

PRM-51-10
(71FR64169)



NUCLEAR ENERGY INSTITUTE

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RULEMAKINGS AND
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60

March 19, 2007

Ms. Annette L. Vietti-Cook
Secretary
U.S. Nuclear Regulatory Commission
Attn: Rulemaking and Adjudications Staff
Mail Stop 0-16C1
Washington, DC 20555-0001

Subject: Massachusetts Attorney General Petition for Rulemaking, Docket No. PRM-51-10

Project Number: 690

Dear Ms. Vietti-Cook:

The Nuclear Energy Institute (NEI)¹ is pleased to submit the enclosed comments opposing the August 25, 2006, petition for rulemaking (Petition) filed with the U.S. Nuclear Regulatory Commission (NRC) by the Massachusetts Attorney General (Attorney General). The NRC published a notice of receipt of the rulemaking petition, docketed as PRM-51-10, at 71 Fed. Reg. 64,169 (Nov. 1, 2006); *see also* 72 Fed. Reg. 2,464 (Jan. 19, 2007).

The Petition alleges that "new and significant information" developed since issuance of NUREG-1437, *Generic Environmental Impact Statement for License Renewal of Nuclear Plants (GEIS)*, shows that the GEIS determination of "insignificant" environmental impacts for high-density spent fuel storage is incorrect. Petitioner asserts, but fails to show, that "spent fuel stored in high-density fuel storage pools is much more vulnerable to fire than the License Renewal GEIS concludes."

On the basis of purportedly "new and significant" information, Petitioner proposes that the NRC revoke some portions of 10 CFR Part 51 and amend other portions to codify the conclusion that the environmental impacts of high density spent fuel storage are "significant" (rather than "insignificant," as reflected in the GEIS and NRC regulations). Petitioner argues that the NRC should prepare environmental impact statements (EIS) specifically addressing the impacts of high

¹ The Nuclear Energy Institute (NEI) is the organization responsible for establishing unified industry policy on matters affecting the nuclear energy industry, including the regulatory aspects of generic operational and technical issues. NEI's members include all entities licensed to operate commercial nuclear power plants in the United States, nuclear plant designers, major architect/engineering firms, fuel fabrication facilities, nuclear materials licensees, and other organizations and individuals involved in the nuclear energy industry.



density spent fuel storage, including fires, and alternatives to avoid any such impacts, for any licensing decision involving spent fuel storage. The Petition also asks the NRC to withhold any decision in the Pilgrim and Vermont Yankee license renewal proceedings pending completion of the relief sought.

As demonstrated in the enclosed NEI comments, the Attorney General's Petition is without merit and should be denied in its entirety. Contrary to the Attorney General's claim, the information relied upon in the Petition is neither "new" nor "significant" under the NRC's own definition of those terms in NRC Regulatory Guide 4.2, Supplement 1.² Thus, the proffered information does not justify any of the relief requested. Nor does this information alter the GEIS's conclusion, based on extensive studies, that the likelihood of a zirconium spent fuel pool fire is "highly remote."

NRC Regulatory Guide 4.2S1 defines "new and significant" information that would require supplementing the GEIS, as "(1) information that identifies a significant environmental issue that was not considered in NUREG-1437 and, consequently, not codified in Appendix B to Subpart A of 10 C.F.R. Part 51, or (2) information that was not considered in the analyses summarized in NUREG-1437 and that leads to an impact finding different from that codified in 10 C.F.R. Part 51."

The information that the Petitioner relies upon fails to satisfy either part of the NRC's two-pronged definition of "new and significant" information (above). First, none of the documents in question "identifies a significant environmental issue that was not considered in NUREG-1437," because the GEIS expressly considered severe spent fuel pool accidents. Second, most, if not all, of the information Petitioner cites was considered in the analyses underlying the GEIS, and therefore is not "new." And even if considered new, none of the information is "significant," because it would not lead to "an impact finding different from that codified in 10 C.F.R. Part 51." (That is, consideration of this information would not lead to a finding of "moderate" or "large" environmental impacts, as opposed to "small" impacts, for on-site spent fuel storage.)

Moreover, Petitioner's reliance on *San Luis Obispo Mothers for Peace v. NRC*, 449 F.3d 1016 (9th Cir. 2006), is not compelling. That legal argument is currently being addressed in another forum. Additionally, the Commission ruled in 2002 that sabotage is adequately addressed in the GEIS. The Petition fails to present any new and significant information that warrants evaluation under the National Environmental Policy Act (NEPA) — even assuming that analysis of malevolent acts were required under NEPA.

In addition to its legal defects, the Petition also fails to make a compelling technical case for relief. Petitioner relies on several studies that draw significantly from NUREG-1738.³ As NEI pointed out

² Supplement 1 to NRC Regulatory Guide 4.2, *Preparation of Supplemental Environmental Reports for Applications to Renew Nuclear Power Plant Operating Licenses* (Sept. 2000) ("Reg. Guide 4.2S1").

³ NUREG-1738, *Technical Study of Spent Fuel Pool Accident Risk and Decommissioning Nuclear Power Plants* (Jan. 2001) ("NUREG-1738").

Ms. Annette L. Vietti-Cook

March 19, 2007

Page 3

to the NRC in 2001, NUREG-1738, while properly concluding that the probability of a zirconium spent fuel fire is extremely low, overestimates the size, duration and releases from a postulated fire.

Although the legal deficiencies of the Petition are determinative, policy considerations also argue against granting the relief requested. The promulgation of unwarranted new regulatory requirements such as those proposed would unnecessarily burden NRC licensees, and require the evaluation of extensive, costly alternatives to offset the presumptive "significant" impacts codified by the rule. It would unnecessarily delay NRC review of current and future license renewal applications. It would require a spent fuel pool fire EIS for all NRC licensing approvals of high-density spent fuel pool storage. The Petition fails to justify any of these outcomes.

Simply put, the Petition fails to make a viable legal or technical case that "spent fuel stored in high-density fuel storage pools is much more vulnerable to fire than the License Renewal GEIS concludes." The industry has nonetheless heeded the cautions raised in the National Academy of Sciences 2006 report, and has enhanced the ability of U.S. nuclear plants to respond to situations that (while extremely unlikely) could lead to pool drain down events. NRC reactor licensees have reviewed their storage pool systems, developed plans for dealing with such eventualities and documented these actions in letters to the NRC.

We appreciate the Commission's consideration of the industry's views on this important matter. For the reasons noted above and in the enclosed comments, we urge the NRC to deny the Petition in its entirety. If you have any questions regarding NEI's comments or the industry's perspective on this issue, please don't hesitate to contact me.

Sincerely,



Steven P. Kraft

Enclosure

c: Mr. Luis A. Reyes, Executive Director for Operations, NRC
Mr. William F. Kane, Deputy Executive Director for Reactor and Preparedness Programs, NRC
Mr. James E. Dyer, Director, Office of Nuclear Reactor Regulation, NRC
Mr. Roy P. Zimmerman, Director, Office of Nuclear Security and Incident Response, NRC
Dr. Brian W. Sheron, Director, Office of Nuclear Reactor Research, NRC

**NUCLEAR ENERGY INSTITUTE COMMENTS ON THE MASSACHUSETTS
ATTORNEY GENERAL'S "PETITION FOR RULEMAKING
TO AMEND 10 C.F.R. PART 51" (PRM-51-10)**

I. OVERVIEW

On behalf of the commercial nuclear energy industry, the Nuclear Energy Institute submits the following comments in opposition to PRM-51-10, the August 25, 2006, petition for rulemaking filed with the NRC on behalf of the Massachusetts Attorney General. This Petition seeks to have the NRC significantly amend its regulations governing the environmental impacts associated with high density spent fuel pool storage at nuclear power plants.¹ Petitioner alleges that "new and significant information" developed since the 1996 issuance of NUREG-1437, *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS), shows that the NRC's determination in the GEIS of "insignificant" environmental impacts for high-density spent fuel storage is incorrect. Petition at 1.

