

## Energy Matters

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### [Graceless Ageing at Salem](#)

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**By Roger Witherspoon**

A series of wide ranging, federal inspections of the twin [Salem nuclear power](#) plants has found extensive decay and cracks as long as six feet in the concrete containment buildings, corrosion of the buildings' steel liners by decades of leaks from radioactive and acidic water, and "aggressive" groundwater penetration throughout the power complex.

In addition, inspectors from the Nuclear Regulatory Commission found that PSEG Nuclear, operators of the Salem nuclear complex, skipped required inspections of the ageing containment buildings. That prompted the agency to send out a generic "information notice" to all nuclear operators around the country to adhere to the inspection schedules and be on the lookout for deepening cracks in the containment walls.

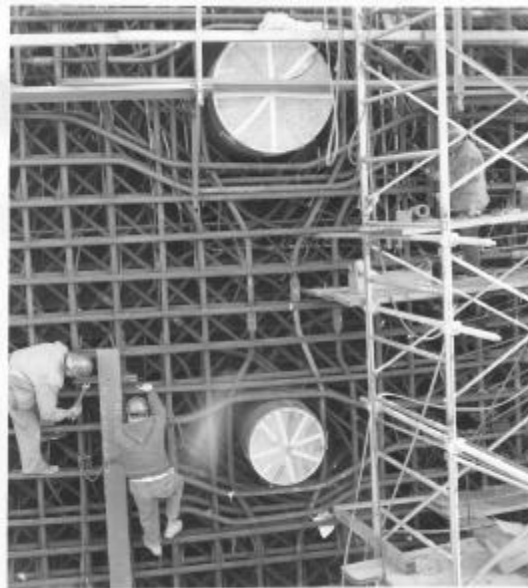
The findings of the plants' deteriorating physical condition are contained in a series of reports by NRC inspection teams analyzing PSEG's ability to maintain the structural integrity of the nearly 40 year old nuclear complex for an additional 20 years. The reports include demands for explanations from Thomas Joyce, president of PSEG Nuclear, for a variety of PSEG maintenance examinations and practices and responses from the nuclear operating company.

In fact, one of the company's erroneous practices prompted the NRC to send out a notice to all the nation's nuclear operators to make sure they were in compliance. In an August 4 Information

Notice, the NRC reminded plant operators that, by law, the condition of the concrete containment buildings housing the reactors are to be thoroughly inspected every five years. Inspectors had discovered that Salem’s operators “have been performing the containment concrete condition surface examination every 10 years.”

NRC spokesman Neil Sheehan said an audit of PSEG practices found that instead of inspecting each containment building every five years, they were alternating inspections “and taking credit for the interval for both units. They were misreading guidance from the American Concrete Institute as well as what the regulations said.”

The operating license for the plants is due to expire and PSEG must convince the NRC that if permitted to operate for an additional 20 years, there will be minimal degradation over the ensuing decades and the ageing plants can be safely operated.



But many of the findings by NRC engineers show conditions which, the agency says, violate regulations for long term inspections and maintenance of these critical structures, which are designed to house the reactor systems and protect the public in case of a nuclear emergency. In some cases, PSEG officials stated they were not concerned about leaks, rust, and possible infrastructure degradation and had no plans monitor the situation or stop the leaking.

For example, NRC analysts found “several” underground walls in both plants during a February inspection “that have evidence of past or present groundwater penetration.”

But when asked if PSEG planned any inspections of hard to reach, reinforced concrete areas to determine if the steel skeleton had been compromised by years of exposure to salt water “The

applicant responded that they did not.” The company felt that since there were no signs that the water had gone all the way through the four- foot-thick walls, there was no need for any additional checking. But the NRC differed, stating:

“Since the applicant does not have plans for inspections of inaccessible areas, the groundwater is aggressive, there have been several incidences of groundwater penetration into the structures, and the interior of the walls may not indicate the condition of the exterior walls, it is unclear to the staff that this is an adequate approach to managing aging of... concrete structures subjected to aggressive groundwater.”

In addition, in some cases incoming water had picked up radioactive contaminants in the ground outside the Salem 1 Auxiliary building and carried it into the building, 64 feet below ground. Rather than trace the source of the contamination or the path used by the area groundwater to get into the building, PSEG merely roped off the contaminated area.

The NRC found saltwater leakage in the containment building was observed through both planned expansion joints and “expansion and shrinkage cracks in the concrete.” An analysis of the water found salt levels of 15,000 parts per million, 30 times the threshold limit for reinforced concrete of 500 parts per million.

Highly corrosive borated water, leaking from the reactor’s coolant system, “was running down the containment liner plate,” a ¾-inch steel lining in both Salem 1 and 2. In Salem 1, the NRC found, “borated water has been leaking in one area of containment for the last 30 years” at a rate of about 100 gallons a day. The result has been corrosion of the liner designed to prevent highly contaminated reactor fluid from escaping into the outside environment.

In a response, PSEG stated that examination of the lining found that in no section had the steel lost more than 10 percent of its thickness to the acidic water leaks and, therefore, still met the standards required by the company’s operating license.



That’s just outrageous,” said Tracy Carluccio, deputy director of the environmental group Delaware Riverkeeper. “There are several mind-blowing, egregious problems here that were

pointed out to PSEG. The responses that PSEG gives are shocking in terms of their inadequacy.”

The concentration of salt in the water found to be infiltrating the plant, Carluccio said, “is saltier than ocean water. But when asked if they had plans for an inspection they said ‘No’. That’s outrageous. So is the absence of a commitment to fix a leakage that has been going on for 30 years. The fact that it could be operated in such a slipshod manner is shocking.”

The wear and tear on the exterior of the concrete structures has been severe and far more extensive than permitted by the operating licenses for the nuclear plants. The containment buildings are massive structures which are intended to withstand the enormous pressure buildup resulting from a rupture of the reactor itself and the sudden vaporizing of hundreds of thousands of gallons of radioactive steam. They are not foolproof, however and the NRC estimates they have a 15 percent chance of failing under the pressure load.

The containment buildings at Salem, which were designed in the 1960s and built in the 1970s, are nearly 192 feet tall, with walls and the characteristic domes 3.5 feet thick. The concrete is built over a lattice of steel rebar 2.25-inches in diameter. But cracks have exposed at least some of the buildings’ steel skeletons to salt water. As a result, each of the buildings is covered with a tracery of cracks and, according to the NRC, has been maintained by PSEG using a standard that is “significantly different and less stringent than the acceptance criteria” specified by agency regulations.

The north wall at Salem Unit 2 was found to have one crack “six feet long and 16 inches wide” as well as cracks at various joints “up to 3 feet long and four inches wide.” NRC regulations, however, state that cracks larger than 8 inches in diameter and 0.04 inches in width “are considered unacceptable and in need of further technical evaluation.”

“It is an issue we have to address,” said PSEG spokesman Joe Delmar. “We are going to monitor it more closely and if we do notice additional cracks we would need to take preventive measures.

“The cracks haven’t posed any issues to the overall health of the structure.”