purchase from GE Vernova for: • An upgrade or newer spares • Refurbished parts, pedigree backed by GE Vernova • Exchange logistics managed by GE Vernova	• Reduce inventory costs • Enhance the value of part life • Flexibility... exchanged parts GE Vernova receives may be (A) fired or unfired or (B) repaired or unrepaired
Zero-Cycle Repairs	Steps to perform a zero-cycle repair are: 1. Specify the parts you want to be repaired 2. We quote replacement parts instead of repair 3. You send GE Vernova your parts to be repaired at the same time you buy and install the replacement parts	• Reduced inventory costs • Parts provided just-in-time to help meet your schedule • Capitalize your repairs • Enhance the value of part life
Repair of Third-Party Components	We may repair non-GE Vernova parts: 1. Not originally manufactured by GE Vernova or 2. Originally manufactured by GE Vernova that have been repaired by others	For your non-GE Vernova parts: • You have an option to obtain the value and quality of an OEM repair by GE Vernova
Repair for Performance	Collaborate with GE Vernova to select the repair solution resulting in the performance outcome you want. We continually innovate and invest in repair technologies to provide you with different options.	• Improve part life and performance • Select an option that best fits your situation and needs

Aeroderivative Gas Turbine Offerings

Program	What It Does	Why GE Vernova?
Engine Exchange	Exchange your engine with a newer engine, a refurbished engine, or a partial-life engine right on your site. Save costs with GE Vernova's standard, condition-based overhaul work scope, where we offer better pricing options.	• Requires only a 2-to-3-day outage • Includes the largest engine exchange pool available • Offers a steady supply of newer engines with the latest engineering improvements • Includes fully refurbished engines as a lower-cost alternative • Offers an expanded partial life engine pool
Module Exchange—On-Site Repair	Not near a GE Vernova service center or have a maintenance event that only involves limited modules? We exchange those modules right at your site or at a field service shop close to you.	• Lets you keep your engine to meet permitting requirements or to maintain the same engine serial number • Reduces outage duration (generally less than 5 days depending on the scope) • Supports both planned and unplanned repairs • Reduces your risk as GE Vernova assumes cost risk for large engine parts and flow path airfoil fall-out • Provides standard GE Vernova warranty coverage on hardware provided
Module Exchange—Service Center Repair	When on-site engine or module exchange is not an option, GE Vernova provides excellent turnaround time. Advance planning and scope definition are key to enhancing turnaround times using service center module exchange.	Helps deliver responsive turnaround times (60 days or less can be achieved with advance planning and supply chain alignment to help ensure availability of parts and service center induction slots)
Firm Fixed Price	If neither of the exchange options are suitable for you, and you prefer to keep your own engine and modules, we address any engine components that require repair or refurbishment. Firm-fixed price repair also covers the cost risk of airfoils, the more than 3000 blades, vanes (or nozzles) and shrouds that are in the flow path of an engine. Airfoils have various levels of wear and tear, depending on many factors including age of the parts and the engine operation condition.	• Aims to improve your economics with firm fixed price for the fastest possible turnaround time (based on scope) • Reduces your risk as GE Vernova assumes the risk of replacing large parts, removing your repair cost uncertainty
Partial Fixed Price or Time and Materials Repair	If you are not cost risk-averse and do not require a quick turnaround from the service center, time and material repairs may be right for you. Scrap risk is not transferred to GE Vernova and your final invoice is based on the actual time and material required to repair your engine. Because time and materials repair can lead to potential commercial and technical delays for negotiation and decision making during the event, GE Vernova also offers a partial firm-fixed price repair under some circumstances. Typically, the fixed price portion will cover a defined work scope with you assuming full responsibility for replacement of any unrepairable material, work scope expansion, and service bulletin compliance at time and material rates.	• Avoids some commercial and technical delays • Reduces turnaround times due to advance planning and scope definition • Smooths supply chain alignment as well as availability of parts and service center induction slots

REPOWER AND RELOCATION SERVICES

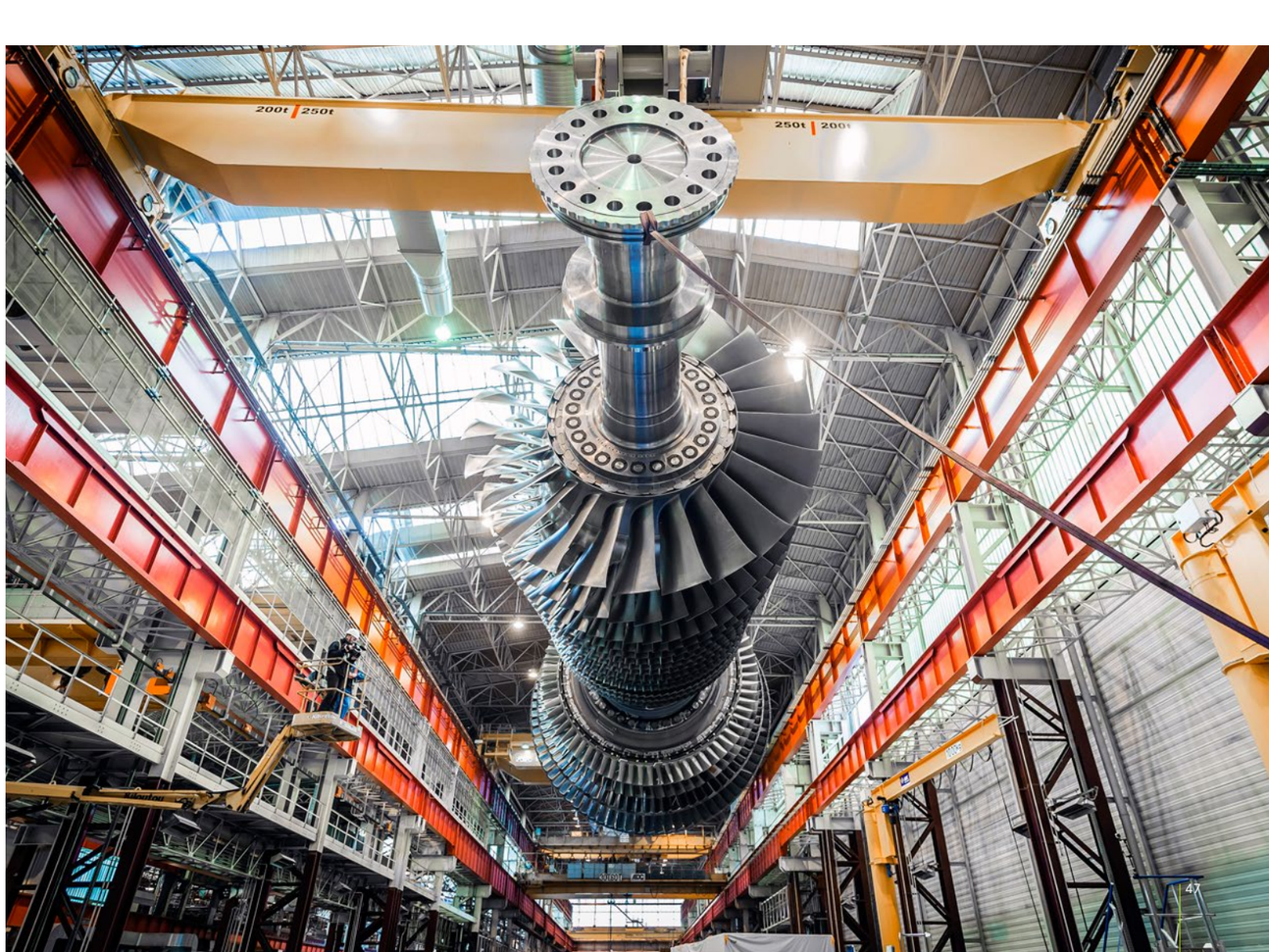
Repower

With GE Vernova's RePower service, customers can achieve significant performance improvements in output and fuel efficiency and add years of profitability and life to a power plant by means of a gas turbine flange-to-flange upgrade. With more than 100 successfully completed projects across all frame sizes and on five continents, GE Vernova has the proven capability and experience to craft the right solution to keep a plant running at its peak potential. GE Vernova can RePower existing GE Vernova assets or non-GE Vernova assets much faster than the time it takes to install a new unit. The flange-to-flange upgrade is a full replacement of an engine within the footprint of an existing gas turbine, utilizing the existing balance-of-plant assets. Such enhancements can be undertaken within reduced outage times, allowing fleet managers to decrease overall downtime while:

- Addressing multiple asset improvements in one simple upgrade
- Reducing emissions to comply with the latest regulations
- Increasing profitability by improving your gas turbine and plant efficiency, reliability, availability, and output
- Retaining or even increasing existing levels of exhaust energy as needed for thermal load, such as with CHP (combined heat and power) and district heating customers
- Extending maintenance intervals with newer, more durable components
- Allowing owners the option to make additional changes, such as migrating to dual fuel or alternative fuel systems

Plant Rehabilitation and Relocation

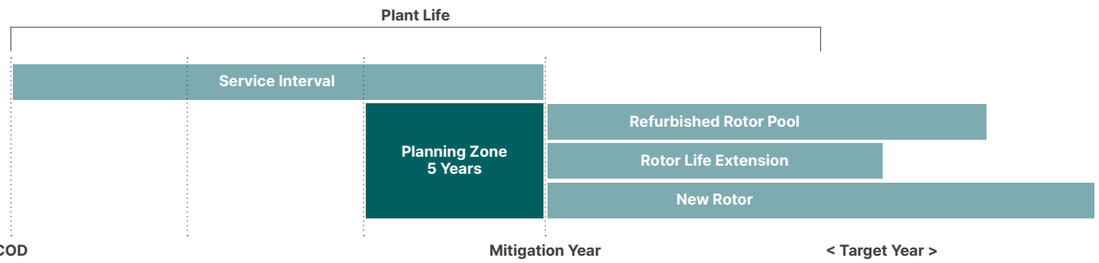
Plant rehabilitation and relocation provides operators with a fast track to reliable power supply, combining plant integration expertise with the proven performance of GE Vernova equipment. Rehabilitating plants that are currently in standstill mode, partially dismantled or damaged offers operators a quick path to power recovery and an opportunity to inject technology for more competitive operation. Plant relocation is an option to not only revitalize an underutilized asset, but also move it to a more advantageous location. Through this program, we help you return standstill units to operation.



ROTOR LIFE MANAGEMENT

Planning for rotor life management begins with a few questions. Experience has shown that starting with the four questions below is a great way to initiate a dialogue around developing a plan:

1. What time frame am I trying to manage the rotor through?
2. In this time frame, what are the future operational expectations for my unit and/or my plant?
3. Should the rotor life management plan encompass an individual unit or extend across a fleet of units?
4. In this time frame, what outage constraints, scope, or timing window should be considered?



One of the most important things GE Vernova talks to customers about is planning early. Typically, our collaboration with operators is the most successful when we start developing a plan three years before reaching the major outage where the rotor solution will be implemented. The first year revolves around understanding the future operational mission of the plant, time frame of the life of the plant, financial imperatives such as asset utilization, depreciation, risk management, then identifying options that most benefit the asset strategy of the plant. The second year is typically spent with customers acquiring various approvals. In the third year GE Vernova procures, manufactures, and tests items in preparation for delivery.

Typically we see operators start planning up to five years in advance of the need to install a solution. This allows a lot of flexibility to evaluate different types of options. There are a few factors that influence the timing of needing a rotor solution. The main drivers are the number of hours and starts run per year. As we have seen gas-powered plants moving toward a more cyclic operation, this can move the timing of rotor maintenance in or out in time.

Our most forward-looking customers have a maintenance and rotor management plan covering multiple time horizons. For example, sometimes their plans exceed 10 years and cover many outage cycles. Having a rolling 10-year perspective allows better decision-making throughout the life cycle of the plant. As the industry changes, the recommended solution may change, too.

Once the operator understands when a rotor solution is needed, it is helpful to analyze the long-term plans for the plant. In some cases, there may be some uncertainty in this area. However, in other cases the plant target year can be defined as the power purchase agreement term or a plant life extension. Understanding how long you need to run your rotor solution helps you make sure you pick an option that gives you the right amount of expected rotor lifetime, not too much or too little.

Welded Rotor Life Management Strategy

Lifetime: GER 3620, Heavy-Duty Gas Turbine Operating and Maintenance Considerations, defines welded rotor minimum expected lifetime for each specific gas turbine type and rotor type. GT24 and GT26 are welded rotor configurations (among other GT frames). In order to achieve the minimum expected lifetime, visual inspections are performed during a standard C inspection. The specific lifetime is defined for each rotor individually. In addition to the implemented rotor life cycle management program, the specific condition and the planned future operation regime are taken into careful consideration for the individual recommendation.

Plan: Welded rotor life cycle management is based on regular rotor assessments performed during routine C-inspections. Based on a thorough prior review of the individual gas turbine rotor operation history, anticipated future operation regime and respective fleet data, a jointly agreed individual inspections schedule for creep and low cycle fatigue (LCF) assessment is defined.

Monitor: The execution of the on-site rotor assessment is aligned with other C inspection work and is carried out by certified GE Vernova non-destructive testing (NDT). Configured for purpose inspection probes, embedding advanced NDT technologies are developed and validated for each specific inspection task to help ensure the required measuring accuracy. In a continuously evolving best practice approach, the resulting measurement data combined with OEM engineering information and fleet data is analyzed to make reliable and risk controlled recommendations for further rotor use.

Recommendations

Continue Operation

If there are no LCF findings or creep elongation findings are well below the maximum allowable limits, a recommendation is to continue operation.

Monitoring

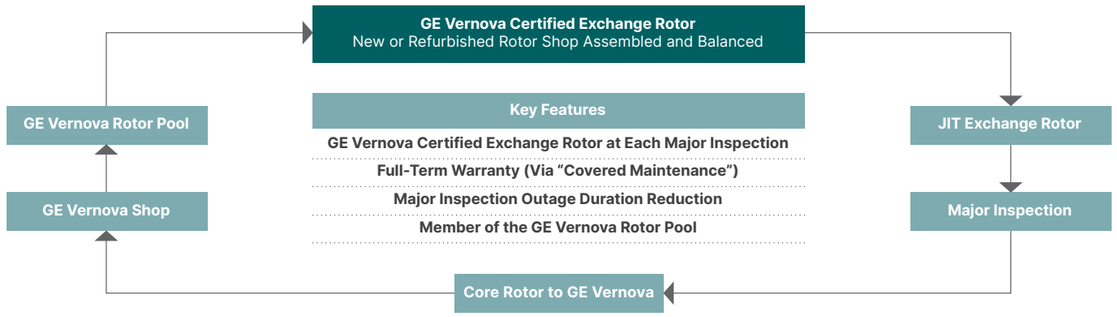
In case of linear indications which are below the maximum allowable depth, a recommendation may be given for further operation with specific monitoring recommendations or with operational limitations.

Repair

If the rotor has deteriorated beyond the serviceable limit or if particular features are damaged, a repair may be recommended. Reconditioning/replacement and technical or economic constraints may eventually lead to a replacement. If the rotor turbine section is approaching its end of life (LCF and/or creep deterioration), it is possible for certain rotor types to replace the turbine section by a new one.

Key Customer Benefits

- Enhanced rotor lifetime without compromising safety and reliability
- Better planning for monitoring, repair and replacement
- OEM engineering support for specific assessments/ recommendations
- Dedicated team of certified GE Vernova NDT specialists.



STEAM TURBINE SERVICES

1200+ installed units to date, more than 195 GW

More than **130 years** of services experience from all major OEM fleets

Strategic outage planning for **rapid response** to emergent needs

STEAM TURBINE

Advanced Steam Path (ASP) or Partial Steam Path (ASP Lite)

GE Vernova has a suite of customizable solutions to improve the reliability of the high pressure (HP) and intermediate pressure (IP) module of your steam turbine. The Advanced Steam Path may be an attractive option that addresses multiple reliability concerns while providing improved performance. When faced with lengthy repairs, ASP can also significantly reduce outage scope and duration.

Key Benefits

- Reduced risk of unplanned outages and major emergent repairs during planned outages that are both costly and extend outage duration
- Increased steam turbine output based on recovery of aging losses and improved technology
- Enables combined cycle plant upgrades that increase steam flow
- Improves combined cycle heat rate

ASP Features*

- Singlet diaphragms in the HP and IP sections
- Modern N_2 packing head configuration made of 9-Cr material with reduced axial loading and improved clearances
- Enhanced sealing features including HP tip and root J-seals, N_2 packing head brush seals, IP tip brush seals
- The newer steam path is engineered to fit within the existing shell
- Phase 1:
  - Newer monoblock rotor with impulse blading in the HP and IP sections
- Phase 2:
  - Newer 3-piece welded rotor with 10-Cr material in the center section with reaction blading in the HP section and impulse blading in the IP section

* Pre-engineered solutions for D11. GE Vernova offers ASPs to most OEM turbine configurations. Reach out to your customer representative for more information.

ASP Lite Features (typical scope)

- Newer rotating blades for at least the first two stages of the HP and IP sections
- Newer singlet or refurbished diaphragms, to address dishing
- Modern seals with improved clearances
- Newer N_2 packing head

SHELL UPGRADES

Benefits of HP-IP Shell Replacement

- Improved reliability and availability
- Utilize field experience and mechanical integrity analysis to improve casing geometry
- Option for 10-Cr material with superior creep resistance and Low Cycle Fatigue (LCF) capability
- Life extension
- Reset the degradation to zero
- Opportunity to include life monitoring
- Opportunity to reduce outage duration with complete HP-IP module

VALVE UPGRADES

GE Vernova's Next Gen Steam Turbine Valves

GE Vernova's Next Gen ST Valves provide our customers with replacement options for valves. Hardware solutions can enable minor outage interval extensions from 3 to 6 factored years or 25kEOH to 50kEOH. Advanced sensors and analytics are applied to selected configurations to move from reactive to proactive/predictive health monitoring.

Key Features

- **Package 1:** replaces only the internals on the main steam control valve (MSCV), with select internals on the combined reheat valve (CRV). This option principally applies to more modern guided outlet MSCV's and CRV's with Rexroth actuators and MT/RT valves with STA* actuators.
- **Package 3:** a full valve replacement option for the MSCV and an upgrade of critical components on the CRV internals and actuators.

Key Benefits

- Valve health monitoring for selected configurations to move from reactive to proactive/predictive health monitoring
- Extended maintenance interval recommendations (from 3 yrs up to 6 yrs or 25kEOH up to 50kEOH)
- Reduces oxidation induced mechanical binding (i.e. sticking valves)
- Improved valve throttling stability margins with reduced solid particle erosion (SPE) rates
- Reduced valve testing requirements (e.g. daily to weekly)
- Improved pressure drop and longevity of the valve body while reducing the risk associated with performing costly, life limiting repairs (Package 3 only)

Opflex* Steam Turbine Agility

Opflex Steam Turbine Agility is a comprehensive system solution to improve start times of combined cycle plants. It includes a combination of controls upgrades with expert plant-level operational analysis and recommendations to aim to deliver significant improvements in combined cycle start performance.

Key Features

- Enhanced rotor stress control
- Flexible hot start
- Automatic temperature ramping
- Modified reverse flow
- Inlet Pressure Control (IPC) Setpoint Tracking

Key Benefits

- Up to a 57% reduction in steam turbine start time
- Up to $9000 in fuel savings per start
- Potentially improve your position in the merit order
- Reduced start up emissions
- More predictable and repeatable combined cycle start times
- Reduced potential for missing generation during peak periods
- Improved balance between start time and steam turbine rotor life.

STEAM PATH WARMING

Heating Blankets

The shell warming system helps deliver a significant reduction in start times and rub induced vibration events while enabling longer sustained HP/IP section efficiencies. The offering consists of a heating blanket system, junction boxes, cabling, thermocouples, and a stand-alone control system. As a separate customer option, the system can also be connected to the plant DCS for all the automated control functions in replacement of stand-alone control system. This integration will typically be performed by the customer with instructions provided by the thermal blanket system supplier.

Key Features

- Insulated heating blanket system
- Junction boxes
- Cabling and thermocouples
- Stand-alone control system

Key Benefits

- Faster start up times (e.g. 0.5 –1 hour reduction)
- Works with OpFlex*
- Longer sustained HP/IP section efficiencies
- Reduces likelihood of rub induced vibration

Heat Conservation

The Steam Turbine Heat Conservation System utilizes heated air as the medium for warm-keeping of the high temperature rotors during periods of standstill and prior to re-start. This solution reduces start-up times by eliminating cold start conditions as well as providing preservation of the steam turbine and condenser by maintaining humidity control when the unit is in stand-still mode. The system can also be operated in reverse mode to perform a controlled forced cool down of the unit.

Key Benefits

- Improved availability through reduced start up times
- Improved start-up efficiency
- Enhanced flexibility by shorter response time upon demands from grid
- Helps avoid penalties for late delivery to the grid
- Steam Turbine lifetime improvement
- Automated preservation of ST components and condenser by removing humidity
- Additional benefit: Controlled forced cooling capability for faster shut-downs and reduction of outage duration

TURBOMAX 7+ STRESS CONTROLLER

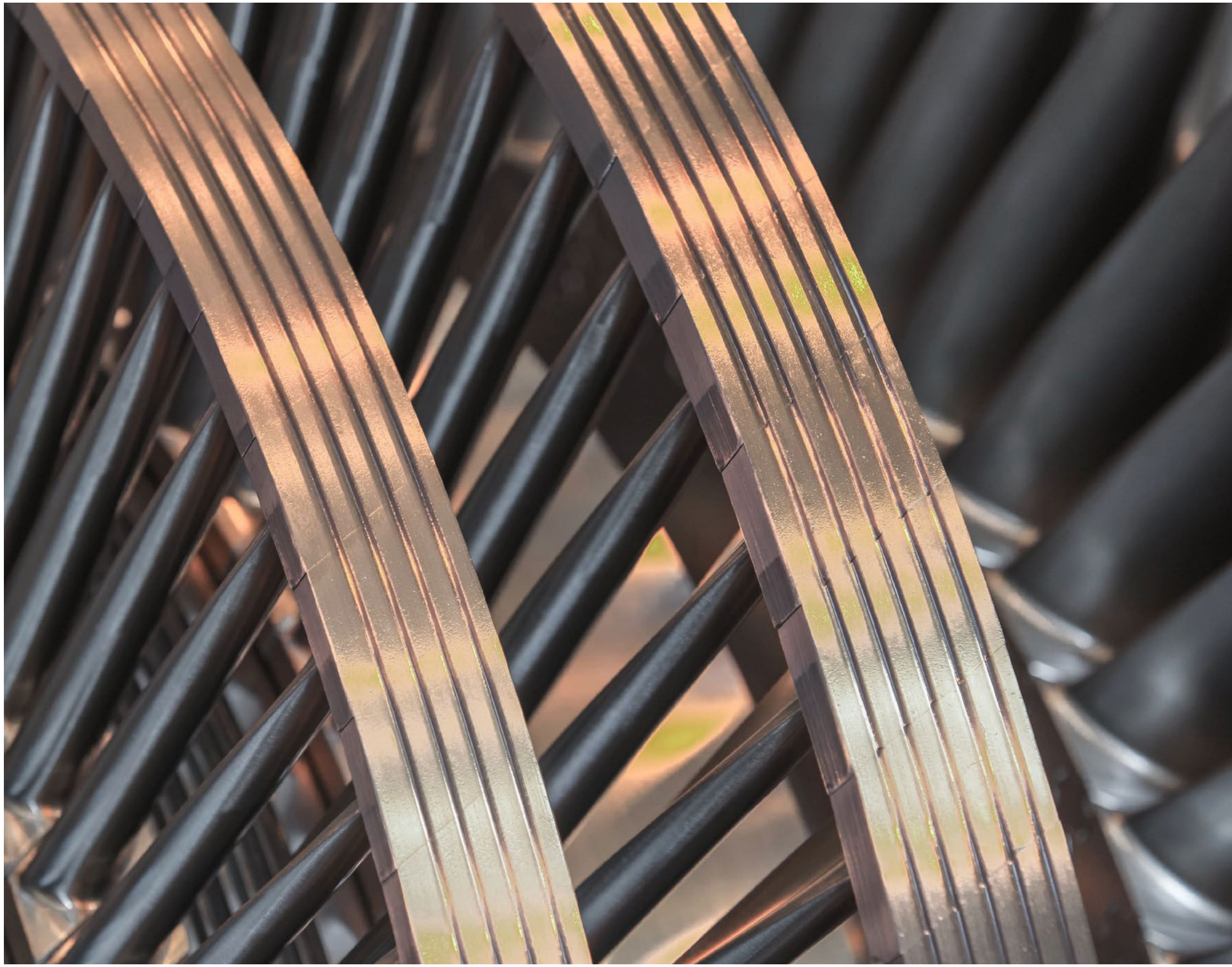
The power generation industry is rapidly changing, and turbines originally manufactured for base-load operation are now required to respond quickly to grid demands. The modern requirements for steam turbine power plants (including combined-cycle installations) are faster and more frequent start-ups, combined with longer phases of low load operation (LLO).

GE Vernova has developed a modern rotor stress controller called Turbomax* 7+, available for units running older versions of Turbomax* that is built around the following modules:

- **Steam Turbine Rotor Stress Calculation Model:** Calculates the thermal stresses for the steam turbine rotors based upon existing measurements typically available in the turbine supervisory instrumentation suite.
- **Steam Turbine Limiter and Control Functions:** Keeps the operation of the steam turbine within the permissible limits for protection of the asset.

Key Benefits

- Improved availability and reliability
- Improved flexibility
- Cost savings during start-up and load ramps



GENERATOR SERVICES

GE Vernova provides full generator life cycle support. Our Services team is here to extend the expected lifetime of the generator, improve reliability and availability, and increase its capacity to help deliver more profit to our customers.

GE Vernova provides a complete range of cost-effective generator services spanning from inspections to complete flange-to-flange retrofits for air, hydrogen, and liquid cooled generators rated from 20 to 1090+ MVA. GE Vernova has performed hundreds of rotor and stator rewinds and responded to thousands of planned and emergent outages with a global pool of generator specialists to serve customer needs.

Generator Services Solutions

GE Vernova continues to invest in developing retrofittable solutions to help bring new life into aging systems, providing full life cycle support which can have a big impact on the entire life of a power plant. GE Vernova focuses on aiming to deliver customer value by improving output, efficiency, availability/reliability, and flexibility, extending generator life, increasing capacity, and reducing outage time all while adhering to the project budget.

Summary

- 125 years of experience
- 1000+ rewinds over the last decade
- 1.7+ GW of generator uprates

World-class response time for emergent needs

- Strategically placed inventory of long lead critical parts and common model exchange rotors
- Large pool of highly trained, safe, and experienced generator specialists and winders
- Continuous investment in upgrade and repair technology
- Focus on the quality and on time delivery embracing GE Vernova's lean processes
- Comprehensive portfolio of solutions built around critical needs of any type or make of generator
- Leading on-line monitoring solutions to support condition-based maintenance

	Output	Efficiency	Availability/ Reliability	Flexibility
Stator Rewind	X	X	X	X
Rotor Rewind/Replacement	X	X	X	X
Generator Replacement	X	X	X	
Advanced Rotor Fan Blades	X	X		
Maintenance Program (Test/Robotic Inspection)			X	X
Generator Off Line Inspection : Retaining ring, rotor in robotic, rotor out			X	X
Generator Health Monitoring (GHM)			X	X
Strategic Spare Parts		X	X	X
Auxiliary Systems Upgrade			X	
Exchange Rotor	X	X	X	X
Stator FlexPACK*			X	X
Rotor FlexPACK*			X	X

Generator Rotor Rewind

Rotor rewind typically consists of re-insulation of the existing copper coils. GE Vernova provides a number of rotor rewind options to fit your needs including newer copper coils, retaining rings, collector rings, and more.

