

**UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION**

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

_____)	Docket Nos. 50-247-LR and
In the Matter of)	50-286-LR
ENTERGY NUCLEAR OPERATIONS, INC.)	
(Indian Point Nuclear Generating Units 2 and 3))	
_____)	March 29, 2012

**ENTERGY'S STATEMENT OF POSITION ON CONSOLIDATED
CONTENTION RK-EC-3/CW-EC-1 (SPENT FUEL POOL LEAKS)**

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Pursuant to 10 C.F.R. § 2.1207(a)(1) and the Atomic Safety and Licensing Board’s (“Board”) Order Granting NRC Staff’s Unopposed Time Extension Motion,¹ Entergy Nuclear Operations, Inc. (“Entergy”) submits this Statement of Position (“Statement”) on Consolidated Contention RK-EC-3/CW-EC-1 (“RK-EC-3/CW-EC-1”) proffered by Riverkeeper, Inc. (“Riverkeeper”) and Hudson River Sloop Clearwater, Inc. (“Clearwater”) (collectively, “Intervenors”). This Statement is supported by the Prefiled Testimony of Entergy Witnesses Donald M. Mayer, Alan B. Cox, Thomas C. Esselman, Matthew J. Barvenik, Carl J. Paperiello, and F. Owen Hoffman Concerning Consolidated Contention RK-EC-3/CW-EC-1 (Spent Fuel Pool Leaks) (“Entergy Testimony”) (ENT000301), and the exhibits thereto (Entergy Exhibits ENT000302 to ENT000368, and ENT000370 to ENT000371). For the reasons discussed below, RK-EC-3/CW-EC-1 lacks merit and should be resolved in favor of Entergy and the U.S. Nuclear Regulatory Commission (“NRC” or “Commission”) Staff.

¹ Licensing Board Order (Granting NRC Staff’s Unopposed Time Extension Motion and Directing Filing of Status Updates) (Feb. 16, 2012) (unpublished).

I. PRELIMINARY STATEMENT

RK-EC-3/CW-EC-1, an environmental contention, challenges whether Entergy's Environmental Report ("ER") and the NRC Staff's Final Supplemental Environmental Impact Statement ("FSEIS") sufficiently analyze the environmental significance of Indian Point Nuclear Generating Unit ("Indian Point") spent fuel pool ("SFP") leaks, as required by the National Environmental Policy Act ("NEPA") and NRC's 10 C.F.R. Part 51 NEPA regulations. In this regard, the Intervenor's testimony by Mr. Arnold Gundersen and Dr. Gillian Stewart claims that Entergy and the Staff fail to appropriately consider: (1) Indian Point Nuclear Generating Unit 2 ("IP2") SFP leaks; (2) contamination from past Indian Point Nuclear Generating Unit 1 ("IP1") SFP leaks; (3) the significance of groundwater contamination; (4) groundwater contamination impacts on the Hudson River, including impacts to aquatic ecology, recreational activities, and a potential desalination facility; and (5) mitigation measures to ostensibly minimize groundwater contamination impacts.

As a threshold legal matter, NEPA does not require particular environmental outcomes. Rather, it requires only that agencies take a "hard look" at the environmental impacts that will result from an agency's action and provide a statement of the environmental impacts that will result.² In connection with this license renewal application ("LRA"), Entergy prepared an ER addressing, among other things, the requirement to identify any "new and significant" information regarding significant environmental impacts not addressed in the Generic

² See *La. Energy Servs., L.P.* (Claiborne Enrichment Ctr.), CLI-98-3, 47 NRC 77, 87-88 (1998); see also *Balt. Gas & Elec. Co. v. Natural Res. Def. Council, Inc.*, 462 U.S. 87, 97-98 (1983) (NEPA requires agency to take a "hard look" at environmental consequences prior to taking major action).

Environmental Impact Statement (“GEIS”).³ The Staff then prepared an FSEIS that evaluates the ER and other information concerning potential new and significant impacts.⁴ In their testimony, Entergy’s experts thoroughly explain why the NRC Staff FSEIS appropriately concludes radionuclide leaks from IP1 and IP2 SFPs into the groundwater and Hudson River ecosystem, while new (*i.e.*, not considered in the GEIS), are not environmentally significant. As the analysis shows, and as demonstrated in the accompanying testimony, the leaks have SMALL environmental impacts, as that term is defined by NRC. Thus, the NRC satisfied the NEPA “hard look” requirement.

Entergy’s experts first provide background on relevant regulations, the Indian Point site and surrounding area, and the circumstances surrounding the IP1 and IP2 SFP leaks. They then discuss the details and results of the extensive Indian Point Site Hydrogeologic Study, submitted to the NRC in January 2008, as well as the subsequent details and results of the Long-Term Groundwater Monitoring Program. In addition, Entergy’s experts summarize the NRC Staff’s and the New York State Department of Environmental Conservation’s (“NYSDEC”) independent IP1 and IP2 SFP leak assessments—all of which conclude that the impacts of such leaks are not significant.

Entergy’s experts demonstrate that these conclusions are buttressed by the fact that Indian Point must report to the NRC annual dose calculations that account for all radionuclide releases from the site, including any releases from groundwater to the Hudson River. Those calculations, in turn, demonstrate Indian Point’s compliance with all applicable federal dose limits. Indeed,

³ See 10 C.F.R. § 51.53(c)(3)(iv); Regulatory Guide 4.2, Supp. 1, Preparation of Supplemental Environmental Reports for Application to Renew Nuclear Power Plant Operating Licenses 4.2-S-4 (Sept. 2000) (“RG 4.2S1”) (ENT000136).

⁴ 10 C.F.R. §§ 51.71(d), 51.95(c)(3).

the total annual dose to a hypothetical maximally-exposed individual from Indian Point groundwater is far less than the typical dose from eating a banana.⁵ Ultimately, Entergy's experts demonstrate that the SFP leaks' environmental impacts on human health, groundwater quality, and ecological resources are all SMALL, as that term is used in long-standing NRC regulations, and that the NRC has fully met its NEPA obligations. In doing so, Entergy's experts address and refute the Intervenor's evidence point-by-point, thereby further demonstrating that Contention RK-EC-3/CW-EC-1 and supporting evidentiary submissions lack legal, factual, and technical merit.

II. PROCEDURAL HISTORY OF CONTENTION RK-EC-3/CW-EC-1

On April 23, 2007, Entergy applied to renew the IP2 and IP3 operating licenses for 20 years beyond their current expiration dates of September 28, 2013, and December 12, 2015, respectively. After the NRC published a Federal Register notice of opportunity for hearing,⁶ Riverkeeper and Clearwater filed separate petitions to intervene, proposing various contentions.⁷

Of relevance here, Riverkeeper RK-EC-3, as initially proposed, alleged that Entergy's Environmental Report ("ER") "does not adequately assess new and significant information regarding the environmental impacts of radioactive water leaks from the Indian Point 1 and Indian Point 2 spent fuel pools on groundwater and the Hudson River ecosystem."⁸ Similarly, Clearwater CW-EC-1 alleged the ER "fails to adequately assess 'new and significant'

⁵ Entergy Test. at A135 (ENT000301).

⁶ Notice of Acceptance for Docketing of the Application and Notice of Opportunity for Hearing Regarding Renewal of Facility Operating License Nos. DPR-26 and DPR-64 for an Additional 20-Year Period, 72 Fed. Reg. 42,134 (Aug. 1, 2007).

⁷ See *Entergy Nuclear Operations, Inc.* (Indian Point Nuclear Generating Units 2 & 3), LBP-08-13, 68 NRC 43, 166-207 (2008).

⁸ Riverkeeper, Inc.'s Request for Hearing and Petition to Intervene in the License Renewal Proceeding for the Indian Point Nuclear Power Plant at 74 (Nov. 30, 2007) ("Riverkeeper Petition"), available at ADAMS Accession No. ML073410093.

information concerning environmental impacts of radioactive substances that are leaking from spent fuel pools.”⁹

Entergy opposed the admission of RK-EC-3 and CW-EC-1 on three principal grounds.¹⁰ First, NRC dose regulations—not U.S. Environmental Protection Agency (“EPA”) drinking water standards—govern the environmental significance of Indian Point SFP leaks.¹¹ Neither Riverkeeper nor Clearwater substantiated their assertion that the EPA standards somehow dictate the outcome of the NEPA analysis.¹² Second, the IP1 SFP leak, the only identified source of strontium-90 groundwater contamination, is not within the legal scope of the IP2 and IP3 license renewal proceeding.¹³ Third, neither Riverkeeper nor Clearwater dispute that doses due to the groundwater pathway are only a small fraction of federal limits.¹⁴ The NRC Staff opposed admission of RK-EC-3 and CW-EC-1 for substantially the same reasons as Entergy.¹⁵

The Board admitted and consolidated RK-EC-3 and CW-EC-1, stating that it was admitting RK-EC-3 “as it relates to the environmental impacts from the *spent fuel pool leaks*”¹⁶

⁹ Hudson River Sloop Clearwater Inc.’s Petition to Intervene and Request for Hearing at 18 (Dec. 10, 2007) (“Clearwater Petition”), *available at* ADAMS Accession No. ML073520042.

¹⁰ *See* Answer of Entergy Nuclear Operations, Inc. Opposing Riverkeeper Inc.’s Request for Hearing and Petition to Intervene at 139-51 (Jan. 22, 2008), *available at* ADAMS Accession No. ML080300071 (“Entergy Riverkeeper Answer”); Answer of Entergy Nuclear Operations, Inc. Opposing Hudson River Sloop Clearwater Inc.’s Petition to Intervene and Request for Hearing at 32-49 (Jan. 22, 2008) (“Entergy Clearwater Answer”), *available at* ADAMS Accession No. ML080300053.

¹¹ *See* Entergy Clearwater Answer at 43-44.

¹² *See id.* at 43-44.

¹³ *See id.* at 42-43.

¹⁴ *See id.* at 44-49; Entergy Riverkeeper Answer at -143-44.

¹⁵ NRC Staff’s Response to Petitions for Leave to Intervene Filed by (1) Connecticut Attorney General Richard Blumenthal, (2) Connecticut Residents Opposed to Relicensing of Indian Point, and Nancy Burton, (3) Hudson River Sloop Clearwater, Inc., (4) the State of New York, (5) Riverkeeper, Inc., (6) the Town of Cortlandt, and (7) Westchester County at 90-92, 112-15 (Jan. 22, 2008) (“NRC Staff Answer”), *available at* ADAMS Accession No. ML080230543.

¹⁶ *Indian Point*, LBP-08-13, 68 NRC at 190 (emphasis added).

and CW-EC-1 to the extent it “raised a genuine dispute regarding the significance of the *environmental impacts* from the *spent fuel pool leaks*.”¹⁷

In admitting RK-EC-3/CW-EC-1, the Board made clear it would not allow the Intervenors to challenge settled Commission regulations, which includes the NRC’s dose regulations. Specifically, the Board explained that while “there is still the question as to whether the maximum groundwater impact (and, in turn, the maximum dose) has been determined for the site,” it was not allowing “an impermissible challenge to Commission regulations.”¹⁸ This restriction is consistent with Commission case law and the Board’s emphasis on a license renewal proceeding’s limited scope.¹⁹

Riverkeeper and Clearwater subsequently conferred and submitted Consolidated Contention RK-EC-3/CW-EC-1, which alleged the ER “fails to adequately analyze the *environmental impacts* of *spent fuel pool leaks* as required by the National Environmental Policy Act (NEPA) and NRC regulations.”²⁰ More specifically, the Intervenors identified three main environmental concerns related to SFP leaks: (1) human health impacts; (2) groundwater quality impacts; and (3) Hudson River ecosystem impacts.²¹

The Intervenors subsequently requested that the Board recognize that the Contention applies to the NRC Staff’s Draft and Final Supplemental Environmental Impact Statements.²²

¹⁷ *Id.* at 193 (emphasis added).

¹⁸ *Id.* at 193-94.

¹⁹ *See id.* at 67.

²⁰ Consolidated Contention of Petitioners Riverkeeper, Inc. (EC-3) and Hudson River Sloop Clearwater, Inc. (EC-1)-Spent Fuel Pool Leaks at 2 (Aug. 21, 2008) (“Consolidated Contention”), *available at* ADAMS Accession No. ML082420284.

²¹ *See id.* at 2-4.

²² Riverkeeper, Inc. and Clearwater, Inc. Challenge to NRC Staff’s Assessment of Impacts of Spent Fuel Pool Leaks in the Final Supplemental Environmental Impact Statement at 3 (Feb. 3, 2011), *available at* ADAMS Accession No. ML110410362; Riverkeeper, Inc.’s Challenge to NRC Staff’s Assessment of Impacts of Spent

The Board granted these requests, making no substantive changes to the admitted contention's scope.²³ Thus, RK-EC-3/CW-EC-1, as admitted, is limited to whether the FSEIS and ER sufficiently analyze the environmental significance of Indian Point SFP leaks.

On December 22, 2011, the Intervenors filed their statement of position and direct testimony of Mr. Gundersen and Dr. Stewart.²⁴ Mr. Gundersen, a nuclear engineer, testifies on "the adequacy of the evaluation by Entergy and the NRC Staff of spent fuel pool leaks and groundwater contamination."²⁵ Dr. Gillian Stewart, a professor of Environmental Science at Queens College in New York, testifies about alleged radionuclide impacts to Hudson River aquatic ecology and a potential drinking water pathway involving a proposed desalination facility.²⁶

On January 30, 2012, Entergy filed a Motion in Limine seeking to exclude portions of the Intervenors' direct testimony,²⁷ a motion the NRC Staff supported and the Intervenors opposed.²⁸

Fuel Pool Leaks in the Draft Supplemental Environmental Impact Statement at 3 (Feb. 27, 2009), *available at* ADAMS Accession No. ML090820633.

