

Siemens Gas Turbines over 100 MW

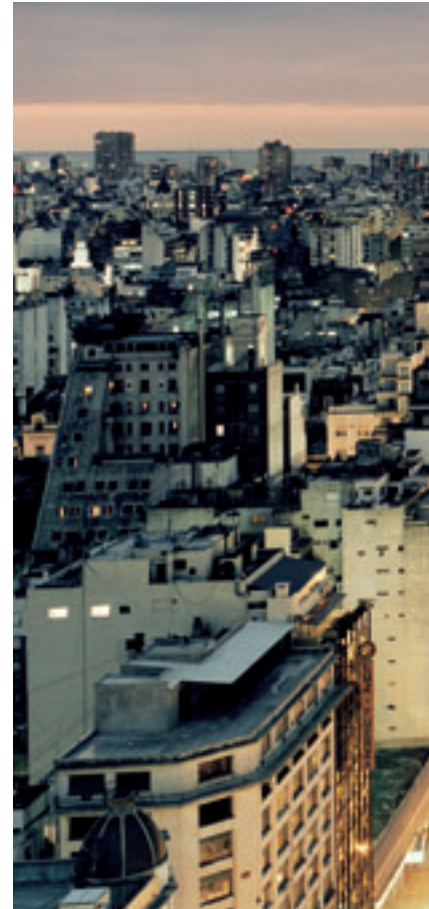


Proven and reliable

Answers for energy.

SIEMENS

State-of-the-art and innovative gas turbines to meet today's energy needs



Changes in today's energy markets are presenting power producers worldwide with new challenges and opportunities. In a competitive, market-driven economy, the ability to reduce the cost of power generation is becoming an increasingly important factor for success. Today, it is more important than ever to find solutions that provide a fast return on investment without sacrificing long-term reliability and flexibility.

To help you meet the challenges of a dynamic market, we have developed our Siemens Gas Turbines (SGT™) that have been proven in operation for many years in a global fleet of 1,010 machines over 50 MW with a combined power generation capacity of 135 GW and more than 18 million cumulative operating hours. Using the most advanced technologies, our engines have ratings

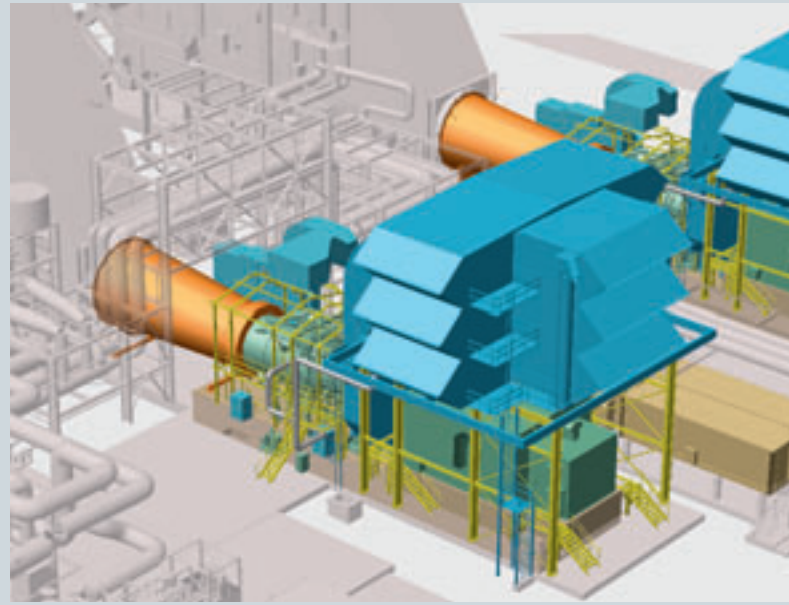


from 113 MW to 340 MW and cover both 50 Hz and 60 Hz applications with efficiencies approaching 40% in simple cycle and over 58% in combined cycle configurations. Siemens' latest development, the new 340 MW SGT5-8000H gas turbine, is designed to achieve more than 60% efficiency in combined cycle operation. Our proven modular design approach provides a flexible range of gas turbine packages in various scopes of supply, ranging from Siemens Gas Turbine Packages (SGT-PACs) to Siemens Combined Cycle Power Islands (SCC™ Power Islands) and Siemens Combined Cycle Turnkey (SCC™ Turnkey) plants, in order to meet individual customer needs.



