Bayswater Energy Center

How Simple Cycle Combustion Turbines Work

Bayswater Energy Center is a peaking plant, which means they are called into service only at times of high customer demand on the regional power grid.

It is called a simple cycle plant because it has only one means of generating electricity—combustion of natural gas or oil. Fuel is ignited inside a combustion chamber and the hot combustion gases blow into a gas turbine, spinning the turbine blades. The spinning turbine is connected by a shaft to a generator. The shaft turns the generator and the generator makes electricity.

About NextEra Energy Resources

- A leading clean energy provider operating wind, natural gas, solar and nuclear power plants
- A portfolio of power generating facilities across the United States and in Canada
- The largest wind generator in North America
- A subsidiary of NextEra Energy, Inc., with headquarters in Juno Beach, Florida
- More than 95 percent of our electricity comes from clean or renewable sources
- Visit us at www.NextEraEnergyResources.com

Overview

- Located in Far Rockaway, New York
- Operated by a subsidiary of NextEra Energy Resources
- A 55-megawatt simple cycle natural-gas fired power plant
- A Pratt & Whitney Power Systems combustion turbine
- When operating at full power, the plant is capable of generating enough electricity for 55,000 homes
- Began commercial operation in 2002

Benefits

- Provides employment opportunities
- Adds tax base to the county
- Supports economy through purchases of regional goods and services
- Supports various local community organizations
Forney Energy Center

How Combined-Cycle Combustion Turbines Work

Forney Energy Center generates electricity using both gas turbines and a steam turbine. First, natural gas is ignited inside a combustion chamber. The hot exhaust gases blow into a gas turbine, spinning the turbine blades.

The spinning turbine is connected by a shaft to a generator. The shaft turns the generator and the generator makes electricity. The hot exhaust gases are then used to heat water to steam, and the steam is piped into steam turbines, which turn generators making additional electricity. After passing through the steam turbine, the steam is condensed back into water, reheated to steam and used again in a continuous process.

This is called a combined-cycle plant because it uses the combination of a gas turbine and a steam turbine to extract maximum energy from the fuel used.

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Overview

» Located in Forney, Texas
» Operated by a subsidiary of NextEra Energy Resources
» A 1,824-megawatt combined-cycle, natural gas-fired power plant
» An intermediate plant, which means it is dispatched to operate approximately 16 hours every day
» When operating at full power, the plant generates enough electricity for more than 1.6 million homes
» Forney uses 14 million gallons of waste water a day reclaimed from the City of Garland, Texas
» Began commercial operation in 2003

Benefits

» Provides employment opportunities
» Adds tax base to the county
» Supports economy through purchases of regional goods and services
» Supports various local community organizations
Lamar Energy Center

How Combined-Cycle Combustion Turbines Work

Lamar Energy Center generates electricity using both gas turbines and a steam turbine. First, natural gas is ignited inside a combustion chamber. The hot exhaust gases blow into a gas turbine, spinning the turbine blades.

The spinning turbine is connected by a shaft to a generator. The shaft turns the generator and the generator makes electricity. The hot exhaust gases are then used to heat water to steam, and the steam is piped into steam turbines, which turn generators making additional electricity. After passing through the steam turbine, the steam is condensed back into water, reheated to steam and used again in a continuous process.

This is called a combined-cycle plant because it uses the combination of a gas turbine and a steam turbine to extract maximum energy from the fuel used.

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Overview

» Located in Paris, Texas, about 110 miles northeast of Dallas
» Operated by a subsidiary of NextEra Energy Resources
» A 1,060-megawatt combined-cycle, natural gas-fired power plant
» An intermediate plant, which means it is dispatched to operate approximately 16 hours every day
» When operating at full power, the plant generates enough electricity for about 1 million homes
» Began commercial operation in 2000

Benefits

» Provides employment opportunities
» Adds tax base to the county
» Supports economy through purchases of regional goods and services
» Supports various local community organizations
Marcus Hook Energy Center

How the plant works

Marcus Hook is two power plants on the same site. Marcus Hook 790 is a combined cycle because it uses a gas and a steam turbine to make electricity. Marcus Hook 50 is a simple cycle because it uses only a gas turbine to make electricity. Both plants ignite fuel inside a combustion chamber. The hot combustion gases blow into a combustion turbine, spinning the turbine blades. The spinning turbine is connected by a shaft to a generator. The shaft turns the generator and the generator makes electricity.

The hot gases are then used to heat water to steam. Marcus Hook 790 (above) has the ability to pipe one million pounds of steam an hour to the Sunoco Refinery for industrial use. The remaining steam turns a steam turbine, generating additional electricity. Marcus Hook 50 pipes all of its steam to the refinery.

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Overview

» Two power plants located south of Philadelphia in Marcus Hook, Pa., within the Sunoco Marcus Hook Refinery
» Both operated by a subsidiary of NextEra Energy Resources
» A 790-megawatt combined-cycle, co-generation, natural-gas fired power plant that began commercial operation in 2004
» An intermediate plant, meaning it is dispatched to operate approximately 16 hours a day
» There is also a 50-megawatt natural gas-fired, co-generation unit that began operation in 1987 and was acquired by NextEra Energy Resources in 1999
» When operating at full power, the plants generate enough electricity for almost 800,000 homes

Benefits

» Provides employment opportunities
» Adds tax base to the county
» Supports economy through purchases of regional goods and services
» Supports various local community organizations
Fact Sheet

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Sayreville Energy Center

How Combined-Cycle Combustion Turbines Work

Sayreville Energy Center generates electricity using both gas turbines and a steam turbine. First, natural gas is ignited inside a combustion chamber. The hot exhaust gases blow into a gas turbine, spinning the turbine blades.

