



CHP and PV Increase Power Reliability at Twentynine Palms MAGTFTC

The Marine Air Ground Task Force Training Command (MAGTFTC) at Twentynine Palms, California, unveiled a new 7.2-MW dual-fueled Combined Heat and Power (CHP, a.k.a. cogeneration) system in February 2003. This project is an outstanding demonstration of the value of CHP for addressing both energy cost and energy security issues at federal sites. The \$16 million CHP project, including more than three miles of high-pressure gas lines, design, construction, and financing, will pay for itself in less than four years. In fact, the revenue stream from this project is providing the financing for phase-three upgrades under an energy savings performance contract (ESPC), including a 1.2-MW photovoltaic (PV) system, three chiller plants, and several other critical infrastructure improvements.

In the Mojave Desert 45 miles north of Palm Springs, the MAGTFTC has a twofold mission—to operate the U.S. Marine Corps Air Ground Combat Center for live-fire combined arms training that promotes readiness of operating forces, and to provide facilities, services, and support responsive to the needs of tenant commands, Marines, sailors, and their families. Energy security is critical to ensuring readiness of operating forces. With more than 10,000 military personnel and family members housed at Twentynine Palms, where summer temperatures can reach higher than 120 degrees, a reliable power supply is a necessity, as is cooling indoor environments. The new CHP unit provides a reliable, efficient, secure energy source at a low cost to support the base's missions.

The CHP system will reduce the base's need to purchase electricity from the local utility by almost two-thirds, resulting in an annual cost savings of approximately \$5.8 million. The savings represent the net effect of reduced electricity purchases, increased natural gas purchases, and maintenance, operation, repair, and replacement costs for the cogeneration system. And in the event of a power outage, the CHP system will provide reliable power to four critical load circuits on the base using natural gas (or diesel in the event of gas failure).



CHP plant under construction; lowering the turbine into the turbine hall.

The project was accomplished under an ESPC administered by the U.S. Army Corps of Engineers and the Naval Facilities Engineering Service Center. ESPCs allow federal agencies to fund improvements from guaranteed energy savings and energy-related operational savings. The

contract was awarded September 2001, and construction began May 2002 and was completed in the spring of 2003.

The total cost of the CHP system was \$16.2 million and included the construction of a new 7200-ft² turbine hall, the 3-mile high-pressure gas line, and all connections to the electrical substation feeding the critical base loads. After generating electricity, the natural-gas-driven hot turbine exhaust is captured in a heat-recovery generator to supply the base's high-temperature hot water system and to power a 200-ton absorption chiller for turbine inlet air cooling and turbine hall space conditioning. The turbine will provide approximately 30–35 MBtuH of high-temperature hot water through the heat-recovery hot-water generator. During summer operations the high-temperature hot water produced will power three new absorption chillers, one in each new chiller plant (approximately 1650 tons of cooling). The system has dual-fuel capability to enable the base to make a seamless switch between gas and diesel if there is a failure in the natural gas fuel supply.

The project also involves installing new fiber-optic communication cabling to connect the cogeneration plant with monitoring and control equipment at the electricity substation serving the base. When complete, the overall system efficiency is expected to be 75%, 2.5 times greater than the average efficiency of the U.S. electric grid.

The collaboration of many parties contributed to the project's success. The USMC-MAGTFTC, the U.S. Naval Facilities Engineering Service Center, and the ESCO, Johnson Controls Inc., were primary partners. U.S. Department of Energy's (DOE's) Federal Energy Management Program (FEMP) took an early interest in the Twentynine Palms project as a showcase for CHP in federal facilities. FEMP helped identify funding for initial design work and provided technical guidance. Southern California Gas completed a preliminary design and feasibility study, funded by DOE's Office of Distributed Energy Resources. Johnson Controls completed final designs, implemented, and financed the project under the Army Huntsville ESPC.

This CHP project is a resounding technical and financial success. It demonstrates CHP's ability to have broad impacts by not only paying for itself, but also by financing renewable energy projects that further reduce peak loads. It also shows how a base-loaded CHP system can be a very cost-effective approach for addressing energy security objectives at federal sites.



View of turbine hall with black-start generator outside building. CHP system is on line.

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