

ATTACHMENT S

Turbine Manufacturers: Current Offerings and NO_x Emissions

As of September 7, 2021

1. Solar Turbines – Caterpillar

Headquarters: San Diego, California, United States

Website: mysolar.cat.com

Solar Turbines Incorporated, a subsidiary of Caterpillar Inc. is known as the pioneer of gas turbine systems design and manufacturing. Solar's industrial gas turbines are used for many purposes including marine propulsion, electrical power generation and natural oil and gas production. The company is focusing on developing new technologies to reduce emissions of its products and improve the fuel economy of gas turbines. The gas turbines manufactured by this company are fitted with SoLoNO_x combustion system which use dry, lean-premixed combustion technology to reduce harmful emissions.

Key products: Saturn 20, Centaur 40, Centaur 45, Mercury 50, Taurus 70, Mars 90 and Titan 250

Only products offered in 1,000–5,000 HP range are Saturn 20, Centaur 40, and Centaur 45.

- **Saturn 20: ISO rated at 2,000 HP.¹ 100 ppm NO_x emissions.**
- **Centaur 40: ISO rated at 4,500 HP.² 25 ppm NO_x emissions.**
- **Centaur 45: ISO rated between 4,700 and 5,000 HP.³ 15 ppm NO_x emissions.**

2. Siemens Energy

Headquarters: Berlin and Munich, Germany

Website: www.siemens.com/energy

Siemens Energy are one of the leading gas turbine manufacturers in the world. Siemens gas turbines are hugely popular among clients due to their high reliability and low maintenance. The company provides a wide range of heavy duty, industrial and aeroderivative gas turbines ranging up to 567MW.

Key products: SGT-100, SGT-A45, SGT-A05, SGT-700, SGT6-8000H and SGT-A65

Smallest unit offered is 4MW (5,300 HP).

¹ Site rating may be under 2,000 HP depending on elevation and temperature.

² Site rating may be under 4,000 HP depending on elevation and temperature.

³ Site rating may be closer to 4,000 HP depending on elevation and temperature.

3. Baker Hughes

Headquarters: Houston, Texas, United States

Website: www.bakerhughes.com

The Turbomachinery & Process Solutions (TPS) segment provides equipment and related services for mechanical-drive, compression and power-generation applications across the oil and gas industry and energy industry, the on-and-offshore, LNG, pipeline and gas storage, refining, petrochemical, distributed gas, flow and process control and industrial segments. TPS is a leader in designing, manufacturing, maintaining and upgrading rotating equipment across the entire oil and gas value chain.

Key products: NovaLT16, NovaLT12, NovaLT5, Frame 5, Frame 6, Frame 7, Frame 9, LM6000PF+, LM9000, LM2500+

Smallest unit offered is 5.5MW (7,800 HP).

4. GE Power

Headquarters: Schenectady, New York, United States

Website: www.gepower.com

GE Power is a subsidiary of GE Electric and offers a wide range of products including engines, turbines, generators, measurement and control systems, nuclear reactors, oil production equipment, solar panels, heat recovery steam generators (HRSG) and wind turbines. GE's heavy duty and aeroderivative gas turbines are reliable even in harsh environmental conditions. GE introduced E-Class, F-Class and H-Class technology to the gas turbine industry. The company also boasts of holding a world record for powering the most efficient combined cycle power plant with its largest high efficiency turbine.

Key products: LM2500, LM6000, 7HA.01, 9F.03, 7E.03 and GT13E2

Smallest unit offered is 34.6MW (46,000 HP).

5. Capstone Turbine Corporation

Headquarters: Van Nuys, California, United States

Website: www.capstoneturbine.com

Capstone Turbine Corporation specializes in the production of microturbines which can run on a variety of fuels including natural gas, biogas and LPG. The key component of Capstone microturbines are air bearings which requires minimum maintenance and eliminates the need for cooling systems. The microturbine generators are used for electrical power generation, cogeneration and as source of power for hybrid vehicles. The company offers a comprehensive

lineup of micro gas turbines ranging from 30kW to 30MW. The fuel flexibility of these turbines makes it ideal for numerous applications in various markets including oil and gas, critical power supply, transportation, renewable energy and marine.

