



# Panda's New Power Plant Up and Running in Texas

**I**n late September, Panda Power Funds dedicated its Panda Temple combined-cycle power plant at an inaugural celebration and ribbon cutting ceremony in Temple, Texas. The event concluded a 30-month long, \$1 billion construction project—the biggest in Central Texas to date—to build the much-needed natural gas-fired facility. The complex was completed two weeks ahead of schedule, and with better performance statistics than guaranteed. It is now completely operational and serving the Central Texas region.

## EFFICIENCY AND ENVIRONMENT

Built on a 250-acre former sunflower field, the 758-MW facility is the first Flex Plant in Texas. As one of the cleanest natural gas-fired plants in the U.S. fleet,

the facility operates at 57.5 percent overall efficiency and can synchronize to the grid in ten minutes, reach an emissions-compliant 60-percent baseload in 20 minutes, and arrive at full power in an hour.

The plant utilizes the latest and most advanced emissions-control technology—Dry Lox-NOx Burners + SCR—to minimize its environmental impact, and it recycles treated municipal waste water from the city of Temple for its cooling. The plant is permitted as a zero-liquid-discharge site and uses evaporation ponds to avoid introducing liquid pollution into the surrounding area. Flex Plant technology allows the facility to avoid holding the gas turbine at a low load during startup. This means the plant can ramp up directly to a low-emissions point, resulting in 84 percent less carbon monoxide (CO) per start cycle, and 89 percent less Nitrogen Oxide (NOx). Carbon monoxide

emissions total less than 10 parts-per-million (ppm), and NOx emissions total less than 2.0 ppm.

## CONSTRUCTION AND EQUIPMENT

The facility was delivered as a turnkey system in a project that brought together the efforts of EPC giant Bechtel and global OEM Siemens. Designed as a power island, all major components of the plant's power block including turbines, boilers, and generators were supplied by Siemens, thereby providing for a composite installation that is highly integrated.

The 2x2x1 combined-cycle plant relies on two Siemens SGT6-5000F turbines with shaping power, followed by newly designed Benson heavy duct-fired horizontal heat recovery steam generators (HRSG) manufactured by NEM, which can utilize all but 185 degrees of the

turbines' waste heat to generate secondary energy completely emissions-free.

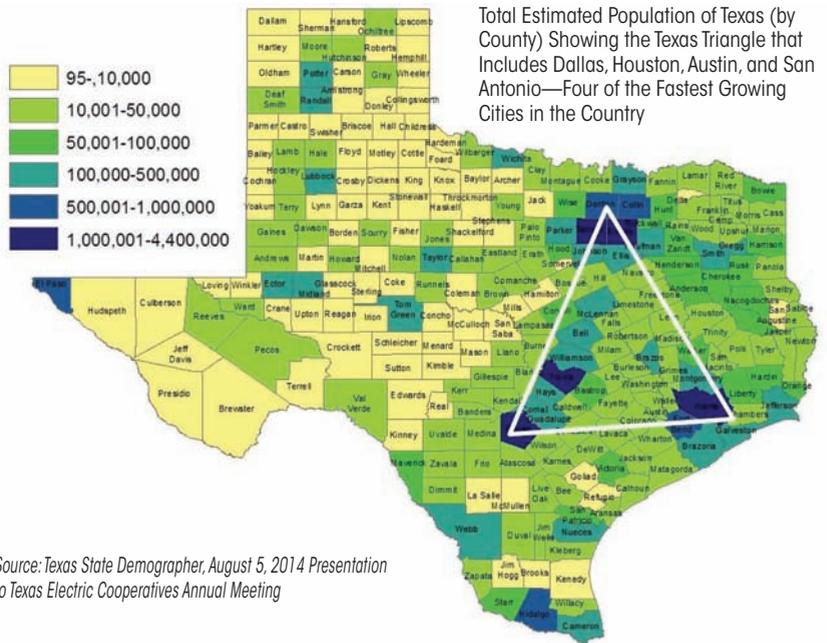
Shaping power allows each turbine to increase overall electricity production by 20 percent, effectively providing built-in peaking capacity that can be called upon during hot conditions or other high-demand times. When combined with newly designed boiler technologies that allow the plant to start more quickly, these innovations make the facility highly responsive to grid demand and market opportunities.