²³ Licensing Board Memorandum and Order (Ruling on Pending Motions for Leave to File New and Amended Contentions) at 36, 72 (July 6, 2011) (unpublished); Licensing Board Order (Applying Consolidated Contention Riverkeeper EC-3/Clearwater EC-1 to the NRC Staff's Draft Supplemental Environmental Impact Statement) at 1-2 (May 28, 2009) (unpublished).

²⁴ Riverkeeper and Hudson River Sloop Clearwater Initial Statement of Position Regarding Consolidated Contention RK-EC-3/CW-EC-1 (Spent Fuel Pool Leaks) at 39 (Dec. 22, 2011) ("Intervenors SOP") (RIV000059).

²⁵ Prefiled Direct Testimony of Arnold Gunersen Regarding Consolidated Contention RK-EC-3/CW-EC-1 (Spent Fuel Pool Leaks) at 4 (Dec. 21, 2011) ("Gunderson Testimony") (RIV000060).

²⁶ Prefiled Written Testimony of Gillian Stewart Regarding Contention RK0EC-3/CW-EC-1 (Spent Fuel Pool Leaks) at 2:24-28 (Dec. 22, 2011) ("Stewart Testimony") (RIV000061).

²⁷ Entergy's Motion in Limine to Exclude Portions of Intervenors' Pre-filed Testimony and Exhibits for Contention RK-EC-3/CW-EC-1 (Spent Fuel Pool Leaks) (Jan. 30, 2012) ("Entergy Motion in Limine"), *available at* ADAMS Accession No. ML12030A203.

²⁸ NRC Staff's Response in Support of Entergy's Motion in Limine to Exclude Portions of Pre-Filed Testimony and Exhibits for Contention RK-EC-3/CW-EC-1 (Spent Fuel Pool Leaks) (Feb. 9, 2012), *available at* ADAMS Accession No. ML12030A203; Riverkeeper, Inc. and Hudson River Sloop Clearwater, Inc. Opposition to Entergy's Motion in Limine to Exclude Portions of Pre-Filed Testimony and Exhibits for Contention RK-EC-3/CW-EC-1 (Feb. 17, 2012), *available at* ADAMS Accession No. ML12048B457.

In particular, Entergy sought to exclude portions of both the expert testimony of Mr. Gundersen and Dr. Stewart, as well as certain of Intervenors' exhibits, arguing, among other things, that:

(1) Mr. Gundersen and Dr. Stewart each lacks expertise in certain areas covered by their testimony; (2) releases from non-SFP systems, structures, and components ("SSCs") and aging management programs ("AMPs") are outside the scope of RK-EC-3/CW-EC-1; and (3) challenges to dose regulations are prohibited.²⁹

On March 3, 2012, the Board granted the Motion in Limine in part and denied it in part.³⁰ Specifically, the Board excluded portions of Mr. Gundersen's testimony and associated exhibits discussing radiological releases from non-SFP sources and challenging non-SFP SSC AMPs.³¹

On March 16, 2012, the Intervenors filed a Motion for Reconsideration or Clarification of the Board's order granting, in part, Entergy's Motion in Limine.³² The Board denied that request.³³ In doing so, the Board reemphasized that RK-EC-3/CW-EC-1 is limited to "SFP leaks—both as to the leakage that might occur from the SFPs and, after such leakage has occurred, its impacts on groundwater and the Hudson River ecosystem" and that to the extent

²⁹ See Entergy Motion in Limine at 1-2.

³⁰ Licensing Board Order (Granting in Part and Denying in Part Applicant's Motions in Limine) (Mar. 6, 2012) (unpublished).

³¹ *Id.* at 27.

³² Riverkeeper, Inc. and Hudson River Sloop Clearwater, Inc.'s Request Leave to File Motion for Reconsideration and/or Clarification of the ASLB's Ruling on Entergy's Motion in Limine to Exclude Portions of Pre-Filed Testimony and Exhibits for Contention RK-EC-3/CW-EC-1 (Mar. 16, 2012); Riverkeeper, Inc. and Hudson River Sloop Clearwater, Inc.'s Motion for Reconsideration and/or Clarification of the ASLB's Ruling on Entergy's Motion in Limine to Exclude Portions of Pre-Filed Testimony and Exhibits for Contention RK-EC-3/CW-EC-1 (Mar. 16, 2012).

³³ Licensing Board Order (Denying Riverkeeper's and Clearwater's Motion for Reconsideration and/or Clarification) at 2 (Mar. 22, 2012) (unpublished).

that SFP leaks “co-mingle” with other sources in the plumes, it would assess groundwater and Hudson River ecosystem impacts “on a site-wide basis.”³⁴

As a result of the Board orders, Intervenor’s testimony regarding non-SFP releases and AMPs are not addressed in Entergy’s testimony or this Statement.³⁵

III. APPLICABLE LEGAL AND REGULATORY STANDARDS

A. Controlling NEPA Principles

Contention RK-EC-3/CW-EC-1 arises under NEPA, which requires that federal agencies, such as the NRC, prepare an environmental impact statement (“EIS”) in conjunction with “major Federal actions significantly affecting the quality of the human environment.”³⁶ NEPA does not mandate substantive results; rather, it imposes procedural restraints on agencies, requiring them to take a “hard look” at a proposed action’s environmental impacts and reasonable alternatives to that action.³⁷ In this regard, the Commission has emphasized that NRC hearings must focus on whether the “NRC Staff has failed to take a ‘hard look’ at significant environmental questions— i.e., the Staff has unduly ignored or minimized pertinent environmental effects.”³⁸

In determining whether the FSEIS is sufficient under NEPA, the Board considers the record as a whole. The record of decision ultimately includes the adjudicatory record and the

³⁴ *Id.* at 3.

³⁵ Entergy acknowledges the Board’s ruling denying Entergy’s other arguments and addresses those issues in Entergy’s testimony, but does not waive any rights in this regard.

³⁶ 42 U.S.C. § 4332(2)(C).

³⁷ *See La. Energy Servs., L.P. (Claiborne Enrichment Ctr.)*, CLI-98-3, 47 NRC 77, 87-88 (1998); *see also Balt. Gas & Elec. Co. v. Natural Res. Def. Council, Inc.*, 462 U.S. 87, 97-98 (1983) (NEPA requires agency to take a “hard look” at environmental consequences prior to taking major action).

³⁸ *Duke Energy Corp. (McGuire Nuclear Station, Units 1 & 2; Catawba Nuclear Station, Units 1 & 2)*, CLI-03-17, 58 NRC 419, 431 (2003); *see also Exelon Generating Co., LLC (Early Site Permit for Clinton ESP Site)*, CLI-05-29, 62 NRC 801, 811 (2005) (“There may, of course, be mistakes in the [EIS], but in an NRC adjudication, it is Intervenor’s burden to show their significance and materiality. Our boards do not sit to flyspeck environmental documents or to add details or nuances.”) (internal quotes omitted), *aff’d sub nom., Env’tl. Law & Policy Ctr. v. NRC*, 470 F.3d 676 (7th Cir. 2006).

Board decision.³⁹ Thus, in NRC licensing proceedings, “the ultimate NEPA judgments regarding a facility can be made on the basis of the entire record before a presiding officer, such that the EIS can be deemed to be amended *pro tanto*.”⁴⁰ Therefore, the Board may consider the full record before it, including the testimony and exhibits at the hearing, to conclude that “the aggregate is sufficient to satisfy the agency’s obligation under NEPA” to take a “hard look” at license renewal environmental impacts and alternatives.⁴¹

Moreover, in determining whether the NRC has satisfied its obligation, both the Commission and the federal courts have emphasized that there are limits to what can be demanded of an agency.⁴² Overall, the “hard look” requirement is subject to a “rule of reason.”⁴³ As a result, NEPA “does not call for certainty or precision, but an estimate of anticipated (not unduly speculative) impacts.”⁴⁴ Nor must an EIS “be so all-encompassing in scope that the task of preparing it would become either fruitless or well nigh impossible.”⁴⁵ And, because there “will always be more data that could be gathered,” agencies enjoy “discretion to draw the line and move forward with decisionmaking.”⁴⁶

³⁹ See, e.g., *La. Energy Servs.* (Nat’l Enrichment Facility), CLI-06-15, 63 NRC 687, 707 n. 91 (2006) (“Adjudicatory findings on NEPA issues, including our own in this decision, become part of the environmental ‘record of decision’ and in effect supplement the FEIS.”); *LES*, CLI-98-3, 47 NRC at 89 (“In NRC licensing adjudications . . . it is the Licensing Board that compiles the final environmental ‘record of decision’ The adjudicatory record and Board decision . . . become, in effect, part of the FEIS.”).

⁴⁰ *La. Energy Servs.* (Nat’l Enrichment Facility), LBP-05-13, 61 NRC 385, 404 (2005).

⁴¹ *La. Energy Servs.* (Nat’l Enrichment Facility), LBP-06-8, 63 NRC 241, 286 (2006).

⁴² See, e.g., *Metro. Edison Co. v. People Against Nuclear Energy*, 460 U.S. 766, 776 (1983) (“The scope of the agency’s inquiries must remain manageable if NEPA’s goal of ‘ensur[ing] a fully informed and well considered decision,’ is to be accomplished.”).

⁴³ *New York v. Kleppe*, 429 U.S. 1307, 1311 (1976); see also *Dep’t of Transp. v. Pub. Citizen*, 541 U.S. 752, 767-69 (2004) (rule of reason is inherent in NEPA and its implementing regulations).

⁴⁴ *La. Energy Servs., L.P.* (Nat’l Enrichment Facility), CLI-05-20, 62 NRC 523, 536 (2005).

⁴⁵ *Kleppe*, 429 U.S. at 1311 (citing *Natural Res. Def. Council v. Callaway*, 524 F.2d 79, 88 (2d Cir. 1975)).

⁴⁶ *Entergy Nuclear Generation Co.* (Pilgrim Nuclear Power Station), CLI-10-11, 71 NRC 287, 315 (2010).

B. NRC's NEPA Implementing Regulations

The NRC NEPA regulations are set forth in 10 C.F.R. Part 51. In 1996, the Commission amended Part 51 to address the scope of its license renewal environmental review.⁴⁷ To make Part 51 more efficient and focused, the NRC prepared the GEIS to evaluate environmental impacts based on experience gained from existing U.S. nuclear power plant fleet operations.⁴⁸ Based on the GEIS, the NRC divided the license renewal environmental requirements into generic and plant-specific components.⁴⁹

Those issues that could be resolved generically for all plants are designated as “Category 1” issues and are not evaluated further in a license renewal proceeding (absent the Commission waiving or suspending the rule based on new and significant information).⁵⁰ The applicant’s ER addresses remaining plant-specific, “Category 2” issues and “new and significant information” about license renewal environmental impacts.⁵¹ The NRC Staff must then supplement the GEIS, preparing a site-specific evaluation that addresses applicable site-specific Category 2 issues and any “new and significant information.”⁵²

⁴⁷ See Final Rule, Environmental Review for Renewal of Nuclear Power Plant Operating Licenses, 61 Fed. Reg. 28,467 (June 5, 1996), *amended by* 61 Fed. Reg. 66,537 (Dec. 18, 1996).

⁴⁸ See Final Rule, Environmental Review for Renewal of Nuclear Power Plant Operating Licenses, 61 Fed. Reg. at 28,490; *see also* NUREG-1437, Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Final Report, Vols. 1 & 2 (May 1996), *available at* ADAMS Accession Nos. ML040690705 and ML040690738 (“GEIS”).

⁴⁹ See Final Rule, Environmental Review for Renewal of Nuclear Power Plant Operating Licenses, 61 Fed. Reg. at 28,490.

⁵⁰ Final Rule, Environmental Review for Renewal of Nuclear Power Plant Operating Licenses, 61 Fed. Reg. at 28,468, 28,470, 28,474; *Fla. Power & Light Co.* (Turkey Point Nuclear Generating Plant, Units 3 & 4), CLI-01-17, 54 NRC 3, 12 (2001).

⁵¹ See 10 C.F.R. § 51.53(c); *Turkey Point*, CLI-01-17, 54 NRC at 11-12.

⁵² 10 C.F.R. § 51.53(c)(3)(ii), (iv).

The NRC codified its generic findings and this classification of issues in Table B-1, Appendix B to Subpart A of 10 C.F.R. Part 51 (“Table B-1”). Table B-1 assigns significance levels for environmental issues based on the following definitions:

SMALL: Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource. For the purposes of assessing radiological impacts, the Commission has concluded that *those impacts that do not exceed permissible levels in the Commission’s regulations are considered small.*

MODERATE: Environmental effects are sufficient to alter noticeably, but not to destabilize, any important attributes of the resource.

LARGE: Environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.⁵³

NRC regulatory guidance defines “new and significant information” as: (1) information that identifies a significant environmental issue that was not considered in the GEIS and, consequently, is not codified in Table B-1; or (2) information that was not considered in the analyses summarized in the GEIS and that leads to an impact finding different from that codified in 10 C.F.R. Part 51.⁵⁴

C. **NRC’s NEPA Regulations on Human Health, Groundwater, and Ecological Impacts**

As noted above, RK-EC-3/CW-EC-1 identifies three main environmental concerns related to the Indian Point SFP leaks: (1) potential human health impacts; (2) potential groundwater quality impacts; and (3) potential aquatic ecology impacts.

⁵³ 10 C.F.R. Pt. 51, Subpt. A, App. B, Tbl. B-1 (emphasis added).

⁵⁴ Regulatory Guide 4.2, Supp. 1, Preparation of Supplemental Environmental Reports for Application to Renew Nuclear Power Plant Operating Licenses, 4.2-S-4 (Sept. 2000) (“RG 4.2S1”) (ENT000338).