- Advanced end-winding blocking supports, advanced insulation materials, and patented copper finned ventilation ducts better support and cool the unit
- Advanced dovetail and rotor end-slot modifications help prevent crack propagation and improve cyclic duty durability
- Advanced repair technologies, such as retaining ring removal and installation automated skids, provide proven rewind capabilities
- Off-the-shelf pre-wound high speed balanced exchange rotors or newer replacement rotors that provide all the benefits of a rotor rewind while significantly reducing outage interval
- With the shift toward more cyclic operation in the fleet, GE Vernova offers the rotor flexpack to provide customers with a solution to reduce risk of forced outage, lower O&M costs and avoid premature rewinds

Generator Stator Rewind

- Advanced end-winding system support and improved bar strand configurations
- More capability through the use of Micapal III*, MICADUR* and/or MICAREX* bar insulation material
  – Proven industry leader in voltage endurance and dielectric strength capabilities
- Strand optimization and roebel bars to reduce eddy current losses and increase output by keeping the stator bar cooler
- Advanced repair technologies, such as stator bar loader and wedge tooling, provide proven rewind capabilities
- Strategically placed inventory of long lead critical parts on many common models provides shorter unplanned outage durations

Generator Offline Inspection, Retaining Ring

Providing Generator Reliability

GE Vernova's retaining ring scanner is a robotic inspection tool made for detecting stress corrosion cracks without the need to remove the retaining rings. The dismantling requirements are reduced and the inspection can be carried out with the rotor in-situ or removed.

Enhance your outage time and increase the level of assurance between major outages by carrying out an air gap inspection in parallel with your retaining ring offline inspection.

Benefit from:

- Reduced downtime
- Lower workforce costs due to reduced dismantling requirements
- Enhanced accuracy related to characterization and location of identified problems

Generator Offline Inspection – Rotor Removed

Providing Generator Availability

GE Vernova's Test and Inspection Program is a set of modular solutions to thoroughly assess the condition of your generator during a major outage. Based on decades of experience across one of the largest installed fleets, our diagnostic experts will provide you with a detailed analysis and recommendations for reliable operation.

Example tests include:

- Generator endwinding vibration testing (Bump Test): Determines if additional support is required for the endwindings
- Generator stator cooling water flow test (UT Flow): Pinpoints individual bars with low flow rates which can lead to higher stator bar temperature and accelerated ground wall insulation aging

Stator and Rotor FlexPACK*

With the shift toward more cyclic operation in the fleet, GE Vernova undertook an enhancement program to provide customers with a solution to reduce risks of forced outage and premature rewinds with FlexPACKs.

Rotor FlexPACK features include:

- Newer end creepage block configuration that lowers coefficient of friction resulting in reduced thermal sensitivity
- Newer turn insulation layout which provides improved bonding and reduces coil end winding distortion
- Thermally compliant centering ring blocking to help prevent end winding distortion
- Slot exit relief at forging channel ends to improve slot armor abrasion protection and provide coil “windability” improvements

Stator FlexPACK features include:

- Fixed axial supports replaced with two piece sliding supports to allow for uniform growth of the endwinding support system.
- The addition of flexible lead connections between connection rings and high voltage bushings. This allows axial movement of the connection rings without putting stress on the high voltage bushings. (Steam turbine driven H33 and H53 generators have flexible leads as shipped).

Onsite Repairs

A Performance Portfolio Built Around Customer Critical Needs

By drawing on decades of engineering and repair experience, we developed a wide range of onsite repair solutions to increase the reliability of your generator asset.

GE Vernova’s onsite repair solutions include:

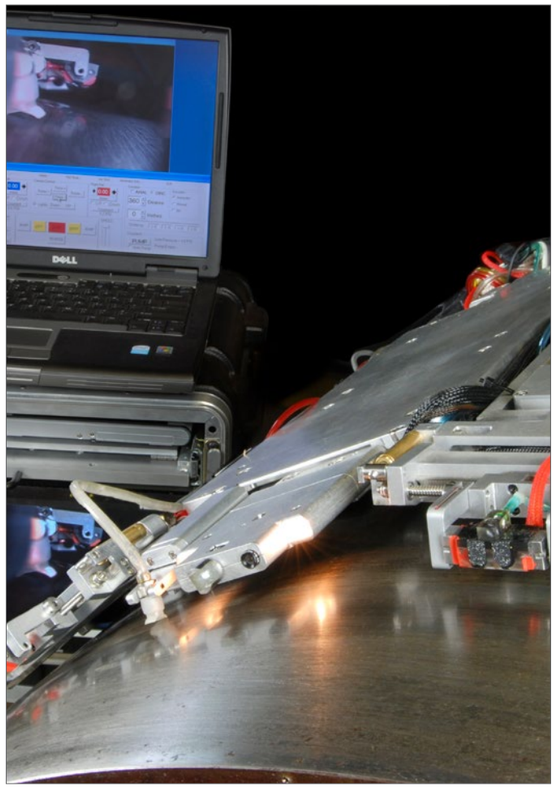
- **APLETEC* – Stator water box leakage repair.**
  Seal leaking water boxes by exposed coating, with only disconnecting the hydraulic hoses (no bar removal)
- **Metal spraying – Onsite rotor repair.**
  Rotor seal oil journals repair – Low coefficient of friction sprayed metal, reducing rubbing effects between rotor and oil seal rings
- **On-site stator core repair.**
  Horizontal core restack and prosthesis - Alternative technology to partial core ends restacking

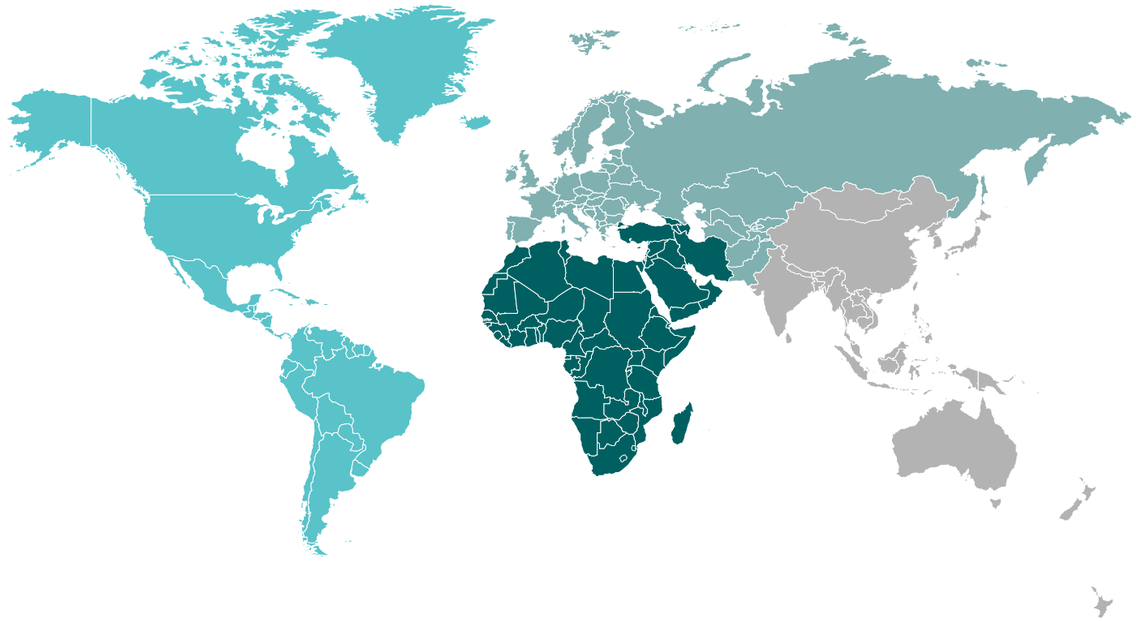
Workshop Repairs

A Global Network of Facilities for Any Kind of Repair

GE Vernova is at the forefront of continuous improvements. Our leading workshop facilities are equipped with the latest tools and equipment technology to repair any type and make of generator to restore full operational confidence.

GE Vernova is well positioned to help deliver repair services where and when you need us by continually investing to develop local resources. Critical to managing this global presence, we’ve mastered the logistics to maintain reliable supply chains, coordinate resources, and comply with regional regulations.





Middle East/Africa (2 Service Centers)	
Capability	**Repair**
Stator Winding	X
Rotor Winding	X
Generator Inspections	X
Exciter Inspection and Rewind	X
Rotor High Speed Balancing	X

Americas (3 Service Centers)		
Capability	**Repair**	**New Parts**
Stator Bar Manufacturing		X
Stator Winding	X	
Rotor Winding	X	
Generator Inspections	X	
Rotor High Speed Balancing	X	
Stator Stacking		X

Europe (4 Service Centers)		
Capability	**Repair**	**New Parts**
Stator Bar Manufacturing		X
Stator Winding	X	
Rotor Winding	X	
Generator Inspections	X	
Exciter Inspection and Rewind	X	
Rotor Manufacturing		X
Coil Manufacturing		X
Stator Stacking		X
Rotor High Speed Balancing	X	

HRSG SERVICES

OEM Expertise for More Than 100 Years

GE Vernova has extensive HRSG expertise, with more than 1,300 HRSGs in operation to date. We offer a one-stop shop for HRSG users. Our product portfolio comprises inspections, repairs, cleanings, life management solutions and life time extension upgrades.

Upgrade Solutions and Parts

Replacement Pressure Parts

Supplying pressure parts for HRSG units requires large-scale facilities and extensive engineering, procurement and construction (EPC) experience. As an OEM with a global workshop network, GE Vernova can offer standard and tailor-made pressure parts for all major HRSG brands. No matter how extended the scope is and how complex the installation might be, we have a solution to streamline your maintenance and improve your unit availability.

Site Services

Inspections, Repairs and Outage Support

With our knowledge, extensive experience, and commitment to safety, GE Vernova offers time-saving and value added inspections, repairs, replacements and outage support services for your HRSG and auxiliary systems, helping you increase availability and save costs before, during, and after your outage.

Planning

- Outage objectives, work scope, and priorities
- Material and parts requirements and logistics

Execution

- Detailed inspections, onsite modifications and repairs
- Condition assessments and remaining life assessments
- Construction services and supervision

HRSG Upgrade After a GT Upgrade

Combined cycle power plant operators typically implement gas turbine (GT) performance upgrades to improve competitiveness and profitability over the life cycle of a plant. GT upgrades typically lead to changes in exhaust gas temperature and mass flow at the inlet of the HRSG. If not properly managed, these changes may have an adverse impact on HRSG safety, reliability or performance. With an HRSG Upgrade Package, GE Vernova will review various areas of the unit to assess the impact of a GT upgrade and provide the products and services necessary to support safe and reliable operation of the HRSG.

To assess the impact of a GT performance upgrade, GE Vernova employs proprietary software and creates a performance prediction model for the HRSG configuration. This software is capable of modeling any HRSG OEM configuration and evaluating the critical parameters of performance and life for the HRSG components. Based on the software output, further analysis could be necessary to assess HRSG performance, pressure part materials, sound levels, piping specification, environmental control equipment, attemperators, valves, and instrumentation.

In addition to proprietary software, GE Vernova draws on our service and operation experience from more than 1,300 HRSGs installed and operating worldwide. Our product and service expertise, combined with the latest monitoring and analytics capabilities, help ensure that an HRSG Upgrade Package will provide continued reliable operation of your HRSG over its lifetime.

HRSG Upgrade Package Features

Basic Scope

- Performance calculations
- Pressure part configuration review
- Review and provision of safety valves and silencers
- Review and provision of attemperators and control valves
- Code compliance assessment

Expanded Scope

- Feedwater/condensate pumps assessment
- Environmental control equipment
- Pressure part lifetime assessment

HRSG Remote Monitoring and Diagnostic Service

HRSGs must endure significant cyclic and long-term high temperature operation that can result in fatigue and potentially creep damage to certain components, potentially leading to cracking and failure of pressure parts. Certain events such as rapid cooling, improper drain operation, low load operation, or inadequate maintenance can produce significant temperature differentials and very high thermal stresses that are not detectable with normal plant DCS instrumentation. GE Vernova's HRSG remote monitoring and diagnostics service provides a significant value to the plant owner, aiming to deliver information that can be used to improve the life expectancy of the HRSG, or enhance the maintenance program.

PressureWave+* HRSG Cleaning

Deposits of iron oxide and ammonium bisulfate on the flue gas side can lead to tube fouling. This reduces the heat transfer efficiency and increases backpressure on an adjoining gas turbine. Additionally, it lowers the HRSG and combined cycle efficiency, which can lead to higher operating costs.

PressureWave+, developed by BANG&CLEAN§ Technologies AG, uses pressure waves to penetrate deep into the tube bundle for a more effective and efficient boiler cleaning. Pressure wave cleaning is done with a special lance, which is inserted into the spaces between the tube bundles. A plastic bag at the end of the lance then is inflated with a mixture of combustible gases that are ignited remotely. The resulting pressure wave and tube vibrations dislodge and clean the deposits from the boiler without damaging the boiler tubing.

Pressure wave cleaning is much faster than traditional cleaning methods—it can be completed in about half the time—and requires no scaffolding. This tube cleaning technology is also much more effective at removing corrosion and sulfur deposits, as the pressure wave cleaning can reverberate into areas previously unreachable by other boiler cleaning methods.

Benefits Include:

- Applies to all HRSG OEMs, vertical and horizontal type
- Requires no scaffolding
- Cleans deeper into the tube bundle, even in areas that cannot be reached by other technologies
- More effective than traditional CO_2/dry ice blasting methods
- Cleans in half the time compared to other methods, without damage to boiler tubing
- Mobilizes quickly
- Reduces gas turbine back pressure
- Improves heat transfer and increases plant performance
- Attractive ROI (return on investment)

HRSG Pressure Parts Replacement

As your Heat Recovery Steam Generator (HRSG) ages, it may be time to consider pressure parts replacement to help ensure unit reliability, save on O&M costs, and extend the lifetime of your plant.

The typical engineering life of HRSG pressure parts is 25-30 years. Operating the HRSG outside of the original specification—especially in a cycling gas turbine operation—can result in accelerated lifetime consumption, which typically leads to an increased risk of forced outage and higher costs.

As an OEM with a global workshop network, GE Vernova can offer replace-in-kind or tailor-made pressure parts for any HRSG specification, including those originally manufactured by Alstom and Doosan. No matter how vast the scope is and how complex the installation might be, we have a solution to streamline the cycle and enhance your unit's availability quickly, safely, and with high quality.

A pressure parts replacement includes the engineering and procurement of the current pressure parts, their installation, an optional site hydrotest, in-kind or upgraded material and/or geometry, and the use of Flow-Accelerated Corrosion (FAC)-resistant material. The scope of the replacement is based on site needs and may include the replacement of headers, harps, or complete modules. Front-end, multi-row headers can be reengineered to improve their lifetime under cycling conditions.

Because we installed the original unit, GE Vernova has in-depth knowledge of every piece of equipment in your HRSG. Not all HRSGs are the same, but GE Vernova has worked and produced drawings for many types, which can save you additional time and money with no need to "reverse engineer" your equipment.

Key Benefits

With a pressure parts replacement, we will replace all the internal equipment in your HRSG, resulting in restored reliability up to 98.5%, reduced O&M costs of up to $100000 per year vs. repairs, a reduced risk of forced outage of up to 90%, and up to 25 years of extended life.

Steam Power Services

400 GW
POWER CAPACITY SUPPORTED

8000
INSTALLED BASE ASSETS

30000+
PART LINES SHIPPED ANNUALLY

500+
REPAIRS EXECUTED ANNUALLY

130+
YEARS OF STEAM POWER EXPERTISE

300+
OUTAGES ANNUALLY

Core Services

- Parts
- Repairs
- Outage planning/ execution
- In-kind replacements
- Maintenance
- Inspections/testing

Life Cycle Solutions

- Life extensions
- Emergency response
- On-site services
- Digital solutions
- Asset management
- Multi-year agreements

STEAM TURBINES | GENERATORS | CONTROLS
BOILERS/AIR QUALITY CONTROL SYSTEM (AQCS) (Americas only)

Fossil

Helping our fossil customers run their plants as efficiently as possible to help deliver reliable power as we navigate the energy transition together.

Nuclear in the Americas

Supporting our nuclear customers in maintaining and extending the life of their operations as they help to deliver carbon-free power.

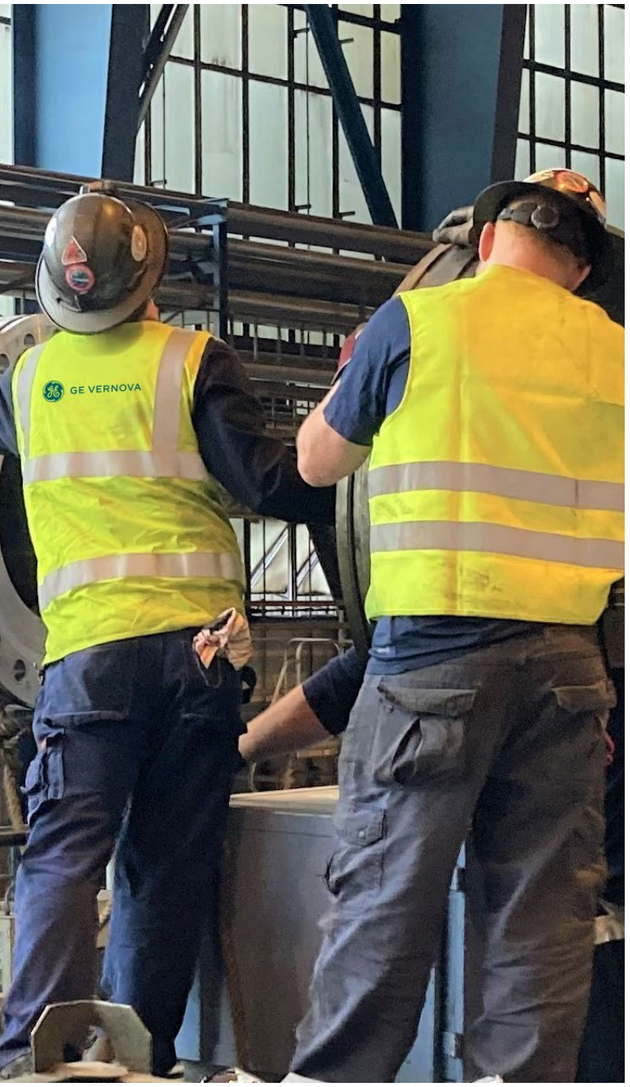
Industrial in the Americas

Collaborating with our industrial customers with cost-effective service solutions to keep their processes running efficiently and reliably.

A Nuclear Services Partner for the Energy Transition

Solutions to extend the life of carbon-free power generation

- Steam path uprates for more output capacity
- Generator rewinds to reset the clock on unit life
- Controls upgrades to avoid obsolescence issues and improve plant performance
- Auxiliary technologies to support upgrade installations
- Engineering assessments to develop custom solutions for your site



Advanced Outage Planning and Execution

The most important aspect of your service strategy

- Long-lead orders/supply chain optimization
- On-site services and technical support
- Mobilization of local field resources and tooling
- Field engineer/craft expertise
- Up-front preparation for potential emergent work
- Global service center support network
- Full-scope project management
- Planning/execution focus on safety and quality

Emergency Response Ready to Mobilize

- Quick on-the-ground response/proposal generation
- Rapid mobilization of local field resources
- Extensive supplier network for accelerated parts delivery
- In-house manufacturing and repairs technologies for select components
- On-site capabilities for emergent repairs/eliminating shipping time
- Cost-effective solutions for late life cycle/ end-of-life operations

Software Solutions

- Unit monitoring to detect anomalies/potential issues and better plan maintenance activities (steam turbine, generator, boiler)
- Plant-level data driven insights to improve operations and predict potential issues
- Remote monitoring and diagnostic services to help deliver operating insights based on fleet data and experience
- Cyber security technologies to protect your plant system and operating data

Later Life Cycle Asset Management

- Understand the current condition/ remaining life of your existing equipment
- Perform a full site assessment without shutting down
- Assess/reduce the risks of operating to the boundaries of your aging assets
- Compare run-to-retire vs. run-to-conversion strategies
- Tailor an ROI-based service strategy for your operating profile/business goals

Multi-Year Agreements

- Long-term commitment to achieving customer outcomes
- Service scope customized to operating/ business needs
- Single source for parts, repairs and services coverage
- Outcome guarantees (e.g. reliability)
- Flexible billing arrangements

Advancing for Today... and the Road Ahead

Service Cycle Time Reduction

- Developed in-house stator bar manufacturing capability for generator rewinds†
- Collaborated with key suppliers to slash production time of select steam turbine blades
- Streamlined the process for executing steam turbine overhauls†

Asset Management Solutions

- Customized a run-to-retire/conversion program to help manage later life cycle operations and aging assets
- Investing in advanced robotic inspection technologies for more cost-efficient condition monitoring

† Available at select locations

GAS TURBINE UPGRADES

UPGRADES: HEAVY DUTY GAS TURBINES

Potential Unit Upgrades

A AVAILABILITY · EF EFFICIENCY · EM EMISSIONS · F FLEXIBILITY · L LIFE EXTENSION · OM O&M · O OUTPUT · R RELIABILITY

UPGRADE	6B	6F†	7E	GT13E	9E	7F	9F	9/7 HA
Flange-to-Flange/ Repower	A EF EM F L OM O R	A EF EM F L OM O R	A EF EM F L OM O R	A EF EM F L OM O R	A EF EM F L OM O R	A EF EM F L OM O R	A EF EM F L OM O R	
9EMax Turbine Module					A EF F L O R			
AGP or MXL2/ MC2	A EF F L OM O R	A EF F L OM O R	A EF F L OM O R	A EF F L OM O R	A EF F L OM O R	A EF F L OM O R	A EF F L OM O R	A EF F L OM O R
Performance Improvement Package	A EF OM O R		A EF OM O R					
Enhanced Capacity	EF F O		F O	EF F O	EF F O			
Enhanced/ Robust Compressor Package	R	A O R	R		R	A O R	A O R	
Flared/Upflow/ High Output Compressor		O R	O R	O		O R	O R	
Axial Fuel Staging (AFS)			EF EM F O		EF EM F O	EF EM F		EF EM F
DLN Combustion Upgrade (B/E 1.0+ F 2.6+)	A EM F	A EM F L	A EM F		A EM F	A EM F L	A EM F L	
Fuel Flexibility (H_2, etc)	A EM F L R	A EM F L R	A EM F L R	A EM F L R	A EM F L R	A EM F L R	A EM F L R	
EV-Alpha Burner				EM F				
AEV Burner				EM F				
Valve Reliability			A OM R			A OM R	A OM R	
Instrumentation Reliability	A OM R	A OM R	A OM R	A OM R	A OM R	A OM R	A OM R	
Liquid Fuel Reliability Solutions		A OM R	A OM R		A OM R			
Robust Exhaust Frame						R	R	

† 6F = 6F.03 only

Potential Unit Upgrades

A AVAILABILITY · EF EFFICIENCY · EM EMISSIONS · F FLEXIBILITY · L LIFE EXTENSION · OM O&M · O OUTPUT · R RELIABILITY

UPGRADE	GT8	GT9	GT11D	GT11N	GT11N2	GT13D	GT24	GT26
High Efficiency (HE)								EF F O
Advanced Performance Package (APP)								A EF F O R
MXL2							A EF F L OM O	
XL/XP Turbine and Compressor				A EF F L OM O				
XL/XP Turbine				A EF F L OM O				
XL Turbine	A L OM							
M Turbine					A EF F L OM O			
Turbine			EF OM O			A EF F L OM O		
Performance Improvement Package		A EF F L OM O						
Compressor			OM O	OM O				
EV-Alpha Burner	EM F			EM F		EM F		
Low Part Load							EM OM	EM OM
Low Load Operation							EM F	EM F
Fast Start	F	F	F	F	F	F	F	F
Combustion Fuel Flexibility	A EM F L R	A EM F L R			A EM F L R		A EM F L R	

UPGRADES: HEAVY DUTY GAS TURBINES

7HA.02 AGP+C1 UPGRADE

APPLICABLE TURBINE MODELS: 7HA

With our 7HA.02 AGP+C1 upgrade, your plant will gain valuable MW's, run more efficiently, and increase its asset utilization.

The upgrade offers higher firing temperatures, resulting in more exhaust energy, and the ability to make your combined cycle megawatts more efficiently. Maximum flexibility for baseload and peak power demands and industry-leading service intervals for minimum downtime make improved merit order a benefit of the upgrade.

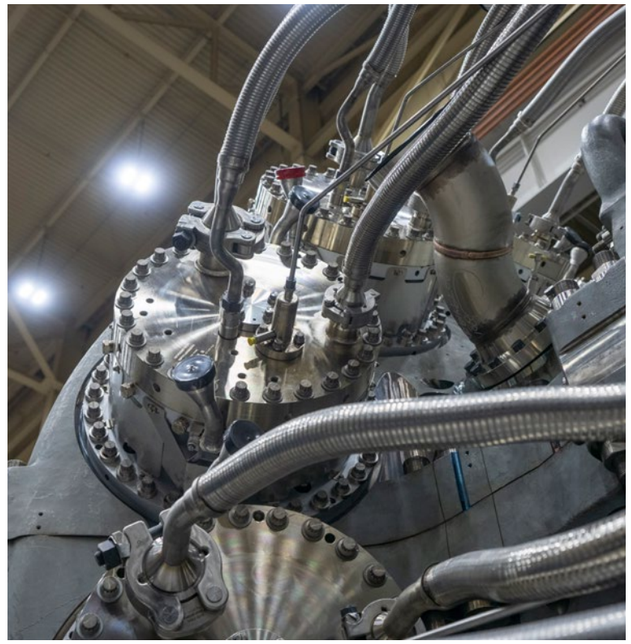
We updated the combustor's Axial Fuel Staging (AFS) configuration for better NOx control. The combustor also features enhanced cooling for durability, additional turbulators for more effective heat transfer, and improved thermal barrier coating (TBC).

For turbine stages 1-4, upgrades to the blades include enhanced reduced conductivity (Low K) thermal barrier coatings and improved cooling. The nozzles now feature a cooled configuration for part-life longevity, enhanced Low K thermal barrier coating, a larger throat area, and new circumferential seals. The shrouds have a new cooling hole pattern and minor flow path changes for better clearance.

Electronic heating blankets were added to improve clearance in the compressor and turbine sections.

What can upgrading do for you?

