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.	)	May 3, 2013
(Indian Point Nuclear Generating Units 2 and 3)	)	

ENTERGY'S REPLY TO NEW YORK STATE'S PROPOSED FINDINGS OF FACT AND CONCLUSIONS OF LAW FOR CONTENTION NYS-12C (SEVERE ACCIDENT MITIGATION ALTERNATIVES ANALYSIS DECONTAMINATION COSTS)

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TABLE OF CONTENTS

Page

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Pursuant to the Atomic Safety and Licensing Board's ("Board") February 28, 2013 Order,[1] Entergy Nuclear Operations, Inc. ("Entergy") submits its Reply to New York State's ("New York") Proposed Findings of Fact and Conclusions of Law on Contention NYS-12C ("NYS-12C"), which concerns the decontamination cost inputs to the severe accident mitigation alternatives ("SAMA") analysis submitted by Entergy as part of the license renewal application ("LRA") for Indian Point Energy Center ("IPEC") Units 2 and 3 ("IP2" and "IP3"). This Reply is based on the evidentiary record in this proceeding, and is set out in numbered paragraphs, with corresponding citations to the record of this proceeding.

I. INTRODUCTION

1. On March 22, 2013, Entergy, the U.S. Nuclear Regulatory Commission ("NRC" or "Commission") Staff, and New York State ("New York") filed proposed findings of fact and

[1] Licensing Board Order (Granting Parties Joint Motion for Alteration of Filing Schedule) at 1 (Feb. 28, 2013) (unpublished).

conclusions of law ("proposed findings") on NYS-12C, among other contentions.[2] NYS-12C challenges the adequacy of the IPEC SAMA analysis, as reviewed and approved by NRC Staff in the December 2010 Final Supplemental Environmental Impact Statement ("FSEIS").[3] Specifically, NYS-12C alleges that Entergy and the Staff have "significantly underestimated" the economic costs of a severe accident at IPEC by relying on computer code input values that are not specific to the uniquely urban New York City area surrounding IPEC, and that do not sufficiently take into account the greater difficulty and costs of cleaning up "small-sized" radioactive particles released by a severe reactor accident.[4] As pursued at hearing, NYS-12C particularly focuses on the decontamination cost and decontamination time values used by Entergy as inputs to the MELCOR Accident Consequence Code System Version 2 ("MACCS2"), the computer code which Entergy used to perform the offsite consequences portion of its SAMA analysis.[5]

2. As set forth in their proposed findings, Entergy and the NRC Staff have carried their respective burdens of proof with respect to NYS-12C, which ultimately relates to the NRC Staff's compliance with the National Environmental Policy Act ("NEPA"),[6] as implemented by the NRC's 10 C.F.R. Part 51 regulations. Specifically, Entergy and the NRC Staff have demonstrated that the contested SAMA analysis computer code inputs are reasonable and

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2 *See* Entergy's Proposed Findings of Fact and Conclusions of Law for Consolidated Contention NYS-12C (Severe Accident Mitigation Alternatives Analysis) (Mar. 22, 2013) ("Entergy Proposed Findings"); NRC Staff's Proposed Findings of Fact and Conclusions of Law Part 5: NYS-12C (Severe Accident Mitigation Alternatives Analysis Decontamination and Cleanup Costs) (Mar. 22, 2013) ("NRC Staff Proposed Findings"); State of New York's Proposed Findings of Fact and Conclusions of Law for Contention NYS-12/12A/12B/12C (NYS-12C") (Mar. 22, 2013) ("New York Proposed Findings").

3 NUREG-1437, Supp. 38, Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Regarding Indian Point Nuclear Generating Unit Nos. 2 and 3, Final Report (Dec. 2010) (NYS00133A-J) ("FSEIS").

4 State of New York Initial Statement of Position [on] Consolidated Contention NYS-12C at 3, 37 ("New York Position Statement") (NYS000240).

5 *See* Official Transcript of Proceedings, Indian Point Nuclear Generating Units 2 & 3 at 2054:23-2055:4 (Oct. 17, 2012) (Lemay) ("Oct. 17, 2012 Tr.").

6 42 U.S.C. § 4321 *et seq.* (2006).

appropriate, as judged under NEPA's "rule of reason,"[7] and in view of the NRC's and industry's current state of knowledge and practice regarding SAMA analyses and other severe accident consequence assessments. They have further shown that New York's criticisms of Entergy's MACCS2 inputs (including New York's proposed alternative values) do not "credibly render the SAMA analysis altogether unreasonable under NEPA standards"[8] or support a finding that there are additional potentially cost-beneficial SAMA candidates beyond those identified in the Staff's FSEIS.[9] Nothing in New York's proposed findings alters these clear and overarching conclusions. Therefore, the Board should resolve NYS-12C in favor of Energy and the NRC Staff.

3. In contrast, in its proposed findings, New York makes broad assertions that lack evidentiary support, inaccurately describes the record and controlling legal principles, and fails to acknowledge contrary testify and evidence that undermine its position. For example, New York challenges—for the first time—the qualifications of Entergy and NRC Staff witnesses.[10] It also argues that certain testimony by those witnesses lacks a proper technical foundation and should be accorded little or no weight.[11] As shown below, New York's criticisms are patently unfounded given the demonstrated expertise of Entergy's and the Staff's witnesses and the thorough manner in which they have addressed the issues in dispute. At most, they are unsuccessful attempts to deflect valid criticisms of New York's position.[12]

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7 *Entergy Nuclear Generation Co.* (Pilgrim Nuclear Power Station), CLI-10-22, 72 NRC 202, 208 (2010) (citing *Communities, Inc. v. Busey*, 956 F.2d 619, 626 (6th Cir. 1992)).

8 *Entergy Nuclear Generation Co*. (Pilgrim Nuclear Power Station), CLI-12-01, 75 NRC __, slip op. at 25 (Feb. 9, 2012).

9 *See* FSEIS, App. G at G-36 to G-38 (NYS00133I).

10 New York Proposed Findings at 31-38 (¶¶ 92-108).

11 *Id.* at 126 (¶ 344).

12 In its proposed findings, New York also frequently complains about the NRC Staff's alleged failure to disclose documents in a timely way. *See*, *e.g.*, *id.* at 3 (¶ 10). The relevance and materiality of these criticisms is unclear,

4. New York also incorrectly describes the basic nature and purpose of a SAMA analysis.[13] Contrary to New York's claim, the SAMA analysis is not a site-specific analysis of severe accident impacts.[14] Rather, it is a site-specific *mitigation alternatives* analysis. Furthermore, New York wrongly suggests that NEPA "requires" implementation of potentially cost-beneficial SAMAs.[15] It does not. As discussed below, controlling judicial and Commission case law is clear on these points.

5. New York's criticisms of both the IPEC SAMA analysis and the NRC Staff's review thereof are not supported by the record. Moreover, such criticisms are inconsistent with settled NEPA principles that New York itself cites. For example, New York emphasizes the need for high-quality and accurate scientific information.[16] However, as the record shows, the alternative decontamination cost and time values proposed by New York's expert, Dr. Lemay, are based on inapplicable references and data that have no apparent nexus to nuclear power plant severe accidents or SAMA analyses performed using MACCS2.[17] Unlike the NRC-approved sources relied upon by Entergy (*e.g.*, NUREG-1150, NUREG/CR-3673, NUREG/CR-4551, and NUREG-1935), Dr. Lemay's supporting references lack the same technical relevance and rigor, as well as the imprimatur of the NRC. One example is Dr. Lemay's reliance on papers discussing plutonium dispersal events and radiological dispersion devices.[18] Notably, the Commission—and

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given that the documents at issue are part of the evidentiary record and relied upon by New York in its testimony and proposed findings; *i.e.*, there is no prejudice to New York or related action requested of the Board.

13 *Id*. at 1-2 (¶¶ 4-5).

14 As discussed below in paragraph 37, the NRC already conducted an analysis of severe accident impacts for purposes of license renewal, and concluded that the probability-weighted consequences of severe accidents are small for all plants.

15 *Id*. at 41 (¶ 113), 110 (¶ 294).

16 *Id.* at 117 (¶ 317).

