

Case Study

Qurayyah IPP

Solution: Turbine Inlet Air Chilling with Energy Storage

Market: Power Generation & Utilities

Design: Modular

Scope: Design & Fabrication



CHALLENGE

With a desert climate and rapidly increasing power demands, Saudi Electric Company sought to boost power production with a new combined-cycle gas-fired power plant equipped with Turbine Inlet Air Chilling (TIAC) and Thermal Energy Storage (TES). Located in Qurayyah, on the eastern coast of Saudi Arabia, the Qurayyah Independent Power Project (IPP) is the largest independent power generation project in the world, designed to deliver approximately 3,927 megawatts (MW) of electricity under a purchase agreement beginning in 2014. The project company, Hajr Electricity Production Company, includes Saudi Electric Company (SEC), ACWA Power International, Samsung C&T and MENA Fund.

SOLUTION

Stellar Energy was selected to supply the massive chilled water plant because of the company's global reach and large-scale project experience. Qurayyah IPP comprises six identical groups of equipment—two Siemens gas turbines, two heat-recovery steam generators and one steam turbine—each delivering 654.5 MW. The Qurayyah IPP is designed with the highest thermal performance possible—more than 50 percent efficiency, which is 14 percent more efficient than any other traditional steam power plant in Saudi Arabia.

For the turbine inlet air chilling system, Stellar Energy provided 16 water-cooled chiller modules and two secondary pump skids integrated with customer supplied turbine inlet chilling coils, filter houses and a thermal energy storage tank. The modules supply each plant with 46,000 tons of refrigeration, for a total of 92,000 tons of refrigeration. The system will store thermal energy during off peak consumption times and increase output during the daily six-hour peak consumption period. The water-cooled plants utilize HCFC 134a, a non-

QUICK FACTS

Owner:	ACWA Power
Location:	Qurayyah, Saudi Arabia
Plant capacity:	3,927-MW Combined Cycle
Project schedule:	Stellar Energy's design work began in April 2012; 16 Stellar Energy modules were delivered in June 2013; Assembly and commissioning will be completed by October 2013
Gas turbine:	Siemens STG6-5000
TR:	92,000 tons of refrigerated water from 16 modules
TES:	16 million-gallon Thermal Energy Storage (TES) tank

"I would like to take an opportunity to praise your team for their participation in the Qurayyah IPP project. I had the privilege to work with many other suppliers on QIPP and found Stellar to be among the best in contribution and cooperation."

*William "Doug" Edgar
Management Consultant
Sargent & Lundy, LLC*

ozone depleting refrigerant. The system design minimizes the number of chiller compressors, enhancing plant reliability and reducing overall operations and maintenance costs. The design also calls for two stages of chillers for superior efficiency and power consumption.

TIAC is a commercially proven way to improve power producers' profitability by increasing a gas turbine's power output by up to 30 percent during periods of high dry bulb and wet bulb temperatures. By mechanically chilling the inlet air before it enters the turbine compressor, TIAC gives the turbine a boost when it needs it most—in hot and humid weather. In addition to increasing power output, TIAC improves the turbine's heat rate, increasing efficiency and lowering emissions.



Stellar Energy delivered 16 water-cooled modules for the turbine inlet air chilling system that will produce a total of 92,000 tons of chilling in order to increase efficiency and power output of the Qurayah IPP.