



# HUMMING Through A Seventh Decade

**R**oland Tyndall, chief operating engineer for the Seaford power plant in Delaware, feels a twinge of nostalgia when he gazes upon the levers, Bakelite knobs and analog dials of the plant's disabled wall-length control panel. The plant now hums along under state-of-the-art digital control; newly installed computerized switchgear allows engineers to bring peak-shaving generators on line with a few mouse clicks.

Gone are the days when Tyndall and his staff had to coax the diesel-powered generators up to speed. With eyes on the Speedotron, the operator would finesse the controls until the output voltage was exactly right, then—at the precise instant—throw the lever to bring the unit on line. Tyndall's hand falls naturally onto the worn handle of a breaker; a motion familiar after decades of running the municipal power plant. Until recently, the switch lever would have moved

a series of connecting rods, operating an oil-filled switch engaging a massive copper bus bar, and delivering power to the city of Seaford.

**D**espite the dated elegance and the mechanical simplicity of the old control system—even if it was reminiscent of the set from a black-and-white movie—it was also a disaster waiting to happen. A simple operator error, such as engaging a breaker a moment too soon, could have violently wrenched a spinning alternator free of its shaft. Worse yet, a failure within the aged control panel could have created a disastrous arc, severely damaging the old generator bus and controls.

The new switchgear is part of a \$3.5 million renovation undertaken to keep the 61-year-old plant functional. Because the peak-shaving generators save Seaford \$900,000 a year on electricity purchased from Delmarva Power, the region's investor-owned

utility, the city will see a quick payback on its investment, with no increase in rates.

Renovations included much more than upgrading controls. New transformers were necessary to match output voltage to the city's distribution voltage. While the Seaford plant's five generators can produce seven megawatts of power, its transformers could not handle the full load. "We couldn't run all our engines at the same time," said Tyndall. The new transformers give Seaford the additional capacity necessary to meet its peak-shaving requirements under the heaviest demands.

**L**ike most communities on Delmarva—the peninsula dangling between the Chesapeake Bay and the Atlantic Ocean—Seaford is proud of its independence. In 1937, city officials felt they were paying too much for streetlighting and decided to build their own power plant. "The city was independent and did all its own generating until 1964," said Tyndall. The city then started buying wholesale power from Delmarva Power. In 1971, it shut down the power plant and placed it on standby. Then, the Arab oil embargo increased energy prices, prompting Seaford to ask Downes Associates, Inc. of Salisbury, Md., to evaluate the feasibility of firing up the plant once again—this time as a peak-shaving facility.

"We found that such an operation would be very beneficial to the community and helped negotiate a new peak-shaving agreement with Delmarva Power," said David V. Downes, vice president and CEO of Downes Associates.

Seaford is a waterfront community, built along the Nanticoke River. A broad tidal tributary emptying into the Chesapeake Bay, the Nanticoke is one of the most pristine rivers east of the Mississippi. The Seaford power plant sits on a waterfront site that has been an important point of industry and commerce for hundreds of years. Once a musket foundry, it was later a bustling seafood port. During the peak of Chesapeake Bay oyster harvests, flotillas of laden vessels nearly blocked the river. Skipjacks, the traditional single-masted dredge boats used to harvest oysters from the bay, would

raft together at Seaford, waiting to unload their treasured bounty of bivalves.

The nondescript brick structure housing the Seaford power plant bears little connection to the history of its site, yet remains united with the river. Environmental improvements included in the project ensure the facility will operate with respect for the fragility of the river.

Fuel tanks once located by the river were moved to the other side of the plant and are surrounded by a containment system that will protect the Nanticoke in the rare case of a spill. Soils previously contaminated by fuel were removed and replaced with clean soils in cooperation with the Delaware Natural Resources Department's innovative voluntary cleanup program.

"We were one of, if not the first, to enter DNREC's voluntary program," said City Manager Dolores Slatcher. "We appreciate and cooperate with DNREC's efforts in Seaford."

