

The NRC and Nuclear Power Plant Safety in 2013

More Jekyll, Less Hyde



[Union of
Concerned Scientists

unless the NRC had formally approved them after determining there would be sufficient staffing and capabilities to ensure the necessary steps could be taken within appropriate time frames.

In 2004, the NRC revised its fire protection regulations to provide owners with two options for managing fire risk: (1) comply with the 1980 regulations or (2) comply with new regulations that permitted manual actions when specific conditions were met.

The owner of the Oconee nuclear plant in South Carolina notified the NRC in 2005 of its intention to transition from non-compliance with the 1980 fire protection regulations to compliance with the 2004 regulations. The owner submitted an application to the NRC in 2008 defining the steps planned to achieve compliance. The NRC approved the company's plan in April 2010 and required that the owner complete all the steps by December 31, 2012.

In July 2012, the owner wrote to the NRC asking that the original deadline be extended by two years until December 31, 2014. Four months later, during a phone call with the NRC staff in November 2012, a company representative announced that additional delays would push the target deadline back yet another year to December 31, 2015 (Wright 2013).

On January 15, 2013, the NRC denied the owner's request for a two-year extension. The NRC denied the request because the risk was too large to allow continued reactor operation without the safety upgrades:

The increase in core damage frequency (CDF) resulting from the change requested in the July 2012 application is about four times the greatest acceptable increase in CDF for a facility with a very low total risk, and 40 times the greatest acceptable CDF increase for a high total risk plant. This significant increase in CDF warrants the denial of the application based on the guidance of RG [regulatory guide] 1.174. (Evans 2013)

After denying a request for a two-year extension because that would be too dangerous, the NRC ordered the owner on July 1, 2013, to complete the safety upgrades no later than November 15, 2016—nearly two years longer than the two-year extension request (Zimmerman 2013).

Thus, the three reactors at Oconee have operated at undue and elevated fire risk since 1980, when the NRC first adopted fire protection regulations. In other words, for more than three decades, Oconee's reactors have never met those fire protection regulations. If they had, there would have been no need to transition to the 2004 regulations. The

The NRC discovered that nearly half the reactors operating in the United States did not comply with the 1980 fire protection regulations.

NRC approved the owner's plan to finally manage the fire risk and set a December 31, 2012, deadline. The reactors' owners neither complied with the 1980 regulations nor with the 2004 regulations. Yet the NRC responded to the company's request for two more years by denying it for safety reasons and then ordering them to take up to nearly four years to try it.

What's protecting the people around Oconee from fire risk? Luck. What's protecting Oconee's owner from the cost and bother of legally managing the fire risk? The NRC.

Congress must take steps to ensure the NRC enforces its own regulations.

Allowing Diablo Canyon to Operate

As described in Chapter 4, the NRC achieved a positive outcome in 2013 by allowing the Fort Calhoun reactor to restart only after ensuring that its known safety shortcomings had been corrected. Sadly, applause for that commendable outcome is muted by the NRC allowing the Diablo Canyon Power Plant at Avila Beach, California (about 12 miles southwest of San Luis Obispo) to operate despite known seismic safety shortcomings.

In 2008, an earthquake fault line was discovered in the seabed close offshore from the two Diablo Canyon nuclear reactors. An earthquake on this fault line could cause ground motions greater than the plant was designed to withstand. The NRC inspector assigned full-time to Diablo Canyon concluded that Pacific Gas & Electric (PG&E) had not properly and thoroughly evaluated the new hazard, but his position was overruled by managers in NRC's Region IV offices who allowed both reactors at the plant to continue operating. Their decision was undermined by the agency's own calculation concluding there was a one-in-six chance that the site could experience a devastating earthquake during its lifetime (Lochbaum 2013).¹⁶

16 For additional information, see <http://allthingsnuclear.org/seismic-shift-the-nrc-and-diablo-canyon>.



The NRC has not enforced seismic regulations at the Diablo Canyon plant in California as it has at other nuclear plants.

