IN THE UNITED STATES COURT OF APPEALS
FOR THE THIRD CIRCUIT

NEW JERSEY ENVIRONMENTAL FEDERATION; SIERRA CLUB; NUCLEAR INFORMATION AND RESOURCE SERVICE; NEW JERSEY PUBLIC INTEREST RESEARCH GROUP; GRANDMOTHERS, MOTHERS AND MORE FOR ENERGY SAFETY	)	
Petitioners,	)	
v.	)	**No. 09-2567**
UNITED STATES NUCLEAR REGULATORY COMMISSION and the UNITED STATES OF AMERICA	)	
Respondents,	)	
EXELON GENERATION COMPANY, LLC	)	
Intervenor.	)	

PETITIONERS' REPLY TO RESPONDENTS AND INTERVENOR'S RESPONSES REGARDING THE FUKUSHIMA ACCIDENT

The second worst nuclear accident that has ever occurred commenced on March 11, 2011 at the Fukushima reactor complex in Japan and is still ongoing. On April 12, 2001, Japanese authorities increased the severity level to 7, putting this accident in the same category as the Chernobyl accident in Russia in 1986, two levels above the Three Mile Island Accident in Pennsylvania in 1979. The four reactors that have emitted substantial amounts of radioactivity into the

environment are all of similar design and vintage to the reactor at Oyster Creek. The oldest of those four reactors is two years newer than Oyster Creek and just obtained a ten year extension of its initial operating license. On March 21, 2011, this Court requested the parties to reflect upon the impact of the ongoing accident upon this proceeding.

Unfortunately, instead of providing a careful analysis of the situation, both the Nuclear Regulatory Commission ("NRC") and Exelon have resorted to reciting platitudes regarding current safety that are unsupported by citation or authority. They also promise future action will be taken where necessary, but fail to note that this approach would largely exclude the public. This failure to engage is particularly surprising in the case of the NRC, which has considerable technical knowledge of the Fukushima accident that it is apparently keeping from the public and this Court. Although Petitioners acknowledge that much is still unknown about the accident at Fukushima, they also show in this brief that some lessons are already evident.

First, the Fukushima accident shows that the decision to relicense Oyster Creek carries potentially enormous consequences. Unlike the Chernobyl accident, which involved a reactor of a different design to those that operate domestically, the Fukushima accident involves G.E. Boiling Water Reactors, which comprise around a quarter of the currently operating U.S reactor fleet, including Oyster

Creek. Second, the accident highlights the need for vigorous public participation and an effective adjudicatory process. Third, the Mark I containment system used at both Fukushima and Oyster Creek is unreliable as a means to contain radioactivity from a reactor accident. Fourth, if the recirculation cooling system fails to operate after the reactor shuts down, the consequences can be disastrous. Fifth, allowing large amounts of spent fuel to be stored in pools on top of reactors, but outside the containment, is needlessly risky. Finally, allowing reactors to operate while technical issues are being resolved is perilous.

Moreover, in addition to ignoring the relevance of these lessons to this case, the NRC now asserts that if upgrades are required at Oyster Creek, they can be achieved through ongoing regulatory processes and that there are "ample opportunities" for the public to participate in these processes. These assertions are simply incorrect. The specific issues raised in the Oyster Creek proceeding were precisely those that the Commission has identified as not being effectively addressed by ongoing operational regulation.

Furthermore, even for the many safety issues that are theoretically covered by ongoing regulation, and so could not be raised in relicensing, the NRC's processes have repeatedly proved deficient. The avenues for public participation in these processes are extremely limited and the NRC routinely ignores the concerns of individuals and even States when they attempt to employ the very

processes that the NRC cites. Moreover, when it adopted the so-called backfit rule, which restricts NRC's ability to require upgrades to licensed plants, the NRC placed the emphasis on making good decisions during the licensing process, rather than deferring those decisions until later.

Thus, like the Three Mile Island and Chernobyl accidents before it, the Fuskushima accident serves as a sobering reminder that nuclear power is inherently dangerous and must be carefully and comprehensively regulated. Unfortunately, the evidence shows that the NRC has not been an effective regulator and may be getting less effective over time, despite the Fukushima accident. In this proceeding, Petitioners showed that the Staff's safety review of Oyster Creek left gaps in the record that the Chair wanted to fill, that the NRC denied Petitioners' hearings on a number of safety issues on specious procedural grounds, and that even where Petitioners did get a hearing, the Commission upheld a Board decision that relied on testimony from the licensee that subsequent events had proved false. In his two informative dissents, the current Chair of the NRC recognized some of these deficiencies. Similarly, Judge Baratta, one of the technical judges on the Board, pointed out some serious safety concerns that went unaddressed.

Fukushima shows that when nuclear safety is at stake it pays to address known deficiencies promptly and thoroughly. As already briefed, this is also a requirement of the Atomic Energy Act, which mandates a "definitive finding" on

safety prior to the issuance of a license to operate a nuclear power plant. Therefore, the facts and the law show that all of the identified deficiencies in the Oyster Creek relicensing review should have been resolved before the NRC renewed Oyster Creek's license. Because they were not, this Court should now require that they be addressed before the plant can continue operating on its current license, which was illegally granted. Furthermore, because Fukushima has called into question the design of the containment and the safety of the spent fuel pool at Oyster Creek, this Court should also require the NRC to review its previous conclusions about these safety issues and mandate any necessary safety improvements that need to be carried out as a condition of licensing, to ensure that the NRC's hands are not tied by the back-fit rule.

I. Summary of the Fukushima Accident and Aftermath

Although many details about the Fukushima reactor accident remain unclear, the NRC Information Notice No. 2011-08 (March 31, 2011)[1] describes the basic facts as follows:

> On March 11, 2011, the Tohoku-Taiheiyou-Oki earthquake occurred near the east coast of Honshu, Japan. This magnitude 9.0 earthquake and the subsequent tsunami caused significant damage to at least four of the six units of the Fukushima Daiichi nuclear power station as the result of a sustained loss of both the offsite and onsite power systems. Efforts to restore

[1] NRC ADAMS Accession No. ML 110830824, *available at* http://pbadupws.nrc.gov/docs/ML1108/ML110830824.pdf.