17 *See generally* Entergy Proposed Findings at 89-103 (¶¶ 174-201).

18 New York Proposed Findings at 85 (¶ 228).

even Dr. Lemay—have noted the dubious relevance of one of New York's principal references, the 1996 Site Restoration Report.[19]

6. Another example of New York's failure to abide by NEPA principles is Dr. Lemay's failure to account for conservation of mass balance in contamination from the plume and his decontamination cost calculations.[20] By assuming that the contaminant plume simulated by MACCS2 is continually replenished, and that all surfaces of a building will be equally contaminated, Dr. Lemay's calculations are inconsistent with MACCS2's integral plume model as well as the laws of nature.[21] In its proposed findings, New York cannot and does not adequately address this major methodological misstep, which severely undermines New York's claim of "unprecedented and extensive technical justification for its conclusions."[22]

7. In a similar vein, New York claims not to advocate worst-case assumptions of the type foreclosed by NEPA.[23] However, Dr, Lemay acknowledges that he focused on the "more severe end of the release spectrum" and relied on Chernobyl and Fukushima reactor accidents as data points in developing his proposed decontamination time values.[24] So again, it is New York, not Entergy or the Staff, that has contravened NEPA's requirements and rule of reason.

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19 *NextEra Energy Seabrook, LLC* (Seabrook Station Unit 1), CLI-12-05, 75 NRC __, slip op. at 40 (Mar. 8, 2012) (stating that the Site Restoration Report is "focused on plutonium dispersal events" and contains "no suggestion that the MACCS2 code assumes inapplicable radionuclide particle sizes", and that the report does not discuss the MACCS2 code at all); Oct. 17, 2012 Tr. at 2012:11-13 (Lemay) (stating that the Site Restoration Report is "not ideal" because it relates to plutonium dispersal events, not to reactor severe accidents); Official Transcript of Proceedings, Indian Point Nuclear Generating Units 2 & 3 at 2108:5-8 (Oct. 18, 2012) (Lemay) ("Oct. 18, 2012 Tr.") (stating that the report's focus on plutonium decontamination costs "is a weakness of the method").

20 New York Proposed Findings at 96 (¶ 258).

21 Entergy Proposed Findings at 98-99 (¶¶ 192-94).

22 *See* New York Proposed Findings at 79 (¶ 211), 122 (¶ 333).

23 *Id.* at 104-07 (¶¶ 278-84).

24 Pre-Filed Written Rebuttal Testimony of Dr. François J. Lemay Regarding Consolidated Contention NYS-12C (NYS-12/12A/12B/12C) at 16:7-12 (June 29, 2012) ("New York Rebuttal Testimony") (NYS000420); New York Proposed Findings at *Id.* at 99 (¶ 264).

8. Finally, New York has not met *its* burden to show that the IPEC SAMA analysis or methodology is unreasonable under NEPA.[25] Instead, New York urges Entergy and the Staff to ignore NEPA's rule of reason by, among other things: (1) relying on inapplicable sources and data (*e.g.*, papers concerning plutonium dispersal events, European decontamination data that have not been reviewed by the NRC or would not be relevant to postulated severe reactor accidents); (2) making technically-unjustified assumptions (*e.g.*, assuming that cesium is more expensive to clean up than plutonium); (3) ignoring established scientific principles (*e.g.*, mass conservation); and (4) modifying the MACCS2 source code and applying inputs that are incongruous with the code's internal decontamination decision-making logic.[26] Indeed, with regard to the last issue, the Commission has stated that "NEPA does not require the NRC to engage in an extensive revision of the MACCS2 code."[27] In contrast to New York, the NRC Staff has fully satisfied its burden

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[25] *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.") (emphasis in original); *see also Vt. Yankee Nuclear Power Corp. v. Natural Res. Def. Council, Inc.*, 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).

[26] New York also asserts that "[t]here is nothing that prevents the Board from evaluating related contentions—such as NYS-16B and NYS-12C—together." New York Proposed Findings at 140 (¶ 373). As Entergy has previously noted, contentions NYS-12C and NYS-16B raise two distinct challenges—separately pled by NYS and supported by two different experts (Dr. Lemay and Dr. Sheppard), separately admitted by the Board, and separately addressed during the October 2012 hearings. NYS-16B alleges that the Staff's FSEIS is legally deficient because it accepts a SAMA analysis predicated on inaccurate population estimates. And, as admitted by the Board, NYS-16B alleges no other underestimated inputs to Entergy's SAMA analysis. Notably, NYS did not assert that NYS-12C and NYS-16B must be evaluated together until it made its June 2012 rebuttal filings. New York's argument is further addressed in Section II.A.3 of Entergy's Reply to New York 's proposed findings on Contention NYS-16B.

[27] *Pilgrim*, CLI-12-01, slip op. at 29 (rejecting an intervenor's demand that the MACCS2 code be modified to include an alternative atmospheric transport and dispersion plume model as "far beyond NEPA requirements").

under NEPA to take a "hard look" at the IPEC SAMA analysis, as summarized below and further discussed in the proposed findings of Entergy and the NRC Staff.

II. REPLY TO NEW YORK'S FACTUAL FINDINGS AND LEGAL CONCLUSIONS

A. The Board's Decision Can Supplement or Amend the FSEIS

9. As a threshold legal issue, New York incorrectly claims that the Board's decision cannot supplement or amend the FSEIS based on the hearing record.[28] According to New York, supplementing or amending the FSEIS through the Board's initial decision is contrary to NEPA and NRC's NEPA regulations.[29] As discussed below, this argument ignores binding precedent and, if adopted, would likely establish an indefinite cycle of litigation over the FSEIS's adequacy.

10. New York's assertion that the FSEIS cannot be supplemented or revised based on the hearing record ignores binding Commission precedent.[30] This precedent clearly mandates that if the entire record of this proceeding (including the hearing record) contains sufficient information to allow for an adequate environmental analysis of the issues raised in a contention, then the FSEIS, as supplemented and/or modified by Board's decision will constitute the NRC's NEPA record of decision.[31] As such, there is no need or basis for the Board to remand any and all FSEIS deficiencies or modifications to the NRC Staff so that it may prepare an FSEIS supplement that is circulated for public comment and that is subject to challenge in new or amended contentions.[32]

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28 *See* New York Proposed Findings at 129-30 (¶¶ 353-70).

29 *See id*.

30 *See* Entergy Proposed Findings at 41-46 (¶¶ 82-93).

31 *See id*.

32 *See, e.g.*, *Hydro Res. Inc.* (P.O. 15910, Rio Rancho, NM 87174), CLI-01-04, 53 NRC 51, 53 (2001) (explaining that "the hearing process itself 'allows for additional and more rigorous public scrutiny of the [FSEIS] than does the usual 'circulation for comment").

11. New York argues that the Commission's deliberate elimination of an earlier regulation, 10 C.F.R. § 51.52 (1983), "that permitted licensing boards to 'modify the content' of an [FSEIS] precludes any suggestion that post hoc supplementation by the Board might be available to cure deficiencies in the challenged FSEIS."[33] The *Limerick* Appeal Board rejected this argument in ALAB-819.[34] In that case, an intervenor argued, like New York does here, that the Commission's decision to not readopt the "deemed modified" language in 10 C.F.R. § 51.52 (1983) when it promulgated a new regulation, 10 C.F.R. § 51.102, as part of a 1984 rulemaking, means that any NEPA deficiency can only be cured by recirculating the FSEIS for public comment.[35] The Appeal Board held that "section 51.102 serves the same purpose as its differently worded predecessor, section 51.52(b)(3)" and, "[o]n its face, 10 C.F.R. § 51.102 thus merges the [FSEIS] with any relevant licensing board decision to form the complete environmental record of decision—just as former 51.52(b)(3) did."[36] Further, the Appeal Board noted that nothing in current 10 C.F.R. § 51.102 "precludes modification of an [FSEIS] by licensing board decision."[37]

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33 New York Proposed Findings at 130 (¶ 353), 131-32 (¶ 356).

34 *Phila. Elec. Co.* (Limerick Generating Station, Units 1 & 2), ALAB–819, 22 NRC 681, 705-07 (1985), *aff'd in part and review otherwise declined*, CLI–86–5, 23 NRC 125 (1986), *remanded in part on other grounds sub nom. Limerick Ecology Action, Inc. v. NRC*, 869 F.2d 719 (3d Cir. 1989).

