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Comment On: NRC-2015-0111-0001
Entergy Nuclear Operations, Inc.; Vermont Yankee Nuclear Power Station; Draft Environmental Assessment and Finding of No Significant Impact; Request for Comment

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Government Agency: State of Vermont

General Comment

See attached file(s)

Attachments

Attachment1_VT June 1 2015 Comments

Attachment2_VT Exhibit 1 to June 1 2015 Comments

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of:

Entergy Nuclear Operations, Inc.; Vermont Yankee Nuclear Power Station Draft Environmental Assessment and Finding of No Significant Impact

Docket No. NRC-2015-0111
Docket No. 50-271

Comments of the State of Vermont

Submitted: June 1, 2015

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INTRODUCTION

The Nuclear Regulatory Commission (NRC) has "worked together" with plant owners and "State and local officials . . . for more than 20 years to create a system of emergency preparedness and response that will serve the public well in the unlikely event of an emergency."[1] But in the last year or so, both the NRC and Entergy Nuclear Operations, Inc. (Entergy) have moved away from this cooperative model of emergency planning to a model that ignores the concerns of State and local officials. As the NRC noted in the environmental assessment at issue here, "[t]he NRC staff *did not* enter into consultation with any other Federal agency or with the State of Vermont regarding the environmental impact of the proposed action."[2] This move away from a cooperative model is harmful not only to State and local officials, but also to the NRC, Entergy, and the nuclear industry more generally.

The cooperative model is being abandoned over a difference of opinion over what safety precautions are required to protect public health and the environment. While Entergy seeks to be relieved of off-site emergency planning beginning in April 2016, the State's view is that off-site planning should continue for an additional four years, until all spent fuel has been moved into dry-cask storage.

The State's position on this issue is reasonable and should not be ignored. One of the four sitting NRC Commissioners recently noted agreement with the State's position that off-site emergency planning should continue until the fuel is

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[1] NRC, Fact Sheet on Emergency Preparedness at Nuclear Power Plants, http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/fs-emerg-plan-prep-nuc-power.html.

[2] Environmental Assessment, Docket No. NRC-2015-0111, at 10 (emphasis added).

moved to dry-cask storage.[3] If the full Commission were presented with the State's filings—as it should have been before it ever took a vote on this issue—as well as an environmental analysis that complies with the National Environmental Policy Act (NEPA), the full Commission could well side with the State's view.

The State files today's Comments in the hope that this will occur. The State finds the NRC's recent draft environmental assessment and finding of no significant impact (FONSI) deficient both procedurally and substantively. It is procedurally deficient because NEPA requires the environmental analysis to occur *before* the relevant decision is made. The NRC violated NEPA when it reversed the order here. The environmental assessment and FONSI are substantively deficient for many reasons, including the failure to prepare a full environmental impact statement.

I. The publication of the environmental analysis—after the relevant decision has already been made—does not comply with NEPA's requirement that the analysis occur *before* a decision is made.

On March 2, 2015, the Commission made the decision to approve Entergy's requested exemptions for emergency planning.[4] The recent publication of the environmental assessment and FONSI—nearly two months after the relevant decision was already made—does not comply with NEPA, which requires the analysis *before* a decision is made. The relevant federal guidelines are clear that the purpose of a NEPA analysis is to inform decisionmakers before a decision is made:

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[3] *See* SECY-14-0125, Commission Voting Record, Commissioner Baran's Comments (Mar. 2, 2015) (ADAMS Accession No. ML15062A135).

[4] SECY-14-0125, Commission Voting Record (Mar. 2, 2015) (ADAMS Accession No. ML15062A135).

> NEPA should not become an after-the-fact process that justifies decisions that have already been made.
>
> ***
>
> [A]n agency shall prepare an EIS so that it can inform the decisionmaking process in a timely manner and will not be used to rationalize or justify decisions already made.[5]

As the U.S. Court of Appeals for the D.C. Circuit has held, "Congress did not intend [NEPA] to be such a paper tiger."[6] Yet that is precisely what the NRC has done in this proceeding. The relevant decision at issue here—whether to approve Entergy's request to be exempted from various regulations governing emergency preparedness—occurred on March 2, 2015. At that time, the NRC had not performed *any* environmental analysis, let alone a NEPA-compliant one.

Although the State is grateful for the opportunity to provide Comments on this matter, it is not clear to what end, given that the Commission has already issued its decision. While the State has sought reconsideration of the Commission's decision, there is no indication that such reconsideration is in fact occurring. To the contrary, just two weeks ago the Atomic Safety and Licensing Board denied the State a right to a hearing in a licensing proceeding on the basis of the Commission's March 2, 2015 decision. The panel noted that "the Commission itself has *already reviewed and approved* the requested exemptions."[7] Similarly, NRC Staff has

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[5] Commission on Environmental Quality Guidance, 77 Fed. Reg. at 14476-77 (footnotes and citations omitted).

[6] *Calvert Cliffs' Coordinating Cmtee. v. U.S. Atomic Energy Commission*, 449 F.2d 1109, 1114 (D.C. Cir. 1971).

[7] Docket 50-271-LA-2, ASLB Decision at 5 (May 18, 2015).

characterized the March 2, 2015 decision as final and binding, and has noted that it is "preparing the exemption for issuance."[8]

To comply with NEPA, the NRC Staff and the Commission should have done the required environmental review before the NRC decided on March 2, 2015 to grant the exemptions. The post-decision release of the draft environmental assessment and FONSI, and the after-the-fact public participation through the current comment process, relegates NEPA to a "paper tiger."[9] "Drafting a proper impact statement involves much more than filling in the blanks of a government form."[10]

By taking comments and analyzing environmental impacts only after the relevant decision has already been made, the NRC was not "fully informed" of potential environmental impacts at the time it was obligated under NEPA to make a "well considered" decision.[11]

NEPA requires federal agencies, such as the NRC, to "examine and report on the environmental consequences of their actions."[12] The U.S. Court of Appeals for the Second Circuit has held in an analogous case that "public scrutiny [is] an 'essential' part of the NEPA process."[13] In *Brodsky*, the Second Circuit vacated the

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[8] Docket 50-271-LA-2, NRC Staff's Answer at 15.

[9] *Calvert Cliffs*, 449 F.2d at 1114.

[10] *Scientists' Institute for Public Information, Inc. v. Atomic Energy Commission,* 481 F.2d 1079, 1092 (D.C. Cir. 1973).

[11] *Vermont Yankee Nuclear Power Corp. v. NRDC,* 435 U.S. 519, 558 (1978).

[12] *New York v. NRC I,* 681 F.3d 471, 476 (D.C. Cir. 2012)

[13] *Brodsky v. NRC*, 704 F.3d 113, 120 (2d Cir. 2013) (quoting 40 C.F.R. § 1500.1(b)).

NRC's decision to grant an exemption before the NRC had undergone the public comment and participation process that NEPA requires.[14]

As in *Brodsky,* the NRC has made the same error here. Specifically, before the release of the draft environmental assessment and FONSI, the NRC failed to solicit public comment, hold a hearing, or make any other effort at public participation, despite knowing that the public was greatly concerned with the matter. Thus, the NRC failed to follow what Courts have long held NEPA requires: that "environmental issues [are] to be considered at every important stage in the decision making process concerning a particular action."[15]

Further, throughout this and other proceedings on the decommissioning of Vermont Yankee, the NRC has erred by segmenting its environmental analyses into discrete parts, rather than looking at their combined effects as NEPA requires.[16] This segmentation contrasts with the NRC's recognition in other proceedings of the value of a comprehensive NEPA analysis:

> While NEPA does not require agencies to select particular options, it is intended to foster both informed decision-making and informed public participation, and thus to ensure that the agency does not act upon

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[14] *Id.*at 124.

[15] *Calvert Cliffs,* 449 F.2d at 1118.

[16] *See, e.g., Del. Riverkeeper Network v. FERC,* 753 F.3d 1304, 1314 (D.C. Cir. 2014) ("The justification for the rule against segmentation is obvious: it prevents agencies from dividing one project into multiple individual actions each of which individually has an insignificant environmental impact, but which collectively have a substantial impact." (quotation and alteration marks omitted)); *see also, e.g., NRDC v. Callaway,* 524 F.2d 79, 88 (2d Cir. 1975) (NEPA is meant to provide "a more *comprehensive* approach so that long term and cumulative effects of small and unrelated decisions could be recognized, evaluated and either avoided, mitigated, or accepted as the price to be paid for the major federal action under consideration" (emphasis added)).

incomplete information, only to regret its decision after it is too late to correct.[17]

For these reasons, the NRC's after-the-fact environmental assessment and FONSI do not comply with NEPA's procedural requirements.

II. The NRC's environmental assessment and FONSI are deficient and inadequate.

In addition to procedural deficiencies, the environmental assessment and FONSI fail to comply with NEPA for at least two other reasons: (1) the NRC's environmental assessment failed to take a "hard look" at the relevant and possible effects of the proposed action; and (2) because the action could result in a significant impact, the NRC should have done a full environmental impact statement.

A NEPA analysis must be comprehensive and must address all "potential environmental effects" unless those effects are so unlikely as to be "remote and highly speculative."[18] Regulations implementing NEPA also require the NRC to analyze the economic impacts of major federal actions significantly affecting the environment.[19] The NRC's environmental analysis does not meet this standard because it ignores potential environmental and economic impacts such as: (1) a cask-drop incident during the transfer of spent fuel from the spent fuel pool to dry-cask storage; (2) emergency services taking longer than 10 hours to contain a spent fuel pool fire due to damaged infrastructure from an earthquake or other natural

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[17] *In Re Duke Energy Corporation (McGuire Nuclear Station, Units 1 and 2; Catawba Nuclear Station, Units and 2)*, CLI-02-17, 56 N.R.C. 1, 10 (2002).

[18] *San Luis Obispo Mothers for Peace v. Nuclear Regulatory Comm'n*, 449 F.3d 1016, 1030 (9th Cir. 2006).

[19] *See, e.g.*, 40 C.F.R. § 1508.8.

disaster; or (3) a spent fuel pool fire occurring in less than 10 hours due to the use of accelerants, such as jet fuel, in a hostile action event. It bears noting that—far from "remote and highly speculative"—this last possibility was the subject of preparatory drills for emergency exercises that occurred onsite in the last few months.

Further, the NRC's environmental analysis ignores significant site-specific factors, such as the presence of an operating elementary school across the street from Vermont Yankee. Another site-specific factor the NRC failed to analyze is that Vermont Yankee is a boiling water reactor and, consequently, its spent fuel pool is not protected with a reinforced concrete ceiling as occurs at pressurized water reactors. Vermont Yankee represents the first boiling water reactor that would be exempted from the normal emergency planning zone requirements after the September 11 attacks. (Although the NRC has within recent memory allowed one other boiling water reactor—Millstone Unit 1—to be exempted from these requirements, Millstone's remaining operating units maintain an emergency planning zone that effectively encompasses all units at the Millstone site.) At a minimum, the NRC must *consider* these factors to determine the potential environmental impacts of eliminating the 10-mile emergency planning zone at Vermont Yankee.

The NRC has failed to consider these and other site-specific factors despite the State raising these issues in filings that predate the NRC's environmental analysis. In particular, on February 9, 2015, the State filed a comprehensive Petition to Intervene, Comments, and Declarations opposing Entergy's requested

exemptions and related license amendments.[20] That filing is attached here as Exhibit 1 and is incorporated in its entirety into these Comments.

Under NEPA, federal agencies must prepare an environmental impact statement for "major Federal actions significantly affecting the quality of the human environment."[21] Granting Entergy's Exemption Request on March 2, 2015 is an established "major federal action."[22] To determine whether an action is significant—and thus requires an environmental impact statement—the Council for Environmental Quality (Council) regulations require an agency to first prepare an environmental assessment.[23] The environmental assessment must be a "concise public document" that "[b]riefly provide[s] sufficient evidence and analysis for determining whether to prepare an environmental impact statement."[24] After completion of the environmental assessment, if the agency determines that a full environmental impact statement is not necessary, the agency must prepare a FONSI "sufficiently explaining why the proposed action will not have a significant

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[20] Docket No. 50-271-LA-2 (Feb. 9, 2015). Although the NRC was aware of this filing at the time it prepared its environmental analysis, nothing in the environmental analysis addresses the State's previously filed comments or even references them in the list of available documents.

[21] 42 U.S.C. § 4332(1)(C)(i); *see generally* 42 U.S.C. §§ 4321 et seq.

[22] 40 C.F.R. 1508.18 (defining "major federal action" as "actions with effects that may be major and which are potentially subject to Federal control and responsibility," including "[a]pproval of specific projects" or other instances where regulatory approval is necessary to a licensee's actions).

[23] 40 C.F.R. § 1508.18.

[24] 40 C.F.R. § 1508.9(a).

environmental impact."[25] The Second Circuit has specified that "[w]hen the determination that a significant impact will or will not result from the proposed action is a close call, an [environmental impact statement] should be prepared."[26] Thus, it is only when the agency's action "*will not* have a significant effect on the human environment" that an environmental impact statement is not required.[27]

An environmental impact statement is required if the agency's review shows "substantial possibility" that the project or action "could significantly affect the quality of the human environment."[28] Under this test, a court will reverse an agency's decision not to prepare an environmental impact statement unless the agency has adequately considered all of the substantially probable effects of its project or action to determine whether an impact statement is required.[29]

Significance determinations are governed by Council regulations, which require agencies to consider both the context of the action and the intensity of the potential environmental impacts.[30] The Council regulations list ten intensity factors

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[25] 40 C. F. R. § 1501.4; *id.* § 1508.14; *New York v. NRC I*, 681 F.3d 471, 477 (D.C. Cir. 2012).

[26] *National Audubon Soc. v. Hoffman*, 132 F.3d 7, 13 (2d. Cir. 1997) (reversing a decision by the U.S. Forest Service not to prepare an environmental impact statement because the Forest Service failed to consider the possible effects of the challenged action); *see also id.* at 18 (agencies should "err in favor of preparation of an environmental impact statement").