- Greater output and improved heat rate
  @ ISO, Baseload
  — Up to -0.53% BTU/kWh
  — Up to +9.6 MW
  @ 85F, Baseload
  — Up to -0.67% BTU/kWh
  — Up to +7.3 MW
- Better availability
- 32k FFH service interval



7F REPOWERING

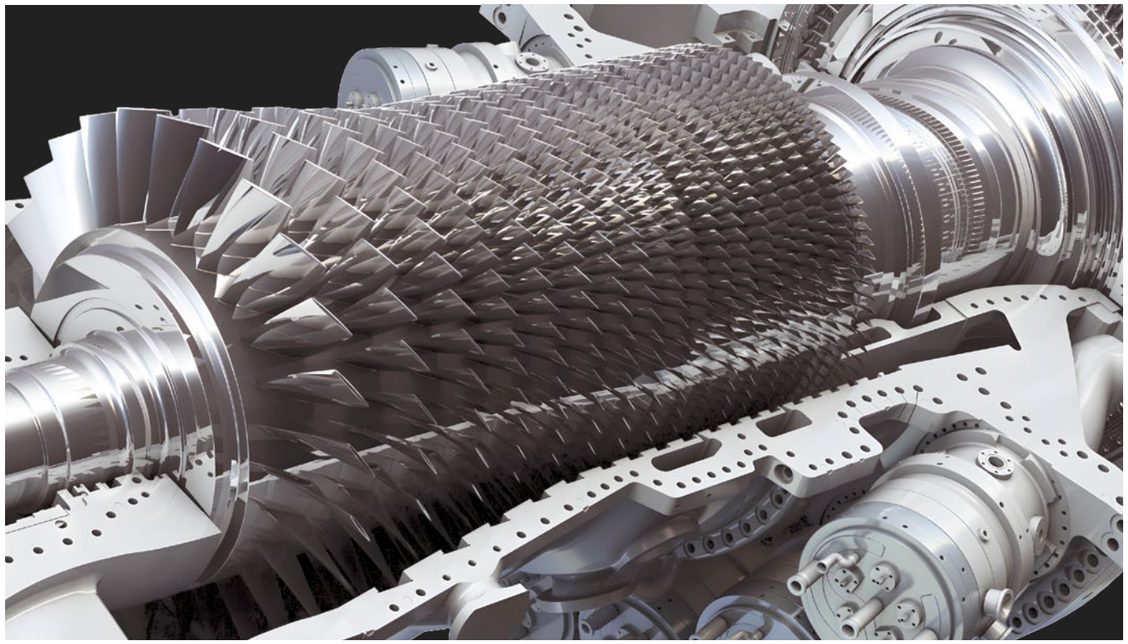
APPLICABLE TURBINE MODELS: 7F.04-200/7F.05

The 7F.04-200 upgrade enables like-new 7F.05 performance, without the additional cost and time needed to install a new unit. Boost output, enhance performance, increase flexibility, and extend lifespan with an upgrade package comprised of existing and proven 7F solutions, enabling operators to improve operations and help ensure long-term sustainability.

Features: Advanced compressor, Dry Low NOx 2.6+ combustor, Advanced gas path (AGP) tech, gas control valves and inlet guide vane actuators, advanced turbine rotor, axial fuel staging (optional), robust exhaust frame (optional), and wet compression (optional).

What can upgrading do for you?

- Up to +40 MW power output impact (at hot day conditions, vs. 7F.03)
- Save money and time as compared to a greenfield project
- Less hassle, no need for a new interconnection
- Extend the asset expected lifetime by 25+ years
- Extend your maintenance intervals with newer, more durable components



UPGRADES: HEAVY DUTY GAS TURBINES

ADVANCED GAS PATH (AGP) FOR F CLASS GAS TURBINES

APPLICABLE TURBINE MODELS: 7F/9F/6F.03

Increase output, efficiency and availability, while reducing fuel consumption and extending your gas turbine assets with GE Vernova's AGP upgrade for F class gas turbines.

We've re-engineered all three stages of buckets, nozzles, and shrouds to deliver increased performance. With refined aerodynamics, cooling, sealing, and advanced materials, your gas turbine can operate at higher temperatures and generate more power — without compromising reliability.

The hardware and software set of solutions help customers unleash the full performance of their existing F class gas turbine.

Some AGP configurations also include an option to modify existing hardware which allows for the same benefits without disposing of existing assets in inventory.

What can upgrading do for you?

- Over 15 years of F class AGP experience
- 50% of the GEV F class fleet has an AGP upgrade installed
- 11-18 days install time with a planned outage
- 30 million hours of proven AGP operation
- Depending on the frame and on current gas turbine configuration, increase MW output by as much as 8-13%, and improve heat rate by as much as 2.5%
- Depending on the frame, achieve maintenance intervals of up to 32k FFH
- Further enhance benefits with available DLN combustion upgrades

F CLASS DLN2.6+ UPGRADE

APPLICABLE TURBINE MODELS: 7F/9F/6F.03

GE Vernova's DLN combustion technology helps deliver industry-leading low emissions. For F class operators, we offer multiple DLN 2.6+ solutions. What you choose will ultimately depend on you and your plant's needs, but whichever DLN combustion system solution is right for you, rest assured that you'll get leading-edge expertise and the operational flexibility you need, helping you reduce emissions, improve fuel flexibility, and start up faster than ever before. The DLN 2.6+ enables additional Op Flex capabilities, hydrogen readiness and, for 7F, Axial Fuel Staging (AFS).

AFS allows even greater flexibility and turndown. For power plants dispatched with greater cyclic operation to allow for increasing renewable use, significantly improved turndown can help avoid many of the cost impacts of cycling. Axially staging combustion in two zones allows one combustor to have enhanced performance at both baseload and minimum turndown.

DLN2.6+ also unlocks the full potential of GE Vernova's latest Advanced Gas Path (AGP) offerings.

What can upgrading do for you?

The DLN2.6+ combustion system allows you to

- Improve turndown as low as 40%, or to 26% with AFS
- Maintains fuel flexibility: +/- 15% MWI
- Reduced emissions
- Improved hydrogen capability
- Maintenance: 32k FFH combustion intervals
- Fuel burn: Up to 25% reduction in minimum fuel burn

UPGRADES: HEAVY DUTY GAS TURBINES

E/B CLASS ADVANCED GAS PATH (AGP)

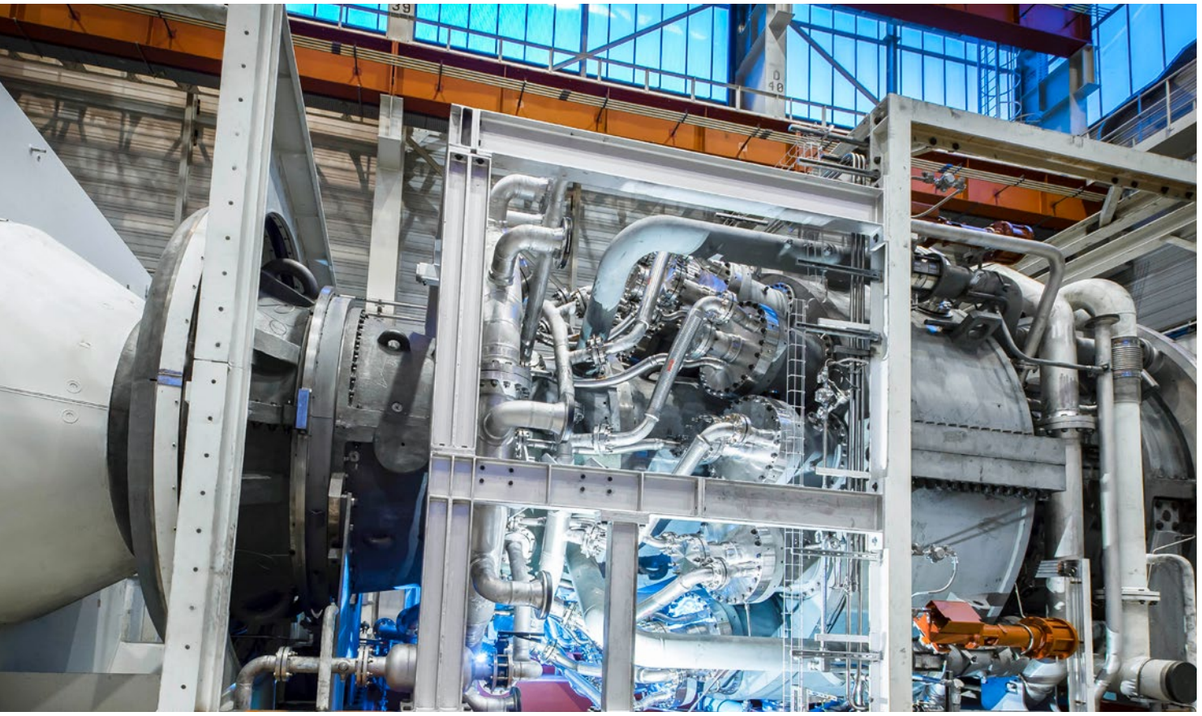
APPLICABLE TURBINE MODELS: 7E/9E/6B

The E/B Class Advanced Gas Path (AGP) and 9E AGP Xpand offerings leverage proven technologies to improve the performance of the 7E, 9E, and 6B gas turbines while maintaining market leading reliability. These products are turbine section performance upgrades comprised of cooling enhancements, sealing improvements, advanced materials, and a firing temperature increase designed to provide more output and exhaust energy with an improved heat rate, beyond the current PIP performance levels.

Depending on the specific frame and the configuration of the AGP solution, maintenance intervals are maintained, or in some cases increased, versus current intervals, even with the increased in base load firing temperature that is included in the upgrade. What this means for you is that this flagship upgrade will give you up to 2.6% increase in output, 2.5% boost in exhaust energy, and 0.2% improvement in heat rate. This translates into lower fuel costs to generate greater reliable revenue for your facility.

What can upgrading do for you?

This upgrade utilizes proven E, F, and H-class developments to increase firing temperature, enable higher output and exhaust energy, lower fuel consumption, and increase maintenance inspection intervals.



GT26 HIGH EFFICIENCY (HE)

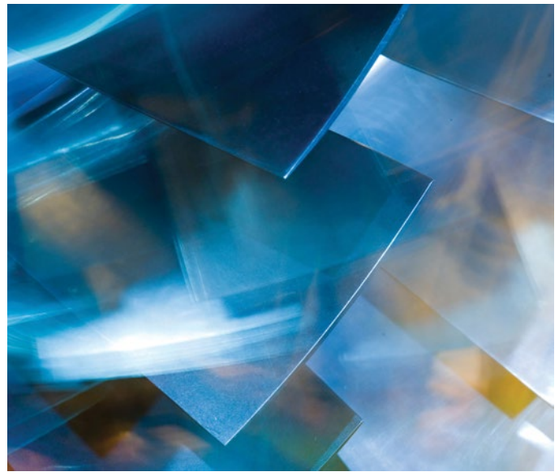
APPLICABLE TURBINE MODEL: GT26

The HE upgrade for our GT26 gas turbine fleet marks an innovation breakthrough. The result is an agile F-class gas turbine with a significant and proven step change in efficiency that brings the GT26 closer to the H-class performance. Unique features include advanced manufactured parts that aim to deliver high performance and reduced cooling requirements. The 3D-Aero profile compressor configuration provides higher baseload and part load performance.

Through advanced upgrades across the compressor, combustor and turbine sections, the GT26 HE builds on GE Vernova's latest proven technology to provide an unprecedented performance and inspection interval increase. Using the same cooling technology as our record-breaking H-class technology, this offering is ready to protect your plant's merit order in an increasingly competitive environment. With growing installation of higher efficiency gas turbines and renewables, existing plants must work even harder to remain competitive.

What can upgrading do for you?

- Up to an additional 1% part load combined cycle (CC) efficiency, so you can compete and win in a grid with heavy renewable generation.
- Substantially reduced fuel costs and improved dispatchability with more than a 2% baseload efficiency increase.
- Increased maintenance inspection intervals and generation days available with up to 32000-hour C-inspection intervals while removing the EOH limit. The HE inspection interval concept provides up to 44000 corresponding equivalent operating hours compared with the traditional EOH concept, resulting in up to 2 years worth of additional operation for balanced cycling operating profiles.
- Increased revenue opportunities during peak demand with an additional 15 MW to 55 MW plant output.
- Reduced CO_2 emissions up to 5%.



UPGRADES: HEAVY DUTY GAS TURBINES

GT24 MXL2 UPGRADE

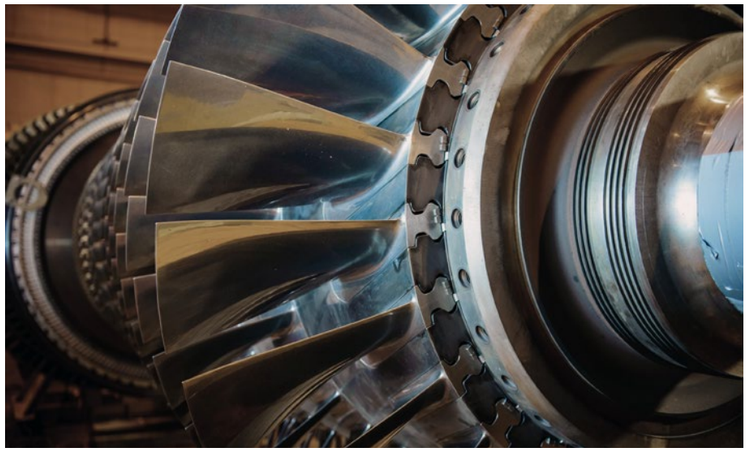
APPLICABLE TURBINE MODEL: GT24

The GT24MXL2 upgrade features completely reengineered turbine blading and an optional compressor upgrade for increased efficiency and extended component life. The upgrade, which is operating successfully in multiple units worldwide, offers the possibility of operating in two different modes. Depending upon specific requirements, the unit may be operated in an extended life (XL) mode or in an increased power (M) mode. Either mode can be selected on demand and while online. This flexibility allows electricity costs to be continuously improved.

The MXL2 upgrade focuses on a newly developed Low Pressure Turbine (LPT), which offers an increased firing temperature. Maintenance costs will be reduced through longer intervals resulting in decreased inspections and increased availability. We have built upon proven technology with an improved airfoil profile, an enhanced components count, reduced losses through shroud improvements, increased flow path due to an increased outer diameter, reduced thickness on the trailing edge (pressure side bleed), and improved internal cooling schemes. With the improved airfoil, 3D airfoil profiling was applied for higher aerodynamic efficiency. To support the increased turbine inlet temperature in M mode, thermal barrier protection was enhanced. The vane part count in the LPT vane rows 1 and 2 was reduced, so less cooled air is required internally. An improved shroud layout of LPT blades and vanes leads to a reduction in over-tip leakages. Spot-accurate heights of vanes and blades makes for tighter compressor clearances and higher performance.

What can upgrading do for you?

Choosing the upgrade in M mode offers you increased performance of up to 17 MW in combined cycle with a 1.0% efficiency improvement. Selecting the XL mode for extended life adds up to 8000 hours between service intervals.



RELIABILITY UPGRADES

APPLICABLE TURBINE MODELS: ALL

Through decades of experience across an installed base of thousands of heavy duty gas turbines, GE Vernova has developed an extensive array of solutions to improve the reliability and availability of your plant.

Enhanced Compressor (9F/7F/6F/9E)

Based on years of compressor development and extensive testing, GE Vernova's suite of enhancements for F-class and 9E compressors are packaged according to your unit and site-level risk.

Enhanced compressor offerings reduce degradation effects and stresses; reduce fretting wear between rotating blade and rotor interfaces; move natural frequences for vibratory margin; improve rub characteristics; add features to enhance durability; and, improve loading and durability on the forward stage stator rings and aft stage stator vanes.

9F/7F Robust Exhaust Frame (9F/7F)

Backed with GE Vernova's extensive fleet experience, this upgrade features advanced exhaust frame technology. The mission-built robust exhaust frame addresses exhaust liner degradation from thermal stress driven by more frequent plant cycling and peaking.

Your 9F/7F plant can gain significant availability and reliability through the reduction of unplanned outage risk, and it will benefit from shortened outage time with reduced scope of repairs.

9E Robust Diffuser (9E)

GE Vernova has developed analytical methods and performed validation testing which has proved that turning vanes are not required to maintain flow uniformity or to direct the flow radially in the 9E diffuser. So, we removed the existing turning vanes, gussets, and poles and added six poles/supports to the lower half of the diffuser.

The result is reduced stress and strain on the diffuser while output and heat rate performance remain as strong as ever, with no impact on downstream components or on emissions. Through the reduced mechanical load, maintenance costs to repair hardware are reduced.

UPGRADES: HEAVY DUTY GAS TURBINES

RELIABILITY UPGRADES (cont.)

APPLICABLE TURBINE MODELS: ALL

Through decades of experience across an installed base of thousands of heavy duty gas turbines, GE Vernova has developed an extensive array of solutions to improve the reliability and availability of your plant.

Instrumentation Reliability (9F/7F/9E/7E/6F/6B)

GE Vernova has developed instrumentation packages to address plant reliability issues (failed starts, forced outages), help prevent major events, and potentially reduce ongoing insurance costs. These packages were developed to save on both cost and installation time. Trip risk is greatly reduced as a result of software and logic enhancement, robust thermocouple and connector engineering. O&M costs are reduced by the elimination of thermocouple damage due to relocated connector. Maintenance costs are reduced with robust optical flame sensors, and risk of casing damage due to cooling water leakage is eliminated by removing cooling water from the GT compartment.

Non-Optical Flame Detector (9F/7F/6F)

Plant reliability can be further enhanced with the introduction of GE Vernova's Non-optical Flame Detector (NOFD) software which can fully replace physical flame sensors by relying on advanced algorithms and other sensors available in the gas turbine while maintaining rigorous safety standards. There is no dependence on gas turbine/combustion hardware or on fuel quality.

Valve Reliability (9F/7F)

GE Vernova has developed a valve package to address plant reliability issues, help prevent major events, and potentially reduce ongoing insurance costs. Trip risk greatly reduced as a result of software enhancement, no varnishing in GCV/IGV, no corrosion and moisture in CBV/system, steady pneumatic actuation pressure. O&M costs are reduced by 96,000 hours maintenance intervals for eGCV/eIGV, ~$300K savings in hydraulic valve overhauls, reduced oil filters inventory, and elimination of servos.

Liquid Fuel Reliability Solutions (7E/6F)

Upgrades the tubing of the liquid fuel oil, water injection, water cooling and purge systems for more reliability during operation and easier maintainability during outages. It also adds in a pressure monitoring on the purge system, depressurization system on the liquid fuel system and temperature logic on the EGT system for more robust unit protection.

B/E-CLASS DLN1+ COMBUSTION UPGRADE SOLUTION

APPLICABLE TURBINE MODELS: 9E/7E/6B

This upgrade offers enhanced asset life, reduced maintenance costs, and increased operational flexibility. When combined with our AGP solution, it offers up to four years of continuous operation between inspections. DLN1+ lowers NOx emissions to 5 ppm without water, steam, or ammonia. It extends inspection intervals to 32000 hours or 1300 starts on natural gas, supports fuel flexibility, and provides dual-fuel capability. DLN1+ includes OpFlex options like AutoTune and Fast Start for greater operational flexibility and real-time data monitoring for improved emissions control. Advanced materials, coatings, and sealing technology enhance performance and extend maintenance intervals, compatible with existing DLN1 systems and Mark* V, Ve, and Vle control systems.

What can upgrading do for you?

- Sub-5 ppm (10 mg/Nm^3) NOx emissions across large load and ambient temperature range of 0°F to 120°F
- Single-digit CO emissions on natural gas at baseload
- Eliminated or reduced need for costly and complicated SCR systems
- Eliminated water use and costs for steam/water injection for NOx control when operating on natural gas
- Decreased operational disruption when installed during routine hot gas path, combustion, or major inspection
- Customized low NOx and CO emissions solution for specific loads and ambient range, available in gas only or dual fuel configurations
- Increase planned maintenance intervals to as much as 32000 FFH or 1300 FFS

9EMAX FLANGE-TO-FLANGE AND TURBINE MODULE

APPLICABLE TURBINE MODEL: 9E

Slash OpEx without sacrificing reliability with our 9E four-stage turbine module. The 9EMax can help cut annual fuel costs and unlock significant revenue—all within the same footprint as your existing 9E gas turbine.

9EMax technology innovations

The 9EMax is provided as a fully assembled, modular solution, which comes as a re-engineered turbine module with newer casings, rotor, advanced exhaust diffuser, and four-stage hot gas path. Its components are more accessible, including a reconfigured diffuser for improved maintainability. The Flange-To-Flange option also provides the ability to address end of life considerations and reset the life counters of the gas turbine. The 9EMax is a game changer with it comes to performance, with power up to 147MW and efficiency up to 37% in simple cycle and 54% in combined cycle.

UPGRADES: HEAVY DUTY GAS TURBINES

GT FRAMES PERFORMANCE

APPLICABLE TURBINE MODELS: GT13D/GT11N2/GT11N/GT9/GT8C

M Turbine Upgrade

The **GT13D** M Turbine Upgrade increases gas turbine performance as well as operational flexibility.

What can upgrading do for you?

- Flexibility: two operation modes for extra performance or extended lifetime
- Lower Cost of Electricity: gas turbine performance is improved up to +11.4 MW power and +1.4% efficiency in P mode and up to +7.3 MW power and +1.7% efficiency in L mode
- Reduced Maintenance Costs: extended service intervals by up to +16,000 equivalent operating hours in L mode and up to +8,000 equivalent operating hours in P mode

The new **GT11N2** M Turbine Upgrade bridges the gap between the latest technological developments and existing proven gas turbine engineering to keep your plant competitive.

What can upgrading do for you?

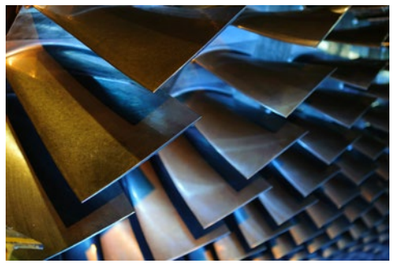
- Flexibility: three switchable operating modes for enhanced extended lifetime or extra power output and efficiency
- Reduced Maintenance Costs: extended service intervals of up to 48000 equivalent operating hours
- Performance: up to 14 MW power output and up to 1.9% (add.) gas turbine efficiency

Compressor Upgrade

GT13D MC Compressor Upgrade can provide a substantial boost in power output.

What can upgrading do for you?

- Lower cost of electricity
- Proven reliability
- Gas turbine power output is boosted by +7 MW and 0.4% efficiency increase (add.) thanks to a newer compressor airfoil construction
- Field-proven since 2012



GT11N MC Compressor Upgrade can provide a substantial boost in power output and a reduction of CO emissions for your operations.

What can upgrading do for you?

- Lower cost of electricity
- Proven reliability
- Improved flexibility and combined cycle part load efficiency: advanced variable inlet guide vanes concept for increased temperature after turbine
- Gas turbine power output is boosted 7.3% thanks to a newer compressor airfoil construction
- Field-proven since 2004

XL/XP Upgrade

The **GT11N** M XL/XP Upgrade increases gas turbine performance as well as operational flexibility.

What can upgrading do for you?

- Flexibility**:** two operation modes for extra performance or extended lifetime
- Lower Cost of Electricity: gas turbine performance is improved up to +3.4 MW power and +0.9% efficiency
- Reduced Maintenance Costs: extended service intervals of up to 32000 equivalent operating hours

The **GT11D** M XL/XP Upgrade increases gas turbine performance as well as operational flexibility.

What can upgrading do for you?

- Flexibility: two operation modes for extra performance or extended lifetime
- Lower Cost of Electricity: gas turbine performance is improved up to +3.2 MW power and +0.3% efficiency
- Reduced Maintenance Costs**:** extended service intervals up to 32,000 equivalent operating hours

The blading upgrade for **GT8C** XL gas turbines longer spans between C-inspection intervals.

What can upgrading do for you?

Improve the availability of your GT8C gas turbine by implementing the GT8C XL turbine upgrade. The upgrade features newer blading which offers extended C-inspection intervals from 24000 to 32000 equivalent operating hours. This results in less downtime and reduced maintenance costs.

Performance Improvement Package

The modular **GT9** D1x Performance Improvement Package has been introduced to address customer-specific requirements for increased performance and reduced maintenance costs.

What can upgrading do for you?

- Extended C-inspection intervals up to +16000 equivalent operating hours (from 16000 to 32000 EOH)
- Flexibility: two operation modes for extra performance or extended lifetime
- Power output increase up to +4.4 MW
- Efficiency increase up to +3.3% (multiplicative)

UPGRADES: HEAVY DUTY GAS TURBINES

TURNDOWN UPGRADES

APPLICABLE TURBINE MODELS: GT26/GT24/7F/9E/7E

7F Axial Fuel Staging

If your 7F gas turbine already has, or will be upgrading to, the DLN2.6+ combustor and your plant runs on Mark* Ve or Vle controls, you can install the Axial Fuel Staging (AFS) upgrade for even greater flexibility and turndown.

Axially staging combustion in two zones allows one combustor to have enhanced performance at both baseload and minimum turndown. During low-load operation, the percentage split in the staged fuel system can be reduced or turned off, thereby keeping the overall combustion system in emissions compliance over a wide range of firing temperatures. The AFS premixers are circumferentially distributed, and the exits of the injectors are flush with the transition-piece inner wall. The AFS fuel system doesn't require any mechanical joints inside the engine. All fuel piping joints are located outside the compressor discharge casing for increased durability.

Our DLN combustion system helps reduce emissions with faster startup than ever before. With the AFS upgrade, you also gain the advantage of improved capacity, minimum fuel burn, and reduced O&M part/outage costs. Plus, you can realize reduced renewable curtailment and increased access to ancillary services.

What can upgrading do for you?

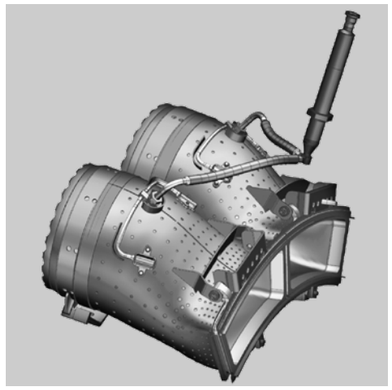
With the AFS upgrade added to your DLN 2.6+ combustion system, you can realize even greater turndown, reduced renewable curtailment, and increased access to ancillary services.

- **Turndown:** Turndown from 40% to 26% in NOx/CO compliance
- **Maintains Fuel Flexibility:** +/- 15% MWI
- **Emissions Range:** <9 ppm NOx, <9 ppm CO
- **Maintenance:** 32000 FFH, 1250 FFS
- **Fuel Burn:** Up to 25% reduction in minimum fuel burn

7E/9E Axial Fuel Staging

GE Vernova's Capacity Performance Package (CPP) enables customers to produce up to 8% more output without increasing NOx or CO production. CPP is backed by GE Vernova's Axial Fuel Staging (AFS) and Corrected Parameter Control (CPC) software platform.

AFS technology introduces gas fuel into the head end of the transition piece through an additional fuel circuit. A current wrapper system is deployed with nimonic transition pieces. CCP enhances the existing static turbine control with an all load temperature reference which is updated as ambient conditions change. This enables better control of unit exhaust temperature and emissions.



In addition to these combustion enhancements CCP also introduces GE Vernova's OpFlex* Start Assurance package. This software includes simpler start permissives and conducts pre-start system checks on major systems to help ensure your turbine is ready to start when the plant is dispatched. Additionally, an HMI start-up sequence display is included to show the progress of the start-up.

These upgrades are applicable to GE Vernova DLN 1 and DLN 1+ configurations and require a Mark*Vle control system.

What can upgrading do for you?

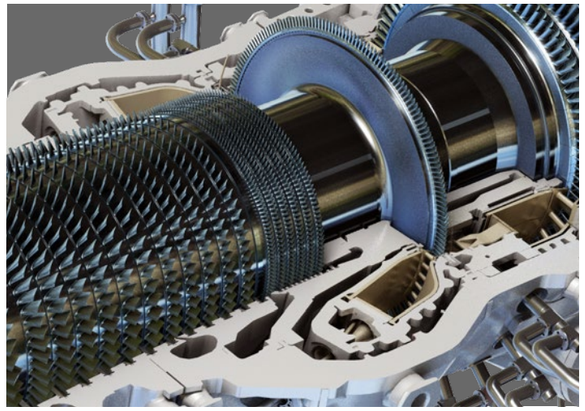
- When combined with Inlet Bleed Heat, allows for emission compliant turndown to as low as 35% load
- Up to +8% output with emission-compliant peak operation
- Up to a 0.4% Heat Rate improvement due to lower pressure drop across the combustor
- Improve baseload performance and emissions: 85% reduction in CO emissions combined with heat rate and output improvements of 0.25% and 0.4%, respectively, with no impact on exhaust energy
- Increase part-load simple-cycle efficiency: more than 2% reduction in heat rate at 70% gas turbine load
- Capable of 32000 FFH or 1300 FFS maintenance intervals (part of a DLN1+ combustion system)
- Available on Gas Only, Dual Fuel, Low NOx (9/15/25 ppm) and Ultra Low N0x (<5ppm on 7E, <9ppm on 9E) DLN1+ combustion systems

Low Part Load & Extended LPL

Take advantage of the GT24/GT26 sequential combustion engine architecture to allow your combined-cycle plant to achieve superlative turndown.

