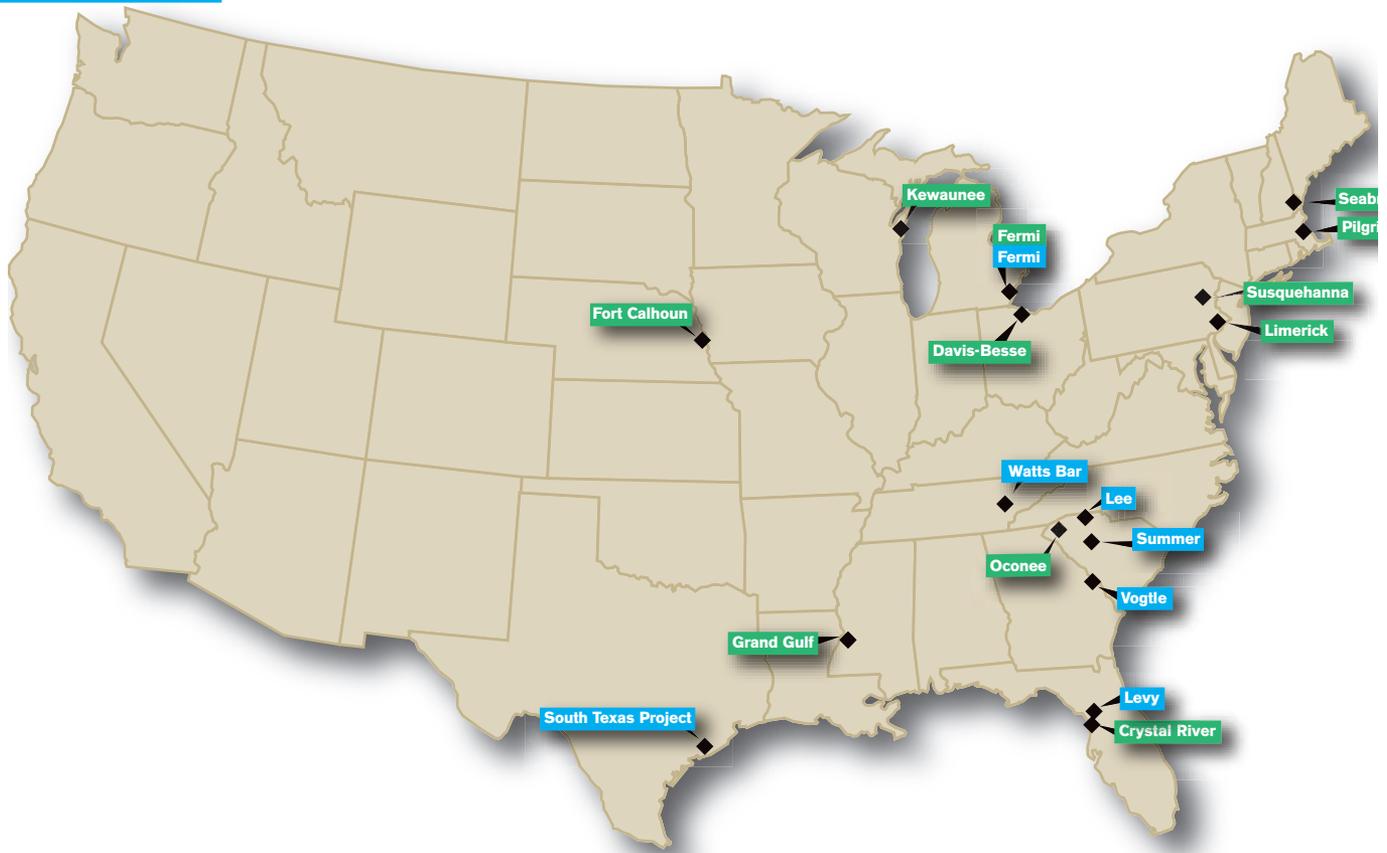


Plant sites shown on this map are involved in news stories in this section. Green tags indicate existing plants; blue tags represent licensing projects.



CRYSTAL RIVER

Duke ends repair effort, closes Unit 3

For the first time in 14-plus years, a licensed power reactor in the United States has been declared to be closed. Duke Energy announced on February 5 that it will not continue with work to repair the concrete delamination in the containment building of Crystal River-3, and that it will not seek to resume power operation of the 860-MWe pressurized water reactor near Red Level, Fla. Instead, Duke will place the facility in a safe storage condition to allow for decommissioning to be carried out later, perhaps decades in the future.