The Petition, however, contains no specific information to support the relief requested. Rather, Petitioner categorizes the Petition as a "companion" document that "raises the same substantive concern" as the Attorney General's proposed contentions filed in the Pilgrim and Vermont Yankee license renewal proceedings. The Petition further states that the Attorney General relies on and incorporates by reference those contentions, which generally allege that spent nuclear fuel stored in high-density storage pools is "much more vulnerable to fire than the License Renewal GEIS concludes."² The proposed contentions, in turn, refer to four documents published since the GEIS as the sources of the purported "new and significant" information. Petitioner asserts that these four

¹ Specifically, the Petition urges that the NRC:

- Revoke 10 C.F.R. Part 51 provisions that codify the conclusion that the environmental impacts of high-density spent fuel storage are insignificant, and that "excuse consideration of spent fuel storage impacts in NEPA decision-making documents." Petition at 1, 20.
- Amend NRC regulations to (1) reflect the determination that the environmental impacts of high-density spent fuel storage are "significant;" and (2) require that any NRC licensing action that approves such storage be accompanied by an environmental impact statement addressing its environmental impacts. *Id.* at 1-2, 19-20.
- Withhold any decision in the Pilgrim and Vermont Yankee license renewal proceedings pending completion of the rulemaking and the NRC's evaluation of the environmental impacts of high-density spent fuel storage at those plants. *Id.* at 3.

² Petition at 2, 4-5 & n. 7. As Attachment 1 to PRM-51-10, Petitioner appends a copy of his hearing request in the *Pilgrim* license renewal proceeding ("Massachusetts Attorney General's Request for a Hearing and Petition for Leave to Intervene with Respect to Entergy Nuclear Operations, Inc.'s Application for Renewal of the Pilgrim Nuclear Power Plant Operating License and Petition for Backfit Order Requiring New Design Features to Protect Against Spent Fuel Pool Accidents") (May 26, 2006) ("Hearing Request").

documents³ show that the GEIS conclusion of "insignificant" environmental impact of potential zirconium spent fuel pool fires associated with high density spent fuel storage is incorrect. *Id.* at 8-10; Hearing Request at 22.

As shown below, this Petition is without merit. The Attorney General has failed to provide any viable legal or technical basis supporting the Petition, and the relief requested is unwarranted. Additionally, the Petition is replete with mischaracterizations of statements and conclusions in Commission documents and other technical documents. Accordingly, NEI urges the NRC to deny this petition in its entirety.

The Commission has studied the effects of high density spent fuel storage since the 1970s; these impacts are well understood. Based on these extensive studies, the GEIS concluded that the likelihood of a zirconium spent fuel pool fire is "highly remote." GEIS at 6-72—6-75. The information brought forward by the Petition neither changes nor undermines this conclusion. While the continued examination of spent fuel pool fires has produced more information, the conclusion remains unaffected: the likelihood of a zirconium pool fire is "very low." NUREG-1738 at ix, xi, 5-1 and 5-3. The additional information in NUREG-1738 does not change the determination that the occurrence of spent fuel pool fires is highly remote. The Commission recognized this fact in the Turkey Point license renewal proceeding, noting that the risk of spent fuel pool accidents continues to remain "acceptably small."⁴ This conclusion is further confirmed by the recent Shearon Harris proceeding involving the expansion of the plant's spent fuel pool storage capacity, in which the occurrence of spent fuel pool fires was determined to be highly remote and speculative such that no environmental impact statement was required.⁵

Regarding the Petitioner's assertion (Petition at 9) that a severe accident caused by malicious attack on a nuclear power plant spent fuel pool is reasonably foreseeable and therefore must be

³ The documents in question include:

- NUREG-1738, *Technical Study of Spent Fuel Pool Accident Risk and Decommissioning Nuclear Power Plants* (Jan. 2001) ("NUREG-1738").
- National Academy of Sciences Committee on the Safety and Security of Commercial Spent Nuclear Fuel Storage, *Safety and Security of Commercial Spent Nuclear Fuel Storage* (The National Academies Press: 2006) ("NAS Rept.").
- Gordon R. Thompson, "Risks and Risk-Reducing Options Associated with Pool Storage of Spent Nuclear Fuel at the Pilgrim and Vermont Yankee Nuclear Power Plants" (May 25, 2006) ("Thompson Rept.").
- Jan Beyea, "Report to the Massachusetts Attorney General on the Potential Consequences of a Spent-Fuel-Pool Fire at the Pilgrim or Vermont Yankee Nuclear Power Plant" (May 25, 2006) ("Beyea Rept.").

⁴ *Florida Power & Light Co.* (Turkey Point Nuclear Generating Plant, Units 3 and 4), CLI-01-17, 54 NRC 3, 22 (2001).

⁵ *See Carolina Power & Light Co.* (Shearon Harris Nuclear Power Plant), CLI-01-11, 53 NRC 370 (2001), *aff'g Carolina Power & Light Co.* (Shearon Harris Nuclear Power Plant), LBP-01-9, 53 NRC 239 (2001).

considered as ordered by the Ninth Circuit in the recent *San Luis Obispo* decision,⁶ this issue is being addressed in another forum. NEI supported Pacific Gas & Electric's petition for *certiorari* to the U.S. Supreme Court, which challenged the unprecedented *San Luis Obispo* ruling as wrongly decided. Notwithstanding the Ninth Circuit's decision and the subsequent denial of *certiorari* by the U.S. Supreme Court, the Commission recently affirmed its "longstanding view that NEPA demands no terrorism inquiry," and that the NRC therefore need not consider the environmental consequences of hypothetical terrorist attacks on NRC-licensed facilities.⁷ Further, the Commission pointed out that, for license renewal, the NRC has in fact examined terrorism under NEPA and found the impacts similar to the impacts of already-analyzed severe reactor accidents.

The Commission's rejection of the Ninth Circuit's view is consistent with the U.S. Supreme Court's position that NEPA should not be read to force agencies to consider environmental impacts for which they cannot reasonably be held responsible. Moreover, the Commission has previously held in the McGuire license renewal proceeding⁸ that sabotage is already addressed and adequately covered in the GEIS. As such, the Petition presents no new and significant information that warrants evaluation under NEPA, even assuming that analysis of malevolent acts were required under that statute. (See further discussion in Section III, below.)

Further, granting the Petition and imposing new requirements such as those that Petitioner proposes would unnecessarily disrupt and almost certainly extend the NRC's review of both current and future license renewal applications. It would make these licensing actions less timely and more complicated and expensive⁹ with no attendant increase in protection of public health and safety. Codifying the environmental impact of potential spent fuel pool fires as "significant" would presumably require the development and evaluation of extensive, costly and unneeded mitigation alternatives to offset the presumptive "significant" impacts codified by the rule.

Granting this Petition also would require a spent fuel pool fire EIS and consideration of costly mitigation alternatives for any NRC licensing action approving high-density spent fuel pool storage, such as re-racking or other spent fuel pool expansion. (See footnote 5, above.) The Attorney General apparently contemplates this additional requirement even for proposed amendments that would make only minor changes in the technical specifications related to spent fuel storage. The Petition fails to justify any of these outcomes.

⁶ *San Luis Obispo Mothers for Peace v. NRC*, 449 F.3d 1016 (9th Cir. 2006), *pet. for certiorari denied*, No. 06-466 (S.Ct.).

⁷ *Amergen Energy Co., LLC* (License Renewal for Oyster Creek Nuclear Generating Station), CLI-07-08, 65 NRC __ (Feb. 26, 2007, slip op. at 2, 6); *see also Pacific Gas & Electric Co.* (Diablo Canyon Power Plant Independent Spent Fuel Storage Installation), CLI-07-11, 65 NRC __ (Feb. 26, 2007, slip op. at 2).

⁸ *Duke Energy Corp.* (McGuire Nuclear Station, Units 1 and 2; Catawba Nuclear Station, Units 1 and 2); CLI-02-26, 56 NRC 358 (2002).

⁹ In addition to the 47 reactor units that have had their licenses renewed and the 8 plants currently going through the license renewal process, licensees for another 23 plants have announced their intent to seek license renewal. *See* www.nrc.gov/reactors/operating/licensing/renewal/applications.html#plant.

II. THE PETITION PRESENTS NO NEW AND SIGNIFICANT INFORMATION THAT WARRANTS THE RELIEF REQUESTED

A. NRC Definition of "New" and "Significant" Information

Supplement 1 to NRC Regulatory Guide 4.2¹⁰ defines "new and significant" information that would require supplementing the License Renewal GEIS¹¹ as follows:

New and significant information is (1) information that identifies a significant environmental issue that was not considered in NUREG-1437 and, consequently, [was] not codified in Appendix B to Subpart A of 10 C.F.R. Part 51, or (2) information that was not considered in the analyses summarized in NUREG-1437 and that leads to an impact finding different from that codified in 10 C.F.R. Part 51.