What can upgrading do for you?

- Increase load flexibility
- Increase turndown to as low as 30% (LPL) and 20% (eLPL) combined-cycle load and maintain CO emissions < 100 ppm
- Reduce fuel costs at minimum environmental load (MEL)
- Larger spinning reserve
- Frequency response capability over the entire load range



UPGRADES: HEAVY DUTY GAS TURBINES

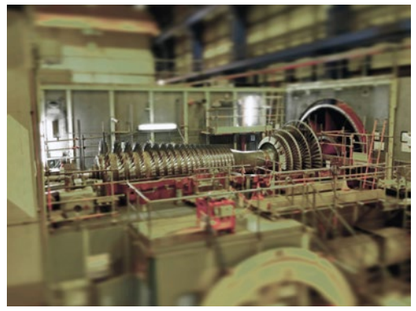
GT13E2 AEV UPGRADE

APPLICABLE TURBINE MODEL: GT13E2

Building on the proven features of GE Vernova's EnVironmental (EV) burner, the AEV burner employs a newer continuous fuel variation concept as the basis for more flexible and reliable operation. The burner introduces emissions-compliant low part load operation, which enables operators to keep their assets online at times of low electrical demand, and react immediately as soon as demand increases.

What can upgrading do for you?

- Emissions-compliant operation down to as low as 10% of gas turbine relative load
- Eliminate switch-over/switch-back between pilot and premix operation
- Improve reliability, especially during fast transients
- Simplified combustion change with 48 AEV burners (instead of 72 EV burners)
- High resistance to changes in fuel gas composition
- Burner sieve to prevent foreign objects entering the turbine



GT13E2 MXL2 UPGRADE

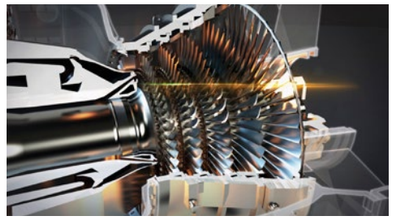
APPLICABLE TURBINE MODEL: GT13E2

Engineered to be compatible with all installed GT13E2 units, the GT13E2 MXL2 upgrade combines GE Vernova's latest technology developments and over 10 million operating hours of GT13E2 fleet experience. The GT13E2 MXL2 upgrade allows operators to benefit from increased efficiency, improved power output, and significantly extended service intervals. The unique modular upgrade program allows operators to select the best-fit upgrade for their GT13E2 machines, and strike the ideal balance in terms of budget, inventory, and the remaining lifetime of their existing turbine components, while drawing from the performance and lifetime benefits of MXL2 technology.

What can upgrading do for you?

A quantum leap in power output, efficiency, and lifetime:

- Increased performance: up to 15 MW of power output and 1.5% of combined-cycle efficiency (absolute)
- Extended lifetime: inspection intervals of up to 48000 hours
- Up to 1.5% increase in combined-cycle efficiency (abs)
- Improve availability, fewer C-inspections



UPGRADES: AERODERIVATIVE GAS TURBINES

Current Unit Upgrades

A AVAILABILITY · EF EFFICIENCY · EM EMISSIONS · F FLEXIBILITY · L LIFE EXTENSION · OM O&M · O OUTPUT · R RELIABILITY

UPGRADE	TM2500	LM2500	LM6000	LMS100
4 Hour Gas Turbine Lockout Prevention	A	A	A	
Anti Icing Upgrade		A R	A R	A R
Assymetric Diffuser	EF EM O	EF EM O		
Automatic Voltage Regulator Upgrade	A F R	A F R	A F R	A F R
Bentley Nevada 3500 Vibration Monitoring System	A R	A R	A R	
Clutchless Synchronour Condensor Upgrade		F		
Direct Drive Ventilation Fan Upgrade		A R	A R	
Evaporative Cooler		EF F O	EF F O	EF F O
Fire Protection Panel Upgrade	A	A	A	A
Gas to Dual Fuel – LM2500		A F		
Gas Turbine Alternative Fuel Retrofit Upgrade	A R	A R		A R
Gas Turbine Control System Upgrade – Micronet Plus		EF F OM	EF F OM	
Gas Turbine Tuning		A EM EF F OM	A EM EF F OM	
Inlet Air Chilling System		EF F O	EF F O	EF F O
Liquid to Dual Fuel LM2500		A EM F R		
LM2500 and LM6000 Fuel Condition Monitoring		A L OM R	A L OM R	
LM2500/TM2500 Base to +/+G4	EM O	EM O		
LM2500/TM2500 SAC to DLE	A EF EM R	A EF EM R		
Mark VIe Gas Turbine Control System Upgrade	EF F OM	EF F OM	EF F OM	EF F OM
Primary Frequency Control Upgrade		A F	A F	A F
Remote VSV Monitoring	A EF	A EF		
TDI Clutch Upgrade	A EM F R	A EM F R		
Water Injection for NOx Reduction		EM O	EM O	EM O
Xtend Hot Section Upgrade – DLE	A R	A R		
Xtend Hot Section Upgrade -SAC	A R	A R		

UPGRADES: AERODERIVATIVE GAS TURBINES

LM6000 FLANGE TO FLANGE UPGRADE

APPLICABLE TURBINE MODELS: LM6000 PA/PB/PD

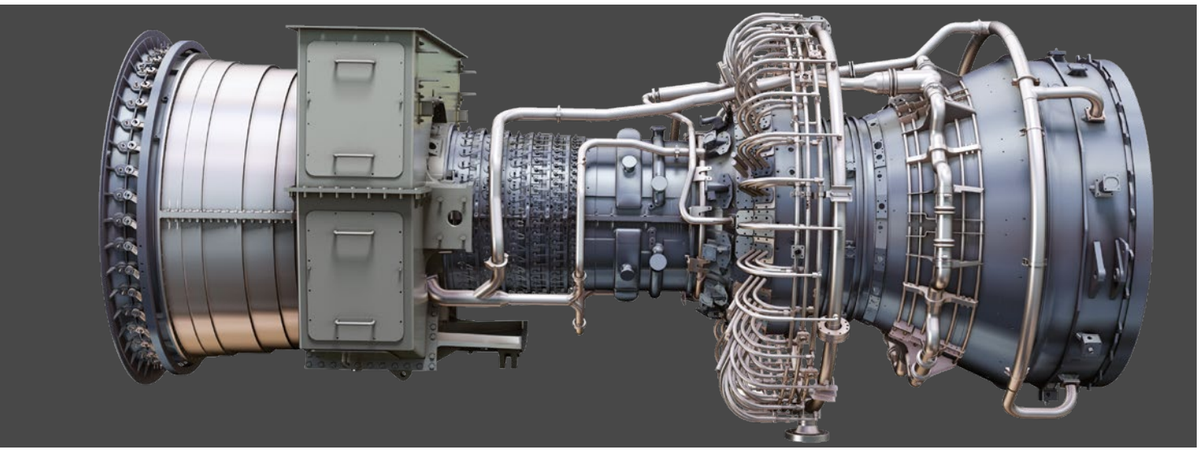
Your plant is still viable, but is it time to replace obsolete and inefficient equipment? GE Vernova's flange-to-flange upgrade for LM6000 gas turbines lowers OpEx, lowers emissions, and can reset asset life to zero.

The flange-to-flange upgrade is a full replacement of your aeroderivative gas turbine engine, giving you our successful engineering innovations. The process is faster than installing a new unit, converts SAC to DLE technology, helps you reach NOx levels as low as 15 ppm, eliminates water consumption for NOx control and improves heat rate levels. You'll achieve significant performance improvements in output and fuel efficiency—restarting the clock on asset life

If your LM6000 has lost its competitive edge over time, flange-to-flange upgrades will renew its serviceable life. Help meet industry needs—like segment and regulatory pressures—and keep your gas turbine tuned to new opportunities.

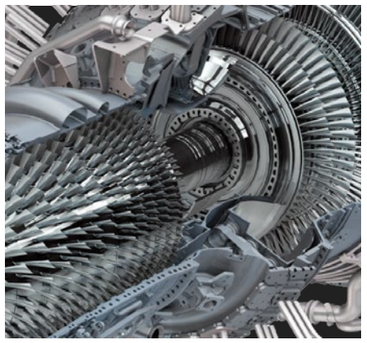
What can upgrading do for you?

- 40 – 60 MW at 42% efficiency
- Fast start < 5 minutes (GT only—0 minutes w/EGT)
- Flexible CC: 140 MW at +55% efficiency
- Boosted output and reduced fuel costs right away
- Lowered emissions to comply with regulations
- Extended maintenance intervals with newer, more durable components



LM6000 RICH QUENCH MIX (RQM) UPGRADE

APPLICABLE TURBINE MODEL: LM6000



The LM6000 RQM upgrade is the next generation of LM6000 SAC combustor that leverages the Rad-Rad swirler technology used in the G48 combustor to provide better emissions while extending maintenance intervals.

It utilizes a dual skin venturi to reduce thermal stress, eliminate flash boiling, and provide a reduction in thermal gradient across TBC and base metal. Coated floating ferrule and fuel nozzles reduce bore wear and redesigned combustor liners improve dilution characteristics and enable lower emissions.

What can upgrading do for you?

- **Combustor Life:** 32500 hrs. @ 25 ppm NOx*/25000 hrs @ 15 ppm NOx
- **Emissions:** 25 ppm NOx & <40 ppm CO/15 ppm NOx & Target 59 ppm CO
- **Heat Rate:** 1% improvement at 25 ppm

LM2500 XTEND SAC UPGRADE

APPLICABLE TURBINE MODELS: LM2500/TM2500 BASE SAC

GE Vernova's advanced hot section technology from the LM2500+G4 utilizes improved materials, coatings, and enhanced cooling. This upgrade doubles the base SAC hot section life, deferring hot section maintenance to the 50k fired hour major overhauls.

What can upgrading do for you?

- Doubles anticipated LM2500 and TM2500 Base SAC hot-section life
- Reduces lifecycle cost 15% by eliminating one hot section repair/exchange in each MOH cycle
- Greater availability from avoided hot section replacement downtime—144 hours of operation over two MOH cycles
- Incorporates technology advancements from Xtend* SAC, including the deswirler
- OEM-approved life extension

PRODUCT OFFERINGS

TOPPING CYCLE

9HA HEAVY DUTY GAS TURBINE

50 HZ

448-571 MW SIMPLE CYCLE OUTPUT
>64% COMBINED CYCLE EFFICIENCY

		9HA.01	9HA.02
SC PLANT PERFORMANCE	SC Net Output (MW)	448	571
	SC Net Heat Rate (Btu/kWh, LHV)	7960	7740
	SC Net Heat Rate (kJ/kWh, LHV)	8398	8166
	SC Net Efficiency (%, LHV)	42.9%	44.0%
1X CC PLANT PERFORMANCE	CC Net Output (MW)	680	838
	CC Net Heat Rate (Btu/kWh, LHV)	5356	5320
	CC Net Heat Rate (kJ/kWh, LHV)	5651	5613
	CC Net Efficiency (%, LHV)	63.7%	64.1%
	Plant Turndown – Minimum Load (%)	33.0%	33.0%
	Ramp Rate (MW/min)	65	88
	Startup Time (RR Hot†, Minutes)	<30	<30
2X CC PLANT PERFORMANCE	CC Net Output (MW)	1363	1680
	CC Net Heat Rate (Btu/kWh, LHV)	5345	5306
	CC Net Heat Rate (kJ/kWh, LHV)	5639	5598
	CC Net Efficiency (%, LHV)	63.8%	64.3%
	Plant Turndown – Minimum Load (%)	15.0%	15.0%
	Ramp Rate (MW/min)	130	176
	Startup Time (RR Hot†, Minutes)	<30	<30

NOTE: All ratings are net plant, based on ISO conditions and natural gas fuel. Actual performance will vary with project-specific conditions and fuel.
† Rapid Response/Hot Start

Marrying sheer power with record-breaking efficiency, the 9HA gas turbine provides reliable and dependable capacity for demanding customer economics. It offers the most cost-effective conversion of fuel to electricity as well as industry-leading operational flexibility for increased dispatch and ancillary services revenue. The 9HA gas turbine is at the heart of one of the world's most efficient combined-cycle power plants in commercial operation today and can support the path to decarbonization by allowing more renewables on the grid.

50% Hydrogen (H_2) Capable with a Technology Pathway Enabling a Future **100%**

7HA HEAVY DUTY GAS TURBINE

60 HZ

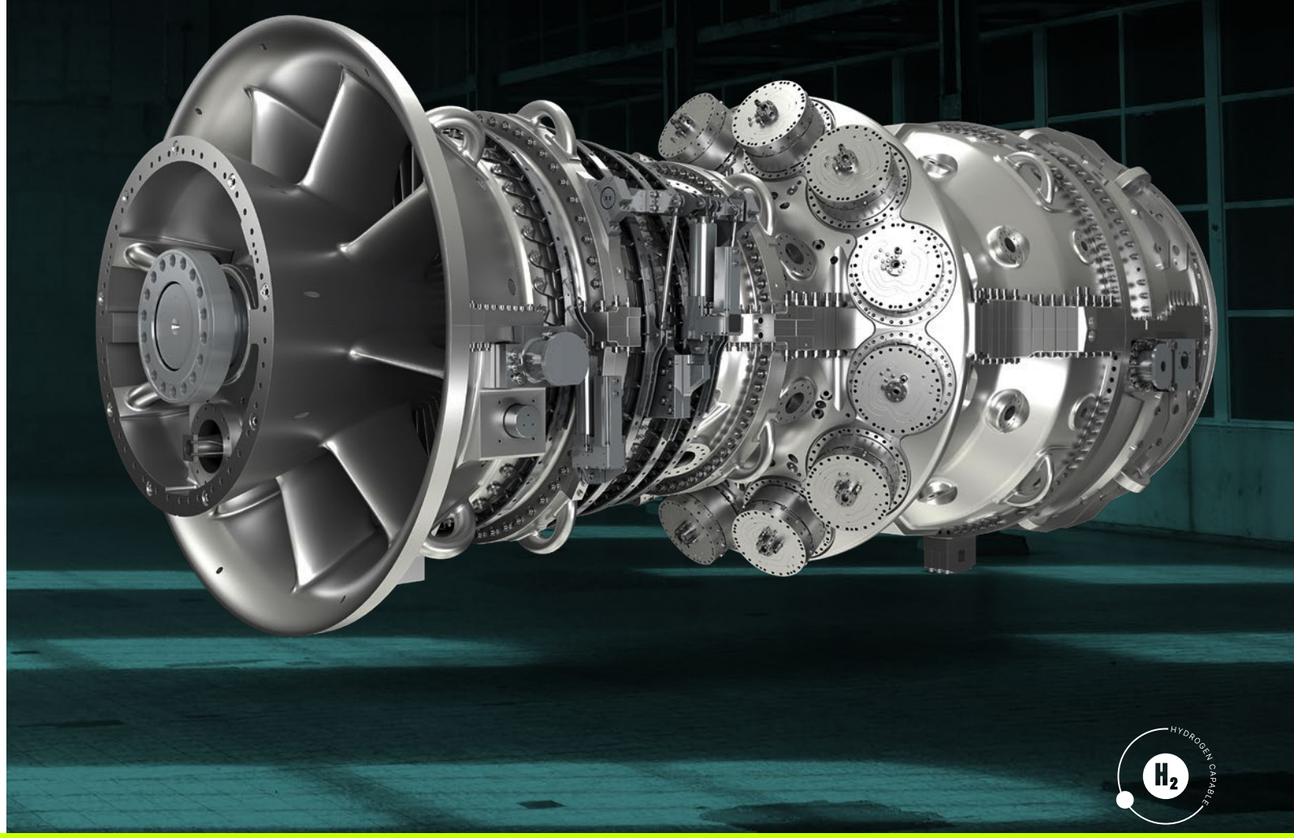
290-430 MW SIMPLE CYCLE OUTPUT
>64% COMBINED CYCLE EFFICIENCY

		7HA.01	7HA.02	7HA.03
SC PLANT PERFORMANCE	SC Net Output (MW)	290	384	430
	SC Net Heat Rate (Btu/kWh, LHV)	8120	8009	7884
	SC Net Heat Rate (kJ/kWh, LHV)	8567	8450	8318
	SC Net Efficiency (%, LHV)	42.0%	42.6%	43.3%
1X CC PLANT PERFORMANCE	CC Net Output (MW)	438	573	640
	CC Net Heat Rate (Btu/kWh, LHV)	5481	5381	5342
	CC Net Heat Rate (kJ/kWh, LHV)	5783	5677	5636
	CC Net Efficiency (%, LHV)	62.3%	63.4%	63.9%
	Plant Turndown – Minimum Load (%)	33.0%	37.0%	26.0%
	Ramp Rate (MW/min)	55	60	75
	Startup Time (RR Hot†, Minutes)	<30	<30	<30
2X CC PLANT PERFORMANCE	CC Net Output (MW)	880	1148	1282
	CC Net Heat Rate (Btu/kWh, LHV)	5453	5365	5331
	CC Net Heat Rate (kJ/kWh, LHV)	5753	5660	5625
	CC Net Efficiency (%, LHV)	62.6%	63.6%	>64.0%
	Plant Turndown – Minimum Load (%)	15.0%	18.0%	15.0%
	Ramp Rate (MW/min)	110	120	150
	Startup Time (RR Hot†, Minutes)	<30	<30	<30

NOTE: All ratings are net plant, based on ISO conditions and natural gas fuel. Actual performance will vary with project-specific conditions and fuel.
† Rapid Response/Hot Start

Today, more than 70 7HA gas turbines have been installed around the globe. These units support base load, load following, peaking, and cogeneration for district heating applications. The 7HA gas turbine can be a key enabler as the energy transition progresses and we move towards a world with less carbon emissions, providing the reliable and flexible power generation needed to complement a world with more renewable generation.

“A 7HA COMBINED CYCLE PLANT, NOW CAPABLE OF >64% EFFICIENCY, PROVIDES AN UP TO 60% REDUCTION IN CO_2 EMISSIONS VS. A SIMILAR SIZE COAL FIRED ASSET.”



50% Hydrogen (H_2) Capable with a Technology Pathway Enabling a Future **100%**

9F HEAVY DUTY GAS TURBINE

50 HZ

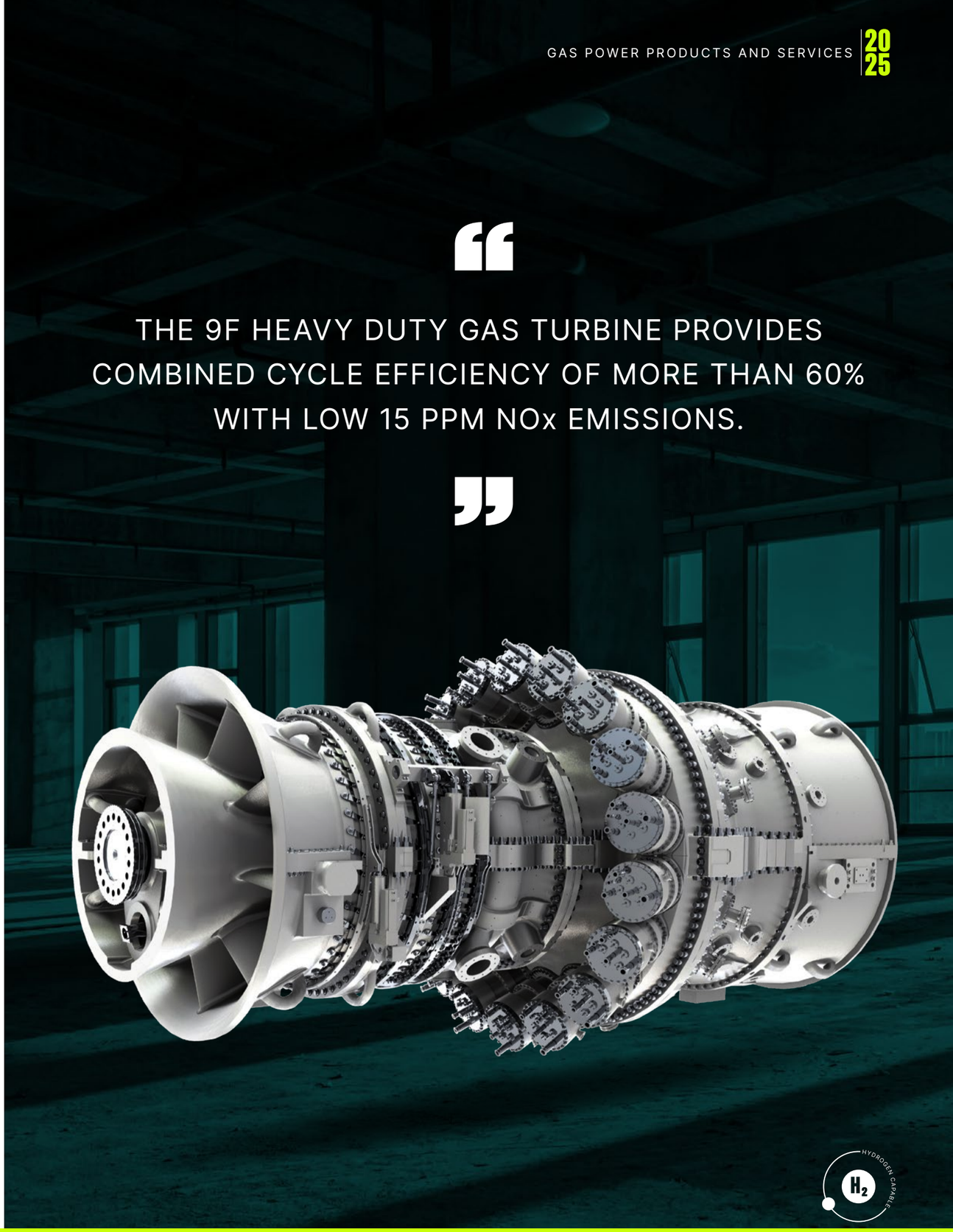
294 MW SIMPLE CYCLE OUTPUT
>60% COMBINED CYCLE EFFICIENCY

		9F.04
SC PLANT PERFORMANCE	SC Net Output (MW)	294
	SC Net Heat Rate (Btu/kWh, LHV)	8811
	SC Net Heat Rate (kJ/kWh, LHV)	9297
	SC Net Efficiency (%, LHV)	38.7%
1X CC PLANT PERFORMANCE	CC Net Output (MW)	452
	CC Net Heat Rate (Btu/kWh, LHV)	5680
	CC Net Heat Rate (kJ/kWh, LHV)	5993
	CC Net Efficiency (%, LHV)	60.1%
	Plant Turndown – Minimum Load (%)	48.0%
	Ramp Rate (MW/min)	22
	Startup Time (RR Hot†, Minutes)	30
2X CC PLANT PERFORMANCE	CC Net Output (MW)	908
	CC Net Heat Rate (Btu/kWh, LHV)	5660
	CC Net Heat Rate (kJ/kWh, LHV)	5972
	CC Net Efficiency (%, LHV)	60.3%
	Plant Turndown – Minimum Load (%)	22.0%
	Ramp Rate (MW/min)	44
	Startup Time (RR Hot†, Minutes)	39

NOTE: All ratings are net plant, based on ISO conditions and natural gas fuel. Actual performance will vary with project-specific conditions and fuel.
† Rapid Response/Hot Start

With over 450 units deployed to more than 40 countries, GE Vernova has one of the largest and most experienced 50 Hz F-Class fleet in the world. Our 9F gas turbine aims to deliver consistent performance and accommodates a diverse range of fuels, making it ideal for a variety of combined cycle and CHP applications. The simple and robust air-cooled architecture is engineered for longer parts durability and extended service inspection intervals, making the 9F an ideal choice for life-cycle value.

“THE 9F HEAVY DUTY GAS TURBINE PROVIDES COMBINED CYCLE EFFICIENCY OF MORE THAN 60% WITH LOW 15 PPM NOx EMISSIONS.”



Up to **10%+** Hydrogen (H_2) Capability

7F HEAVY DUTY GAS TURBINE

60 HZ

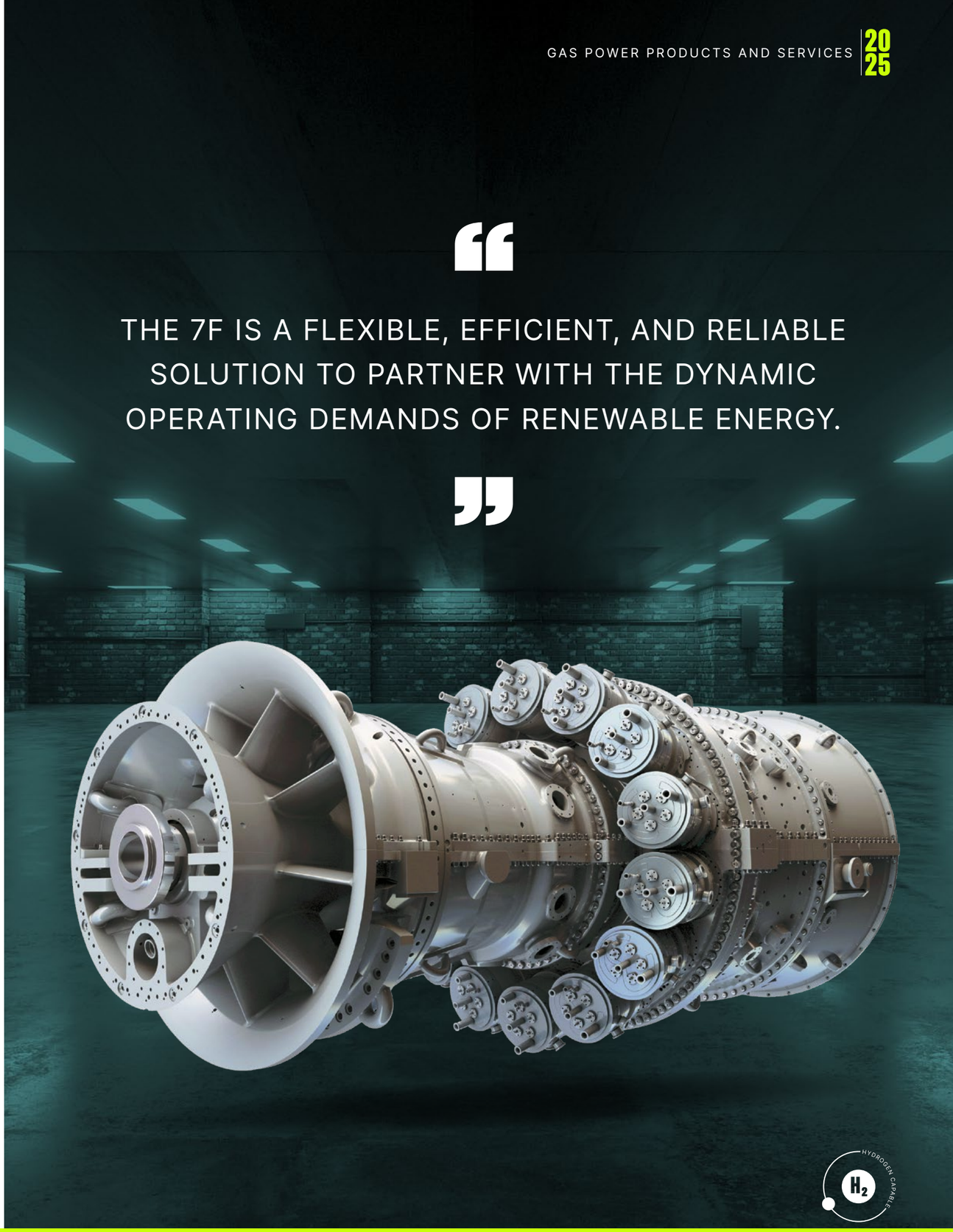
201-239 MW SIMPLE CYCLE OUTPUT
>60% COMBINED CYCLE EFFICIENCY

		7F.04	7F.05
SC PLANT PERFORMANCE	SC Net Output (MW)	201	239
	SC Net Heat Rate (Btu/kWh, LHV)	8873	8871
	SC Net Heat Rate (kJ/kWh, LHV)	9362	9359
	SC Net Efficiency (%, LHV)	38.5%	38.5%
1X CC PLANT PERFORMANCE	CC Net Output (MW)	309	379
	CC Net Heat Rate (Btu/kWh, LHV)	5716	5667
	CC Net Heat Rate (kJ/kWh, LHV)	6031	5979
	CC Net Efficiency (%, LHV)	59.7%	60.2%
	Plant Turndown – Minimum Load (%)	58.0%	46.0%
	Ramp Rate (MW/min)	30	40
	Startup Time (RR Hot†, Minutes)	28	25
2X CC PLANT PERFORMANCE	CC Net Output (MW)	622	762
	CC Net Heat Rate (Btu/kWh, LHV)	5675	5640
	CC Net Heat Rate (kJ/kWh, LHV)	5987	5951
	CC Net Efficiency (%, LHV)	60.1%	60.5%
	Plant Turndown – Minimum Load (%)	27.0%	22.0%
	Ramp Rate (MW/min)	60	80
	Startup Time (RR Hot†, Minutes)	28	25

NOTE: All ratings are net plant, based on ISO conditions and natural gas fuel. Actual performance will vary with project-specific conditions and fuel.
† Rapid Response/Hot Start

The first 7F gas turbine started commercial operation in 1990 and is still operational and producing electricity today. With more than 950 installed units producing ~175 GW of power in 11 countries, the 7F is the workhorse of the F-Class fleet. The 7F has been relevant for more than 30 years and continuous technological innovations and investments have helped ensure it is still an industry leading solution.