With regard to the potential for human health impacts due to radiation exposures to the public, the GEIS concludes that radiation exposure from power reactor operation is a “Category 1” issue with SMALL significance.⁵⁵ SMALL is defined as not exceeding the Commission’s dose limits.⁵⁶ Table B-1 codifies this finding and indicates that license renewal-related radiation exposure has a SMALL significance level because “[r]adiation doses to the public will continue at current levels associated with normal operations.”⁵⁷ Thus, any challenge to human health impacts that turns on contesting the conclusion that SMALL effects will occur absent a violation of NRC dose regulations is contrary to Table B-1 and impermissible.⁵⁸

The GEIS also considered groundwater quality impairments, including potential tritium contamination impacts.⁵⁹ The GEIS concluded that groundwater quality impacts have SMALL significance when a plant does not contribute to changes in groundwater quality that preclude current and future groundwater uses.⁶⁰ The GEIS specifically considered low-level groundwater contamination at the Prairie Island nuclear power plant site and concluded that “the contribution of plant operations (during the license renewal period) to the cumulative impacts of major activities on groundwater quality would be relatively small.”⁶¹ Table B-1, however, does not list

⁵⁵ GEIS at 4-95 (NYS00131B).

⁵⁶ 10 C.F.R. Pt. 51, Subpt. A, App. B, Tbl. B-1.

⁵⁷ *Id.*

⁵⁸ *See Dominion Nuclear Conn., Inc.* (Millstone Nuclear Power Station, Units 2 & 3), CLI-01-24, 54 NRC 349, 364 (2001) (“If the Petitioners are objecting to all possible routine adjustments in effluent releases, then their claim amounts to an impermissible general attack on our regulations governing public doses at operating nuclear plants.”); *Entergy Nuclear Generation Co.* (Pilgrim Nuclear Power Station), LBP-06-23, 64 NRC 257, 315 (2006) (refusing to allow litigation on contention argument suggesting “doses not in violation of NRC regulations might be harmful to health”).

⁵⁹ *See* GEIS at 4-118 (NYS00131B).

⁶⁰ *See id.* at 4-119.

⁶¹ *Id.*

groundwater quality impacts due to radiological contamination as a Category 1 or Category 2 issue.

Third, the GEIS and Table B-1 list several issues related to ecological impacts.⁶² However, none of these issues address specifically the potential radionuclide impacts on aquatic organisms from SFP leaks during the license renewal term. But, as discussed fully in Entergy's testimony, radiation dose limits protective of persons are also protective of other species.⁶³

D. NRC's Dose Limits and Environmental Monitoring Requirements

The Atomic Energy Act requires that the NRC "promulgate, inspect and enforce standards that provide an adequate level of protection of the public health and safety and the environment."⁶⁴ In carrying out this obligation, NRC regulations conservatively provide a margin of safety.⁶⁵

Regulations in 10 C.F.R. Part 20, establish standards to protect against radiation resulting from NRC licensee activity. Part 20 incorporates by reference the EPA environmental radiation protection standard, which imposes dose limits to any member of the public from planned radioactive materials discharges to the general environment from uranium fuel cycle operations (which includes nuclear power plant operations).⁶⁶

In addition, 10 C.F.R. Part 50 places further restrictions on public dose from nuclear power plant operations. Specifically, 10 C.F.R. § 50.36a imposes conditions on nuclear power reactor effluents, requiring operators to keep "as low as reasonably achievable" ("ALARA")

⁶² See, e.g., 10 C.F.R., Pt. 51, Subpt. A, App. B, Tbl. B-1 (listing various aquatic ecology-related Category 1 and 2 issues).

⁶³ Entergy Test. at A139 (ENT000301).

⁶⁴ Final Rule, Environmental Review for Renewal of Nuclear Power Plant Operating Licenses, 61 Fed. Reg. at 28,476 (NYS000127).

⁶⁵ *Id.*

⁶⁶ 10 C.F.R. § 20.1301(e); 40 C.F.R. § 190.10(a).

radioactive material effluent releases to unrestricted areas during normal operations, including expected occurrences (*e.g.*, leaks and spills). Appendix I to 10 C.F.R. Part 50 establishes numerical design objectives to meet the ALARA requirement.⁶⁷

These Appendix I numerical design objectives are a fraction of the Part 20 limits (including the EPA 40 C.F.R. § 190.10 limits). Thus, in practice, because the Part 50, Appendix I design objectives are far more restrictive than Part 20 allowable dose limits or effluent concentration levels, the Part 50, Appendix I ALARA objectives are controlling for power reactor licensees. The relevant NRC and EPA limits are summarized in the GEIS and reproduced below.

⁶⁷ See 10 C.F.R. § 50.36a(b).

Table E.4 Ten CFR Part 50, Appendix I, design objectives and annual limits on radiation doses to the general public from nuclear power plants^a

Tissue	Gaseous	Liquid
Total body	5 mrem	3 mrem
Any organ (all pathways)	—	10 mrem
Ground-level air dose	10 mrad gamma and 30 mrad beta	—
Any organ ^b (all pathways)	15 mrem	—
Skin	15 mrem	—

^aCalculated doses.

^bParticulates, radioiodines.

Note: To convert millirem to millisievert, multiply by 0.01.

Table E.5 Forty CFR 190, Subpart B, annual limits on doses to the general public from nuclear power operations^a

Tissue	Limit	Source
Total body	25 mrem	All effluents and direct radiation from nuclear power operations
Thyroid	75 mrem	"
Any other organ	25 mrem	"

^aCalculated doses.

Note: To convert millirem to millisievert, multiply by 0.01.

Source: GEIS at E-10 (NYS00131H)

To demonstrate compliance with these dose limits, NRC regulations require licensees to monitor and control radioactive materials in effluents released to unrestricted and controlled areas, regardless of their source, including planned and unplanned releases.⁶⁸ For example, licensees must submit to the NRC an Annual Radioactive Effluent Release Report, stating the

⁶⁸ 10 C.F.R. § 20.1302; *see also* SECY-11-0019, Senior Management Review of Overall Regulatory Approach to Groundwater Protection, Encl. 2, at 2 (Regulatory Framework) (ENT000322).

amount of radioactive material released to the environment during the past year.⁶⁹ In addition, NRC regulations require that licensees survey radiation levels in both unrestricted and controlled areas as part of a Radiological Environmental Monitoring Program, the results of which are reported to the NRC in an Annual Radiological Environmental Operating Report.⁷⁰ Each licensee has an Offsite Dose Calculation Manual, which the NRC Staff regularly inspects, that establishes procedures implementing these requirements.⁷¹

E. Burden of Proof

At the hearing stage, an intervenor has the initial “burden of going forward”; *i.e.*, it must provide sufficient evidence to support the claims made in the admitted contention.⁷² The mere admission of the contention does not satisfy that burden. Moreover, an intervenor cannot meet its burden by relying on unsupported allegations and speculation.⁷³ Rather, it must introduce sufficient evidence during the hearing phase to establish a *prima facie* case.⁷⁴ If it does so, then the burden shifts to the applicant to provide sufficient evidence to rebut the intervenor’s

⁶⁹ 10 C.F.R. § 50.36a(a)(2)

⁷⁰ See 10 C.F.R. Pt. 50, App. I § IV.B.

⁷¹ See *Millstone*, CLI-01-24, 54 NRC at 354-55.

⁷² *AmerGen Energy Co., LLC* (Oyster Creek Nuclear Generating Station), CLI-09-7, 69 NRC 235, 269 (2009) (quoting *Consumers Power Co.* (Midland Plant, Units 1 & 2), ALAB-123, 6 AEC 331, 345 (1973)) (“The ultimate burden of proof on the question of whether the permit or license should be issued is . . . upon the applicant. But where . . . one of the other parties contends that, for a specific reason . . . the permit or license should be denied, that party has the *burden of going forward* with evidence to buttress that contention. Once he has introduced sufficient evidence to establish a *prima facie* case, the burden then shifts to the applicant who, as part of his overall burden of proof, must provide a sufficient rebuttal to satisfy the Board that it should reject the contention as a basis for denial of the permit or license.”), *aff’d sub nom. N.J. Envtl. Fed’n v. NRC*, 645 F.3d 220 (2011); see also *Vt. Yankee Nuclear Power Corp. v. NRDC*, 435 U.S. 519, 554 (1978) (upholding this threshold test for intervenor participation in licensing proceedings); *Phila. Elec. Co.* (Limerick Generating Station, Units 1 & 2), ALAB-262, 1 NRC 163, 191 (1975) (holding that the intervenors had the burden of introducing evidence to demonstrate that the basis for their contention was more than theoretical).

⁷³ See *Oyster Creek*, CLI-09-7, 69 NRC at 268-70; see also *Phila. Elec. Co.* (Limerick Generating station, Units 1 & 2), ALAB-857, 25 NRC 7, 13 (1987) (stating that an intervenor may not merely assert a need for more current information without having raised any questions concerning the accuracy of the applicant’s submitted facts).

⁷⁴ See *Oyster Creek*, CLI-9-07, 69 NRC at 268-70.

contention.⁷⁵ While the NRC Staff, not the applicant, has the burden of complying with NEPA,⁷⁶ the applicant also has the burden of proof in licensing proceedings if it becomes a proponent of the challenged portion of the Staff's FSEIS.⁷⁷ Ultimately, a preponderance of the evidence must support the applicant's position.⁷⁸

IV. ARGUMENT

A. Entergy's Witnesses

This Statement of Position on RK-EC-3/CW-EC-1 summarizes testimony from Entergy's witnesses listed below. The testimony, evidence, and opinions these witnesses present are based on their technical and regulatory expertise, professional experience, and personal knowledge of the issues raised in RK-EC-3/CW-EC-1. Collectively, these witnesses demonstrate that RK-EC-3/CW-EC-1 lacks merit.

1. **Donald M. Mayer**

Mr. Mayer, Entergy's Director of IP1, manages and has overall project direction of the retired IP1 plant. As summarized in his *curriculum vitae* (ENT000302), he holds a Master of Radiological Sciences degree from the University of Massachusetts-Lowell and a Master of Business Administration ("MBA") degree from Mt. St. Mary College in Newburg, New York. Mr. Mayer has more than 28 years of professional experience in Radiation Protection and Project Management and has been a Certified Health Physicist since 1988.

⁷⁵ See, e.g., 10 C.F.R. § 2.325; *La. Power & Light Co.* (Waterford Steam Electric Station, Unit 3), ALAB-732, 17 NRC 1076, 1093 (1983) (citing *Midland*, ALAB-123, 6 AEC at 345).

⁷⁶ See, e.g., *Duke Power Co.* (Catawba Nuclear Station, Units 1 & 2), CLI-83-19, 17 NRC 1041, 1049 (1983).

⁷⁷ *La. Energy Servs., L.P.* (Claiborne Enrichment Ctr.), LBP-96-25, 44 NRC 331, 338-39 (1996) (citing *Pub. Serv. Co. of N.H.* (Seabrook Station, Units 1 & 2), ALAB-471, 7 NRC 477, 489 n.8 (1978), *rev'd on other grounds*, CLI-97-15, 46 NRC 294 (1997)).

⁷⁸ See *Pac. Gas & Elec. Co.* (Diablo Canyon Nuclear Power Plant, Units 1 & 2), ALAB-763, 19 NRC 571, 577 (1984).

During the 2005 to 2009 timeframe, Mr. Mayer managed the Indian Point groundwater investigation, including the hydrogeological, remedial, and radiological aspects of the investigation, and which culminated in a January 11, 2008 Site Investigation Report and comprehensive Long-Term Groundwater Monitoring Program. Based on this experience, Mr. Mayer is familiar with the history and status of IP1 and IP2 SFP leaks, as well as issues related to SFP remediation activities, groundwater monitoring (including the results of ongoing Indian Point groundwater monitoring), dose assessments, NRC inspection activities, and other independent SFP leak assessments, including NYSDEC and the United States Geological Survey (“USGS”) assessments.

2. Alan B. Cox

Mr. Cox is Entergy’s Technical Manager, License Renewal and, since 2001, has worked full-time on license renewal supporting the development of integrated plant assessments and LRAs for Entergy and other utilities. As summarized in his *curriculum vitae* (ENT000031), he is a member of the Nuclear Energy Institute (“NEI”) License Renewal Task Force and has been a past representative on NEI license renewal working groups. Mr. Cox has participated in developing nine LRAs and in peer reviewing at least twelve additional LRAs. He holds a Bachelor of Science degree in Nuclear Engineering from the University of Oklahoma and an MBA from the University of Arkansas at Little Rock, and has more than 34 years of nuclear power industry experience.

As Technical Manager, Mr. Cox directly participated in preparing the Indian Point LRA, and in developing and reviewing required aging management program (“AMP”) descriptions. He is also directly involved in developing or reviewing Entergy responses to NRC Staff Requests for Additional Information (“RAIs”) concerning the Indian Point LRA. Based on this

experience, Mr. Cox is familiar with NRC's license renewal regulations and Entergy's programs to manage the effects of aging on the IP2 and IP3 SFPs.

3. Thomas C. Esselman

Dr. Esselman is a Principal at Lucius Pitkin, Inc., a company that provides wide-ranging engineering services to the nuclear power, energy generation and distribution, aerospace, petrochemical, and infrastructure industries. As summarized in his *curriculum vitae* (ENT000303), Dr. Esselman has over 35 years of engineering experience, including experience in component and structure performance analysis, aging, stress analysis, dynamics, seismic design and analysis, mechanical design, thermo-hydraulics, materials, materials degradation, and failure analysis. He holds a Bachelor of Science degree in Mechanical Engineering, and a Master of Science degree and a Ph.D. in Engineering Mechanics, all from Case Western Reserve University.

Throughout his career, Dr. Esselman has worked periodically with the Indian Point plants, including on assessments of IP1 and IP2 SFPs' integrity, leak detection, and fitness-for-service. Based on this experience, Dr. Esselman is familiar with the Indian Point SFPs' design, leak investigations, and analyses, including SFP aging evaluations.

4. Matthew J. Barvenik

Mr. Barvenik is a Senior Principal and Senior Technical Consultant with GZA GeoEnvironmental, Inc. ("GZA"), a company that provides wide-ranging geotechnical engineering, environmental consulting, and remediation services. As summarized in his *curriculum vitae* (ENT000304), Mr. Barvenik has over 35 years of professional experience in hydrogeology, civil, geotechnical, and instrumentation engineering, and has focused on contaminated soil and groundwater investigation and remediation. He holds a Bachelor of Science degree in Civil Engineering from Northeastern University and a Master of Science

degree in Geotechnical Engineering from the Massachusetts Institute of Technology.