Reg. Guide 4.2S1 at 4.2-S-4 (emphasis added). This definition is fully consistent with judicial and NRC precedent establishing that "a supplemental EIS is only required where new information provides a seriously different picture of the environmental landscape."¹² It is also fully consistent with the new draft final rule amending 10 CFR Part 52, which makes clear that "new and significant" information is information that was neither considered in preparing an EIS nor generally known at the time of its preparation, that would affect EIS findings or conclusions.¹³

The information set out in the Attorney General's Hearing Request, and relied upon in his Petition, fails to meet the NRC standard for "new and significant" information in Reg. Guide 4.2S1. The documents relied upon do not meet the first prong of the NRC definition because they do not

¹⁰ Supplement 1 to Regulatory Guide 4.2, *Preparation of Supplemental Environmental Reports for Applications to Renew Nuclear Power Plant Operating Licenses* (Sept. 2000) ("Reg. Guide 4.2S1").

¹¹ NEPA requires a supplement to an EIS if "new information [regarding the action] shows that the remaining action will affect the quality of the environment 'in a significant manner or to a significant extent not already considered.'" *Nat'l Comm. for the New River, Inc. v. FERC*, 373 F.3d 1323, 1330 (D.C. Cir. 2004) (quoting *Marsh v. Or. Natural Res. Council*, 490 U.S. 360, 374 (1989)) (*emphasis added*); *see also* 10 CFR § 51.92(a).

¹² *New River*, 373 F.3d at 1330. (emphasis in original, internal quotations omitted) (*quoting City of Olmsted Falls v. FAA*, 292 F.3d 261, 274 (D.C. Cir. 2002)). *See also Sierra Club v. U.S. Army Corps of Eng'rs*, 295 F.3d 1209, 1215-16 (11th Cir. 2002) (significant impact not previously covered); *S. Trenton Residents Against 29 v. FHA*, 176 F.3d 658, 663 (3d Cir. 1999) ("seriously different picture of the environmental impact"); *Hughes River Watershed Conservancy v. Glickman*, 81 F.3d 437, 443 (4th Cir. 1996) (same); *Sierra Club v. Froehle*, 816 F.2d 205, 210 (5th Cir. 1987) (same). "To require otherwise would render agency decisionmaking intractable, always awaiting updated information only to find the new information outdated by the time a decision is made." *Marsh*, 490 U.S. at 373 (footnote omitted). NRC precedent is in fully in accordance with this judicial precedent. *Hydro Resources, Inc.*, CLI-01-4, 53 NRC 31, 51 (2001) ("The new circumstance must reveal a seriously different picture of the environmental impact of the proposed project.") (internal quotes and citations omitted).

¹³ *See* SECY-06-0220, Final Rule to Update 10 CFR Part 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants" (Rin Ag24) (Oct. 31, 2006) at 7.

identify "a significant environmental issue that was not considered in NUREG-1437" Because the GEIS expressly considered severe spent fuel pool accidents (GEIS at 6-72—6-75), the information presented by the Petitioner cannot satisfy this part of the NRC standard.

Similarly, the information relied upon by the Petitioner fails to meet the second prong of the NRC's definition of new and significant information. To satisfy this part of the standard, information must: (1) be "new" in that it was not considered in the analyses underlying the GEIS and (2) be "significant" in that it "leads to an impact finding different from that codified in 10 C.F.R. Part 51." Most, if not all, of the information in question was considered in the analyses underlying the GEIS, and therefore is not "new." Even if considered new, none of the information is significant.

Regarding the requirement that "significant" information must lead to an impact finding different from that codified in 10 CFR Part 51, the License Renewal GEIS defined three "impact" findings that could arise from license renewal: "small," "moderate," or "large." GEIS at 1-4—1-5; Reg. Guide 4.2S1 at 4.2-S-5. The GEIS determined that the environmental impacts for on-site spent fuel storage during the period of extended operation will be "small." GEIS at 6-86. This finding was codified in 10 CFR Part 51, Subpart A, Appendix B. Significantly, the NRC's determination of "small" environmental impacts for on-site spent fuel storage made in the GEIS embraces all spent fuel issues, including "all spent fuel accidents; whatever their cause."¹⁴

Thus, even if the Attorney General's information were new (which we do not concede), supplementation of the License Renewal GEIS would be required only if the information "leads to an impact finding" of "moderate" or "large" for on-site spent fuel storage. As discussed below, such is clearly not the case.

B. The GEIS Evaluation of Spent Fuel Storage Environmental Impacts

In determining that the environmental impacts for on-site spent fuel storage are "small," the License Renewal GEIS states that the "[c]urrent and potential environmental impacts from spent fuel storage have been studied extensively and are well understood." GEIS at 6-81. Further, the GEIS expressly considered severe spent fuel pool accidents and concluded that "even under the worst probable cause of a loss of spent-fuel pool coolant (a severe seismic-generated accident causing a catastrophic failure of the pool), the likelihood of a fuel-cladding fire is highly remote." GEIS at 6-72—6-75 (citation omitted).

The GEIS's determination that the occurrence of a zirconium spent fuel pool fire is "highly remote" references and relies on the Commission's 1990 Review and Revision of the Waste Confidence Decision,¹⁵ which in turn is based on a series of technical studies dating back to 1979 and before. As set forth in the primary technical study referenced by the Waste Confidence Decision, NUREG-

¹⁴ *Turkey Point, supra*, CLI-01-17, 54 NRC at 22-23.

¹⁵ Review and Final Revision of Waste Confidence Decision, 55 Fed. Reg. 38,474 (Sept. 18, 1990).

1353,¹⁶ these technical studies analyzed a wide range of potential accident initiators for the spent fuel pool, for example, seismically induced failure of the spent fuel pool structure, other potential pool structural failures, inadvertent drainage or boil-down of the spent fuel pool, and others. NUREG-1353 at 4-13—4-36. These studies conducted plant-specific evaluations to determine the likelihood of occurrence of these different accident initiators, as well as whether their occurrence might result in a spent fuel pool fire.

Based on these analyses, the Commission concluded in the Waste Confidence Decision that:

[E]ven if the timing¹⁷ of a spent fuel pool failure were conducive to fire, a fire could occur only with a relatively sudden and substantial loss of coolant — a loss great enough to uncover all or most of the fuel, damaging enough to admit enough air to keep a large fire going, and sudden enough to deny operators the time to restore the pool to a safe condition. Such a severe loss of cooling water is likely to result only from an earthquake well beyond the conservatively estimated earthquake for which reactors are designed. Earthquakes of that magnitude are extremely rare.

The plant specific studies . . . found that, because of the large safety margins inherent in the design and construction of their spent fuel pools, even the more vulnerable older reactors could safely withstand earthquakes several times more severe than their design basis earthquake. Factoring in the annual probability of such beyond-design-basis earthquakes, . . . the average annual probability of a major spent fuel pool failure at an operating reactor . . . was calculated at two chances in a million per year of reactor operation.

55 Fed. Reg. at 38,481 (emphasis added) (citations omitted).

Thus, the probability of the dominant accident sequence contributing to the risk of a spent fuel pool fire — seismically induced major spent fuel pool failure — was calculated at two chances per million per reactor year of operation,¹⁸ which the Commission considered "extremely rare." 55 Fed. Reg. at 38,481. The Commission went on to note that the risks due to other accident scenarios — such as structural failure of the pool due to high energy tornado or other missiles, aircraft crashes, and heavy load drops, inadvertent drainage of the pool, and boil-down of the pool due to loss of spent fuel cooling or make-up water — "are at least an order of magnitude smaller." *Id.* These other probabilities are summarized in Table 1 below.

¹⁶ NUREG-1353, *Regulatory Analysis for the Resolution of Generic Issue 82, "Beyond Design Basis Accidents in Spent Fuel Pools"* (April 1989) (NUREG-1353).

¹⁷ In this context, the "timing" of a spent fuel pool failure refers to the age of the fuel when the event occurs that might lead to a zirconium spent fuel fire. Fuel age as a contributor to fire potential is addressed below.

