

Amid extensive challenges, from space constraints to outdated infrastructure, leading EPC provider Zachry Holdings, Inc. completed the environmentally-innovative Topaz Barney Davis and Nueces Bay projects in March 2010. Barney Davis and Nueces Bay remain some of the largest re-powering projects in recent history, replacing 660 megawatts from outdated plants with 1,340 megawatts of clean energy—enough to power 597,000 homes.

Barney Davis and Nueces Bay, located in Corpus Christi, Texas, restored outdated infrastructure with modern GE gas turbines and Nooter-Erikson HRSGs, lowering emissions by 80 percent. The projects, which began in July 2007, were awarded the Best Industrial Project of 2010 by *ENR Texas & Louisiana* magazine last December.

### Overcoming Challenges

While re-powering Barney Davis and Nueces Bay, two Brownfield sites about 20 miles from each other on the Gulf Coast, Zachry created collaborative solutions to problems such as aged existing infrastructure, necessary demolition, close waterlines and lack of laydown space.

Nueces Bay held five existing 1940s gas-fired plants resting on manmade land, which was previously the bay. The site, located adjacent to the ship canal, required massive structure modifications on reclaimed earth unsuitable for building. Three of the five units were completely demolished at the start of construction to meet schedule demands; despite the challenges, Nueces Bay was completed 26 days ahead of schedule.

Zachry mitigated ongoing issues with tight planning and efficient work systems, focusing on the re-powering project while carefully navigating through problems with the existing infrastructure. Unit 7 was repowered using the latest in combustion turbine and HRSG technology, upgrading a 1960s steam turbine and decreasing plant emissions by 80 percent.

The 4.5-acre site, small compared to a typical 20 acres for a project of this size, was further restricted by its bounded three sides of water. Zachry coordinated with the Port of Corpus Christi to allow for laydown space for

large supplies, such as the combustion turbine-generators, which were transported via heavy haul vehicles to the site.

*“Continuous planning throughout the entire duration of the job was necessary to move things forward,” Anderson said. “Timing each piece was essential.”*

With two units on the Barney Davis site, Zachry re-powered Unit 2 while de-commissioning both units and segregating the common systems in an ongoing three-month-long outage. Everything was reverse-engineered to re-power Unit 2, while keeping Unit 1 operational. The situation required Zachry to survey the building, locate interconnecting structures and implement an outage plan. After Unit 2 was re-powered, Zachry added Units 3 and 4.

“Early on we were working in and around an operating facility and later we were segregating Unit 1 from Unit 2,” Anderson said. “We were rebuilding old equipment and then starting it all up, so we had to educate ourselves on 40-year-old parts in a limited timeframe.”

### Re-powering Innovation

Unlike a complete plant replacement, re-powering jobs create an alternative source of steam for an existing steam turbine. Both of the Topaz projects replaced the rankine cycle of the plant to create a modern, combined cycle facility.

“As re-powering projects, the Topaz projects provided some interesting challenges,” said Jimmy Stinnett, associate project executive for Zachry. “One of the first things we did was to assess the condition of the existing equipment to see what was usable and what should be retired. From there, we had to interface the new components with the old.”

After the re-powering, Units 2 and 7 exceeded promised heat rate and power. The projects involved the modernizations of the cooling water systems, control rooms and replacements of existing conventional boilers with new gas turbines and HRSGs.



“We designed new systems with old plants. It took construction and engineering developing ideas and mobilizing as a team,” Anderson said. “It was a group effort whereby construction and engineering arrived at the best solutions.”

Zachry Engineering worked closely with the Zachry construction team to match existing infrastructure. The engineering team engineered the piping design, wiring, controls systems and steam turbine upgrades to work with the existing infrastructure, piecing together a puzzle generations apart.

***“We were a single entity working toward a common goal,” Anderson said. “In a word: synergy.”***

To modernize the units as combined cycle plants, the boiler systems and steam turbine were either replaced or modified. The team used duct firing and installed electrical chiller packaging to produce more steam and power. The design called for the best available control technology to limit NO<sub>x</sub> and CO<sub>2</sub> emissions.

### **Employee & Customer Commitment**

On both Barney Davis and Nueces Bay, planning was a major factor in project delivery with zero change orders. As a full Zachry EPC project, engineering and construction worked together to create a construction-driven design and follow through with the plan.

“Everyone clearly understood the path and what we needed to do. We were one team, with one objective in all cases,” Anderson said.

Full EPC work is not new to Zachry who has six projects completed or in-process with the co-efforts of both Zachry Industrial’s Construction Group and Zachry Engineering. Their Zachry Project Execution Planning Process (ZPEPP®) is designed to include stakeholders in the project early to limit miscommunication later on.

“These two projects were some of the first Zachry projects completed as one engineering and construction team in-house,” Stinnett said. “We had excellent collaboration among the San Antonio office, design office and the job sites.”

Safety also proved to be an important part of efficient completion in both projects. With a low absentee rate and impressive safety record, Topaz Barney Davis was awarded the first-ever internal Heart of Zachry award to a construction site.

Employees on Heart of Zachry-award-winning sites receive takeaway pieces such as medallions, certificates, a banner or plaque, as well as a celebration at the site including a dinner or lunch; recognition from the customer; and esteem within the Zachry organization.

“Safety was the culture we created from the first day and extended for the entire project. Everyone on the job site shared a goal for safety and were impassioned about safety,” Anderson said.

At each stage, Zachry implemented solutions while planning and building large and complex re-powering projects. Replacing 660 megawatts with 1,340 megawatts presented difficulties, but through the process, Zachry displayed a commitment to safety, service and quality. The result—clean energy, renewed power and units able to stand the test of time.

***“Because of the re-powering, these projects were unique,” Stinnett said. “They proved to be very successful, allowing a win-win for our customer, Topaz, as well as Zachry.”***

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