PG&E submitted a license amendment request to the NRC in October 2011, seeking to make the results from evaluations it did in the 1970s (for earthquakes on what is known as the Hosgri fault) and in the 1980s (under its Long Term Seismic Program) become the seismic design basis for Diablo Canyon. These results essentially reflect the same hazard posed by the shoreline fault. The NRC’s approval of the company’s proposed amendment to the operating license would indicate that existing protective measures against earthquakes were adequate even for the new fault discovered in 2008.

But the NRC could not and did not approve. On February 13, 2012, NRC staffers met to discuss their review of the license amendment request. The meeting’s agenda covered the reasons why the agency could not approve the request:

- The license amendment request did not satisfy the provisions within the NRC’s Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants.
- PG&E’s re-evaluation of the reactor coolant system—the reactor vessel, the pressurizer, the steam generators, the reactor coolant pumps, and connecting piping—for the forces caused by an earthquake on the shoreline fault had not been completed.
- PG&E had not submitted a probabilistic risk assessment for earthquake hazards at Diablo Canyon (Sebrosky 2012).

Thus, the license amendment request was unacceptable to the NRC because it was incomplete and its completed portions failed to conform with the NRC’s established criteria. Yet the NRC allows the reactors to continue operating.

In the past, similar shortcomings were found in the earthquake protection for reactors at Beaver Valley in Pennsylvania; West Valley and FitzPatrick in New York; Humboldt Bay, San Onofre, and the General Electric Test Reactor in California; Surry in Virginia; and Maine Yankee. The NRC did not permit those eight nuclear facilities to operate with the known protection vulnerabilities. And the NRC did not permit their owners to use the unacceptable methods and assumptions used by PG&E (Lochbaum 2013).

NRC’s Region IV oversees both Fort Calhoun and Diablo Canyon. Faced with similar safety shortcomings, the staff and managers in this NRC office kept Fort Calhoun shut down for over two years while Diablo Canyon kept operating. Absent random decision-making processes like flipping a coin or tossing a dart at a “yes/no” chart, such disparate treatment cannot be explained.

The NRC is not right when preventing a reactor from operating and wrong when allowing a reactor to operate. The NRC is right by allowing safe reactors to operate and by preventing unsafe reactors from operating. The NRC was right in not allowing Fort Calhoun, Beaver Valley, Maine Yankee, and the other facilities to operate until known safety shortcomings were corrected. The NRC is wrong to allow Diablo Canyon to operate despite known safety shortcomings.

Improperly Hiding Information

In June 2010, the NRC issued an order requiring Duke Energy to take 15 steps to lessen the likelihood that the company's earth-and-rock-fill Jocassee Dam (about 20 miles up the Keowee River from the Oconee nuclear plant) could fail, and to take additional steps to lessen flooding vulnerabilities at Oconee in the event the dam fails (Reyes 2010).

Months of discussions about the flooding hazard between the NRC and Duke preceded the order. The discussions included formal correspondence (e.g., Giitter 2010) and email messages (e.g., Ferrante 2010). In April 2009, the deputy director of the NRC's Division of Risk Assessment wrote:

No other potential initiating event at Oconee is as risk significant. The probability of core damage from a Jocassee Dam failure is three times higher than the sum total probability of core damage from all initiating events. Duke has acknowledged that, given a Jocassee Dam failure with subsequent site inundation, all three Oconee units will go to core damage; that is, given a dam failure, the conditional core damage probability (CCDP) is 1.0 [100 percent]. (Criscione 2012)

But the NRC withheld from the public this order and all correspondence between it and Duke regarding the potential for all three reactors melting down if the Jocassee Dam broke. The information remained hidden until investigative reporter

small-break LOCAs are also threats posed by cooling water inventory losses. But drainage rates would be less, yielding a greater chance of successful intervention because there is more time before meltdown occurs and less makeup flow is needed.

The NRC estimated that the Jocassee Dam was 100 times more likely to occur than a large-break LOCA. Yet, before licensing Oconee to operate, the NRC determined that an array of emergency core cooling systems and containment barriers adequately protected the public from the large-break LOCA threat. The NRC's operating license for Oconee's reactors includes limitations on how the reactors can continue operating with emergency pumps out of service or containment degraded. Typically, that time is limited to 72 hours. If the problem cannot be corrected within that time limit, the reactor must be shut down.

