Some half-built combined-cycle plants can be had for a ‘song,’ but they are not without challenges

Somewhere in China, a while ago, someone reportedly said, “May you live in interesting times.” Perhaps that person was gazing at the heavens and had a vision of the men and women associated with the US gas-turbine-based power business at the end of the 20th century and beginning of the 21st.

Consider the following: In the late 1990s, the relatively low price of natural gas and the promise of riches in deregulated power markets converged to create the greatest boom market in this sector of the electric power industry. From the beginning of 1998 through the end of 2004 more than 200,000 MW of GT-based capacity was installed in the US, according to A Michael Schaal, an analyst for Energy Ventures Analysis Inc, a consulting firm in the Washington (DC) area. And still more equipment was ordered for plants cancelled prior to the start of construction and during construction.

To put this boom in perspective, consider that only three countries, in addition to the US, had a total generating capability of more than 200,000 MW at the end of 2003—China, Japan, and Russia.

A tripling of gas prices, and the realization in 2002 that there was far too much generating capacity nationwide to serve the projected demand, caused the biggest bust in the history of the industry. The transition from boom to bust came so quickly that large projects in construction were shut down almost over night to stem the flow of red ink on owners’ books.

One example was Houston-based Duke Energy America’s (formerly Duke Energy North America) 1200-MW Moapa project a few miles north of Las Vegas. The majority of its construction crew of nearly 1100 was gone in less than a week after the decision was made to lay up the facility, according to a knowledgeable source. Lay up took a small group of Duke Fluor Daniel employees three months to complete. Note that Duke Fluor Daniel, an EPC partnership that has been dissolved, was responsible for construction until it was halted.

Short of making anchors or razor blades, the only option for equipment ordered and not installed and equipment installed but not operating was storage (1) in a warehouse, (2) out of doors (climate permitting), or (3) in place at a partially completed powerplant. How to prepare equipment for storage to retain its value was the subject of “Don’t underestimate the demands of storing powerplant equipment long-term,” COMBINED CYCLE Journal, Fall 2004; available at www.psimedia.info/ccjarchives.htm.

Shortly after that article appeared, the industry began to resuscitate. This was expected for reasons that include these:

First of two units at Nevada Power Co’s Lenzie combined-cycle plant—formerly Moapa—is expected in service before year-end.
Storage is expensive so it is not prudent long-term.

Some owners of stored equipment had refocused their core businesses away from the unregulated generation sector of the industry and wanted to divest assets.

Other owners just threw in the towel and walked away from assets, leaving them for the lenders to deal with.

A few traditional electric utilities were interested in rebuilding or expanding their generation business units.

New generating capability actually was needed in a few areas of the country.

Recently, several partially completed plants have been sold. Sellers, such as Duke Energy, have benefited by cleaning up their balance sheets while the new owners—such as Nevada Power Co, Las Vegas—have benefited from purchasing assets for substantially less than the original owner paid for them.

To learn more about the challenges associated with restarting construction of partially completed GT-based powerplants—so-called “remobilization”—and to get an objective assessment on the condition of equipment removed from long-term storage, the editors spoke with the following experts:

Project Directors Tom Burns and Mike O’Leary, Sterling Energy International Inc, Carlsbad, Calif, who specialize in equipment storage and preservation.

VP Operations Brad Friesen, Fluor Energy & Chemicals Group, headquartered in Houston, who is currently responsible for restarting and completing construction on at least two large combined-cycle plants that were laid up partially complete and another being built from the ground up with equipment purchased out of storage.

Andrew H McNeil, director of new generation project management for Nevada Power and the person responsible for completing construction of the Moapa project sold by Duke Energy to the utility and renamed the Chuck V Lenzie Generating Station.

J B McKinney, the former project director for the Moapa project, now a special consultant to McNeil.

R Michael Ferguson, construction manager, Washington Group International, Denver, the owner’s engineer on the Lenzie project.

Due diligence is required before buying any pre-owned equipment. Sterling Energy’s Burns and O’Leary caution: Remember that the primary goal of a preservation program is to actively maintain equipment in storage “as-new.” In some instances, these programs were implemented with “soon to be released” staff with little background and expertise in the practices of long-term equipment preservation. Caveat emptor suggests careful examination of what you are thinking of buying. Some questions you need answers to are these:

1. What equipment/components are missing from the plant inventory?

2. Did the preservation program do its job? This obviously is determined by physical inspection, but you must first obtain the preservation plan for individual pieces of equipment, maintenance documentation, inspection reports, etc.