Mr. Barvenik is a registered Licensed Site Professional in Massachusetts and a member of the American Nuclear Society (“ANS”). He served on the ANS Working Group responsible for the recently completed standard for Evaluation of Subsurface Radionuclide Transport at Commercial Nuclear Power Plants, and is a member of two newly-formed ANS Working Groups responsible for drafting standards on the evaluation of groundwater supplies and remediation methods for nuclear power sites.

Since the identification of the IP2 SFP shrinkage crack in September 2005, Mr. Barvenik has served as the lead technical investigator for the Indian Point hydrogeologic site characterization program, including the January 11, 2008 Site Investigation Report, the Site Conceptual Model, the Long-Term Groundwater Monitoring Program, and the radionuclide mass flux portion of dose computations. Based on this experience, Mr. Barvenik is familiar with the Indian Point hydrogeologic setting and groundwater flow patterns, identified contaminant sources and transport, historical and ongoing groundwater monitoring efforts, and current remediation plans. Mr. Barvenik is also familiar with the history and status of Indian Point SFP leaks, corresponding dose assessments, and associated NRC, NYSDEC, and USGS inspection activities.

5. Carl J. Paperiello

Dr. Paperiello is a Senior Nuclear Consultant with Talisman International, LLC. As summarized in his *curriculum vitae* (ENT000305), he has more than 40 years of professional experience in health physics, nuclear physics, environmental radiochemical analysis, and nuclear spectroscopy. Dr. Paperiello was an NRC Staff member from 1975 to 2006 where he served in multiple leadership positions, including as Director of the Office of Nuclear Regulatory Research, Director of the Office of Nuclear Materials Safety and Safeguards, and Deputy

Executive Director for Materials, Research, and State Programs. He holds a Bachelor of Science degree in Physics from the LaSalle College and a Ph.D. in Nuclear Physics from the University of Notre Dame. He has been certified in Comprehensive Health Physics since 1975 and was recently re-elected a Councilor for the National Council for Radiological Protection and Measurements (“NCRP”), the organization chartered by the U.S. Congress to make recommendations on radiation protection and measurements.⁷⁹ In 2011, he was elected a Fellow of the Health Physics Society.

Dr. Paperiello has extensive experience developing and applying NRC regulations and programs addressing radionuclide effluent releases and environmental monitoring. Furthermore, he is familiar with the Indian Point Offsite Dose Calculation Manual, Annual Radioactive Effluent Release Reports, and Annual Radiological Environmental Operating Reports. Based on this experience, Dr. Paperiello is familiar with Indian Point’s compliance with NRC dose regulations and the potential for human health impacts.

6. F. Owen Hoffman

Dr. Hoffman is president and director of SENES Oak Ridge, Inc. Center for Risk Analysis, an organization that specializes in human health and ecological risk estimation, risk assessment, and risk communication. As summarized in his *curriculum vitae* (ENT000306), Dr. Hoffman has more than 39 years of experience in issues related to evaluating human and ecological risk from the release and transport of radionuclides and chemicals in terrestrial and aquatic systems. He is a Distinguished Emeritus Member of the NCRP and formerly a corresponding member of the International Commission on Radiological Protection (“ICRP”), a renowned independent, international advisory organization that provides recommendations and

⁷⁹ See *Cellular Phone Taskforce v. F.C.C.*, 205 F.3d 82, 87 (2d Cir. 2000).

guidance on radiation protection. Dr. Hoffman is also a consultant to the United Nations Scientific Committee on the Effects of Atomic Radiation (“UNSCEAR”). He holds a Bachelor of Science degree in Biological Conservation from the San Jose State College, a Master of Science degree in Fisheries Limnology from Oregon State University, and a Ph.D. in Ecology, with a specialty in Radiation Ecology, from the University of Tennessee.

Dr. Hoffman has extensive experience assessing human health and aquatic biota impacts from radionuclide releases, including releases to aquatic environments. Furthermore, he is familiar with the Indian Point Offsite Dose Calculation Manual, Annual Radioactive Effluent Release Reports, and Annual Radiological Environmental Operating Reports. Dr. Hoffman has also independently assessed the radiological impacts to the Hudson River ecosystem from Indian Point SFP leaks to site groundwater. Based on this experience, Dr. Hoffman is familiar with Indian Point’s compliance with NRC dose regulations, and the potential for human health and aquatic biota impacts.

B. Entergy’s Statement of Position

In their testimony, Entergy’s experts explain why the NRC Staff FSEIS appropriately concludes that, while new, information regarding radionuclide leaks from IP1 and IP2 SFPs into the groundwater and Hudson River ecosystem is not significant. To establish the foundation necessary to evaluate SFP leaks, Entergy’s experts provide background on the Indian Point site and surrounding area; IP1 and IP2 SFP leaks; and the details and results from the extensive Indian Point Site Hydrogeologic Study, submitted to the NRC in January 2008, and subsequently from the Long-Term Groundwater Monitoring Program. In addition, Entergy’s experts summarize the NRC Staff’s and the New York State Department of Environmental Conservation’s (“NYSDEC”) independent assessments of the IP1 and IP2 SFP leaks, confirming the results of Entergy’s extensive analyses. Entergy’s experts then demonstrate that the SFP

leaks' environmental impacts on human health, groundwater quality, and ecological resources are SMALL, as that term is used in long-standing NRC regulations. In doing so, Entergy's experts address and refute the Intervenor's evidence point-by-point, thereby demonstrating that Contention RK-EC-3/CW-EC-1 and supporting evidentiary submissions lack legal, factual, and technical merit. Key aspects of their detailed testimony are summarized below.

1. The Indian Point Site

In Section V of Entergy's testimony, Messrs. Mayer and Barvenik provide an overview of the Indian Point site, explaining that IP2 has operated since August 1974, and IP3 since August 1976.⁸⁰ Entergy purchased IP3 from the New York Power Authority in 2000 and IP2 from Consolidated Edison in 2001.⁸¹

IP1, which is located between IP2 and IP3, ceased operations in October 1974 and is currently in safe storage condition ("SAFSTOR") until decommissioning is performed in conjunction with the decommissioning of IP2.⁸² When Entergy purchased IP2 from Consolidated Edison in 2001, it also purchased IP1.⁸³

Indian Point is located on the eastern bank of the Hudson River, in the Village of Buchanan, in upper Westchester County, New York.⁸⁴ Indian Point does not utilize groundwater, either for plant operations or for potable water.⁸⁵ In fact, there are no active

⁸⁰ Entergy Test. at A58 (ENT000301).

⁸¹ *Id.*

⁸² *Id.*

⁸³ *Id.*

⁸⁴ *Id.* at A59; FSEIS at 1-6 (NYS00133A).

⁸⁵ Entergy Test. at A60(ENT000301).

potable water wells in the vicinity of Indian Point.⁸⁶ Instead, drinking water in the area surrounding Indian Point is supplied from surface water reservoirs located in Westchester County and the Catskills region.⁸⁷ The nearest of these reservoirs is the Camp Field Reservoir, which is located 3.3 miles north-northeast of Indian Point, in a cross-gradient direction (*i.e.*, perpendicular to the direction that groundwater flows), several watersheds away and at an elevation more than 300 feet above the Indian Point power block.⁸⁸

2. Indian Point SFP Leaks

In Sections V and VI of the testimony, Mr. Mayer, Dr. Esselman, and Mr. Barvenik describe the Indian Point SFPs and provide an overview of the history of IP1 and IP2 SFP leaks.⁸⁹ Entergy has identified no leaks from the IP3 SFP.⁹⁰

a. IP1 SFP Leaks

Entergy's witnesses explain that the previous owner identified ongoing IP1 SFP leaks in 1992, and subsequent investigations by the previous owner and NRC Staff concluded the releases were well within the 10 C.F.R. Part 50 ALARA dose guidelines.⁹¹ The previous owner's corrective actions focused on identifying potential leakage paths within the IP1 plant structures, including groundwater collected in the external IP1 building foundation drain system.⁹²

⁸⁶ FSEIS at 2-111 (NYS00133A); *see also* NYSDEC 2007 Community Fact Sheet at 1 (Sept. 2007) (ENT000325).

⁸⁷ *See* GZA Geoenvironmental, Inc., Hydrogeologic Site Investigation Report at 14 (Jan. 7, 2008) ("Site Investigation Report") (ENT00331A).

⁸⁸ Entergy Test. at A61 (ENT000301).

⁸⁹ *See id.* at A58-76.

⁹⁰ *Id.* at A76.

⁹¹ *See* NRC Inspection Report Nos. 05000003/200710, 05000247/2007010, at 11-12 (May 13, 2008) ("May 13, 2008 NRC Inspection Report") (RIV000067).

⁹² Entergy Test. at A66 (ENT000301).

After completing the purchase of the Indian Point units in September 2001, Entergy began planning to install a separate, more effective and efficient system foundation drain treatment system, which became fully operational by February 2004.⁹³ Entergy believed that this system was adequately capturing the leakage from the IP1 SFPs until 2006, when Entergy discovered that some of the leakage had bypassed the foundation drain systems.⁹⁴ By this time, however, Entergy already had begun to take proactive efforts to empty and drain the IP1 SFPs.⁹⁵ In late 2008, IP1 SFP leakage was permanently stopped when Entergy removed all the spent fuel from the IP1 SFPs and subsequently drained the pool water.⁹⁶ As such, the IP1 SFPs are no longer an active source of radionuclides to the subsurface.⁹⁷

b. IP2 SFP Leaks

Entergy's witnesses also describe Entergy's comprehensive site investigations following the discovery in August 2005 of shrinkage cracks exhibiting moisture on an excavated exterior IP2 SFP wall.⁹⁸ Entergy installed a temporary collection device over these cracks to collect any leaking liquid and, in January 2006, prior to backfilling the excavation, installed a permanent leak collection device directly over the cracks, from which collected water is piped to an adjacent building where it is sampled and its volume measured prior to final processing.⁹⁹

⁹³ *Id.* at A66.

⁹⁴ *Id.*

⁹⁵ *Id.*

⁹⁶ See E-mail from Donald Mayer, Entergy, to John White, NRC, "Indian Point 1" (Nov. 5, 2008) ("Mayer Nov. 5, 2008 E-mail") (ENT000324).

⁹⁷ Entergy Test. at A66 (ENT000301).

⁹⁸ Entergy's witnesses also discuss an earlier IP2 SFP leak identified in 1992 by the former previous owner, which was caused by an inadvertent maintenance error that resulted in a liner puncture and was repaired in 1992. See *id.* at A68.

⁹⁹ *Id.* at A69.

During the course of investigating potential SFP leakage sources from 2005 through 2007, Entergy inspected the IP2 SFP using several techniques, including the use of robotic cameras, general visual inspections, and vacuum box testing using divers on areas of the IP2 SFP liner that were suspect based on general visual and robotic camera inspections.¹⁰⁰ As part of these efforts, in 2007, Entergy drained the IP2 SFP canal used to transfer spent fuel from the reactor to the main portion of the pool to inspect its stainless steel liner and identified a pinhole leak in a single weld imperfection, which it repaired in December 2007.¹⁰¹ Entergy determined that the IP2 transfer canal leak likely released tritiated pool water into the interstitial space between the SFP liner plates and the SFP walls when the transfer canal was filled above the elevation of the imperfection.¹⁰² Although Entergy repaired the transfer canal leak in December 2007, it is likely that maintaining water in the transfer canal during normal plant operations resulted in a generally-continuous release of SFP water into the interstitial space behind the liner over time, and then potentially into the groundwater.¹⁰³

As discussed in more detail below, following these repairs, the overall quarterly groundwater monitoring data indicate that tritium activity in the IP2 SFP plume have been undergoing long-term, overall reductions.¹⁰⁴ Ongoing investigations into more recently-observed increased flow to the leak collection device (*i.e.*, flow rates averaging 1.5 liters per day) indicate that the flow is attributable, at least in part, to prior transient raising of the SFP water to levels above the elevation at which several underwater lighting electrical junction boxes are

¹⁰⁰ *Id.* at A71.

¹⁰¹ *Id.* at A69. This leak was identified after Entergy submitted the Indian Point LRA.

¹⁰² *Id.*

¹⁰³ *Id.*

¹⁰⁴ *Id.* at A70.

mounted.¹⁰⁵ This leak path has been temporary repaired through sealing the light boxes, and those boxes are planned to be removed and permanently sealed.¹⁰⁶ Notwithstanding the negligible dose associated with such leakage, which is discussed in more detail later, additional evaluations are ongoing.¹⁰⁷

c. Integrity of the IP2 SFP

In Section VI of the testimony, Entergy's witnesses, including, Mr. Mayer and Dr. Esselman, explain that since the discovery of the IP2 SFP hairline cracks in 2005, Entergy has employed several inspection techniques, including the use of robotic cameras, general visual inspections, and divers performing vacuum box testing on areas of the IP2 SFP liner that were suspect based on general visual and robotic camera inspections.¹⁰⁸ Overall, Entergy has inspected greater than 65 percent of the IP2 SFP liner, including the transfer canal liner.¹⁰⁹ Entergy has identified no liner leaks other than the IP2 transfer canal pinhole leak repaired in December 2007.¹¹⁰

Dr. Esselman further explains that previously-identified IP2 SFP leaks were not the result of age-related degradation mechanisms, and SFP inspections and analyses have not identified aging mechanisms that would cause a SFP leak or that would increase the size of any undetected existing leak.¹¹¹ Entergy has identified no leaks from the IP3 SFP.¹¹²

¹⁰⁵ *See id.* .

¹⁰⁶ *See id.*

¹⁰⁷ *See id.*

¹⁰⁸ *Id.* at A71.

¹⁰⁹ *Id.* at A72.

¹¹⁰ *Id.* at A69.

¹¹¹ *Id.* at A38, 145.

¹¹² *Id.* at A73.