All of the Siemens Gas Turbines share these proven common technical features:

- Four-stage turbine for moderate stage loading
- Low NO_x combustion system for reduced environmental impacts
- Cold end generator drive for increased efficiency
- Two-bearing rotor for simplified rotor alignment
- Variable inlet guide vanes for improved efficiency
- All blades removable with rotor in place for easy maintenance and shorter outages
- Unique design features for field serviceability across the fleet



Our Siemens Gas Turbine Packages have power outputs up to 340 MW.

High-performance gas turbines

Covering a wide spectrum of applications

Today, our materials engineering, blade cooling, thermodynamics and combustion technology know-how, together with our production engineering expertise, provide a sound basis for successful developments designed for the widest range of applications:

- Combined cycle power plants for base-load or flexible intermediate-load duty
- Cogeneration plants, where heat extraction and steam can increase fuel utilization
- Peak-load stations, where our gas turbines put their exemplary fast start capability to the test with fast start-up times
- Repowering of older coal-fired power plants to increase profitability; depending on the concept employed, this results in efficiency improvements of approximately 20 percentage points with a simultaneous increase in power output
- Integrated Gasification Combined Cycle (IGCC) power plants are a clean and efficient solution that makes coal and refinery residual products viable fuel options



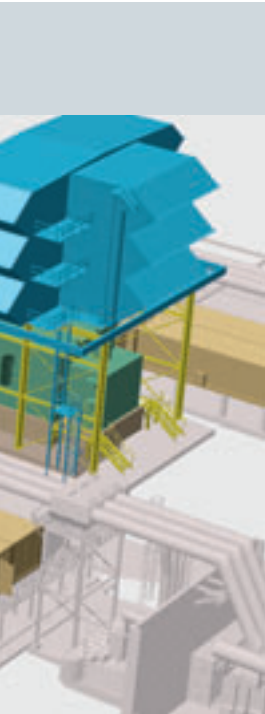
Shuweihat S1, United Arab Emirates: 1,500 MW combined cycle power plant with desalination using five V94.3A (new: SGT5-4000F) gas turbines in a multi-shaft configuration



Paka, Malaysia: 404 MW combined cycle power plant consisting of two blocks with two V94.2 (new: SGT5-2000E) gas turbines each



Uruguaiana, Brazil: 600 MW combined cycle power plant with two W501F (new: SGT6-5000F) gas turbines in 2x1 multi-shaft configuration



Proven and reliable Siemens Gas Turbines for power generation ranging from 113 MW to 340 MW:

SGT5-8000H	340 MW
SGT5-4000F	292 MW
SGT6-5000F	208 MW
SGT6-4000F	187 MW
SGT5-2000E	168 MW
SGT6-2000E	113 MW

■ We also offer a complete line of industrial gas turbines with ratings from 4 MW to 47 MW.

■ The SGT6-4000F (187 MW) gas turbine is available for custom applications.

A global network of service and support for the entire life cycle of your plant

At Siemens, we want to develop an ongoing partnership to ensure your project's long-term success. We are committed to serving our customers well after plant commissioning. As part of our commitment to being customer-focused, we have established a powerful and responsive service network with more than 3,000 field engineers and technicians in regional service offices around the globe. So wherever you are, wherever your plant is located, we speak the language, we know the market and we are available to provide customer service and support 24 hours a day, 7 days a week.

That is why we offer comprehensive service options including Corrective Maintenance, Preventive Maintenance, Performance Enhancement Programs, Service Agreements, as well as Training & Consulting.

With our extensive knowledge in supplying and servicing the power market, we offer an unparalleled level of comprehensive solutions that help our customers achieve competitiveness and profitability faster and easier. Furthermore, our global diversity and financial strength mean that we will be there when and where you need us.