35 *See Limerick*, ALAB-819, 22 NRC at 705-06.

36 *Id.* at 706. In addition to the lack of support for New York's argument in the case law, nothing in the regulatory history of 10 C.F.R. § 51.102 or its predecessor suggests that the NRC "lacks the power" to follow its longstanding practice of using adjudicatory decisions to modify the Staff's NEPA analyses. New York Proposed Findings at 131-32 (¶ 356).

37 *Limerick*, ALAB-819, 22 NRC at 706. Contrary to this holding, New York also argues that 10 C.F.R. § 51.103(c) does not explicitly authorize the Board to incorporate by reference material in the hearing record and thus precludes supplementation because the Board's decision will not "include" testimony or exhibits. *See* New York Proposed Findings at 137 (¶ 367). New York points to nothing in NEPA (or any general administrative law principle) requiring that an agency decision actually "include" all underlying documents. To the contrary, agencies are encouraged to summarize relevant materials in their NEPA documents rather than simply wholesale include voluminous materials. *See* 10 C.F.R. Pt. 51, App. A, § (b); 40 C.F.R. § 1502.21. Nor does anything in 10 C.F.R. § 51.103(c) (or in any other regulation) preclude the Board's decision from including, as appropriate, relevant material from the hearing record in its decision. In fact, the parties proposed findings all request that the Board do just that and integrate relevant evidence into an initial decision.

12. Although New York cites ALAB-819, it does so only to claim that it, and later Commission decisions, are "inconsistent" with 10 C.F.R. § 51.102(c) and NEPA.[38] ALAB-819, however, sets forth a contrary interpretation of both 10 C.F.R. § 51.102(c) and NEPA that is binding on this Board.[39] Moreover, even aside from ALAB-819, New York ignores the numerous more recent decisions that continue to endorse the holding that it is entirely proper for an adjudicatory decision to supplement or amend an FSEIS.[40] Thus, the governing case law is clear that the Commission's NEPA regulations allow an adjudicatory decision to supplement or amend an FSEIS. And although New York attempts to narrowly distinguish the D.C. Circuit decision in *Nuclear Info. & Res. Serv. v. NRC* as not interpreting NRC's NEPA regulations, it ignores the court's holding that the administrative record in that case, including the hearing record, showed that the NRC "plainly met its NEPA obligation to take a 'hard look' at the environmental consequences."[41]

13. Rather than fully acknowledge the considerable precedent that is directly adverse to its position, New York cites to general federal NEPA principles and non-binding cases involving

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38 New York Proposed Findings at 137 (¶ 366).

39 *See James L. FitzPatrick*, CLI-08-19, 68 NRC at 260 n.23; *Sequoyah Fuels Corp.* CLI-94-11, 40 NRC at 59 n.2.

40 *See* Entergy Proposed Findings at 41-43 (¶¶ 83-85) (citing *Nuclear Innovation North America LLC* (South Texas Project, Units 3 & 4), CLI-11-6, 74 NRC __, slip op. at 8 n.33 (2011)); *Pac. Gas & Elec. Co.* (Diablo Canyon Power Plant Indep. Spent Fuel Storage Installation), CLI-08-26, 68 NRC 509, 526-27 n.87 (2008); *Dominion Nuclear N. Anna, LLC* (Early Site Permit for North Anna ESP Site), CLI-07-27, 66 NRC 215, 230 n.79 (2007); *Hydro Res., Inc.*, CLI-01-04, 53 NRC at 53; *Pilgrim*, CLI-12-01, slip op. at 30; *La. Energy Servs. L.P.* (Nat'l Enrichment Facility), CLI-06-15, 63 NRC 687, 707 n.91 (2006); *La. Energy Servs., L.P.* (Nat'l Enrichment Facility), CLI-05-28, 62 NRC 721, 731 (2005); *La. Energy Servs., L.P.* (Claiborne Enrichment Ctr.), CLI-98-3, 47 NRC 77, 87-89 (1998); *S. Nuclear Operating Co.* (Early Site Permit for Vogtle ESP Site), LBP-09-7, 69 NRC 613 (2009)). New York attempts, unsuccessfully, to distinguish *two* of these nine decisions: CLI-98-3 and CLI-06-15. *See* New York Proposed Findings at 136-37 (¶¶ 364-66). All of these cases show that an adjudicatory decision may modify or supplement an FEIS in all types of NRC proceedings regardless of the whether the NRC ultimately regulates the environmental impact at issue. Nor is there any significant difference between the procedural posture of this proceeding and the purportedly "highly specific" circumstances in CLI-98-3. *See id.* at 137 (¶ 365 n.64).

41 *Nuclear Info. & Res. Serv. v. NRC*, 509 F.3d 562, 569 (D.C. Cir. 2007).

other agencies.[42] But the U.S. Courts of Appeals, across multiple circuits, have consistently upheld the NRC's practice as consistent with the Atomic Energy Act[43] and NEPA.[44] New York attempts to dismiss some of these cases as inapplicable because they were decided under a superseded version of 10 C.F.R. § 51.52.[45] However, as the *Limerick* Appeal Board held, "[t]here is no reason to believe that the courts would not be just as approving of the same procedure today, either as embodied in section 51.102 or, indeed, in the absence of any regulation, as a matter of board practice."[46]

14. New York argues that the Commission's practice of supplementing the NEPA record with its adjudicatory decisions is akin to impermissible *post hoc* rationalizations that courts have rejected,[47] but these cases are readily distinguished because this hearing is part of the NRC's decisionmaking process, not a judicial review of the NRC's decision. The NRC has not yet issued renewed licenses for Indian Point, and the hearing record is an element of the overall record of the NRC's decision on Entergy's license renewal application. In contrast, in *Pennaco Energy v. U.S. Dep't of Interior*, the *post hoc* affidavit at issue in that case was prepared and submitted to the

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42 Appeals Boards have readily distinguished these cases, holding that they are inapplicable to the NRC hearing process. *See* Entergy Proposed Findings at 45-46 (¶¶ 90-92). Similarly, the potential supplementation of the record through the Board's decision does not violate the general NEPA principles recited in New York's new cases. *See Brodsky v. U.S. Nuclear Regulatory Comm'n*, 704 F.3d 113, 119 (2d Cir. 2013); *Sierra Club v. Watkins*, 808 F. Supp. 852, 858 (D.D.C. 1991); *South Fork Band Council of W. Shoshone v. U.S. Dep't of Interior*, 588 F.3d 718, 726 (9th Cir. 2009).

43 *Nuclear Info .& Res. Serv.* , 509 F.3d at 562, 568 (holding that supplementing an EIS through the hearing record does not violate the Atomic Energy Act).

44 *See id.* at 568-69; *Citizens for Safe Power, Inc. v. NRC*, 524 F.2d 1291 1294 n.5 (D.C. Cir. 1975) (holding that the "deemed modified" principle did not depart "from either the letter or the spirit" of NEPA); *Ecology Action v. AEC*, 492 F.2d 998, 1001-02 (2nd Cir. 1974) (omissions from an FEIS can be cured by subsequent consideration of the issue in an agency hearing); *New England Coalition on Nuclear Pollution v. NRC*, 582 F.2d 87, 94 (1st Cir. 1978) (having "no trouble finding" that the NRC's supplementation process satisfies NEPA); *see also Pub. Serv. Co. of N.H.* (Seabrook Station, Units 1 & 2), CLI-78-1, 7 NRC 1 (1978).

45 *See* New York Proposed Findings at 138 (¶ 368 & nn. 65-66).

46 *Limerick*, ALAB-819, 22 NRC at 706-07.

47 *See, e.g.*, New York Proposed Findings at 133-32 (¶¶ 360-61).