3. Comprehensive Groundwater Investigations

As Mr. Barvenik explains in Section VII of Entergy's testimony, following the discovery of the IP2 SFP hairline cracks in September 2005, Entergy conducted a comprehensive, multi-year groundwater investigation of all three Indian Point reactor units and surrounding areas.¹¹³ The purpose of the investigation was to identify the nature and extent of radiological groundwater contamination and, by using state-of-the-practice science and technology, assess the hydrogeologic implications and extent of radiological groundwater contamination.¹¹⁴ This led to the development of the January 11, 2008 Site Investigation Report; a key component of which was the Conceptual Site Model, which provides a thorough understanding of site groundwater flow and radionuclide transport at Indian Point.¹¹⁵

As Mr. Barvenik details in Section VIII of Entergy's testimony, these investigations provided the foundation necessary for Entergy to establish a Long-Term Groundwater Monitoring Program, which allows Entergy to monitor the existing plumes and to monitor for potential future releases to the subsurface.¹¹⁶ The groundwater monitoring network is extensive—it contains over 150 depth-specific sampling locations at 65 monitoring installations, which allows Entergy to sample groundwater at various depths from the groundwater surface to over 300 feet below the top of bedrock.¹¹⁷ Under the Long-Term Groundwater Monitoring Program, Entergy conducts groundwater monitoring and sampling activities, and evaluates the

¹¹³ *Id.* at A77.

¹¹⁴ *Id.*

¹¹⁵ *Id.* at A94.

¹¹⁶ *Id.* at A93-95.

¹¹⁷ *Id.* at A95.

data for four primary purposes: dose computations, SSC leak detection, off-site migration monitoring, and plume attenuation monitoring.¹¹⁸

Mr. Barvenik explains in Section IX of the testimony that, as a result of the hydrogeologic investigation and continued groundwater monitoring, Entergy determined that groundwater flows into the Indian Point power block area from the north, east and south, and then flows to the Hudson River to the west; *i.e.*, groundwater, and any radionuclides contained in the groundwater, do not flow off the site from the power block area, except to the Hudson River.¹¹⁹

In addition, Mr. Barvenik explains that Entergy has identified two distinct “plumes” of groundwater containing radionuclides; one containing principally tritium, and one containing principally strontium.¹²⁰ As a result of site hydrogeology work, and further investigation, Entergy has concluded that the “tritium plume” is primarily a result of releases from the IP2 SFP and the “strontium plume” is primarily a result of past releases from IP1 SFPs.¹²¹

Mr. Barvenik also demonstrates the worst case tritium and strontium plumes existed prior to termination of the historic releases from the IP1 and IP2 SFPs, but that the total activity of these two plumes has subsequently been decreasing, with periodic, localized fluctuations in activity and overall reductions in the rate of decrease with time, as would be expected.¹²² As

¹¹⁸ *Id.* at A95.

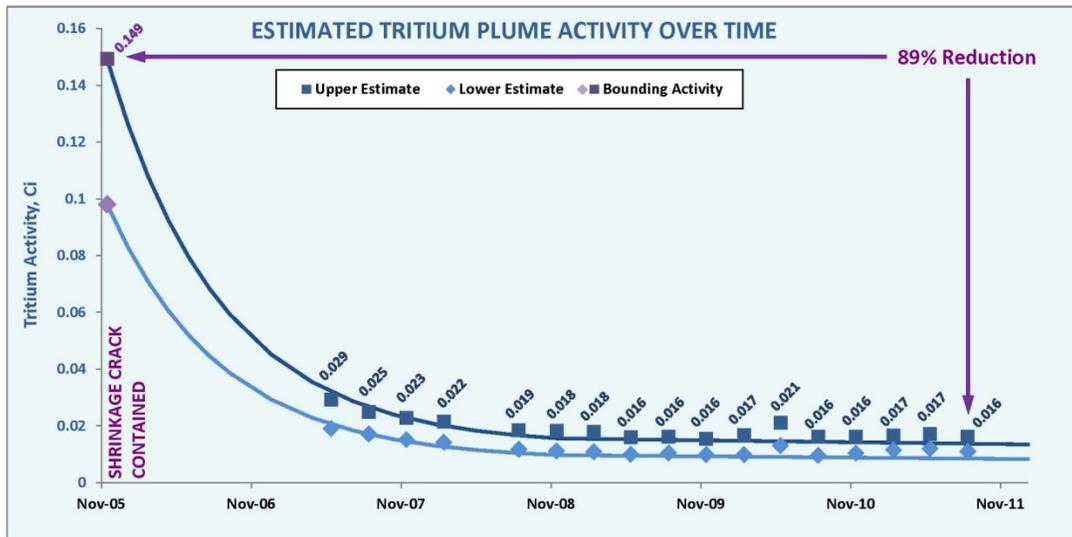
¹¹⁹ *Id.* at A96.

¹²⁰ *Id.* at A97.

¹²¹ *Id.* at A97, 100.

¹²² *Id.* at A99.

shown below, the total amount of tritium in the IP2 plume has decreased substantially—approximately 89 percent—since the shrinkage crack leaks were contained in late 2005.¹²³



Source: GZA, Changes in Computed Tritium Plume Total Activity Over Time - Exponential Decay Curve Trending of Quarterly Data through Q3 2011 (ENT000332).

Entergy’s witnesses also explain that the existing monitoring systems consist of an extensive network of over 150 depth-specific sampling locations at 65 monitoring installations, site storm drains, sumps, and building footing drains.¹²⁴ As they explain, these systems provide reasonable assurance that Entergy can readily detect future releases of radionuclides to groundwater that are substantially smaller than the historically-identified and corrected IP2 SFP leaks.¹²⁵ Entergy will therefore be able to take appropriate corrective actions if any such future releases are detected.¹²⁶

¹²³ *Id.* at A100.

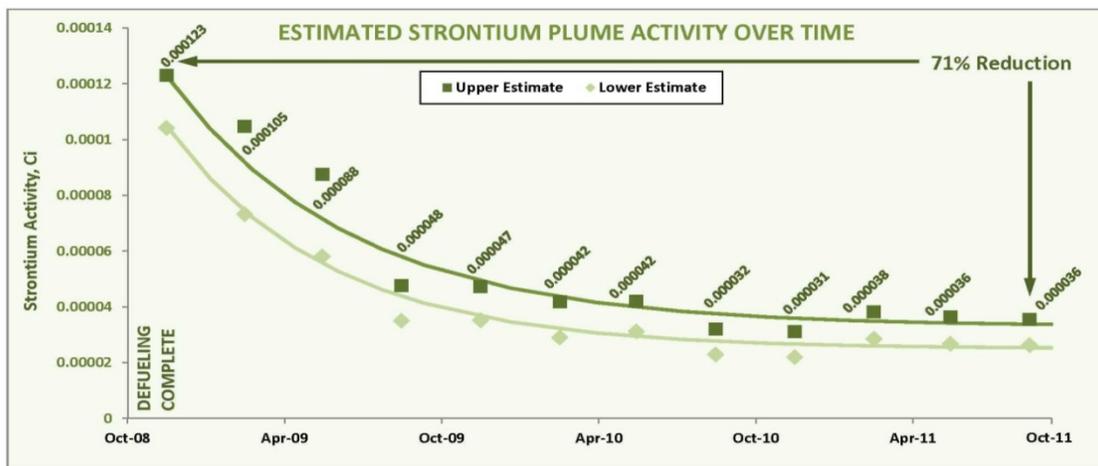
¹²⁴ *Id.* at A77, 95.

¹²⁵ *Id.* at A101.

¹²⁶ *Id.*

To the extent that a small, undetected leak may still exist, it must be smaller than those identified and repaired by Entergy, given the subsequent attenuation of the tritium plume.¹²⁷ Moreover, there is no indication that this leakage, if it exists, has resulted in any material increase in the tritium plume.¹²⁸

The total amount of strontium in the IP1 plume has also decreased substantially—approximately 70 percent—since the spent fuel was removed from the IP1 SFPs and the pool water was drained in late 2008.¹²⁹



Source: GZA, Changes in Computed Strontium Plume Total Activity Over Time - Exponential Decay Curve Trending of Quarterly Data through Q3 2011(ENT000333).

4. Monitored Natural Attenuation

As discussed in Section IX of Entergy’s testimony, extensive site investigations led Entergy to select Monitored Natural Attenuation as the appropriate remedial strategy to address Indian Point groundwater contamination.¹³⁰ In his testimony, Mr. Barvenik demonstrates that

¹²⁷ *Id.* at A38.

¹²⁸ *See id.*

¹²⁹ *Id.* at A66.

¹³⁰ *Id.* at A103.

Monitored Natural Attenuation is a recognized and proven remedial approach that allows natural processes to reduce contaminant concentrations.¹³¹ Not only does the EPA recognize Monitored Natural Attenuation as valid remedial approach, but Mr. Barvenik also demonstrates that it is the appropriate remediation strategy for Indian Point.¹³² The NRC Staff and NYSDEC both accepted Monitored Natural Attenuation as the appropriate remediation approach to address the groundwater plumes.¹³³ And while Monitored Natural Attenuation is the primary remedial technology, groundwater extraction through a number of foundation drains also has been, and continues to be, implemented at the site.¹³⁴ These drains capture radionuclides in groundwater and remove them from the subsurface for subsequent discharge through monitored pathways.¹³⁵ The IP1 drains are particularly effective at further reducing already-low groundwater dose, capturing the majority of the strontium which would otherwise migrate to the river through the groundwater pathway.¹³⁶

5. Independent Assessment of Indian Point SFP Leaks

As discussed in Section X of Entergy's testimony, the NRC (with support from the United States Geological Survey ("USGS")) and NYSDEC (with support from the New York State Department of Health ("NYSDOH")) independently verified Entergy's SFP leaks evaluations and conclusions regarding insignificant public health and environment impacts.¹³⁷

¹³¹ *Id.* at A104.

¹³² *Id.* at A105-06.

¹³³ *See* May 13, 2008 Inspection Report at vi to viii (RIV000067); NYSDEC 2008 Community Fact Sheet (ENT000345).

¹³⁴ *Id.* at A107.

¹³⁵ *Id.*

¹³⁶ *Id.*

¹³⁷ *See* Entergy Test. at A108 (ENT000301).

After Entergy informed the NRC of the hairline cracks identified in the IP2 SFP wall in 2005, which led to the discovery of low levels of tritium contamination in the groundwater, NRC Staff initiated special inspections.¹³⁸ As part of these efforts, the NRC Staff (and NYSDEC) assessed Entergy's plans for more extensive site characterization, and verified groundwater sample results by independently analyzing split samples from monitoring wells.¹³⁹

After receiving the Site Investigation Report in January 2008, the NRC Staff conducted its own, detailed inspection, the results of which are set forth in the NRC Staff's May 13, 2008 Inspection Report. Specifically, the May 13, 2008 Inspection Report, which confirmed Entergy's conclusions, documented several important NRC Staff findings, including:

- Entergy had properly identified the source of groundwater releases as the IP1 and IP2 SFPs;
- No releases were observed or detected from IP3;
- Entergy's hydrogeologic site characterization studies provide sufficiently-detailed field observations, monitoring, and test data that supported the development and confirmation of a reasonable Conceptual Site Model;
- The Conceptual Site Model provides a reasonable basis to support the finding that liquid effluent releases from the SFPs migrate west towards the Hudson River and do not otherwise migrate offsite;
- There are no drinking water sources that can be impacted by the contaminated groundwater conditions;
- The annual calculated exposure to the hypothetical maximally-exposed individual relative to the liquid effluent aquatic food exposure pathway is currently, and is expected to remain, less than 0.1 percent of the ALARA guidelines in Appendix I of 10 C.F.R. Part 50, which are considered to be negligible with respect to public health, safety, and the environment;
- There is no evidence of any significant leak or loss of radioactive water inventory from the site that was discernable in the offsite environment; and

¹³⁸ *Id.* at A109.

¹³⁹ *Id.* at A110-11.

- Entergy's remediation approach (*i.e.*, Monitored Natural Attenuation) and plans for long-term monitoring of residual groundwater contamination were reasonable.¹⁴⁰

In reaching these conclusions, the NRC Staff relied, in part, on an independent USGS analysis of groundwater transport through fractured bedrock (utilizing geophysical well logging data).¹⁴¹ The NRC Staff also worked closely with NYSDEC by sharing data and assessment information, coordinating independent split sampling of various sample media, and providing combined oversight of Entergy.¹⁴² The findings in the May 13, 2008 Inspection Report are summarized and incorporated by reference in the FSEIS.¹⁴³

NYSDEC (with support from NYSDOH) actively monitored Entergy's hydrological investigation, independently analyzed split samples from onsite and offsite monitoring wells, and made recommendations on the work being performed.¹⁴⁴ Importantly, NYSDEC performed its own independent assessment of public health and environmental impacts due to the SFP leaks.¹⁴⁵ NYSDEC's conclusions are consistent with the findings in the Site Investigation Report and confirmed by the NRC Staff. NYSDEC also determined strontium levels in fish near the site are no higher than those collected from other statewide locations.¹⁴⁶ Additionally, NYSDEC corroborated Entergy's finding that doses to the public through fish consumption are less than one percent of the allowable NRC 10 C.F.R. 50, Appendix I annual dose objectives.¹⁴⁷ Thus,

¹⁴⁰ See May 13, 2008 Inspection Report at vi to viii (RIV000067); Entergy Test. at A112 (ENT000301).

¹⁴¹ See USGS, Flow-Log Analysis for Hydraulic Characterization of Selected Test Wells at the Indian Point Energy Center, Buchanan, New York (2008) (ENT000341).

¹⁴² May 13, 2008 Inspection Report at 1 (RIV000067); Entergy Test. at A112 (ENT000301).

¹⁴³ See FSEIS at 2-111 (NYS00133A).

¹⁴⁴ Entergy Test. at A114 (ENT000301).

¹⁴⁵ See FSEIS at 2-112 (NYS00133A); NYSDEC 2007 Community Fact Sheet (ENT000325); NYSDEC Strontium Study (ENT000321).

