

Times are tough for US nukes—Perry Sioshansi's letter from America

There are few signs of an end to premature closures of operating US reactors

Since 1990s, roughly 100+ nuclear reactors have provided roughly 20% of US generation, give or take a little. The US nuclear fleet out-produced France—the country with the next highest nuclear generation—by more than 2-1; with Russia a distant third.

This feat has been the result of improved reliability and performance of the US fleet, operating at ever higher capacity factors, in the 90%+ range. Which means that they operate nearly around the clock, 24/7, except for short periods required for infrequent maintenance or refuelling. There was even talk about a nuclear renaissance, with a new generation of safer and more reliable reactors coming on line, providing carbon-free electricity for the next generation. The existing fleet, now aging, would get refurbished and get relicensed, extending their useful life into 60-80 years and beyond.

The reality is rather different. Only a handful of new reactors are under construction in the US, all receiving generous federal loan guarantees, special state-level regulatory concessions and all are in states where there are no competitive wholesale markets, virtually guaranteeing that the utilities will recover their investments through rate of return regulations from captive customers. None are even contemplated in regions with competitive wholesale electricity markets. The story gets even worse. Instead of seeking extensions of their operating licence, at least a dozen US reactors are planning to shut down before their existing licence expires. Few have already shut down and there are indications that more will follow.

Why has nuclear's story come to such a sorry state, especially when America – like every other country – is trying to transition to a low-carbon future?

If you ask Marvin Fertel, CEO of the Nuclear Energy Institute (NEI), the lobbying arm of the US nuclear industry, the blame rests with flawed wholesale electricity markets that do not adequately recognize the full value of low-cost, carbon-free, base-load nuclear power.

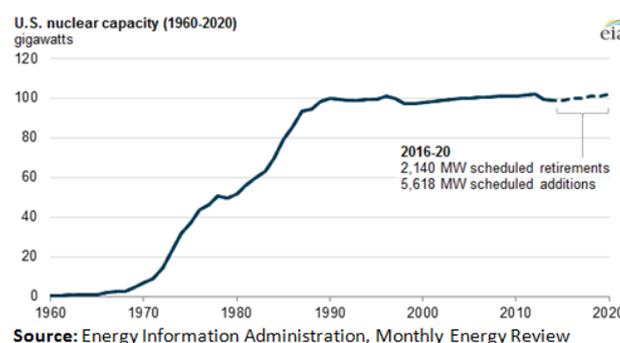
The industry's woes got worse starting in 2013 when the Kewaunee Nuclear Power Station in Wisconsin shut down prematurely stating insufficient revenues. NEI blamed the flawed wholesale markets. The following year, Vermont Yankee Nuclear Reactor shut down. Fertel repeated his warnings to whoever would listen, to no avail.

In 2015, after Entergy announced it was closing Pilgrim Nuclear Plant in Massachusetts, Fertel repeated his message in stronger terms: "Today's announcement is more proof that the reforms urgently needed in competitive electric markets are too slow in coming. Design flaws in wholesale markets such as New England continue to result in artificially low electricity and capacity prices."

The result? Entergy announced it would close down the FitzPatrick Nuclear Plant in New York. Fertel warned again: "The fact that the FitzPatrick nuclear energy facility in New York is the industry's fourth nuclear power plant to prematurely close due to uncorrected flaws in competitive electricity markets is alarming."

Alarming or not, in early June 2016, Exelon Corp. the largest US nuclear operator, announced that it would shut down its Quad Cities and Clinton nuclear power plants in 2017-18. The two stations are said to have lost a combined \$800mn during the past seven years, despite being two of Exelon's best-performing plants.

This was followed by announcement that Omaha Public Power District's sole nuclear reactor at Fort Calhoun would cease operation and—surprise, surprise—the news that Pacific Gas & Electric Company (PG&E)'s Diablo Canyon, the only two remaining operating nuclear reactors in California, were slated to shut down by 2025. Fertel must be frustrated.



In late June 2016, PG&E reached an agreement with local environmental and labour organizations to shut down the 2 operating reactors at Diablo Canyon by 2025, replacing their output with renewable energy, energy efficiency and energy storage. Part of the motivation—hard to believe but apparently true—is that base load power resources like Diablo Canyon are increasingly becoming a liability as renewable energy resources begin to dominate generation—in part in response to state’s mandatory 50% renewable portfolio standard (RPS) and the equally taxing climate bill, which requires state-wide CO2 emissions to be reduced to 1990 levels by 2020. What California sorely needs is not inflexible base-load generation but rather increasing amounts of flexible resources, demand-response and storage. Nuclear plants don’t fit the bill moving beyond 2025. As part of its agreement, PG&E has voluntarily committed to meet 55% of its retail sales from renewables by 2031, exceeding California’s 50% renewable mandate by 2030.

Clearly, NEI’s warnings are not being heeded. Wholesale markets, as everyone acknowledges, have flaws. But the demise of nuclear—and much more so for coal—can be explained in the context of broader developments affecting the US power sector.

For one thing, demand for electricity is no longer growing as it used to. With so much renewables coming on line due to mandatory RPSs and other policy-driven objectives, conventional thermal plants are gradually getting squeezed out of the dispatch merit order.

Moreover, the traditional dispatch merit order, consisting of low-cost base-load, followed by mid-range and peaking units, is beginning to break down. Zero marginal cost renewables are replacing base-load units with mid-range and flexible peaking units filling the gap left by variable renewables.

Even more stunning is the fact that base-load units with little or no flexibility to adjust their output, as nuclear plants, are in fact becoming a liability since they cannot respond to fluctuations in load or variable renewable generation. What market operators will increasingly crave and pay for is flexible generation and load plus storage and demand response. Base-load nuclear is not as valuable as it used to be.

In case of California, Tony Early, the CEO of PG&E stunned many when he pointed out the obvious realities of California’s emerging electricity market: “Our analysis continues to show that, instead of continuing to run all the time, there will be parts of the year where Diablo will not be needed,” adding, “At a plant like Diablo, with large fixed costs, if you effectively only run the plant half the time, you’ve doubled the cost.”

That plus the fact that natural gas prices are at historic lows, is eroding the viability of nuclear and coal. Without a specific and tangible carbon price, the market is simply not rewarding nuclear power’s zero-carbon generation. Hard to fathom, but it is true. In competitive wholesale markets, nuclear power is no longer competitive.

That explains why, since October 2012, 14 nuclear reactors have closed or announced closure. Only a miracle can reverse the inevitable, and even that may be too little, too late. There was a sliver of good news as the New York Department of Public Service (DPS) proposed subsidizing zero-carbon electric generating stations, namely nuclear power plants, as a way to prevent their closure.

Using estimates of the social cost of carbon, the DPS staff has proposed crediting nuclear power with a zero-emissions credit (ZEC) to be administered in six 2-year tranches, beginning April 1, 2017. The price to be paid for ZECs would be determined administratively by the Public Service Commission.

According to the staff’s analysis, low natural gas prices are causing wholesale market prices to be significantly lower than the average operating costs of the nuclear units—precisely what the NEI has been saying for some time.

Perry Sioshansi is founder and president of Menlo Energy Economics and is the editor and publisher of *EEnergy Informer*, from which we have sourced this article, and which we commend.

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