Interior Board of Land Appeals ("IBLA") *after* the agency had acted by completing the disputed lease sale.[48]

15. Furthermore, there is no merit to New York's specter of harm that would ostensibly result from allowing supplementation or amendment of the FSEIS in this case.[49] First, in arguing that it would be unclear which part of the record the Board decision was relying upon to cure any NEPA deficiency,[50] New York overlooks that the Board is more than capable of writing a clear decision with citations to the record. Second, New York's claim that any supplemental information would not necessarily have been meaningfully analyzed by the NRC Staff[51] ignores that Commission regulations authorize the Board—not the NRC Staff—to resolve NEPA disputes through the hearing process and that the Staff fully participated in that process as a party.[52] Third, the Commission has already rejected the argument that supplementation is inconsistent with NEPA's public participation process because the hearing process allows for *greater* public

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48 *See Pennaco Energy v. U.S. Dep't of Interior*, 377 F.3d 1147, 1152 (10th Cir. 2004). The *Pennaco* decision and the other IBLA cases cited by New York are inapplicable for a variety of additional reasons: (1) the 10th Circuit's decisions are not binding outside of that circuit; (2) nothing in the IBLA jurisprudence undermines the validity of the NRC's processes under NEPA; and (3) New York's interpretations of the IBLA decisions are oversimplified and appear to gloss over significant internal disputes over the interpretation of IBLA's precedent. *See, e.g.*, *Wyoming Outdoor Council*, 158 IBLA 155, 171 (IBLA 2003) ("While the Board may look to post-EA [environmental assessment] generated materials in search of BLM's 'hard look,' those materials, *in this case*, present unresolved water quality issues.") (emphasis added); *see also id.* at 177 (Admin. J. Grant, dissenting) ("In evaluating whether BLM has taken a hard look at environmental impacts necessary to support a FONSI, this Board has found it proper to consider the entire record including comments, responses, and analysis generated before and after the EA was prepared"); *see also id.* at 180 ("[W]hile on appeal the appellants have made many assertions . . . these concerns have been addressed in the record, and when viewed in its entirety, the record supports the FONSI").

49 *See* New York Proposed Findings at 138 (¶ 369) (arguing that supplementation would be "fraught with problems").

50 *Id*.

51 *Id*.

52 *See* 10 C.F.R. §§ 2.1202(b)(2)-(3), 51.104(a)(2)-(3). Contrary to New York's focus on the NRC Staff, NEPA "is addressed to agencies as a whole, not only to their professional staffs." *Calvert Cliffs' Coordinating Comm. v. AEC*, 449 F.2d 1109, 1118 (D.C. Cir. 1971).

participation than NEPA otherwise requires.[53] Fourth, contrary to New York's argument,[54] NEPA does not preclude supplementation because it would mean that "all the pertinent environmental information would no longer appear in one document."[55]

16. Finally, New York's proposal would elevate form over substance and would likely undermine the efficient resolution of this adjudicatory proceeding. Surely, any change in the FSEIS—even if fully documented in the hearing record—does not require the publication of an FSEIS supplement for comment and subsequent hearing opportunity. Drawing out the NEPA review in such an indefinite fashion would undermine the Commission's goals of an efficient, stable, and predictable regulatory process for license renewal.[56] It would also undermine NEPA's ultimate purpose, which is not better documents but better decisions.[57]

17. In summary, this adjudicatory proceeding is not immune or isolated from the requisite "hard look" required of the NRC by NEPA; it is a key part of it. The Board must follow binding NRC precedent and reject New York's claim that "no 'adjudicatory findings' could cure" the defects New York purports to identify.[58] As discussed below and detailed in Entergy's and

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53 *Hydro Res.*, CLI-01-04, 53 NRC at 53. For this same reason, New York incorrectly relies on the Board's decision granting New York summary disposition on NYS-35/36 as support for its claim that a remand to the NRC Staff is the appropriate remedy for any NEPA deficiency. *See* New York Proposed Findings at 139 (¶ 370). That decision is distinguishable because resolution of that contention did not involve an evidentiary hearing (*i.e.*, there was no public airing of the issues). Entergy also respectfully notes that it believes that Board erred in that decision.

54 New York Proposed Findings at 138-39 (¶ 369).

55 To the contrary, NEPA allows agencies to rely on environmental analyses in multiple documents. *See, e.g.*, 10 C.F.R. Part 51, App. A, § (b) (authorizing tiering and incorporation by reference).

56 *See* Final Rule, Nuclear Power Plant License Renewal; Revisions, 60 Fed. Reg. 22,461, 22,461 (May 8, 1995); Proposed Rule, Revisions to Environmental Review for Renewal of Nuclear Power Plant Operating Licenses, 74 Fed. Reg. 38,117, 38,118 (July 31, 2009).

57 40 C.F.R. § 1500.1(c) ("Ultimately, of course, it is not better documents but better decisions that count. NEPA's purpose is not to generate paperwork—even excellent paperwork—but to foster excellent action. The NEPA process is intended to help public officials make decisions that are based on understanding of environmental consequences, and take actions that protect, restore, and enhance the environment.").

58 *See* New York Proposed Findings at 136 (¶ 364).

NRC Staff's Proposed Findings, to the extent any further NEPA analysis is required beyond the FSEIS, there is ample information in record from which Board can draw to supplement the FSEIS.

B. Facts Not Disputed by New York

18. As discussed below, although New York continues to disagree with Entergy and the NRC Staff on numerous factual and legal issues, the record evidence does reflect agreement (at least in principle) among the parties on some key facts. In particular, the parties agree that:

- A SAMA analysis is intended to identify potential changes to a nuclear power plant, or its operations, that could reduce the already-low risk (the likelihood and/or the impact) of a severe accident, for which the benefit of implementing the change outweighs the cost of implementation.[59]

- A SAMA analysis models numerous accident release conditions that could, based on probabilistic analysis, occur at any time under varying weather conditions during a one-year period to calculate the mean annual consequences of a severe accident for the entire 50-mile radius area of interest.[60]

- A SAMA analysis makes use of "best estimate" values and involves an averaging of potential consequences.[61]

- The industry has developed a guidance document, NEI 05-01, Rev. A ("NEI 05-01") to facilitate the preparation of complete SAMA analyses.[62] The Staff has specifically endorsed NEI 05-01 and recommended that applicants for license renewal follow the guidance provided in NEI 05-01 when preparing their SAMA analyses.[63]

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[59] Oct. 17, 2012 Tr. at 1900:9-23 (Teagarden); Testimony of Entergy Witnesses Lori Potts, Kevin O'Kula, and Grant Teagarden on Consolidated Contention NYS-12C (Severe Accident Mitigation Alternative Analysis) at 17 (A28) (Mar. 30, 2012) ("Entergy Testimony") (ENT000450); NRC Staff Testimony of Nathan E. Bixler, S. Tina Ghosh, Joseph A. Jones and Donald G. Harrison Concerning NYS' Contentions NYS 12/16 at 19 (A8) (Mar. 30, 2012) ("NRC Staff Testimony") (NRC000041); Pre-filed Written Testimony of Dr. Francois J. Lemay Regarding Consolidated NYS-12-C (NYS-12/12-A/12-B/12-C) at 10:206-19 (Dec. 21, 2011) ("New York Direct Testimony") (NYS000241).

[60] Oct. 17, 2012 Tr. at 1927:16-24 (Teagarden); Entergy Testimony at 18 (A31) (ENT000450); NRC Staff Testimony at 25-26 (A19) (NRC000041) New York Direct Testimony at 11:231-33 (NYS000241).

[61] Oct. 17, 2012 Tr. at 1937:1-21 (Teagarden, Bixler, and Lemay).

[62] *Id.* at 1926:5-8 (Teagarden); *id.* at 1945:15-16 (Lemay); Entergy Testimony at 17 (A29) (ENT000450); *see* NEI 05-01, Rev. A, Severe Accident Mitigation Alternatives (SAMA) Analysis, Guidance Document (Nov. 2005) ("NEI 05-01") (NYS000287).

[63] Oct. 17, 2012 Tr. at 1926:10 (Teagarden); Entergy Testimony at 18 (A30) (ENT000450).

