



Overseer's Undercurrent Can Palo Verde Stage Another Comeback?

August 25, 2006

Almost exactly 11 years ago, I predicted the inevitable early demise of at least one of three units at the Palo Verde nuclear generating complex in Arizona. Then, the facilities' co-owner and operator Arizona Public Service Co. (APS) proved me wrong by stabilizing operations and turning the plants into reliable performers and national models for cost reductions at nuclear plants.

I'm wondering whether they can do it again.

The early 1990s were not good years for Palo Verde operators. Extended outages and poor performance led several of its utility co-owners, including Southern California Edison and Public Service Company of New Mexico, to openly explore selling their combined 25 percent share in the complex. The problem was that they couldn't find any takers.

California gets 27 percent of Palo Verde's output, with Edison's share 60 percent of that amount - roughly 600 MW.

The facilities' financial impacts went deep. APS at one time took a \$400 million write-off for nuclear expenses. Regulatory rate cases became battlegrounds over proposed disallowances and cost recovery. After years of shouldering the Palo Verde burden, minority shareholder El Paso Electric went into Chapter 11 bankruptcy.

Although the units managed "record generation" in 1992, the subsequent discovery of extensive cracking in the steam generators for units 2 and 3 seemed to undermine all of the effort APS had put into improved performance.

Writing about the plants' predicament in August 1995, I flatly predicted, "Within five years [unit 2] will be pushed into early retirement by its deteriorating steam generator and increasing costs of operation and repairs."

Needless to say, that statement did not sit lightly with Palo Verde's keepers, who promised to show me that I was mistaken. Amazingly, they did so, both in person and in performance.

When I finally got the opportunity to tour Palo Verde the following April, my visit coincided with an unusual event - the kind that sets off sirens and alarms across all of Maricopa County. During refueling of unit 2, one of 240 fuel-rod assemblies had become stuck in its housing, necessitating site visits from the Nuclear Regulatory Commission and the kind of nail-biting emergency response one usually sees on made-for-TV movies.

Local media were primed for some sort of radiation release or, worse, a China Syndrome meltdown. I witnessed the false rush of the media pack to the plant when a minor fire in some electrical wiring (unrelated to the fuel-rod problem) set off alarms.

After a week of practice, with patience and quite a bit of finesse, the plant operators were finally able to dislodge the assembly without further damage or release. Though at the time, I did not recant my prediction, I came away mightily impressed with the quiet fortitude of the plants' staff and management. One told me that after the planned steam generator replacement, unit 2 would be able to run another 60 years.

Subsequent years of excellent performance softened my stance, and I quietly dropped my "death watch" on the units. A resurgent economy and load growth throughout the Southwest meant that Palo Verde capacity was no longer "surplus" but in fact a core component of regional generation. Throughout the restructuring years and market collapse, Palo Verde seemed to offer the kind of operational performance that had always been promised by the nuclear industry, with capacity factors exceeding 90 percent and marginal costs slipping to about 1.3 cents/kWh.

Then something happened.

Starting about 2003, performance at all three units became unpredictable and subject to

recurring problems. Once again, extended outages became the norm. So much so that during 2005, the complex's capacity factor dropped to 77 percent, largely because of faulty oil seals and the planned steam generator replacement for unit 1. Even after the replacement was complete, however, the problems continued, and excessive vibrations on a cooling line pipe caused APS to take the unit out of service until earlier this year.

In a newly released report to the Arizona Corporation Commission on the 2005 outages at Palo Verde, consultant GDS Associates concluded: "By almost any measure, performance of Palo Verde was poor."

Only four other nuclear units in the nation had lower capacity factors than Palo Verde 1 in 2005, GDS noted. It was bad enough in 2004, but the next year the complex suffered through 1,100 more hours of outages than the year before. Unit costs continued to rise to \$16.94/MWh, the highest level since the early problem years. "The performance of Palo Verde during 2003-05 was at the bottom of the U.S. nuclear industry," GDS said.

The utility owners again feel the bite of lost generation. APS itself lost the equivalent of 1 million MWh in 2005 (for its nearly 30 percent share) and reported spending more than \$45 million for replacement power. The utility this week said it has spent a comparable amount in 2006 to date.

We don't know the full impact for other owners, but earlier this year Edison reported that it was losing \$4.5 million per month for replacement energy. Last autumn, the Los Angeles Department of Water & Power said it was spending \$300,000 each day, or \$9 million per month - all attributed to the Palo Verde outages.

GDS also found that at least four of eight unplanned outages experienced during the year "were avoidable and the result of imprudent actions by APS." Others were caused by faulty equipment sold to the plant, GDS said, but APS should be liable for about one-third of its declared replacement costs. Regulators should also consider imposing minimum performance standards and financial penalties for failing to meet them, the report concluded.

What happened?

That's still not entirely clear, even to Palo Verde's management. "There's no question Palo Verde has had a tough couple of years," said Jim McDonald, APS spokesperson. "We took our eyes off the ball."

Internal surveys conducted by APS have uncovered a pervasive "weakness in human performance culture" at Palo Verde. That translated into lack of leadership or the expectation of excellence among operators, as well as "yellow tag" violations imposed by the NRC. It's important to note that safety of operations has not been an issue.

Once again, Palo Verde's managers profess that the worst is behind them and that they are putting in a "tremendous effort" to reverse course after several difficult years.

"All three Palo Verde units are currently operating at 100 percent."

This time, I'm not making any predictions. But I'm still watching.

[Arthur O'Donnell](#)