¹⁸ 55 Fed. Reg. at 38,481, *citing* NUREG-1353 at ES-3-4. In subsequent studies, the NRC has concluded that the risk of a seismically induced structural failure of the spent fuel pool is in the range of 2×10^{-6} to 2×10^{-7} . NUREG-1738 at 3-36 to 3-38.

TABLE 1		
NUREG-1353 Accident Initiators and Associated Probabilities		
Accident Initiator	Probability of Spent Fuel Pool Drain-down or Boil-down	NUREG-1353 Page References
Tornado and Other High Energy Missiles	1 x 10 ⁻⁸	4-13 – 4-18, 4-36
Aircraft Crash	6 x 10 ⁻⁹	4-14, 4-36
Heavy Load Drop	3.1 x 10 ⁻⁸	4-14 – 4-15, 4-36
Inadvertent Drainage (including Pneumatic Seal Failure)	4.2 x 10 ⁻⁸	4-15 – 4-22, 4-36
Boil-down due to Loss of Cooling or Makeup	6.0 x 10 ⁻⁸	4-22 – 4-28, 4-36

All of these events are highly remote and speculative, far below any threshold probability that could trigger an EIS.¹⁹ Hence, they require no consideration under NEPA.

The Petition provides no data that would alter the Commission’s determination in its Waste Confidence Decision (relied upon in the GEIS) that "even if the timing of a spent fuel pool failure were conducive to fire, the likelihood of such a fire would be 'extremely rare.'" As discussed below, none of the four sources of information referenced by the Attorney General contains new and significant information that would lead to an impact finding different from that codified in 10 CFR Part 51 so as to require amendment of the rules.

C. NUREG-1738 Presents No New and Significant Information that Justifies the Relief Requested by the Petition

The Petition asserts that significant new information in NUREG-1738²⁰ (and other sources) shows that the "fuel is much more vulnerable to fire" than was assumed in the studies underlying the Waste Confidence Decision. Petition at 8-9. Petitioner claims that NUREG-1353 and the other technical studies relied on in the Waste Confidence Decision were based on two faulty assumptions: "(a) total instantaneous drainage is a more severe case than partial drainage and (b) aged fuel will not burn." Petitioner contends that significant new information in NUREG-1738 "now firmly establishes that, across a broad range of scenarios, (a) if the water level in a fuel storage pool drops to the point where the tops of the fuel assemblies are uncovered, the fuel will burn, (b) the fuel will burn regardless of age, (c) and the fire will propagate to other assemblies in the pool." *Id.*

¹⁹ See *Shearon Harris*, CLI-01-11, 53 NRC at 388 n.8.

²⁰ NUREG-1738 considered the potential for spent fuel pool fires in the context of plants undergoing decommissioning.

The Petition misstates the conclusions of NUREG-1738. Significantly, the NUREG did not conclude that the fuel will burn shortly after the tops of the fuel assemblies are uncovered regardless of its age. Rather, the NUREG's conclusion was that, because of differing spent fuel pool designs and many other variables, the possibility of a zirconium fire "cannot be precluded" on a generic basis relying solely on the decay time of the fuel. NUREG-1738 at 2-1 – 2-2 (emphasis added). That the possibility of a fire "cannot be precluded" based upon fuel age alone portrays a far smaller chance of occurrence than the Petitioner's bald statement that "fuel will burn at any age." The Petitioner's statement is both misleading and erroneous. Likewise, the NUREG assumed that accident sequences would be initiated upon the water level dropping within three feet above the top of the fuel, not because the fuel would burn at that point, or once the top of the assemblies were uncovered, but solely to simplify the analysis. *Id.* at 3-1 – 3-2; *see also* Appendix 1.A, page A1A-1.

Furthermore, the Attorney General's claim that the Waste Confidence Decision was based on the assumption that "aged fuel will not burn," ignores the Commission's conclusion that "even if the timing of a spent fuel pool failure were conducive to fire, the likelihood of such a fire would be "extremely rare." 55 Fed. Reg. at 38,481. The Commission's determination that the occurrence of a spent fuel pool fire is highly remote was not based on the assumption that the aged fuel would not burn, as claimed by the Attorney General. Rather, the Commission's determination was based on the premise that the pool would fail at an opportune time for the fuel to ignite and burn.²¹

²¹ The studies underlying the Waste Confidence Decision assumed that the probability of fire upon the loss of water from the pool was 1.0 for PWR spent fuel storage pools. NUREG-1353 at ES-2, 4-10. The assumed probability of fire upon loss of water for BWR spent fuel storage pools was 0.25. *Id.* The lower probability for BWR spent fuel pools was based on the lower amount of residual heat in BWR spent fuel assemblies and the configuration of BWR spent fuel storage, not the age of the spent fuel. *Id.* at 4-8 – 4-11. Thus, for both PWR and BWR spent fuel, NUREG-1353 assumed that fuel of any age could burn, because the age of the spent fuel was not considered.

Likewise, the Attorney General's contention that the studies underlying the Waste Confidence Decision failed to consider that partial drainage of the pool may be a more severe condition is erroneous and misleading. A 1979 Sandia National Laboratory study²² evaluated the effect of incomplete spent fuel pool drainage and concluded: "It is clear . . . that an incomplete drainage [of the pool] can potentially cause a more severe heatup problem than a complete drainage [of the pool]." NUREG/CR-0649, § 5.1, *Effect of Incomplete Drainage*, at 73-78. This report was one of the authoritative sources extensively relied upon and subsumed within the technical analyses underlying the Commission's Waste Confidence Decision and the GEIS. See, e.g., NUREG-1353 at 4-7 – 4-11, 8-1. Thus, it does not constitute new information as Petitioner claims.²³

In sum, the Petition inflates and incorrectly states the asserted new information in NUREG-1738, as well as the existence of any limitations in the pre-existing studies. As a subsequent study of spent fuel pool fires, NUREG-1738 does provide some additional information. However, none of the information presented in NUREG-1738 controverts the GEIS conclusion that the occurrence of a zirconium spent fuel pool fire is "highly remote." Indeed, NUREG-1738 ultimately concludes that there is a "very low likelihood" of a zirconium pool fire (NUREG-1738 at ix, xi, 5-1 and 5-3; emphasis added) — thereby paralleling and reconfirming the GEIS conclusion that the likelihood of a fuel cladding fire is "highly remote" (GEIS at 6-72 – 6-75).²⁴

The lack of any new and significant information in NUREG-1738 that undermines the GEIS conclusions is reinforced by the probabilities that NUREG-1738 determined for the various accident initiators. NUREG-1738 considered accident initiating events similar to those considered in NUREG-1353 and reached similar conclusions regarding the improbability of those events causing pool drain-down or boil-down. The probabilities of pool drain-down or boil-down resulting from the various accident scenarios evaluated in NUREG-1738 are set forth in Table 2 below.

²² NUREG/CR-0649, *Spent Fuel Heatup Following Loss of Water During Storage* (Mar. 1979).

²³ The pool heatup model in NUREG-1353 did assume instantaneous draining of the pool to simplify the analysis. However, this assumption was not intended to be representative of the accident scenarios considered in the NUREG, other than perhaps the catastrophic failure due to a beyond design basis earthquake, and was not a limitation on the study as suggested by the Attorney General. See NUREG-1353 at 4-8. In this respect, NUREG-1353 included a wide range of accident scenarios that included both inadvertent and partial drainage of the spent fuel pool and the loss of cooling/makeup water and resulting boil-down of the pool. *Id.* at 4-15 – 4-28.

²⁴ In renewing the Turkey Point operating license, the Commission observed that the accident risk found by NUREG-1738 was "very low," CLI-01-17, 54 NRC at 22 n. 11, and noted that the Waste Confidence studies and NUREG-1738 had "concluded that the risk of accidents is acceptably small." 54 NRC at 22.