- Entergy followed the NRC-approved, prescriptive guidance in NEI 05-01 to perform the SAMA analysis and used the NRC and industry standard code (MACCS2) in the analysis.[64]

- A SAMA analysis involves four major sequential steps: (1) characterization of plant risk, (2) identification of potential SAMA candidates, (3) quantification of risk reduction potential and SAMA implementation costs, and (4) identification of potentially cost-beneficial SAMAs.[65]

- The MACCS2 code is the standard software tool used in the U.S. to perform the offsite consequence analysis for the Level 3 portion of nuclear power plant PRA-type evaluations.[66]

- MACCS2 performs its calculations based on plant- and site-specific, regional, and industry-standardized regulatory inputs.[67] Plant-specific inputs to MACCS2 include, for example, the PRA-based source terms for each source term release category and the reactor core radionuclide inventory, site-specific meteorological data, projected population distribution, and land-related economic data.[68]

- MACCS2 is divided into three primary modules—ATMOS, EARLY, and CHRONC.[69] NYS-12C challenges certain Entergy inputs to CHRONC, which uses the atmospheric radioactivity concentrations determined by ATMOS to determine long-term offsite population dose and long-term economic costs.[70]

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64 Entergy Testimony at 17-18 (A29-30), 46 (A61) (ENT000450).

65 *See* October 17, 2012 Tr. at 1900:24-1919:14 (Teagarden); *see also* Entergy Testimony at 18 (A31) (ENT000450); NRC Staff Testimony at 19 (A9) (NRC000041); NEI 05-01 at 2 (NYS000287).

66 NRC Staff Testimony at 21 (A12) (NRC00041); Entergy Testimony at 24 (A39), 76-77 (A101) (ENT000450); New York Direct Testimony at 11:244-12:251 (NYS000241); *see also Pilgrim,* CLI-12-01, slip op. at 3 ("NRC-endorsed guidance on SAMA analysis endorses use of the MACCS2 code.") (citing *Entergy Nuclear Generation Co.* (Pilgrim Nuclear Power Station), CLI-10-11, 71 NRC 287, 291 & n.11 (2010)).

67 Oct. 17, 2012 Tr. at 1938:4-9 (Teagarden), 1944:11-1945:4 (O'Kula); New York Testimony at 13:269-77 (NYS000241); *see also* NEI 05-01 at 13-15 (NYS000287).

68 Oct. 17, 2012 Tr. at 1947:16-1950:8 (Teagarden); New York Direct Testimony at 12:261-64 (NYS000241); *see also* NEI 05-01 at 13-15 (NYS000287).

69 Oct. 17, 2012 Tr. at 2056:22-2057:25 (O'Kula); Entergy Testimony at 28-29 (A44 & Fig. 2) (ENT000450) (citing NUREG/CR-6613, "Code Manual for MACCS2," Vol. 1 at 2-1 to 2-3 (May 1998) ("NUREG/CR-6613") (NYS000243)); NRC Staff Testimony at 25 (A19) (NRC000041); New York Direct Testimony at 13:286-14:294 (NYS000241).

70 Entergy Testimony at 28 (A44) (ENT000450); NRC Staff Testimony at 36-37 (A32) (NRC000041); New York Direct Testimony at 14:307-14 (NYS000241).

- The MACCS2 code conserves mass through a source depletion model; *i.e.,* there is conservation of mass between the modeled plume and the contamination deposited by that plume; *i.e.*, more contamination is not deposited than was originally released.[71]

- MACCS2 accounts for varying population densities and the cost of nonfarm decontamination within the modeled 50-mile radius SAMA analysis region by applying the CDNFRM input values on a per person basis.[72]

- MACCS2 provides results in terms of offsite population dose and offsite economic cost that are used to compute the offsite risk measures; *i.e.*, population dose risk ("PDR") expressed in units of person-rem/year, and offsite economic cost risk ("OECR") expressed in dollars/year.[73] The individual PDRs and OECRs for the spectrum of different accident release categories are summed (outside of MACCS2) to determine the overall PDR and overall OECR for the plant's SAMA analysis.[74]

- The nonfarm decontamination cost (CDNFRM) and decontamination time (TIMDEC) parameter inputs to MACCS2 have the most significant impact of the MACCS2 parameters at issue in NYS-12C.[75]

- The maximum CDNFRM value accepted by the MACCS2 code is $100,000 per person. The maximum TIMDEC value accepted by the MACCS2 code is one year.

- Entergy relied on CDNFRM, TIMDEC, and dose reduction (decontamination) factors (DSRFCT) obtained from NUREG-1150.[76] Entergy updated the CDNFRM input values using the Consumer Price Index ratio for 1986 to 2005 (the basis year for the IPEC SAMA analysis), consistent with NEI 05-01 guidance.[77]

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71 Oct. 18, 2012 Tr. at 2143:19-23 (Bixler); *id.* at 2176:23-2177:10 (Lemay).

72 *Id*. at 2166:18-20 (Teagarden); New York Direct Testimony at 11:233-35 (NYS000241).

73 Oct. 17, 2012 Tr. at 1907:17-22, 1913:3-14, 1918:1-22 (Teagarden); Entergy Testimony at 45 (A59) (ENT000450) New York Position Statement at 13 (NYS000240).

74 Entergy Testimony at 45 (A59) (ENT000450); Oct. 18, 2012 Tr. at 2191:22-25 (Teagarden); *see also id.* at 2194:17-24 (Lemay).

75 *See* Oct. 17, 2012 Tr. at 2053:18-2055:8 (Teagarden, Lemay).

76 *See id*. at 2058:20-22 (Teagarden); *id.* at 2059:14-16 (Teagarden) ("The sample problem reflects values from NUREG-1150. The Entergy analysis used values from NUREG-1150."); New York Direct Testimony at 23:498-503 (NYS000241).

77 *See* Entergy Testimony at 53 (A71) (ENT000450) (citing NL-08-028, Letter from Fred Dacimo, Vice President, Entergy, to NRC, Reply to Request for Additional Information Regarding License Renewal Application – Severe Accident Mitigation Alternatives Analysis, Attach. 1 at 38 (Feb. 5, 2008) ("February 2008 RAI Response") (ENT000460)); Oct. 17, 2012 Tr. at 1962:20-22 (Teagarden); New York Direct Testimony at 23:498-503 (NYS000241).

C. New York's Attempts to Diminish the Qualifications and Dismiss the Testimony of Entergy's and NRC Staff's Expert Witnesses Are Groundless

19. In its proposed findings, New York contends, for the first time in this proceeding, that Entergy's and the Staff's expert witnesses lack sufficient qualifications or experience and rely on "unsupported assumptions and conclusions," such that portions of their testimony should be afforded "little or no weight."[78] New York's arguments clearly are groundless. Indeed, New York's criticisms are more appropriately directed at its own expert, who has no prior experience with performing NRC-required SAMA analyses, and whose own testimony has been shown to contain numerous material errors and incorrect assumptions.[79]

20. All of Entergy's and the NRC Staff's witnesses are eminently well qualified to testify on the issues raised in NYS-12C. The professional qualifications of both parties' expert witnesses are summarized in Entergy's proposed findings.[80] Nonetheless, in light of New York's misdirected attempts to impugn the testimony of Entergy's and the Staff's witnesses, Entergy reiterates and augments that discussion here.

1. Entergy's Expert Witnesses and Testimony

21. Ms. Potts, a nuclear engineer by training, has over 30 years of relevant technical experience, is a co-author of the industry's NRC-approved SAMA analysis guidance, and has been directly involved in the preparation or peer review of SAMA analyses for approximately one dozen nuclear power plants.[81] In the *Pilgrim* license proceeding, Ms. Potts co-authored an expert

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78 *See* New York Proposed Findings at 96 (¶ 257), 125 (¶ 343), 129 (¶ 350).

79 *See*, *e.g.*, NRC Staff Proposed Findings at 43 (¶ 5.73) ("Entergy's and the NRC's experts identified serious errors in accounting for land area, conservation of mass, the net present value of money expended over multiple years, the inter-related nature of the MACCS2 data inputs, and the allowable input ranges.").

80 *See* Entergy's Proposed Findings at 47-52 (¶¶ 94-104).