> power to emergency equipment were hampered and impeded by damage to the surrounding areas due to the tsunami and earthquake.
>
> Units 1, 2 and 3 were operating at the time of the earthquake. Following the loss of electric power to normal and emergency core cooling systems and the subsequent failure of backup decay heat removal systems, water injection into the cores of all three reactors was compromised, and reactor decay heat removal could not be maintained. The operator of the plant, Tokyo Electric Power Company, injected sea water and boric acid into the reactor vessels of these three units, in an effort to cool the fuel and ensure that the reactors remained shut down. However, the fuel in the reactor cores became partially uncovered. Hydrogen gas built up in Units 1 and 3 as a result of exposed, overheated fuel reacting with water. Following gas venting from the primary containment to relieve pressure, hydrogen explosions occurred in both units and damaged the secondary containments.
>
> Units 3 and 4 were reported to have low spent fuel pool (SFP) water levels. Fukushima Daiichi Units 4, 5 and 6 were shut down for refueling outages at the time of the earthquake. *Id.* The fuel assemblies for Unit 4 had recently been offloaded from the reactor core to the SFP. The SFPs for Units 5 and 6 appear to be intact. Emergency power is available to provide cooling water flow through the SFPs for Units 5 and 6.

Id at 1-2. Since then, Areva, a private reactor vendor, has provided a more detailed summary of the accident.[2] This summary shows that Units 1 to 3 are General Electric Boiling water reactors with Mark 1 containments, similar to Oyster Creek.

[2] Areva, *The Fukushima Daiichi Incident* (April 7, 2011), *available at* http://www.scribd.com/doc/52743735/AREVA-Fukushima.

Id. at 3. Unit 1 came online in 1971 and units 2 and 3 commenced operation in 1974. *Id.* After approximately three quarters of the length of the fuel rods became exposed, significant amounts of hydrogen started to be generated by the reaction of water with the zirconium cladding that forms the fuel rods. *Id.* at 17. Because the pressure inside the drywell containment became too great, some of the gases in the containment had to be vented from all three units into the reactor building. *Id.* at 20. At units 1 and 3, the vented gas exploded, damaging the buildings. *Id.*

In Unit 2 a hydrogen explosion occurred within the containment, breaching the containment wall, so that highly radioactive gases and water could escape. *Id.* at 23. This breach led to much higher releases of radioactivity from the accident. *Id.* at 28. Concurrently, the spent fuel pool at Unit 4, which contained the full core of that reactor, lost water and overheated, causing a hydrogen explosion in that building.[3] According to the NRC internal assessment (which was leaked to the press unofficially), "fuel particulates may have been ejected from the pool" based upon finding neutron emitters up to 1 mile from the plant and some very high-dose material between Units 3 and 4. *Id.*

The full magnitude of the accident has only become clear recently. The Japanese government has raised the severity rating to 7, which is the highest

[3] NRC Reactor Safety Team, *RST Assessment of Fukushima Daiichi Units*, at 13 (March 26, 2011), *available at* http://www.scribd.com/doc/52467769/NRC-Rst-Assessment-26march11.

possible and equivalent to the rating given to the Chernobyl accident.[4] By comparison, the Three Mile Island accident in 1979 rated a 5 on the same scale. *Id.* A Japanese professor of nuclear engineering commented that this severity rating "shows that current safety standards are woefully inadequate." *Id.* A commissioner on Japan's Nuclear Safety Commission commented that much of the radioactivity escaped through the breach of containment at Unit 2. *Id.*

The International Atomic Energy Agency has found areas that are unacceptably contaminated up to 40 miles from the Fukushima reactors, well beyond the initial 12-mile evacuation zone and the 19-mile zone within which residents were advised to stay indoors. *Id.* The Japanese government is therefore recommending that residents in the more distant high contamination areas move out within a month. *Id.* In addition, it is now recommending that children and pregnant women should not come within 19 miles of the Fukushima reactors. *Id.*

While the NRC has set up some task forces to review reactor safety in the United States, it has also insisted that the Fukushima accident should have no effect on licensing, and has provided no mechanism for effective public participation in these reviews. Indeed, on April 15, 2011, a leading member of the House Energy and Commerce Committee wrote a letter to the NRC Chair

---

[4] Keith Bradsher, Hiroko Tabuchi, and Andrew Pollack, *Japan Nuclear Disaster Put on Par With Chernobyl*, N.Y. TIMES, April 12, 2011, *available at* http://www.nytimes.com/2011/04/13/world/asia/13japan.html.

expressing concerns that "the NRC has decided to keep the results of most of the investigations secret, and their scope and depth maybe severely constrained."[5] The letter details the minimal staff time allocated to the reviews and the desire to keep the parts of the resulting assessments relating to beyond design basis accidents from the public. *Id.*

Although the NRC cannot see a link between Fukushima and licensing, at least one licensee, the State of New York, and multiple public interest groups have already made this connection. In a letter to the NRC the licensee for Diablo Canyon nuclear power plant wrote that "[i]n light of recent events at the Fukushima Daiichi power plant, and the considerable public concern regarding the need to assure the seismic safety at [Diablo Canyon], PG&E has decided it is most prudent to have completed certain seismic studies" before a new license is issued.[6] As discussed in detail below, soon after the Fukushima accident, the Attorney General of New York requested the NRC to expand the scope of the Indian Point relicensing to include earthquake risks. Furthermore, on April 14, 2001, over 45

---

[5] Letter from Edward J. Markey, U.S. Representative, to Gregory Jaczko Chairman, Nuclear Regulatory Commission (April 15, 2011), *available at* http://markey.house.gov/docs/4.15.11.nrc.pdf.

[6] Ben Casselman and Steven Power, *Diablo Plant Delays License Bid for Quake Study*, WALL ST. J., April 12, 2011, *available at* http://online.wsj.com/article/SB10001424052748704529204576257302591577840.html?KEYWORDS=diablo+nuclear.

public interest groups involved in licensing proceedings petitioned the NRC to suspend licensing to allow the lessons-learned at Fukushima to be applied.

II. Public Adjudication During Licensing Improves Safety

Fukushima Unit 1 recently had its license extended for another ten years, but the Japanese license renewal process was conducted without any substantial input from the public.[7] It is now clear that the licensing and relicensing processes for the Fukushima plants failed to address site flooding as a common failure mode for the core and spent fuel pool cooling systems at all the reactors on the site. Although this issue was raised at one point, it was dealt with through undertaking further studies, which were ongoing at the time of the accident.[8] Had an avenue for public intervention been available, there is at least a chance that a public intervenor would have been able to point out this deficiency.

