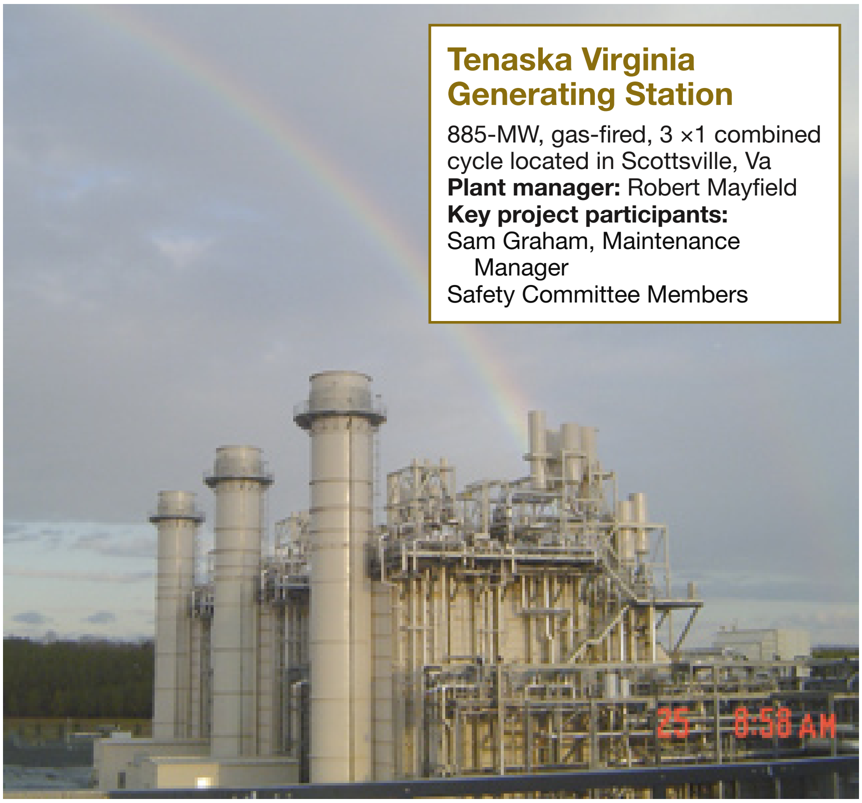


Tenaska Virginia

Tenaska Virginia Generating Station

885-MW, gas-fired, 3 ×1 combined cycle located in Scottsville, Va
Plant manager: Robert Mayfield
Key project participants:
Sam Graham, Maintenance Manager
Safety Committee Members

example, the cooling-tower manufacturer provided guidance on fall protection, safety handrails were added throughout the facility, and fall protection guide wires were installed for areas that required access.

- Post-outage reviews determined where process improvements could be made. Outage safety luncheons were held with all contractors and employees to express the importance of safety policies and procedures, sharing safety ideas and to demonstrate commitment to safety. "Near misses" were added to the company program of "event reports" and "lessons learned." This aggressive approach to redefine problems is contingent upon a blame-free environment where individuals are able to report errors or close calls without punishment, as well as a willingness on the part of the organization to direct resources to address safety concerns.

Monthly safety audits are conducted and daily morning briefs are held to discuss operational, safety and maintenance concerns. All employees attend monthly safety training. The night-shift team audits all new work permits and LOTOs for the day. Any employee can stop work if he or she sees an unsafe work practice. The first two days of every outage, managers review all outage paperwork to ensure attention to detail is displayed on administration requirements such as LOTO and work permits. Contractors are given a safety brief prior to commencing work followed by a written exam. An annual written safety exam is given to all employees. Employee safety drills are performed on a frequent basis.

Results. The safety program was invigorated by establishing goals and promoting a new safety-culture atmosphere. As the Safety Committee witnessed first-hand the positive impact it could have on the safety culture, it fueled the desire to improve all plant processes. This enthusiasm spilled over to other members of the plant team resulting in increased employee involvement in the continuous improvement effort. The Safety Committee started to take on new responsibilities and actively look for improvement areas. Post-outage reviews, near-miss reporting, and evaluation of routine activities began to provide areas for improvement that were fairly easy to implement.