*Payne Creek, Florida, USA:
515 MW combined cycle power plant with two W501F (new: SGT6-5000F) gas turbines in 2x1 multi-shaft configuration*

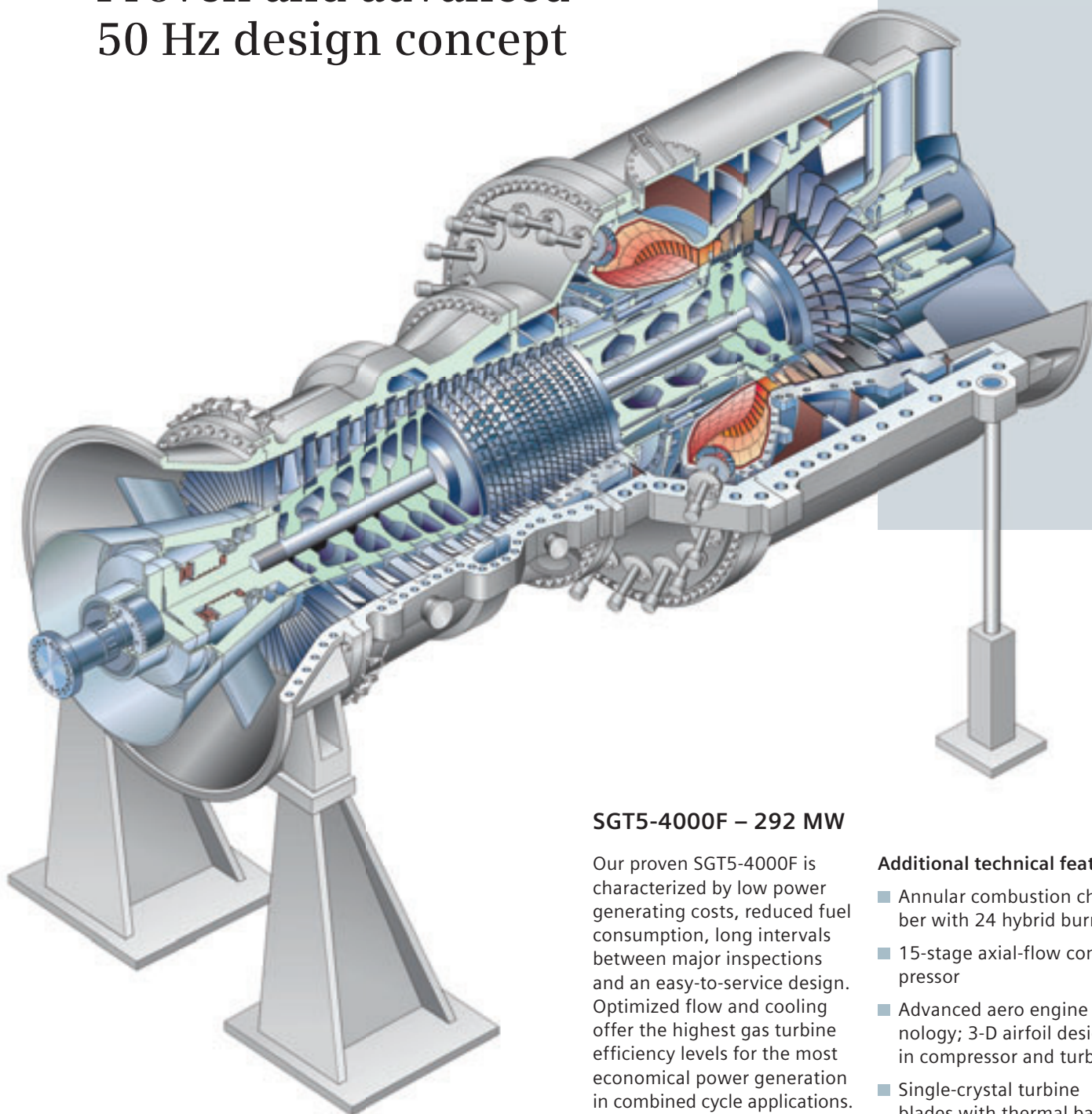


*Mainz-Wiesbaden, Germany:
400 MW combined cycle cogeneration power plant using one V94.3A (new: SGT5-4000F) gas turbine*



*Buggenum, Netherlands:
290 MW IGCC power plant with one V94.2 (new: SGT5-2000E) gas turbine for both syngas and natural gas application*

Proven and advanced 50 Hz design concept



SGT5-4000F – 292 MW

Our proven SGT5-4000F is characterized by low power generating costs, reduced fuel consumption, long intervals between major inspections and an easy-to-service design. Optimized flow and cooling offer the highest gas turbine efficiency levels for the most economical power generation in combined cycle applications. Its advanced technology is based on proven design features, resulting in a fleet reliability of over 99% and a combined experience of nearly 4,500,000 operating hours for all family members.

