Siemens Gas Turbines over 100 MW

Proven and reliable

Answers for energy.
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.
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

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

- Four-stage turbine for moderate stage loading
- Low NOx 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

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

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**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

**Uruguayano, Brazil:**
600 MW combined cycle power plant with two W501F (new: SGT6-5000F) gas turbines in 2x1 multi-shaft configuration
We also offer a complete line of industrial gas turbines with ratings from 4 MW to 47 MW.

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.

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

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

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

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.

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
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.

**SGT5-4000F – 292 MW**

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

(Standard design, ISO ambient conditions)

<table>
<thead>
<tr>
<th>Siemens Gas Turbines</th>
<th>SGT6-5000F</th>
<th>SGT6-2000E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross power output (MW)</td>
<td>208</td>
<td>113</td>
</tr>
<tr>
<td>Gross efficiency (%)</td>
<td>38.1</td>
<td>34.0</td>
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<tr>
<td>Gross heat rate (kJ/kWh)</td>
<td>9,446</td>
<td>10,606</td>
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<tr>
<td>Gross heat rate (Btu/kWh)</td>
<td>8,953</td>
<td>10,052</td>
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<tr>
<td>Pressure ratio</td>
<td>17.2</td>
<td>11.8</td>
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</table>

<table>
<thead>
<tr>
<th>Siemens Gas Turbine Packages*</th>
<th>SGT6-PAC 5000F</th>
<th>SGT6-PAC 2000E</th>
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</thead>
<tbody>
<tr>
<td>Net power output (MW)</td>
<td>206</td>
<td>111</td>
</tr>
<tr>
<td>Net efficiency (%)</td>
<td>37.6</td>
<td>34.0</td>
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<tr>
<td>Net heat rate (kJ/kWh)</td>
<td>9,580</td>
<td>10,717</td>
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<tr>
<td>Net heat rate (Btu/kWh)</td>
<td>9,081</td>
<td>10,158</td>
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<tr>
<td>Exhaust temperature (°C/°F)</td>
<td>600/1,113</td>
<td>545/1,014</td>
</tr>
<tr>
<td>Exhaust mass flow (kg/s)</td>
<td>504</td>
<td>365</td>
</tr>
<tr>
<td>Exhaust mass flow (lb/s)</td>
<td>1,110</td>
<td>805</td>
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<tr>
<td>Generator type</td>
<td>Air-cooled</td>
<td>Air-cooled</td>
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<p>| Siemens Combined Cycle Plants* |</p>
<table>
<thead>
<tr>
<th>Multi-Shaft 1x1</th>
<th>SCC6-5000F 1x1</th>
<th>SCC6-2000E 1x1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net power output (MW)</td>
<td>314</td>
<td>171</td>
</tr>
<tr>
<td>Net efficiency (%)</td>
<td>57.0</td>
<td>51.3</td>
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<tr>
<td>Net heat rate (kJ/kWh)</td>
<td>6,320</td>
<td>7,007</td>
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<tr>
<td>Net heat rate (Btu/kWh)</td>
<td>5,990</td>
<td>6,642</td>
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<tr>
<td>Multi-Shaft 2x1</td>
<td>SCC6-5000F 2x1</td>
<td>SCC6-2000E 2x1</td>
</tr>
<tr>
<td>----------------</td>
<td>----------------</td>
<td>----------------</td>
</tr>
<tr>
<td>Net power output (MW)</td>
<td>623</td>
<td>342</td>
</tr>
<tr>
<td>Net efficiency (%)</td>
<td>57.2</td>
<td>51.6</td>
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<tr>
<td>Net heat rate (kJ/kWh)</td>
<td>6,290</td>
<td>6,971</td>
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<tr>
<td>Net heat rate (Btu/kWh)</td>
<td>5,960</td>
<td>6,608</td>
</tr>
</tbody>
</table>

* 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 combusters 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 NOx 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
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.

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

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

### Siemens Gas Turbine SGT5-8000H and Siemens Combined Cycle Plant SCC5-8000H
(Standard design, rated data at ISO ambient conditions)

<table>
<thead>
<tr>
<th>Siemens Gas Turbine</th>
<th>SGT5-8000H</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grid frequency (Hz)</td>
<td>50</td>
</tr>
<tr>
<td>Gross power output (MW)</td>
<td>340</td>
</tr>
<tr>
<td>Pressure ratio</td>
<td>19.2</td>
</tr>
<tr>
<td>Exhaust temperature (°C/°F)</td>
<td>625/1,157</td>
</tr>
<tr>
<td>Exhaust mass flow (kg/s)</td>
<td>820</td>
</tr>
<tr>
<td>Exhaust mass flow (lb/s)</td>
<td>1,808</td>
</tr>
</tbody>
</table>

**Gas Turbine Emissions**
- NOx (ppm): 25
- CO (ppm): 10

**Gas Turbine Physical Dimensions**
- Weight (t): 440
- Length (m): 13.2
- Height (m): 5.0
- Width (m): 3.0

<table>
<thead>
<tr>
<th>Siemens Combined Cycle Power Plant</th>
<th>SCC5-8000H</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net power output (MW)</td>
<td>330</td>
</tr>
<tr>
<td>Net efficiency (%)</td>
<td>60</td>
</tr>
<tr>
<td>Net heat rate (kJ/kWh)</td>
<td>6,000</td>
</tr>
<tr>
<td>Net heat rate (Btu/kWh)</td>
<td>5,687</td>
</tr>
</tbody>
</table>

**Siemens Gas Turbine**
- 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**
- NOx (ppm): 25
- CO (ppm): 10

**Gas Turbine Physical Dimensions**
- Weight (t): 440
- Length (m): 13.2
- Height (m): 5.0
- Width (m): 3.0

**Siemens Combined Cycle Power Plant**
- Single-Shaft
- SCC5-8000H
- Net power output (MW): 330
- Net efficiency (%): 60
- Net heat rate (kJ/kWh): 6,000
- Net heat rate (Btu/kWh): 5,687