Remaining contaminated soils will continue to be restored by the natural biological action of oil-eating bacteria. The site will be monitored using groundwater wells and regular testing.

**F**or decades, Seaford's engines were cooled with water pumped from the Nanticoke and returned directly to the river. Despite a Delaware Department of Natural Resources' grandfather clause that would have allowed the plant to continue drawing river water, the city opted to install an enclosed cooling tower system. The new closed system not only protects the river, but also improves operating efficiency. Previously, during low tides and when summer warmed the water, the plant experienced difficulty cooling its engines and had to scale back operations.

At first glance, the new computerized equipment appears out of place in the industrial-age setting of the power plant's six vintage Fairbanks-Morse generator sets. Five of the six units—all predating the jet age—can operate on a daily basis during Delmarva Power's peak demand periods. The five units, ranging from 1,360 kW to 2,000 kW, produce the plant's seven-MW total. The sixth unit, a

pre-World War II model, has been retired since parts are no longer available.

**G**eorge E. Owens, P.E., president of Downes Associates, has fond memories of Seaford's entire electric system. "I started my career with Downes Associates nearly 25 years ago working in Seaford and later made the community my home," he said. "Downes and Seaford are family to me and to each other. Our early involvement in the power plant provided support and later startup of the mothballed generators in 1980. Seaford began a very effective peak-shaving operation that continues today, saving the citizens of Seaford up to \$85,000 per month with the use of the new switchgear, transformers and computerized controls."

Rick Garner of Downes Associates remembers the first time he gazed inside the city's power plant. "It was the engineering equivalent of walking into Jurassic Park," he said. In-house maintenance and regular rebuilds have kept the diesel engines in like-new operating condition, and Tyndall has no doubt they can continue running flawlessly for decades. From Garner's perspective, however, there was the challenge of integrating digital controls with vacuum-tube-era equipment. It was a task akin to installing modern avionics into a B-17 bomber.

Fortunately, Woodward, the company that provided the original engine controls, still supported the aged Fairbanks-Morse diesels. Working with Gehardt's Inc., a Woodward distributor in Delaware, Downes configured a control system suited to the Seaford power plant. While the engines still require manual starting, the generators can be brought on line automatically, semi-automatically or manually.

The PC-based interface allows parallel operation of all generator sets, but should the system fail, plant personnel can control units individually, providing the plant a near fail-safe redundancy. Moreover, the new controls give "black start" capability. Should

Delmarva Power experience a transmission system outage in the Seaford region, the city could bring its plant on line in minutes, routing electricity to emergency services, traffic signals and Nanticoke Memorial Hospital—one of the utility's most important energy customers.

Rewiring the aged facility presented its own set of challenges. "Armor-clad cables saved Seaford the cost and time of installing metal conduit," said Garner. All of the new control equipment, control wiring, and power conductors had to be installed without disrupting normal power plant operations.

"Thanks to the diligent work and cooperation from contractors, equipment vendors, and power plant staff," said Garner, "the five generators were seamlessly transferred over to the new control system without missing a single day of peak-shaving operations."

Garner also emphasized the safety of the new system, something he appreciates after working behind the old control panel with his head only inches from the live bus bar. New busses are housed in Class C arc-resistant switchgear built by ABB. Should a fault occur with any of the equipment, the switchgear housing would contain the blast, channeling the explosive force through vented doors on top and away from personnel.

**W**hen Tyndall stands next to the new transformers and looks at the lines leading to the Seaford substation, he allows himself a smile of satisfaction. Back inside the plant, he admits that, after years of using knobs and levers, it will take some time getting used to operating generators from a computer screen. But, adds Tyndall, he and his staff are proud to supply the citizens of Seaford with state-of-the-art reliability—with no increase in rates.

As for the old control panel, Tyndall and his staff plan to restore it as a museum piece. "Come see us," invites Tyndall. "We'll show you the past and the future in one visit." ■  
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