In contrast, the record shows that public participation in NRC proceedings has triggered heightened review and improved safety. For example, prior to public review of the Oyster Creek relicensing proposal, the NRC had accepted Exelon's discontinuation of monitoring for the severely corroded sandbed region of the

---

[7] Hiroko Tabuchi, Norimitsu Onishi, and Ken Belson, *Japan Extended Reactor's Life, Despite Warning*, N.Y. TIMES, March 21, 2011, *available at* http://www.nytimes.com/2011/03/22/world/asia/22nuclear.html.

[8] *Id.* Unfortunately, this story sounds quite familiar to those who follow the NRC. For example, the NRC has yet to finally resolve issues concerning fire protection, despite over a decade of study on each issue. GAO-08-747, *NRC's Oversight of Fire Protection at U.S. Commercial Nuclear Units Could Be Strengthened* (June 2008), *available at* http://www.gao.gov/new.items/d08747.pdf.

primary containment (termed the drywell shell), based in part on readings in 1996 that showed the metal in this area got thicker (a physical impossibility). Based upon the same readings, Exelon had concluded no more thickness monitoring was needed, even if the reactor life was extended by 20 years. *See* A86 (petition filed in November 2005); A89 (monitoring added for the first time on December 9, 2005; monitoring during extended operation added for the first time on April 4, 2006). However, once the public filed an intervention petition complaining about the complete lack of thickness monitoring, Exelon started to improve its monitoring proposals. *E.g.* A89. These improvements became more urgent after the intervenors' expert showed that the 1996 readings were in error and the Staff agreed. Ultimately Exelon improved its monitoring regime for this area five times. *See* A89-93; A96.

In addition, the NRC revised its metal fatigue calculations for Oyster Creek and seven other reactors after an intervenor's expert in the Vermont Yankee proceeding showed that similar calculations for that reactor were overly optimistic. A1003-04; A1597; A1634. NRC Staff revisited its approval at Oyster Creek and required Exelon to perform additional calculations. A60-62. Although a dispute remains about whether a hearing was required to review these calculations, but for the Vermont Yankee intervention they would not have been done at all.

These examples validate a 1974 statement by the Atomic Safety and Licensing Appeal Board (since abolished) that "[p]ublic participation in licensing proceedings not only 'can provide valuable assistance to the adjudicatory process,' but on frequent occasions demonstrably has done so."[9] Similarly, a licensing Board judge in 2008 commended intervenors in one licensing case for drawing safety issues to the Board's attention despite the disadvantages under which they have to labor. *Id.*

A major difference between the United States and Japan is that Congress gave the public a right in the Atomic Energy Act to participate in licensing decisions for nuclear power plants. Because public involvement increases safety, and safety is supposed to be the NRC's sole mission, one would think that the NRC would welcome intervenors who raise significant safety issues.

Unfortunately, while the NRC occasionally pays lip service to public participation, it has been decidedly hostile to public participation in adjudicatory proceedings, citing constantly to procedures that are "deliberately stringent," "strict," and "deliberately heavy." NRC Br. at 15, 17, 32. The record at Oyster Creek and in other reactor relicensing proceedings shows that the NRC has made

[9] Roisman, Anothony Z. et al., *Nuclear Power in the New Millennium*, 26 Pace Envtl. L. Rev. 317, 328 (2009) ("Roisman Article").

intervention extraordinarily difficult.[10] The NRC has used rulemaking to narrow the substantive scope of relicensing and make the procedural rules onerous for members of the public, who usually receive no financial support and cannot even cover their costs.[11] The NRC has then further impeded public participation by opposing interventions in its role as a party, adopting hostile and textually unsupportable interpretations of its pleading rules in its role as an adjudicator, and avoiding the release of important information.

In its role as a party, the Staff nearly always marches in lock-step with the applicant by vigorously opposing intervenors. Ironically, at oral argument, counsel for NRC complained about how time consuming this is, but drew precisely the wrong conclusion. Hearings do not have to be time consuming for the Staff, because the NRC Staff only become a party if they affirmatively choose to do so. 10.C.F.R § 2.1202(b)(1). If the NRC Staff choose to become a party, they can reduce their work by not duplicating the applicant's presentation. If NRC Staff do not become a party, the NRC's Atomic Safety and Licensing Board hears evidence from only the licensee and the intervenor. The Board's panels, which are

[10] Prior to the hearing regarding the admitted Oyster Creek contention, over 45 reactors had been relicensed without an adjudicatory hearing.
[11] Webster, R., *Spotlight on Safety at Nuclear Power Plants: The View from Oyster Creek*, 26 Pace Envtl. L. Rev. 365, 370-72; 381-82 (2009); Roisman Article at 336-344.

composed of two technical judges and one lawyer, will then make appropriate decisions based on the evidence from the opposing parties.

In addition, as Exelon showed in this case, applicants are capable of seeking the advantages of NRC's procedural rules on their own, without help from NRC Staff . Furthermore, the NRC has made applicant's job even easier, and intervenors' much harder, by consistently interpreting those rules in a manner that is hostile to public participation. For instance, in denying the metal fatigue contention, the NRC found that the standard for re-opening issues applies even though Petitioners had no prior opportunity to raise that particular issue. A64-65; A78-79. In addition, the NRC has used other timing rules as dispositive. Petitioners have regularly found themselves in an environment that was "through the looking glass," like Alice in Lewis Carol's novel, because the NRC has ruled that a contention could only be raised earlier or later, but never at the present time. Paraphrasing Lewis Carol, Petitioners' conversation with the NRC went as follows:

> NRC: "The rule is, contentions tomorrow and
> contentions yesterday - but never contentions today."
> "It MUST come sometimes to 'contentions today,'"
> Petitioners objected.
> "No, it can't," said the NRC. "It's contentions every
> OTHER day: today isn't any OTHER day, you know."
> "I don't understand you," said Petitioners. "It's dreadfully
> confusing!"

The most glaring example of the NRC's twisted application of the timing rules involved the issue of lack of thickness monitoring for the sandbed region. Petitioners raised that issue at the outset of the proceeding, but it became moot when Exelon belatedly proposed monitoring for that region during the proposed period of extended operation. A89. However, even though the Board allowed Petitioners to challenge the frequency of that monitoring, it excluded a simultaneous challenge to the scope of that monitoring. A91-92. Since then, the NRC has taken inconsistent positions on when such a challenge would have been timely. *See* A132 (Board found time to file scope contention was after the December 2005 commitment to take more measurements, but Commission found that December 2005 commitment contained no new information, so could not make the scope contention timely); A462 (Petitioners cannot challenge thickness monitoring prior to the period of extended operation). It has also been unable to point to any time at which Petitioners could have successfully made this challenge.