The NRC typed "NOT FOR PUBLIC RELEASE—SECURITY RELATED INFORMATION" across the top and bottom of every page in the documents it withheld from the public. In most cases, the NRC only crossed out these headers and footers and did not redact any information from the documents before releasing them. In other words, the documents simply did not contain security-related information—which can and should be protected from public disclosure—and the NRC improperly applied this classification to hide the documents from the public. Had the NRC possessed a valid reason for withholding the documents, the documents

The NRC remained silent about the problem it ordered Duke in June 2010 to correct at Oconee: namely, that a Jocassee Dam failure would yield a 100 percent chance of all three reactors melting down.

Paul Koberstein of the *Cascadia Times* obtained it in response to his request under the Freedom Of Information Act (FOIA; Koberstein 2012). Additional FOIA requests from Koberstein and others resulted in the NRC releasing dozens, if not hundreds, of documents in 2013.

The flooding hazard at Oconee is very real and very high. Figure 7 (p. 42) is the NRC's own assessment of the flooding risk relative to other hazards at Oconee. For example, a large-break loss of coolant accident (LOCA) involves the rupture of a large pipe connected to the reactor vessel, rapidly draining away cooling water. Unless the standby emergency pumps quickly start and refill the reactor vessel, the reactor core will be damaged by overheating. The medium-break and

either would not have been released in response to the FOIA requests or would only have been released with security-related information redacted.

That the Jocassee Dam information was improperly hidden by the NRC is further evidenced by similar flooding hazards at other nuclear plants that the NRC made public. The NRC publicly described flood protection shortcomings at the Fort Calhoun Station in Nebraska (Collins 2010), Watts Bar Nuclear Plant in Tennessee (McCree 2013), and Monticello Nuclear Generating Plant in Minnesota (Pederson 2013).

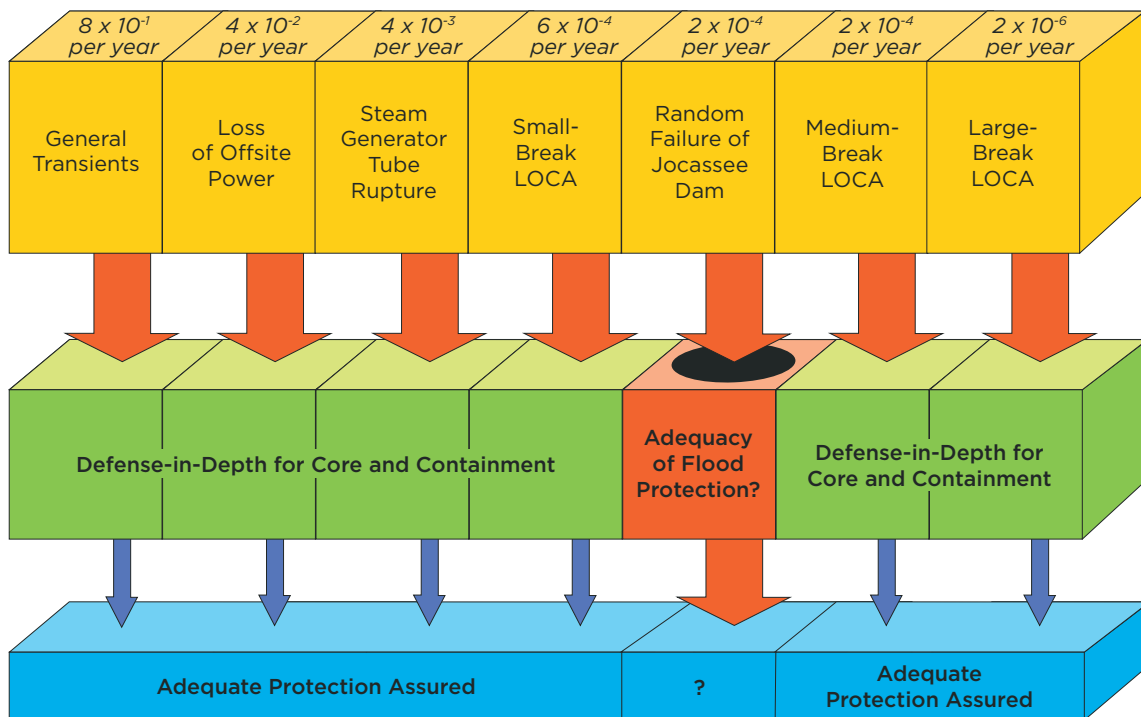
Like Oconee, Watts Bar operates within NRC Region II. As at Oconee, the NRC identified flood protection deficiencies