TABLE 2 NUREG-1738 Accident Initiators and Associated Probabilities		
Accident Initiator	Probability of Spent Fuel Pool Drain-down or Boil-down	NUREG-1738 Page References
Tornado Missile	$<1.0 \times 10^{-9}$	3-38
Aircraft Crash	2.9×10^{-9}	3-38
Cask Drop	2×10^{-7}	3-38
Boil-down (Loss of Cooling, Makeup, etc.)	1.8×10^{-7}	3-35
Drain-down Due to Seismic Events ²⁵	2×10^{-6} (LLNL) 2×10^{-7} (EPRI)	3-36 – 3-38

In connection with the Petition’s assertions, it is important to note that the probabilities in Table 2 above (as well as those in Table 1) represent the likelihood of occurrence of pool drain-down or boil-down. Therefore, these probabilities subsume a probability of 1.0 for ignition of the fuel and assume that the fuel will burn if drain-down or boil-down occurs due to any of these initiating events (even though the NUREG recognizes that as the fuel ages it may well not burn). Furthermore, NUREG-1738 expressly considers partial drainage and obstructed air flow scenarios (e.g., NUREG-1738 at A1A-4), which the Attorney General erroneously claims had not been taken into account in earlier Commission studies.

It is clear based on the probabilities in Table 1 and Table 2 that this information, whether or not it is new, is not significant.²⁶ These two Tables show that the probability of accident initiators in

²⁵ NUREG-1738 utilized the separate seismic hazard estimates developed independently by Lawrence Livermore National Laboratory ("LLNL") and the Electric Power Research Institute ("EPRI") for U.S. nuclear power plants, and developed separate spent fuel pool fire estimates based on each. See NUREG-1738 at ix, 3-7 – 3-9, 3-36 – 3-38.

²⁶ Regarding our conclusion that the information in NUREG-1738, even if considered new, is not significant, the Attorney General suggested in his pleadings in the Pilgrim and Vermont Yankee license renewal proceedings that the findings of NUREG-1738 are inapplicable to operating plants because NUREG-1738 solely concerned decommissioned plants. See Massachusetts Attorney General’s Reply to Entergy’s and NRC Staff’s Responses to Hearing Request and Petition to Intervene With Respect to Pilgrim License Renewal Proceeding (June 29, 2006) at 13-14 ("Reply"). However, the spent fuel pools of both operating and decommissioned plants would be subject to the same types of accident sequences (e.g., seismic induced structural failure, loss of spent fuel cooling and makeup), as evidenced by the similarity of the accident sequences evaluated in NUREG-1353 and NUREG-1738. Furthermore, NUREG-1738 conducted analyses for plants that had only recently been shut down (starting at 30 or 60 days after final shutdown depending on the analyses). Moreover, it assumed that, because the plant was permanently shutting down, the full core would be unloaded into the spent fuel pool. NUREG-1738 at 2-1, 3-28, A1A-3 – A1A-4, A4-2; see also NAS Rept. at 45. Because of its assumption that the full core had just recently been off-loaded to the spent fuel pool, the analysis in NUREG-1738 is in fact conservative compared to an operating plant, where typically only one-third of the core is off-loaded to the spent fuel pool at each refueling outage:

NUREG- 1738 (which expressly account for partially obstructed pool fires) is virtually identical to that in NUREG-1353. Hence, even if new, the information in NUREG-1738 that partial drainage of a pool is a more severe condition than total, instantaneous drainage, or that the fuel might burn regardless of age, is not significant, because the likelihood of a spent fuel pool fire remains unchanged from NUREG-1353. That likelihood is still highly remote. Thus, any asserted "new" information in NUREG-1738 does not "lead[] to an impact finding different from that codified in 10 C.F.R. Part 51" and no supplemental EIS is required.

In addition, in 2001, NEI provided NRC with the results of an industry analysis²⁷ showing that the very unlikely conditions postulated in NUREG-1738 alleged to lead to a zirconium spent fuel pool fire do not result in the fire (or, therefore, the releases) postulated by NUREG-1738. (The Alvarez and Beyea reports relied upon those postulated results.) This NEI report concludes that: "The chemical energy release would dominate the fuel bundle response which would lead to cladding melting and relocation (compaction) of the core materials."²⁸ Thus, the air to support oxidation of the fuel will be choked-off and fire will self-extinguish. This means that NUREG-1738, while showing that the probability of a fire is extremely small, over-estimates the severity of the fire itself and the resultant potential for releases.

**D. The Thompson Report Presents No New and Significant
Information that Justifies the Relief Requested by the Petition**

The Petition attaches and relies upon an August 23, 2006 Declaration of Dr. Gordon R. Thompson, which in turns summarizes and incorporates the May 25, 2006 Thompson Report that formed part of the basis of the Attorney General's hearing requests in the Pilgrim and Vermont Yankee license renewal proceedings. The Thompson Report addresses both malicious and non-malicious spent fuel pool accident initiating events, but provides no new and significant information regarding either.

The Thompson Report (as well as the Beyea Report discussed below) repeats a number of arguments made in a 2003 paper by Alvarez, *et al.* (referenced in the Thompson Report at 12 and the Beyea Report at 3). In a 2003 evaluation of the Alvarez article, the NRC found that this document was based on speculation and excessive conservatism, and that the authors' recommendations lack a sound technical basis.²⁹ For example, the NRC concluded that the Alvarez paper provided "no justification for the postulated probabilities of worst case spent fuel pool damage." The paper offered no "probabilistic analysis of the likelihood" of a terrorist attack, or any other event, leading to severe damage of a spent fuel pool and its fuel. Rather, the paper merely

²⁷ See Jan. 10, 2001, letter from R. Beedle, NEI, to Samuel Collins, Director of Nuclear Reactor Regulation, NRC, enclosing *FAI/00-104, The Response of the Spent Fuel Pool to Postulated Accident Conditions*, prepared by R. Henry, Fauske & Associates (Dec. 2000).

²⁸ *Id.* at 15.

²⁹ See COMSECY-03-0019, Review of the Paper *Reducing the Hazards from Stored Spent Power-Reactor Fuel in the United States*, Robert Alvarez *et. al.*, January 31, 2003 (Aug. 7, 2003), Adams Accession No. ML052340740.

postulated such probabilities, which were claimed to justify moving the spent fuel to dry cask storage. COMSECY-03-0019, Attachment at 2-4.

Dr. Thompson's Report, as relied upon by the Attorney General, remains deficient. It provides no information regarding the probability of spent fuel damage resulting from a terrorist attack. Indeed, the Report states that the "record of experience does not allow a statistically valid estimate of this probability." Thompson Rept. at 26. Rather, the Report claims, without factual support or explication, that "prudent judgment indicates that a probability of at least one per century is a reasonable assumption for policy purposes." *Id.* This is the same sophistry that the NRC has rejected as meaningless. See COMSECY-03-0019, Attachment at 2-4. Such speculation clearly provides no new and significant information that would warrant reconsideration of GEIS findings on spent fuel storage.

The Thompson Report similarly relies on deceptive reasoning in its discussion of non-terrorist accident initiating events. It alleges that "non-malicious events that could lead to pool fire" include "(i) an accidental aircraft impact, with or without an accompanying fuel-air explosion or fire; (ii) an earthquake; (iii) dropping of a fuel transfer cask or shipping cask; (iv) a fire inside or outside the plant building; and (v) a severe accident at the adjacent reactor." Thompson Rept. at 18. However, the Report provides no basis to show that any of these scenarios is sufficiently probable to warrant consideration under NEPA.

With respect to the first four scenarios, the Thompson Report provides neither an estimated probability of occurrence nor any factual basis from which a probability of occurrence could be inferred. It does not identify the necessary sequence of events by which such scenarios might lead to spent fuel pool fires, or discuss the probability of their occurrence. For example, neither the sequence of events by which the dropping of a fuel transfer cask or shipping cask might lead to a spent fuel pool fire nor the likelihood of occurrence of such an accident scenario is discussed.

With respect to earthquakes the Report again simply suggests — without any factual explication of a sequence or probability — that a severe earthquake that damages the reactor and its supporting systems and causes a core-melt accident "could cause leakage of water from the pool." Thompson Rept. at 19. The Report provides no basis to assume that the probability of a seismic event causing a catastrophic failure and drainage of the steel-lined, seismic category 1 spent fuel pool is the same as the probability of a seismic event causing core damage. The Report ignores the different nature of the structures (*e.g.*, the thick spent fuel pool walls and floor) and systems involved.³⁰ Similarly, this Report provides no factual explication of a sequence or likelihood of a potential accident scenario involving accidental aircraft crash impacts or fires inside or outside the plant.³¹ Thus, the

³⁰ In its Waste Confidence Decision, the Commission found that "because of the large safety margins in the design and construction of their spent fuel pools," spent fuel pools could safely withstand earthquakes "several times more severe" than the plant's design basis earthquake. See Section II.B.

