



San Diego VA Hospital

4.6 MW Gas Turbine CHP System

Site Description

The Veteran's Affairs San Diego Healthcare System (VASDHS) provides health care to more than 241,892 veterans in the San Diego and Imperial Valley counties. VASDHS has 232 hospital beds, 512,771 annual outpatient visits, 53,980 enrolled patients, 6,941 admissions, and 2,061 full time employees. VASDHS is affiliated with the University of California, San Diego School of Medicine. The site covered by the project includes the VA Hospital complex, which consists of the Main Hospital Building, the Spinal Cord Injury Building, and the Central Heating and Cooling Plant. VASDHS was selected as co-winner in the category of waste/pollution prevention in the 2006 White House Awards Program.

Project Profile

In September 2003, Honeywell Building Solutions, formerly Sempra Energy Services (SES), entered into a 10-year energy savings performance contract (ESPC) with the U.S. Department of Veteran Affairs and the Department of Energy (DOE). The ESPC, which guaranteed savings to the hospital of \$1.4 to 1.5 million dollars annually, was based on using a 4.6 megawatt (MW) Solar Turbines Mercury™ 50 gas turbine generator set with a heat recovery steam generator. The project required replacing a single 800 kilowatt (kW) solar Saturn turbine generator installed in 1987 that did not have emission control capability. By replacing the generator with the low-emission Mercury™ 50, which utilizes an ultra-lean premix combustor design and produces less than 5 ppmv oxides of nitrogen (NO_x), the hospital was able to generate \$4.2 million dollars in emissions offset credits over the lifespan of the project. The lower emissions of the Mercury™ 50 will save an estimated 40 tons of NO_x pollution annually. The credit funds were used to help support the installation of the new plant and upgrades.

Quick Facts

LOCATION: San Diego, California
MARKET SECTOR: Health sector
TOTAL PROJECT COST: \$4 million
PAYBACK PERIOD: 4 years
ENERGY BILL SAVINGS: \$ No Data
EQUIPMENT: 4.6 MW Mercury™ 50 gas turbine (GT), heat recovery steam generator, absorption chiller, cooling tower, and variable frequency drive (VFD) on air handlers through out the hospital
FUEL: Natural gas
USE OF THERMAL ENERGY: Space and autoclave heating and abs. chilling
FACILITY SIZE: 1,030,000 square feet
FACILITY PEAK LOAD: 5.4 MW
FACILITY AVERAGE LOAD: 2.2 MW
CHP IN OPERATION SINCE: 2005



San Diego VA Medical Center

Cost Reduction Measurement and Verification Activities

The 4.6 MW gas turbine was an ideal fit for the hospital due to its recuperated exhaust heat design. The recuperator recovers exhaust heat by transferring it to the combustion air downstream of the compressor. The result is a significant electrical efficiency improvement while still providing 13,000 pounds per hour of 150 psig saturated steam used for heating, autoclaves, and absorption cooling on the hospital campus. In addition, the turbine handles nearly all the

hospital's power needs and also provides secure onsite generation in case of a utility failure. After 2,000 hours of operation, the plant received an Energy Star award from the U.S. DOE.

Under an "energy cost reduction method" verification strategy adopted by VASDHS, the 4.6 MW turbine included continuous metering for power generation, natural gas use, and ambient air temperature. Two performance characteristics were determined from these measurements: 1) the gas turbine heat rate, and 2) the gas turbine availability. Additionally, a third methodology was performed to determine the economic savings. Post installation and measurement and verification activities were conducted for two years following the installation. A set of 15-minute trend data was collected for year two that showed that the gas turbine met the expected heat rate and availability levels, as well as the cost savings that were achieved for the first performance year. The annual savings associated with the new chiller and cooling tower accounted for five percent of the total savings. The project achieved second year savings of \$1,620,162, which exceeded the guaranteed savings of \$1,547,492.



Gas turbine exhaust controls



4.6 MW Mercury™ 50 gas turbine at SDVA

"During a critical pricing day in the summer the hospital imports approximately 1.5 megawatts. Through load shedding and event day alerts the SDVA is reducing those imports by 500 kilowatts or almost 33 percent. We are also looking to install inlet cooling to increase output and further offset imports during summer peak periods." – Michael Moriarty, GovEnergy

HVAC Improvements

The VASDHS installed variable frequency drives (VFDs) on all 14 air handler units and the associated exhaust fans. In total, 27 VFDs were installed. The sequence of operations is as follows: at 5:00 PM each day, the VFD is reset to 90% speed for the selected fans and the associated exhaust fans in a synchronized manner. At 7:00 AM, all fans are set back to 100% speed. The frequency of all fans is trended on an hourly basis as part of system measurement activities that continued for two years post-installation. The results of the study found an electric energy savings of 286,991 kWh/year, natural gas savings of 977 million BTU/year, an energy savings of 1,956 million BTU/year, and a total energy cost savings of \$30,126/year from the improved VFD system operation.

For More Information

Solar Turbines Inc.:

<http://www.solarturbines.com>

GovEnergy: <http://www.govenergy.gov>

SDVA: <http://www.sandiego.va.gov/>

U.S. DOE: <http://www.energy.gov/>

Additional CHP Pacific Projects Profiles:

<http://www.pacificcleanenergy.org>

Date Produced: 8-16-2011

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