[27] *Id.* Further, it is settled law that an agency's decision not to prepare an environmental impact statement under NEPA is a final administrative decision reviewable under the Administrative Procedures Act. 5 U.S.C. § 701.

[28] *National Audubon Soc.*, 132 F.3d at 14.

[29] *Id.*

[30] 40 C.F.R. § 1508.27.

agencies must consider.[31] Courts often consider the factors "as a whole" or "as a group."[32] Courts frequently examine the agency's consideration and analysis of these factors when deciding whether the agency was correct in issuing a FONSI.[33]

Although there is not a "prescribe[d] weight to be given to these criteria,"[34] the NRC must at least consider these criteria.[35] The NRC did not do so here. Its decision to issue an environmental assessment, rather than an environmental impact statement, failed to consider at least *six* of the intensity factors for determining significance: (1) public health effects; (2) unique characteristics; (3) controversy; (4) uncertainty; (5) precedence; and (6) whether the action is related to other actions with cumulatively significant impacts.[36] The presence of several of these factors here requires the preparation of an environmental impact statement.[37]

The intensity factor of "affect[ing] public health or safety" is present here because the major federal action reduces emergency preparedness for radiological incidents.[38] Unlike federal decisions that only affect the environment, this one has

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[31] *Id.*

[32] *Sierra Club v. U.S. Forest Serv.*, 843 F.2d 1190, 1193 (9th Cir. 1988); *Found. for North Am. Wild Sheep v. U.S. Dep't of Agric.*, 681 F.2d 1172, 1182 (9th Cir. 1982).

[33] *Sierra Club v. Van Antwerp*, 661 F.3d 1147 (D.C. Cir. 2011).

[34] *Friends of the Ompompanoosuc v. FERC*, 968 F.2d 1549, 1556 (2d. Cir. 1992).

[35] *Am. Pub. Transit Ass'n v. Goldschmidt*, 485 F. Supp. 811 (D.D.C. 1980); *Ocean Advocates v. U.S. Army Corps of Eng'rs*, 402 F.3d 846 (9th Cir. 2005).

[36] 40 C.F.R. § 1508.27(b)(2-7).

[37] *Lower Alloways Creek Tp. v. Public Service Elec. & Gas Co.*, 687 F.2d 732 (3d. Cir. 1982); *Advocates for Transportation Alternatives, Inc. v. U.S. Army Corps of Eng'rs*, 453 F. Supp. 2d 289 (D. Mass 2006); *Friends of Back Bay v. U.S. Army Corps of Eng'rs*, 681 F.3d 581 (4th Cir. 2012).

[38] 40 C.F.R. § 1508.27(b)(2).

direct and significant implications for public health and safety. Further review is thus required.

Another reason further review is required here is because this site has "unique characteristics" due to, among other things, an operating elementary school directly across the street from the plant.[39] This is precisely the type of unique characteristic that should lead an agency to develop an environmental impact statement, so that it can determine whether any mitigation measures are appropriate here.[40] At a facility with a nearby operating elementary school, there are a number of mitigation measures that should be considered in determining whether to eliminate an emergency planning zone. For instance, the NRC should consider limiting certain activities—such as the transfer of spent fuel from the spent fuel pool to dry-cask storage—to times when elementary school children are not present.

The presence of elementary school children so close to this site also makes it unreasonable for the NRC to limit its analysis of environmental impacts to whether the public will be exposed to radiological levels above the EPA's protective action guidelines. As the State has previously noted, State and local officials would be called upon to respond to any radiological incident, regardless of dose levels,

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[39] 40 C.F.R. 1508.27(b)(3) (requiring analysis of "unique characteristics" that are in "proximity" to the affected area).

[40] *See, e.g.*, *Robertson v. Methow Valley Citizens Council*, 490 U.S. 332, 351 (1989) ("[O]ne important ingredient of an [environmental impact statement] is the discussion of steps that can be taken to mitigate adverse environmental consequences.")

especially if elementary school children are present.[41] And there are potential adverse health and environmental consequences associated with even low-level radiological releases.[42] NEPA requires analyzing all of these potential health and environmental impacts.[43]

Further, the NRC's environmental analysis fails to give any consideration to the fact that Vermont Yankee has high-burnup fuel in its spent fuel pool—another unique circumstance that should be considered when determining what emergency preparedness measures should be in place when transferring spent fuel.[44] The NRC has recognized that the presence of high-burnup fuel causes special problems, including a greater chance of accidents and an increased chance of structural failure of the fuel rods such that transfer to dry casks is more difficult, more dangerous, and more expensive.[45] This intensity factor requires further analysis, including

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[41] Exhibit 1 at 35-36 (Irwin Declaration at 3-4).

[42] *Id.*

[43] 42 U.S.C. § 4332(2)(c); 40 C.F.R. § 1508.27.

[44] Exhibit 1 at 15-16 (Leshinskie Declaration at 3-4).

[45] *Id.*; *see also, e.g.*, NUREG-1738 at ix, 3-1; National Research Council, Board on Radioactive Waste Management, Committee on the Safety and Security of Commercial Spent Nuclear Fuel Storage, National Academies Press (2006) at 101, *available at* http://www.nap.edu/openbook.php?record_id=11263&page=101 (noting that high-burnup fuel "results in an increase in the decay-heat power of the spent fuel assembly by the time it is put into the spent fuel pool"); R. Alvarez, *The Storage and Disposal Challenges of High Burnup Spent Power Reactor Fuel* (Jan. 3, 2014) at 9-11 (noting that new evidence shows that when high-burnup fuels are placed in the spent fuel pools at certain reactors, it can create special problems that interfere with Spent Fuel Pool systems integrity); NRC Division of Spent Fuel Storage and Transportation Interim Staff Guidance-24, Revision 0 (Issue: The Use of a Demonstration Program as Confirmation of Integrity for Continued Storage of High Burnup Fuel Beyond 20 Years) (ADAMS Accession No. ML13056A516) (recognizing that further studies are needed on the long-term structural integrity and safety of storing and transferring high-burnup fuel).

whether mitigation measures related to emergency preparedness should be in place during the transfer of high-burnup fuel.

Another intensity factor present here is the "degree to which the effects on the quality of the human environment are likely to be highly controversial."[46] Of all of the comments the NRC recently received in response to Entergy's proposed decommissioning plans, at least half were from concerned citizens urging the NRC to maintain the current emergency planning zone. Further, the State and a number of local governments have informed the NRC and Entergy that they oppose elimination of the emergency planning zone.

The intensity factor of "uncertainty" is also present here.[47] The NRC itself has previously concluded in NUREG-1738 that "fuel assembly geometry and rack configuration . . . are subject to *unpredictable* changes after an earthquake or cask drop that drains the pool."[48] Similarly, the U.S. General Accounting Office concluded in August 2012 that "it is difficult to quantify the probability" of a spent fuel pool fire.[49] And as noted earlier, there are a number of potential scenarios in which a spent fuel fire could occur in less than 10 hours, or in which the necessary response could take more than 10 hours. This uncertainty—both over what might cause a nuclear incident (e.g., the use of jet fuel accelerant) and over what collateral

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[46] 40 C.F.R. § 1508.27(b)(4).

[47] 40 C.F.R. § 1508.27(b)(5).

[48] NUREG-1738 at x, 5-2 (emphasis added); *see also* Exhibit 1 at 16 (Leshinskie Declaration at 4).

[49] *See* GAO 12-797 at 27; *see also* Exhibit 1 at 14 (Leshinskie Declaration at 2).

damage to infrastructure might occur at the same time (e.g., in the event of a natural disaster like an earthquake)—warrants further consideration and analysis.

Precedence is another intensity factor here for three reasons.[50] First, the relevant precedent is that Vermont Yankee has had a 10-mile emergency planning zone in place for decades. More analysis is required before the NRC can consider changing the status quo for this plant by eliminating the emergency planning zone. Second, as noted earlier, if Vermont Yankee is exempted, it will effectively become the first site with a relatively-exposed spent fuel pool and no emergency planning zone. Third, because there are no other nuclear power plants in Vermont, Entergy's exemption request means that State and local officials may no longer receive training in the many unique aspects of radiological incidents.[51] The NRC must take this into account in analyzing whether it is reasonable to allow Entergy to rely exclusively on the State's general comprehensive emergency management plan process.[52] To grant Entergy's exemption request in these circumstances would set a new precedent and thus warrants further analysis.

Finally, another intensity factor present here is that the action "is related to other actions with . . . cumulatively significant impacts."[53] For instance, Entergy recently stopped providing State officials with relevant information from its

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[50] 40 C.F.R. § 1508.27(b)(6) (looking at "[t]he degree to which the action may establish a precedent for future actions with significant effects").

[51] *See, e.g.*, Exhibit 1 at 29 (Bornemann Declaration at 8); Exhibit 1 at 37-39 (Irwin Declaration at 5-6).

[52] *Id.*

[53] 40 C.F.R. § 1508.27(b)(7).

Emergency Response Data System. It did so despite opposition from State officials. (The matter is currently on appeal to the Commission.) This is a related action that should be analyzed in conjunction with elimination of the 10-mile emergency planning zone, as both actions hamper the State's ability to respond to a radiological incident.

For these reasons, NEPA requires an environmental impact statement before the NRC can consider granting Entergy's requested exemptions. "This detailed statement insures the integrity of the agency process by forcing it to face those stubborn, difficult to answer objections without ignoring them or sweeping them under the rug" and serves as an "environmental full disclosure law so that the public can weigh a project's benefits against its environmental costs."[54] The procedures of NEPA serve a "vital purpose" that "can be achieved only if the prescribed procedures are faithfully followed."[55] Because the NRC has failed to take the required "hard look" at potential environmental impacts, its environmental assessment and FONSI do not comply with NEPA.

CONCLUSION

For these reasons, publication of the environmental analysis—after the relevant decision has already been made—does not comply with NEPA. Further, even if the NRC had followed the proper procedure here, the environmental assessment and FONSI are substantively deficient. In particular, the agency failed

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[54] *National Audubon Soc.*, 132 F.3d at 12 (citing *Sierra Club v. United States Army Corps of Eng'rs*, 772 F.2d 1043, 1049 (2d. Cir. 1985)).

[55] *Lathan v. Brinegar*, 506 F.2d 677, 693 (9th Cir.1974).

to consider all of the relevant Council factors. Had the NRC taken a "hard look" at "the context and intensity" of its proposal, it would have had to have prepared an environmental impact statement. As noted earlier, even when it is a close call as to whether there is a significant environmental impact from a proposed action, an environmental impact statement should be prepared.[56] This is not even a close call, given the many potential environmental impacts from eliminating an emergency planning zone that has been in place for decades. As the D.C. Circuit has noted, "[s]imple, conclusory statements of 'no impact'"—as the NRC has done here—"are not enough to fulfill an agency's duty under NEPA."[57]

The State respectfully requests that the NRC withdraw its environmental assessment and FONSI, and proceed to preparation of an environmental impact statement that, among other things, addresses the State's Comments and analyzes potential mitigation measures. That is what NEPA requires, and the State looks forward to working with the NRC as this matter goes forward.

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[56] *National Audubon Soc.*, 132 F.3d at 13.

[57] *Found. on Econ. Trends v. Heckler*, 756 F.2d 143, 154 (D.C. Cir. 1985).

Exhibit 1

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of	)	
	)	
ENTERGY NUCLEAR VERMONT YANKEE, LLC AND ENTERGY NUCLEAR OPERATIONS, INC.	)	Docket No. 50-271-LA-2
	)	
	)	February 9, 2015
	)	
(Vermont Yankee Nuclear Power Station)	)	

STATE OF VERMONT'S
PETITION FOR LEAVE TO INTERVENE, AND HEARING REQUEST

I. INTRODUCTION

Pursuant to 10 CFR § 2.309, the State of Vermont ("State"), through the Vermont Department of Public Service, submits the following Petition for Leave to Intervene, and Hearing Request in response to Entergy Nuclear Vermont Yankee, LLC and Entergy Nuclear Operations, Inc.'s (together, "Entergy") license amendment request ("LAR") related to the Vermont Yankee Nuclear Power Station ("VY") Permanently Defueled Emergency Plan and Emergency Action Level Scheme. The State opposes Nuclear Regulatory Commission ("NRC") issuance of the LAR. The State seeks to participate as a party in this proceeding, and it requests that the NRC and/or the Atomic Safety and Licensing Board ("ASLB") hold an evidentiary hearing in order to develop a full evidentiary record for the NRC and/or ASLB to consider when reviewing the LAR.

On June 12, 2014, Entergy filed its LAR seeking to revise the VY site emergency plan ("SEP") and Emergency Action Level ("EAL") scheme to reflect a permanently defueled

condition.[1] The LAR is based on exemptions from certain portions of 10 CFR §§ 50.47(b), 50.47(c)(2), and Part 50, Appendix E, Section IV requested by Entergy, but not yet granted by the NRC.[2] The State filed comments in response to the LAR, outlining its concerns and objections to the proposed license amendments on February 9, 2015.[3]

II. PETITION FOR LEAVE TO INTERVENE

The State meets all standing requirements outlined in 10 CFR § 2.309(d). The State, as represented by the Vermont Department of Public Service, 112 State Street, Montpelier, VT 05620, has a significant interest in the proposed license amendments contained in the LAR presently at issue. The VY station is located within the state of Vermont. As explained in the State's February 9, 2015 Comments and Declarations, and in the contentions below, the LAR, if granted, would significantly hinder the State's ability to coordinate and execute an effective response to an emergency situation at the station. This hindrance poses a safety risk to Vermont

[1] *See* Letter from Christopher Wamser, Entergy Site Vice President, to NRC Document Control Desk, June 12, 2014 (BVY 14-033)(NRC Agencywide Document Access Management System [ADAMS] Accession No. ML14168A302).