Additional technical features:

- Annular combustion chamber with 24 hybrid burners
- 15-stage axial-flow compressor
- Advanced aero engine technology; 3-D airfoil design in compressor and turbine
- Single-crystal turbine blades with thermal barrier coating and film cooling
- Advanced cooling technology
- Multiple fuels capability
- Hydraulic turbine blade tip clearance control

Siemens Gas Turbines and Siemens Combined Cycle Plants for 50 Hz Grids (Standard design, ISO ambient conditions)

	SGT5-4000F	SGT5-2000E
Siemens Gas Turbines		
Gross power output (MW)	292	168
Gross efficiency (%)	39.8	34.7
Gross heat rate (kJ/kWh)	9,038	10,366
Gross heat rate (Btu/kWh)	8,567	9,825
Pressure ratio	18.2	11.7
Siemens Gas Turbine Packages*		
	SGT5-PAC 4000F	SGT5-PAC 2000E
Net power output (MW)	288	165
Net efficiency (%)	39.5	34.5
Net heat rate (kJ/kWh)	9,114	10,471
Net heat rate (Btu/kWh)	8,638	9,925
Exhaust temperature (°C/°F)	580/1,075	539/1,002
Exhaust mass flow (kg/s)	688	526
Exhaust mass flow (lb/s)	1,516	1,161
Generator type	Air-cooled	Air-cooled
Siemens Combined Cycle Plants*		
Single-Shaft		
	SCC5-4000F 1S	SCC5-2000E 1x1
Net power output (MW)	423	251
Net efficiency (%)	58.4	52.2
Net heat rate (kJ/kWh)	6,164	6,895
Net heat rate (Btu/kWh)	5,842	6,535
Multi-Shaft		
	SCC5-4000F 2x1	SCC5-2000E 2x1
Net power output (MW)	848	505
Net efficiency (%)	58.5	52.5
Net heat rate (kJ/kWh)	6,158	6,860
Net heat rate (Btu/kWh)	5,836	6,502