81 Ms. Potts' professional qualifications are provided in her curriculum vitae (ENT000004) and summarized in her testimony. *See* Entergy Testimony at 1-3 (A1-4) (ENT000450).

declaration (along with Dr. O'Kula and another witness) that supported Entergy's successful opposition to a proposed SAMA contention based on the March 2011 accident at Fukushima.[82]

22. Dr. O'Kula has a Ph.D. in nuclear engineering and over 30 years of relevant technical experience, including over twenty years of experience using, applying, and providing training on the MACCS/MACCS2 computer codes.[83] Dr. O'Kula was a member of the Peer Review Committee for NRC's State-of-the-Art Reactor Consequence Analyses ("SOARCA") project.[84] He has authored dozens of publications germane to severe accident consequence analysis, including SAMA analysis.[85] In the *Pilgrim* license renewal proceeding, the Board and the Commission relied extensively on Dr. O'Kula's expert testimony in dismissing SAMA-related contentions at the contention admissibility and merits stages of that proceeding.[86] In the *Davis-Besse* license renewal proceeding, another Board relied on an expert declaration prepared by Dr. O'Kula and Mr. Teagarden in granting summary disposition of an admitted SAMA contention.[87]

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82 *See* Declaration of Joseph R. Lynch, Lori Ann Potts, and Dr. Kevin R. O'Kula in Support of Entergy's Answer Opposing Commonwealth Claims of New and Significant Information Based on Fukushima (June 27, 2011) ("Lynch, Potts, and O'Kula Declaration"), *available at* ADAMS Accession No. ML11346A301; *Entergy Nuclear Generation Co.* (Pilgrim Nuclear Power Station), LBP-11-35, 74 NRC __, slip op. at 28-29, 34-40 (Nov. 28, 2011), *aff'd*, CLI-12-06, 75 NRC __, slip op. (Mar. 8, 2012) (citing extensively to the Lynch, Potts, and O'Kula Declaration in rejecting the petitioner's technical arguments.).

83 Dr. O'Kula's professional qualifications are provided in his curriculum vitae (ENT000005) and summarized in his testimony. *See* Entergy Testimony at 3-5 (A5-9) (ENT000450).

84 The NRC initiated the SOARCA project in 2006 to develop revised best estimates of the offsite radiological health consequences of severe reactor accidents by including significant plant improvements and updates not reflected in earlier NRC assessments. *See* Entergy Testimony at 26 (A41) (ENT000450).

85 *See Curriculum Vitae* of Kevin R. O'Kula at 5-6 (ENT000005).

86 *See Entergy Nuclear Generation Co.* (Pilgrim Nuclear Power Station), LBP-11-18, 74 NRC __ slip op. (July 19, 2011), *aff'd*, CLI-12-01, 75 NRC __, slip op. (Feb. 9, 2012); *Entergy Nuclear Generation Co.* (Pilgrim Nuclear Power Station), LBP-12-01, 75 NRC __, slip op. (Jan. 11, 2012), *aff'd*, CLI-12-15 (June 7, 2012).

87 *See* Joint Declaration of Kevin O'Kula and Grant Teagarden in Support of FirstEnergy's Motion for Summary Disposition of Contention 4 (SAMA Analysis Source Terms) (July 26, 2012) ("Joint Declaration by Dr. O'Kula and Mr. Teagarden"), *available at* ADAMS Accession No. ML12208A429; *FirstEnergy Nuclear Operating Co*. (Davis-Besse Nuclear Power Station, Unit 1), LBP-12-26, 76 NRC __, slip op. at 10-11, 20-23, 26-28 (Dec. 28, 2012) (citing Joint Declaration by Dr. O'Kula and Mr. Teagarden in granting summary disposition of admitted SAMA contention). Notably, this Board also relied, in part, on a joint declaration submitted by Dr. O'Kula and Mr. Teagarden in denying New York's August 28, 2009 motion for summary disposition of SAMA contention

23. Mr. Teagarden, a mechanical engineer by education, has over fourteen years of relevant technical experience.[88] He has substantial expertise in performing Level 2 and Level 3 PRAs, and as Manager for Consequence Analysis for ERIN Engineering & Research, Inc., Mr. Teagarden is the company lead for Level 3 PRA consequence analysis. In that capacity, he has developed Level 3 PRA models for the Limerick, Callaway, Diablo Canyon, Salem, Hope Creek, Three Mile Island ("TMI"), Prairie Island, Palisades, and Monticello nuclear power plants (in support of those plants' license renewal SAMA analyses).[89] He also has developed Level 3 models to support several design certification, early site permit, and new reactor license applications.[90] Finally, Mr. Teagarden supported the applicants' successful resolution of admitted SAMA contentions in the *Prairie Island* and *Davis-Besse* license renewal proceedings.[91]

24. New York contends that Entergy's witnesses are not sufficiently qualified because they have not "attempted to develop site-specific cost inputs (other than population and farm/nonfarm wealth) to the CHRONC module of the MACCS2 code."[92] It further asserts that those witnesses instead "have only ever used Sample Problem A values, escalated using the

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NYS-16/16A. *See* Licensing Board Memorandum and Order (Ruling on Motions for Summary Disposition) at 8-14 (Nov. 3, 2009 (unpublished) (citing Joint Declaration of Kevin O'Kula and Grant Teagarden in Support of Entergy's Answer Opposing New York State's Motion for Summary Disposition of Contention NYS-16/16A (Sept. 18, 2009)).

88 Mr. Teagarden's professional qualifications are provided in his curriculum vitae (ENT000007) and summarized in his testimony. *See* Entergy Testimony at 5-7 (A10-13) (ENT000450).

89 *See Curriculum Vitae* of Grant A. Teagarden at 1 (ENT000007).

90 *See id.*

91 *See id*.; *see also supra* note 86 .

92 New York Proposed Findings at 33 (¶ 98). New York claims that "Dr. Lemay and ISR have experience developing site-specific inputs and, in fact, analyzed how site-specific inputs should be developed for Indian Point." *Id*. However, there is no indication in Dr. Lemay's curriculum vitae (NYS000291) or testimony that he has any prior experience in performing NRC-mandated SAMA analyses, much less developing "site-specific" economic and decontamination-related inputs for such analyses. Further, New York presupposes that Dr. Lemay's proposed decontamination time and cost values are technically justified. For the many reasons set forth in Entergy's and the Staff's testimony and proposed findings, Dr. Lemay's proposed values are anything but technically justified.

Consumer Price Index."[93] New York misses the point. Based on their substantial expertise and experience in performing or reviewing MACCS2 based SAMA analyses, Entergy's witnesses testified that the NUREG-1150/Sample Problem A values challenged by New York *are* reasonable and acceptable for use in a SAMA analysis.[94] In fact, they testified that, in their professional opinions, the values used by Entergy represent the best available information, and to the best of their knowledge, there are no technically superior values for use in a SAMA analysis.[95] There is no "knowledge and experience gap" as alleged by New York,[96] or any need to undertake the development of additional studies or cost estimates under NEPA.[97]

25. New York also suggests that because Entergy's witnesses did not actually perform the IPEC SAMA analysis, as revised in December 2009, they are somehow unable to testify on the adequacy of that analysis or New York's criticisms thereof.[98] That argument is frivolous. Ms. Potts specifically testified that she: (1) was involved with the IPEC SAMA analysis from its inception in 2005; (2) provided advice to the Entergy Fuels and Analysis Department engineers during preparation of the original SAMA analysis and the December 2009 revised SAMA analysis; (3) reviewed the summaries of those analyses and provided suggestions for improvement before they were submitted to the NRC; and (4) has personal knowledge of the MACCS2

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93 *Id*.

94 *See generally*, Entergy Proposed Findings at 67-74 (¶¶ 135-148), 77-87 (¶¶ 154-171), 103-110 (¶¶ 204-216), 113-119 (¶¶ 222-235) (including testimony and exhibits cited therein).

95 *See* Oct. 17, 2012 Tr. at 2040:2-5 (Teagarden); *see also id.* at 2043:24-2044:4 (Ms. Potts) ("As Mr. Teagarden said, these are the best values that we know of, the only values that are available, and its irrational to think that the authors of [NUREG-]1150 would have used them for all five of the plants in that study if they were not applicable.").