¹⁴⁶ NYSDEC 2007 Community Fact Sheet at 1 (ENT000325).

¹⁴⁷ NYSDEC 2008 Community Fact Sheet (ENT000345).

NYSDEC's findings confirm that there is no effect on fish from the radionuclide releases to groundwater, and no public health concern.¹⁴⁸

In addition, NYSDEC concluded that any radionuclides reaching the Hudson River as a result of the radionuclide releases to groundwater did not violate state and federal drinking water levels.¹⁴⁹ Moreover, it accepted Monitored Natural Attenuation as the appropriate remedial approach for addressing the tritium and strontium plumes: "With the removal of the active contamination source, Entergy's planned use of monitored natural attenuation is an acceptable approach to managing the remaining Sr-90 and H-3 plumes."¹⁵⁰

NYSDEC also conducted an enhanced, independent radiological surveillance of several aquatic species in the lower Hudson River and published the results from this assessment in 2009.¹⁵¹ Specifically, NYSDEC concluded that there were no significant differences in the concentrations of strontium in fish and shellfish samples near Indian Point and those sampled upriver at reference locations (including an additional reference location in the river, 50 miles north of Indian Point, so as to be outside the migratory range of the subject fish).¹⁵² In addition, NYSDEC concluded that the levels of all radionuclides (including strontium) in fish and shellfish at all of the sampling locations were two to five orders of magnitude lower than established criteria for protecting freshwater ecosystems.¹⁵³

¹⁴⁸ See NYSDEC 2007 Community Fact Sheet at 1 (ENT000325).

¹⁴⁹ NYSDEC 2008 Community Fact Sheet at 1 (ENT000345).

¹⁵⁰ See *id.*

¹⁵¹ See NYSDEC Strontium Study (ENT000321).

¹⁵² See *id.* at 8.

¹⁵³ See *id.*

6. Compliance with Applicable Dose Limits

In Section XI of Entergy’s testimony, Dr. Paperiello and Dr. Hoffman demonstrate that Entergy complies with applicable dose limits.¹⁵⁴ They explain that the NRC limits and ALARA design objectives do not differentiate between normal effluent discharges and unplanned releases such as leaks containing radioactive materials.¹⁵⁵ Consistent with NRC guidance and regulations, the Offsite Dose Calculation Manual specifies the methods for performing the required quantification and dose assessment of all pathways, including radioactive groundwater leaving Indian Point.¹⁵⁶ Entergy performs calculations annually to account for actual groundwater source terms, release rates, and dilution flows throughout the year.¹⁵⁷ These reports show that Entergy meets all NRC 10 C.F.R. Part 20 and Part 50, Appendix I requirements at Indian Point by a very wide margin, as well as EPA 40 C.F.R. Part 190 requirements.¹⁵⁸ The combined groundwater and storm water dose is in fact less than 0.1 percent of the ALARA guidelines in Appendix I of 10 C.F.R. Part 50.¹⁵⁹

7. Environmental Impacts During the License Renewal Term

As discussed below, Entergy’s witnesses demonstrate that the FSEIS took the required “hard look” at the relevant environmental consequences of Indian Point SFP leaks and appropriately concludes that human health, groundwater quality, and the Hudson River ecosystem impacts have been and will continue to be SMALL, as defined in NRC regulations—

¹⁵⁴ Entergy Test. at A118 (ENT000301).

¹⁵⁵ *Id.* at A49.

¹⁵⁶ *Id.* at A51.

¹⁵⁷ *See* IPEC ODCM Pt. II, at 9 (ENT000307); Entergy Test. at A52 (ENT000301).

¹⁵⁸ Entergy Test. at A118 (ENT000301).

¹⁵⁹ *Id.*

i.e., impacts are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource.

a. Human Health Impacts Are SMALL

As discussed in Section XIII.A of Entergy’s testimony, human health impacts due to radiation exposures to the public from Indian Point are SMALL. Table B-1 establishes that “[f]or the purposes of assessing radiological impacts, the Commission has concluded that those impacts that do not exceed permissible levels in the Commission’s regulations are considered small.” As Entergy’s witnesses demonstrate, Indian Point appropriately accounts for all release pathways, including the groundwater pathway, and does not exceed any dose limits specified in 10 C.F.R. Part 20 and Part 50, Appendix I of the Commission’s regulations, or in EPA’s 40 C.F.R. 190.10.¹⁶⁰ Therefore, pursuant to Commission regulation, the human health impacts due to radiation exposures from SFP leaks are SMALL.

b. Intervenors’ Claims About Human Health Impacts Are Invalid

The Intervenors’ witnesses present a series of unsupported claims concerning bioaccumulation, recreational, desalination plant, and other human health impacts.¹⁶¹ Entergy’s witnesses demonstrate that none of these issues affects the ultimate conclusion that human health impacts are SMALL.

(i) Bioaccumulation Impacts

The Intervenors claim that the human health impact evaluation should have considered the potential for strontium bioaccumulation resulting from past 1P1 SFP leaks.¹⁶² However, Dr. Hoffman demonstrates that Entergy’s dose calculations not only account for

¹⁶⁰ *Id.* at A35, 118.

¹⁶¹ *Id.* at A151.

¹⁶² *See* Intervenors SOP at 39 (RIV000059).

bioaccumulation, but consistent with NRC guidance, conservatively assume that bioaccumulation occurs at the point of the maximum conceivable discharge, prior to mixing and dilution by the Hudson River estuarine system's ebb and flow.¹⁶³ Thus, Entergy's dose calculations likely overestimate actual doses received by individuals who consume fish and other organisms harvested from the Hudson River.¹⁶⁴ In fact, Hudson River fish or shellfish sampling shows no radionuclides attributable to Indian Point SFP leaks.¹⁶⁵

(ii) Recreational Activity Impacts

The Intervenors assert that Entergy and the NRC Staff should have considered additional exposure pathways attributable to Hudson River recreational activities, namely swimming and boating.¹⁶⁶ Entergy's experts explain that, based on the methodology set forth in Regulatory Guide 1.109, the only significant pathway for liquid releases is consumption of aquatic foods; *i.e.*, Hudson River fish and invertebrates.¹⁶⁷ Nevertheless, although there is no regulatory or practicable reason to include alternative non-consumption pathways, Entergy's experts demonstrate that if other hypothetical exposure pathways had been considered, such as swimming, boating, and inadvertent consumption of water while swimming, the resulting additional doses to a hypothetical maximally-exposed individual would be a fraction of the

¹⁶³ Entergy Test. at A151 (ENT000301).

¹⁶⁴ *Id.*

¹⁶⁵ *Id.* at A151, 152, 153.

¹⁶⁶ Intervenors SOP at 62-63 (RIV000059).

¹⁶⁷ IPEC –CHM-12-005, IPEC ODCM Liquid Effluent Pathway Bases (Feb. 12, 2012) (ENT000329); Consolidated Edison, An Evaluation to Demonstrate the Compliance of the Indian Point Reactors with the Design Objectives of 10 CFR Part 50, Appendix I, Vol. 1 – Main Report at 39-40, 74 (Feb. 1977) (“Consolidated Edison Evaluation”) (ENT000330).

already very small dose from fish consumption alone.¹⁶⁸ In other words, even if you added the dose from recreational pathways, it would not result in a material increase in the overall dose.¹⁶⁹

(iii) Desalination Facility Impacts

The Intervenors assert that Entergy and the NRC Staff should have given additional consideration to potential impacts to a proposed desalination facility located downstream of Indian Point.¹⁷⁰ Again, however, Intervenors provide no evidence that adverse human health impacts from such a pathway are anything other than remote and speculative.

Although Indian Point is not required to account for a potential future water use in its dose calculations to demonstrate compliance with NRC and EPA regulations, if and when a desalination plant becomes a reality, a potable water pathway will be included in routine effluent calculations.¹⁷¹ Moreover, Entergy's experts demonstrate that it is highly unlikely that the proposed desalination plant would result in any material change in the already small public dose resulting from liquid effluent releases from Indian Point.¹⁷²

The very document relied upon by the Intervenors, which was prepared by United Water New York, the entity planning the facility, contains results from Hudson River water samples collected in 2007 and 2008, a period which would have included Indian Point SFP leak groundwater releases to the Hudson River.¹⁷³ Notably, those results show that all EPA drinking water standards for radionuclides were met in *untreated* water.¹⁷⁴ In addition, as Entergy's

¹⁶⁸ Entergy Test. at A147 (ENT000301).

¹⁶⁹ See IPEC-CHM-12-005 (ENT000329); Consolidated Edison Evaluation at 39-40, 74 (ENT000330).

¹⁷⁰ Intervenors SOP at 64-66 (RIV000059).

¹⁷¹ Entergy Test. at A149 (ENT000301).

¹⁷² *Id.*

¹⁷³ *Id.*

¹⁷⁴ *Id.*

experts explain, the detected radionuclides, albeit at a very low level, are the result of natural background radioactivity and residual weapons testing fallout, with no observable contributions from the Indian Point releases.¹⁷⁵ More recent testing as part of the desalination plant pilot study has confirmed these results.¹⁷⁶

In summary, these empirical data show that any increase in dose to the public due to the operation of a United Water reverse-osmosis water treatment facility at Haverstraw would be minimal, radionuclide levels in the drinking water produced would be a very small fraction of EPA's drinking water standards, and those radionuclides would be unconnected to IP2 and IP3.

(iv) Other Human Health Impacts

The Intervenors argue that Entergy and the NRC Staff should have considered human health impacts associated with doses well within NRC limits.¹⁷⁷ Any claim objecting to releases within these limits amounts to an impermissible challenge to NRC regulations.¹⁷⁸

Nonetheless, Entergy's experts directly demonstrate that the relevant dose is so small as to be inconsequential to human health or the environment.¹⁷⁹ For example, in 2010, the total annual Indian Point radiation dose to a hypothetical maximally-exposed individual from groundwater and storm water releases was 0.0002 mrem.¹⁸⁰ By comparison, the average annual

¹⁷⁵ *Id.* at A150.

¹⁷⁶ United Water Haverstraw Water Supply Project 6 NYCCRR Part 601 Water Supply Permit Application at 4-5 to 4-7; *id.* § 4, App. B, Tbl. 1A at 1, Tbl. 1B at 6, Tbl. 2A at 13, Tbl. 2B at 18. (ENT00320A-D).

¹⁷⁷ Intervenors SOP at 63 (RIV000059).

¹⁷⁸ *See Millstone*, CLI-01-24, 54 NRC at 364 (“If the Petitioners are objecting to all possible routine adjustments in effluent releases, then their claim amounts to an impermissible general attack on our regulations governing public doses at operating nuclear plants.”); *Pilgrim*, LBP-06-23, 64 NRC at 315 (refusing to allow litigation on contention argument suggesting “doses not in violation of NRC regulations might be harmful to health”).

¹⁷⁹ Entergy Test. at A134 (ENT000301).

¹⁸⁰ *See* 2010 Effluent Release Report: NL-11-068, at 34 (ENT000319).

radiation exposure for the typical individual in the United States is 620 mrem.¹⁸¹ Indeed, the typical radiation exposure to a person from eating a banana, which contains small amounts of radioactive potassium, is 0.01 mrem.¹⁸²

As the Intervenors concede, they have performed no dose calculations to refute this conclusive evidence.¹⁸³ Although they cite the National Research Council “BEIR VII” report (RIV000093), that report only confirms the inconsequential nature of the dose from the Indian Point groundwater and storm water pathway.¹⁸⁴ Applying the BEIR VII report’s linear no-threshold model, the risk from 0.0002 mrem (the 2010 total annual radiation dose to a hypothetical maximally-exposed individual from groundwater and storm water releases) is 1 additional incidence of cancer in 5 billion.¹⁸⁵ In other words, there would need to be 5 billion people (almost the entire world’s population) maximally exposed to Indian Point’s groundwater releases to create the expectation of one additional incidence of cancer.¹⁸⁶ The very low dose risk demonstrates conclusively that SFP leaks have no material negative human health effect.¹⁸⁷

c. Groundwater Quality Impacts Are SMALL

As discussed in Section XIII.B of Entergy’s testimony, groundwater quality impacts are SMALL. Entergy’s witnesses explain that there has been a long-term decrease, which is

¹⁸¹ National Council on Radiation Protection and Measurements (“NCRP”), NCRP Report No. 160, Ionizing Radiation Exposure of the Population of the United States (2009) (ENT00269A) (stating that the total effective dose per individual in the U.S. is 6.2 mSv or 620 mrem).

¹⁸² Entergy Test. at A135 (ENT000301).

¹⁸³ Riverkeeper, Inc. and Hudson River Sloop Clearwater, Inc. Opposition to Entergy’s Motion in Limine to Exclude Portions of Pre-Filed Testimony and Exhibits for Contention RK-EC-3/CW-EC-1 at 11 (Feb. 17, 2012) (“Mr. Gundersen has not performed his own specific dose assessment in relation to the releases from Indian Point.”).

¹⁸⁴ Entergy Test. at A148 (ENT000301).

¹⁸⁵ *Id.*

¹⁸⁶ *Id.*

¹⁸⁷ *Id.*

expected to continue, in radionuclide activity in the overall Indian Point site groundwater and that specifically reaching the Hudson River.¹⁸⁸ Based on sampling and testing of Hudson River water in the vicinity of Indian Point and at control locations away from Indian Point, the migration of low levels of radionuclides to the Hudson River has had no discernible effect on the level of radionuclides contained in Hudson River water.¹⁸⁹ Entergy’s network of groundwater monitoring wells is sufficient to allow Entergy to detect comparable potential future releases to groundwater at the site and respond rapidly and appropriately to such releases.¹⁹⁰ Thus, because contaminated water does not flow offsite, except to the Hudson River, and there are no current or reasonably-anticipated users for onsite groundwater, the impacts on groundwater quality during license renewal are SMALL.¹⁹¹

d. Intervenor’s Claims About Groundwater Impacts Are Invalid

The Intervenor’s assert that Entergy and NRC Staff improperly minimize the significance of Indian Point’s groundwater contamination by focusing on dose-related impacts.¹⁹² In doing so, the Intervenor’s appear to concede that the dose analysis demonstrates that Indian Point SFP leaks have not, and will not, adversely affect public health or safety. Instead, citing Council on Environmental Quality (“CEQ”) regulations, the Intervenor’s claim that the NRC should have considered other factors—namely, “[t]he degree to which the effects on the quality of the human environment are likely to be highly controversial,” and whether the proposed action “threatens a

¹⁸⁸ *Id.* at A137.