[2] *See* Letter from Christopher Wamser, Entergy Site Vice President, to NRC Document Control Desk, March 14, 2014 (BVY 14-009)(NRC ADAMS Accession No. ML14080A141); *Biweekly Notice; Applications and Amendments to Facility Operating Licenses and Combined Licenses Involving No Significant Hazards Considerations*, (79 FR 73109)(December 9, 2014). The December 9, 2014 Federal Register notice notes that "[t]he Commission may issue the license amendment before expiration of the 60-day period provided that its final determination is that the amendment involves no significant hazards consideration." Such issuance of the amendment prior to the expiration of the 60-day period to file a hearing request does not, however, preclude commission review of this request for hearing. The Federal Register makes clear that any hearing will take place after issuance of an amendment should the NRC make a No Significant Hazards Consideration Determination prior to review of this request.

[3] The LAR was noticed in the December 9, 2014 edition of the *Federal Register* (79 FR 73109). The notice requested the submission of public comments on or before January 8, 2015. On January 8, 2015, the NRC issued a 30 day extension of the public comment period to February 9, 2015. *See* Notice from James Kim, Plant Licensing IV-2 and Decommissioning Transition Branch, January 8, 2015 (ADAMS Accession No. ML15008A098).

residents. The State therefore petitions the NRC for leave to intervene as a full party in this proceeding.[4]

III. REQUEST FOR HEARING

The State requests that a hearing be held to develop a full evidentiary record related to the contentions stated below and any later amendments to the contentions pursuant to 10 CFR § 2.309. It also requests that the State be granted the opportunity to engage in limited discovery to aid in the development of the evidentiary record, either as a matter of right in the event that the ASLB and/or NRC grants a hearing pursuant to 10 CFR Part 2, Subpart G, or, alternatively, at the discretion of the ASLB and/or NRC under Subpart L.

CONTENTION ONE

Entergy's license amendment request is not ready for review, as the amendment request is predicated upon and assumes approval of an exemption request that has not been ruled upon by the Nuclear Regulatory Commission and/or Atomic Safety and Licensing Board.

BASES

Entergy's instant LAR is not ready for review by the NRC and/or the ASLB. Entergy readily concedes in the LAR that "[t]he proposed PDEP and Permanently Defueled EAL scheme are predicated on approval of requests for exemption from portions of 10 CFR 50.47(b), 10 CFR 50.47(c)(2) and 10 CFR Part 50, Appendix E, Section IV, previously submitted."[5] The requested exemptions would remove the planning, notice and protective action requirements in the event of

[4] *See In the Matter of Entergy Nuclear Vermont Yankee, LLC, and Entergy Nuclear Operations, Inc.* Docket No. 50-271-LA, Memorandum and Order (Ruling on Request for Hearing and Petition to Intervene)(January 28, 2015) at 7 ("Vermont has standing because Vermont Yankee is "located within the boundaries of the State" and, accordingly, 'no further demonstration of standing is required.'").

[5] BVY14-033 at 2.

an emergency,[6] reduce the emergency planning zone to the footprint of the plant,[7] eliminate hostile action scenario planning,[8] and eliminate State participation in emergency response exercises.[9] The LAR seeks approval of a Permanently Defueled Emergency Plan and Permanently Defueled Emergency Action Level scheme that would reduce the scope of emergency planning at the VY site, and increase notification time of an emergency declaration to the State from 15 minutes to 60.[10]

The LAR, as presented, assumes actions by the NRC that have not yet occurred, and, more importantly, may never occur in the future. Approval of the LAR without NRC review of the predicate exemptions request – which would allow the State to comment on that request and request a hearing – is inappropriate, both as a matter of law and public policy. The exemptions request and the LAR effectively constitute a complete request by Entergy for changes to its approach to emergency planning and response. The two filings cannot be reviewed separately as they are dependent on one another. However, the State has not been afforded an opportunity to respond in a meaningful way to the exemptions request.

In addition, the NRC has options at its disposal beyond simple approval or denial the requested exemptions. It could, for example, impose conditions for approval. Neither the State nor the NRC is able to evaluate the full extent to which the proposed license amendment will or will not meet NRC safety and environmental requirements until the final decision on the

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[6] BVY 14-009, Attach. 1 at 4-7, addressing changes to 10 CFR § 50.47(b); 11, addressing changes to Part 50, App. E.IV; 16, addressing changes to Part 50 App. E.IV.A; 19-22, addressing changes to E.IV.D; 25-28, addressing changes to Part 50, App. E.IV.E.

[7] *Id.* at 8, addressing changes to 10 CFR § 50.47(c)(2).

[8] *Id.* at 10, addressing changes to 10 CFR 50, App. E IV.1; 15, addressing changes to Part 50, App. E.IV.A; 17, addressing changes to Part 50 App. E.IV.B; 26, addressing changes to Part 50, App. E. IV.E.

[9] *Id.* at 33-36, addressing changes to Part 50, App. E.IV.F.

[10] BVY 14-033 at 2; App. 1 at 4; App 2 at 35.

exemption requests is made. The State is materially and unfairly disadvantaged when it is forced, as it is here, to challenge the LAR when the exact terms of the request are not known.

This issue is within the scope of the proceeding. NRC approval of exemptions request serves as the foundation on which the LAR is built. In this instance, Entergy seeks approval of the LAR prior to the necessary foundation being laid. Unless and until the State is given an opportunity to at least comment on the exemptions request and the NRC makes a ruling on the same, the issue of whether the NRC and/or ASLB is in an appropriate position to even review the LAR is within the scope of this proceeding. Likewise, this issue is material to core findings that the NRC must make – namely that the predicate exemptions are approved – to support the changes Entergy seeks in the LAR. The ASLB and/or NRC should, at a minimum, hold this proceeding and the deadline for filing contentions and a hearing request in abeyance until at least 30 days after NRC has taken final action on Entergy's exemptions request. The NRC should likewise provide a meaningful opportunity for the State to provide comments and request a hearing with respect to the exemptions request.

SUPPORTING EVIDENCE

This issue poses a genuine dispute between Entergy and the State with respect to the appropriateness of LAR review now. A significant portion of the State's February 9, 2015 LAR Comments and Declarations speak to significant concerns it has with the LAR that flow from the underlying exemptions request, and are incorporated into this Petition by reference.[11] The Comments and Declarations detail the deficiencies and problems of the requested exemptions,

[11] See Vermont Department of Public Service LAR Comments and Declarations (February 9, 2015), attached as Attachment A; Vermont Division of Emergency Management LAR Comments and Declarations (February 9, 2015), attached as Attachment B; and Vermont Department of Health LAR Comments and Declarations (February 9, 2015), attached as Attachment C.

and illustrate the interaction between the LAR and the exemptions request. This interaction, as detailed by the Declarations, cuts to the core of the findings the ASLB and/or NRC must make in reviewing the LAR here. As discussed below, the State disputes Entergy's claim that the proposed PDEP and Permanently Defueled EAL scheme continues to "preserve the . . . effectiveness of the emergency plan," particularly when evaluated in conjunction with the requested exemptions.[12]

CONTENTION TWO

Entergy's license amendment request, if approved along with the predicate requested exemptions, fails to account for all credible emergency scenarios, undermines the effectiveness of the site emergency plan and off-site emergency planning, and poses an increased risk to the health and safety of Vermont citizens in violation of NRC regulatory requirements 10 CFR § 50.54(q)(4) and Appendix E to Part 50.

BASES

The LAR, if approved in conjunction with Entergy's requested exemptions, would increase the threat to public health and safety in the event of a credible accident scenario at the VY plant. First, the requested exemptions outlined above would eliminate Entergy's obligations to keep the State emergency response organizations and the general public informed in the event of an emergency.[13] The exemptions would further reduce the State's ability to adequately and effectively respond to an emergency by discontinuing the federal requirement for support to State planning and monitoring activities, placing the health and safety of Vermont citizens in jeopardy in the event of a plant emergency. The exemptions would hamper the State's ability to

[12] BVY-033 at 2.

[13] BVY 14-009, Attach. 1 at 19-22, addressing changes to Part 50, App. E.IV.D.

implement the Vermont Radiological Emergency Response Program, and any additional off-site response to an emergency.[14]

The exemptions request effectively treats the VY plant, with radioactive material stored in a spent fuel pool, as if it were a dry cask independent spent fuel storage installation ("ISFSI") and/or monitored retrievable storage ("MRS") facility, which is clearly not the case now or for the next several years. Entergy's exemptions request does not even contain implementing procedures, preventing the State from understanding what changes it would need to make to its emergency response protocols if the exemptions and LAR are approved. The State would be unable to effectively execute its own Radiological Emergency Response Plan in harmony with the VY Emergency Plan without such implementing procedures in the event of an emergency at the plant. In sum, the requested exemptions would eliminate substantial emergency plan requirements contained in 10 CFR Part 50, Appendix E, which in turn would necessarily reduce the effectiveness of any VY emergency plan going forward, including the PDEP and EAL schemes proposed in the instant LAR. The requested exemptions would significantly reduce, if not eliminate, notification procedures currently required by 10 CFR Part 50, Appendix E. For instance, the exemptions request proposes that the procedures requiring notification and interaction with State and local agencies be eliminated almost in their entirety, based on the erroneous assumption that the VY station (in its present state with spent fuel in the cooling pool) be viewed as an ISFSI and/or MRS facility. This would result in no effective means for Entergy to communicate critical information to the State in the event of an emergency, as required by Part 50, Appendix E.[15]

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[14] *See* DEMHS LAR Comments and Declarations at 1-3, 5-9; and VDH LAR Comments and Declarations at 5-7.

[15] *See* BVY 14-009, Attach. 1 at 19-22, addressing changes to Part 50, App. E.IV.D.

Second, the LAR fails to adequately analyze a number of credible scenarios whereby public health and safety may be put at risk. The LAR does not provide analysis of multiple credible Beyond Design Basis scenarios that continue to pose a health risk while fuel rods remain in the VY spent fuel cooling pool. The exemptions request, if granted, would eliminate the federal requirement that Entergy take responsibility for planning a response to a spent fuel pool emergency that may last more than 10 hours.[16] This problem would be compounded by the lack of clear notification procedures to the State otherwise required by Part 50, Appendix E. Likewise, Entergy has relied upon stale NRC guidance issued prior to the September 11, 2001 attacks in developing the PDEP / EAL scheme that does not consider post-9/11 security concerns. The PDEP /EAL scheme should address all safety concerns present in today's threat environment. The LAR fails to do so. The LAR also fails to address heightened safety concerns at Vermont Yankee due to the existence of high-burnup fuel at the site, even though the NRC has recognized that the use of high-burnup fuel causes special problems, including a greater chance of accidents and an increased chance of structural failure of the fuel rods such that transfer to dry casks is more difficult, more dangerous, and more expensive.[17]

When viewed together, the exemptions request and LAR create a circular logic that results in a clear reduction in emergency plan effectiveness that cannot meet the requirements of 10 CFR § 50.54(q)(4) and companion Part 50, Appendix E emergency plan requirements. Entergy has filed the LAR pursuant to § 50.54(q)(4), which requires a request to change an emergency plan that would reduce the effectiveness of the plan to include "the basis for concluding that the licensee's emergency plan, as revised, will continue to meet the requirements

[16] *See*, for instance, DPS LAR Comments and Declarations at 1-2, addressing the possibility of fuel pool accident scenarios involving accelerants.

[17] *See* DPS LAR Comments and Declarations at 3.

in appendix E to this part." The exemptions request seeks to strike significant portions of 50 App. E.IV.B and D related to actions outside the plant boundary and emergency notification to state and local response organizations. The LAR meets the requirements of § 50.54(q)(4) only in the event Entergy is exempted from material requirements of Part 50, Appendix E. Section 50.54(q)(4), however, mandates that all Appendix E requirements are met. The LAR therefore fails to satisfy § 50.54(q)(4).

The contention is within the scope of this proceeding. The LAR must show that it conforms to the requirements of Part 50, Appendix E given that Entergy readily admits its request would reduce the effectiveness of the VY emergency plan. On its face, the LAR does not meet all the Appendix E requirements as mandated by § 50.54(q)(4). Furthermore, the contention is material to the finding the NRC must make that the LAR satisfies all requirements of § 50.54(q)(4) and Appendix E of Part 50. The State has submitted comments from experts in its Division of Emergency Management and Homeland Security, the Department of Health, and the Department of Public Service, all of which raise concerns about the LAR and companion exemptions request's adverse impact on the State's ability to execute monitoring and emergency response programs in the event of an emergency. The exemptions and LAR fail to adequately analyze credible Beyond Design Basis scenarios while spent fuel is present in the VY cooling pool, eliminate critical State notification, monitoring and planning activities, and fail to adopt dose radiation monitoring standards that would best protect public health and safety, as spelled out in the State's Comments and Declarations.[18]

[18] *See* DPS LAR Comments and Declarations at 1-2; DEMHS Comments and Declarations at 1-2, 5, 7-9; VDH Comments and Declarations at 3-9/

SUPPORTING EVIDENCE

A genuine dispute exists between the State and Entergy with respect to whether the LAR meets all Part 50, Appendix E requirements aimed at ensuring protection of the public health and safety of Vermont citizens. The State has submitted extensive evidence in the form of Declarations sponsored by experts in their respective fields. The details spelled out in the Declarations strongly support the bases by which this contention is set forth, and are incorporated into this Petition by reference. The LAR provides insufficient analysis of credible Beyond Design Basis emergency scenarios and is based on inadequate NRC guidance. The requested exemptions fail to meet the requirements of 10 CFR § 50.54(q)(4) and companion Appendix E to Part 50 by eliminating the federal requirement for notification protocols, and planning and monitoring resources to the State required to ensure public health and safety.