* incl. pressure losses



SGT5-4000F



SGT5-2000E

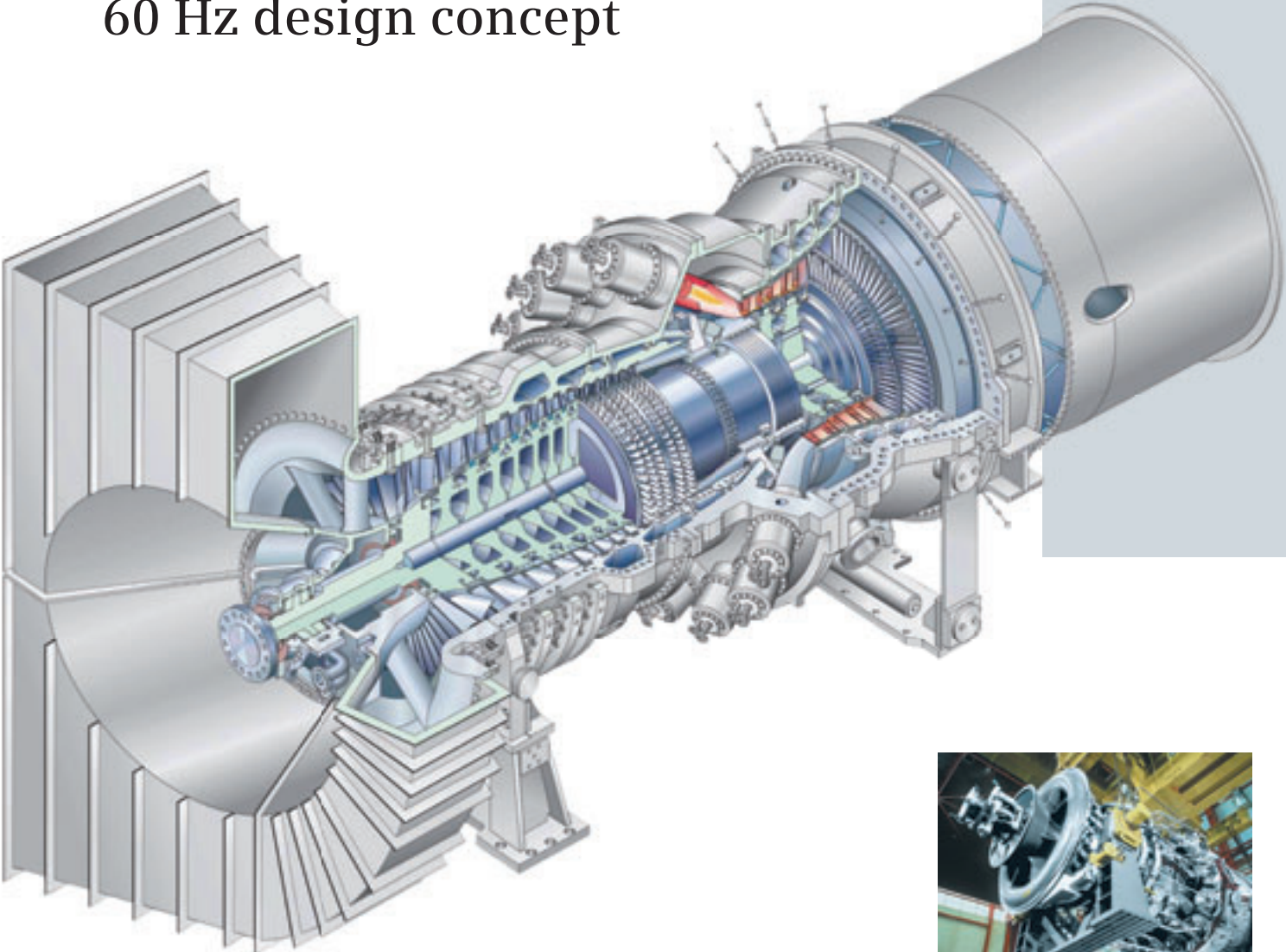
SGT5-2000E – 168 MW

The SGT5-2000E is a long-proven machine for simple or combined cycle applications, with or without combined heat and power, and for all load ranges – particularly peak-load operation. The machine is capable of burning a variety of fuels – from low to high caloric gaseous and/or liquid fuels to treated heavy oil at lowest emission levels. For IGCC applications, we offer the SGT5-2000E (LCG) machine with a modified compressor. The SGT5-2000E has a record of durability with more than 300 units accounting for over 6,400,000 operating hours. This gas turbine is also available for 60 Hz markets named SGT6-2000E.

Additional technical features:

- Two walk-in combustion chambers for hot-gas-path inspection without cover lift
- Combustion chambers lined with individually replaceable ceramic tiles
- 16-stage axial-flow compressor
- Hybrid burners for premix and diffusion mode operation with natural gas, fuel oil and special fuels, such as heavy oil and refinery residues
- Fast inlet guide vanes for peak-load operation and frequency stabilization (optional)
- Wet compression (optional)

Proven and advanced 60 Hz design concept



SGT6-5000F – 200 MW



SGT6-2000E

Siemens Gas Turbines and Siemens Combined Cycle Plants for 60 Hz Grids

(Standard design, ISO ambient conditions)