With regard to withholding information, the most egregious example in the record is that the NRC Staff traveled to Exelon's Washington D.C. office to review a key analysis regarding metal fatigue, instead of obtaining a copy to review in their own government offices. A1677. As a result, that document remained a non-government document and could not be obtained from the NRC under the Freedom

of Information Act. *Id.* Counsel for NRC then attempted to exclude this conduct from the record before this Court.[12]

The hostility to meaningful public participation exhibited by the NRC stands in marked contrast to other areas of administrative law that grant similar public hearing rights. For example, the Clean Water Act requires the Environmental Protection Agency and states to allow public hearings on water pollution discharge permits, and the courts have interpreted that right broadly to grant the public "a genuine opportunity to speak on the issue of protection of its waters." 33 U.S.C. § 1342(a)(1), (b)(3); *NRDC v. EPA*, 859 F.2d 156, 177 (D.C. Cir. 1988). To ensure that the NRC's decisions benefit from the public participation that Congress envisaged when it passed the Atomic Energy Act, this Court should find that the NRC violated Petitioners' hearing rights and issued Oyster Creek's operating license illegally.

III. The General Electric Mark 1 Containment System Is Inadequate By Design and Has Become Weaker Due to Corrosion

As early as September 20, 1972, an employee of the Atomic Energy Commission, the predecessor to the NRC, recognized that the General Electric Mark 1 pressure suppression design had some major drawbacks and recommended

[12] Counsel for NRC only agreed to add the FOIA denial to the administrative record after this Court granted Petitioners' Motion to Compel such action.

that it should be phased-out within two years.[13] In particular, the employee recognized the danger of hydrogen generation within the containment vessel. *Id.* at 2. This memo prompted a rapid response from a future NRC Commissioner stating that banning these already-approved containment vessels "could well be the end of nuclear power" and "generally create more turmoil that I can stand thinking about."[14]

An official with the NRC later warned that these containment vessels had a 90% chance of failure in accident scenarios.[15] Subsequently, to guard against complete failure of these containment vessels in accident situations, both Oyster Creek and the Fukushima reactors were retro-fitted with venting systems to help relieve pressure during an accident. At Fukushima 1 and 3, hydrogen explosions occurred while hydrogen was being vented from the containment, while at Fukushima 2, a hydrogen explosion occurred within the containment vessel leading to its breach. The latest assessment is that the failure of the containment at Fukushima 2 led to a large increase in the amount of radioactivity escaping. Thus, much of the release of radioactivity at Fukushima can be traced to the inadequacy of the Mark I containment vessel.

---

[13] Memorandum from Hanauer to O'Leary, dated September 20, 1972 (Attachment 1).

[14] Note from Hendrie to O'Leary, dated September 25, 1972 (Attachment 2).

[15] Tom Zeller, Jr., *Experts Had Long Criticized Potential Weakness in Design of Stricken Reactor*, N.Y. TIMES, March 15, 2011, *available at* http://www.nytimes.com/2011/03/16/world/asia/16contain.html.

The containment vessel at Oyster Creek is similar to the one at Fukushima. Compounding this problem, Oyster Creek's containment has become much weaker over time due to severe rusting. In the thinnest measured spot, over half an inch of steel has been lost, leaving a thickness of 0.602 inches. A547 (measurement 7a in 2006). The Board concluded that the general area acceptance criterion was met by a margin of only 0.064 inches, down from 6 times that amount when the reactor was new. A-800. Unfortunately, the issue of whether the containment met the localized acceptance criteria was never adjudicated. A795, 799, 800-01. Because less than 0.1% of the area of the sandbed region was actually measured, *see* A553, Petitioners' expert testified that compliance with the localized acceptance criteria cannot be evaluated with any certainty until more measurements are done, but was probably violated. A624-625 (local area acceptance criterion is based upon a 9 square foot area with a thickness of less than 0.736 inches) ; A540-41 (local acceptance criterion requires areas less than 0.736" thick to be less than 9 square feet; Exelon's assessment showed exceedance of that criterion); A550-51 (showing exceedance of local area criterion in Bays 1 and 13).

Judge Baratta, one of the technical judges on the Board, warned that "there are large areas of the sandbed that do not have any recent measurements or any measurements at all." A-837. This is the very point that Petitioners sought to remedy through adjudication, but were denied any opportunity to do so. The

agency has offered numerous contradictory excuses for the exclusion of the contention about the spatial scope of these measurements on timing grounds, but the record shows that the time at which Petitioners offered a valid contention about the frequency of measurement was also the time at which Petitioners offered a similarly valid contention about the spatial scope of the measurement program. The NRC therefore should have allowed that contention to be admitted.

Petitioners recognize that adjudication of this contention would not address the bigger question of whether licensing reactors with this inadequate containment should no longer be permitted now that actual experience has confirmed that venting systems do not fully remedy the inadequacy of the design. However, a remand from this court would give the NRC the ability to impose any new safety standards it develops from its ongoing reviews of lessons learned from Fukushima without the constraints of the back-fit rule. As discussed in detail below and contrary to the impression given by the NRC's brief, the back-fit rule imposes severe constraints upon the NRC's ability to order upgrades after the NRC grants operating licenses.

IV. The Quality of the NRC's Safety Review Was Inadequate

The accident at Fukushima shows that we cannot be complacent about nuclear safety. Even though there are multiple systems of back-up power, an unanticipated event disabled all of these back-ups at Fukushima. Furthermore, the

natural tendency as mechanical equipment gets older is that it becomes less reliable. Thus, to ensure that old reactors like Oyster Creek do not become unsafe over time, it is necessary to ensure that aging management plans are in place to detect the effects of aging before equipment becomes inoperable.

Recognizing that the ongoing maintenance processes were inadequate for long-lived passive components, the NRC rules require applicants for relicensing to show that they have aging management for such components under control. *E.g.* *Federal Respondents Mem. Re: Fukushima* at 18. When reviewing the applicant's proposals, the NRC Staff is supposed to examine the failures that have occurred to date and reach an independent judgment about how well the applicant's proposal's would prevent such failings in the future. A1423-24. This process is called review of operating experience.