The spinning turbine is connected by a shaft to a generator. The shaft turns the generator and the generator makes electricity. The hot exhaust gases are then used to heat water to steam, and the steam is piped into steam turbines, which turn generators making additional electricity. After passing through the steam turbine, the steam is condensed back into water, reheated to steam and used again in a continuous process.

This is called a combined-cycle plant because it uses the combination of a gas turbine and a steam turbine to extract maximum energy from the fuel used.

Overview

» Located in the Borough of Sayreville, in central New Jersey
» 315-megawatt combined cycle gas-fired power plant
» A subsidiary of NextEra Energy Resources operates the plant and owns 157.5 megawatts of the facility
» An intermediate plant, which means it is dispatched to operate approximately 16 hours a day based on seasonal demand
» When operating at full power, the plant generates enough electricity for approximately 300,000
» Began commercial operation in 1991
» Acquired by NextEra Energy Resources in 1998

Benefits

» Provides employment opportunities
» Adds tax base to the county
» Supports economy through purchases of regional goods and services
» Supports various local community organizations
William F. Wyman 4 Station

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Overview

» Located in Yarmouth, Maine, on Cousins Island in Casco Bay along the coast of Maine
» Operated by a subsidiary of NextEra Energy Resources
» W. F. Wyman is an oil-burning plant, which began operation in 1978
» The plant consists of four units. The largest unit, W. F. Wyman Unit 4, is 613 megawatts.
» In 1999, a subsidiary of NextEra Energy Resources acquired an ownership interest in Unit 4 and currently owns 516.8 megawatts
» When operating at full power, the plants generate enough electricity for approximately 600,000 homes

Benefits

» Provides employment opportunities
» Adds tax base to the city
» Supports economy through purchases of regional goods and services
» Supports various local community organizations

How Conventional Steam Turbines Work

W. F. Wyman 4 is a conventional steam-powered plant, meaning it burns fuel, in the case of Wyman, residual fuel oil, to boil water to make steam to turn a turbine generator. Heat from burning oil in the boiler heats water and converts the water to steam. The steam is then superheated and piped to turbines, where it blows over the turbine blades, turning the turbine shaft.

The spinning turbines in the W. F. Wyman 4 unit are connected by a shaft to a generator. The shaft turns the generator, and the generator makes electricity. The steam is then condensed back to water, reheated in the boiler, and the process is repeated in a continuous cycle.
W.F. Wyman 1-3, Cape Energy Stations

How the plants work
Wyman 1-3 and the Cape units are peaking units, which means they are called into service only at times of high customer demand on the regional power grid. Wyman 1-3 is a conventional steam cycle, and Cape Station is a simple combustion steam cycle. Fuel is ignited to produce steam (in the case of Wyman) or hot compressed combustion gases (for Cape) to spin turbine blades. The spinning turbine blades are connected by a shaft to a generator. The shaft turns the generator, and the generator makes electricity.

Overview
- W. F. Wyman 1-3 is located in Yarmouth, Maine, and Cape Station on Portland Harbor in South Portland, Maine
- Operated by a subsidiary of NextEra Energy Resources
- Combined, the units total 250 megawatts
- Both stations have oil-burning units
- The land for Cape Station is leased, and the units are operated remotely by operations staff at W.F. Wyman Station
- Acquired by NextEra Energy Resources in 1999

Benefits
- Provides employment opportunities
- Adds tax base to the county
- Supports economy through purchases of regional goods and services
- Supports various local community organizations
Jamaica Bay Station

How Simple Cycle Combustion Turbines Work

Jamaica Bay Station is a peaking plant, which means it is called into service only at times of high customer demand on the regional power grid.

It is called a simple cycle plant because it has only one means of generating electricity—combustion of natural gas or oil. Fuel is ignited inside a combustion chamber, and the hot combustion gases blow into a gas turbine, spinning the turbine blades. The spinning turbine is connected by a shaft to a generator. The shaft turns the generator, and the generator makes electricity.
Fact Sheet

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Bellingham Energy Center

Overview
» Located in the town of Bellingham, in south central Massachusetts
» A 305-megawatt gas or oil-fired, combined-cycle plant
» A subsidiary of NextEra Energy Resources operates the plant and owns 152.5 megawatts of the facility
» An intermediate plant, which means it is dispatched to operate approximately 16 hours a day based on seasonal demand
» When operating at full power, generates enough electricity for approximately 300,000 homes
» Began commercial operation in 1991
» Acquired by NextEra Energy Resources in 1998

Benefits
» Provides employment opportunities
» Adds tax base to the county
» Supports economy through purchases of regional goods and services
» Supports various local community organizations

How Combined-Cycle Combustion Turbines Work

The Bellingham Energy Center generates electricity using both gas turbines and a steam turbine. First, natural gas is ignited inside a combustion chamber. The hot exhaust gases blow into a gas turbine, spinning the turbine blades.

The spinning turbine is connected by a shaft to a generator. The shaft turns the generator and the generator makes electricity. The hot exhaust gases are then used to heat water to steam, and the steam is piped into steam turbines, which turn generators making additional electricity. After passing through the steam turbine, the steam is condensed back into water, reheated to steam and used again in a continuous process.

This is called a combined-cycle plant because it uses the combination of a gas turbine and a steam turbine to extract maximum energy from the fuel used.