IV. CONCLUSION

Based on the foregoing the State of Vermont, through the Vermont Department of Public Service, respectfully requests the U.S. Nuclear Regulatory Commission and/or Atomic Safety and Licensing Board to grant its request for intervention, admit the State's two contentions offered above, and hold a hearing on Entergy's LAR related to the VY Permanently Defueled Emergency Plan and Emergency Action Level Scheme with the opportunity for the State to engage in discovery to develop a full evidentiary record for review when considering the LAR and associated exemptions request.

Dated at Montpelier, Vermont this 9th of February, 2015

Respectfully submitted,

/s/ Christopher Recchia

Christopher Recchia
Commissioner
Vermont Department of Public Service
112 State Street
Montpelier, VT 05620
(802) 828-2811

COMMENTS AND DECLARATIONS OF THE VERMONT DEPARTMENT OF PUBLIC SERVICE REGARDING VERMONT YANKEE PERMANENTLY DEFUELED EMERGENCY PLAN AND EMERGENCY ACTION LEVEL SCHEME LICENSE AMENDMENT REQUEST BVY 14-033

February 9, 2015

The Vermont Department of Public Service (Department or DPS), by and through Anthony Leshinskie, Vermont State Nuclear Engineer and Decommissioning Coordinator, (curriculum vitae attached) submits the following comments and declarations with respect to the license amendment request filed by Entergy Nuclear Operations, Inc. (Entergy) regarding the Vermont Yankee Permanently Defueled Emergency Plan and Emergency Action Level Scheme on June 12, 2014. *See Letter from Chris Wamser, Entergy Site Vice President, to NRC Document Control Desk*, June 12, 2014 (BVY 14-033) (NRC Agencywide Document Access Management System [ADAMS] Accession No. ML14168A302).

The License Amendment Request (LAR) generally raises significant concerns to the Department, both because of the flawed assumptions used by Entergy in assessing threat scenarios, and because of Entergy's reliance on outdated NRC guidance as support for the LAR.

The representations made by Entergy in the LAR do not contemplate the full scope of possible threat scenarios impacted by the proposed license amendments. Analysis of certain credible Beyond Design Basis events is not properly presented, preventing the Department (and the NRC) from adequately evaluating the impact of the proposed license amendments.

For example, the LAR fails to analyze Potential Hostile Actions such as aircraft assault. Entergy states throughout the Permanently Defueled Emergency Plan (PDEP) / Emergency Action Level (EAL) scheme filing that the remaining Design Basis Accidents and credible Beyond Design Basis events will progress slowly. This assertion is used to justify extending the required emergency level notification time from 15 to 60 minutes, and in part to justify the

elimination of Site Area Emergency and General Emergency EALs currently used in Vermont Yankee Emergency Planning. The PDEP and its EALs rely on a definition of Hostile Action described in NEI-99, Rev. 6 Sections 3.1.3 & 3.1.4. Potential Hostile Actions include aircraft assault, which—based on the discussion in the PDEP—can occur with little or no advanced warning. The lack of advanced warning for this type of Hostile Action contradicts the slow progression assumption.

Additionally, the Fuel Assembly Heat Up / Zirconium Fire probability event discussed in the PDEP / EAL scheme (but submitted as part of a separate License Exemption Request, *see Entergy Request for Exemptions from Portions of 10 CFR 50.47 and 10 CFR 50, Appendix E*, March 14, 2014 (BVY 14-009) (ADAMS Accession No. ML14080A141)) lacks adequate analysis. It ignores the conclusion of the U.S. General Accounting Office in August 2012 that "it is difficult to quantify the probability" of a spent fuel pool fire. *See* GAO 12-797 at 27. While it attempts to work around the conclusion by assuming that a fire will occur once a 900 °C fuel temperature is reached, there is no NRC defined criteria to determine whether this is an acceptable evaluation method. It also does not discuss the possibility of chemical accelerants being used to reduce the time to reach the 900°C fuel temperature defined as the onset of a Zirconium Fire, even though such an accelerant was considered in a recent Vermont Yankee Hostile Action Emergency Drill. One potential accelerant would be jet fuel from an aircraft intentionally crashed into the spent fuel pool (which could conceivably fuel a fire regardless of the water level in the Spent Fuel Pool) causing a fuel assembly fire well before the 10 hour "heat-up time" determined by the Zirconium Fire analysis. The possibility of a much more rapid heat-up time contradicts the slow progression assumption of the PDEP / EAL scheme, and could require an EAL beyond Alert to properly address.

The Department also has significant concerns about the quality of the NRC guidance Entergy used in developing the PDEP / EAL scheme. A significant portion of the guidance used to develop the PDEP / EAL scheme is derived from plant decommissioning information that the NRC has compiled in SECY-00-145, well before the September 11, 2001 attacks. By the NRC's own admission, the SECY-00-145 guidance has not been updated since then because plant security concerns raised by the September 11, 2001 attacks were given higher priority. As such, the SECY-00-145 guidance has not been reevaluated while considering post-9/11 plant security concerns. The Department believes that, once the SECY-00-145 guidance has been considered, ideas such as reducing the Emergency Planning Zone (EPZ) to the Vermont Yankee fence line and relying on "ad hoc" offsite emergency planning (rather than continued offsite radiological emergency planning support) will be found to be imprudent and unwarranted.

The LAR is also deficient because it fails to properly analyze the risks of an accident while transferring fuel from the spent fuel pool to dry casks. This risk is heightened at Vermont Yankee because of the existence of high-burnup fuel at the site. The NRC has recognized that the use of high-burnup fuel causes special problems, including a greater chance of accidents and an increased chance of structural failure of the fuel rods such that transfer to dry casks is more difficult, more dangerous, and more expensive. *See* NUREG-1738 at ix, 3-1; *see also, e.g.*, National Research Council, Board on Radioactive Waste Management, Committee on the Safety and Security of Commercial Spent Nuclear Fuel Storage, National Academies Press (2006) at 101, *available at* http://www.nap.edu/openbook.php?record_id=11263&page=101 (noting that high-burnup fuel "results in an increase in the decay-heat power of the spent fuel assembly by the time it is put into the spent fuel pool"); R. Alvarez, *The Storage and Disposal Challenges of High Burnup Spent Power Reactor Fuel* (Jan. 3, 2014) at 9-11 (noting that new evidence shows

that when high-burnup fuels are placed in the spent fuel pools at certain reactors, it can create special problems that interfere with Spent Fuel Pool systems integrity); NRC Division of Spent Fuel Storage and Transportation Interim Staff Guidance-24, Revision 0 (Issue: The Use of a Demonstration Program as Confirmation of Integrity for Continued Storage of High Burnup Fuel Beyond 20 Years) (ADAMS Accession No. ML13056A516) (recognizing that further studies are needed on the long-term structural integrity and safety of storing and transferring high-burnup fuel).

In addition:

Section 5.1.2: The Fuel Assembly Heat Up / Zirconium Fire event discussed as part of the PDEP / EAL scheme has been submitted as part of a separate License Exemption Request (BVY 14-009), but that exemption has not been granted or even noticed for public comment yet. Further, Entergy's zirconium fire analysis ignores the NRC's conclusion in NUREG-1738 that "fuel assembly geometry and rack configuration . . . are subject to *unpredictable* changes after an earthquake or cask drop that drains the pool." NUREG-1738 at x, 5-2 (emphasis added).

Section 5.1.3.1: Additional information supporting the discussion of the Loss of Spent Fuel Pool Cooling event is required, but the submittal does not provide a reference supporting the stated results. Please indicate where the analysis supporting the stated results can be found.

Section 5.5.3: While it is stated that Entergy will discuss the implementation of the PDEP / EAL scheme with Vermont State and Local officials subsequent to NRC approval, such discussions should occur prior to NRC approval to allow for modification of Entergy's action prior to regulatory approval.

Section 6.2: The cited examples of decommissioning plants extending their required emergency level notification time from 15 to 60 minutes were all granted prior to the September

11, 2001 attacks. Once post-9/11 plant security concerns are considered, the Department believes that permitting this increase in emergency level notification time will be found to be imprudent and unwarranted.

Section 6.3: The Department disagrees with the conclusion that no reduction in safety margin would occur with the implementation of the proposed PDEP / EAL scheme. Elimination of the Site Area Emergency and General Emergency EALs indicates that significant changes in plant operations during emergency conditions will occur, which bears on safety.

Attachment 1, Sections 3.3 & 7.7: These sections discuss notifying the NRC of Emergency Conditions via a system called the Emergency Notification System (ENS). Under the terms of the Site Access MOU between Entergy and DPS, Entergy is required to send the Department Designee all notifications made to the NRC. The LAR should reflect this arrangement.

Attachment 1, Section 6.1: This section notes that the safety of on-site Vermont Yankee staff during an on-going security event or Hostile Action could result in the suspension of Emergency Response Organization activation. The Emergency Operation Facility (EOF) in the proposed PDEP / EAL scheme is the on-site Vermont Yankee Control Room. In the current emergency plan, the EOF is located off-site. The LAR contains no assurances that EOF activation will be restored in sufficient time for the Emergency Response Organization to respond within the emergency response times discussed throughout the proposed PDEP / EAL scheme. The Department believes that Entergy should include an alternate, off-site EOF, such as the current Vermont Yankee EOF, in the proposed PDEP / EAL scheme.

Attachment 1, Section 7.0: The proposed PDEP / EAL scheme makes no mention of the Entergy / State of Vermont communication channel via the DPS Designee (typically the State

Nuclear Engineer) that exists during emergency conditions. This communication means should be described as part of the proposed PDEP / EAL scheme.

Attachment 1, Section 9.9.2: The noted evacuation of on-site plant contractors during an Alert condition could impede the DPS Designee (typically the State Nuclear Engineer) from reaching the EOF (the Vermont Yankee Control Room) in the proposed PDEP / EAL scheme. Measures to mitigate this potential impediment should be made either in the PDEP / EAL scheme or in a related implementation procedure.

Conclusion

Based on these and other reasons, the LAR lacks the requisite analysis and supporting evidence and should be denied. The Department respectfully recommends that the NRC conduct a thorough examination of the LAR's impacts on a full range of Beyond Design Basis events, as well as the PDEP / EAL scheme assumptions in the post-9/11 world.

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EXPERIENCE

STATE OF VERMONT, PUBLIC SERVICE DEPARTMENT — **MONTPELIER & VERNON, VT**

STATE NUCLEAR ENGINEER & DECOMMISSIONING COORDINATOR, June 2014 to Present

- Monitor the Vermont Yankee Nuclear Power Station's compliance with relevant federal and state regulations on behalf of the State of Vermont (and the general public residing within a 10-mile radius of the plant).
- Provide technical information on Nuclear Power and its regulation to the Vermont Public Service Board, Public Service Department, relevant additional State Agencies and the general public.
- Recommend modifications to State of Vermont Emergency Planning and Environmental Monitoring programs in response to Vermont Yankee's ongoing decommissioning.
- Provide technical information and administrative support for the Vermont Nuclear Decommissioning Citizens Advisory Panel (NDCAP).
- Evaluate Vermont Yankee Reactor License Amendment and Exemption Requests for impact on Vermont's Radiological Emergency Response Plan and their likely impact on the general public.
- Represent Vermont at Regional & National conferences on Reactor Decommissioning, Radiological Emergency Planning and Radiological Waste Transportation.

WESTINGHOUSE ELECTRIC COMPANY, LLC — **WINDSOR, CT**
(Previously known as ABB Combustion Engineering, Inc.)

SENIOR ENGINEER, Transients and Design Analysis Department (and its predecessors) [1985 through 2013]

Design Safety Analysis & Regulatory Compliance Activities:

- As part of Original Equipment Manufacturer (Combustion Engineering / ABB / Westinghouse) organization, supported commercial power plant operations, nuclear fuel reloads and major equipment upgrades by delivering systems simulation products (FSAR Chapters 14/15, 10 & 7 support) and related regulatory documentation on over 150 projects.
- Demonstrated compliance with ASME Pressure Vessel Code (Sections III & XI) and NRC Departure from Nucleate Boiling Ratio / Core Melt / Radiological Dose criteria for Combustion Engineering (CE) and Westinghouse-designed nuclear power plants using heat transfer, thermal-hydraulic and balance-of-plant computer simulations and engineering judgment.
- Developed, maintained and verified system simulation code databases and plant equipment controller models for CE and Westinghouse AP1000-design plants (CENTS / CESEC-III / RETRAN-2W / LOFTRAN finite element analysis codes similar to RELAP).

- Resolved over 100 equipment aging, plant start-up and plant operating issues through evaluations, instrumentation setting changes, operating procedure modifications and additional oral / written customer support; incorporating results into modification packages for nuclear power plants (e.g., 10 CFR 50.59 screenings and reports, reactor license amendments, Safety Analysis Reports, plant Technical Specifications / Operating Procedures changes, responses to NRC RAIs), often on short schedules.
- Prepared and presented technology transfer training material (including step-by-step procedures) on over 20 selected Safety Analysis and Quality Assurance subjects for CE-fleet customers (Entergy, Palo Verde, San Onofre and Korea Nuclear Fuels Corp.) and Westinghouse internal use.
- As safety analysis task leader, provided technical direction to a team of 3 to 5 engineers on 7 nuclear refueling projects.
- As Safety Analysis Subject Matter Expert for San Onofre Units 2&3 (2002-2013) and Waterford Unit 3 (2007-2013) delivered analysis, regulatory documentation and training products on over 30 major projects and over 200 design basis evaluations.
- As AP1000 Equipment Licensing Basis compliance team member (October 2012 to February 2013), confirmed that Chemical Volume Control System and Automated Depressurization System component requirements included in the AP1000 DCD Rev. 19 complied with internal component specifications (10 CFR 52 compliance).
- As HERMITE reactor core simulator Subject Matter Expert (a CE-fleet neutron diffusion model with several transient analysis options) addressed reduced coolant flow, power distortion and core design concerns for over 12 years.
- As Program Engineer for STRIKIN-II reactor core simulator (a multi-node heat transfer and coolant flow channel simulator with thermal-hydraulic and critical heat flux correlation modeling options), addressed program functionality questions for over 7 years.
- Addressed fuel pellet strain, clad strain and clad burst criteria on 4 different Westinghouse fuel products using STRIKIN-II code.
- As departmental point of contact for Thermal Conductivity Degradation concerns (a high Burn-Up Fuel issue) in Westinghouse Fuel Performance Analysis methods, demonstrated CE-design PWRs' compliance with new NRC requirements (August 2011 to June 2012).
- Revised event analysis requirements to address Thermal Conductivity Degradation in Westinghouse Fuel Performance and Fuel Pellet Strain Analysis methods (August 2012 to February 2013).
- Designed, Tested, Validated and Verified computer software and base deck data for the Core Protection Calculator System (a digital reactor shutdown system featuring dynamic compensation filters and direct calculation of engineering quantities significant to reactor safety) at CE-design PWRs (Arkansas Unit 2, Waterford Unit 3, Palo Verde, San Onofre, and 8 Korean plants).
- Evaluated digital instrumentation system responses to design events, assuring safe plant operation on over 90 nuclear fuel reloads.
- Additional project experience in reactor core design evaluation, fuel performance assessments and radiological dose calculations (including NRC Reg. Guide 1.183 and 1.195 standards).