> “THE 7F IS A FLEXIBLE, EFFICIENT, AND RELIABLE SOLUTION TO PARTNER WITH THE DYNAMIC OPERATING DEMANDS OF RENEWABLE ENERGY.”



Up to **30%+** Hydrogen (H_2) Capability

GT13E2 HEAVY DUTY GAS TURBINE

50HZ

210 MW SIMPLE CYCLE OUTPUT
>55% COMBINED CYCLE EFFICIENCY

		GT13E2-210
SC PLANT PERFORMANCE	SC Net Output (MW)	210
	SC Net Heat Rate (Btu/kWh, LHV)	8980
	SC Net Heat Rate (kJ/kWh, LHV)	9474
	SC Net Efficiency (%, LHV)	38.0%
1X CC PLANT PERFORMANCE	CC Net Output (MW)	305
	CC Net Heat Rate (Btu/kWh, LHV)	6189
	CC Net Heat Rate (kJ/kWh, LHV)	6530
	CC Net Efficiency (%, LHV)	55.1%
	Plant Turndown – Minimum Load (%)	40.0%
	Ramp Rate (MW/min)	14
	Startup Time (RR Hot†, Minutes)	30
2X CC PLANT PERFORMANCE	CC Net Output (MW)	613
	CC Net Heat Rate (Btu/kWh, LHV)	6153
	CC Net Heat Rate (kJ/kWh, LHV)	6492
	CC Net Efficiency (%, LHV)	55.5%
	Plant Turndown – Minimum Load (%)	19.0%
	Ramp Rate (MW/min)	28
	Startup Time (RR Hot†, Minutes)	30

NOTE: All ratings are net plant, based on ISO conditions and natural gas fuel. Actual performance will vary with project-specific conditions and fuel.
† Rapid Response/Hot Start

With over 190 gas turbines installed and more than 14 million operating hours in a wide range of environmental and operational conditions, the GT13E2 gas turbine has the versatility to fit many power plant applications. The GT13E2 can reliably operate with multiple fuel compositions, including high hydrocarbon fuels, without hardware changes, and can also operate with up to 30% hydrogen.

> “THE GT13E2 HAS TWO OPERATING MODES TO PRIORITIZE EITHER OUTPUT OR AVAILABILITY, AND CAN OPERATE IN EXTREME CONDITIONS FROM -50°C TO +55°C.”

Up to 30%+ Hydrogen (H_2) Capability

9E HEAVY DUTY GAS TURBINE

50 HZ

132-147 MW SIMPLE CYCLE OUTPUT
>55% COMBINED CYCLE EFFICIENCY

		9E.03	9E.04
SC PLANT PERFORMANCE	SC Net Output (MW)	132	147
	SC Net Heat Rate (Btu/kWh, LHV)	9960	9238
	SC Net Heat Rate (kJ/kWh, LHV)	10508	9747
	SC Net Efficiency (%, LHV)	34.3%	36.9%
1X CC PLANT PERFORMANCE	CC Net Output (MW)	205	218
	CC Net Heat Rate (Btu/kWh, LHV)	6421	6203
	CC Net Heat Rate (kJ/kWh, LHV)	6775	6545
	CC Net Efficiency (%, LHV)	53.1%	55.0%
	Plant Turndown – Minimum Load (%)	45.0%	46.0%
	Ramp Rate (MW/min)	50	29
	Startup Time (RR Hot†, Minutes)	38	38
2X CC PLANT PERFORMANCE	CC Net Output (MW)	412	439
	CC Net Heat Rate (Btu/kWh, LHV)	6372	6166
	CC Net Heat Rate (kJ/kWh, LHV)	6723	6505
	CC Net Efficiency (%, LHV)	53.5%	55.3%
	Plant Turndown – Minimum Load (%)	22.0%	22.0%
	Ramp Rate (MW/min)	100	58
	Startup Time (RR Hot†, Minutes)	38	38

NOTE: All ratings are net plant, based on ISO conditions and natural gas fuel. Actual performance will vary with project-specific conditions and fuel.
† Rapid Response/Hot Start

The 9E is a robust, proven platform that helps deliver high availability, reliability, and durability. The 9E.04 represents the most recent addition to the 9E family, providing more power and performance with a newer 4 stage turbine module that fits within the same footprint as an already installed 9E gas turbine unit. A strong performer in a variety of applications, the 9E provides a wide range of fuels capability, and can even switch fuels while running under full load.

“GE VERNOVA’S 9E CAN RUN ON MORE THAN 52 TYPES OF FUEL WHILE DRASTICALLY REDUCING EMISSIONS WITH PROVEN DLN COMBUSTION TECHNOLOGY.”

Up to **100%+** Hydrogen (H_2) Capability

7E HEAVY DUTY GAS TURBINE

60 HZ

90 MW SIMPLE CYCLE OUTPUT
>52% COMBINED CYCLE EFFICIENCY

		7E.03
SC PLANT PERFORMANCE	SC Net Output (MW)	90
	SC Net Heat Rate (Btu/kWh, LHV)	10107
	SC Net Heat Rate (kJ/kWh, LHV)	10664
	SC Net Efficiency (%, LHV)	33.8%
1X CC PLANT PERFORMANCE	CC Net Output (MW)	140
	CC Net Heat Rate (Btu/kWh, LHV)	6514
	CC Net Heat Rate (kJ/kWh, LHV)	6873
	CC Net Efficiency (%, LHV)	52.4%
	Plant Turndown – Minimum Load (%)	45.0%
	Ramp Rate (MW/min)	40
	Startup Time (RR Hot†, Minutes)	35
2X CC PLANT PERFORMANCE	CC Net Output (MW)	283
	CC Net Heat Rate (Btu/kWh, LHV)	6454
	CC Net Heat Rate (kJ/kWh, LHV)	6809
	CC Net Efficiency (%, LHV)	52.9%
	Plant Turndown – Minimum Load (%)	22.0%
	Ramp Rate (MW/min)	80
	Startup Time (RR Hot†, Minutes)	35

NOTE: All ratings are net plant, based on ISO conditions and natural gas fuel. Actual performance will vary with project-specific conditions and fuel.
† Rapid Response/Hot Start

When reliability and availability are critical, customers turn to GE Vernova's 7E gas turbine. Whether providing raw horsepower to drive industrial and petrochemical processes, or steady, reliable output for CHP operation, the 7E helps deliver. Known for its world-leading fuel handling equipment and combustion system options, the 7E includes tri-fuel capability, which allows fuel switching while running or shutdown.

> "THE 7E ACCOMMODATES A FULL RANGE OF FUEL OPTIONS WHILE HELPING TO DELIVER BETTER RELIABILITY AND LOWER EMISSIONS THAN OTHER TECHNOLOGIES IN ITS CLASS."

Up to **100%+** Hydrogen (H_2) Capability

6F.03 HEAVY DUTY GAS TURBINE

50/60 HZ

88 MW SIMPLE CYCLE OUTPUT
>57% COMBINED CYCLE EFFICIENCY

		6F.03
SC PLANT PERFORMANCE	SC Net Output (MW)	88
	SC Net Heat Rate (Btu/kWh, LHV)	9277
	SC Net Heat Rate (kJ/kWh, LHV)	9788
	SC Net Efficiency (%, LHV)	36.8%
1X CC PLANT PERFORMANCE	CC Net Output (MW)	135
	CC Net Heat Rate (Btu/kWh, LHV)	5998
	CC Net Heat Rate (kJ/kWh, LHV)	6328
	CC Net Efficiency (%, LHV)	56.9%
	Plant Turndown – Minimum Load (%)	44.0%
	Ramp Rate (MW/min)	7
	Startup Time (RR Hot†, Minutes)	45
2X CC PLANT PERFORMANCE	CC Net Output (MW)	272
	CC Net Heat Rate (Btu/kWh, LHV)	5944
	CC Net Heat Rate (kJ/kWh, LHV)	6271
	CC Net Efficiency (%, LHV)	57.4%
	Plant Turndown – Minimum Load (%)	21.0%
	Ramp Rate (MW/min)	13
	Startup Time (RR Hot†, Minutes)	35

NOTE: All ratings are net plant, based on ISO conditions and natural gas fuel. Actual performance will vary with project-specific conditions and fuel.
† Rapid Response/Hot Start

Performance and versatility in a powerful package, the 6F.03 draws on the best of GE Vernova's F-class technology to address a wide range of applications, from small scale power and industrial cogeneration to floating and island installations. With over 240 units sold and 11 million operating hours on the fleet, the 6F.03 is a proven and dependable gas turbine, incorporating scaled F and H class technology and segment-leading 32k maintenance intervals.

"GE VERNOVA'S 6F.03 INCLUDES OUR LATEST IN COMBUSTION TECHNOLOGY FOR SUPERIOR TURNDOWN, FLEXIBILITY, AND FUEL PERFORMANCE."

Up to **100%+** Hydrogen (H_2) Capability

6B HEAVY DUTY GAS TURBINE

50/60 HZ

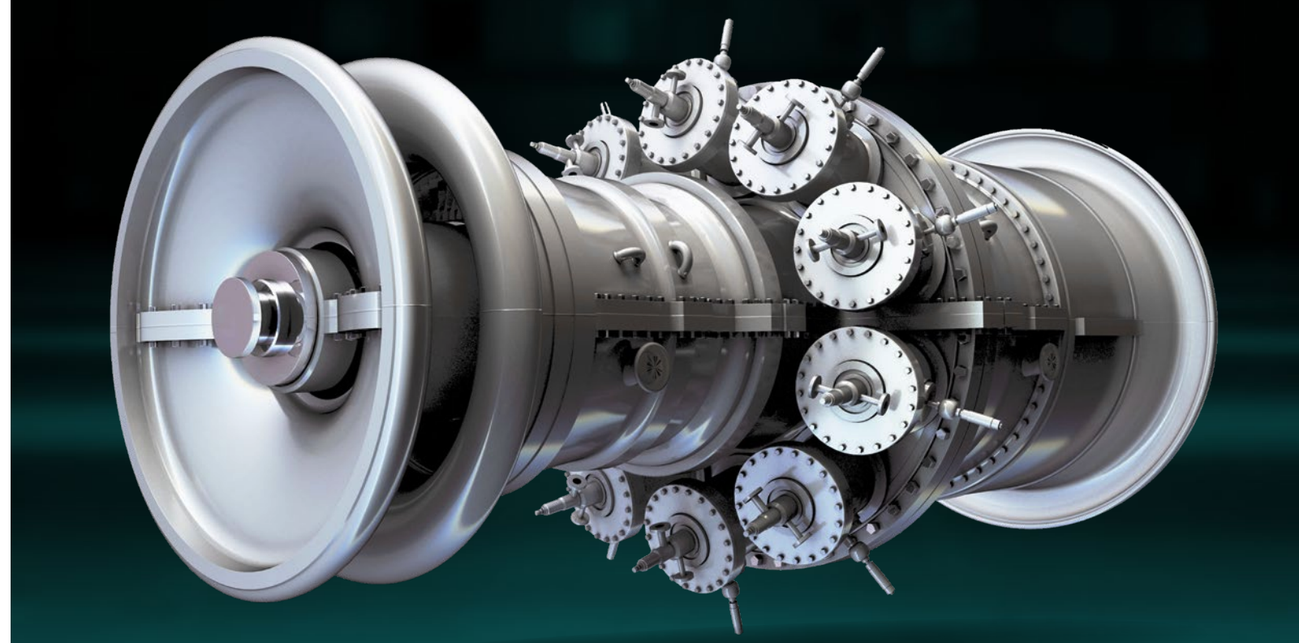
45 MW SIMPLE CYCLE OUTPUT
>52% COMBINED CYCLE EFFICIENCY

		6B.03
SC PLANT PERFORMANCE	SC Net Output (MW)	45
	SC Net Heat Rate (Btu/kWh, LHV)	10216
	SC Net Heat Rate (kJ/kWh, LHV)	10779
	SC Net Efficiency (%, LHV)	33.4%
1X CC PLANT PERFORMANCE	CC Net Output (MW)	70
	CC Net Heat Rate (Btu/kWh, LHV)	6578
	CC Net Heat Rate (kJ/kWh, LHV)	6940
	CC Net Efficiency (%, LHV)	51.9%
	Plant Turndown – Minimum Load (%)	41.0%
	Ramp Rate (MW/min)	20
	Startup Time (RR Hot†, Minutes)	30
2X CC PLANT PERFORMANCE	CC Net Output (MW)	141
	CC Net Heat Rate (Btu/kWh, LHV)	6515
	CC Net Heat Rate (kJ/kWh, LHV)	6874
	CC Net Efficiency (%, LHV)	52.4%
	Plant Turndown – Minimum Load (%)	20.0%
	Ramp Rate (MW/min)	40
	Startup Time (RR Hot†, Minutes)	30

NOTE: All ratings are net plant, based on ISO conditions and natural gas fuel. Actual performance will vary with project-specific conditions and fuel.
† Rapid Response/Hot Start

Rugged, versatile, and reliable is the best way to describe plants utilizing GE Vernova's 6B.03 gas turbine. The turbine can ramp to 20 MW in less than five minutes and accommodate nearly every non-standard fuel in cogeneration and industrial power operations. Capable of black starts on volatile grid environments, the 6B.03 remains a preferred solution for remote installation and extreme operation conditions. Pre-installed gas turbine packaging means easier transport and faster site installation—as quick as six months from order to operation. GE Vernova has built more than 1100 6B units, and the platform has exceeded 90 million running hours.

> "THE 6B OPERATES ON A WIDE RANGE OF GASEOUS AND LIQUID FUELS, INCLUDING UP TO 100% HYDROGEN, ALLOWING FOR USE OF THE MOST ECONOMICAL AND LESS CARBON EMITTING FUELS AVAILABLE."



Up to 100%+ Hydrogen (H_2) Capability

LMS100 AERODERIVATIVE PACKAGE 50/60 HZ

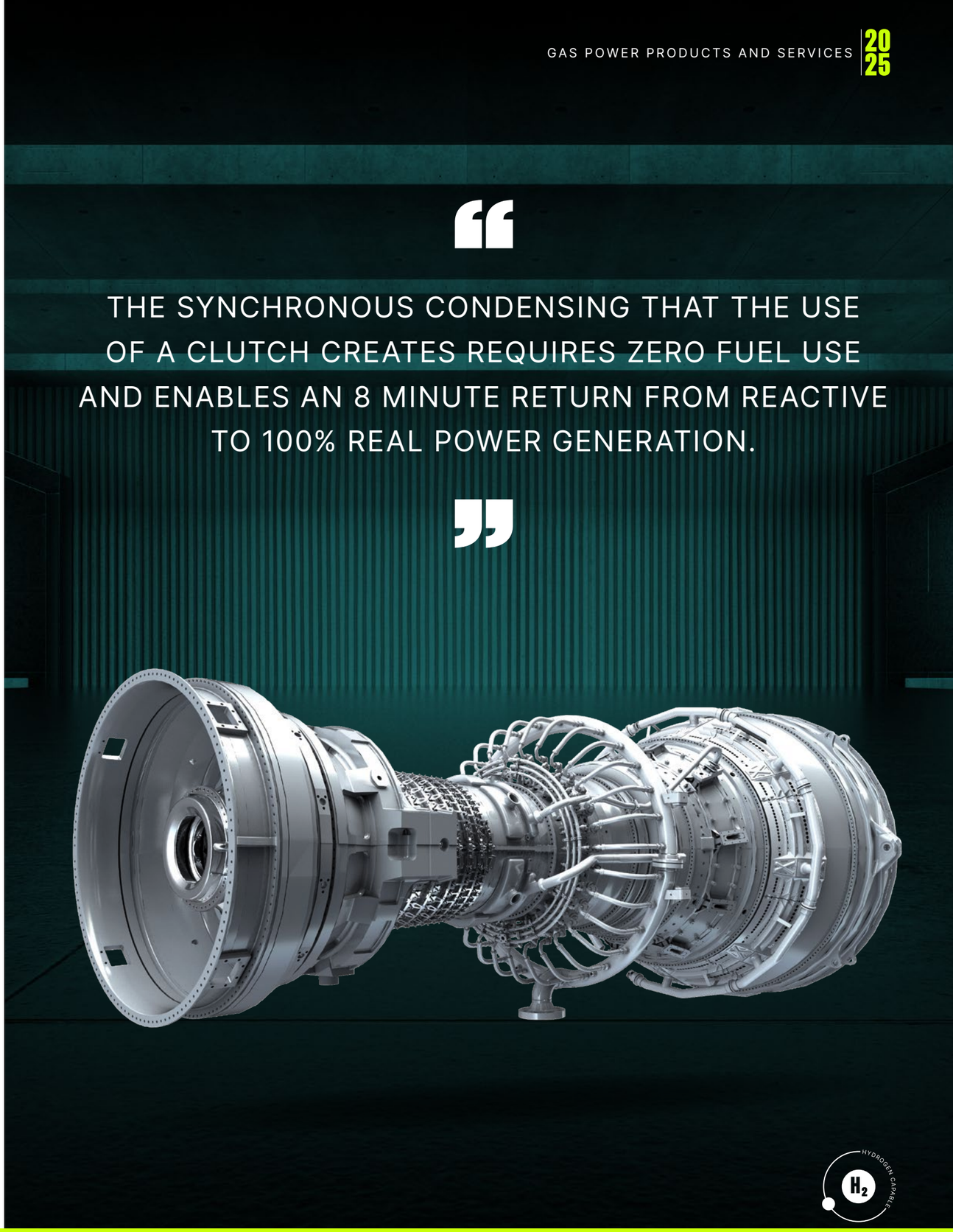
~116 MW SIMPLE CYCLE OUTPUT
~44% SIMPLE CYCLE EFFICIENCY

		LMS100 PA+
SC PLANT PERFORMANCE	SC Net Output (MW)	112.9/115.8††
	SC Net Heat Rate (Btu/kWh, LHV)	7935/7773††
	SC Net Heat Rate (kJ/kWh, LHV)	8372/8201††
	SC Net Efficiency (%, LHV)	43.0%/43.9%††
	Fast Start Capability (Minutes)	8
1X CC PLANT PERFORMANCE	CC Net Output (MW)	134.6/137.2††
	CC Net Heat Rate (Btu/kWh, LHV)	6634/6566††
	CC Net Heat Rate (kJ/kWh, LHV)	6999/6928††
	CC Net Efficiency (%, LHV)	51.4%/52.0%††
	Plant Turndown – Minimum Load (%)	28.0%/28.0%††
	Ramp Rate (MW/min)	50+
	Startup Time (RR Hot†, Minutes)	30
2X CC PLANT PERFORMANCE	CC Net Output (MW)	269.9/274.8††
	CC Net Heat Rate (Btu/kWh, LHV)	6616/6554††
	CC Net Heat Rate (kJ/kWh, LHV)	6980/6915††
	CC Net Efficiency (%, LHV)	51.6%/52.1%††
	Plant Turndown – Minimum Load (%)	28.0%
	Ramp Rate (MW/min)	100
	Startup Time (RR Hot†, Minutes)	30

NOTE: Net Plant ratings are based on ISO conditions, natural gas, inlet and exhaust losses included and balance of plant equipment excluded. Actual performance will vary with project specific conditions, fuel and ambient conditions. 2PNRH = Two pressure, non-reheat.
† Rapid Response/Hot Start
†† 50 Hz/60 Hz

If it's efficiency you're looking for, search no more. Our LMS100 aeroderivative gas turbine package is currently the highest simple cycle efficiency gas turbine in the world. Its intercooled gas turbine system provides rapid startup, with an 8 minute start to full load and emergency ramp speeds of up to 50 MW/minute. In high renewable penetration areas like California, our LMS100 gas turbines are providing 2.8 GW of generation with more than 1400 MW/minute of ramping capability.

> "THE SYNCHRONOUS CONDENSING THAT THE USE OF A CLUTCH CREATES REQUIRES ZERO FUEL USE AND ENABLES AN 8 MINUTE RETURN FROM REACTIVE TO 100% REAL POWER GENERATION."



Up to 30%+ Hydrogen (H_2) Capability

LM6000 AERODERIVATIVE PACKAGE 50/60 HZ

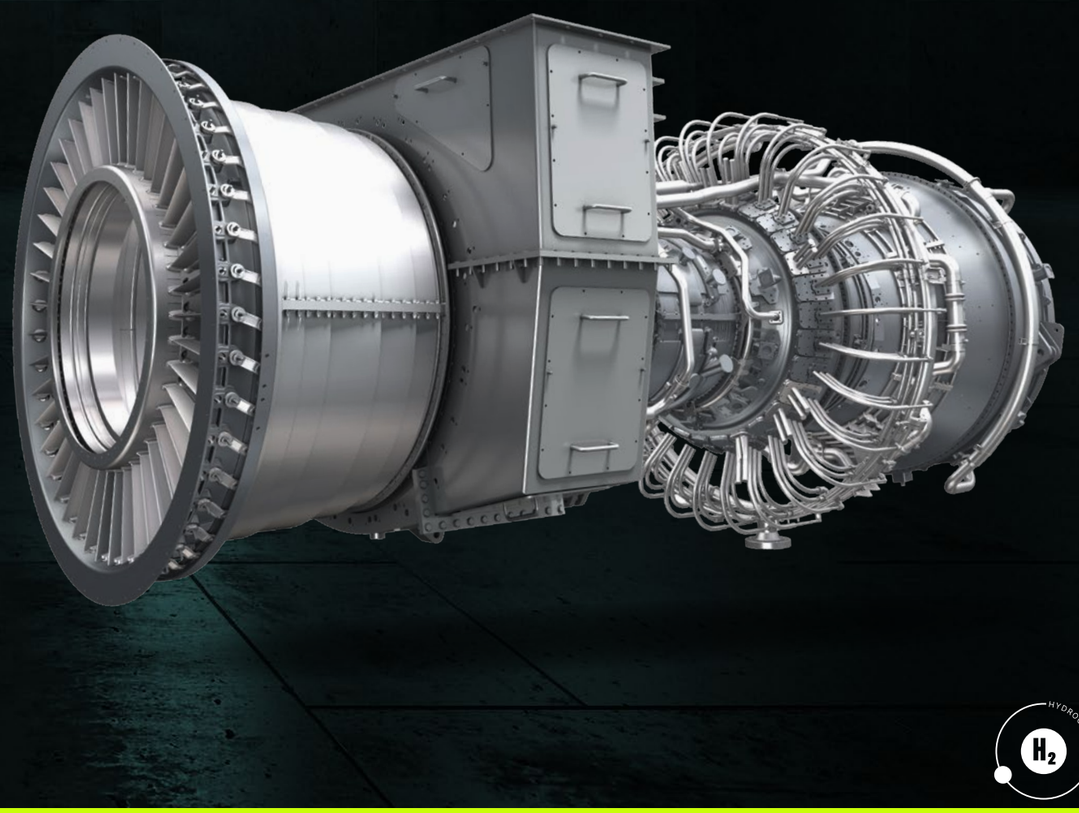
~57 MW SIMPLE CYCLE OUTPUT
41% SIMPLE CYCLE EFFICIENCY

		LM6000 PC SPRINT	LM6000 PF+ SPRINT
SC PLANT PERFORMANCE	SC Net Output (MW)	51.1	56.9
	SC Net Heat Rate (Btu/kWh, LHV)	8585	8328
	SC Net Heat Rate (kJ/kWh, LHV)	9068	8800
	SC Net Efficiency (%, LHV)	39.7%	41.0%
	Fast Start Capability (Minutes)	5	5
1X CC PLANT PERFORMANCE	CC Net Output (MW)	66.5	75.8
	CC Net Heat Rate (Btu/kWh, LHV)	6596	6218
	CC Net Heat Rate (kJ/kWh, LHV)	6960	6560
	CC Net Efficiency (%, LHV)	51.7%	54.9%
	Plant Turndown – Minimum Load (%)	37.0%	37.0%
	Ramp Rate (MW/min)	30	30
	Startup Time (RR Hot†, Minutes)	30	30
2X CC PLANT PERFORMANCE	CC Net Output (MW)	133.8	152.0
	CC Net Heat Rate (Btu/kWh, LHV)	6560	6202
	CC Net Heat Rate (kJ/kWh, LHV)	6921	6543
	CC Net Efficiency (%, LHV)	52.0%	55.0%
	Plant Turndown – Minimum Load (%)	18.0%	18.0%
	Ramp Rate (MW/min)	60	60
	Startup Time (RR Hot†, Minutes)	30	30

NOTE: Net Plant ratings are based on ISO conditions, natural gas, inlet and exhaust losses included and balance of plant equipment excluded. Actual performance will vary with project specific conditions, fuel and ambient conditions. 2PNRH = Two pressure, non-reheat.
† Rapid Response/Hot Start

Over 40 million operating hours and more than 1,320 units shipped makes GE Vernova's LM6000 aeroderivative gas turbine package a leader in the +40 MW space. The LM6000 offers greater than 99 percent start and operational reliability and greater than 98 percent availability. Its 5-minute fast start allows operators to differentiate their dispatch capability while a simple two-spool configuration results in lower overall maintenance costs. Universal and modular packaging gives the LM6000VELOX a smaller footprint and allows for faster installation and commissioning.

"GE VERNOVA'S FIRST GAS TURBINE TO BE PAIRED WITH A BATTERY ENERGY STORAGE SYSTEM. FOUR OF THESE STORAGE UNITS ARE ALREADY IN OPERATION, AND THE TECHNOLOGY IS EXPANDING TO CREATE A NEW "HYBRID" PRODUCT LINE."