	SGT6-5000F	SGT6-2000E
Siemens Gas Turbines		
Gross power output (MW)	208	113
Gross efficiency (%)	38.1	34.0
Gross heat rate (kJ/kWh)	9,446	10,606
Gross heat rate (Btu/kWh)	8,953	10,052
Pressure ratio	17.2	11.8
Siemens Gas Turbine Packages*		
	SGT6-PAC 5000F	SGT6-PAC 2000E
Net power output (MW)	206	111
Net efficiency (%)	37.6	34.0
Net heat rate (kJ/kWh)	9,580	10,717
Net heat rate (Btu/kWh)	9,081	10,158
Exhaust temperature (°C/°F)	600/1,113	545/1,014
Exhaust mass flow (kg/s)	504	365
Exhaust mass flow (lb/s)	1,110	805
Generator type	Air-cooled	Air-cooled
Siemens Combined Cycle Plants*		
	SCC6-5000F 1x1	SCC6-2000E 1x1
Multi-Shaft 1x1		
Net power output (MW)	314	171
Net efficiency (%)	57.0	51.3
Net heat rate (kJ/kWh)	6,320	7,007
Net heat rate (Btu/kWh)	5,990	6,642
	SCC6-5000F 2x1	SCC6-2000E 2x1
Multi-Shaft 2x1		
Net power output (MW)	623	342
Net efficiency (%)	57.2	51.6
Net heat rate (kJ/kWh)	6,290	6,971
Net heat rate (Btu/kWh)	5,960	6,608

* incl. pressure losses



SGT6-5000F – 208 MW

The SGT6-5000F gas turbine continues to break reliability and continuous operation records.

With more than 4,600,000 hours of fleet operation, the SGT6-5000F is ideally suited for either simple cycle or heat recovery applications including cogeneration, combined cycle and repowering.

Our SGT6-PAC 5000F provides economical, rapid on-line generation that is ideal for peaking duty, intermediate operation or continuous service.

Additional technical features:

- 16 can-type combustors in a circular array
- 13-stage axial-flow compressor with advanced 3-D design technology
- Multiple power augmentation options
- Best 60 Hz simple cycle efficiency in its class
- Fuel flexibility for diverse applications
- Low emissions technologies including 9 ppm NO_x combustion system
- Robust and proven rotor design

SGT6-2000E - 113 MW

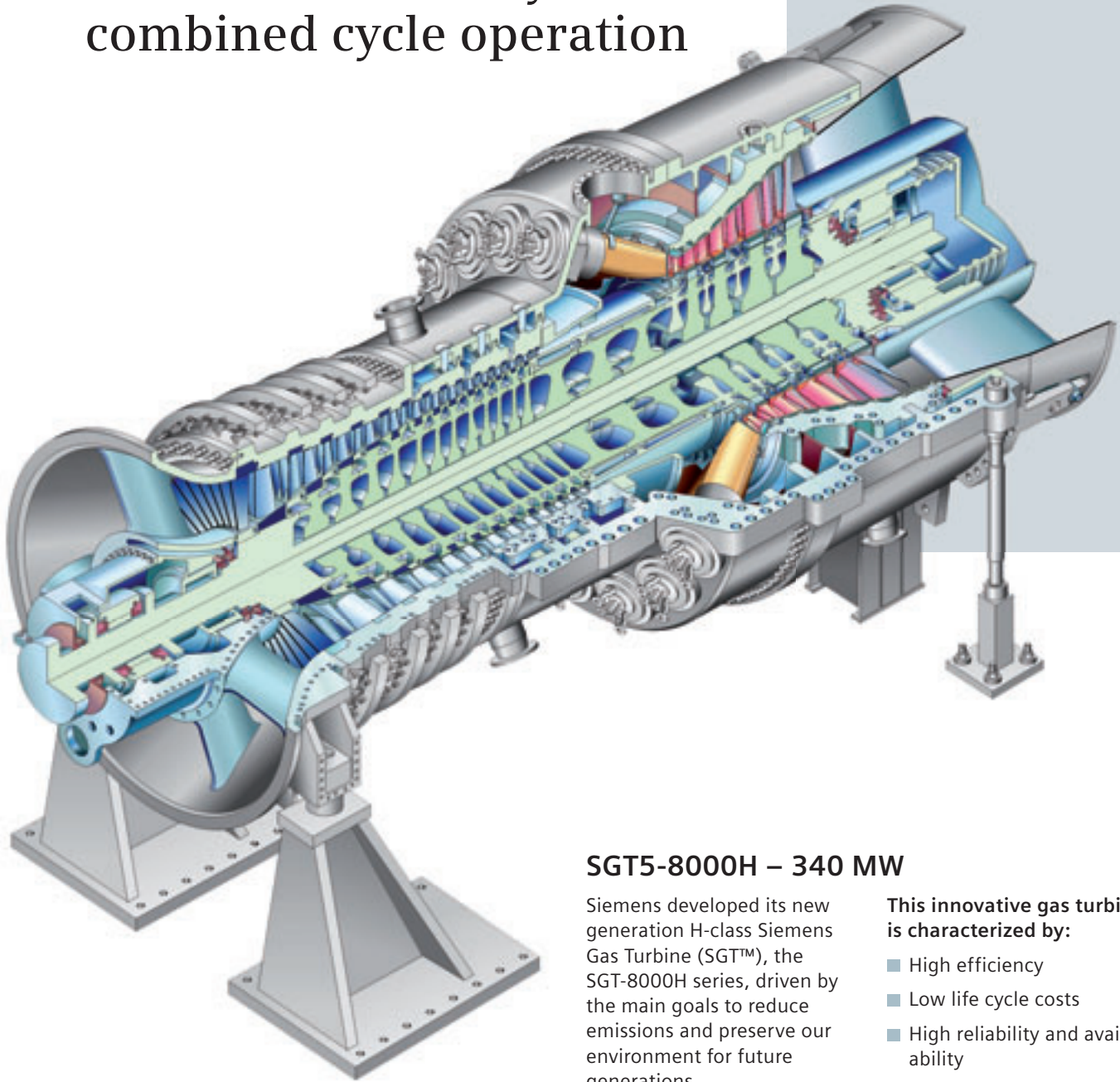
The SGT6-2000E gas turbine is designed for reliable, efficient and flexible power generation. With more than 3 million hours of fleet operation, the SGT6-2000E is a proven machine for simple cycle and combined cycle applications for all load ranges.