Unfortunately, there is considerable evidence that the Staff failed to do a careful review of such issues at Oyster Creek and other reactors. A report by the Office of Inspector General shows that 76% of report samples lacked any substantive NRC comments about operating experience. A1414. Forty-two percent of report samples were almost word for the word the same as the application, while 34% lacked any support for the Staff's conclusion at all. A1452. The Inspector General cautioned "the audit report may cast doubt as to what, exactly, the NRC did to independently review the licensee's program other than

restate what was provided in the renewal application." A1414. These failures were compounded by the early disposal of Staff working papers for the Oyster Creek review making it impossible for the Inspector General to delve deeper into what the Staff actually did. A1031-32.

Further illustrating the Staff's lack of a systematic approach to the safety reviews, on the eve of the hearing regarding the Oyster Creek containment, the Staff changed its mind about the need for the applicant to meet a specific requirement of the engineering code. Even though the applicant acknowledged the need to meet this code requirement, the Staff suggested that the standard was for design purposes only. A497. That view was rejected by the Board, but illustrates that even finding out what the safety requirements are is difficult for the Staff, applicants, and intervenors. A793-92, n. 20. In the absence of this knowledge, it is extremely difficult for the Staff to determine whether aging management programs are adequate. Codification of the requirements of the Current Licensing Basis has been suggested and should logically be the starting point for relicensing safety reviews, but the NRC has failed to require it.[16]

The failure to effectively examine operating experience by both the applicant and the Staff was further highlighted at Oyster Creek when an underground pipe leaked water containing radioactive tritium into the ground a

[16] *In the Matter of Energy Nuclear Operations , Inc. (Indian Point Nuclear Generating Station Units 2 and 3)*, 68 N.R.C. 43, 70 (July 31, 2008).

week after the NRC granted the renewed license. The report examining the root cause of this problem found that the relicensing review of this piping was "insufficient/nonexistent" that 23 previous leaks had occurred since 1980, and that documents incorrectly showed that the pipe that leaked had been replaced by a stainless steel pipe.[17] Furthermore, as discussed above, the Staff's failure to spot potential flaws in metal fatigue calculations at Oyster Creek and seven other reactors before an intervenor pointed out flaws in similar calculations at Vermont Yankee again shows that the Staff's safety review was not sufficiently thorough.

This leakage of radioactive tritium and the Staff's failure to spot flawed metal fatigue calculations serve to underline the conclusion of the Chair that the Inspector General's report called into question whether the Staff made an informed independent judgment on safety during the Oyster Creek safety review. A37. Because the record "neglects to address" this issue, the Chair would have required further confirmation to ensure that the Staff's safety review had been effective and thorough. A37-38. The Fukushima accident provides a salutary reminder that the NRC's decisions must be based upon a complete record because nothing can be taken for granted when it comes to nuclear safety. This Court should therefore remand this matter back to the NRC with a requirement that the safety review for Oyster Creek be carried out in a manner that ensures all NRC requirements are

[17] Exelon, Root Cause Evaluation Report, 65; 41; 19 (June 5, 2009), *available at* NRC ADAMS accession number ML100740217.

both met and seen to be met through a transparent process with full opportunities for public participation.

V. The Recirculation System is Safety Critical

One of the reasons that the NRC denied a contention about metal fatigue on the recirculation intake nozzle was intervenors' alleged failure to show that a safety significant issue could result from such fatigue. This NRC found this failure even though Petitioners quoted an agency spokesperson stating that if the nozzle broke it could lead to a failure of the recirculation cooling system and a severe accident. A985; A1638. That opinion was reinforced by one of the technical judges on the licensing Board who stated that the contention raised a "significant safety issue" and "an issue of grave importance." A1144. He found the majority's rejection of the contention "extreme" and a "grave error" that could undermine nuclear safety. A1151-54. The Fukushima disaster shows how bad the failure of the recirculation cooling system can be.

After this rejection, Petitioners provided an expert affidavit to the Chair of the NRC highlighting the experts' concerns about the revised metal fatigue calculations. A1231-34. As discussed above, that expert had uncovered deficiencies in metal fatigue calculations at Vermont Yankee that the NRC Staff had failed to find during safety reviews for eight other reactors, including Oyster Creek. The NRC did not respond to this expert analysis.

This example illustrates once more how NRC repeatedly elevated form over substance in the license renewal hearings for Oyster Creek. As a result, multiple opportunities to examine publicly the basis for the applicant's case were lost. The Fukushima accident shows that such exercises are valuable because they improve safety. Furthermore, as Congress understood when it granted the hearing right in the Atomic Energy Act, allowing a full public airing of a number of safety issues also serves to increase public confidence when things go wrong. The behavior of the NRC in this case did the opposite. By going to great lengths to deny the public the hearings to which they were entitled on numerous safety issues, the NRC gave the impression that it wanted to avoid any outside scrutiny of nuclear safety, undermining its bland assurances that everything is safe even after Fukushima.

V. The NRC Has Prematurely Decided That Fukushima Will Not Affect Licensing

The NRC has stated that it does not believe Fukushima affects licensing and that it can take all required actions outside of licensing reviews. Petitioners believe that this view is premature because NRC is constrained by the back-fit rule except during licensing, public participation rights outside of licensing are severely limited, and it is unclear whether improvements to spent fuel pools, which the NRC Chair favors, could be mandated outside of licensing. Moreover, NRC's ongoing enforcement processes have repeatedly failed to correct known potential

safety problems.[18] Finally, as discussed above, Fukushima also calls into question whether Mark 1 containments should continue to be licensed.