¹⁸⁹ *Id.*

¹⁹⁰ *Id.*

¹⁹¹ *Id.*

¹⁹² Intervenor’s SOP at 49 (RIV000059).

violation of Federal, State, or local law or requirements.”¹⁹³ As discussed below, these arguments are unsupported and do not affect the ultimate conclusion that groundwater quality impacts are SMALL.

(i) SFP Leak Environmental Impacts Are Not Controversial

The Intervenor’s reference to the “highly controversial” nature of radiological leaks and alleged negative public perceptions misconstrues CEQ regulations.¹⁹⁴ By focusing on widely-attended NRC public meetings and certain negative public comments, the Intervenor essentially equate public opposition with highly controversial environmental impacts. Courts, however, have made clear that the CEQ “controversy” regulation applies only when the *environmental impacts* are highly controversial, not merely when there is some public opposition to the action.¹⁹⁵ Here, the environmental impacts from SFP leaks are not highly controversial as Entergy, NRC Staff, and NYSDEC all agree there are no adverse environmental impacts. Accordingly, there is no merit to the Intervenor’s suggestion that public opposition should have played some role in the FSEIS findings about the SFP leaks’ environmental significance.

(ii) Indian Point SFP Leaks Do Not Violate Water Quality Standards

The Intervenor’s claim that Indian Point SFP leaks violate New York State water quality standards is incorrect.¹⁹⁶ The Intervenor claim that Indian Point SFP leaks violate New York State water quality standards by causing: (1) onsite groundwater to exceed EPA drinking water

¹⁹³ *Id.* at 50 (quoting 40 C.F.R. § 1508.27(b), (d)).

¹⁹⁴ *See id.* at 55-56.

¹⁹⁵ *See, e.g., Soc’y Hill Towers Owners’ Ass’n v. Rendell*, 210 F.3d 168, 184 (3d Cir. 2000); *Orangetown v. Gorsuch*, 718 F.2d 29, 39 (2d Cir. 1983); *Rucker v. Willis*, 484 F.2d 158, 162 (4th Cir. 1973); *Hanly v. Kleindienst*, 471 F.2d 823, 830 (2d Cir. 1972).

¹⁹⁶ Intervenor SOP at 50-54 (RIV000059).

Maximum Contaminant Levels (“MCLs”) and (2) releases to the Hudson River of “high-level radioactive waste.”¹⁹⁷

First, EPA MCLs apply only to drinking water from EPA defined “public water systems” and, therefore, do not apply to Indian Point site groundwater.¹⁹⁸ Indian Point is not a drinking water provider, and no plant-related radionuclides attributable to the Indian Point leakage have affected drinking water supplies in the Indian Point vicinity, let alone in excess of EPA MCLs.¹⁹⁹ Nor is it reasonable to expect that groundwater onsite will be used for drinking water in the foreseeable future because it is impracticable to develop a potable water source from Indian Point groundwater for reasons completely unrelated to SFP leaks.²⁰⁰

Entergy’s witnesses acknowledge that EPA MCLs are sometimes used as a comparison benchmark for screening purposes, but explain that if groundwater levels are above those levels, the next step is to evaluate whether or not there is a completed exposure pathway. As the FSEIS appropriately explains, in the case of Indian Point, groundwater travels into the Hudson River and that pathway has been thoroughly evaluated and found to have SMALL impacts.

Second, the Intervenors’ argument concerning high-level waste also lacks merit. High-level radioactive waste is defined as: (1) irradiated reactor fuel; (2) liquid wastes from reprocessing irradiated reactor fuel; and (3) solid wastes from which such liquid waste have been

¹⁹⁷ *Id.* at 55.

¹⁹⁸ See 40 C.F.R. §§ 141.1, 141.2 (indicating that federal drinking regulations apply to public water systems); see also May 13, 2008 NRC Inspection Report at 7 (RIV000067); SRM SECY-97-046A: Final Rule on Radiological Criteria for License Termination at 74 (Mar. 31, 1997) (ENT000356).

¹⁹⁹ See NYSDEC 2007 Community Fact Sheet (ENT000325) (“There are no known impacts to any drinking water sources [from Indian Point leaks]”); NYSDEC 2008 Community Fact Sheet (ENT000345) (“No drinking water sources are effected [by Indian Point leaks]”); May 13, 2008 NRC Inspection Report at vii (RIV000067) (“Currently, there is no drinking water exposure pathway to humans that is affected by the contaminated groundwater conditions at Indian Point Energy Center. Potable water sources in the area of concern are not presently derived from groundwater sources or the Hudson River, a fact confirmed by the New York State Department of Health.”).

²⁰⁰ Entergy Test. at 90 (ENT000301).

converted.²⁰¹ Nothing in the Intervenor's evidentiary submissions suggests that the low-level radionuclides in water that leaked from the IP1 and IP2 SFPs, principally tritium and strontium, meets this definition. In fact, NYSDEC agrees that these releases are not high-level radioactive waste under State law.²⁰²

e. Aquatic Ecology Impacts Are SMALL

As discussed in Section XIII.C of Entergy's testimony, Hudson River aquatic ecosystem impacts are also SMALL because radionuclide migration from Indian Point groundwater to the Hudson River has had no discernible effect on radionuclide levels in Hudson River water.²⁰³ Further, calculations by Dr. Hoffman confirm that dose rates from Indian Point groundwater releases to the Hudson River are orders of magnitude below widely-accepted guidelines used to assess the potential for ecologically significant impacts.²⁰⁴ The independent dose assessment by NYSDEC, reviewed by the National Marine Fisheries Service ("NMFS") reaches the same conclusion.²⁰⁵ Accordingly, these evaluations all demonstrate that Hudson River aquatic ecosystem impacts are SMALL.

f. Intervenor's Claims About Aquatic Impacts Are Invalid

The Intervenor's witnesses present a series of unsupported claims concerning aquatic impacts, which Entergy's witnesses demonstrate do not affect the ultimate conclusion that aquatic impacts are SMALL.

²⁰¹ 10 C.F.R. §§ 60.2, 63.2. While neither State law nor the Clean Water Act define "high-level radioactive waste," EPA regulations define "high-level radioactive waste" according to the definition contained in the Nuclear Waste Policy Act of 1982 ("NWPA"). See 40 CFR 191.02(h). The NWPA gives NRC authority to define this term. 42 U.S.C. § 10101(12).

²⁰² Joint Application for CWA § 401 Water Quality Certification, Transcript of Cross-Examination of Paul J. Kolakowski, NYSDEC at 2736-37 (Nov. 15, 2011) (ENT000365).

²⁰³ Entergy Test. at A36, 137 (ENT000301).

²⁰⁴ *Id.* at A141.

²⁰⁵ *See id.* at A142.

First, Mr. Gundersen's and Dr. Stewart's assertions that strontium-90 bioaccumulation could impact Hudson River fish in the future are overly simplistic.²⁰⁶ Whether or not releases of strontium-90 (and other radionuclides) from Indian Point result in a future material "impact" to Hudson River fish will depend on the dose rate delivered to the fish, not simply whether bioaccumulation takes place.²⁰⁷ Mr. Gundersen and Dr. Stewart do not estimate the dose rate to fish from Indian Point releases of strontium-90 and other radionuclides.²⁰⁸ Dr. Hoffman, however, performed such an assessment and found that dose rates are orders of magnitude below the dose which accepted guidelines establish as the dose at which environmentally significant impacts might occur.²⁰⁹ In addition, a NYSDEC ecological dose rate and risk assessment examining radionuclides in Hudson River fish also found the combined total dose rate well below the level at which environmentally significant impacts might occur.²¹⁰

Second, the Intervenors opine that radionuclides from Indian Point "may have impacted" Hudson River fish.²¹¹ In making this speculative statement, the Intervenors offer no evidence of any measurable adverse impact to aquatic biota. Nor could they, as Riverkeeper's own consultant performed a study of Hudson River shellfish and sediment to assess the long-term environmental impacts from Indian Point radiological releases and found that radionuclides in

²⁰⁶ Entergy Test. at A151 (ENT000301).

²⁰⁷ *Id.*.

²⁰⁸ *Id.*

²⁰⁹ *Id.* at 151. As Dr. Hoffman and Dr. Paperiello explain, the NRC has not issued radiation dose limits to protect aquatic biota because radiation dose limits protective of persons are also protective of other species. *Id.* at A139. The U.S. Department of Energy ("DOE") has, however, promulgated specific guidelines that are generally accepted as conservative benchmarks, below which there would be no negative impacts. *Id.* at A140.

²¹⁰ *Id.* at A151.

²¹¹ See Intervenors SOP at 58-69 (RIV000059).

shellfish and sediment were below detection levels and not elevated, respectively.²¹² Even though their consultant found that “the data is solid,”²¹³ this sampling is not mentioned in the Intervenors’ prefiled direct testimony.

Instead, the Intervenors put forth Mr. Gundersen, who relies on data from the 1970s and 1980s that he contends showed detectable levels of strontium-89 and strontium-90 in fish and shellfish. Entergy’s experts demonstrate that Mr. Gundersen’s claim is without scientific merit because these strontium levels are consistent with levels resulting from nuclear weapons testing fallout during these periods.²¹⁴ Furthermore, the presence of strontium-89 is an indication that such fallout occurred within a period of several months of the sampling, not that releases were from Indian Point.²¹⁵

Third, Mr. Gundersen speculates that the NYSDEC study finding that radionuclide levels in fish and shellfish samples taken near and upstream of Indian Point did not differ must not have accounted for other possible radionuclide sources.²¹⁶ As Entergy’s witnesses explain, Mr. Gundersen’s concern is irrelevant because, regardless of the source, the study found that the dose to Hudson River aquatic biota was orders of magnitude below relevant guidelines used to identify potential ecologically significant impacts.²¹⁷ Similarly, Dr. Hoffman’s Indian Point-

²¹² See E-mail from Christopher J. Gobler, Ph.D., Stony Brook Univ., to Scott Cullen, Riverkeeper (Aug. 17, 2007) (Bates # RK0001060) (ENT000366); Study of Hudson River Finfish, Shellfish and Sediment to Assess the Long-term Environmental Impacts of Liquid Radiological Releases from Indian Point on the Hudson River Biota (Bates # RK0001105) (ENT000367).

²¹³ E-mail from Christopher J. Gobler, Ph.D., Stony Brook Univ., to Phillip Musegaas, Riverkeeper (July 10, 2008) (Bates # RK0001069) (ENT000366).

²¹⁴ Entergy Test. at A152 (ENT000301).

²¹⁵ *Id.*

²¹⁶ See Intervenors SOP at 60 (RIV000059).

²¹⁷ NYSDEC Strontium Study at 8 (ENT000321).

specific calculations demonstrate that dose rates to aquatic biota from Indian Point are well below these guidelines.²¹⁸

Entergy's witnesses also explain that there is no reason to question the NYSDEC study conclusion that there are no differences in the concentrations of strontium-90 from locations near Indian Point and Hudson River locations upstream and downstream.²¹⁹ The NYSDEC study and its references make clear that the strontium-90 detected in Hudson River fish and shellfish originated from widespread fallout from nuclear weapons atmospheric testing.²²⁰ Mr. Gundersen engages in speculation when he suggests strontium-90 releases from the Knolls Atomic Power Lab contributed to the lack of a significant difference among the strontium-90 concentrations in the samples taken at locations upstream and downstream from Indian Point.

Finally, the reliability of the NYSDEC study is demonstrated by the fact that the National Marine Fisheries Service ("NMFS"), the federal agency responsible for implementing the Endangered Species Act with respect to marine and anadromous species, relied upon the NYSDEC study when NMFS concluded that "the effects to shortnose sturgeon from radionuclides [are] insignificant and discountable."²²¹

8. Intervenor's Assertions About the Significance of Past IP1 SFP Leaks Lack Merit

The Intervenor erroneously assert that Entergy and NRC Staff dismiss the significance of past IP1 SFP leaks, asserting that radionuclides associated with these leaks will continue to be released to the groundwater and the Hudson River throughout the proposed license renewal

²¹⁸ Entergy Test. at A153 (ENT000301).

²¹⁹ NYSDEC Strontium Study at 6 (ENT000321).

²²⁰ Entergy Test. at A152 (ENT000301).

²²¹ NMFS 2011 Biological Opinion at 51 (ENT000355).

period and maintaining that such IP1 SFP leaks are somehow relevant to the current license renewal application.²²²

As an initial matter, this proceeding concerns only Entergy's LRA for IP2 and IP3. Environmental impacts from historic IP1 SFP leaks are not impacts caused by the IP2 and IP3 license renewal. Nor have the Intervenors demonstrated any nexus between the proposed license renewal of IP2 and IP3—the sole focus of this proceeding—and the future decommissioning process for IP1. Therefore, there was no need for the FSEIS to separately evaluate environmental impacts from past IP1 SFP leaks.²²³ Further, as the Intervenors are aware, the IP1 SFPs were emptied and drained in December 2008—more than 3 years ago.²²⁴

Nevertheless, Entergy's witnesses explain that the Site Investigation Report and subsequent Long-Term Groundwater Monitoring thoroughly address and account for strontium and other radionuclides from past IP1 SFP leaks as Entergy (and the NRC Staff) investigated groundwater contamination on the Indian Point site as a whole and resulting cumulative environmental impacts.²²⁵ For example, Entergy evaluated the worst case depiction of the IP1 SFP strontium plume and established it had and will continue to have no material impact on public health or the environment.²²⁶ Even so, Entergy continues to operate and maintain the IP1

²²² See Intervenors SOP at 38-39 (RIV000059).