Environmental Stewardship

Water mist replaces CO_2 to protect personnel, environment

Whiting Clean Energy

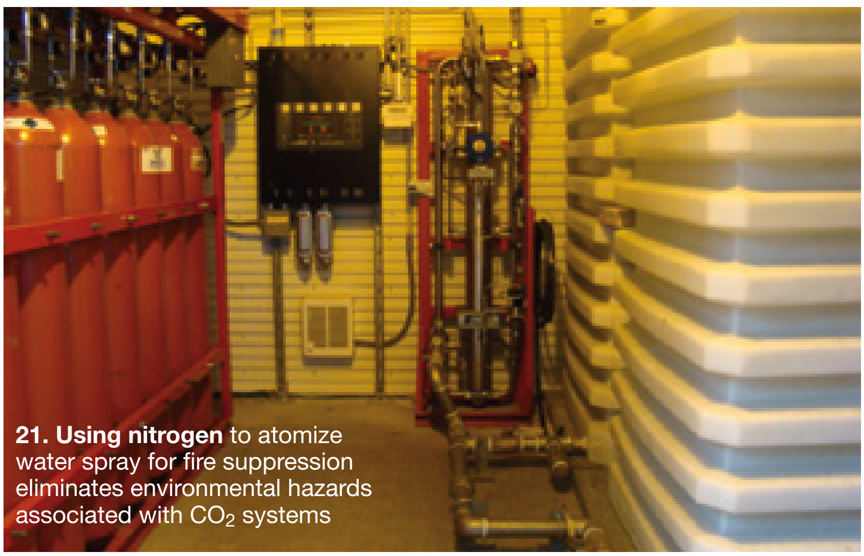
Owned by BP

Operated by GE Contractual Services

Challenge. The goal of plant staff was to provide a fire suppression system for the site's GT modules that

Whiting Clean Energy

525-MW, gas-fired, 2 × 1 combined-cycle cogeneration facility located in Whiting, Ind
Plant manager: Donald Christensen
Key project participants:
Whiting Clean Energy plant staff



21. Using nitrogen to atomize water spray for fire suppression eliminates environmental hazards associated with CO_2 systems effectively extinguishes fires while minimizing equipment damage. The system would minimize greenhouse gases and eliminate risk to personnel—features not found with the existing CO_2 system.

Solution. The water-mist fire protection system selected uses water as the suppressant and nitrogen as the atomizing medium. While water is the primary extinguishing agent, nitrogen is used to enhance the system's extinguishing capability in the case of small fires. System design ensures that the oxygen level in the protected spaces (zones) is maintained within a range that is safe for personnel occupancy.

Results. The new fire suppression system meets all of the site's requirements. The facility was able to eliminate the existing CO_2 system while reducing the operating cost associated with that extinguishing agent. A positive impact was made on the environment by reducing the risk of a potential discharge of environmentally harmful CO_2. Switching from CO_2 to water mist also eliminated the cost of upgrades associated with recent regulatory requirements concerning releases of greenhouse gases.

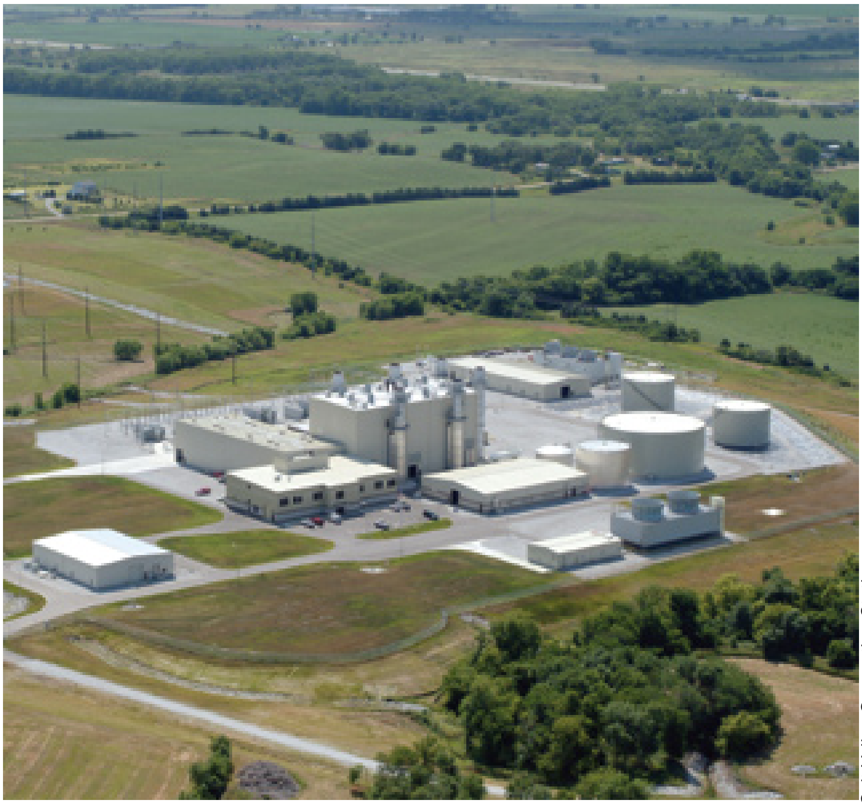
Water-use study spurs conservation projects

Salt Valley Generating Station

Lincoln Electric System

Challenge. Reducing effluent pumping and treatment costs and wastewater streams provides economic and environmental relief. A 175-MW combined-cycle facility constructed in 2003 was designed to use effluent from a municipal wastewater treatment plant as its main water source. The peak water usage for the facility is 1.9 million gpd.

In 2007, more than 94 million gal of effluent were chlorinated and pumped the two miles from the water treatment plant to the generating station; over 41 million gal of powerplant wastewater were returned to the municipal treatment plant. Water-plant effluent is treated to varying degrees of purity and that process creates wastewater streams, so any reduction in plant water use reduces municipal-plant effluent supply requirements and the associated pumping and treatment costs as well as wastewater processing costs.