A. The NRC's Ability to Improve Safety For Licensed Activities is Restricted By the Back-fit Rule

Victor Galinsky, one of the Commissioners who was on the Commission during the Three Mile Island accident, has recently pointed to the so-called back-fit rule as a critical problem with the NRC's ongoing oversight process:

> The NRC regulation that covers safety upgrades (called "backfits" in regulatory jargon) is strongly biased against any costly improvements. The last time the NRC launched such a review of the U.S. nuclear plants, in 1996, the industry mobilized then-Senator Pete Domenici (R-N.M.), who was the chairman of the NRC's appropriation subcommittee. Domenici promptly threatened a stunned NRC Chairperson Shirley Jackson with a deep budget cut unless she reversed her approach and made the agency more industry-friendly. Jackson did exactly that: she fired some of the top officials and toned down the NRC's criticism of industry. The staff got the message. Domenici brags about this episode in his 2004 book, A Brighter Tomorrow, and goes on to write that he has "been very impressed with the NRC." So has the nuclear industry, which has always preferred self-regulation to government oversight.[19]

---

[18] *E.g.* Over 40 years, the Union of Concerned Scientists has "repeatedly found that NRC enforcement of safety regulations is not timely, consistent, or effective." Union of Concerned Scientists, *The NRC and Nuclear Power Plant Safety in 2010: A Brighter Spotlight Needed*, 1 (March 2011) *available at* http://www.ucsusa.org/assets/documents/nuclear_power/nrc-2010-full-report.pdf.

[19] Victor Gilinsky, *Preventing the Next Nuclear Meltdown*, FOREIGN AFFAIRS, March 21, 2011, *available at* http://www.foreignaffairs.com/articles/67667/victor-gilinsky/preventing-the-next-nuclear-meltdown.

The backfit standard used to be that if resolution of a previously unresolved safety problem was warranted, it was required. Roisman Article at 334. The NRC changed that standard in 1985 and clarified it after litigation in 1988. 53 Fed. Reg. 20,610 (June 6, 1988). Under the revised backfit standard (which is applied to safety improvements to licensed plants, because in licensing the NRC deems that they already meet the minimum safety requirements of the Atomic Energy Act), such safety improvements must now be both substantial and cost-justified, specifically:

> the Commission shall require the backfitting of a facility only when it determines a substantial increase in the overall protection of the public health and safety or the common defense and security to be derived from the backfit and that the direct and indirect costs of implementation for that facility are justified in view of this increased protection.

10 C.F.R. § 50.109(a)(3). Since this standard has been in place, the NRC seldom mandates safety improvements. Instead, it largely relies on negotiating voluntary safety improvements with licensees.

B. Outside of Licensing Public Participation is Severely Limited

Following Fukushima, the Attorney General of New York provided a good illustration of how difficult it is for even states to raise safety issues outside of licensing proceedings. He recently wrote to the NRC about inadequate earthquake protection at the Indian Point nuclear power plant and stated "the NRC has

consistently blocked consideration of New York's seismic concerns, as well as related concerns about population, emergency evacuation, fire safety, and security."[20] He further showed that New York has attempted on multiple occasions to raise issues about outdated seismic data in safety studies regarding Indian Point but the NRC has failed to take any action until now. *Id.*

As the NRC notes in its filing, in theory, citizens may request enforcement of the NRC's safety-requirements through a petition described by 10 C.F.R. § 2.206. However, this process suffers from at least two key problems. First, even though such a petition must "specify the action requested and set forth the facts that constitute the basis for the request," there is no provision for discovery. Thus, the petitioner must glean all the information required from public sources. This is a very difficult task because even the basic safety requirements that each plant must meet, called the "Current Licensing Basis" ("CLB"), are not compiled in a publicly accessible form.[21] In fact, experience at Oyster Creek showed that even the NRC Staff got the CLB wrong throughout the hearing process on the safety of the containment system.[22] Finally, many of the underlying documents on specific

---

[20] Letter from Eric Schneiderman, Attorney General of New York, to NRC Commissioners, March 18, 2011, *available at* http://www.riverkeeper.org/wp-content/uploads/2011/03/3-18-11-Schneiderman-Letter-to-NRC.pdf

[21] *In the Matter of Energy Nuclear Operations , Inc. (Indian Point Nuclear Generating Station Units 2 and 3)*, 68 N.R.C. at 70 (July 31, 2008).

[22] *In the Matter of AmerGen Energy Co., LCC (License Renewal for Oyster Creek Nuclear Generating Station)*, 66 N.R.C. 327, 343-344 n. 20 (December 18, 2007).

safety issues are unobtainable because the NRC Staff either does not retain them, or reviews them at the licensee's site.[23] Thus, a lack of transparency is one critical hindrance to citizens participating effectively in the ongoing oversight of nuclear plants.

Second, pro-safety public interest groups have become disillusioned with the § 2.206 petition process because the NRC Staff effectively reviews its own work and the rights of appeal are very limited. It is hardly surprising that the Staff normally finds that its own actions are sufficient and justified. Furthermore, it is unclear whether petitioners have a right to appeal an adverse decision to the Commission. 10 C.F.R. § 2.206(a) & (c). The Second Circuit has found that that a refusal to take enforcement action pursuant to a § 2.206 petition is not judicially reviewable.[24] However, other courts have found that there is an exception to this presumption of unreviewablity, where the § 2.206 petition relates to licensing.[25] At a minimum, petitioners' rights to judicial review are in doubt and petitions for enforcement of NRC regulations during operation are unlikely to be reviewable.The other major avenue open to the public is rulemaking petitions, but the NRC seldom grants such petitions. For example, on the issue of spent fuel pool

[23] NRC Office of the Inspector General ("OIG"), *Audit of NRC's License Renewal Program* (OIG-07-A-15) at 14-15 (September 6, 2007) ("OIG Report"), *available at* NRC ADAMS accession no.ML072490486.
[24] *Riverkeeper, Inc. v. Collins*, 359 F.3d 156 (2d Cir. 2004).
[25] *Nuclear Information Resource Service v. Nuclear Regulatory Com'n*, 969 F.2d 1169, 1178 (D.C. Cir. 1992).

safety, which even the Chair of the Commission thought should be improved, the NRC rejected rulemaking petitions filed by Massachusetts and California.[26]

C. The NRC Fails To Discuss the Controversy Regarding Elevated Spent Fuel Pools

The Fukushima accident has provided a somber reminder that the spent fuel pools at Oyster Creek and other similar reactors are a major source of radioactivity that is outside the primary containment vessel. The density of the fuel pool at Oyster Creek has increased over time and now contains more than double the amount of fuel that was in the most densely packed pool at Fukushima.[27] These pools are another example of how the NRC has failed to improve nuclear safety over time.

The controversy regarding spent fuel pools has been simmering since at least 1979, when an NRC-sponsored study found that a severe accident could result if a spent fuel pool became partially drained. *Id.* at 6. Experts have found that the chance of an accidental spent fuel pool fire is approximately twice the chance of a core-damage event. *Id.* at 11. Moreover, the consequences of such a fire are potentially devastating. For example, induced lung cancers could occur in up to 24,000 people. *Id.* Furthermore, the long-term restricted area due to radiation

---

[26] NRC, Denial of Petitions for Rulemaking, Docket Nos. PRM-51-10 & PRM-51-12 *available at* NRC ADAMS accession no. ML080170641.