Quality Assurance & Business Development Activities:

- Annually identified and implemented 1 to 3 "rapid response" project proposals based on customer concerns, providing a gross income of $50,000 to $120,000 per project for the previous 5 years.
- Routinely interfaced with multiple engineering departments and customers, assuring error-free product delivery on-time and within budget, on over 90 projects.
- As Departmental Coordinator for Engineering Impact & Evaluation (EIES) process, delivered evaluations, corrective action recommendations and new proposal estimates for over 6 years (process governed by 10 CFR 21 and 10 CFR 50.59).
- As Westinghouse-Certified Apparent Cause Investigator, delivered corrective action and quality procedure improvement recommendations for over 8 years.
- As Quality Assurance Lead on the initial CENTS model for AP1000 design; verified that information from design specifications and associated diagrams / drawings was correctly incorporated into database and controller parameters.
- Conducted major revisions to 5 different departmental quality procedures (safety analysis standards) within 3 year period, employing human performance tools to address analysis error patterns identified via corrective action programs; with one procedure becoming a company-wide standard.
- Departmental point-of-contact for 10 quality assurance audits (3 NUPIC, 2 ISO 9001 / Lloyd's Registry, 5 internal) in which no significant deficiencies were identified.
- Assessed new company-wide quality procedures for inclusion in departmental quality requirements (2011 to 2013).
- Development team member on a major (1-year effort) Quality Assurance Procedure Manual (QAPM-101) revision implemented throughout ABB Combustion Engineering's Nuclear Fuels division.

EDUCATION

THE PENNSYLVANIA STATE UNIVERSITY — **UNIVERSITY PARK, PA**

- Awarded Bachelor of Science Degree in Nuclear Engineering, May 1984.
- Earned eighteen credits beyond Bachelor's Degree requirements while working as Research Assistant.
- As Research Assistant, developed computer control / data collection software on an experimental reactor water level gauge system; Operated experimental system during 4 loss of coolant accident tests at Idaho National Laboratory (Loss of Fluid Test facility).

VOLUNTEER CAUSES & ORGANIZATIONS

SOCIETY FOR CREATIVE ANACHRONISM, Northern & Eastern Connecticut Chapter
(aka the Barony Beyond the Mountain chapter), [2003 through Present]

- Volunteer in 1 public relations and 2 managerial positions within a 100+ member local chapter of an international, non-profit educational organization re-enacting the Medieval & Renaissance periods of European history.
- Coordinate public demonstrations of local chapter activities that present arts, sciences and aspects of daily life from the Middle Ages & early Renaissance (including day-long demonstrations at the 2013 & 2014 Eastern States Exhibition, i.e. TheBigE.com).

MANCHESTER COMMUNITY COLLEGE — **MANCHESTER, CT**

ADJUNCT FACULTY in Continuing Education Program

- Beginner and intermediate ethnic dance class instructor since June 2001
- Medieval history class instructor since April 2010.

COMMENTS AND DECLARATIONS OF THE VERMONT DIVISION OF EMERGENCY MANAGEMENT AND HOMELAND SECURITY ON BVY 14-033 VERMONT YANKEE PERMANENTLY DEFUELED EMERGENCY PLAN AND EMERGENCY ACTION LEVEL SCHEME

February 9, 2015

INTRODUCTION

The Vermont Division of Emergency Management and Homeland Security, by and through Erica Bornemann, Chief of Staff, (curriculum vitae attached) submits the following comments and declarations with respect to the license amendment request filed by Entergy Nuclear Operations, Inc. (Entergy) regarding the Vermont Yankee Permanently Defueled Emergency Plan and Emergency Action Level Scheme on June 12, 2014. *See Letter from Chris Wamser, Entergy Site Vice President, to NRC Document Control Desk*, June 12, 2014 (BVY 14-033) (NRC Agencywide Document Access Management System [ADAMS] Accession No. ML14168A302).

The Vermont Yankee Permanently Defueled Emergency Plan (VY PDEP) and Emergency Action Level Scheme (EAL) proposed in Entergy's license amendment request presents a number of concerns for the State of Vermont (the State) regarding the status of off-site emergency preparedness if the Vermont Yankee Nuclear Power Station (VY) receives exemption from portions of 10 CFR § 50.47(b), 10 CFR § 50.47(c)(2) and 10 CFR § 50, Appendix E. Through the requested exemptions, VY seeks to alter the emergency planning requirements imposed by its license and subsequently revise the current VY Emergency Plan after the plant enters an anticipated permanently defueled condition. If those license exemptions are granted, Entergy intends to essentially cease its off-site emergency preparedness and response functions beyond the statutorily mandated all-hazards approach required of each Vermont town today. If

the requested exemptions are granted, the license would no longer require the licensee to support activities such as planning, exercises, and training even though the proposed plan continues to rely upon supplemental emergency response organizations and agencies for incidents on-site.

Under the proposed exemptions, Entergy also intends to significantly reduce the number of personnel in the Emergency Response Organization which has historically been tasked with managing a declared incident on-site. Entergy intends to make these reductions even while nuclear fuel remains in the Spent Fuel Pool (SFP) before being moved to Dry Cask Storage. The licensee has proposed to be given a series of exemptions to a relatively robust set of safety measures for which there is not a comparable substitute commensurate with the hazards presented until the fuel is housed in dry casks.

The State continues to bear a large responsibility for response to a Vermont Yankee incident (industrial or radiological). Although the spectrum of possible incidents is reduced, there are still significant risks posed by the plant that require planning and preparedness. Off-site response organizations (ORO) and government entities cannot just dismiss hazards such as those posed by Vermont Yankee in its permanently defueled status.

Vermont law identifies the Division of Emergency Management and Homeland Security (DEMHS) as the delegated lead entity to coordinate all emergency management functions within the State. As such, DEMHS is responsible for maintaining a robust set of preparedness standards for local jurisdictions, public and private sector partners, and governmental partners to uphold. DEMHS is also the steward of the State Emergency Operations Center (SEOC) which coordinates all state level response to incidents such as those which could potentially occur at Vermont Yankee at any time. The Radiological Emergency Response Program (RERP) is housed in DEMHS and includes the state- and local-level plans to respond to an incident at VY.

Licensee funding for the RERP program supports Emergency Management Directors (EMD) and their staff in the six Emergency Planning Zone (EPZ) towns to train and exercise on a regular basis in order to sustain their level of readiness. It supports agencies such as the Department of Health (VDH) and the Division of Fire Safety (DFS) to train Radiological Plume Tracking and Radiological Sampling Teams. The funding also supports the equipment and training needs of fire, rescue, and law enforcement organizations in the EPZ specific to the hazards presented at Vermont Yankee. Regular training and exercises, as well as the periodic planning meetings, ensures that local and state personnel have solid relationships ahead of catastrophic events that stress systems beyond their capabilities. The State has historically followed the robust set of standards in the Federal Emergency Management Agency (FEMA) Radiological Emergency Preparedness (REP) Program Manual to ensure the public safety of the citizens who live outside of plant boundaries through the evaluation of exercises and the maintenance of plans, facilities and equipment.

THE VY PDEP PROPOSES INSUFFICIENT STANDARDS FOR THE FACILITY WHILE SPENT FUEL REMAINS IN THE FUEL POOL

Title 10 of the Code of Federal Regulations (CFR) outlines the regulations nuclear power plants are required to follow to ensure "there is reasonable assurance that adequate protective measures can and will be taken in the event of a radiological emergency." 10 CFR. §§ 50.47(a)(1)(i) in 10 CFR § 50.47 and 10 CFR § 50 Appendix E. If a licensee is exempted from the applicable portions of these regulations, its license no longer imposes needed standards until the license is amended once more and the site is classified as an Independent Spent Fuel Installation (ISFSI) and required to adhere to 10 CFR § 72.32. The set of regulations in 10 CFR § 72.32 specifically pertain to ISFSIs or Monitored Retrieval Storage (MRS) and as such are not

written to support the inherently different hazards presented while fuel is stored in a spent fuel pool and not in dry cask storage. While the spent fuel remains in pool storage, the facility poses a higher risk than an ISFSI. The standards applied at VY should reflect and respond to the circumstances at the site.

VY VDEP SUBMISSION IS INCOMPLETE

10 CFR § 72.32 requires licensee emergency plans to "promptly notify offsite response organizations and request offsite assistance, including medical assistance for the treatment of contaminated injured onsite workers when appropriate." 10 C.F.R. § 72.32(a)(8). The proposed VY PDEP refers to the need for supplemental assistance in several places including the following:

> Arrangements have been made for the extension of the ERO's capability to address emergencies. The following arrangements are in place through letters of agreement for ambulance services, treatment of contaminated and injured patients, fire support services, and law enforcement response as requested by the station:
>
> 1. Transportation of injured personnel using an ambulance service;
>
> 2. Treatment of radioactively contaminated and injured personnel at a local support hospital (Brattleboro Memorial) as specified in the local support hospital plans; and
>
> 3. Fire support services by the Vernon and Brattleboro Fire Departments and the Tri-State and Southwestern Fire Mutual Aid Networks.
>
> 4. Law enforcement support services provided by local, county, state, and federal law enforcement authorities as appropriate and response capabilities are documented in the letters of agreement maintained by Security.

> Evidence of agreements with participating local services is addressed in Appendix E; the Vermont Yankee Fire Protection Program; and the Annual Law Enforcement Letters of Agreement (Safeguards Information) maintained by Security.

LAR, Attachment 2, *Vermont Yankee Nuclear Power Station Permanently Defueled Emergency Plan*, Rev. 0, at 21

The agreements referred to in this section of the plan were not included in the submission. Rather the reader is directed to the Vermont Yankee Emergency Preparedness Department where the documents are said to be on file. LAR, Attachment 2 at 50. Among those agreements said to be on file is one with the State of Vermont. The current agreement Vermont Yankee maintains with the State pertains to Emergency Plan activation under the current regulatory guidelines and outlines response based on the current Emergency Response Organization structure. Before the State could adequately prepare for the implementation of the proposed VY PDEP, the agreement would need to be updated and reflect the conditions as they will exist if the VY PDEP is applicable. Without this piece of documentation in place, the VY PDEP does not comply with 10 CFR § 72.32.

Appendix E of the VY PDEP submission references an Index of Emergency Plan Implementing Procedures and Support Plans, yet none of these pieces of documentation is available for review. Implementing Procedures are meant to provide depth and detail not contained in the main plan. Without the Implementing Procedures and Support Plans, the proposed VY PDEP does not adequately describe how the Emergency Response Organization will respond to an emergency. Without this level of depth it is impossible for those agencies and governmental entities identified to provide supplemental support to the licensee to understand how and when that support will be needed. In these circumstances, the NRC should not approve the exemptions since it cannot find that no significant hazards consideration is needed.

THE VY PDEP FAILS TO ADEQUATELY EVALUATE AND SUPPORT OFF-SITE RESPONSE RESOURCES

Exercises are a cornerstone of the Federal Emergency Management Agency's (FEMA) evaluation that OROs can provide reasonable assurance they can respond to an incident at a nuclear power plant. "FEMA bases its reasonable assurance determination that OROs can protect the health and safety of the public in the event of an incident at an NPP on both adequate plans/procedures and the demonstrated ability to implement them. OROs use exercises, drills, seminars, training, SAVs, and actual events to practice and fine-tune plan implementation." Federal Emergency Management Agency, *Program Manual Radiological Emergency Preparedness*, June 2013 at III-1. The VY PDEP describes the exercise activities the licensee will maintain:

> Biennial exercises shall be conducted to test the timing and content of implementing procedures and methods; to test emergency equipment and communication networks; and to ensure that emergency personnel are familiar with their duties. VY offers the following organizations the opportunity to participate to the extent assistance would be expected during an emergency declaration; however, participation is not required:
>
> 1. State of Vermont
> 2. Brattleboro Memorial Hospital
> 3. Brattleboro Fire Department
> 4. Law Enforcement
> 5. Rescue, Inc. Ambulance Service
>
> At least one drill involving a combination of some of the principal functional areas of emergency response shall be conducted in the interval between biennial exercises.