³¹ With respect to aircraft crashes, during plant licensing the likelihood of an aircraft impacting the site would have been determined to be less than 1 E-7. See NUREG-0800, *Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants*, §§ 2.2.3 & 3.5.1.6. Thus, even without

Thompson Report provides no information to suggest that the event probabilities for these events reported in NUREG-1353 and NUREG-1738, which establish that the occurrence of a severe spent fuel pool accident due to such events is highly remote, are in any way incorrect.

With respect to the allegation that "a severe accident at the adjacent reactor" would cause a spent fuel pool fire, the Thompson Report again fails to demonstrate that this scenario is sufficiently probable to warrant analysis under NEPA, or that it would alter the GEIS conclusions regarding spent fuel storage. This same issue was raised and litigated with respect to the expansion of spent fuel pool storage capacity at the Shearon Harris nuclear power plant.³² In that proceeding, Dr. Thompson served as the expert for the intervenor who alleged that a severe reactor accident could cause the loss of all spent fuel cooling and makeup systems and result in the zirconium spent fuel pool fire.³³ Dr. Thompson's allegations were rejected by the Atomic Safety and Licensing Board in the Shearon Harris case for lack of any credible factual basis.

After extensive litigation in which licensee Carolina Power & Light ("CP&L") undertook a detailed probabilistic risk assessment ("PRA"), both the Licensing Board and the Commission concluded that the occurrence of a severe accident causing a spent fuel pool fire was highly remote and speculative, and did not require formal analysis under NEPA. In its PRA, CP&L calculated the probability of a severe reactor accident causing a spent fuel pool fire to be 2.78 E-08. LBP-01-9, 53 NRC at 267. The Staff calculated this probability as 2.0 E-07. *Id.* at 254, 256-57, 267. The Licensing Board found the Staff's estimates to be reasonable and supported by the more detailed PRA analysis performed by CP&L. The Board concluded that the probability of the postulated sequence of events resulting in a spent fuel pool fire was "conservatively in the range described by the Staff: 2.0 E-07 per reactor year . . . , or less." *Id.* at 267. Based on this low probability, the Board found that the Dr. Thompson's alleged accident scenario was "remote and speculative" and

considering the likelihood of occurrence of subsequent events that would be necessary for an aircraft crash to cause a spent fuel pool fire, the likelihood of a spent fuel fire caused by aircraft crashes would be considered remote and speculative for purposes of NEPA on the basis of the crash probability alone. See discussion *infra* (an accident probability of 2.0 E-07 is below any threshold for requiring preparation of an EIS).

³² *Carolina Power & Light Co.* (Shearon Harris Nuclear Power Plant), CLI-01-11, 53 NRC 370 (2001), *aff'g Carolina Power & Light Co.* (Shearon Harris Nuclear Power Plant), LBP-01-9, 53 N.R.C. 239 (2001). Because four plants were originally planned for the Harris site, the fuel handling building was constructed with four spent fuel pools. Initially, only two of the spent fuel pools were used to support the single unit at Harris. In 1998, CP&L filed a license amendment application to increase the plant's spent fuel storage capacity by adding spent fuel racks and utilizing the two previously inactive spent fuel pools. This triggered the licensing proceeding discussed above. LBP-01-9, 53 NRC at 242.

³³ The accident scenario alleged by Dr. Thompson in the Shearon Harris proceeding involved considering the probability of a sequence of seven events: (1) a degraded core accident; (2) containment failure or bypass; (3) loss of all spent fuel cooling and makeup systems; (4) extreme radiation doses precluding personnel access; (5) inability to restart any pool cooling or makeup systems due to extreme radiation doses; (6) loss of most or all pool water; and (7) initiation of exothermic oxidation reaction in the spent fuel pool. LBP-01-9, 53 NRC at 244-45.

hence did not require consideration in an EIS. *Id.* at 271. The Commission affirmed the Licensing Board's decision.³⁴

The May 25, 2006 Thompson Report provides no new information different from the information that was extensively considered and rejected in the Shearon Harris spent fuel pool licensing proceeding. In that proceeding, Dr. Thompson had assumed a conditional probability of 1 for a spent fuel pool fire, given an early release from the adjacent reactor for which he provided no explication or supporting analysis. *See* LBP-01-9, 53 NRC at 267. In contrast, based on its detailed PRA, licensee CP&L calculated a conditional probability of less than 3% that a severe reactor accident releasing radioactivity would trigger a spent fuel pool fire,³⁵ and the Staff calculated a conditional probability of less than 1% that a severe reactor accident releasing radioactivity would trigger a spent fuel pool fire.³⁶

Perhaps in response to his experience in the Shearon Harris proceeding, Dr. Thompson no longer assumes a conditional probability of 1 for a spent fuel pool fire given an early release from the adjacent reactor. Rather, he now "assumes that the conditional probability of a spent-fuel-pool fire, given an early release from the adjacent reactor, is 50 percent." Thompson Rept. at 20. Moreover, Dr. Thompson limits the applicability of his new 50% conditional probability to boiling water reactors. He makes no assertions, and provides no supporting factual basis, regarding the conditional probability of spent fuel pool fires for pressurized water reactors given an early release from the adjacent reactor. *See id.* at 20-21.

The Thompson report refers to the Shearon Harris proceeding as the sole support for Dr. Thompson's use of a 50% conditional probability of a spent fuel pool fire given an early release from the adjacent reactor. *Id.* He asserts that "[a]ll three parties to the proceeding — the NRC Staff, Carolina Power & Light, and Orange County — reached the same conclusion on an issue" relevant to the appropriateness of a conditional probability of 50 percent for BWRs such as Pilgrim and Vermont Yankee. *Id.* The Report provides no citations or other support for this statement and it must be dismissed as without foundation. Clearly, the conditional probability of less than 1% calculated by the NRC Staff, and the conditional probability of less than 3% calculated by CP&L

³⁴ The Commission noted that although the "Commission has never determined a threshold accident probability figure for imposing the requirement of preparing an EIS," 2.0E-07 is certainly below any such threshold. CLI-01-11, 53 NRC at 388 n.8.

³⁵ CP&L calculated a probability of 7.7 E-06 for the release of radioactivity into the environment (*i.e.*, through step 2 of the scenario evaluated, see note 32) and an overall probability for a spent fuel fire of 2.78 E-08. LBP-01-9, 53 NRC at 267. This is a factor of more than 35 lower than the release of radioactivity, or a conditional probability of less than 3% that a severe reactor accident releasing radioactivity would trigger a spent fuel pool fire.

³⁶ The Staff calculated the probability of a significant release (through step 2, see note 35) to be 1.2 E-05 and an overall probability of a spent fuel fire to be 2.0 E-07. LBP-01-9, 53 NRC at 254, 256-57, 267. This is a factor of more than 166 lower than the release of radioactivity, or in other words a conditional probability of less than 1% that a severe reactor accident releasing radioactivity would trigger a spent fuel pool fire.

(discussed above), provide no support whatsoever for Dr. Thompson's 50% conditional probability.³⁷

Dr. Thompson claims that his 50% conditional probability of a spent fuel fire given an early release from an adjacent reactor is appropriate for BWRs where the reactor and the spent fuel pools are in the same building. Nowhere does the Thompson Report address the probability of each of the events that must occur subsequent to an early reactor release before the spent fuel will ignite and burn. See Thompson Rept. at 21. Rather, Dr. Thompson appears to assume his conditional probability of 50% with no supporting factual basis, just as he had similarly assumed a 1.0 conditional probability in the Shearon Harris case without factual support. For example, Dr. Thompson provides no basis for suggesting that an early release would trigger a loss of spent fuel cooling, a claim expressly rejected by the NRC Licensing Board in the Shearon Harris proceeding. LBP-01-9, 53 NRC at 257-58.

Similarly, in the Shearon Harris proceeding, the Licensing Board found a "high" likelihood of success that the necessary makeup water could be provided to the spent fuel pools even if cooling were lost, since at least several days (about 10 days for Shearon Harris) would be available to restore cooling. 53 NRC at 262, 264. Dr. Thompson's claim that such recovery would not be possible in a BWR presumes, with no supporting basis, that recovery could be effectuated only by entering highly radioactive areas, and that makeup water (which need consist of only a single water hose) could not be provided by robotic means within the several days available before the water level approached the top of the spent fuel. These claims should therefore be discounted.