[27] Letter from Richard Webster to NRC, dated September 8, 2006 at 13, *available at* NRC ADAMS accession no. ML062610359.

released from a fuel pool fire could be greater than half of the area of New Jersey. *Id.* at 12. Such pools have already been phased-out in Germany as a risk reduction measure.[28]

The NRC's filing fails to note that in addition to multiple states, including New Jersey, the Chair of the NRC believes that the risks from high-density spent fuel pools should be reduced, by moving fuel that is over 5 years old to dry cask storage.[29] Even though the majority of the Commission did not share the

---

[28] "Concerns that the turbine shaft of a crashing high-speed fighter jet or an act of war might penetrate the wall of a spent-fuel storage pool and cause a loss of coolant led Germany in the 1970s to require that such pools be sited with their associated reactors inside thick-walled containment buildings. When Germany decided to establish large away-from-reactor spent-fuel storage facilities, it rejected large spent-fuel storage pools and decided instead on dry storage in thick-walled cast-iron casks cooled on the outside by convectively circulating air. The casks are stored inside reinforced-concrete buildings that provide some protection from missiles.

On May 16, 1979, the government of the German state of Lower Saxony issued a ruling about a proposed nuclear fuel center at Gorleben. One aspect of the ruling was a refusal to license high-density pool storage, in part from concern about war impacts. The ruling followed a public hearing in which more than 60 scientists, including two of the present authors (J. B. and G. T.), presented their analyses. A third author (K. J.) had been responsible for the design of the pool and subsequently oversaw the design of the dry casks currently used in Germany."

From Alvarez et al., *Reducing the Hazards from Stored Spent Power-Reactor Fuel in the United States*, 11 SCIENCE AND GLOBAL SECURITY, Jan.-Apr. 2003, at 15 and endnote 42. *See also* RAMBERG, BENNETT, NUCLEAR POWER PLANTS AS WEAPONS FOR THE ENEMY: AN UNRECOGNIZED MILITARY PERIL, (University of California Press) (1984).

[29] NRC News Release, *Thoughts on Spent Fuel Storage*, Prepared Remarks for The Honorable Gregory B. Jaczko (May 13, 2008), *available at*

Chairman's view, this issue should now be revisited because the Fukushima accident has shown that cascading failures could occur and that high radioactivity from spent fuel pools can impede repair work on the rectors themselves. Importantly, a remand in this case could allow the NRC to require the switch to a low density fuel pool without being subject to the back-fit rule.

CONCLUSION

When Three Mile Island occurred, the NRC briefly stirred and made some major improvements in nuclear safety. In contrast, now that it is faced with a much more serious accident at four reactors in Japan of very similar design to 23 reactors in the United States, including Oyster Creek, the NRC has prematurely decided that the Fukushima disaster should have no effects on licensing. Far from emboldening the NRC to carefully review the record and the licensing basis for Oyster Creek and other reactors, the NRC seems to have embraced the role of trying to placate a concerned public by offering generalized assurances about the effectiveness of its regulations.

For the reasons stated above, this Court should require the NRC to comply with the Atomic Energy Act by vacating Oyster Creek's operating license, remanding Petitioners' unresolved contentions for a hearing, and requiring the NRC to carry out and document a comprehensive and effective safety review. This

---

http://www.nrc.gov/reading-rm/doc-collections/commission/speeches/2008/s-08-023.html.

Court may also consider asking the NRC for an explanation of whether it believes that Oyster Creek's containment is adequate, whether Oyster Creek's spent fuel pool should be operated at low density, as the NRC Chair favors, and what other safety upgrades the NRC is going to require at Oyster Creek as a result of its lessons-learned review of the Fukushima disaster.

Respectfully submitted,

/s

RICHARD WEBSTER
Public Justice P.C.
1825 K St NW #200
Washington DC 20006

KEVIN PFLUG
Eastern Environmental Law Center
744 Broad Street, Suite 1525
Newark, NJ, 07102

Attorneys for Petitioners

April 18, 2011

Attachment 1

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

September 20, 1972

J. F. O'Leary, L
F. E. Kruesi, RO
L. Rogers, RS

Here is an idea to kick around. Please let me have your reactions.

S. H. Hanauer, DRTA

cc: E. G. Case, L
J. M. Hendrie, L
D. F. Knuth, L
R. L. Tedesco, L
V. Stello, L
G. Lainas, L

DRAFT

Pressure-Suppression Containments

1. Conclusions and Recommendations

Recent events have highlighted the safety disadvantages of pressure-suppression containments. While they also have some safety advantages, on balance I believe the disadvantages are preponderant. I recommend that the AEC adopt a policy of discouraging further use of pressure-suppression containments, and that such designs not be accepted for construction permits filed after a date to be decided (say two years after the policy is adopted).

2. Discussion

A pressure-suppression containment system has some means of absorbing the heat of vaporization of the steam in the fluid released to the containment volume. In all three GE models, the steam is forced to bubble through a pool of water and is condensed. In the Westinghouse design, the steam is condensed by flowing it over ice cubes. The objective is to reduce the pressure in the containment through "suppressing" the partial pressure of the steam by condensing it. To be effective, pressure suppression must take place concurrent with the flow of steam into the containment, and its effectiveness is therefore dependent on the rate at which steam is generated or released. If some unexpected event should result in steam generation or flow greater than the suppression capability, then the steam that is not condensed would add an increment of containment pressure. Since the objective of pressure suppression is to permit use of a smaller containment, rated at lower pressure than would be required without suppression, then incomplete suppression would lead to overpressurizing a pressure-suppression containment so designed.

It may be noted that the Stone and Webster "subatmospheric" design has little effect on the initial containment pressure rise due to an accident, and is therefore not a "pressure-suppression containment" for the present discussion. In this design, chilled water sprays are used to reduce the containment pressure, and therefore the containment leakage, quickly after a postulated LOCA. The pressure capability and volume are designed to take the full accident, without credit for condensation.