Up to 35% (LM6000 DLE) and 100% (LM6000 SAC) Hydrogen (H_2) Capability

LM2500XPRESS

AERODERIVATIVE PACKAGE

50/60 HZ

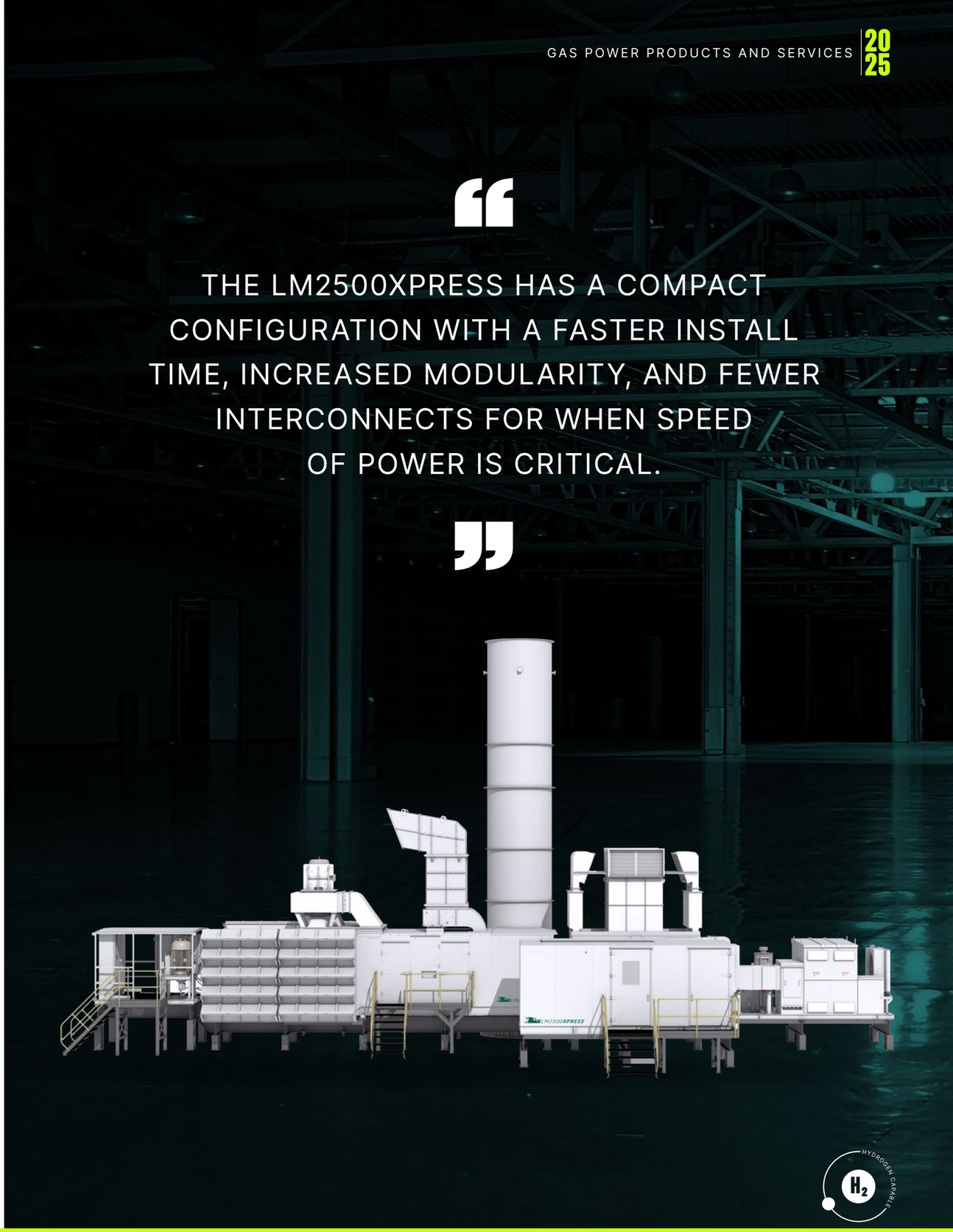
~37 MW SIMPLE CYCLE OUTPUT
>39% SIMPLE CYCLE EFFICIENCY

		LM2500XPRESS+G4 DLE UPT	LM2500XPRESS+G5 DLE UPT (25ppm NOx)	LM2500XPRESS+G5 DLE UPT (15ppm NOx)
SC PLANT PERFORMANCE	SC Net Output (MW)	34.5/34.4††	36.3/36.8††	33.9/34.5††
	SC Net Heat Rate (Btu/kWh, LHV)	8669/8563††	8751/8646††	8774/8693††
	SC Net Heat Rate (kJ/kWh, LHV)	9146/9034††	9233/9122††	9257/9172††
	SC Net Efficiency (%, LHV)	39.4%/39.8%††	39.0%/39.5%††	38.9%/39.2%††
	Fast Start Capability (Minutes)	5	5	5
1X CC PLANT PERFORMANCE	CC Net Output (MW)	47.9/47.4††	51.4/51.7††	47.7/48.2††
	CC Net Heat Rate (Btu/kWh, LHV)	6221/6184††	6156/6129*	6223/6201††
	CC Net Heat Rate (kJ/kWh, LHV)	6564/6525††	6495/6466††	6566/6542††
	CC Net Efficiency (%, LHV)	54.8%/55.2%††	55.4%/55.7%††	54.8%/55.0%††
	Plant Turndown – Minimum Load (%)	35.0%	35.0%	35.0%
	Ramp Rate (MW/min)	30	30	30
	Startup Time (RR Hot†, Minutes)	30	30	30
2X CC PLANT PERFORMANCE	CC Net Output (MW)	96.6/95.6††	103.6/104.3††	96.2/97.2††
	CC Net Heat Rate (Btu/kWh, LHV)	6173/6136††	6107/6075††	6174/6149††
	CC Net Heat Rate (kJ/kWh, LHV)	6513/6474††	6443/6410††	6514/6488††
	CC Net Efficiency (%, LHV)	55.3%/55.6%††	55.9%/56.2%††	55.3%/55.5%††
	Plant Turndown – Minimum Load (%)	35.0%	35.0%	35.0%
	Ramp Rate (MW/min)	60	60	60
	Startup Time (RR Hot†, Minutes)	30	30	30

NOTE: Net Plant ratings are based on ISO conditions, natural gas, inlet and exhaust losses included and balance of plant equipment excluded. Actual performance will vary with project specific conditions, fuel and ambient conditions. 2PNRH = Two pressure, non-reheat.
† Rapid Response/Hot Start
†† 50 Hz/60 Hz

With up to 95% assembly in the factory, the LM2500XPRESS was created for speed and simplicity. The LM2500XPRESS comes pre-packaged in 10 simplified modules for easy installation and features 27 electrical interconnects vs. 130+ for a traditional plant, as well as greatly reduced mechanical interconnects. Module systems flushing is completed at the factory, so customers don't need to flush on-site. For customers who need power in days, not weeks, the LM2500XPRESS package can be installed in about 14 days by 20 people. Its plug and play nature lets you get power to the grid quickly and efficiently, or provides industrial companies the ability to get up and running fast.

> "THE LM2500XPRESS HAS A COMPACT CONFIGURATION WITH A FASTER INSTALL TIME, INCREASED MODULARITY, AND FEWER INTERCONNECTS FOR WHEN SPEED OF POWER IS CRITICAL."



Up to 35% Hydrogen (H_2) Capability

TM2500 AERODERIVATIVE PACKAGE 50/60 HZ

~36 MW SIMPLE CYCLE OUTPUT
~40% SIMPLE CYCLE EFFICIENCY

		TM2500 SAC	TM2500 DLE
SC PLANT PERFORMANCE	SC Net Output (MW)	34.6/36.9††	34.5/34.4††
	SC Net Heat Rate (Btu/kWh, LHV)	9814/9377††	8648/8557††
	SC Net Heat Rate (kJ/kWh, LHV)	10354/9893††	9124/9028††
	SC Net Efficiency (%, LHV)	34.8% 36.4%††	39.5%/39.9%††
	Fast Start Capability (Minutes)	5	5
1X CC PLANT PERFORMANCE	CC Net Output (MW)	49.5/51.5††	47.9/47.5††
	CC Net Heat Rate (Btu/kWh, LHV)	6833/6701††	6209/6175††
	CC Net Heat Rate (kJ/kWh, LHV)	7209/7070††	6551/6515††
	CC Net Efficiency (%, LHV)	49.9%/50.9%††	55.0%/55.3%††
	Plant Turndown – Minimum Load (%)	35.0%	35.0%
	Ramp Rate (MW/min)	30	30
	Startup Time (RR Hot†, Minutes)	30	30
2X CC PLANT PERFORMANCE	CC Net Output (MW)	99.9/103.9††	96.5/95.8††
	CC Net Heat Rate (Btu/kWh, LHV)	6776/6640††	6160/6124††
	CC Net Heat Rate (kJ/kWh, LHV)	7149/7006††	6499/6461††
	CC Net Efficiency (%, LHV)	50.4%/51.4%††	55.4%/55.7%††
	Plant Turndown – Minimum Load (%)	35.0%	35.0%
	Ramp Rate (MW/min)	60	60
	Startup Time (RR Hot†, Minutes)	30	30

NOTE: Net Plant ratings are based on ISO conditions, natural gas, inlet and exhaust losses included and balance of plant equipment excluded. Actual performance will vary with project specific conditions, fuel and ambient conditions. 2PNRH = Two pressure, non-reheat.
† Rapid Response/Hot Start
†† 50 Hz/60 Hz

The TM2500 package is ideal for providing a baseload bridge to permanent power installations or for generating backup power in the wake of emergencies like natural disasters, plant shutdowns, or grid instability. Our complete solutions, including a trailer-mounted gas turbine generator set and containerized balance-of-plant, can put power on the grid within as little as 30 days of the contract signature. This fast power provides the greatest power density among gas turbine trailer-mounted offerings.

“SWITCHING FROM A DIESEL ENGINE AND ELECTRIC GENERATOR (DIESEL GENSET) TO A TM2500 BURNING NATURAL GAS CAN SAVE UP TO $8 MILLION PER YEAR IN OPERATING COSTS.”

Up to 75% (TM2500 +G4 SAC)† Hydrogen (H_2) Capability

† Package changes are required.

BOTTOMING CYCLE

STEAM TURBINE OFFERINGS

GE Vernova's highly efficient and reliable steam turbine portfolio has the breadth and depth to help meet any project-specific need, integrating seamlessly with our gas turbines, HRSGs, and balance-of-plant equipment to help ensure operational success, satisfaction, and profitability for our customers across various applications.

A World Leader in Steam Turbine Technology

For more than 130 years, GE Vernova has been one of the industry's leaders in steam turbine technology and innovations. GE Vernova's steam turbines continue to be an industry leader, helping deliver efficiency and reliability to help ensure our customers' success. GE Vernova's steam turbines equip ~40% of the world's combined cycle steam turbine capacity. GE Vernova has more than 1,200 combined-cycle steam turbines operating in 80+ countries, generating more than 195 GW of power. Our steam turbines can be installed and operational in eight months or less for rapid commissioning.

Steam Turbines with High Availability and Reliability

- Our robust, reliable steam turbines are enhanced by the power of our digital and control solutions
- Our proprietary long-term testing program validates material behavior and improves steam turbine component reliability
- Advanced techniques during the engineering phase result in fewer maintenance intervals and increased turbine availability
- Hardware is thoroughly tested to make sure every machine meets the reliability and performance standards our customers demand

High-efficiency Steam Paths

- Industry-leading performance with high reaction 3-D blading engineered for high pressure (HP), intermediate pressure (IP) and low pressure (LP) steam turbine modules
- Our steam turbine engineering process provides precise control of radial clearances and throat areas to help ensure greater output and efficiency
- Last stage blades (LSBs) aim to deliver 10% or more of total steam turbine output, making the blade one of the most critical components in the steam turbine. GE Vernova is an industry leader with its last stage blade portfolio ensuring high efficiency, reliability and availability

Enhanced Operational Flexibility for Steam Turbines in Thermal Power Plants

- Advanced life prediction methods provide reliable lifetime assessment of the steam turbine components and increased cycling capabilities
- Enhanced blade-to-rotor connection configuration reduces thermal stresses for increased rotor life

Welded Rotors

- With more than 80 years of welded rotor experience, we provide configurations that are proven and reliable
- GE Vernova uses welded and monobloc rotors providing our customers with an improved solution aiming to ensure longer life, and higher reliability and availability

Single Bearing Configuration

- Multi-casing steam turbines have a single bearing between each turbine section that enables avoidance of load shifting for higher reliability and reduced installation time due to efficient shaft alignment
- Shorter overall turbine shaft length for lower building costs

High-efficiency Last-stage Blades

- Greatly enhanced back pressure capability allows for smaller air-cooled condensers, lowering overall plant cost
- Densely staggered last-stage blade sizes for project-specific cold-end conditions and increased efficiency—up to 48" for 50 Hz and up to 50" for 60 Hz
- Robust blade-to-rotor configuration with high cyclic life capability for high reliability and availability
- Features such as full tip shroud, enhanced tip section with low shock loss, aerodynamic part span connector, and increased root-reaction improve steam turbine performance
- Advanced radial vortexing improves performance and hood integration over a range of loads

Advanced Sealing Features

- Shaft and tip brush seals, developed in conjunction with our global research organization, improve leakage control when compared to more conventional sealing technology
- Abradable coatings on stationary seals enable the reduction of radial clearances, decreasing long-term performance degradation

Advanced Blading

- Modern, three-dimensional profile configuration that results in higher efficiency
- High pressure, intermediate pressure, and low pressure front stage blades that are milled from a single forging for excellent mechanical integrity and higher reliability

STF-600 Series Steam Turbines

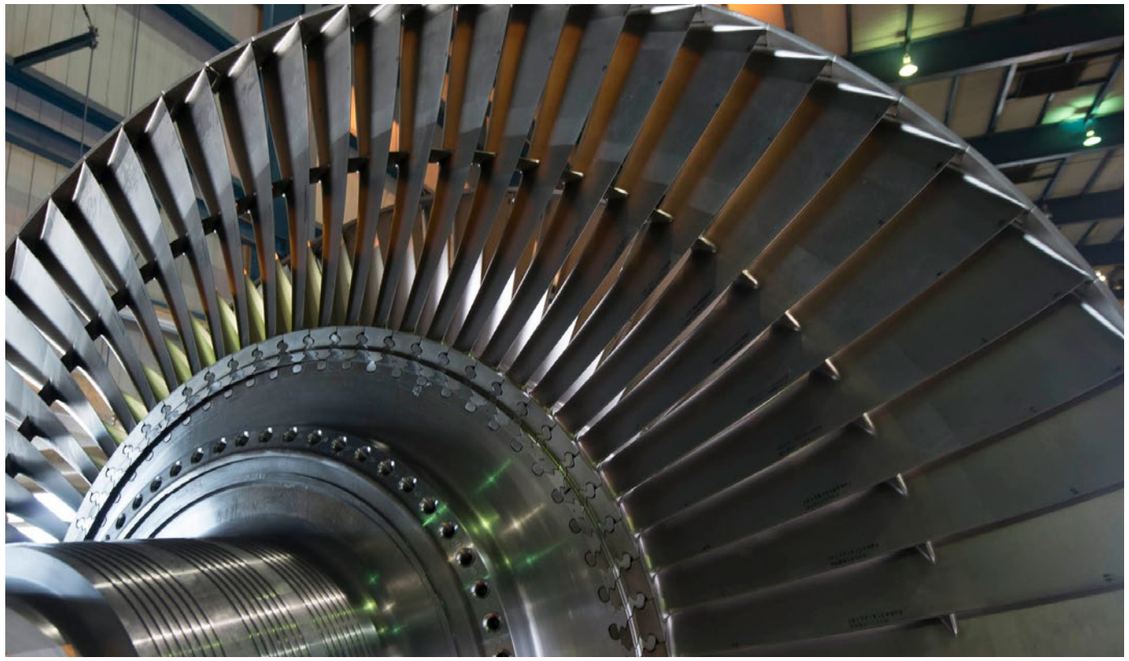
GE Vernova's STF-A650, STF-D600, and STF-D650 combined-cycle reheat steam turbines provide industry leading efficiency, reliability, flexibility, and availability for today's combined cycle applications. The STF-A650, STF-D600, and STF-D650 reheat steam turbines have proven their value in combined cycle, combined heat and power (CHP), and industrial applications. They combine GE Vernova's unique shrink ring configuration with the flexibility of a modular turbine configuration.

Configuration Flexibility

The fully modular architecture allows configuring the steam turbines for even the most demanding applications. Options include but are not limited to full condensing or multiple controlled steam extractions used for industrial processes, district heating or carbon capture.

Enabling Reduced Plant Total Installed Cost

Most of the steam turbine sections and components are factory assembled and pre-tested, reducing site installation time and improving schedule predictability. The configuration with an axial flow (STF-A650) or side flow (STF-D600 and STF-D650) exhaust configuration enables a lower centerline height, reducing total installed cost. The STF-D600 and STF-D650 steam turbines can also be configured with down flow exhaust, typically used where there are space constraints.



STF-200 Series Steam Turbines

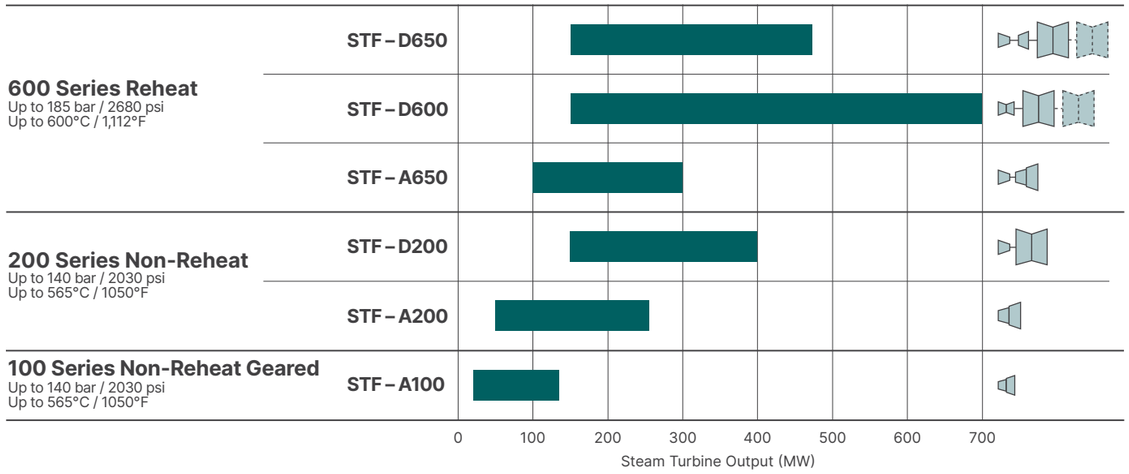
GE Vernova's two-casing dual LP flow STF-D200 steam turbine and single-casing, axial exhaust STF-A200 steam turbine provide flexible configurations in 50 Hz and 60 Hz non-reheat applications in multi-shaft and single-shaft configurations, covering a wide range of industrial and utility applications.

Configuration Flexibility

The fully modular architecture allows configuring the steam turbine for even the most demanding applications. Options include throttling high pressure steam, the ability to have a combination of multiple controlled and uncontrolled extractions, and condensing, district heating or back pressure exhausts.

Enhanced for integration

The STF-A200 non-reheat steam turbine is available in a fully assembled, frame mounted configuration to reduce installation time. Both the STF-A200 and STF-D200 enable low centerline height installations and a simplified foundation interface further lowering the total installed cost.

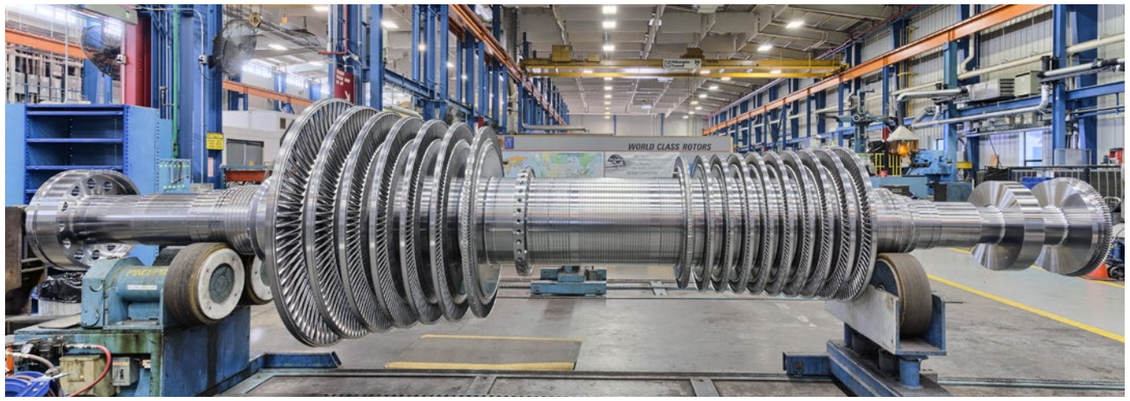


600 Series Product Specifications

	STF-A650	STF-D600	STF-D650
Main Steam Pressure	185bar (2680psig)	180bar (2611psig)	220bar (3191psig)
Main Steam/Reheat Steam Temperature	600°C/600°C (1112°F/1112°F)	600°C/600°C (1112°F/1112°F)	600°C/620°C (1112°F/1148°F)
Frequency	50 Hz and 60 Hz	50 Hz and 60 Hz	50 Hz and 60 Hz
Output	100 – 300 MW	150 – 700 MW	150 – 700 MW

200 Series Product Specifications

	STF-A200	STF-D200
Main Steam Pressure/Temperature	140bar (2030psig)/565°C (1050°F)	140bar (2030psig)/565°C (1050°F)
Frequency	50 Hz and 60 Hz	50 Hz and 60 Hz
Output	50-250 MW	150-400 MW



HRSG OFFERINGS

HRSG Technology is Critical to Combined Cycle Efficiency

GE Vernova offers a variety of HRSG solutions that are tailored to help meet customers' operating flexibility and performance requirements. With over 100 years of boiler experience and more than 1300 HRSGs installed worldwide, GE Vernova is one of the leading HRSG OEMs in the world.

Our portfolio of products and services brings the engineering and manufacturing of all major components in a combined cycle power plant under one roof. GE Vernova's whole integrated system approach provides high power output and efficiency as well as improved plant operability.

GE Vernova's HRSGs provide reliable high-cycling duty due to the innovative single-row harp configuration in the front (hot) end of the HRSG, producing three times less stress than conventional multi-row harps and capable of fast starts, rapid response and low turndown.

Numerous integrated scope options are available, such as supplementary firing for peak power output, SCR, and CO catalysts for emissions control, accessories for noise abatement and exhaust gas bypass systems.

A choice of various modular construction options lets you choose the degree of prefabrication that best fits your specific project site requirements. GE Vernova provides four basic options of prefabricated Pressure Part Modules:

Harp Bundle	Modules	C-Frame	Fully Assembled
• Limited infrastructure • Limited large crane availability • Low site labor costs	• Suitable for most sites • Fewer transportation restrictions • Large crane availability • Medium site labor costs	• Sites with good water access • Large crane availability • High site labor costs	• Sites with excellent water access and specialized transport • High site labor costs

In addition to these options and to reduce the total installed cost further, GE Vernova offers even more constructability options such as shop installed vents and drains, shop installed large bore valves, drum modularization, stack in cans, etc.

HRSG Product Portfolio

Horizontal Drum

The flow of gas in this most popular HRSG type is horizontal while the water is heated in vertical tubes with natural circulation.

Horizontal Once Through (OT)

The horizontal once through has the same basic arrangement as the horizontal drum, but eliminates the high pressure drum, while using GE Vernova's OT technology to increase flexibility, efficiency, and daily cycling capabilities.

Vertical Drum

With vertical gas flowing across horizontal tubes, this HRSG type is ideal when site space is limited. It is particularly well-suited for heavy fuel oil applications.

OT HRSG Technology

GE Vernova's proven Once Through (OT) HRSG technology is a key enabler in advanced water-steam cycles aiming to deliver higher combined cycle efficiency with high cyclic capability and offers the following advantages:

- Proven experience with over 2.5 million operating hours
- Superior performance at part loads and across the ambient temperature range due to the ability to vary feedwater flow resulting in increased combined cycle efficiency
- Increased combined cycle efficiency due to the ability to operate at higher HP steam pressures
- Stable operation from low load to baseload with superior cyclic operation and flexibility
- GE Vernova's Ultra-Pure Water (UPW) solution with the GE Vernova OT requires a small polisher (3%) for make-up water in lieu of a typical 50% condensate polisher required by competing offerings, inherently decreasing total plant cost

Towantic Power Plant, 7HA.01 2×1 805 MW multi-shaft combined cycle power plant, CPV Towantic Energy Center, Oxford, CT.

The GE Vernova Advantage

Capability

- A whole system approach helps ensure integrated engineering with other system components
- HRSGs can be configured and engineered for any type of gas turbine and steam cycle
- Various modular construction options aimed to meet Customer's specific project needs

Versatility

- Complete portfolio of horizontal and vertical HRSGs including in-house developed OT HRSG technology
- Capable of fast starts, rapid response, and low turndown

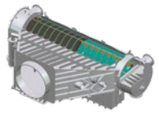
Reliability

- GE Vernova's HRSG configuration provides reliable high cycling duty due to innovative single-row harp configuration in the front (hot) end of the HRSG which produces three times less stress than conventional multi-row harps
- Increased quality assurance through in-house manufacturing of pressure part modules
- Access to a worldwide dedicated service organization

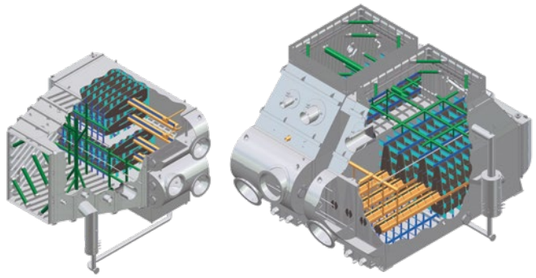
WATER COOLED CONDENSERS

GE Vernova offers high-performance deaerating water-cooled surface condensers for once through and cooling tower heat rejection systems. With decades of steam turbine and condenser manufacturing experience, we understand that your assets must harmonize to achieve sustained high power plant cold-end performance. Our water-cooled condensers are custom tailored to support specific project needs across a wide range of steam turbine applications, from small industrial-scale to large utility-scale units. Featuring uncomplicated and robust construction in pre-assembled modules, these condensers are easy to transport and install on site.

In addition to heat rejection and deaeration of condensate and make-up water, our condensers provide numerous critical safety functions. One critical operation mode involves full-flow desuperheated steam that bypasses the steam turbines and is admitted directly into the condenser. This is a particularly demanding operational mode for any condenser, but GE Vernova's configuration handles it safely and efficiently, without operational or lifetime restrictions.



Industrial Scale
50 MW Steam Turbine Power Output



Utility Scale
>500 MW Steam Turbine Power Output

	Cylindrical Shell Condensers	Rectangular Shell Condensers
Power Range	Up to approximately 50 MWe steam turbine output	From 50 MWe up to the largest steam turbine outputs
Arrangement	Downward, lateral or axial turbine exhaust	Downward, lateral or axial turbine exhaust
Surface Area	1000 m^2 (10080 ft^2) up to 6000 m^2 (640600 ft^2)	3000 m^2 (32300 ft^2) up to 35000 m^2 (38000 ft^2) with single shell
Tube Length	5 to 14 m (16 to 46 ft)	Up to 18 m (60 ft)

GE VERNOVA'S CONDENSER ENGINEERING GOES BEYOND THE HEAT EXCHANGE INSTITUTE (HEI) GUIDELINES FOR CONDENSER HEAT EXCHANGE AREA.