Vermont Yankee will continue to be evaluated by the NRC to assess their on-site response capabilities yet several areas of the plan reference the assistance provided by OROs to supplement their own capabilities. Without the requirement to evaluate OROs, the assessment of the licensee's ability to address significant issues is inherently incomplete. The NRC should, at a minimum, require the evaluation of OROs by FEMA to respond as outlined in the PDEP and subsequent Letters of Agreement. Instituting this requirement would lead to a more holistic approach to evaluation instead of the compartmentalized framework that currently exists in regulation. Without this requirement, the NRC and the licensee have no basis in which to enforce improvement actions for those areas that rely on ORO assistance. Furthermore, without a specific requirement to train and evaluate OROs in exercise there is potential risk agencies will not have the knowledge needed to ensure proficiency in responding to a very specialized type of response such as a nuclear power plant incident. The institution of regimented planning, training and exercise requirements for OROs consequently requires the licensee to support them through financial means in order to facilitate the compliance with said measures. The licensee should be required, rather than encouraged, to continue coordination efforts in order to ensure planning standards continue to be upheld.

THE NRC STAFF HAS FAILED TO CONSIDER THE ABILITY OF OFF-SITE RESOURCES TO PROVIDE NECESSARY ASSISTANCE TO VERMONT YANKEE

On November 14, 2014, the NRC Executive Director for Operations issued a memorandum to NRC Commissioners outlining NRC Staff analysis and recommendations related to Entergy's pending request for exemption from certain emergency planning requirements. In that memorandum, the Staff analysis and recommendations speak, in part, directly to the substance of the LAR. The State therefore includes comments on the

memorandum on the basis and to the extent that the memorandum encompasses issues that are intimately tied to the LAR under review.

The NRC Staff's recommendations included in the November 14 memorandum assert that the analysis conducted by ENO "provides reasonable assurance that in granting the requested exemptions to ENO: (1) an offsite radiological release will not exceed the EPA PAGs at the site boundary for a DBA; and (2) in the unlikely event of a beyond DBA resulting in a loss of all SFP cooling, there is sufficient time to initiate appropriate mitigating actions and, if a release is projected to occur, there is sufficient time for offsite agencies to take protective actions using a CEMP to protect the health and safety of the public." Memorandum from Mark Satorius, NRC Executive Director of Operations to NRC Commissioners, November 14, 2014 (SECY-14-0125) (ADAMS Accession No. ML14227A711). These assertions assume that Comprehensive Emergency Management Plans (Emergency Operations Plans or EOPs) at the State and local level specifically account for an incident involving a radiological release from a fixed facility such as Vermont Yankee. While the all hazards emergency management concept is widely adopted and implemented in Vermont as outlined in the National Response Framework, incidents such as a radiological release are extremely specialized in nature. Even if a release did not exceed Environmental Protection Agency (EPA) Protective Action Guidelines (PAGs) off-site, the burden remains with local and State government to validate what has or has not occurred. The health and economic viability of the areas surrounding Vermont Yankee depend on the assurances provided by governmental entities that impacted areas are safe as is the case in any other disaster. Those assurances can only be provided by training, exercising and equipping personnel to assess the impacts to health and the environment outside of site boundaries. Without the ongoing license requirement to maintain accident assessment capabilities off-site and the

subsequent provision of support, as is now the case, the State might have to rely on resources of surrounding states and the federal government. Unfortunately that reliance could delay response times as resources are mobilized and assigned. This is time that cannot be wasted once a release has occurred even if it below EPA PAGs.

The NRC Staff appears to have come to a number of conclusions regarding the status of off-site EOPs without conducting any sort of formal review of those documents to assure their readiness to address the changing circumstances at the plant. Coupled with the fact that significant portions of the proposed VY PDEP are not available for review by State and local entities, it is impossible for the EOPs of OROs to be revised to reflect the specific response and recovery actions at the plant. Again, the State contends that the NRC Staff should not make a no significant hazards consideration determination as long as plans on-site call for the supplemental assistance of OROs without reviewing the associated plans for such instances and providing the opportunity for revision as applicable.

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Education

Bachelor of Arts
Major: Political Science
Minor: Public Administration

Western New England College
Springfield, MA
May 2008

Master of Public Administration

Norwich University
Northfield, VT
June 2010

Employment Experience

Chief of Staff, Vermont Division of Emergency Management and Homeland Security

Waterbury, VT
December, 2014

- Oversee the daily operations of the Division including the Planning, Operations and Logistics, Homeland Security, and Recovery and Mitigation Sections
- Maintain and track progress on the Statewide Emergency Management and Homeland Security Strategic Plan.
- Develop and implement policy initiatives in accordance with Division goals and objectives.
- Engage in leading disaster response and recovery activities in the State Emergency Operations Center.
- Oversee programmatic monitoring for all Division grant programs.
- Ensure human capital management activities occur consistent with Division goals and objectives.

Planning Section Chief, Vermont Division of Emergency Management and Homeland Security

Waterbury, VT
November 2012-
December 2014

- Engage in disaster response and recovery operations as the Planning Section Chief.
- Ensure the continuous revision and update of the Vermont State Emergency Operations Plan.
- Provide primary programmatic oversight of the Emergency Management Performance Grant and the Radiological Emergency Response Program Fund.
- Manage the Radiological Emergency Response Program.
- Ensure the annual development of the statewide Threat/ Hazard Inventory and Risk Assessment.
- Oversee the execution of the statewide critical infrastructure program including the Vermont Infrastructure Protection Plan.
- Implement statewide policy directives to enhance local and state emergency preparedness.
- Conduct an annual self-assessment and onsite assessment every five years of the Emergency Management Accreditation Program.

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Emergency Management Program Specialist, Vermont Emergency Management — Waterbury, VT — March 2011- November 2012

- Revise and update the Radiological Emergency Response Incident Annex to the State Emergency Operations Plan and all associated state-level plans and procedures.
- Plan and conduct quarterly Vermont Yankee exercises including the 2011 and 2013 FEMA Graded Ingestion Pathway and Plume Phase Graded Exercises.
- Ensure statewide compliance with the FEMA Radiological Emergency Preparedness Program Manual Planning Standards and Exercise criteria.

Emergency Management Planner, Vermont Emergency Management — Waterbury, VT — August 2008- March 2011

- Engage in disaster response activities within the State Emergency Operations Center under the Planning Section.
- Coordinate the use and exercise of dam emergency action plans with state, local, and private sector officials.
- Evaluate and facilitate exercises across the state designed with an all-hazards approach to prepare participants for disaster.
- Liaison between state, local, and non-government officials for the planning and activation of the state's regional Med Surge/ Mass Care Facilities.
- Plan and conduct the annual statewide Emergency Preparedness Conference.
- Act as an Accreditation Manager during the successful accreditation of Vermont's emergency management program by the Emergency Management Accreditation Program.
- Coordinate yearly revision and updates for the Department of Public Safety's Continuity of Operations Plan.

Related Experience

Lamoille County Co-Coordinator, American Red Cross, Northern Vermont Chapter — March 2010- January 2012

- Lead the Lamoille County Disaster Action Team in responding to and providing support for local and regional disasters.
- Provide support in events that require shelter operations, client casework, feeding, and search and rescue services on a twenty-four hour basis.
- Interface with local and state officials to promote the mission of the team.

Skills and Training

Windows, Microsoft Word, Microsoft Excel, Microsoft Power Point, HTML
Strong Organizational and Interpersonal Skills
IS-100: Introduction to Incident Command System
IS-200: Incident Command System for Single Resources and Initial Action Events
IS-300: Incident Command System for Expanding Incidents
IS-400: Advanced Incident Command System
IS-700: National Incident Management System, An Introduction
IS-800.A: The National Response Plan, An Introduction
Homeland Security Exercise and Evaluator Program, Train-The-Trainer and Toolkit
Orientation to Mission Assignment Processing
The Effective Facilitator, Leadership Strategies Institute
Emergency Management Assistance Compact Advanced Team Member
Hazardous Materials Awareness Level
EOC Operations and Planning for All Hazards
Threat and Risk Assessment
Leadership in Police Organizations

COMMENTS AND DECLARATIONS OF THE VERMONT DEPARTMENT OF HEALTH ONENTERGY VERMONT YANKEE'S LICENSE AMENDMENT REQUEST FOR THE EMERGENCY PLANNING ZONE IN LETTER BVY 14-033 DATED JUNE 12, 2014 AND SECY-14-0125 DATED NOVEMBER 14, 2014.

February 9, 2015

Introduction to Comments from the Vermont Department of Health

The Vermont Department of Health (VDH or Department), by and through Dr. William Irwin, Sc.D, CHP, Vermont Radiological and Toxicology Sciences Program Chief (curriculum vitae attached), focuses its comments and declarations on the NRC staff analysis and recommendations contained in a November 14, 2014 Policy Issue memorandum addressing certain exemption requests made by Energy Nuclear Operations, Inc. (ENO). See *Memorandum from Mark Satorius, NRC Executive Director of Operations to NRC Commissioners*, November 14, 2014 (Satorius Memorandum)(SECY-14-0125)(NRC Agencywide Document Access Management System [ADAMS] Accession No. ML14227A711). Specifically, the Satorius Memorandum seeks "Commission approval for the staff to grant [ENO's] request for exemptions from certain emergency planning (EP) requirements of Part 50 . . . of Title 10 of the *Code of Federal Regulations*." *Id.*, at 1. ENO's request for the referenced exemptions was filed on March 14, 2014, prior to this License Amendment Request (LAR). See *Entergy Request for Exemptions from Portions of 10 CFR 50.47 and 10 CFR 50, Appendix E*, March 14, 2014 (BVY 14-009)(ADAMS Accession No. ML14080A141).

While the SECY-14-0125 Satorius Memorandum is not necessarily under review by the commission here, the memorandum's contents are highly relevant to any Commission consideration of the instant LAR. The BVY 14-009 exemption request acts foundational requirement for the operation of this LAR. As a result, the Commission's review of the LAR is

necessarily predicated upon consideration of SECY-14-0125, and comment on the memorandum is appropriate and within the scope of relevant commentary.

VDH strongly disagrees with the recommendation of the NRC staff in SECY-14-0125 to grant Entergy Nuclear Operations' (ENO) requested emergency plan (EP) exemptions from certain requirements of 10 CFR § 50.47 (b) and Appendix E to 10 CFR Part 50. The primary reasons for this are:

1. The exemption approval recommendation of the NRC staff is inappropriately based solely upon dose of radioactive contamination and does not include the health impacts of radioactive contamination from releases that result in doses below the Environmental Protection Agency (EPA) Protective Action Guidelines (PAGs);
2. The exemption approval recommendation of the NRC staff incorrectly assumes a comprehensive emergency management plan (CEMP) appropriate for response and recovery from radioactive contamination releases can exist and be maintained by offsite response organizations without licensee financial support; and
3. There has been no rulemaking and public comment appropriate to the proposed exemptions to the EP requirements of 10 CFR 50 .47 (b) and Appendix E to 10 CFR Part 50.

The Recommendation for Exemption Approval Is Based Only on Doses In Excess Of EPA PAGs Which Ignores Other Possible Public Health Consequences

Entergy and the NRC staff has determined that accidents at Entergy Vermont Yankee Power Station after April 2016 are unlikely to result in whole body doses in excess of one rem or thyroid doses in excess of five rem beyond the site boundary. The Department has not had the opportunity to assess the evidence to support that conclusion. Beyond that, those dosage levels are not the only thresholds for potential detriment to public health. Should a fire, a leaking container, or a transportation or industrial accident result in the release of radioactive materials that contaminate the environment around Vermont Yankee, numerous other consequences that are a detriment to public health will occur.

Radioactive contamination in solid, liquid or gaseous form that leaks from structures, systems or components or is released due to deliberate or accidental container damage or destruction may contaminate the water, land or air beyond the Vermont Yankee site boundary. While, according to the NRC staff and ENO, the contamination may not lead to doses that exceed the EPA PAGs, there still could be adverse health consequences. Some members of the public may inhale or ingest radioactive materials and receive low doses. Nonetheless, these doses will solely be due to the release from Vermont Yankee, and even though they may be less than the EPA PAGs, they still pose a risk of later health effects in those exposed. While evacuation and medical counter measures like potassium iodide may not be ordered in such circumstances, many of those exposed will self-evacuate and expect medical care.

In the case of a release related to Vermont Yankee, the public will look to the Department to explain what occurred, how the exposure affects health and well-being and what should be done in response to the exposures. Environmental samples would be collected by Vermont's

radiological first responders and samples would be analyzed in the VDH radiochemical laboratory. The analytical results would then be published to provide facts to allow people to trust that the land and water are, or will be at some future time, free of contamination. These capabilities have been developed over 42 years of Vermont Yankee operation, and should be sustained until the large volumes of radioactive materials stored at Vermont Yankee are removed from Vermont and properly disposed of at licensed radioactive waste facilities.

The NRC staff is using the EPA PAGs improperly. They are designed to provide guidance, not regulation, as to when and how protective actions like evacuation, potassium iodide administration, relocation, reentry and return may be appropriate, not when emergency plans are to be written, replaced or exempted. Emergency Plan requirements for nuclear power reactors in SAFSTOR must address all sources of radioactive contamination of the environment and not just those that result in doses greater than the EPA PAGs. This includes planning for and funding of dedicated state radiological health resources to survey the environment outside the site boundary for contamination of any media, analysis of those media for contamination, even at low levels, and reporting of the results to the public.

The Vermont Department of Health also lacks confidence that Entergy has provided sufficient evidence that all accident scenarios have been considered for its permanently defueled emergency plan. In particular, the accident and dose assessment software used by Entergy, Unified RASCAL Interface 2.0.1.0 of October 2014 (URI) does not recognize the widely accepted possibilities of hostile action-based scenarios that could severely damage spent nuclear fuel in its spent fuel pool. Such scenarios are described by the NRC in NUREG-1738 and the National Academies of Science. *Safety And Security Of Commercial Spent Nuclear Fuel Storage (Public Report), Committee on the Safety and Security of Commercial Spent Nuclear Fuel*

Storage Board on Radioactive Waste Management Division on Earth and Life Studies National Research Council Of The National Academies (2006). Lacking consideration of these and other scenarios in this important Entergy Vermont Yankee emergency preparedness software is evidence that the PDEP does not adequately consider these scenarios as pointed out by the Vermont Public Service Department in its comments on the license amendment request.