at Watts Bar involving upstream dam failures that it required to be remedied by measures intended to lower the chances of dam failures and to increase protection levels against flooding. Unlike at Oconee, the NRC publicly released information about the problems at Watts Bar.

The NRC conducted a public meeting in Seneca, South Carolina, on April 19, 2011, to update the community on the results of its oversight activities at Oconee during 2010. Several residents, reporters, and local officials attended this meeting (Bartley 2011). The NRC remained silent about the problem it ordered Duke in June 2010 to correct at Oconee: namely, that a Jocassee Dam failure would yield a 100 percent chance of all three reactors melting down (Criscione 2012).

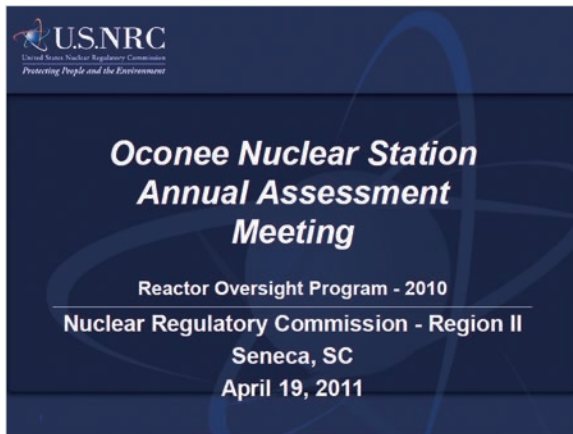
At the time of this meeting, the NRC knew that the failure of the Jocassee Dam was 100 times more likely to happen than a large-break LOCA. The NRC knew that the floodwater from a Jocassee Dam failure would almost certainly cause all three reactors at Oconee to melt down, just as three reactors had melted down at Fukushima when flooded just a month earlier. The NRC knew that Oconee was protected against a large-break LOCA, but could not operate for many days if the protective equipment was unavailable. The NRC knew that the fixes it ordered in June 2010 to properly protect Oconee from flooding had not all been implemented. The NRC knew that Oconee’s reactors continued operating despite this high and unmitigated risk. Yet the NRC withheld that knowledge