The Temple plant is only the third Flex Plant in operation in the United States. It features innovative design features that enable the fast-start facility to ramp up and down very quickly, across a large operating window, from low plant turn-down to high plant output. This functionality allows the plant to meet the challenges of an increasingly diversified power generation landscape in which facilities are called upon to supplement intermittent renewable energies at a moment's notice. Located as it is in Texas, a state with vast amounts of wind generation, the plant's fast-start capabilities offer a highly-attractive feature that will greatly benefit the region. Speaking about these benefits, Martin Tartibi, Senior Executive Vice President at Siemens Energy Solutions Americas said, "Siemens' fast and efficient Flex-Plant technology is a perfect fit in balancing intermittent renewable resources."

Bechtel depended on the services of more than 1,000 workers for construction of the plant. Of these, about 70 percent of the project's contractors, and 80 percent of its craft workers were locally sourced in Texas. The Temple project also represented the inauguration of a program in which discharged military veterans from Fort Hood in Killeen, Texas were trained and put to work as carpenters, ironworkers, electricians, pipefitters, and millwrights.

Bechtel was well-suited to such a large-scale project. With 116 years' experience and 53,000 employees globally, the company has been the number one power industry engineer and constructor for 16

## Population in the Texas Triangle



Source: Texas State Demographer, August 5, 2014 Presentation to Texas Electric Cooperatives Annual Meeting

consecutive years. To date, the company has completed more than 125 combined-cycle gas turbine power projects with a total generating capacity of 54,000 MW.

The Temple project was managed by Michael Robinson, who was responsible for engineering, procurement, and execution of plant construction. Despite the heavy industrial work—the project required a construction lift of 750,000 pounds for the steam turbine generator—the entirety of the project was completed safely across two million man-hours, without any lost-time accidents. "Panda Temple represents a tremendous team effort, including our partners Siemens and Panda, all of whom worked seamlessly to bring the plant online early, which was important for both our customer and the community," said Mary McLaughlin, president of Bechtel's thermal power business line.

The plant required 24,000 cubic yards of concrete, 80,000 cubic yards of excavated dirt, 1,086 tons of steel, 125,000 linear feet of installed pipe, and 1.5 million linear feet of electrical cable. At baseload, it has the equivalent of

approximately 1.1 million horsepower, or about nine 747 jet aircraft.

In addition to its primary F-class turbines, the plant also includes one SST6-5000 steam turbine, two SGen6-1000A generators, one SGen6-2000H generator, and an SPPA-T3000 instrumentation and control system, all manufactured by Siemens at its production facility in Charlotte, North Carolina. The combustion turbines were proactively designed to be upgraded as needed across their useful service life, allowing the plant to keep pace with advancements in electric generation technologies to be realized in the coming decades.

Located in the Texas Triangle that includes Dallas, Houston, Austin, and San Antonio—four of the fastest growing cities in the country—the Temple plant is well-positioned to provide electricity to an area of the state that needs it badly. Speaking about the future of energy in Texas, Todd Carter, Senior Partner and President of Panda Power Funds said, "One thousand new residents move to Texas every day, and this increase in