96 New York Proposed Findings at 125 (¶ 342).

97 *See*, *e.g.*, *Lee v. United States Air Force*, 354 F.3d 1229, 1244 (10th Cir. 2004) (holding that the U.S. Air Force was not required to carry out its own study regarding the impact of low-level overflights on livestock, and that "agencies must use the 'best available scientific information' when assessing environmental impacts.").

98 *See* New York Proposed Findings at 32-34 (¶¶ 94-98).

modeling and assumptions used in the IPEC SAMA analysis.[99] She also stated that she reviewed various materials in preparing her written testimony, including those portions of the IPEC LRA relating to SAMAs.[100] Dr. O'Kula and Mr. Teagarden testified that they thoroughly reviewed the various inputs and assumptions used in Entergy's SAMA analysis (as revised in December 2009) to calculate offsite consequences associated with a postulated severe accident at IPEC, including relevant supporting documentation, and that they have personal knowledge of the MACCS2 modeling, and inputs and assumptions used in the IPEC SAMA analysis.[101]

26. Finally, New York claims certain testimony by Dr. O'Kula and Mr. Teagarden lacks adequate supporting documentation. For example, Mr. Teagarden testified at hearing that after accounting for the full spectrum of release categories and frequencies considered in the IPEC SAMA analysis, he estimated that the "average" number of decontamination workers would be approximately 60,000 to 80,000 people.[102] New York contends that this testimony should be disregarded because Entergy has offered "no analysis or documentation" to support Mr. Teagarden's statement.[103] Similarly, New York asserts that Dr. O'Kula's testimony concerning his "informal look" at Dr. Lemay's CONDO and Risø decontamination cost values should be afforded no weight due to an alleged lack of supporting data or analysis.[104]

27. New York's argument lacks force. New York could have lodged an objection to Mr. Teagarden's testimony at the time he proffered it or, alternatively, cross-examined him on the

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99 *See* Entergy Testimony at 2-3 (A4) (ENT000450).

100 *See id.* at 3 (A4).

101 *See id.* at 5 (A9), 6-7 (A13).

102 Oct. 18, 2012 Tr. at 2191:2-6 (Teagarden).

103 New York Proposed Findings at 129 (¶ 351).

104 *See id.* at 128 (¶ 349). Dr. O'Kula testified that he renormalized the surface factors for internal walls and exterior walls used by Dr. Lemay in the ISR Report to make them more realistic, and that the values "became much like those applied in the Entergy SAMA analysis." Oct. 18, 2012 Tr. at 2366:5-12 (O'Kula).

bases for his decontamination worker estimate.[105] It did neither. Accordingly, the Board should accord Mr. Teagarden's testimony its due weight.

28. With respect to Dr. O'Kula's testimony concerning his "renormalization" of Dr. Lemay's CONDO-related decontaminating cost estimates, New York did raise such an objection.[106] However, that objection was overruled by the Board.[107] New York also requested that any spreadsheets or analyses documenting Dr. O'Kula's assessment of Dr. Lemay's CONDO-related cost estimates be disclosed.[108] The Board did not rule on this request, but noted that New York could review the transcript and file an appropriate motion, if necessary.[109] Entergy voluntarily disclosed and produced a copy of a spreadsheet prepared by Dr. O'Kula as an interim disclosure on November 30, 2012.[110] New York did not move to exclude Dr. O'Kula's testimony from the hearing record as unreliable, or seek to supplement its testimony, based on its review of that disclosure. Therefore, Dr. O'Kula's testimony also should be accorded its due weight.[111]

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105 *Cf. Toucet v. Maritime Oversees Corp.*, 991 F.2d 5, 10 (1st Cir. 1993) (holding that burden of exploring facts and assumptions underlying expert testimony rests on opponent); *Ratliff v. Schiber Truck Co., Inc.*, 150 F.3d 949, 955 (8th Cir. 1998) (holding that party opposing expert's testimony has burden of exploring facts and assumptions underlying the expert's opinion; thus, trial court had discretion to allow cross-examination of testifying expert about inadmissible document not in evidence but relied on by expert).

106 *See* Oct. 18, 2012 Tr. at 2365:17-22 (Liberatore).

107 *See id.* at 2365:23-2366:2 (Judge McDade) ("This is the opportunity of Entergy to ask the question. I think it was an appropriate question. I'm going to allow the witness appropriate question. I'm going to allow the witness to answer in the way he thinks is most responsive, and the objection is overruled.").

108 *See id.* at 2384:9-15 (Liberatore).

109 *See id.* at 2384:16-24 (Judge McDade).

110 *See* Entergy Disclosure Log No. 9432, CONDO and RISO Spreadsheet, prepared by Dr. Kevin O'Kula (Oct. 2012). Entergy also listed Dr. O'Kula's spreadsheet in its Forty-Sixth Supplemental Disclosure Log transmitted to the parties on December 5, 2012.

111 *Cf. Donahue v. Barnhart*, 279 F.3d 441, 446 (7th Cir. 2002) (holding that an expert is free to give "bottom line" opinion, as long as underlying data and reasoning are available on demand). Here, New York did not ask the Board for the opportunity to perform additional cross-examination of Dr. O'Kula or to supplement its testimony.

2. NRC Staff's Expert Witnesses and Testimony

29. Dr. Bixler holds a Ph.D. in Chemical Engineering and has been employed by Sandia National Laboratories for nearly three decades.[112] Since 1998, he has been the principal investigator for code development and analysis of nuclear accident consequences for the NRC for multiple codes, including the MACCS2 code. Dr. Bixler has authored or co-authored publications related to severe accidents and the MACCS2 code.[113] He also testified on behalf of the NRC Staff in the *Pilgri*m license renewal proceeding in connection with an admitted SAMA contention that was dismissed in favor of Entergy and the NRC Staff after an evidentiary hearing on the merits.[114]

30. Dr. Ghosh holds advanced nuclear engineering degrees and a B.S. degree in civil engineering from two of the most prestigious academic institutions in the nation, the Massachusetts Institute of Technology (where she was supervised by NRC Commissioner George Apostolakis and has since served as a guest lecturer) and Princeton University.[115] Dr. Ghosh, who has substantial expertise in risk-informed decision-making, served as the NRC lead for the SOARCA project, and has reviewed numerous license renewal SAMA analyses.

31. Mr. Jones is a Distinguished Member of the Technical Staff at Sandia National Laboratories.[116] He has nearly thirty years of experience in engineering and analysis, and has been involved in radiological emergency preparedness, consequence management, and radioactive

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[112] Dr. Bixler's professional qualifications are provided in his statement of qualifications (NRC000042) and summarized in his testimony. *See* NRC Staff Testimony at 1-3 (A1-2) (NRC000041).

[113] *See* Statement of Qualifications of Nathan E. Bixler at 4-6 (NRC00042).

[114] *See*, *e.g.*, *Pilgrim*, CLI-12-01, slip op. at 4, 14, 19 (citing Affidavit of Dr. Nathan Bixler Concerning the Board's Questioning from Board Majority Regarding the Mechanics of Computing "Mean Consequences" in SAMA Analyses (Nov. 18, 2010)).

[115] Dr. Ghosh's professional qualifications are provided in her statement of qualifications (NRC000043) and summarized in her testimony. See NRC Staff Testimony at 1-3 (A1-2) (NRC000041).

[116] Mr. Jones' professional qualifications are provided in his statement of qualifications (NRC000044) and summarized in his testimony. *See* NRC Staff Testimony at 1-4 (A1-2) (NRC000041).

materials cleanup activities both nationally and internationally. Mr. Jones has managed project teams in the decontamination and decommissioning of radioactively-contaminated facilities at Sandia and the development of advanced decontamination techniques for radioactive materials.

32. Mr. Donald Harrison is a nuclear engineer and has over twenty-five years of technical expertise in PRA and risk-related activities.[117] He is a recognized expert in PRA techniques and risk-informed applications who has been involved in many of the NRC's highest priority activities that relied upon risk insights. Notably, Mr. Harrison assisted the Office of Commission Appellate Adjudication as an adjudicatory employee, providing technical advice in the Catawba and McGuire license renewal proceedings.[118]

33. All of the NRC Staff's witnesses identified the specific documents that they reviewed in preparing their prefiled written testimony on NYS-12C.[119] In short, they reviewed Entergy's SAMA analysis, as revised, including key supporting technical documentation, as well as the relevant portions of the FSEIS for IPEC license renewal.[120] Thus, the Staff's witnesses have personal knowledge of the inputs and assumptions used in the IPEC SAMA analysis.