FIGURE 7. Risk of Core Damage at Oconee from Various Threats

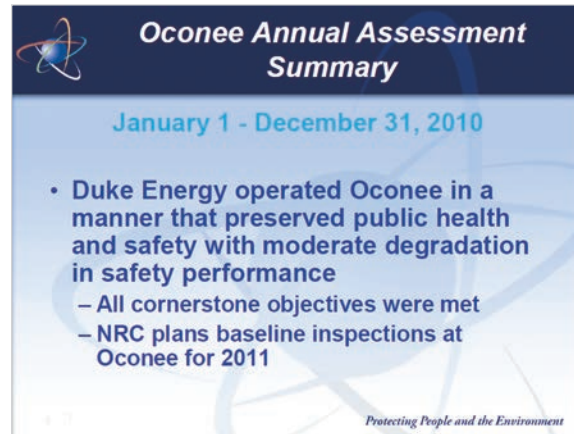


The NRC’s analysis of the risk of reactor core damage from the unresolved flood protection problems posed by a possible Jocassee Dam failure relative to other risks at Oconee. The numbers in the top row are the likelihood of the respective events happening in a given year (2×10^{-6} per year corresponds to one event every 500,000 years; 2×10^{-4} per year corresponds to one event every 5,000 years). The NRC estimated the odds of the large tsunami that devastated Fukushima as one in 1,000 years (Rampton 2011). The green row in the middle reflects the design features installed at Oconee to protect against hazards. The blue row at the bottom reflects the NRC’s determination that the design features adequately manage the risks posed by these hazards. The figure shows that the probability of a Jocassee Dam failure is comparable to or higher than other events (top row), but measures to prevent such a failure from causing core damage are not in place (middle row), and could therefore lead to the meltdown of the reactors at Oconee (bottom row).

SOURCE: FERRANTE 2010.



Title slide from the public meeting conducted by the NRC for community members around the Oconee plant in April 2011. (Source: Bartley 2011)



Summary slide from the NRC's public meeting. The "moderate degradation in safety performance" involved problems with a backup safety system installed in 1985 that was described in the first annual UCS nuclear safety report (Lochbaum 2011). The NRC did not inform community members that it had ordered Duke Energy to implement safety fixes for problems that could cause all three reactors to melt down, or that all of the NRC's mandated fixes had not yet been implemented. (Source: Bartley 2011)

from the public in April 2011 and provided false assurance that all was well. The NRC misrepresented the current situation at Oconee to the plant's neighbors by painting a rosier picture of conditions than they knew existed.

When a document contains security, trade-secret, or confidential personal information, the NRC should by all means withhold or redact it. But when a document lacks any such information, the NRC should by no means withhold or redact it. And it is never acceptable for the NRC to mislead the American public.

Observations on Ineffective NRC Oversight

We cannot understand how the NRC can enforce safety regulations at Fort Calhoun, Maine Yankee, Surry, Beaver Valley, and other facilities and yet ignore them at Oconee and Diablo Canyon. Robert Louis Stevenson wrote a compelling novel about a good doctor turning into an evil entity, which has been made into a feature film several times. Good as it is, this tale need not be reprised as a regulatory drama on the NRC's stage.

The NRC did not allow Fort Calhoun's single reactor to resume operating until fire and flood protection problems were corrected. Yet the NRC allows Oconee's three and Diablo Canyon's two reactors to continue operating despite unresolved safety issues of at least equal and likely greater severity.

In 2001, the NRC allowed another reactor to operate despite known safety shortcomings. The Davis-Besse Nuclear

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Power Station in Oak Harbor, Ohio, was among a dozen reactors that the NRC required to perform safety inspections before the end of the year. Because the reactor had to be shut down in order to conduct the mandated inspections, Davis-Besse's owner resisted the NRC's request. The NRC staff applied five safety principles to determine whether it could justify postponing the inspections. They concluded that four of the safety principles were clearly not met and the fifth probably was not met. The NRC staff drafted an order that would require Davis-Besse to be shut down by the end of 2001. But senior management at the NRC buckled under pressure from the

owner, shelving the shutdown order and allowing Davis-Besse to continue operating into 2002.

After degradation of the reactor vessel head at Davis-Besse was discovered, researchers at the Oak Ridge National Laboratory estimated that the degradation could have breached the reactor vessel in as little as 60 more days—rapidly draining cooling water and challenging the safety systems intended to refill the vessel before the reactor core was damaged.

As baseball great Yogi Berra famously said, it's *déjà vu* all over again. The NRC knows that Oconee and Diablo Canyon are operating outside pre-established safety

regimes. Luck protected the people of northern Ohio as Davis-Besse's single reactor operated for months before it was finally shut down and its serious problems fixed. Luck is now protecting the people of California and South Carolina, where five reactors have operated for years with known safety problems.

The people of Nebraska had different luck. They were lucky the NRC properly enforced safety regulations and did not allow Fort Calhoun to restart until its known problems had been remedied. The NRC did right by the people of Nebraska (and Georgia) and must do right by all Americans.



The NRC allowed the Davis-Besse reactor in Ohio to operate with known safety problems.

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