Like all containments, the pressure-suppression designs are required to include margins in capability. Experiments have been conducted by GE and Westinghouse to establish the rate of steam generation that can be accommodated. The pressure-suppression pools, ice condenser, etc., are then sized for the double-ended break steam flow, with margins for unequal distribution of steam to the many modular units of which the condenser is composed. The rate and distribution margins are probably adequate.

More difficult to assess is the margin needed when applying the experimental data to the reactor design. Recently we have reevaluated the 10-year-old GE test results, and decided on a more conservative interpretation than has been used all these years by GE (and accepted by us). We

now believe that the former interpretation was incorrect, using data from tests not applicable to accident conditions.

We are requiring an independent evaluation of the ice condenser design and its bases to make less probable any comparable misinterpretation of this design.

Since the pressure-suppression containments are smaller than conventional "dry" containments, the same amount of hydrogen, formed in a postulated accident, would constitute a higher volume or weight percentage of the containment atmosphere. Therefore, such hydrogen generation tends to be a more serious problem in pressure-suppression containments. The small GE designs (both the light-bulb-and-doughnut and the over-under configurations) have to be inerted because the hydrogen assumed (per Safety Guide 7) would immediately form an explosive mixture. The GE Mod 3 and the Westinghouse ice condenser designs (they have equal volumes) require high-flow circulation and mixing systems to ensure even dilution of the hydrogen to avoid flammable mixtures in one or more compartments (see following for an additional serious disadvantage of this needed recirculation and its valves). By contrast, the dry containments only require recombination or purging starting weeks after the accident.

All pressure-suppression containments are divided into two (or more) major volumes, the steam flowing from one to the other through the condensing water or ice. Any steam that flows from one of these volumes to the other without being condensed is a potential source of unsuppressed pressure. Neither the strength nor the leakage rate of the divider (between the volumes) is tested in the currently approved programs for initial or periodic inservice testing. Some effort is now underway to devise a leakage test, but none has so far been accomplished.

Because of limited strength against collapse, the "receiving" volume has to be provided with vacuum relief. In all designs except GE Mod III, this function is performed by a group of valves. Such a valve stuck open is a large bypass of the condensation scheme; the amount of steam that thus escapes condensation can overpressurize the containment.

Valves do not have a very good reliability record. Recently, five of the vacuum relief valves for the pressure-suppression containment of Quad Cities 2 were found stuck partly open. Moreover, these valves had been modified to include redundant "valve-closed" position indicators and testing devices, because of recent Reg concerns. The redundant position indicators were found not to indicate correctly the particular partly open situation that obtained on the five failed valves. We have only recently begun to pay serious attention to these valves, so previous surveillance programs have not generally included them. The GE Mod III design has an elegant water-leg seal that obviates the need for vacuum relief valves.

The high-capacity atmosphere recirculation systems provided for hydrogen mixing involve additional valves which, if open at the wrong time, would constitute a serious steam bypass and thus a potential source of containment

over-pressurization. These valves are large, and must open quickly and reliably when recirculation is needed. In other engineered safety features, no single valve is relied on for such service, yet redundancy has not been provided even for single failures, open and closed, of these valves. This is a serious mission, since opening at the wrong time leads to over-pressurization, while failure to open when needed inhibits recirculation.

The smaller size of the pressure-suppression containment, plus the requirement for the primary system to be contained in one of the two volumes, has led to overcrowding and limitation of access to reactor and primary system components for surveillance and in-service testing. Separate shielding of components has tended to subdivide into compartments the volume occupied by the primary system. (Some compartmentation of dry containments also occurs.) A pipe break in one of these compartments creates a pressure differential; each compartment must be designed to withstand this pressure. A method of testing such designs has not been developed.

What are the safety advantages of pressure suppression, apart from the cost saving. GE people talk about a decontamination factor of 30,000 from scrubbing of iodine out of the steam by the water. This is hard to swallow, but some decontamination undoubtedly occurs. One wonders why GE doesn't do an experiment to measure it, and get credit for it. The ice condenser decontamination is measurable but not significant.

Recirculation of the containment atmosphere through the ice has the potential for rapidly reducing the containment pressure by cooling its atmosphere. But in the present design there's not ~~enough ice for that, so containment~~ sprays are furnished (in both volumes), just as in dry containments. Recirculation through the water in the GE designs seems not to have been tried, but may be necessary in Mod III for hydrogen control. We have no analysis whether any significant cooling will result.

It is by no means clear that the pressure-suppression containments are, overall, significantly cheaper than dry containments when all costs are included. Information on this point would be useful in evaluating costs and benefits, and should be obtained.

Attachment 2

September 25, 1972

Note to John F. O'Leary

With regard to the attached, Steve's idea to ban pressure suppression containment schemes is an attractive one in some ways. Dry containments have the notable advantage of brute simplicity in dealing with a primary blowdown, and are thereby free of the perils of bypass leakage.

However, the acceptance of pressure suppression containment concepts by all elements of the nuclear field, including Regulatory and the ACRS, is firmly imbedded in the conventional wisdom. Reversal of this hallowed policy, particularly at this time, could well be the end of nuclear power. It would throw into question the continued operation of licensed plants, would make unlicensable the GE and Westinghouse ice condenser plants now in review, and would generally create more turmoil than I can stand thinking about.

Joseph M. Hendrie

CERITIFCATE OF SERVICE

In accordance with the Fed. R. App. P. and the Local Rules, I hereby certify that:

1. I am a member in good standing of the bar of the United States Court of Appeals for the Third Circuit.

2. This Brief complies with the type-face limitations of Fed. R. App. P. 32(a)(5) and the type style requirements of Fed. R. App. P. 32(a)(6) because the brief has been prepared in proportionally spaced typeface using 14 point Times New Roman in Microsoft Word.

3. This Brief complies with Third Circuit Rule 3 l.l(c) because text in the electronic copy of this Brief is identical to the text in the paper copies.

4. I caused a copy of this Brief to be served by U.S. mail, and a courtesy copy electronically, on the following counsel to the parties in this matter:

Robert M. Rader, Esq.
United States Nuclear Regulatory Commission
Washington, DC 20555-0001

John E. Arbab, Esq.
U.S. Department of Justice
Environment & Natural Resources Division
P.O. Box 23795
Washington, DC 20026

Brad Fagg, Esq.
Morgan, Lewis & Bockius LLP
1111 Pennsylvania Ave., NW
Washington, DC 20004

/s/ Richard Webster
Richard Webster, Esq.

April 18, 2011
Washington, DC