Recent use of the software by the Vermont Department of Health's US Department of Energy-trained Assessment Scientists revealed that URI would be useless for spent fuel accidents caused by aircraft crashes, whether accidental or hostile action-based or by large explosions caused by missiles or by armed intruders. Other scenarios that could result in the loss of the sheet metal structure that is the only secondary containment for the spent fuel pool, such as those identified with the accident at Fukushima, also do not appear to have been provided for in URI and the PDEP. The Health Department recognizes it would require the use of other software to model the consequences of these scenarios. The Department is well-trained in this other software, and in the interpretation of its output for the public and decision-makers. The elements of a law enforcement, fire department and emergency medical services based Comprehensive Emergency Management Plan are not.

The Assumption That a Comprehensive Emergency Management Plan (CEMP) Adequate to Respond to Radiological Releases from a Decommissioning Nuclear Facility Can Exist and Be Maintained without Licensee Support is Erroneous

SECY-14-0125 states that "elements of the revised emergency plan would facilitate the ability of offsite authorities to take protective actions under a CEMP." *Satorius Memorandum* at 5. There are numerous industrial accident scenarios, especially involving the movement or transportation of radioactive materials, hostile action based scenarios, and natural disasters that

could lead to the release of radioactive materials being stored in the structures, systems and components used for SAFSTOR for what ENO projects in its PSDAR to be a period of fifty years. Assaying these kinds of offsite consequences requires much more than law enforcement, fire department and emergency medical service personnel. It requires personnel trained to survey people and the environment for radioactive contamination, personnel trained to interpret radioactive material contamination for dose consequences and decisions about decontamination and disposal as radioactive waste, and personnel to inform decision-makers and the public of the situation to put risks in perspective and to plan other response actions. These kinds of people make up the existing offsite response organizations that the ENO exemptions would eliminate.

SECY-14-0125 also notes that precedent for approval of the EP exemption request has been set at Kewaunee Power Station and the Zion facility. *Id.* at 2. This is not evidence, let alone adequate evidence, for the NRC staff to recommend approval of the EP exemptions requested by ENO in its March 14, 2014 letter. See *BVY 14-009.*Emergency Planning has always been, is now, and always will be a local matter, and what other states or localities may have approved—in processes that Vermont was not a party to—cannot be imposed on Vermont. There are significant differences between Vermont and other states where decommissioning has occurred that show the exemption should not be approved here. Most importantly, unlike all other states with nuclear reactors in SAFSTOR, Vermont does not have other operating nuclear facilities within its borders and therefore, absent continued support from Vermont Yankee, would lack the infrastructure required to respond to a radiological release, including those resulting in doses less than the EPA PAGs.

SECY-14-0125 describes how the Federal Emergency Management Agency (FEMA) concurs with the NRC staff position recommending approval of the ENO EP exemptions. Should

there no longer be EP requirements to financially or otherwise support Vermont Yankee offsite response organizations, there is no way these organizations can meet FEMA or any other authority's guidance. It is also likely that, absent the emergency planning requirements for which ENO seeks exemption, any of the FEMA resources described in SECY-14-0125 (the Federal Radiological Preparedness Coordinating Committee, FEMA Headquarters and FEMA Regional Staff) would actually support Vermont's EP efforts at a level required for the people and environment of Vermont.

Not only should the decommissioning EP require plans that include offsite response organizations including the Vermont Radiological Tracking Team, the Radiological Sampling Team, and the Vermont Department of Health and its radiochemistry laboratory, but ENO should be required to financially support them.

There Has Been No Rulemaking and Public Comment on Exemptions from EP Requirements for Decommissioning Facilities

In its summary, the SECY-14-0125 letter includes the statement that "there are no explicit regulatory provisions distinguishing EP requirements for a power reactor that has been shut down from those for an operating power reactor." *Satorius Memorandum* at 1. The document notes that rulemaking for nuclear power plant decommissioning was planned, but put off with the "higher priority work after the terrorist attacks of September 11, 2001." *Id.*, at 3. With a growing number of nuclear power reactors presently undergoing decommissioning and expected to begin decommissioning in the next twenty years, this lack of clear regulation and absence of rulemaking makes circumstances unpredictable for many states who have lacked the opportunity to have their concerns for emergency planning addressed properly.

The NRC staff inappropriately based its recommendation to approve emergency plan exemptions for Vermont Yankee on analyses applicable to an independent spent fuel storage installation (ISFSI) or monitored retrieval Site (MRS). This methodology is inappropriate because former nuclear power reactors in SAFSTOR contain very large radioactive materials storage areas, not discrete spent fuel canisters tested and licensed specifically for the storage of high level waste. The structures, systems and components of a nuclear power reactor in SAFSTOR present a multitude of pathways for releases of radioactive materials into the environment. While the consequences may not result in doses in excess of EPA PAGs, environmental and public health consequences are possible. The probability of such releases is clearly greater than zero as has been documented in the Vermont Yankee PSDAR, including the extensive leak of reactor coolant/condensate from the augmented off gas system discovered in 2009.

Had there been required rulemaking for decommissioned nuclear power reactors, many states, including Vermont likely would request that NRC staff require licensees, including ENO, to financially support offsite radiological emergency response. Funding levels would be commensurate with the appropriate level of offsite response, and not simply eliminate essentially all offsite radiologically appropriate emergency response. One level might be set for the period through the removal of all spent fuel from the spent fuel pool (SFP), and another, reduced level might be set for the remaining time until decontamination, dismantling, and license termination. Absent rulemaking with public comment, the opportunity for states to weigh in is lost or significantly diminished.

It is unfortunate that the NRC staff has reinforced the misleading implication put forth by ENO in its Permanently Defueled Emergency Plan (PDEP) that elements of the EP "have been

established with the review and agreement of responsible State authorities." BVY 14-033, Attachment 2, *Vermont Yankee Nuclear Power Station Permanently Defueled Emergency Plan*, Rev. 0, at 35, § 11.1. It is the understanding of the Department that the only review of the decommissioning EP with State authorities has occurred in briefings by ENO EP personnel in routine meetings of what is called the Tri-State Directors. A brief slide presentation before this audience is certainly not adequate State review and it should not be construed as State agreement.

Absent appropriate regulations for emergency planning during the decades-long phases of decommissioning, ENO should be allowed by the NRC staff to work extensively with the State of Vermont to identify mutually agreeable conditions for offsite radiological emergency response rather than have that possibility hampered by exemption of offsite responsibilities.

Conclusions of the Vermont Department of Health

According to SECY-14-0125, "FEMA acknowledges that individual states and local governments have the primary authority and responsibility to protect their citizens and respond to disasters and emergencies." *Id.*, at 6. This certainly includes radiological emergencies, and it includes those that contaminate the environment with radioactive materials and lead to doses to members of the public both less than and greater than the EPA PAGs. These radiological emergencies require significantly more resources than what the NRC staff describes as a comprehensive emergency management plan using law enforcement, fire departments and emergency medical services. This includes the capability to survey for contamination, to properly collect samples with chain of custody, to efficiently analyze a wide variety of environmental media for radioactive material concentrations, to precisely interpret field

measurements and laboratory results, and to effectively report the situation to the public to allay concerns and to decision-makers so agencies can take appropriate public health and environmental protection response actions.

The recommendations of SECY-14-0125 undermine the ability to provide necessary emergency services for a plant in SAFSTOR by unilaterally exempting NRC licensees from most offsite emergency planning regulation based on inappropriate analysis applicable to ISFSIs and MRSs and a lack of consideration of hostile action-based scenarios. The Commission should reject the staff recommendations of SECY-14-0125.

Respectfully,

/s/ William Irwin
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Radiological and Toxicology Sciences
Program Chief
Vermont Department of Health
108 Cherry Street
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William E. Irwin, Sc.D., CHP

Education

- **Doctor of Science, Work Environment Engineering**, University of Massachusetts Lowell
- **Master of Science, Radiological Sciences**, University of Massachusetts Lowell
- **Master of Business Administration**, Southern New Hampshire University
- **Bachelor of Arts, Philosophy and History**, Christopher Newport University

Experience

- ***Vermont Department of Health, December 2005-present: Radiological and Toxicological Sciences Program Chief.*** Manage a staff of scientists who provide guidance to the public, state agencies and other stakeholders on the health risks and methods of health protection for acute and chronic exposures to ionizing and non-ionizing radiation and toxic materials. Provide guidance to citizens of Vermont and advice to members of Vermont state government on regulated and unregulated radiological and toxicological health matters. Manage environmental surveillance and emergency preparedness for the Vermont Yankee Nuclear Power Station.
- ***Harvard University, October 2001-September 2005: Health Physicist, Laser Safety Officer, Associate Radiation Protection Officer.*** Directed technical services for environmental health and safety programs at Harvard University. Managed a staff of eight technicians and physicists at the Harvard Medical School and the Faculty of Arts and Sciences. Significant accomplishments included direction of radiological and environmental health activities during the decommissioning of the Harvard Cyclotron Laboratory, and development and initial implementation of the Harvard University Laser Safety Program. Taught courses in laser health physics.
- ***Massachusetts Institute of Technology, October 1992-October 2001: Health Physicist, Assistant Radiation Protection Officer*** Managed the safe use of ionizing and non-ionizing radiation producing devices for campus research laboratories. Designed safety measures for radiological hazards, taught courses in radiological health protection, performed measurements and calculations for radiological emissions, supervised technicians, and determined doses and potential consequences of radiological exposures. Special projects included leading the MIT-Cambridge Collaboration on Education for the Environment.
- ***Biological, Chemical and Radiological Occupational Health Consultant, 1994-2005:*** Praecis Pharmaceuticals; Suntory Pharmaceuticals, Wolfe Laboratories, Inc.; Satori Pharmaceuticals, Inc.; Cubist Pharmaceuticals; Arcturus Pharmaceuticals; Millenium Pharmaceuticals; Kinetix Pharmaceuticals; Animal Rescue League of Boston; W.R.Grace; Sontra Pharmaceuticals, Inc.; Implant Sciences; East Coast Chiropractic; Chemical & Atomic Workers Union; Lasertron; Vizidyne; Duracell; Gillette; Senior Flexonics; Telephotonics; Esdaile, Barret & Esdaile; AT&T Wireless; Bell Atlantic Mobile; Entel; NLS; Omnipoint;Verizon Wireless; Sprint PCS; T-Mobile Communications; the Town of Medfield, MA; the Town of Wrentham, MA; General Dynamics, Inc.
- ***North Atlantic Energy Services, July 1990--October 1992:*** Health Physics and Supervisor Training Instructor. Designed, developed and taught courses in health physics, nuclear power plant operations, and supervision. Emergency Responder and Emergency Response Trainer.
- ***Arizona Public Service Company, December 1985 –July 1990:*** Health Physics, Chemistry, and Engineering Training Instructor and Supervisor. Designed, developed and taught courses in health physics, nuclear power plant operations, and chemistry. Led the team of instructors who prepared and presented courses in engineering and plant operations, and supervised the team of chemistry instructors.
- ***Contract Health Physics Instructor and Technician during refueling and maintenance outages, June 1984 -December 1985:*** Virginia Power (Surry and North Anna Stations); Southern Nuclear Operating Company (Farley Station); South Carolina Electric & Gas (Brunswick Station); Carolina Power & Light (V.C. Summer Station).

- ***Newport News Shipbuilding and Dry Dock Company, Newport News, Virginia, Radiological Controls Technician. October 198 –June 1984.*** Trained and worked according to the US Navy Training Criteria of NAVSEA 389-0288 on submarines, aircraft carriers and guided missile cruisers.

Professional Certifications

- **Certified Health Physicist**, certified by the American Board of Health Physics, comprehensive examination passed July, 1996. Re-certified in 2000, 2004 , 2008, 2012.
- **Hazardous Materials Technician/Specialist/Crew Chief**, Vermont Hazardous Materials Response Team, August 2007.
- **Firefighter I**, certified by the Vermont Fire Service Training Council, May 2008
- **Firefighter II**, certified by the Vermont Fire Service Training Council, February 2012
- **Emergency Medical Technician,** certified by the National Registry of Emergency Medical Technicians, June 2013
- **AgriSafe Provider,** certified by the University of Iowa Center for Agricultural Safety & Health, July 2013.
- **Professional Ski Instructor**, certified by the Professional Ski Instructors of America, March 2009

Professional Affiliations

- **Conference of Radiation Control Program Directors** (CRCPD), Chair-Elect (2004-2005), Director Member; Chair of CRCPD Homeland Security/Emergency Response Task Force 4 for evaluation of resources for radiological and nuclear emergency response; Advisor to CRCPD Environmental Task Force 43 for radiological data sharing policy development.
- **National Council on Radiation Protection and Measurements (NCRP)**, Member of Council Committee CC-1 *Radiation Protection Guidance for the United States* and Scientific Committee SC 3-1, *Guidance for Emergency Responder Dosimetry.*
- **New England Radiological Health Conference**, Executive Board Member.
- **American Academy of Health Physics**, Diplomat.
- **Health Physics Society**, Plenary Member
- **Vermont Firefighters Association**, Member
- **Bakersfield Volunteer Fire Department**, Fire Captain and EMT

Specialized Training

- **Turbo FRMAC, Assessment Scientist**, 24 hour course conducted by Sandia National Laboratories on the use of derived response level, derived intervention level and emergency worker protection computer software, July 2013.
- **Emergency Medical Technician,** 144 hour course with scheduled completion by April 2013.
- **Agricultural Medicine and Occupational Safety Training**, 48 hour course on agricultural illnesses, injuries and exposures with a focus on prevention, as well as care presented by the University of Iowa Center for Agricultural Safety & Health and the New York Center for Agricultural Medicine & Health, July 2013.
- **Computer Assisted Management of Emergency Operations**, 24 hour course conducted by the Environmental Protection Agency, May 2013.
- **HazCat Field Identification Course,** 32 hour course presented by Haz Tech Systems , Inc., February 2013.
- **Firefighter II**, 90 hour training and certification provided by the Vermont Fire Service Training Council, February 2012.
- **Turbo FRMAC, Assessment** Scientist, 24 hour course conducted by Sandia National Laboratories on the use of derived response level, derived intervention leve and emergency worker protection computer software, March 2009.
- **HazCat Field Identification Course,** 32 hour course presented by Haz Tech Systems , Inc., October 2008.