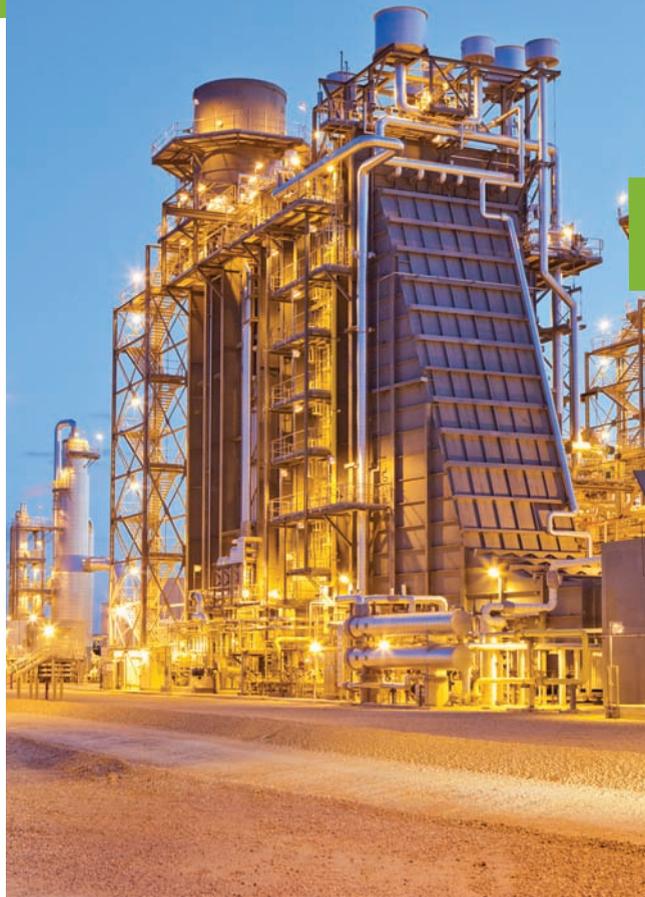
population has the potential to outpace the state's generation capacity. To solve this problem, the grid must grow in proportion to the state's growth." The Temple facility will provide enough energy to power 750,000 homes in a 60,000 square mile area, and contribute up to 1.6 billion dollars to the Central Texas economy, as verified by economic analysis conducted by Impact Data Source in Austin.

Looking up outside the plant, Jacki Engel, marketing manager for Siemens' 60 Hz product line said, "I'm very proud of this project. I know you're not supposed to think a power plant is beautiful, but I can't help but see beauty in this facility's clean functionality."

An identical plant—Temple II—is now being constructed adjacent to the current facility. When it becomes operational in 2015, it will double the facility's capacity.

## ABOUT PANDA POWER FUNDS

Formed in 2010 and headquartered in Dallas, Panda Power Funds grew out of Panda Energy International. Run by former senior management from Panda Energy, Panda Power is comprised of executives who have financed, developed, built, and operated 9,000 MW of generating capacity in projects totaling about \$6 billion. The company employs 59 people.



Panda Power Funds' 758-MW Combined-Cycle Power Plant in Temple, Texas. Photo courtesy: Siemens

"Siemens' fast and efficient Flex-Plant technology is a perfect fit in balancing intermittent renewable resources."

- Martin Tartibi, Sr. Exec. VP,  
Siemens Energy Solutions

Past projects include two of the largest natural gas-fueled power plants in the

country—a 2,250-MW plant in Gila Bend, Arizona, and a 2,250-MW plant in Eldorado, Arkansas—which required the combined efforts of more than 40 banks for financing.

The 2012 financing of the Panda Temple plant is regarded as a breakthrough for the U.S. project-finance market, and represents the first time in six years that institutional investors have financed a capital-intensive construction project in the U.S. using a term loan.

Panda Power focuses on domestic, greenfield power development, and brownfield acquisition and expansion. The company currently has multiple power projects in various stages of development or construction, including a 758-MW plant in Sherman, Texas of similar size to the new facility in Temple, a second sister plant called Panda Temple II located immediately adjacent to the current Temple facility, the Panda Stonewall project in Leesburg, Virginia, and two 829-MW plants called Liberty and Patriot in Pennsylvania. The Fund also develops solar and other energy projects. In 2011, it developed and constructed one of the Northeast's largest solar farms in Pilesgrove, New Jersey. The 20-MW facility was a joint project between Panda Power and ConEdison. 

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