Salt Valley Generating Station

Salt Valley Generating Station

175-MW, gas-fired, 3 × 1 combined cycle located in Lincoln, Neb
Plant manager: Brad Hans
Key project participants:
Vern Cochran, Maintenance Manager
Jim Dutton, Operations Manager
Byron Bakenhus, Senior Engineer
Tom Davlin, Manager of Projects Engineering

Solution. To reduce effluent and wastewater volumes the plant initiated a water-use study with the purpose of identifying potential water conservation, reuse, or recovery opportunities. Four water projects were identified as viable:

- Recovery of condensate from the cooling of GT inlet air.
- Reuse of water-treatment-system RO flush water.
- Recovery of water used to cool the condensate polishing system pump.
- Reuse of probe run-off water from RO and chlorine analyzers.

Results. Nearly 1000 gal/hr of condensate can be generated by our LM6000 inlet-air cooling system during a hot, humid summer day. This water is of very high quality but was being diverted to a storm water drain. To make use of the condensate, plant staff designed storage tanks, pumps, and piping to recover it from the three combustion turbines serving the site.

The high-quality water is injected into the steam-turbine cooling-water loop. Since cooling-tower evaporation is the largest use of water onsite, recovery of condensate reduces both the plant's effluent requirements and wastewater discharges: Cooling-tower water quality is improved and blowdown decreased. Condensate temperature also is lower than that of the steam-turbine cooling-water loop, thereby improving condenser performance.

The plant's water treatment system uses reverse osmosis (RO) which requires periodic flush/rinsing of the filters with high-quality deionized water. Up to 13,000 gpd of rinse water was being discharged to the wastewater drain. This water is of relatively good quality (much better than the effluent), therefore it was returned to the "medium" quality service-water storage tank. By recovering and reusing the 4.7 million gal/yr of rinse water the plant does not have to send it back to the wastewater treatment plant for processing and reduces effluent pumping and treatment requirements for, a total annual savings of over $30,000.

A steam-turbine condensate conditioning system recently was installed. It includes a gas-transfer membrane system and a vacuum pump. The water use study identified a discharge of approximately 4 gpm of high-quality condensate makeup water to drain for the vacuum pump sealing water. Plant personnel designed and installed a recovery tank, pump and piping that allows this water to be returned to the condensate storage tank, saving 36,288 gal/yr of condensate.

The water treatment system neutralization basin was being dumped into the wastewater system. The discharge is normally just probe run off water, mainly from the RO and chlorine analyzers, etc. The plant owner is designing a system to send approximately 7500 gpd back to the main effluent storage tank.

Columbia Energy Center

EPA, state recognize emissions-control efforts

Columbia Energy Center
600-MW, gas-fired, 2 × 1 combined-cycle cogeneration facility located in Gaston, SC
Plant manager: Gil Kaelin
Key project participants:
Julie Stinedurf, Regional Environmental Coordinator
Victor Shaw, Plant Engineer

Columbia Energy Center

Calpine Corp

Challenge. Our 2 × 1 F-class combined cycle provides 1 million lb/hr of steam to an adjacent Eastman Chemical facility, thereby allowing that plant to retire several old coal-fired boilers. The 54%-efficient CHP system reduces CO_2 emissions by nearly 150,000 tons/yr compared to an onsite steam plant at the chemical manufacturing facility.

Calpine's Columbia Energy Center sought recognition for its CHP design. Proactively increasing communications and engaging in open dialogue with the EPA and South Carolina Environmental Excellence Program (SCEEP) gave the plant national and local forums to advance the definition of environmental stewardship.

Solution. The plant applied to become an EPA Energy Star CHP partner. This partnership works to promote the economic, environmental, and energy infrastructure benefits of CHP facilities. We also volunteered to become a SCEEP member, a state-run program focused on preserving the environment and facilitating the flow of ideas between facilities and regulatory agencies.

Results. Columbia Energy Center was awarded the 2008 EPA Energy Star CHP Award for using GT exhaust to produce the steam supplied to the adjacent Eastman Chemical plant. Our plant also was recently accepted into SCEEP, a voluntary program similar in intent to OSHA VPP. SCEEP provides members the opportunity for closer communication with state agencies and more detailed background on state initiatives for compliance.

Low-emissions power benefits plant's host community

Faribault Energy Park

Minnesota Municipal Power Agency

Challenge. The average citizen is skeptical about siting a powerplant in his or her community. The familiar Nimby (not in my back yard) factor is very real—frequently stopping projects in their tracks. A Google search for the term "power plant opposition" yields 1.2 million listings.

Virtually everyone in the industry knows how opponents, contrarians, or activists who emerge from the community (or from outside it) can impact a project, including: disrupt or destroy schedules, increase cost, make state regulatory bodies hesitant to grant approvals, add a political shading to local inspection processes, or just kill it.

Solution. In this age of environmental activism, it was clear that the community needed to hear about environmental benefits of our project before the first shovel of earth was turned. We began communicating with the host community early and often about how this facility would include an appealing package of environmental and community benefits. Even the nomenclature was important, calling it an "Energy Park" instead of powerplant. From the start, we emphasized that this plant would produce "green" energy,