- **Small-scale Chemical and Biological Weapons Production,** 40 hour course by Responders Resource Technology, January 2007.
- **Homeland Security Exercise Evaluation Program**, Vermont Homeland Security Unit, November 2008
- **Firefighter I**, 160 hour training and certification provided by the Vermont Fire Service Training Council, May 2008.
- **Hazardous Materials Technician**, Vermont Hazardous Materials Response Team, February 2007-2012.
- **Hazardous Materials Emergency Responder.** 24-hour course presented by Harvard University, 2001, 2002, 2003, 2004, 2005.
- **Multi-Agency Radiological Survey and Site Investigation Manual.** 8-hour course presented by the American Academy of Health Physics, July 2004.
- **Concepts and Methods for Communicating with Responders and the Public**. 8-hour course presented by the American Academy of Health Physics, July 2003.
- **Medical Management of Patients from Radiological Terrorist Events.** 8-hour course presented by the American Academy of Health Physics, June 2002.
- **Incident Command System.** NIMS 700, ICS 100, 200, 300, 400 and 441 qualified through courses presented by the Vermont Criminal Justice Training Council through May 2006-September 2011.
- **Non-Ionizing Radiation Safety: Evaluation and Management Techniques**, 24-hour course presented by Narda Microwave, November 1998.
- **Radiofrequency Radiation Safety in the Telecommunications Industry**, 8-hour course presented by Narda Microwave, September 1996.
- **Advanced Laser Safety**, 24-hour course presented by the Engineering Technology Institute, August 1996.
- **Health Physics at Research Reactors**, 8-hour course presented by the American Academy of Health Physics, July 1996.
- **Radiation Physics at Accelerators**, 8-hour course presented by the American Academy of Health Physics, July 1995.
- **Environmental Radioactivity Quantification**, 8-hour course presented by Canberra Industries, June 1994.
- **Laser Safety**, 32-hour course presented by the Engineering Technology Institute, June 1993.
- **MIT Reactor Safety Study,** 40-hour course presented by the Massachusetts Institute of Technology, Department of Nuclear Engineering, July 1988.
- **Arizona Public Service, Instructor Development:** Instructor Platform Skills; Course Documentation; Conducting Topic, Task and Paradigm Analysis; Incorporation of Operating Experiences in Training Programs; Learning Objectives; Evaluating Student Performance; Maintaining Training Materials; Motivating Students and Responding to Student Needs; Advanced Platform Skills; Laboratory instruction.
- **Arizona Public Service Technical Development:** Management Oversight and Risk Tree Root Cause Analysis; Emergency Planning; Fundamentals of Working Fluids; Chemistry; Mitigating Core Damage; Plant Modifications; Instrumentation and Process Controls; Systems, Plant Components and Design Bases; reactor Theory; Plant Operations, Human Performance Evaluation Systems; Hazardous Materials Control; Nuclear Reactor Safety
- **U.S. Naval Reactors Radiological Controls**, three-month training program presented by Newport News Shipbuilding and Dry Dock Company, October-December 1981.

Publications

- ***Symptoms Associated with prolonged Radio Frequency Radiation Exposure,*** Lee, Ernest C., Irwin, William E. and Winters, Thomas H., Environmnetal Health Perspectives, June 2004.
- ***Radio Frequency Radiation Risk - A Focus on Wireless Telephones***. Dissertation for The University of Massachusetts Lowell, 2002.
- ***New Technology in Art.*** Encyclopedia of Occupational Health and Safety, Fourth Edition, International Labour Office, Geneva, Switzerland, 1996.

Software Knowledge

- **HPAC, RASCAL, TurboFRMAC, RES/RAD, MetPac,** and **HotSpot** for response and recovery from radiological and nuclear emergencies.
- **CAMEO** for computer assisted management of emergency operations for chemical releases.
- **Microshield** for external dose and shielding calculations.
- **Varskin** for skin dose calculations.
- **INDOS** for internal dose calculations.
- **Lazan** for laser nominal hazard zone, MPE and OD calculations
- **SPSS** for epidemiological statistics and **Stata** for other statistics.
- **Microsoft Word** for word processing, **Excel** for spreadsheets, **Powerpoint** for presentations, **Access** for databases, and **Project** for project management.

Presentations

- ***Vermont Yankee Decommissioning,*** New England Chapter of the Health Physics Society, May 2014.
- ***Science and Response to a Nuclear Reactor Accident,*** National Academies of Science, May 2014.
- ***Regional Rad/Nuc Exercises,*** Conference of Radiation Control Program Directors, May 2014
- ***Chemical and Biological Weapons***, Vermont Hazardous Materials Response Team, July 2013.
- ***The Vermont Dairy Air: Formaldehyde Use on Farms,*** National Environmental Health Association, July 2013.
- ***Public Health Response to an Improvised Nuclear Device.*** Vermont Emergency Medical Services Conference, Burlington, Vermont, October 2012.
- ***Public Health Response to an Improvised Nuclear Device.*** New England Radiological Health Conference, October 2012.
- ***Public Health Response to an Improvised Nuclear Device.*** Vermont Healthcare Preparedness Conference, Burlington, Vermont, June 2012.
- ***Tri-State Radiological Analysis of Fish.*** New England Radiological Health Conference, October 2012.
- ***Vermont Yankee Groundwater Protection and the 2010 Tritium Leak.*** Northeast Epidemiology Conference, October 2012.
- ***The CRCPD Radiological/Nuclear Emergency Toolbox for Response and Recovery for an RDD or IND.*** Conference of Radiation Control Program Directors, Orlando, Florida, May 2012.
- ***TMI, Chernobyl, Fukushima and their Impacts on Vermont Yankee.*** Vermont Emergency Preparedness Conference, Stowe, Vermont, November 2011.
- ***The Fukushima Reactor and Spent Fuel Pool Accidents.*** Vermont Healthcare Preparedness Conference, Stowe, Vermont, October 2011.
- ***Situational Awareness and Assessment.*** CDC Radiation Emergencies Bridging the Gaps Conference, Atlanta, Georgia, March 2011.
- ***Vermont Yankee Tritium Release.*** International Emergency Management Conference, Porsmouth, NH, December 2010.
- ***Vermont and Empire 09.*** The National Radiological Emergency Preparedness Conference, Chicago, Illinois, July 2009.
- ***The NERHC 2007 RDD Conference Exercise.*** Conference of Radiation Control Program Directors, Columbus, Georgia, May 2009.
- ***Radiological/Nuclear Emergency Response for EMS.*** Vermont Emergency Medical Services Conference, Burlington, Vermont, March 2009.
- ***The Health Physics of Radon.*** Vermont Radon Conference, Bolton, Vermont, January 2009.
- ***Radiological/Nuclear Emergency Response for Emergency Department Directors.*** Killington, Vermont, September 2007.
- ***Radio Frequency Radiation Risk from Base Stations in the Environment***. Hundreds of Presentations to communities in Massachusetts, Connecticut, Rhode Island, New Hampshire and New York; January 1993 to September 2004.
- ***Radio Frequency Radiation Risk - A Focus on Wireless Telephones***. Presentation to the Health Physics Society, Washington, DC, July 2004.

- ***Decommissioning of the Harvard Cyclotron***. Presentation to the Health Physics Society, Washington, DC, July 2004.
- ***Decommissioning of the Harvard Cyclotron***. Presentation to the New England Chapter of the Health Physics Society, Westford, MA, June 2003.
- ***Radon in the Home and Laser Safety***. Presentations for the Massachusetts Institute of Technology Independent Activities Period, 1995 - 2000.
- ***Radiation Safety***, for the Massachusetts Safety Council, Braintree, MA, December 2000.
- ***Laser Accidents at the Massachusetts Institute of Technology***. Presentation to the North American Campus Radiation Safety Officers, 17th Biennial CRSO Conference, July 1999.

Testimony

- Testimony before the Vermont Public Service Board relative to the granting of a Certificate of Public Good for the on Vermont Yankee Nuclear Power Station, June 2013.
- Testimony before Vermont Legislature on wind turbine sound, radiofrequency radiation from smart meters, Vermont Yankee Nuclear Power Station and radiological program funding from 2009 to present.
- Testimony on the physics and health impacts of wind turbine sound at the Vermont Public Service Board, February 2011.
- Testimony on the physics and health effects of electromagnetic field and radio frequency radiation sources:
    - In Massachusetts - Arlington, Barnstable, Billerica, Boston, Boxboro, Braintree, Brighton, Brookline, Bridgewater, Brookfield, Brookline, Burlington, Cambridge, Dedham, Dennis, Dorchester, Easton, Fairhaven, Fall River, Fitchburg, Gloucester, Grafton, Groton, Groveland, Hamilton, Hanson, Harvard, Harwich, Holliston, Hudson, Jamaica Plain, Lancaster, Lexington, Lincoln, Lynnfield, Mansfield, Marblehead, Marshfield, Mattapoisett, Maynard, Medfield, Methuen, Middleton, Millis, Nantucket, Needham, Newton, Norfolk, Northborough, North Dartmouth, Norton, Norwell, Ogunquit, Orleans, Oxford, Peabody, Plymouth, Provincetown, Quincy, Randolph, Reading, Revere, Rochester, Rockport, Saugus, Sharon, Scituate, Stoneham, Sudbury, Sutton, Swampscott, Tewksbury, Tisbury, Townsend, Waltham, Wellfleet, Westborough, Weston, West Roxbury, Westminster, Westwood, Weymouth, Winthrop, Worcester and Wrentham
    - In New Hampshire - Candia, Derry, Goffstown, Hollis, Hudson, Nashua, Sutton and Pelham
    - In New York - Duanesburg and Saratoga Springs
    - In Rhode Island - Barrington, Johnston, Portsmouth, Providence, Middletown, North Providence, North Smithfield, Smithfield, Warwick and Woonsocket.

Teaching Experience

- **Harvard University, 2001-September 2005, *Laser Safety*:** Two-hour course delivered to research faculty, students and staff on the physics of lasers, biological effects of lasers, engineering and administrative controls for laser safety.
- **Massachusetts Institute of Technology, 1992-2001, *Radiation Safety:*** Three-hour course to research students, faculty and staff on physics of radiation, biological effects of radiation, radiation detection methods, and radiation protection regulations. ***Laser Safety*:** Two-hour course delivered to research faculty, students and staff on the physics of lasers, biological effects of lasers, engineering and administrative controls for laser safety. ***Occupational and Environmental Law, Radiological Risk Management in High Technology Enterprise, Environmental Health and Safety Case Studies - The Microelectronics and Biotechnology Industries*; *Comprehensive Environmental Health and Safety Program Design Projects***: Presentations for the MIT Independent Activities Period, 1999.
- **North Atlantic Energy Services, 1990-1992, *Team Building*:** As part of the overall management training program, this eight-hour course used a variety of tools to better understand people and how they might be motivated to become part of a highly successful team. ***Kepner-Tregoe Problem Solving and Decision Analysis:*** As part of the management Training Program, this 24-hour course presented a set of tools for systematic analysis of work situations leading to effective decisions and well-planned

strategies for work. ***Power Plant Fundamentals*:** Forty-hour course in mathematics, physics and chemistry fundamentals; nuclear fission; electrical power generation; plant systems and components; instrumentation and control; normal and emergency plant operations

- **Arizona Public Service, 1985-1990, *Nuclear Power Plant Operations*:** Forty-hour course as part of the engineering and chemistry training programs that presented power plant fundamentals, nuclear fission, reactor systems, startup, routine operations, and emergency operations. ***Plant Systems*:** Forty-hour course in all major systems of a nuclear power plant, including the nuclear reactor, steam generation, electricity generation and safety system components.

Educational Details

- **University of Massachusetts Lowell, Work Environment Engineering, Doctor of Science:** Doctoral courses in Biostatistics, Epidemiology, Ergonomics, Industrial Hygiene, Environmental Law, Occupational Law, Pollution Prevention, Cleaner Production and Healthy Work Organization Design. Research in occupational cancer policy, recombinant DNA health protection, radio frequency radiation risk and the Environmental Protection Agency. Dissertation: A risk assessment on wireless telephones.
- **University of Massachusetts, Lowell, Radiological Sciences, Master of Science:** Masters courses in Mathematical Methods, Radiochemistry, Internal Dosimetry, Radiation Shielding, Radiation Dosimetry and Radiation Safety and Control. Research thesis on Gamma Spectroscopy.
- **Southern New Hampshire University, Masters in Business Administration:** Graduate courses in Managerial Accounting, Finance, Statistics, Economics, Marketing, Management, Business Law, Strategic Analysis, Operations Management, Research Methods, Database Management, Information Engineering, Organizational Behavior and Computer Information Systems. Research in electric utility operations management.
- **Arizona State University, Business Administration:** Computer Information Systems, Managerial Statistics, Management, Managerial Marketing, Legal Environment of Business, Managerial Accounting, Financial management, Managerial Communications and Macro- and Micro-economics.
- **Old Dominion University, Physics:** Algebra, Trigonometry, Calculus and Chemistry.
- **Christopher Newport University, Bachelor of Arts in Philosophy and History:** In addition to the required curriculum for a bachelor's degree, courses in Logic, Ethics, Aesthetics, Epistemology, Metaphysics, Politics, Existentialism, and Chinese, Indian, and Greek Philosophy; American, European, Russian and Asian History. Thesis in Architectural History.