3. Was the equipment protected such that it can be installed without repair or refurbishment? If not, what must be done to prepare the equipment for installation or operation (for example, an acid flush of the heat-recovery steam generator if an internal inspection of components reveals rusting), who is going to do it, to what schedule, and for what cost?

4. Was sensitive electrical equipment protected from humidity, temperature extremes, etc, and ready to be energized?

5. What performance guarantees are available for the major pieces of equipment?

6. What is the status of warranty coverage?

Do not underestimate the job of equipment assessment, stresses Fluor’s Friesen. For Lenzie, his team was awarded the contract to locate and inspect each piece of equipment installed or placed in storage at the plant site and determine its condition and if repair or replacement was necessary. Nevada Power wanted price certainty, he said, and that meant no surprises.

Due diligence was included in Fluor’s lump-sum work package to finish constructing the plant. Friesen said his team located and examined about 95% of the equipment within the 90-day window allowed by the contract. It is important to complete a large portion of the equipment assessment task before construction restarts, he continued, or you run the risk of withdrawing equipment and components that have not been inventoried and inspected.

Reflecting, Friesen said most of the equipment
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that was supposed to be at Linzie was. The biggest problem, perhaps, was locating it. The construction site was shut down quickly, he said, and a nonunion “pickup crew” unfamiliar with the project and having little, if any, familiarity with powerplant equipment was brought in to pack what was lying around on the jobsite and repack open packaging in the storage yard. This team did not use Duke Energy’s materials management system and things got mixed up, Friesen continued. The lack of “continuity of knowledge” created a bigger challenge than expected, he added.

McNeil said that Nevada Power negotiated project completion with Fluor because it believed that this was the most risk-adverse way to bring in the plant. Construction is going well, continued McNeil. First fire of the GTs for Lenzie Unit 1 is scheduled for this summer and the expectations are that Fluor will complete that unit by year-end.

Fluor completing Luna as well

Fluor also is finishing the 570-MW Luna Energy Facility near Deming, NM. There, Friesen said, the job of equipment assessment was easier. Two reasons: There’s only one combined-cycle unit at Luna compared to the two at Lenzie and the original construction crew did the packing and storing when the project was laid up. Construction of both Lenzie and Luna was a little more than half complete when work was suspended. Design was at about the 95%-complete mark at Lenzie; Duke completed the design as part of the asset sale.

McNeil expects excellent results from the units. As a former Duke Energy employee he is familiar with the company’s plants and is confident that this fourth-generation facility should render good performance.

Friesen said equipment condition at Lenzie and Luna was excellent for the most part. At Luna, the shrink wrap on a couple of water-treatment skids was so tight that the PVC pipe deformed in the desert heat and had to be replaced. Also, airborne sand and dirt were found in the cooling-tower fill. A general observation was that preservation packaging for critical valves was inconsistent and could have been better.

In terms of where the people responsible for long-term lay-up could have done a better job, Friesen mentioned spool-piece labeling at Lenzie. Most of the pieces had to be identified by matching to drawings. At Luna, higher-quality identification labels, more rigorous inventory, and tarp enclosures facilitated this work.

Problems with spool-piece labeling were a discussion topic at the 2005 HRSG User’s Group meeting (see conference report elsewhere in this issue). There the suggestion was made to stamp or etch the part ID on a washer and tack-weld it in a location convenient for inventory purposes. In the case of boiler tubes, one attendee said to stamp diameter, wall thickness, and material on the washer and tack weld it to the tube. Someone else mentioned that if a tube was withdrawn from stock and had to be cut, that it be cut from the end opposite to the washer. Sounds obvious, but reminders prevent errors.

Of warranties and design changes

Friesen suggests that anyone responsible for a remobilization effort prepare for possible anxiety over (1) warranties, (2) design changes suggested by recent lessons learned (participating in user-group meetings helps in this regard), and (3) equipment upgrades necessitated by new developments, changes in regulations, etc.

Regarding the first point, Friesen said, “Suppliers rarely have an incentive to renegotiate warranties. Equipment is already paid for. What’s in it for them? You have to carefully evaluate the cost/benefit of a manufacturer’s inspection required for a warranty extension versus the risk taken for not having a warranty.”

In many cases, he continued, when knowledgeable people inspect equipment considered reli-
able based on past experience and they give the “thumbs-up” sign, don’t worry about the warranty. Exceptions are gas and steam turbines, generators, and perhaps some others. Burns generally agreed, saying “Don’t be held hostage to warranties.”