Additional technical features:

- Two walk-in combustion chamber for hot gas path inspection without cover lift
- Combustion chambers lined with individually replaceable ceramic tiles
- Multiple fuel capability



Designed to achieve more than 60% efficiency in combined cycle operation



SGT5-8000H – 340 MW

Siemens developed its new generation H-class Siemens Gas Turbine (SGT™), the SGT-8000H series, driven by the main goals to reduce emissions and preserve our environment for future generations.

The new, advanced SGT-8000H series gas turbines and the SCC-8000H series combined cycle power plants feature the best-in-class technology captured from our long line of large direct-drive Siemens 50 Hz and 60 Hz heavy-duty gas turbines and power plants.

This innovative gas turbine is characterized by:

- High efficiency
- Low life cycle costs
- High reliability and availability
- Operational flexibility
- Low emissions

Siemens Gas Turbine SGT5-8000H and Siemens Combined Cycle Plant SCC5-8000H

(Standard design, rated data at ISO ambient conditions)

Siemens Gas Turbine		SGT5-8000H
Grid frequency (Hz)		50
Gross power output (MW)		340
Pressure ratio		19,2
Exhaust temperature (°C/°F)		625/1,157
Exhaust mass flow (kg/s)		820
Exhaust mass flow (lb/s)		1,808
Gas Turbine Emissions		
NO _x (ppm)		25
CO (ppm)		10
Gas Turbine Physical Dimensions		
Weight (t)		440
Length (m)		13.2
Height (m)		5.0
Width (m)		5.0
Siemens Combined Cycle Power Plant		
Single-Shaft		SCC5-8000H
Net power output (MW)		530
Net efficiency (%)		60
Net heat rate (kJ/kWh)		6,000
Net heat rate (Btu/kWh)		5,687



Features for high efficiency include:

- New compressor with advanced blade design
- Advanced materials to increase the firing and exhaust-gas temperature
- Advanced sealing system for low-leakage cooling air
- Advanced high-efficiency, high-pressure, high-temperature combined cycle process with BENSON® boiler, based on the high mass flow and exhaust-gas temperature of the new engine

Features for lowest life cycle cost include:

- H-class – designed for more than 60% efficiency in combined cycle mode and reduced emissions at part load
- Less complexity in engine and parts which can lead to lower maintenance and operating costs
- Straightforward operational concept



Features for advanced operating flexibility include:

- Air-cooled engine for a cooling method that is always present at speed
- Fast start-up and cycling capability to support intermediate load requirements
- Less complexity in engine and plant design leading to more flexibility in operation and reduced start-up time
- Improved turndown capability for high efficiency and low-emissions part-load operation

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