



CHP
TECHNICAL ASSISTANCE
PARTNERSHIPS

Tesoro Petroleum

22-MW CHP System



Saving money was the primary reason the Tesoro refinery in Salt Lake City installed a large CHP system. The system nets Tesoro an approximate \$500,000 extra per month, in addition to increasing the reliability of the refinery's electric supply and improving the efficiency and environmental performance of the site.

Site Description

Constructed in 1908 and operated under the UTOCO and Amoco brand names, the Salt Lake City refinery was acquired by San Antonio-based Tesoro Petroleum Corporation in 2001. Tesoro Petroleum Corporation, a Fortune 500 Company, is an independent refiner and marketer of petroleum products and provider of marine logistics services.

The 55,000-barrel per day Salt Lake plant serves the growing hub of the intermountain west. The refinery produces gasoline, diesel fuel, and propane that are sold into the high-growth markets of Utah and Idaho. The refinery also supplies jet fuel to Salt Lake City International Airport and the U.S. Air Force bases in Utah and Idaho.

Quick Facts

LOCATION: Salt Lake City, Utah
MARKET SECTOR: Refineries
TOTAL PROJECT COST: \$25,000,000
ENERGY BILL IMPACTS: \$200,000 in savings plus \$300,000 in sales to utility
PAYBACK: 4.2 years
EQUIPMENT: 2 Solar Titan Turbines and 2 Rentech Heat Recovery Steam Generators
FUEL: Natural gas & refinery fuel gas
USE OF THERMAL ENERGY: Process steam
FACILITY SIZE: 145 Acres, 200 employees
FACILITY PEAK LOAD: 15 MW
FACILITY AVERAGE LOAD: 14 MW
CHP IN OPERATION SINCE: 2004
ENVIRONMENTAL BENEFITS: CO₂ emissions reduced by more than 85,100 tons/ year

Reasons for CHP

Two reasons drove Tesoro's investment in a CHP system: reducing operating costs and improving reliability. Tesoro's cost to generate electricity depends largely on natural gas prices, and currently the site can produce energy for \$35–\$40 per megawatt, enabling it to save \$200,000 per month on its energy bill. Additionally, it sells \$300,000 of energy per month to its utility, making a net improvement to its operations of \$500,000 per month.

The CHP system also boosted the site's reliability. The refinery is located in Rocky Mountain Power's rapidly expanding load center, where it was challenging for utility investment in transmission infrastructure to keep up with demand, resulting in power outages that were disruptive to the refinery's 24/7 operations. Other important drivers included the need to replace vintage 1940's boilers and a desire to be more efficient and environmentally conscious.



The CHP system operates efficiently and reliably 24/7 and supplies all of the refinery's power and steam needs, with excess power sold to the grid.

CHP System Equipment & Configuration

The CHP system uses two Solar Turbines SoLoNOx Titan T-130 gas turbine generators and two heat recovery steam generators (HRSGs) that can each produce 240,000 PPH of steam. The power and steam fully supplies the refinery's operations, with excess electricity sold to the utility grid. Power can also be imported from the grid if one of the turbines is down for maintenance.

The CHP system runs on two types of fuels: high pressure natural gas and refinery fuel gas. The facility is connected to the existing boiler feedwater systems in addition to other plant utilities. The two turbines each exhaust into their own heat recovery steam generator (HRSG) to produce the process steam required by the plant. The HRSGs use a supplemental burner system that is fired as needed to meet plant steam demands. Each HRSG feeds a common steam header at the CHP facility that is connected to the existing steam system. Steam production is limited by permit to 350,000 pounds per hour.

CHP Operation

- The CHP system operates 24 hours per day, seven days a week.
- The CHP system covers 100 percent of the refinery's 15-MW total peak electric load and 14-MW average load. Approximately 7–10 MWs of excess power are exported to the grid.
- The equipment follows steam load at 240,000 pounds per hour.
- Availability at startup was problematic, and the system experienced many trips in the first twelve months of operation. Completion of system FMEA to improve availability has resulted in 99% uptime.
- Each unit train is shut down for three days each year for routine maintenance, and once every five years for a turbine assembly replacement. In addition, the CHP system is configured with remote monitoring to alert staff to any problem.
- The net heat rate is 5,500 Btu/kWh.
- CAT Finance owns the facility. Tesoro leases from CAT Finance and manages the day-to-day operations.

For More Information

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