Thus, the claim of a 50% conditional probability of a spent fuel pool fire given an early release from an adjacent reactor is most charitably viewed as speculation by Dr. Thompson, whom the Licensing Board found to have "little experience in the actual operation of a nuclear power plant or in PRA[s]." LBP-01-9, 53 NRC at 251. The Thompson Report provides no meaningful information to indicate that this scenario is sufficiently probable to warrant analysis under NEPA, or that it would change any GEIS conclusions regarding spent fuel storage.

³⁷ The Attorney General's Reply in the Pilgrim and Vermont Yankee license renewal proceedings asserted that Dr. Thompson's 50% conditional probability is supported by the parties' assumption in the Shearon Harris proceeding that "the conditional probability for a fire in spent fuel pools C and D at the Harris plant would be 1 (*i.e.*, 100%) if water were lost from pools A and B." Reply at 25. This assertion is incorrect, and misstates the parties' position and testimony in Shearon Harris. This is clear from the portions of the testimony quoted in the Reply (at 25-27), as well as the testimony read in its entirety. The conditional probability of 1 of a fire in pools C and D given a fire in pools A and B (referred to in the Staff and CP&L testimony) concerned the probability of an exothermic oxidation reaction, where the loss of cooling and make-up capability and the inability to restore this capability had already occurred in both sets of pools for a period of several days resulting in the in the boil-down of the pools. This is expressly stated in the quoted testimony of the Staff that "it is assumed conservatively that the probability [of a fire] is 1, given that the sequence has progressed to the point that the water in the pools has been lost through evaporation." Reply at 26 (emphasis added). This testimony provides no basis to assume that the conditional probability of going from "containment failure and bypass" to "initiation of an exothermic oxidation reaction in pools" is 50%, as claimed by Dr. Thompson.

E. The National Academy of Sciences Study Presents No New and Significant Information that Justifies the Relief Requested by the Petition

The NAS Study fails to provide any significant new information mandating Commission reconsideration of its license renewal GEIS. The NAS Study focused on the potential for terrorist attacks to cause a severe spent fuel accident. However, the Commission has previously ruled that NEPA imposes no legal duty on the NRC to consider intentional malevolent acts. (See discussion in Section III below.)

The NAS Study provides no new and significant information that would require the Commission to reconsider its position concerning terrorist-initiated attacks on spent fuel pools. While concluding that the possibility of terrorist attacks at a nuclear power plant should be considered in light of the events of September 11, as the Commission certainly does in the context of 10 CFR Part 73 requirements, the NAS Study concluded that the "probability of terrorist attacks on spent fuel storage cannot be assessed quantitatively or comparatively." NAS Rept. at 36. This conclusion reflects one of several key rationales underlying the Commission's policy of not analyzing malevolent acts under NEPA. Furthermore, after reviewing the information in the NAS Study, the NRC continues to generally consider "the likelihood of a zirconium fire capable of causing large releases of radiation into the environment to be extremely low."³⁸ Thus, the NRC has fully considered the NAS Study and found no basis, even in the context of a terrorist attack, to change its conclusion regarding the risks of spent fuel pool fires stated in the GEIS.

Furthermore, the Commission has acted on the Study's Findings and Recommendations as it deemed appropriate to reduce the potential vulnerability and likelihood of a spent fuel pool fire resulting from a terrorist attack. As the NRC noted in its Report to Congress on the NAS Study, the NRC had in a February 2002 Order "required licensees to develop specific guidance and strategies to maintain or restore [spent fuel pool] cooling capabilities" in "circumstances associated with the loss of large areas of the plant due to large fires and explosions." NRC Rept. on NAS Study at 6, 17. Additionally, in a July 2004 letter the NRC directed licensees "to implement additional 'spent fuel mitigative measures,' as appropriate," including "reconfiguration" of the fuel as recommended by the NAS Study. *Id.* at 17, 21.³⁹

³⁸ *U.S. Nuclear Regulatory Commission Report to Congress on the National Academy of Sciences Study on the Safety and Security of Commercial Spent Nuclear Fuel Storage* (Mar. 2005) ("NRC Rept. on NAS Study") at 21 (emphasis added).

³⁹ The March 14, 2005, cover letter from NRC Chairman Nils Diaz to Chairman Domenici of the Senate Subcommittee on Energy and Water Development forwarding the NAS Study ("Diaz Letter") describes (at page 2) the "numerous actions" taken to "enhance the security of spent nuclear fuel." Chairman Diaz also noted that, while agreeing with many points raised by the NAS, the NRC believes, "based on information developed in NRC vulnerability assessments," that some scenarios identified by the NAS Study are "unreasonable." Diaz Letter at 1. Chairman Diaz further stated that the NRC "disagreed with some NAS recommendations" because "they lacked a sound technical basis," including in particular the "NAS finding that earlier movement of spent fuel from pools into dry storage would be prudent." *Id.*

Hence, the NAS Study provides no new and significant information to warrant analysis of terrorist initiated events on spent fuel pools under NEPA.

**F. The Beyea Report Presents No New and Significant Information
that Justifies the Relief Requested by the Petition**

Relying upon the Beyea Report, the Petition claims (pp. 9-10) that new and significant information "shows that the consequences of severe pool accident could be grave, and that the consequences of pool accidents differ in significant respects from the consequences of reactor accidents." However, the Beyea Report relies on excessive and unrealistic conservatisms that overestimate radiation releases and societal costs associated with a severe spent fuel accident (such as those criticized in COMSECY-03-0019, Attachment at 4-5). This Report also is suspect because it uses the same "methodologies" as the Alvarez Report and the 2004 addendum to that Report. Beyea Rept. at 3. For example, the Beyea Report continues to assume releases of 10% and 100% of the spent fuel pool cesium inventory, even though such release estimates, particularly anything approaching 100%, are unrealistic. *Id.* at 4.

One example of the excess conservatism reflected in the Report is its calculation of societal damages. The Report assumes a 5% loss in property value for properties extending out 1000 miles from the plant. Beyea Rept. at 9-10. This unsupported and unrealistic assumption, which essentially posits property damage to nearly one-third of the nation, results in estimates of hundreds of billions of dollars of damage. *Id.* Similarly, the Report's projection of thousands of cancer deaths appears to be based on contamination affecting a population within a 1000-mile radius (*id.* at 30-33). This estimate relies on the remarkable assumption that resuspended radioactivity would cause more cancers than the remediated plume. See *id.* at 24. Further, Dr. Beyea advocates a supra-linear dose-response curve — a position that is not supported by any recognized advisory authority (*e.g.*, BEIR, NCRP, ICRP, UNSCEAR, NRC, or EPA).

In sum, because the Beyea Report fails to provide a reliable, credible assessment of consequences, it provides no basis to support a re-examination of the risk of spent fuel pool fires. It is well established that NEPA does not require "worst-case analyses" such as those presented in the Beyea Report.⁴⁰ Moreover, this Report contains no new information that would mandate the NRC's reconsideration of its GEIS findings regarding consequences of spent fuel storage accidents.⁴¹

⁴⁰ *Robertson v. Methow Valley Citizens Council*, 490 U.S. 332, 354-56 (1989), where the Supreme Court clearly enunciated that NEPA does not require a "worst case analysis" because, among other reasons, worst case analyses would "distort[] the [NEPA] decisionmaking process by overemphasizing highly speculative harms." *Id.* at 356 (citation omitted). This legal precedent has been repeatedly followed. See, *e.g.*, *Edwardsen v. Dep't of Interior*, 268 F.3d 781, 785 (9th Cir. 2001) ("an EIS need not include a worst-case scenario").

⁴¹ In this respect, the technical studies underlying the GEIS determinations evaluated the consequences of a spent fuel pool fire (*e.g.*, NUREG-1353 at 4-36 – 4-42) and, while noting differences between the consequences of severe reactor accidents and those of spent fuel fires (*e.g.*, there are "no 'early fatalities and the risk of early injury is negligible" for spent fuel fires, *id.* at 4-41), the results showed that consequences from a spent fuel pool fire "could be comparable to those for a severe reactor

III. THE PETITION FAILS TO ESTABLISH THE NEED FOR NRC CONSIDERATION OF TERRORIST ATTACKS UNDER NEPA

The Petition also argues that a "severe accident caused by an intentional attack on a nuclear power plant spent fuel pool is also reasonably foreseeable," particularly in view of 9/11, and therefore that such an occurrence must be addressed as ordered by the Ninth Circuit in the recent *San Luis Obispo* decision. Petition at 9.