Fluor pursues warranties aggressively where owners have concerns. At Lenzie, a performance guarantee for the air-cooled condensers—said to be the world’s largest—was thought prudent. The manufacturer and constructor eventually agreed on acceptance criteria for heat rejection at 98.5% of the original contract, this to accommodate fouling that occurred during lay-up. Friesen said that Fluor’s buying power pays dividends at the negotiating table. Warranties were maintained for the GTs, STs, and GT inlet-air coolers.

Lessons learned by the industry suggested modifications to the HRSGs, which had been purchased from Aalborg. Not much room for negotiation here because that company had two changes in ownership since the units were ordered: Erie Power Technologies Inc bought Aalborg and then the Belgian firm CMI bought Erie and renamed the company CMI EPTI LLC. Modifications/replacements were made to critical control valves based on recent industry experience. Software upgrades also were made to some programmable logic controllers. And the control system platform was upgraded to Windows XP.

Hiring and training more than 1000

One aspect of any remobilization project that should not be underestimated, said Friesen, is the actual mobilization effort itself, which has a direct influence on schedule. Relaunching of construction at Lenzie, he continued, was a bigger challenge than he had anticipated. “For example, on a ‘normal’ construction project manpower ramps up incrementally and newcomers have ready access to coworkers for job-related questions, etc.

On a restart like Lenzie, you’re hiring and providing site orientation and EHS [environmental, health, and safety] training for more than 1000 construction workers virtually simultaneously. Just ordering, receiving, and distributing hand tools and consumables for a new crew of this size is challenging.”

Nevada Power’s McNeil, who had been the project director of Duke Energy’s Grays Harbor project in Washington state which also was terminated about halfway through construction, offered a description of Lenzie when lay-up was initiated. He said that the GTs were bolted in place and the enclosures installed, drums and harps were set for the HRSGs, and work was terminated on the steam turbine before the low-pressure rotors were installed. They were retained in their respective shipping crates with a dose of vapor corrosion inhibitor (VPI) and sealed in plastic. The upper half of the casing was placed on the lower half, already in place, and sealed.

Duke Energy had planned to restart construc-
tion of their Moapa facility within two years, so after lay-up was completed in December 2002, it engaged a local contractor to provide maintenance support—specifically to rotate shafts, megger motors, check the integrity of tarps and other enclosures monthly. Note that all major components were onsite. The company did return field run electrical cabling and piping where possible, paying only a small restocking fee.

Duke Energy developed the preservation procedures to ensure that critical components were maintained in “as-new” condition. Monthly, for example, oil was heated and circulated in the GT inlet air chillers. Twice annually the HRSGs were inspected. Inspectors did not enter drums, but coupons in drums and harps were removed to verify the effectiveness of VPIs. Annually the GTs were inspected with a borescope. All inspections were thoroughly documented.

Greenfield construction

Not all GT-based plants for which equipment was ordered were postponed after construction began. Components for many plants are sitting in warehouses waiting for someone to pour foundations (Figs 1, 2). The mobilization plan for such projects has the added element of moving equipment from warehouses in timely fashion and in the proper sequence for construction.

Burns says that the shipping program must consider the capability of the receiving site to provide interim protection of the equipment until it is installed. “You don’t want to screw up what was preserved,” he adds. In some cases, it is necessary to remove transport packing at the warehouse to ensure proper preservation. This equipment must be repackaged for transport to the job site.

Burns considers as necessary a project-specific remobilization plan that identifies the myriad preservation-related work packages that must be dovetailed into construction completion activities, a timeline for scheduling tasks, and assignment of “outcome responsibility” to individual team members.

A meticulous record of inventory must be maintained as equipment moves from the warehouse to the construction site. This includes photos, lots of them, to show what was shipped and the condition it was in when shipped.

Friesen, who has become a remobilization expert, is also building a combined cycle from warehoused parts for Brazos Electric Power Cooperative Inc, Waco, Tex. The Jack County Energy Facility, now about 90% complete, has two GTs and two HRSGs, and much balance-of-plant equipment purchased from Duke Energy. The steam turbine/generator was bought new. Few storage-related equipment issues, reported Friesen, who added that this plant was build in a different sequence than Fluor would use normally, because of the ready availability of equipment from the warehouse. The benefit of rethinking the construction sequence, he said, was a shorter schedule. CCJ