

# SHOWCASE PLANTS

## Calpine Corporation Baytown Energy Center



Founded in 1984, the Calpine Corporation is the leading independent power company in the United States, with over 19,000 MW of capacity in operation and 10,000 MW of capacity under construction. Calpine generates and markets power through plants it develops, owns, and operates in 23 states in the United States, 3 provinces in Canada, and the United Kingdom. Calpine is the world's largest producer of renewable geothermal energy and owns approximately one trillion cubic feet of proven natural gas reserves in Canada and the United States.

With the exception of 900 MW of geothermal generation capacity in northern California, Calpine uses natural gas to generate power. This fuel source, combined with state-of-the-art combustion and emissions control technologies, enables Calpine to provide its customers with clean, efficient, and reliable energy.

Calpine's Baytown Energy Center (BEC) in Baytown, Texas, began operations in June 2002 and is one of 75 natural gas-fired power plants operated by the company. This combined-cycle cogeneration facility has a base capacity of up to 700 MW throughout the year plus an additional 130 MW of "peaking" power during the hot summer months. The BEC provides the neighboring Bayer Corporation chemical facility with all of its electricity and steam needs under a long-term contract. The remaining electric capacity joins Calpine's ERCOT (Electric Reliability Council of Texas) portfolio and is sold into the ERCOT wholesale and retail markets.

The BEC's combined-cycle operation generates electricity using three natural gas-fired combustion turbines, and then recovers thermal energy from the hot combustion exhaust to create steam. The steam is used to generate additional electricity in a steam turbine. This combined-cycle operation enables the BEC to produce electricity with 30% less fuel than the average fossil fuel-fired plant in Texas.

To make more complete use of the excess steam available, the BEC routes a portion to the Bayer plant to satisfy its steam requirements. BEC thus generates and uses both power and thermal energy (steam) from a single fuel source for industrial purposes. This approach, known as cogeneration, improves the BEC's efficiency by 10%.

Together, the combined-cycle operation and the cogeneration of electricity and steam produce a net heat rate of approximately 6,200 Btu per kWh, which is about 40% lower than the average fossil fuel-fired plant in Texas.

To reduce emissions, the BEC uses a combination of low-NO<sub>x</sub> combustion systems and selective catalytic reduction (SCR) technology. These technologies enable the BEC to produce electricity with 90% fewer NO<sub>x</sub> emissions and 45% fewer CO<sub>2</sub> emissions than the average fossil fuel-fired generation facility in Texas. Extending this comparison to annual performance, the Baytown facility represents potential emissions reductions of 7,000 tons of NO<sub>x</sub>, 13,000 tons of SO<sub>2</sub>, and 2.9 million tons of CO<sub>2</sub>. Moreover, the BEC's arrangement to supply steam to Bayer has allowed Bayer to cease operation of its boilers, which had much higher emission rates.

Beyond reducing emissions, the BEC also conserves water by recycling storm water and boiler blowdown to help maintain the cooling tower water supply. Additionally, the BEC receives back over half of the condensate associated with the steam that it sends to Bayer.