As stated in the government's December 2006 brief on petition for a writ of *certiorari* in *San Luis Obispo*:

The court of appeals' unprecedented holding that NEPA requires analysis of the environmental effects of potential terrorist attacks is wrong, and the court's refusal to apply the "reasonably close causal relationship" test conflicts with decisions of this Court.

As construed in *Public Citizen* and *Metropolitan Edison*, NEPA does not require NRC to analyze the effects of a potential terrorist attack, because the agency's licensing decision could not be construed as the legal cause of such an attack or its environmental impact. Under the traditional understanding of the proximate cause doctrine of tort law, intervening criminal activity generally breaks the chain of causation Here, a terrorist's intentional criminal act of mass murder and destruction, not a licensing decision, would proximately cause a terrorist attack's consequences.⁴²

Similarly, as stated in the government's January 12, 2007, brief on petition for review in the U.S. Court of Appeals for the District of Columbia Circuit of the NRC's issuance of a license for the Private Fuel Storage Independent Spent Fuel Storage Installation:

As the Supreme Court has made clear, NEPA requires agencies to analyze only impacts that their actions "proximately cause." Here, NRC permissibly decided not to analyze the environmental impacts of hypothetical terrorist attacks. Intervening criminal terrorist acts break the chain of proximate causation between licensing the PFS facility and terrorist-caused environmental effects. Utah's brief ignores the proximate cause requirement entirely. Utah's brief also fails to rebut NRC's alternative rationale that a terrorist attack at PFS's 'remote, desert location' is particularly unlikely.⁴³

accident." NUREG-1738 at 3-28. This conclusion is confirmed by the recent analysis in NUREG-1738. *Id.* at 3-28 – 3-34.

⁴² Brief for the Federal Respondents at 6-7, *Pacific Gas and Electric Co. v. San Luis Obispo Mothers for Peace*, No. 06-466 (internal citations omitted).

⁴³ Brief for the Federal Respondents at 49 (see also pp. 88-96), *Ohngo Gaudadeh Devia and State of Utah v. U.S. NRC*, No. 05-1419, 05-1420, 06-1087.

As the NRC reasonably concluded, environmental harm that might be caused by a terrorist attack on a federally-licensed nuclear facility is not the sort of potential environmental effect that could reasonably be viewed as a proximate result of the NRC licensing decision.

NEI concurs with the NRC that *San Luis Obispo* was wrongly decided: NEPA should not be construed to force agencies to consider environmental impacts for which they cannot reasonably be held responsible.⁴⁴ Notwithstanding the Ninth Circuit's decision and the subsequent denial of *certiorari* by the U.S. Supreme Court, the Commission recently affirmed its "longstanding" view that NEPA requires no "terrorism inquiry," and that the NRC therefore need not consider the environmental consequences of hypothetical terrorist attacks on NRC-licensed facilities.⁴⁵ Consistent with Supreme Court precedent, the Commission clearly reiterated last month that the environmental effects of intentional malevolent acts are "simply too far removed from the natural or expected consequences of agency action to require a study under NEPA. The claimed impact is too attenuated to find the proposed federal action to be the proximate cause of that impact."⁴⁶ Further, it opined that a NEPA-driven review of terrorism would be "largely superfluous," given the agency's extensive post 9/11 security enhancements at nuclear facilities, which provide the most effective mechanism for protecting public health and safety.⁴⁷

This Petition provides no additional information to support the consideration of terrorist acts under NEPA. As previously discussed, both the NAS Study and the Thompson Report concur with the Commission that the probability of malevolent attacks on spent fuel storage cannot be assessed quantitatively and therefore provide no new and significant information on this controlling issue.

Moreover, regardless of what is legally required under NEPA, the Commission has previously held in the McGuire and Catawba Nuclear Station joint license renewal proceeding that sabotage is already addressed and adequately covered in the GEIS. As stated there by the Commission:

Even if we were required by law to consider terrorism under NEPA, the NRC has already issued a Generic Environmental Impact Statement ("GEIS") that considers sabotage in connection with license renewal The GEIS concluded that, if such an event were to occur, the resultant core damage and radiological release would be no worse than those expected from internally initiated events.

⁴⁴ See *Metropolitan Edison Co. v. People Against Nuclear Energy*, 460 U.S. 766 (1983); *Dep't of Transp. v. Pub. Citizen*, 541 U.S. 752 (2004).

⁴⁵ *Amergen Energy Co., LLC* (License Renewal for Oyster Creek Nuclear Generating Station), CLI-07-08, 65 NRC __ (Feb. 26, 2007, slip op. at 2, 6); see also *Pacific Gas & Electric Co.* (Diablo Canyon Power Plant Independent Spent Fuel Storage Installation), CLI-07-11, 65 NRC __ (Feb. 26, 2007, slip op. at 2).

⁴⁶ *Amergen Energy Co.*, CLI-07-08, slip op. at 7 (internal citations omitted).

⁴⁷ *Id.*, slip op. at 9-10.

McGuire, CLI-02-26, 56 NRC at 365 n.24 (citations omitted). As such, the GEIS expressly concludes that "the risk from sabotage . . . at existing nuclear power plants is small." NUREG-1437, at 5-18 (emphasis added).

This conclusion of the GEIS is made in the context of severe reactor accidents. However, as shown in NUREG-1353 and NUREG-1738 (see note 40), the consequences from a spent fuel fire could be "comparable," but not worse, than those for a severe reactor accident. Hence, this conclusion would apply to sabotage risks for spent fuel accidents as well.

Accordingly, even assuming NEPA requires consideration of intentional attacks (a position which the Commission has rejected), the GEIS already incorporates considerations of sabotage by concluding that consequences resulting from terrorist-induced accident would no worse than those expected from severe accidents already analyzed as part of the GEIS. Because the probability of terrorist attack cannot be assessed quantitatively, as acknowledged by both the NAS Study and Dr. Thompson, no measurement of risk of a terrorist attack is feasible and the qualitative comparison to severe accident consequences provides a decision-maker as much relevant information as possible. *See Limerick Ecology Action v. NRC*, 869 F.2d 719, 741-42 (3d Cir. 1989).

Furthermore, because risk cannot be measured, Petitioner's request for a SAMA analysis that measures the benefits and costs of mitigative actions is not feasible. Moreover, the GEIS concluded that consideration of "mitigation alternatives" for spent fuel storage was not required because the NRC's "regulatory requirement already provide adequate mitigation incentives for on-site storage of spent fuel." GEIS at 6-86. This GEIS conclusion is equally applicable to mitigation for malevolent acts given the extensive security enhancements that the Commission has required licensees to undertake in response to the events of 9/11. As the Commission readily recognizes, this information should not in any event be subject to public disclosure in a NEPA evaluation.

In sum, the GEIS already appropriately incorporates considerations of sabotage, and the Commission has made clear that it will not require consideration of intentional attacks under NEPA outside of the ongoing Diablo Canyon Independent Spent Fuel Storage Facility proceeding, which was the subject of the Ninth Circuit's remand.

From: "REYNOLDS, Deirdre" <dmr@nei.org>
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Subject: Massachusetts Attorney General Petition for Rulemaking - Docket No. PRM-51-10

March 19, 2007

Ms. Annette L. Vietti-Cook
Secretary
U.S. Nuclear Regulatory Commission

Attn: Rulemaking and Adjudications Staff
Mail Stop 0-16C1
Washington, DC 20555-0001

Subject: Massachusetts Attorney General Petition for Rulemaking, Docket
No. PRM-51-10

Project Number: 690

Dear Ms. Vietti-Cook:

The Nuclear Energy Institute (NEI) is pleased to submit the enclosed comments opposing the August 25, 2006, petition for rulemaking (Petition) filed with the U.S. Nuclear Regulatory Commission (NRC) by the Massachusetts Attorney General (Attorney General). The NRC published a notice of receipt of the rulemaking petition, docketed as PRM-51-10, at 71 Fed. Reg. 64,169 (Nov. 1, 2006); see also 72 Fed. Reg. 2,464 (Jan. 19, 2007).

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