Key Benefits

- **Proven performance, high reliability:** GE Vernova's tube bundle has a 50-year track record of outstanding performance and unrivaled reliability in both original installations and retrofits.
- **Excellent effiency:** Our standardized tube bundles, each containing 870 to 7300 tubes, are scaled to help meet the needs of any power plant, regardless of size.
- **Simplified integration, standardized interfaces:** Every GE Vernova condenser is supported by accurate thermal and 3D models to facilitate integration into your specific power plant. Our configuration eliminates all proprietary and nonstandard interfaces, helping to deliver industry standard connections for piping, instrumentation and foundation supports. This makes it easy to adapt to any type of steam turbine.
- **Reduced costs:** Floor-mounted axial or lateral condensers simplify construction of the turbine foundation, shortening civil work and construction durations. For a streamlined construction process, our condenser arrives on-site in hydrotested and assembled modules with minimal welding requirements and accompanied by clear and concise interface and construction documentation.
- **Robust construction:** Built to handle turbine and steam generator overloads and variations in cooling water temperature, our condensers are resistant to impingement erosion and tube vibration. GE Vernova engineers also carefully select tube and tubesheet material based on cooling water specifications.
- **Deaerating performance:** GE Vernova's condensers reach extremely low oxygen content in the condensate by efficiently deaerating make-up water without the need for external steam sources.

Other Heat Exchanger Products

In addition to water-cooled condensers, GE Vernova offers high performance, reliable heat exchanger products developed in-house, including district heaters, direct contact heaters and deaerators, feedwater tanks, and shell and tube closed cooling water coolers.

THE RESULT IS A CONDENSER WITH SIGNIFICANTLY REDUCED AREA FOR THE SAME CONDENSER PRESSURE.

ELECTRICAL CONVERSION

GENERATOR OFFERINGS

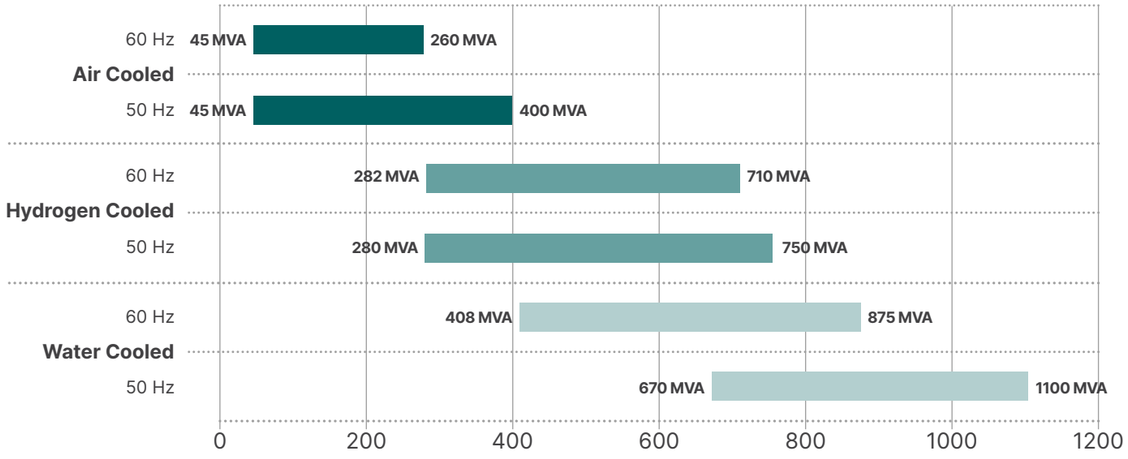
GE Vernova is bringing generator technology and performance to the next level. We engineer and build our generators to help meet the demanding specifications that keep our customers on the leading edge of efficient, reliable electricity generation. Our equipment benefits from time-proven technology; it installs quickly, integrates easily, operates reliably and helps deliver more power. With an installed base of +12200 turbine generators, GE Vernova has accumulated more than a century of experience helping to deliver innovative high voltage solutions in generation, transmission, and distribution networks. GE Vernova understands the world's challenges and is committed to provide solutions to help solve the global energy transition.

Our generators offer a complete range of configurations from small industrial applications to large power plants. GE Vernova generators are engineered for ease of installation, low maintenance, and incorporate extensive fleet experience to help support low cost, reliable operation.

GE Vernova's generators can be configured for multi-shaft or single-shaft operation with project-specific variables like gas and steam turbine, desired power output, regional fuel cost, and local environmental conditions ultimately driving product selection. GE Vernova generators share common characteristics that are proven, dependable, capable, versatile and cost effective.

GE Vernova's generator product line is divided into three categories based on cooling method:

- **Air-cooled** generators are ideal for systems that demand simple, flexible operation. Prepackaged generator solutions arrive ready-to-install at site reducing project cycle time with increased reliability.
- **Hydrogen-cooled** generators feature low gas density, high specific heat, and high thermal conductivity, making them ideal for high efficiency applications. GE Vernova has developed technologies that increase the power output capability of the hydrogen cooled machine, as a cost effective alternative to historical applications that required direct water-cooled stator windings.
- **Water-cooled** generators operate efficiently and reliably within a small footprint when high output requirements exceed the cooling capabilities of air-cooled or conventional hydrogen-cooled generators.



GE Vernova Technologies Are:

Proven

GE Vernova generators utilize the best of many OEM technologies we have acquired over time. Building upon a rich heritage, GE Vernova helps deliver a reliable, available, and efficient generator that helps meet our customers' needs. Derived from fleet experience, GE Vernova has invested in a state-of-the-art full scale rapid comprehensive validation test stand to help ensure all new prototypes meet the highest reliability and availability expectations. This capability accelerates testing to simulate extended operation, cyclic loading, and multiple machine start-stops for verification and characterization. Every new product is subjected to this testing to help ensure operability and performance prior to commercial production.

Dependable

Utilizing vast fleet experience (a fleet installation of more than 12200 units), GE Vernova generators incorporate engineering features that improve durability of the generator operating under cyclic duty operations (starts/stops/MVA cycling). GE Vernova generators consistently perform above the industry average for reliability and availability.

- End-winding technologies such as the Tetraloc*, re-tightenable, and sliding axial systems, accommodate for cyclic thermal expansion and maintain mechanical integrity to drive lifelong reliability
- Advanced rotor cooling technologies that reduce thermal gradients between coils, reducing mechanical insulation wear features in rotors to improve robustness
- Advanced core suspension system technology, reducing stator core vibration, reducing noise and extending life
- Collector system remote monitoring to help maintain long term health of the equipment and lessen exposure of operators, reducing risk and improving safety.

Capable

Air-, hydrogen- and water-cooled generators cover a broad range of generator output ratings from small industrial applications to large combined cycle power plants. GE Vernova generators strive for the highest power density in the world which leads to cost effective, high efficiency, grid friendly solutions.

- Advanced Class F insulation enables higher power density with advanced voltage stress and thermal conductivity capabilities for greater armature performance
- Capable of frequency and voltage variation to support grid stability needs

Versatile

Flexible line lead configurations are complementary with multiple exhaust configurations driving lower plant centerline, small turbine buildings and efficient use of plant maintenance equipment, resulting in millions in overall plant cost savings.

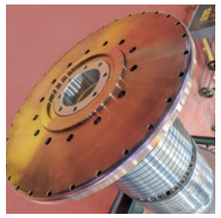
Cost Effective

Compact and flexible configurations reduce total installed cost and footprint. High power density (small footprint, high output, lighter weight), longer maintenance intervals, and other features are engineered to reduce operations and maintenance cost, enable more profitable power generation to the industry.

- Rotor removal not required for planned maintenance
- Engineered for borescopic and robotic rotor-in inspections enabling lower maintenance cost
- Broad range of product offerings ship rotor installed to reduce transportation costs, reduce installation cycle, and ultimately reduce total installed cost of the generator
- Advanced long fin aero fan blades contribute to lower windage losses and reduced O&M costs
- Continuous online health monitoring systems to empower customers to manage scheduled maintenance, increase availability and reduce overall plant O&M costs

Worldwide Generator Facilities

Manufacturing and Repair/Service Locations (regional headquarters highlighted)




“

OUR GENERATORS OPERATE AT AN AVAILABILITY RATE THAT’S 0.38% ABOVE THE INDUSTRY AVERAGE.

”

CONTROLS AND DIGITAL

CONTROL SOLUTIONS AND SERVICES

A radically changing energy landscape is bringing a unique set of challenges and opportunities for power generators. The growth of renewables means changing operating models, as well as priorities, with an increased focus on generation agility and profitability pressures. How this shift towards more renewables impacts plants can depend on decisions in the control of utilities and independent power producers (IPP). A new normal for operations has emerged, one with more centralized operations centers and more remote workers, along with a rise in automation that demands a different skillset. Additionally, an evolving workforce means reshaping an approach to safety, priority, and productivity—and rethinking resourcing along the way. Indeed, optimal developments make it possible to improve revenue in this dynamic environment. So, how can you survive and thrive in this new environment? We have answers!

A Complete Solutions Portfolio From GE Vernova

We understand the need to take a holistic and integrated approach to power generation success—covering assets, operations and people—and that's why our digital and control solutions are created to help you:

- Secure and operate critical equipment with confidence
- Enhance equipment reliability and O&M efficiency
- Increase operations flexibility and profitability
- Boost worker effectiveness and safety
- Reduce obsolescence risk with extended controls lifecycle

These solutions embody deep GE Vernova experience and extensive expertise culminating into a unique inter-operable solution stack for power plants. Building on a solid foundation of technology, Digital Twins and other advanced analytics from edge to cloud, GE Vernova offers a range of integrated solutions that are robust, flexible, and effective. We help deliver solutions from the smallest sensors to mission-critical operator control systems, to a full suite of industrial software applications for your entire fleet.

Our Integrated Control Solutions

Enhance your uptime and improve your output with our tightly integrated plant control solutions that aim to deliver robust process control with seamless connectivity and real-time information management. And our industrial application software helps you monitor and enhance assets, operations, and people to address marketplace dynamics and challenges associated with the energy transition.

Engineered for Extended Lifecycle

Historically, the lifecycle of turbine-generator controls has been approximately ten years, followed by parts and service support and eventual replacement upgrades, resulting in bigger capital expenses to our customers. GE Vernova's cost effective solution to this paradigm was the creation of the Mark* VIe. The goal was to offer a platform that provided customers a long-lasting control system over the life of their assets and plant while managing the rapidly changing and evolving world of electronics technology.

Mark* VIe Component-Based Architecture

The engineered philosophy of the Mark* VIe control system is extended life through a modular structure. This allows for incremental technology upgrades, obsolescence protection, and comprehensive system refresh and upgrades, without replacing the entire control system. It includes an Ethernet backbone and discrete modular building blocks, such as controllers, network components, and I/O modules with extensive software tools.

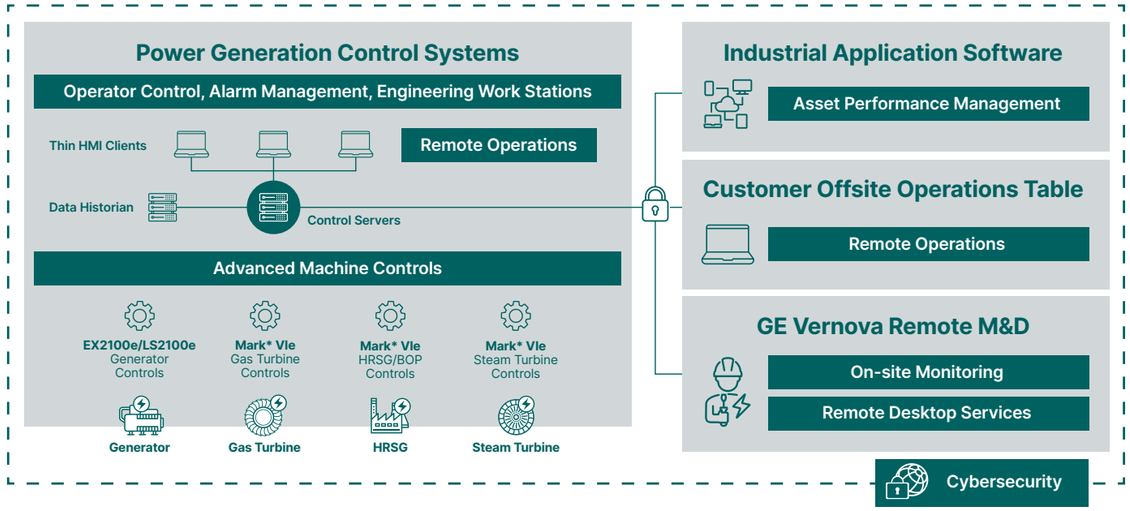
Mark* VIe Turbine Controls (Gas and Steam)

Downtime is one of the greatest detriments to power plant productivity and profitability. That's why it is imperative to have a system in place that provides high levels of system reliability and availability—all day, every day. To help meet the needs of today's connected industries, GE Vernova has combined our digital technology with our rich history of process control to provide the Mark* VIe series of control systems.

OpFlex*

What if you could immediately improve the value of your plant's newly installed units, or boost the performance of your existing hardware without performing a major outage?

The OpFlex suite of software takes advantage of state-of-the-art controls technology with advanced software algorithms to enhance operability, performance, insight, and control of new or existing assets so you can respond quickly and confidently to new opportunities and changing demand. With solutions targeting start-up agility, combustion versatility, load flexibility and system reliability, OpFlex can help deliver whatever solution is needed to help keep your plant competitive in an ever-changing marketplace.



Generator Excitation and Static Starter Controls

GE Vernova's Excitation and Starter control systems enable customers to prepare for the energy transition with improved responsiveness and sensitivity to grid disturbances. Our advanced high-speed detection and control algorithms (EED) provide (EED) enabling generation assets with faster response to changing grid needs such as frequency swings or voltage dips. We offer a full range of solutions for generator excitation systems covering most generator sizes and types. From small automatic voltage regulator systems to large static exciters, our excitation solutions build upon more than 50 years of industry experience and an installed base of over 10,000 units in 70 countries across gas, steam, and hydro applications. We also offer static starters that can be used as the starting means for gas turbines. One starter can start multiple units or you can cross connect two starters to start your unit of choice.

Mark* VIe Safety Controls

A convergence of increasing connectivity and improved safety, and the associated risks to infrastructure and processes, is occurring just as a generation of skilled workers is retiring. This combination of factors has resulted in more stringent safety regulations and system certification requirements as well as greater scrutiny of program and operator integrity. Our Mark* VIeS Functional Safety System can help meet your need for a high-performance automation solution that also helps ensure the safety and integrity of your process and equipment.

Distributed Control Systems

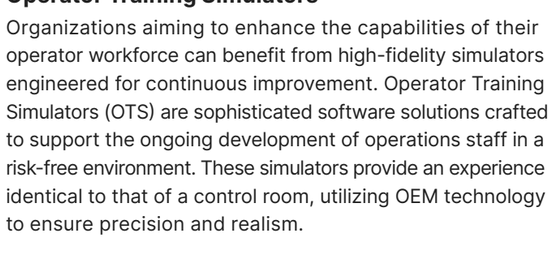
Helping to provide advanced performance, interoperability, and availability for today's connected plant, GE Vernova's distributed control system solutions are easily adapted to your constantly evolving requirements and integrate seamlessly to the gas, steam, and generator controllers for a total plant solution. With integrated plant and unit controllers, performance and operability can be enhanced without operational complexity. In addition, this common data fabric provides a single source of truth, open communication protocols and common date/time stamping across the whole plant from turbine to generator to HRSG to BOP systems, making troubleshooting a breeze. O&M teams will benefit from common operator screens, historical data, and alarms all from one system.

The Mark* VIe Distributed Control Solution offers:

- A proven solution
- Flexible and highly scalable architecture
- Rapid equipment return to service time with best-in-class diagnostic tools
- Enhanced productivity and efficiency
- Seamless integration with primary control systems
- Comprehensive engineering and integration
- Robust maintenance and services offering

Source	DCS Type	GT tech	Data Range	Number of Units	Train Availability Delta	Train Reliability Delta
ORAP	Mark* VIe	F-Class Gas Turbine	2010-2021	125	+3.9%	+0.9%
ORAP	Non-GE Vernova	F-Class Gas Turbine	2010-2021	438	Baseline	Baseline

Operational Reliability Analysis Program (ORAP)



ORAP = Operational Reliability Analysis Program (by Strategic Power Systems, Inc)

- Mark* VIe DCS enables GE Vernova to apply its expertise and "know how" from years of developing, installing, integrating, and operating gas turbine power plants.
- Mark* VIe DCS includes GE Vernova engineering as part of a single plant level integrated system that improves your plant's operability and availability.
- Mark* VIe DCS combined cycle plants experience up to +3.9% availability and +0.9% reliability vs. other DCS steam cycle plants[1]

+3.9% Incremental Availability

+14 DAYS of Generation Per Year

+$5.2M[2] Annual Value

System Availability and MTBFO for the Typical Mark* VIe Plant Control System[3]

Model Description	Results
Typical Mark* VIe DCS Availability	99.9997%
Typical Mark* VIe DCS MTBFO (Mean-Time Between Forced Outage)	1,203,293 hrs

[1] This data has been taken directly from ORAP. All rights reserved by SPS. Information may be protected by other intellectual property rights owned by SPS.

[2] Assuming 1000 MW plant x 15 $/MWh spark spread.

[3] As per typical offering, where total critical I/O configured as dual or triple redundant, with dual controller & I/O network.

HMI Solutions

Your plant is a huge investment that requires routine maintenance and upgrades to keep it running efficiently, safely, and profitably. If you're running an older HMI operating platform, your business is at risk of cyberattacks and the associated lost revenue. As the OEM for your existing HMI, GE Vernova knows your equipment. Our latest advanced HMI solution will provide advanced features such as alarm rationalization and action-oriented visualization to help operate your plant securely for many years to come.

Operator Training Simulators

Organizations aiming to enhance the capabilities of their operator workforce can benefit from high-fidelity simulators engineered for continuous improvement. Operator Training Simulators (OTS) are sophisticated software solutions crafted to support the ongoing development of operations staff in a risk-free environment. These simulators provide an experience identical to that of a control room, utilizing OEM technology to ensure precision and realism.

With these simulators, organizations gain access to an invaluable training tool that replicates the operation of actual equipment. This allows operators to engage in hands-on practice, acquiring critical experience without the risks associated with real-world operations. The "virtual power plant" experience offered by these simulators is developed to enhance skills and boost readiness, ensuring operators are thoroughly prepared for real-world scenarios with confidence and expertise.

By integrating high-fidelity simulators into their training programs, organizations can expect significant improvements in operational efficiency and increased preparedness among their teams. These simulators support training goals and assist in maintaining a proficient and capable workforce. Organizations can rely on this advanced technology to advance their training strategies, achieve their objectives, and maintain a competitive edge.

Collaborating with a company offering such training solutions can contribute to the success of an organization's training initiatives, ensuring the development of a skilled and capable operator workforce.

OTArmor Benefits

Reduce cost and staff inefficiencies
GE Vernova's cybersecurity platform packages and pre-integrates dozens of security technologies—so your teams don't have to. The solution eliminates all the efforts that would be required to procure, integrate, deploy, and maintain these solutions individually. The solution centralizes the management of patches, anti-malware, backup and recovery, and user identities. Further, the solution helps deliver automation and advanced technology that streamlines ongoing management and maintenance.

Mitigate risk
With GE Vernova's cybersecurity platform, you can gain actionable insights into your operational technology (OT) environment and security posture. You can quickly establish comprehensive security mechanisms that mitigate the risk of cyber attacks and failed compliance audits. The solution can help your team address a broad range of cyber security regulations, standards, and guidelines, including NEI 08-09, NERC CIP, and IEC-62443 (ISA 99).

Improve availability
GE Vernova's cybersecurity platform helps your team ensure that the security controls implemented are aligned with your operational goals. The solution supports the implementation of maintenance and governance processes that help protect your most critical assets.

Remote Operations

Remote Operations software provides remote and mobile workers with secure and compliant access to plant control systems. Whether for monitoring, troubleshooting or full remote control, Remote Operations helps you ensure operating continuity, enable worker location flexibility and benefit from the economies of centralized operations across the plant or entire fleet.

OTARMOR: GE Vernova's Cybersecurity Solution

GE Vernova's end-to-end cybersecurity portfolio offers unparalleled protection for your Operational Technology (OT) needs, helping to ensure the highest standards of cybersecurity in critical infrastructure and industrial environments, while assisting your organization in meeting regulatory compliance standards. GE Vernova's cybersecurity solution called OTArmor* helps deliver comprehensive security capabilities in a single, pre-integrated platform, enabling your organization to establish robust, defense-in-depth controls in plant environments. Our cybersecurity solutions and services are engineered to safeguard critical assets, reduce downtime, mitigate risk, and enhance operational resilience through cutting-edge threat detection, real-time network monitoring, asset visibility and rapid incident response.

Trust in GE Vernova's expertise to protect what matters most, empowering your business with secure, sustainable, and efficient operations.

The solution provides security controls and OT maintenance tools for GE Vernova's Mark* VI and Mark* VIe networks. With our solution, you can utilize a full suite of security capabilities—without all the time, cost, and effort of procuring, testing, integrating, and deploying these disparate solutions independently.

GE Vernova's cybersecurity platform collects, correlates, and forwards security logs and events, and it presents this information to plant personnel in a highly usable format. The solution offers identity and password management capabilities for control-system environments. In addition, the solution can be customized so it aligns with your existing environment, including your Security Information and Event Management (SIEM) platform, backup mechanisms, anti-virus technologies, log management platforms, and more.

Key Capabilities

Asset Visibility: This capability identifies all network assets and maps the flow of data traffic between them, analyzes network traffic and conducts deep packet inspection (PCAP data), and establishes a baseline which is then used to detect anomalies.

Malware Protection: GE Vernova's cybersecurity platform features antivirus capabilities that detect and disrupt malicious code discovered on the network. The solution also offers application control capabilities that help ensure only authorized software runs in the environment.

Patch Validation Program: This optional program offers comprehensive patch management services, covering all the GE Vernova assets in the environment that are managed by GE Vernova's cybersecurity platform. This program offers testing and validation of anti-virus and host intrusion detection signature updates as well as operating system patches. Through this program we help deliver patches via a convenient, secure web portal. These patches are provided in complete, scripted packages that are easy to deploy. Featuring cumulative updates, these packages also help you ensure you're current with the latest releases. Plus, using GE Vernova's cybersecurity platform appliance, you can establish automated, centrally managed deployment of patches.

System Hardening: GE Vernova's cybersecurity platform employs a number of hardware and software configurations that make assets more difficult to attack. GE Vernova's cybersecurity platform features a hardened appliance with secure-by-design configurations. Based on the server, the solution includes mounting hardware, security bezel, and blockers for unused USB and network ports.

Network Intrusion Detection and Prevention Systems: This customizable network security option provides the ability to monitor and block malicious activity and attacks, and provides continuous visibility of unusual activity and potential threats to the control system network.

Controls Lifecare Services

Downtime is one of the greatest detriments to power plant productivity and profitability. To help ensure equipment performance when called upon, GE Vernova offers value added services to de-risk your operating environment, improve availability, and reduce the downtime that can result from hardware issues, outdated software, and lack of cybersecurity measures.

While every facet of your plant is crucial and must work seamlessly, one area that is particularly vital is your entire control system i.e., turbomachinery control and DCS. If something goes wrong with your control system, the effect can compound quickly – along with the costs. Coupled with the need to balance risk while improving production and availability, today's landscape can be challenging.

To address these challenges, you need strategies for extended life, business continuity, and cybersecurity compliance. Controls Lifecare Services (CLS) from GE Vernova elevates asset productivity with bundled services configured to keep your control system healthy, secure, and updated throughout its entire life cycle.

With CLS, GE Vernova proactively maintains your control systems and provides responsive expertise to help meet your immediate technical support needs. And, we make sure the parts you need are available when you need them. Our versatile and scalable services can be provided as long term agreements, Controls Lifecare Services program, based on your plant specific requirements, operational objectives, and resources capabilities. And we can help you select the best solutions from our CLS portfolio so that you can achieve your business goals.

Offered in a Multi-Year Agreement format, the key benefits are:

- Lower O&M spend & reduced plant downtime
- Predictable maintenance spend
- Around the clock technical support and proactive service for lifecycle needs with expertise, quality, and timeliness
- Dedicated contract managers for constant support across the system's life-cycle
- Offered in 1-, 3- and 5-Year Plans

Features

- **ControlsConnect**
  Phone and email support services
- **Control Maintenance**
  Periodic site visits by a Controls TA
- **PartSmart**
  Inventory strategy for reserve spares
- **Training**
  Flexible training solutions, onsite or our facilities
- **Remote Diagnostic Services**
  Remote access support
- **Cyber Security**
  Cyber protection with software (S/W) patching
- **Lifecycle Review**
  Parts, S/W, and TILs analysis
- **Parts Services**
  New, exchange, repair, test and certify
- **Resident Engineer**
  Customized to supplement your support staff
- **Single Point of Contact**
  Customer success manager

DIGITAL SOLUTIONS

Improve operations to be more adaptable and responsive, optimizing operations flexibility and profitability. Covering assets, operations and people, we engineer software to help ensure your equipment runs smoothly and efficiently, improving asset reliability. Our ultimate goal is to be your trusted service provider in achieving reliable, efficient, and profitable operations.

Whether you prefer cloud-based or on-premises solutions, GE Vernova offers options to address your organization's most critical business needs. We provide both point solutions and comprehensive end-to-end enterprise software solutions.

Asset Performance Management

Improve equipment reliability and O&M efficiency across the plant and and fleet with Asset Performance Management (APM). Featuring built-in GE Vernova industry expertise, advanced analytics and work process automation, APM is the backbone to achieving operational excellence.

GE Vernova's APM solution includes the following applications to help meet your evolving needs:

APM Strategy: Comprehensive Asset Strategy

For asset-intensive businesses, do your current asset management strategies need help with optimization and alignment to achieve the highest profitability at the lowest risk and cost? Classify asset risk, assign values, and actively manage strategies in an easy-to-use digital interface. Assess if your O&M strategy and enhance it for the future with a sustainable, closed-loop continuous improvement cycle.

APM Health: Condition-Based Monitoring

Gain a unified view from anywhere, remote or on-site, of your critical assets' with APM Health. By reducing data disparity and latency associated with industrial asset management, APM Health provides early warning of potential failures and highlights elevated risk areas.

Rounds Pro

A mobile application that provides route creation, assignment, and measurement for operators. Collects image, temperature, vibration, and other critical equipment data that integrates into APM. This data helps create indicators in order to prioritize work and easily integrates with the rest of GE Vernova's APM solutions for greater control and timely critical decision making.

APM Reliability: Failure Prevention

APM Reliability provides visibility and analysis of asset performance, trends, and predictive alerts. With built-in workflows for root-cause analysis, reliability management, and collaboration, APM Reliability allows customers to investigate and remediate emerging issues while driving long-term performance improvements.

APM Performance Intelligence: Heat Rate Management

APM Performance Intelligence is engineered to reduce heat rate. Near real-time thermal advisory solution, it operationalizes heat rate with advanced physics-based digital twins, combined with actionable recommendations. Features include strategic business decision support with What-If and Economic Advisory features and Carbon Analytics.

APM Integrity: Helping Facilities Stay Contained and Compliant

Enhance your overall Mechanical Integrity (MI) program by calculating risk and remaining useful life of fixed assets with APM Integrity. The solution offering includes an integrated set of tools and work-processes to profile asset degradation mechanisms and containment threats and further generate enhanced inspection strategies targeted at mitigating these risks.