²²³ See CEQ Guidance on Consideration of Past Action in Cumulative Effects Analysis 1-2 (June 24, 2005) (ENT000146) (explaining that, rather than separately evaluating the environmental effects of individual past actions, agencies may take existing conditions as the baseline from which to measure any different impacts from the proposed action).

²²⁴ See Mayer Nov. 5, 2008 E-mail (ENT000324).

²²⁵ See Entergy Test. at 113 (ENT000301).

²²⁶ Entergy Test. at A34 (ENT000301).

foundation collection drain treatment system which captures a large majority of the residual IP1 contamination partitioning off of the subsurface materials into the groundwater.²²⁷

9. Environmental Impacts Will Likely Remain SMALL Notwithstanding the Intervenor’s Speculation About Future SFP Leaks

The Intervenor’s incorrectly claim that a “key premise” of Entergy’s and NRC’s NEPA evaluations is that there are no active IP2 SFP leaks.²²⁸ Thus, according to the Intervenor’s, the FSEIS is inadequate because IP2 SFP leaks have continued since 2005, and because it is impossible for Entergy to “definitively” rule out other current or likely future leaks.²²⁹

As an initial matter, neither Entergy nor the NRC Staff premised their evaluations on the absence of active IP2 SFP leaks. The Site Investigation Report, as well as Entergy’s license renewal RAI responses, acknowledged that additional active leaks cannot be completely ruled out, but, if any exist, the data indicate that they are very small and of no material impact.²³⁰ Likewise, the FSEIS, by incorporating by reference the findings in the NRC Staff’s May 13, 2008 Inspection Report, recognized the potential for additional unidentified IP2 SFP leaks.²³¹

Moreover, the Intervenor’s cite no technical or legal support requiring that Entergy “definitively” exclude the possibility of future SFP leaks.²³² As the Commission has made clear, “NEPA is not absolute,” but rather is governed by a “rule of reason.”²³³ Entergy’s witnesses demonstrate that the FSEIS reasonably addresses SFP leaks by evaluating the bounding, worst

²²⁷ *Id.* at A38.

²²⁸ Intervenor’s SOP at 33 (RIV000059).

²²⁹ *See id.* at 30-33.

²³⁰ Site Investigation Report at 2-4, 92; NL-08-023, Attach. 1, at 2.

²³¹ May 13, 2008 Inspection Report, Encl. at 10; *see also* FSEIS at 2-111.

²³² Intervenor’s SOP at 30-33.

²³³ *Private Fuel Storage, LLC* (Indep. Fuel Storage Installation), CLI-02-25, 56 NRC 340, 347 (2002).

case depiction of the IP2 SFP tritium plume.²³⁴ This represents the highest, upper bound concentrations for samples taken at any time from the investigation’s beginning, and thus encompasses releases prior to installing the leak collection device and repairing the SFP transfer canal leak.²³⁵ Environmental impacts associated with these leaks have already been evaluated and shown to have no impact on public health or the environment.²³⁶

Furthermore, through the extensive Long-Term Groundwater Monitoring Program, Entergy has the ability to identify, characterize, and respond appropriately to any future radionuclide releases to the groundwater of a magnitude comparable to prior SFP leaks should they occur during the Indian Point’s future operation.²³⁷ Entergy will therefore be able to take timely and appropriate corrective action upon detecting any such releases.²³⁸ Although a smaller hypothetical leak might in theory go undetected, it would be essentially impossible to detect offsite and its impact would be bounded by the impacts shown in previous evaluations (*i.e.*, they would be SMALL).²³⁹

The Intervenors also rely on Mr. Gunderson’s generalized assertions and reference to the “bathtub” curve to suggest that future IP2 SFP leaks are likely. Mr. Gunderson, however, does not identify any age-related degradation mechanism that would impact the IP2 SFP. Nor does he cite to any Indian Point-specific data or engineering analysis supporting his belief.

²³⁴ See Entergy Test. at A97 (ENT000301).

²³⁵ *Id.*

²³⁶ *Id.*

²³⁷ *Id.* at A102.

²³⁸ *Id.* at A101.

²³⁹ *Id.* at A74.

To the contrary, Dr. Esselman explains that IP2 SFP evaluations confirm that no active time-dependent aging mechanism is currently occurring in the SFP.²⁴⁰ Since the discovery of the IP2 SFP hairline cracks, Entergy has employed several inspection techniques, including robotic cameras, general visual inspections, and divers performing vacuum box testing of IP2 SFP liner areas that general visual and robotic camera inspections indicated might be suspect.²⁴¹ Overall, greater than 65 percent of the IP2 SFP liner, including the transfer canal, has been inspected.²⁴² Notwithstanding the theoretical possibility that a pinhole leak exists in the IP2 SFP's unexamined portion, evaluations performed to date have identified no mechanism for such a leak to get worse or for a new leak to develop.²⁴³ Thus, aging mechanisms are not expected to cause new SFP leaks or increase leakage rates through any existing leaks.²⁴⁴

In summary, the evaluation of the bounding, worst-case depiction of the tritium plume, Entergy's extensive Long-Term Groundwater Monitoring Program, and IP2 SFP engineering evaluations that identify no mechanism for such a leak to get worse or for a new leak to develop, provide reasonable assurance that the FSEIS conclusions are appropriate notwithstanding the theoretical potential for ongoing or future IP2 SFP leaks.²⁴⁵

10. Intervenors' Arguments Concerning Mitigation Are Flawed

The Intervenors assert that Entergy and NRC Staff should have considered additional or alternative mitigation measures, in particular: (1) extracting contaminated groundwater; (2) instituting preventative measures to identify leaks before they occur; (3) enhancing aquatic

²⁴⁰ *Id.* at A145.

²⁴¹ *Id.* at A71.

²⁴² *Id.* at A72.

²⁴³ *Id.* at A73.

²⁴⁴ *Id.* at A38.

²⁴⁵ Entergy Test. at A157 (ENT000301).

ecology monitoring; and (4) increasing public access to information about leaks and groundwater contamination.²⁴⁶

As discussed throughout this Statement, Entergy's witnesses demonstrate that the new information regarding radionuclide leaks from IP1 and IP2 SFPs into the groundwater and Hudson River is not significant. Given the lack of environmental significance, there was no need for the FSEIS to consider additional or alternative mitigation measures. As the D.C. Circuit has held, an agency may decline to discuss mitigation measures when it believes the environmental impact of the action will be minor.²⁴⁷ NEPA requires only that possible mitigation measures "be discussed in sufficient detail to ensure that environmental consequences have been fairly evaluated."²⁴⁸ Thus, in this case, it is entirely appropriate not to evaluate potential additional mitigation for impacts that are SMALL. Nevertheless, as summarized below, essentially all of the Intervenor's suggested "mitigation" has already been considered or put in place.

First, Entergy's witnesses explain that Entergy and the NRC Staff reasonably considered, but rejected, groundwater extraction.²⁴⁹ Specifically, the NRC Staff May 13, 2008 Inspection Report clearly considers and explains the basis for rejecting the extraction option:

Considering factors including the radiological and non-radiological contamination condition at Unit 1, Entergy determined that any immediate remediation (such as groundwater pump down) of the existing contaminated groundwater in the vicinity of the Unit 2 spent fuel pool would be inappropriate at this time. Such remedial action could adversely affect the current groundwater contamination condition, in particular, it would create a situation in which contaminated water that is currently collected, monitored

²⁴⁶ See Intervenor's SOP at 67-74 (RIV000059).

²⁴⁷ See *Transmission Access Policy Study Grp. v. FERC*, 225 F.3d 667, 737 (D.C. Cir. 2000) (upholding agency's decision to "decline to adopt mitigation measures to address a problem that it believed might not even develop").

²⁴⁸ *City of Carmel-by-the-Sea v. U.S. DOT*, 123 F.3d 1142, 1154 (9th Cir. 1997).

²⁴⁹ May 13, 2008 Inspection Report, Encl. at 13; see also FSEIS at 2-111.

and discharged from the Unit 1 drain systems in accordance with NRC regulatory requirements, to spread elsewhere unnecessarily. Accordingly, the NRC agrees that, in the absence of any overriding public health and safety concern, pump and treat remediation of the Unit 2 SFP could adversely affect the spread of the Unit 1 groundwater contamination plume and is not advisable.²⁵⁰

Entergy's experts further explain the detailed consideration that was given to groundwater extraction. This included a pilot pumping test showing that although it is possible to effectively capture the tritium plume around the IP2 SFP, the detection of strontium proximate to the pumping well shortly after the testing also demonstrated that pumping was more likely than originally predicted to cause strontium migration from IP1 to IP2.²⁵¹ Such pumping-induced migration would lead to partitioning and, thus, adsorption of strontium to subsurface geologic materials, resulting in increased residual contamination over an additional acre of land between IP1 and IP2.²⁵² This demonstrated that there was a substantial disadvantage to groundwater extraction.²⁵³ Thus, Entergy selected, and NRC Staff and NYSDEC accepted, Monitored Natural Attenuation; a recognized and proven remedial approach that allows natural processes to reduce contaminant concentrations.²⁵⁴ While Monitored Natural Attenuation is the primary remedial technology, groundwater extraction through a number of foundation drains also has been, and continues to be, implemented at the site.²⁵⁵

Second, Entergy's experts address the extensive assessments Entergy has already performed to assess the potential for new SFP leaks. Overall, greater than 65 percent of the IP2

²⁵⁰ May 13, 2008 Inspection Report, Enclosure at 13.

²⁵¹ Entergy Test. at A155 (ENT000301).

²⁵² *Id.*

²⁵³ *See id.*

²⁵⁴ *Id.* at A103.

²⁵⁵ *Id.* at A107.

SFP liner, including the transfer canal, has already been inspected.²⁵⁶ Evaluations of the IP2 SFP confirm that no active time-dependent aging mechanism is currently occurring in the SFP.²⁵⁷ Based on this finding, there was no reason for the FSEIS to discuss the inspection of the entire liner.²⁵⁸

Third, although the Intervenors suggest additional enhanced aquatic monitoring, Entergy already performs ongoing radiological surveillance under the REMP involving samples of edible tissues of two or more fish or invertebrate species in the vicinity of Indian Point and a reference station about 21 miles from the site.²⁵⁹ The NYSDEC study discussed the one-time enhancement in 2007 to Entergy's REMP sampling to look at additional species and locations even farther upstream of Indian Point.²⁶⁰ All results to date—including those published by NYSDEC and those by the Intervenors' consultant—reach the same conclusion: IP1 and IP2 SFP leaks have had no discernible effect on the level of radionuclides contained in Hudson River water and aquatic biota.²⁶¹ Dr. Hoffman's calculations confirm that dose rates from releases of Indian Point groundwater to the Hudson River are orders of magnitude below accepted dose guidelines at which environmentally significant impacts might occur.²⁶² Because there are no adverse impacts to the Hudson River ecosystem, there was no reason for the FSEIS to consider additional

²⁵⁶ *Id.* at A72.

²⁵⁷ *Id.* at A145.

²⁵⁸ *Id.* at A73.

²⁵⁹ *Id.* at A142.

²⁶⁰ *Id.*

²⁶¹ *Id.* at A36, 137.

²⁶² *Id.* at A141.

enhanced aquatic monitoring beyond that already conducted in accordance with established NRC regulations.²⁶³

Finally, the Intervenors suggest that Entergy and the NRC Staff should have considered increasing public access to information about SFP leaks and groundwater contamination.²⁶⁴ The Intervenors provide no explanation of why or how the disclosure of such information would qualify as mitigation as that term is defined in the context of NEPA.²⁶⁵ For example, they provide no explanation how additional information might further reduce already SMALL impacts.

Moreover, Entergy already submits an Annual Radioactive Effluent Release Report, which reports the amount of radioactive material released to the environment during the past year, and an Annual Radiological Environmental Operating Report, which reports the results of Entergy conducted surveys of radiation levels in both unrestricted and controlled areas as part of a Radiological Environmental Monitoring Program. NRC makes both reports publicly available.²⁶⁶ These and all other evaluations to date demonstrate that the resulting environmental impacts are SMALL.²⁶⁷ The FSEIS incorporates this information, as well additional publicly available from the Site Investigation Report, NRC Staff inspection reports, and NYSDEC evaluations that already contain considerable information about SFP leak impacts.²⁶⁸

²⁶³ Entergy Test. at A37.

²⁶⁴ Intervenors SOP at 74 (RIV000059).

²⁶⁵ See 40 C.F.R. § 1508.20.

²⁶⁶ See Entergy Test. at 53 (ENT000301).

²⁶⁷ See *id.* at A33. 35-38, 143, 157.

²⁶⁸ Entergy Test. at A124.

V. CONCLUSION

For the foregoing reasons, the FSEIS takes the required “hard look” at environmental impacts of Indian Point SFP leaks. Entergy’s experts demonstrate that the SFP leaks’ environmental impacts on human health, groundwater quality, and ecological resources are all SMALL, as that term is used in long-standing NRC regulations, and that NRC has fully met its NEPA obligations. The Intervenors thus fail to substantiate their claims that the FSEIS improperly ignores or minimizes such impacts. Accordingly, Entergy respectfully requests that the Board resolve Consolidated Contention RK-EC-3/CW-EC-1 in favor of Entergy and the NRC Staff.

Respectfully submitted,

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Dated in Washington, D.C.
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**UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION**

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of)	Docket Nos.	50-247-LR and
)		50-286-LR
ENTERGY NUCLEAR OPERATIONS, INC.)		
)		
(Indian Point Nuclear Generating Units 2 and 3))		
)	March 29, 2012	

CERTIFICATE OF SERVICE

I certify that, on March 29, 2012, copies of Entergy's Statement of Position, Testimony, and associated exhibits on Consolidated Contention RK-EC-3/CW-EC-1 were served electronically with the Electronic Information Exchange on the following recipients:

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