Key products: C30, C65, C200, C200S ICHP, C600S and C800S

Smallest unit is 30KW (40 HP), but only used for power generation.

6. Kawasaki Heavy Industries

Headquarters: Chūō-ku, Kobe and Minato, Tokyo, Japan

Website: <https://global.kawasaki.com>

High performance gas turbines are one of the key offerings of Kawasaki Heavy Industries (KHI). The company specializes in the production of small and medium sized gas turbines and gas turbine cogeneration systems. Kawasaki has developed advanced technologies such as DLE combustion method, fluid analysis technology and steam/water injection method to offer their customers eco-friendly and highly efficient gas turbines. By monitoring the turbine operation situation using a proprietary remote monitoring system, Kawasaki provides its customers with quick and precise service.

Key products: M1A-13A, L30A, M7A-03, GPS 2000, GPS 5000 and MGP1250

Smallest unit is 1.5MW (2,000 HP), but only used for power generation.

7. OPRA Turbines

Headquarters: Hengelo, The Netherlands

Website: <http://www.opraturbines.com>

OPRA develops and manufactures 2MW power generator sets using OP16 series of gas turbines. By installing multiple sets, the power output can be extended to 10MW. The OP16 generator sets can be configured for low emission and dual/ multifuel capabilities according to the needs of the customer. OPRA gas turbines are characterized by high reliability and efficiency, and low emissions and cost of ownership. These turbines are used in various sectors including oil and gas, industrial, commercial and marine sectors.

Key products: OP16 series gas turbines

Smallest unit is 2MW (2,600 HP), but only used for power generation.

8. Centrax Gas Turbines

Headquarters: Newton Abbot, Devon, England

Website: <https://centraxgt.com/>

Centrax gas turbines mainly focuses on the production of high efficiency gas turbine powered generator packages for a wide range of industries and power applications. These generator packages use high performance Siemens core engines to provide power outputs ranging from 3MW to 15MW. Centrax gas turbines are known for their high efficiency, reliability and continuous operation in extreme environmental conditions.

Key products: CX501-KB5, CX501-KB7, CX300 and CX400

Smallest unit is 3MW (4,000 HP), but only used for power generation.

9. Ansaldo Energia

Headquarters: Genova, Italy

Website: www.ansaldoenergia.it

Ansaldo Energia is one of the leading manufacturers of heavy duty gas turbines. Ansaldo gas turbines are characterized by easy maintenance, high efficiency and low environmental impact. The company offers products in E, F and H class technology segments with power output ranging from 80MW to 538MW.

Key products: AE64.3A, AE94.3A, AE94.2, GT26, GT36-S6 and GT36-S5

Smallest unit is 80MW (107,282 HP).

10. Mitsubishi Heavy Industries

Headquarters: Minato, Tokyo, Japan

Website: www.mhi.com

By integrating latest technologies in aerodynamics, cooling design and materials, Mitsubishi Heavy Industries (MHI) develops gas turbines which are highly efficient and reliable. The company offers a wide range of gas turbines from 40MW to 490MW capacities.

Key products: M501D, M501F, M701G, M701J, H-25 and H100

Smallest unit is 40MW (53,000 HP).

11. MAN Energy Solutions

Headquarters: Augsburg, Bavaria, Germany

Website: mandieselturbo.com

The gas turbines manufactured by MAN Energy Solutions are mostly used in small energy supply companies and oil and gas industry. MAN gas turbines are used for cogeneration in on-site power plants to increase the efficiency and reduce greenhouse emissions by recovering and utilizing the thermal energy of hot exhaust gases. These gas turbines are also used as mechanical drives to run compressors and pumps in pipeline compressor stations and offshore oil production units.

Key products: MGT6000-1S, MGT6000-2S and THM 1304

Smallest unit is 6.4MW (8,900 HP).