APM SmartSignal: AI/ML Predictive Analytics

Enhance availability by transitioning from reactive to proactive maintenance with a mature, proven solution that helps power generators avoid unplanned downtime. Accelerate time-to-value across your investment with AI/ML driven digital twins building upon GE Vernova's expertise. Our APM solution provides over 340+ Digital Twin Blueprints that provide out-of-the-box analytics to your assets that matter the most. SmartSignal is OEM agnostic to provide you with scalability and flexibility to cover all your critical assets.

Autonomous Tuning: Closed-loop Optimization to Reduce Emissions

Manual gas turbine tuning is costly and only temporarily improves emission and fuel efficiency. To keep up with variable weather and rising fuel costs, utilize equipment models and AI/ML to continuously find optimal flame temperatures and fuel splits for gas turbines. Achieve up to 1% reduction in fuel consumption and CO_2 emissions, up to 14% reduction in CO and up to 14% reduction in NOx emissions.

Generation Optimization and Planning

A short-term marketplace optimization and planning software to help improve use of assets.

Performance Predictions

AI/ML capacity predictions for thermal plants and energy predictions for renewables. Gain visibility into near term generation potential across your fleet.

- **Gas Fuel Nominations:** automate fuel demand projections to reduce cost
- **Out Scheduling Advice:** recommendations to manage risk to outage timing

Capacity Dispatch Optimizer and Capacity Trader

Improve GE Vernova F-Class gas turbine energy production during peak demand for increased plant dispatch by operating at Cold Part Load and "banking" hours that can be used for peak fire application. All without incurring costly maintenance adders or adversely impacting the maintenance interval.

CERius: Emission management Software

Carbon Emissions Management is a cloud-based system of record to automate accurate greenhouse gas emissions (GHG) data collection, provide insights, and identify actions to operationalize carbon reduction.

- Improve accuracy of scope emissions measurement to improve decarbonization planning and support regulatory compliance
- Gain a single view of emissions operation-wide to build effective net-zero strategies
- Automate tracking to compare emissions data and progress on abatement goals

TECHNICAL TRAINING

GE Vernova's customer training solutions are constructed to develop your team's expertise, provided through a variety of flexible methods throughout your plant's lifecycle.

Our pool of more than 50 GE Vernova expert instructors shares insights based on a thorough knowledge of OEM configuration, installation, operation, and maintenance, using the latest highly effective training tools and techniques:

Site-Specific Courses

Our portfolio of over 200 high value Site-Specific courses is built using site-specific manuals, configurations, drawings, and software (as available) to help meet your specific needs, and to develop your team's expertise. They are provided either at your site or at one of our Gas Power global learning centers in the language of your choice, and on a schedule that works for you. Courses may contain a mix of classroom learning, site walkdowns, and hands-on training.

Operation & Maintenance On-the-Job Training (OJT)

To supplement our Site-Specific Courses, O&M staff can apply, practice, and deepen what they have learned in the classroom through on-the-job practice of the target skills. A GE Vernova expert will shadow the participants through key tasks, providing instruction, coaching and guidance at the point of work.

OJT offerings are currently available as supplemental to our New Equipment Site Specific Course packages.

Open Enrollment Courses

Provided via Distance Learning or in one of our Global Gas Power Leaning Centers.

With technology-specific content, our Open Enrollment training offers a comprehensive selection of more than 75 English language courses for small staff or new team member training, or to expand the skills of select employees. Courses offer a mix of learning techniques and may contain walkdowns and/or hands-on training.

Online Courses

A cost-effective solution for a broad range of employees, our 25-plus self paced Online English language courses let you train your personnel anytime, anywhere, and at their own pace. Each course ranges in duration from one to several hours and can be started and stopped at the student's discretion.

Training Simulators

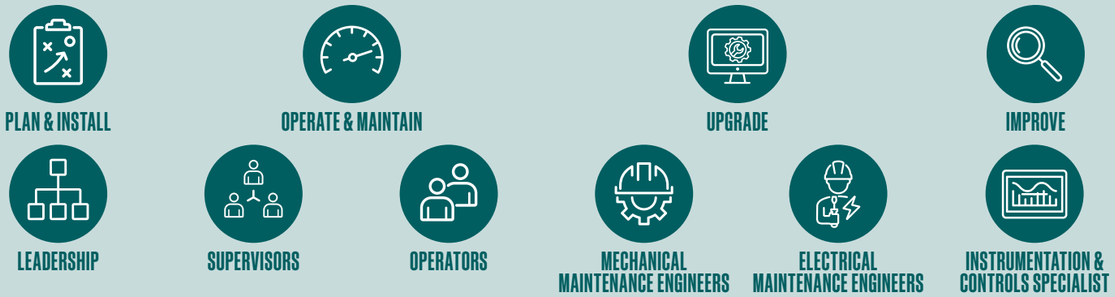
GE Vernova offers a variety of training simulator solutions to help meet your needs—whether you require an onsite simulator tailored to your equipment or remote access to a technology-specific simulator. These simulators are effective, convenient, and comprehensive, while posing no operational risk to GE Vernova's OEM equipment.

Multi-Year Training Agreements

Our long-term flexible training agreement is our highest value offering, which allows you to simplify your budgeting and planning efforts. This agreement entitles you to a fixed number of annual training days for GE Vernova's Site-Specific and/or Open Enrollment courses, unlimited use of all our available Online courses, plus exclusive access to our Technology-Specific Simulator. We work with you throughout your plant's lifecycle to help you select the training solutions that best meet your evolving needs.

www.gevernovatechtraining.com

Comprehensive Flexible Training Solutions to Help Meet Your Total Plant Needs



Controls | Gas Turbines | Steam Turbines | Generators | HRSG

APPENDIX

HEAVY DUTY GAS TURBINES

		60 Hz						50 Hz						50/60 Hz (Geared)	
		7HA.03	7HA.02	7HA.01	7F.05	7F.04	7E.03	9HA.02	9HA.01	9F.04	GT13E2-210	9E.04	9E.03	6B.03	6F.03
SC PLANT PERFORMANCE	SC Net Output (MW)	430	384	290	239	201	90	571	448	294	210	147	132	45	88
	SC Net Heat Rate (Btu/kWh, LHV)	7884	8009	8120	8871	8873	10107	7740	7960	8811	8980	9238	9960	10216	9277
	SC Net Heat Rate (kJ/kWh, LHV)	8318	8450	8567	9359	9362	10664	8166	8398	9297	9474	9747	10508	10779	9788
	SC Net Efficiency (%, LHV)	43.3%	42.6%	42.0%	38.5%	38.5%	33.8%	44.0%	42.9%	38.7%	38.0%	36.9%	34.3%	33.4%	36.8%
GAS TURBINE PARAMETERS	Compression Pressure Ratio (X:1)	23.7	23.1	21.6	18.8	17.0	12.7	23.8	22.8	17.4	18.2	13.2	13.1	12.8	16.4
	Exhaust Temperature (°F)	1217	1202	1158	1205	1158	1018	1184	1199	1153	959	1016	1022	1041	1151
	Exhaust Temperature (°C)	658	650	626	652	626	588	640	648	623	515	547	550	561	622
	Exhaust Mass Flow (lb/s)	1718.0	1609.4	1293.7	1163.9	1028.6	644.0	2292.5	1869.0	1496.0	1370.4	925.1	929.3	319.9	482.4
	Exhaust Mass Flow (kg/s)	779.3	730.0	586.8	527.9	466.6	292.1	1039.9	847.8	678.8	621.6	419.6	421.5	145.1	218.8
	GT Turndown Minimum Load (%)	20%	30%	25%	43%	49%	35%	25%	25%	35%	30%	35%	35%	30%	35%
	GT Ramp Rate (MW/min)[1]	75	60	55	40	30	40	88	65	23	14/36	29	50	20	22
	NOx (ppmvd) at Baseload (@15%O_2)	25	25	25	12	9	4	25	25	15	15	15	25	4	15
	CO (ppm) at Min Turndown w/o Abatement	9	9	9	9	9	25	9	9	24	25	25	5	25	9
	Startup Time, Conventional/Peaking (Min)[2]	21	21/10	21/10	21/11	21/11	23/10	23/	23/	23/20	25/15	30/10	30/10	12/10	13/10
1X CC PLANT PERFORMANCE	CC Net Output (MW)	640	573	438	379	309	140	838	680	452	305	218	205	70	135
	CC Net Heatrate (Btu/kWh, LHV)	5342	5381	5481	5667	5716	6514	5320	5356	5680	6189	6203	6421	6578	5998
	CC Net Heatrate (kJ/kWh, LHV)	5636	5677	5783	5,979	6031	6873	5613	5651	5993	6530	6545	6775	6940	6328
	CC Net Efficiency (%)	63.9%	63.4%	62.3%	60.2%	59.7%	52.4%	64.1%	63.7%	60.1%	55.1%	55.0%	53.1%	51.9%	56.9%
	Plant Turndown Minimum Load (%)	26%	37%	33%	46%	58%	45%	33%	33%	48%	40%	46%	45%	41%	44%
	Ramp Rate (MW/min)[1]	75	60	55	40	30	40	88	65	22	14	29	50	20	7
	Startup Time (RR Hot, Minutes)[3]	<30	<30	<30	25	28	35	<30	<30	30	30	38	38	30	45
	Bottoming Cycle Type	3PRH	3PRH	3PRH	3PRH	3PRH	2PNRH	3PRH	3PRH	3PRH	2PNRH	2PNRH	2PNRH	2PNRH	3PRH
	ST Configuration (Type)	STF-D650	STF-D650	STF-D650	STF-D650	STF-D650	STF-A200	STF-D650	STF-D650	STF-D650	STF-A200	STF-A200	STF-A200	STF-A100	STF-A200
2X CC PLANT PERFORMANCE	CC Net Output (MW)	1282	1148	880	762	622	283	1680	1363	908	613	439	412	141	272
	CC Net Heat Rate (Btu/kWh, LHV)	5331	5365	5453	5640	5675	6454	5306	5345	5660	6153	6166	6372	6515	5944
	CC Net Heat Rate (kJ/kWh, LHV)	5625	5660	5753	5951	5987	6809	5598	5639	5972	6492	6505	6723	6874	6271
	CC Net Efficiency (%, LHV)	>64.0%	63.6%	62.6%	60.5%	60.1%	52.9%	64.3%	63.8%	60.3%	55.5%	55.3%	53.5%	52.4%	57.4%
	Plant Turndown – Minimum Load (%)	15%	18%	15%	22%	27%	22%	15%	15%	22%	19%	22%	22%	20%	21%
	Ramp Rate (MW/min)[1]	150	120	110	80	60	80	176	130	44	36	58	100	40	13
	Startup Time (RR Hot, Minutes)[3]	<30	<30	<30	25	28	35	<30	<30	39	30	38	38	30	35
	Bottoming Cycle Type	3PRH	3PRH	3PRH	3PRH	3PRH	2PNRH	3PRH	3PRH	3PRH	2PNRH	2PNRH	2PNRH	2PNRH	3PNRH
	ST Configuration (Type)	STF-D650	STF-D600	STF-D600	STF-D650	STF-D650	STF-D200	STF-D650	STF-D650	STF-D650	STF-D200	STF-D200	STF-D200	STF-A200	STF-A200

[1] Ramp rates are Fast Ramp via AGC.

[2] Start times recognize purge credit. Turning gear to full speed, full load and synchronized to grid. Peaking maintenance factors may apply depending on the operating profile.

[3] Start times are based on rapid response technologies in hot start conditions with purge credit recognized. Simultaneous start sequence of gas turbine may apply depending on exact project configurations.

NOTE: All ratings are net plant, based on ISO conditions and natural gas fuel. Actual performance will vary with project-specific conditions and fuel.
All performance figures based on once through condenser with 1.2" Hga condenser pressure. 2PNRH = Two pressure, non-reheat; 3PRH = Three pressure, reheat.

AERODERIVATIVE GAS TURBINES†

		TM 2500 SAC		TM 2500 DLE	
	Frequency	50 Hz	60 Hz	50 Hz	60 Hz
SC PLANT PERFORMANCE	SC Net Output (MW)	34.6	36.9	34.5	34.4
	SC Net Heat Rate (Btu/kWh, LHV)	9814	9377	8648	8557
	SC Net Heat Rate (kJ/kWh, LHV)	10354	9893	9124	9028
	SC Net Efficiency (%, LHV)	34.8%	36.4%	39.5%	39.9%
GAS TURBINE PARAMETERS	Compression Pressure Ratio (X:1)	26.2	26.3	26.2	26.3
	Exhaust Temperature (°F)	978	962	978	962
	Exhaust Temperature (°C)	526	517	526	517
	Exhaust Mass Flow (lb/s)	214.8		214.8	
	Exhaust Mass Flow (kg/s)	97.4		97.4	
	GT Turndown Minimum Load (%)	35%		35%	
	NOx (ppmvd) at Baseload (@15%O_2)	25		25	
	CO (ppm) (@15%O2)[1]	54	56	54	56
	Startup Time, Conventional/Peaking (Min)	30		30	
1X CC PLANT PERFORMANCE	CC Net Output (MW)	49.5	51.5	47.9	47.5
	CC Net Heat Rate (Btu/kWh, LHV)	6833	6701	6209	6175
	CC Net Heat Rate (kJ/kWh, LHV)	7209	7070	6551	6515
	CC Net Efficiency (%)	49.9%	50.9%	55.0%	55.3%
	Plant Turndown – Minimum Load (%)	35%		35%	
	Ramp Rate (MW/min)	30		30	
	Startup Time (RR Hot, Minutes)	30		30	
	Bottoming Cycle Type	2PNRH		2PNRH	
	ST Configuration (Type)	Condensing		Condensing	
2X CC PLANT PERFORMANCE	CC Net Output (MW)	99.9	103.9	96.5	95.8
	CC Net Heat Rate (Btu/kWh, LHV)	6776	6640	6160	6124
	CC Net Heat Rate (kJ/kWh, LHV)	7149	7006	6499	6461
	CC Net Efficiency (%, LHV)	50.4%	51.4%	55.4%	55.7%
	Plant Turndown – Minimum Load (%)	35%		35%	
	Ramp Rate (MW/min)	60		60	
	Startup Time (RR Hot, Minutes)	30		30	
	Bottoming Cycle Type	2PNRH		2PNRH	
	ST Configuration (Type)	Condensing		Condensing	

[1] At baseload/minimum turndown without abatement

NOTE: Net Plant ratings are based on ISO conditions, natural gas, inlet and exhaust losses included and balance of plant equipment excluded. Actual performance will vary with project specific conditions, fuel and ambient conditions. 2PNRH = Two pressure, non-reheat.

† Aeroderivative simple and combined performance numbers for 2024 have been updated to reflect best available information for each engine model and its operating auxiliary loads, and sourced equipment/sub-system performance, consistent with the requirements and needs of most customers.

LM2500XPRESS+G4 DLE UPT	LM2500XPRESS+G5 DLE UPT (25ppm NOx)	LM2500XPRESS+G5 DLE UPT (15ppm NOx)	LM6000 PC SAC	LM6000 PC SAC SPRINT	LM6000 PF DLE
50 Hz/60 Hz	50 Hz/60 Hz	50 Hz/60 Hz	50/60 Hz	50/60 Hz	50/60 Hz
34.5/34.4††	36.3/36.8††	33.9/34.5††	46.5	51.1	55.8
8669/8563††	8751/8646††	8774/8693††	8598	8585	8680
9146/9034††	9233/9122††	9257/9172††	9068	9068	9217
39.4%/39.8%††	39.0%/39.5%††	38.9%/39.2%††	39.7%	39.7%	39.3%
25.5	25.6/25.8††	25.6/25.8††	32.7	34.9	35.2
1023/994††	1026/1018††	1026/1018††	846	892	895
550/534††	552/548††	552/548††	452	478	480
206.7/203.2††	206.1/207.6††	206.1/207.6††	299.8	317.7	319.4
93.7/92.2††	93.5/94.2††	93.5/94.2††	136.0	144.1	144.9
35%	35%	35%	37%	37%	37%
25	25	25	25	25	25
25	25	25	89	59	59
30	30	30	30	30	30
47.9/47.4††	51.4/51.7††	47.7/48.2††	60.7	66.5	73.9
6221/6184††	6156/6129††	6223/6201††	6586	6596	6559
6564/6525††	6495/6466††	6566/6542††	6949	6960	6920
54.8%/55.2%††	55.4%/55.7%††	54.8%/55.0%††	51.7%	51.7%	52.0%
35%	35%	35%	37%	37%	37%
30	30	30	30	30	30
30	30	30	30	30	30
2PNRH	2PNRH	2PNRH	2PNRH	2PNRH	2PNRH
Condensing	Condensing	Condensing	Condensing	Condensing	Condensing
96.6/95.6††	103.6/104.3††	96.2/97.2††	122.2	133.8	148.8
6173/6136††	6107/6075††	6174/6149††	6548	6560	6513
6513/6474††	6443/6410††	6514/6488††	6909	6921	6872
55.3%/55.6%††	55.9%/56.2%††	55.3%/55.5%††	52.1%	52.0%	52.4%
35%	35%	35%	18%	18%	18%
60	60	60	60	60	60
30	30	30	30	30	30
2PNRH	2PNRH	2PNRH	2PNRH	2PNRH	2PNRH
Condensing	Condensing	Condensing	Condensing	Condensing	Condensing

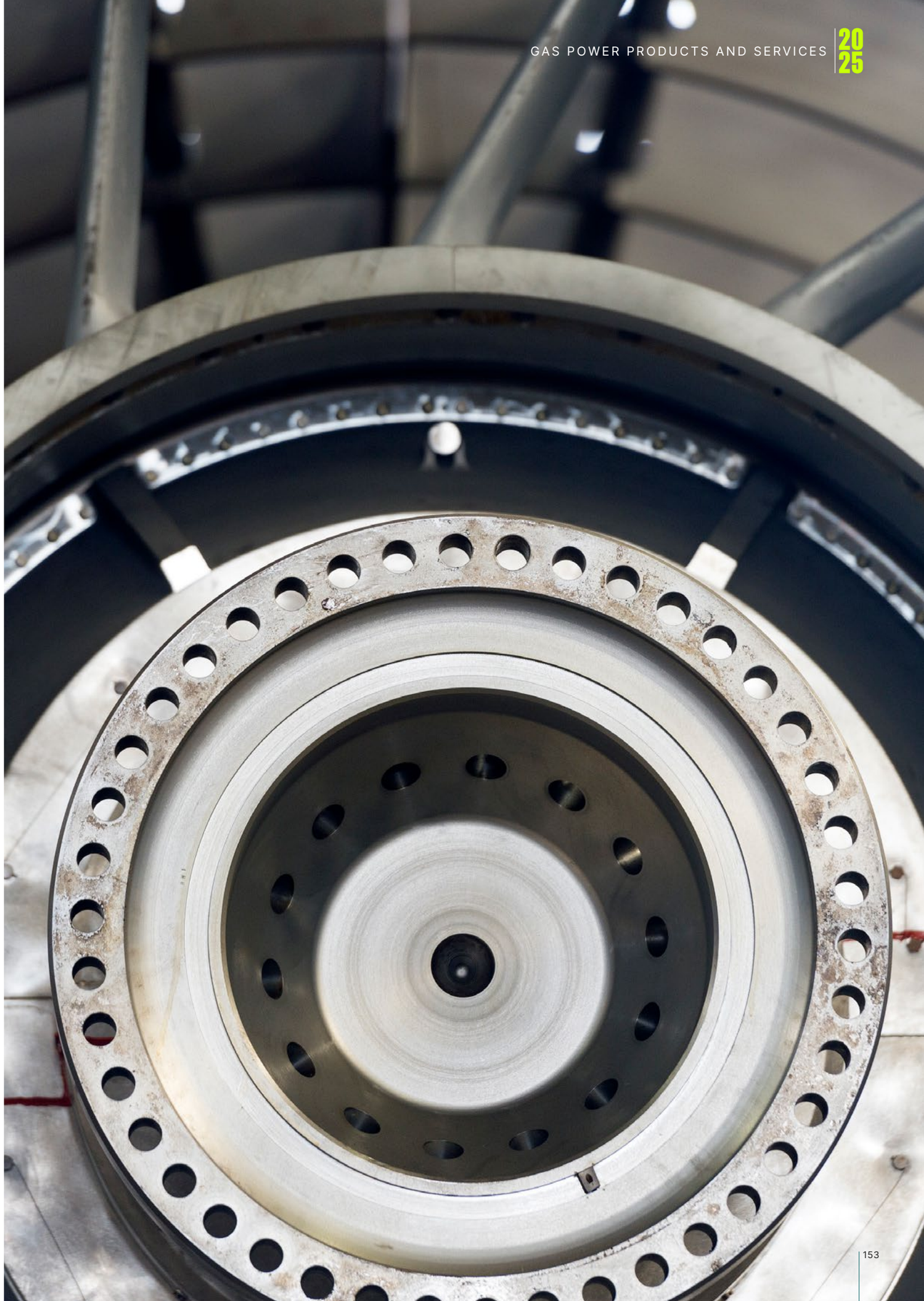
AERODERIVATIVE GAS TURBINES (cont.)†

		LM6000 PF DLE SPRINT	LM6000 PF+ SPRINT (25ppm NOx)	LM6000 PF+ DLE SPRINT (25ppm NOx)	LMS100 PA+
	Frequency	50/60 Hz	50/60 Hz	50/60 Hz	50/60 Hz
SC PLANT PERFORMANCE	SC Net Output (MW)	48.7	59.9	56.7	112.9/115.8††
	SC Net Heat Rate (Btu/kWh, LHV)	8303	8328	8319	7935/7773††
	SC Net Heat Rate (kJ/kWh, LHV)	8701	8800	8742	8372/8201††
	SC Net Efficiency (%, LHV)	41.1%	41.0%	41.0%	43.0%/43.9%††
GAS TURBINE PARAMETERS	Compression Pressure Ratio (X:1)	31.1	33.0	35.9	44.6/44.5††
	Exhaust Temperature (°F)	864	864	908	786/777††
	Exhaust Temperature (°C)	462	462	487	419/414††
	Exhaust Mass Flow (lb/s)	280.7	295.5	324.8	516.2/514.5††
	Exhaust Mass Flow (kg/s)	127.3	134.0	147.3	234.1/233.4††
	GT Turndown Minimum Load (%)	37%	37%	37%	28%
	NOx (ppmvd) at Baseload (@15%O2)	25	25	25	25
	CO (ppm) (@15%O2)1	25	25	25	11/10††
	Startup Time, Conventional/Peaking (Min)	30	30	30	30
1X CC PLANT PERFORMANCE	CC Net Output (MW)	63.6	75.8	75.7	134.6/137.2††
	CC Net Heat Rate (Btu/kWh, LHV)	6365	6218	6227	6634/6566††
	CC Net Heat Rate (kJ/kWh, LHV)	6715	6560	6570	6999/6928††
	CC Net Efficiency (%)	53.6%	54.9%	54.8%	51.4%/52.0%††
	Plant Turndown – Minimum Load (%)	37%	37%	37%	28%
	Ramp Rate (MW/min)	30	30	30	50+
	Startup Time (RR Hot, Minutes)	30	30	30	30
	Bottoming Cycle Type	2PNRH	2PNRH	2PNRH	2PNRH
	ST Configuration (Type)	Condensing	Condensing	Condensing	Condensing
2X CC PLANT PERFORMANCE	CC Net Output (MW)	127.7	152.0	152.6	269.9/274.8††
	CC Net Heat Rate (Btu/kWh, LHV)	6335	6202	6181	6616/6554††
	CC Net Heat Rate (kJ/kWh, LHV)	6684	6543	6521	6980/6915††
	CC Net Efficiency (%, LHV)	53.9%	55.0%	55.2%	51.6%/52.1%††
	Plant Turndown – Minimum Load (%)	18%	18%	18%	28%
	Ramp Rate (MW/min)	60	60	60	100
	Startup Time (RR Hot, Minutes)	30	30	30	30
	Bottoming Cycle Type	2PNRH	2PNRH	2PNRH	2PNRH
	ST Configuration (Type)	Condensing	Condensing	Condensing	Condensing

† At baseload/minimum turndown without abatement

NOTE: Net Plant ratings are based on ISO conditions, natural gas, inlet and exhaust losses included and balance of plant equipment excluded. Actual performance will vary with project specific conditions, fuel and ambient conditions. 2PNRH = Two pressure, non-reheat.

† Aeroderivative simple and combined performance numbers for 2022 have been updated to reflect best available information for each engine model and its operating auxiliary loads, and sourced equipment/sub-system performance, consistent with the requirements and needs of most customers.



STEAM TURBINES

600 Series

	STF-A650	STF-D600	STF-D650
Main Steam Pressure	Up to 2680psi (185bar) Up to 1112°F (600°C)	Up to 2680psi (185bar) Up to 1112°F (600°C)	Up to 3191psig (220bar) Up to 1112°F (600°C)
Reheat Steam Temperature	Up to 1112°F (600°C)	Up to 1112°F (600°C)	Up to 1148°F (620°C)
Frequency	50 Hz and 60 Hz	50 Hz and 60 Hz	50 Hz and 60 Hz
Output	85 – 300 MW	180 – 700 MW	150 – 700 MW

200 Series

	STF-D200	STF-A200
Main Steam Pressure	Up to 2030psi (140bar) Up to 1050°F (565°C)	Up to 2030psi (140bar) Up to 1050°F (565°C)
Reheat Steam Temperature	N/A	N/A
Frequency	50 Hz and 60 Hz	50 Hz and 60 Hz
Output	150 – 340 MW	70 – 220 MW

GENERATORS

Output >	**30 – 320 MW**			**240 – 605 MW**			**530 – 920 MW**		
Gas Turbines >	**LM/TM2500; LM6000; LMS100; B/E/F-Class**			**F/H-Class**			**H-Class**		
Steam Turbines >	**O&G; IST; A200; D200**			**A200; D200; A650; D650; D600**			**A650/D650**		
	Model	**MVA**	**Freq**	**Model**	**MVA**	**Freq**	**Model**	**MVA**	**Freq**
	A35	105/145	50/60	H35	285	60	W84	790	60
	A39	200	50/60	H53	355/405	50/60	W86	975/875	50/60
	A70	260	60	H65	450/545	50/60	W88	1100	50
	A74	295	50	H78	750	50			
	A78	400	50	H84	625/710	50/60			

Air Cooled	**50 Hz**	**60 Hz**
Power Factor	0.8	0.85
MVA	400	260
Efficiency	Up to 98.9%	Up to 98.8%
Terminal Voltage	Up to 21 kV	Up to 18 kV

Hydrogen Cooled	**50 Hz**	**60 Hz**
Power Factor	0.8	0.85
MVA	750	710
Efficiency	Up to 99.0%	Up to 99.02%
Terminal Voltage	Up to 23 kV	Up to 26 kV

Water Cooled	**50 Hz**	**60 Hz**
Power Factor	0.8	0.85
MVA	Up to 1100	Up to 875
Efficiency	Up to 99.08%	Up to 98.98%
Terminal Voltage	Up to 24 kV	Up to 25 kV

THE ENERGY OF CHANGE

The Energy of Change is all about the real progress and breakthrough innovations that are shaping the future of energy – not in the distant future, but what we're building together, right now. Behind those breakthrough innovations is the relentless optimism of our team – never giving up and seeing what's possible.

It is what fuels our mission and our breakthroughs—growing power to meet growing needs, taking the grid where it's never been before and running the world on smarter energy every day. Together with our customers and partners across continents and time zones, we're confidently pushing boundaries, solving tough challenges, and driving technology breakthroughs at every level.

The Energy of Change lives in each of us, and we're more optimistic than ever for what's next.

‡ Decarbonization as used in this catalog is intended to mean the reduction of carbon emissions on a kilogram per megawatt hour.

§ Trademark of BANG&CLEAN Technologies.

* Trademark of GE Vernova and/or its affiliates.

GEA35421 (07/2025)

GE VERNOVA