Crystal River-3 had not operated since 2009, when it was shut down for refueling and steam generator replacement. A large opening had to be cut in the containment to allow the old generators to be removed and the new ones installed. The delamination (the separation of concrete from reinforcing bars) occurred after the replacement, when the concrete had been restored and the rebars were being tensioned. A repair effort addressed this delamination, but rebar tensioning caused yet another delamination.

The reactor, which began commercial operation in 1977, was originally owned by Florida Power Corporation. In 2003, Flori-

New natural gas-fired capacity is being considered as an option to compensate for the loss of the power generated by Crystal River-3.



Crystal River: Applications for license renewal and a power uprate had been under review.

da Power merged with Carolina Power & Light Company to form Progress Energy, which in turn merged with Duke Energy last year. The steam generator replacement was part of an overall initiative to maximize the utility of Crystal River-3. Progress applied in December 2008 to the Nuclear Regulatory Commission for renewal of the reactor's license, which was to expire in December 2016. Renewal would have allowed the reactor to remain in service until December 2036. In June 2011 (after the delamination issue arose, but before the merger with Duke), Progress applied to the NRC for an extended power uprate, which would have raised the peak power level to about 990 MWe. The delamination complicated the technical review process for the renewal, and the uprate would have been the first ever for a reactor manufactured by Babcock & Wilcox. All of this put Progress, and later Duke, in the position of pursuing two major licensing activities simultaneously, even as the work to repair the containment concrete continued to encounter problems.

Duke stated that its decision to close the plant followed a comprehensive, months-long engineering analysis of the containment structure, and that although repairing the plant was seen as a viable option, "the nature and potential scope of repairs brought increased risks that could raise the cost dramatically and extend the schedule." Duke also stated that it is working to place as many of the plant's employees as it can in other positions within the company, and that it will work with Citrus County to lessen the economic effects of the closure.

Also closed are Duke's claims on coverage by Nuclear Electric Insurance Limited (NEIL) for the damage incurred by the delaminations. Under a mediated settlement accepted by both parties, NEIL will pay Duke \$530 million in addition to the \$305 million it has already paid. Duke stated that the total will go toward reducing customers' electric bills.

The Florida portion of the Duke/Progress service area has been doing without Crystal River-3's output for more than three years, and even if the repair job had resumed, the reactor would have remained off line until next year or later. With restart now off the table, however, Duke has stated that it is reviewing alternatives to replace the power produced by the unit, including the construction of a new natural gas-fueled plant, which the company believes could come on line in 2018. Asked by *Nuclear News* whether the project to build two new reactors at a site in Levy County, about eight miles from Crystal River, could be accelerated so that the reactors could enter service sooner, a Duke spokesperson said that the company will continue to pursue combined construction and operating licenses (COL) for Levy but is not seeking to speed up the project.

The NRC is nearing the end of its technical reviews for the Levy COLs, although the agency will not take final action on any new reactor licenses until the fall of 2014 or later (see story on page 30). Even before the NRC suspended final actions on new reactor licenses, however, Duke/Progress had delayed the startup target dates for Levy-1 and -2 to 2024 and 2025 or 2026, respectively. The schedule has been based not on how long it would take for the reactors to be built, but on the rate recovery approved by the state for the project.

Before the announcement about Crystal River-3, the U.S. power reactor fleet had not seen a reactor closure since Northeast Util-

ities closed Millstone-1 in July 1998. That closure ended a 10-and-a-half year period during which 15 electricity-producing nuclear facilities were closed. Two of them were federally owned and were not intended primarily as power plants (EBR II and Hanford-N), three were small reactors that were retired after a long service life (Big Rock Point, LaCrosse, and Yankee), and one had never become a steady producer (Fort St. Vrain). San Onofre-1, Haddam Neck, and Millstone-1 might have continued to operate, but they were small by modern standards and had each run for over two decades. The more significant loss to the fleet came from the early closures of

Maine Yankee, Rancho Seco, Trojan, Zion -1 and -2, and the never-fully-operated Shoreham.

The subsequent era of no closures paralleled the arrival of license renewal by the NRC, which gave licensees the prospect of an additional 20 years of operation to compensate for the major expenses incurred at plants in their third decade, such as steam

generator replacement. Even before the Crystal River-3 announcement, however, this new era was already about to end. Dominion Generation announced last October that it would close Kewaunee, a 574-MWe PWR in Wisconsin, for which the license has been renewed but expiring power purchase agreements have not been extended. Kewaunee is to cease operation this

spring.

As the costs of complying with new regulatory requirements based on lessons learned from Fukushima Daiichi become better known, and “fracked” natural gas continues to be available at low cost, other small to mid-sized reactors may lose some of the economic attractiveness they have enjoyed in recent years.—*E. Michael Blake*