34. In summary, based on their specialized technical knowledge and experience, the Entergy and NRC Staff witnesses identified above provided expert testimony that will help the Board to understand the evidence and resolve the issues raised in NYS-12C. Collectively, those witnesses have roughly 170 years of relevant technical experience, have been directly involved in preparing and reviewing dozens of SAMA analyses, and previously have offered expert testimony

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117 Mr. Harrison's professional qualifications are provided in his statement of qualifications (NRC000045) and summarized in his testimony. *See* NRC Staff Testimony at 2-4 (A1-2) (NRC000041).

118 *See* Statement of Qualifications of Donald G. Harrison at 2 (NRC000045).

119 *See* NRC Staff Testimony at 6-12 (A5.a-A.5d) (NRC000041).

120 *See id.*

relied on by other Licensing Boards and the Commission. There is no basis for New York to belatedly claim that any of their testimony should be disregarded or accorded no weight.

D. A SAMA Analysis Is a Site-Specific Mitigation Alternatives Analysis, Not a Severe Accident Impacts Assessment

35. In its proposed findings, New York incorrectly suggests that a SAMA analysis is site-specific assessment of the environmental impacts of a postulated severe accident.[121] For example, New York states that "[t]he SAMA analysis is crucial" because "[i]t is the only time that NRC Staff evaluates the environmental *impacts* associated with a severe accident at Indian Point before deciding whether to grant Entergy's license renewal application."[122] It later asserts that "[t]he SAMA analysis is the vehicle by which NRC Staff considers, in the FSEIS, the environmental impacts of a severe accident."[123]

36. These and other similar statements by New York are factually incorrect and contrary to Commission legal precedent. As the Commission stated less than one year ago:

> The [facility's] SAMA analysis must also be understood against the backdrop of our Generic Environmental Impact Statement (GEIS), which contains a bounding, generic severe accident impacts analysis, applicable to all plants. Thus, although our rules require that potential severe accident mitigation alternatives be considered for license renewal, *no site-specific severe accident impacts analysis need be done*.[124]

37. As noted by the Commission, the NRC's GEIS provides an evaluation of severe accident impacts that applies to all U.S. nuclear power plants—including IPEC.[125] Further, the

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121 New York Proposed Findings at 23-26 (¶ 75-80).

122 *Id*. at 1 (¶ 5) (emphasis added).

123 *Id.* at 23 (¶ 75), 109 (¶ 290).

124 *Pilgrim*, CLI-12-15, slip op. at 5-6 (emphasis added) (citations omitted).

125 *See* NUREG-1437, Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Vol. 1 at 5-12 to 5-116 (May 1996) ("GEIS") (NYS00131C); *Pilgrim*, CLI-10-11, 71 NRC at 316 ("Because the GEIS provides a severe accident impacts analysis that envelopes the potential impacts at all existing plants, the

Commission has noted that the GEIS analyses represent *plant-specific* estimates of the impacts from severe accidents that would generally over-predict, rather than under-predict, environmental consequences.[126] Based on the GEIS evaluation, 10 C.F.R. Part 51 concludes that "[t]he probability weighted consequences of atmospheric releases, fallout onto open bodies of water, releases to ground water, and societal and economic impacts from severe accidents are *small for all plants*."[127] Thus, contrary to New York's claim, NRC SAMA analyses are not a substitute for, and do not represent, the NRC NEPA analysis of potential impacts of severe accidents.[128]

E. Neither NEPA Nor the NRC's 10 C.F.R. Part 54 License Renewal Regulations Require Implementation of Potentially Cost-Beneficial SAMAs

38. New York also erroneously suggests that NEPA compels implementation of SAMAs identified by Entergy as potentially-cost beneficial.[129] For instance, it claims that the NRC Staff's allegedly inappropriate acceptance of Entergy's decontamination cost values "deprives millions of New Yorkers and others living around Indian Point of the potential benefits of mitigation measures that could protect them in the event of a severe accident."[130] Citing the Board's July 2011 summary disposition ruling concerning contention NYS-35/36, New York further asserts that "[o]ne goal of the SAMA analysis is to provide sufficient information about

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environmental impacts of severe accidents during the license renewal term already have been addressed generically in bounding fashion."); *see also* GEIS at 5-17, 5-22, 5-29, 5-34, 5-36, 5-38, 5-40, 5-45, 5-47, 5-85 to -88, 5-97 (NYS0131C).

126 Final Rule, Environmental Review for Renewal of Nuclear Power Plant Operating Licenses, 61 Fed. Reg. 28,467, 28,480 (June 5, 1996).

127 FSEIS at 5-3 (NYS00133B) (*quoting* 10 C.F.R. Pt. 51, Subpt. A, App. B, Tbl. B-1 (Postulated Accidents; Severe Accidents)) (emphasis added).

128 *Pilgrim*, CLI-10-11, 71 NRC at 315-16**.**

129 At hearing, Entergy objected to this argument as being outside the scope of the contention. Oct. 17, 2012 Tr. at 1922:3-12 (Bessette). The NRC Staff also noted that this argument was outside the scope of this contention. Oct 18, 2012 Tr. at 2226:2-8 (Ghosh).

130 New York Proposed Findings at 2 (¶ 8).

mitigation alternatives for NRC Staff to adequately analyze mitigation alternatives under NEPA and determine whether to *require* particular accident mitigation alternatives."[131]

39. New York's assertions again are contrary to settled law. The Commission has stated in this proceeding that "NEPA is a procedural statute—although it requires a 'hard look' at mitigation measures, it does not, in and of itself, provide the statutory basis for their implementation."[132] And, even more recently, the Commission rejected an intervenor's claim that NRC must "require" Entergy to implement "all possible" mitigation alternatives.[133] It correctly noted that such a demand is inconsistent with NEPA, "which neither requires nor authorizes the NRC to order implementation of mitigation measures analyzed in an environmental analysis."[134]

40. The Commission's statements in this proceeding and in *Pilgrim* are consistent with a long line of judicial opinions—including the Supreme Court's *Robertson* decision—holding that NEPA imposes no substantive requirement that mitigation measures actually be taken.[135] Among the most recent of those decisions is the First Circuit's February 2013 decision denying a petition

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131 *Id*. at 41 (¶ 113) (citing *Entergy Nuclear Operations, Inc.* (Indian Point Nuclear Generating Units 2 and 3), LBP-11-17, 74 NRC 11, 27 (2011), *pet. for rev. denied*, CLI-11-14, 74 NRC __ (slip op.) (Dec. 22, 2011)) (emphasis added).

132 *Indian Point*, CLI-11-14, slip op. at 16 (citing *Robertson v. Methow Valley Citizens Council*, 490 U.S. 332, 353 n.16 (1989)).

133 *Entergy Nuclear Generation Co.* (Pilgrim Nuclear Power Station), CLI-12-10, 75 NRC __, slip op. at 11 (Mar. 30, 2012).

134 *Id.* (citing *Robertson*, 490 U.S. at 353).

135 *See*, *e.g.*, *Robertson*, 490 U.S. at 352, 353 ("[I]t would be inconsistent with NEPA's reliance on procedural mechanisms—as opposed to substantive, result-based standards—to demand the presence of a fully developed plan that will mitigate environmental harm before an agency can act."); *Nat'l Parks & Conservation Ass'n v. U.S. Dep't of Trans.*, 222 F.3d 677, 681 n.4 (9th Cir. 2000) (stating that "a mitigation plan need not be legally enforceable, funded or even in final form to comply with NEPA's procedural requirements"); *Cnty. of Rockland v. FAA*, 335 Fed.Appx. 52, 55 (DC. Cir. 2009) ("NEPA does not impose 'substantive requirement that a complete mitigation plan be actually formulated and adopted' before agency can act") (quoting *Robertson*, 490 U.S. at 352); *Citizens Concerned About Jet Noise, Inc. v. Dalton*, 48 F.Supp.2d 582, 603 (E.D.Va. 1999) (citing *Robertson*, 490 U.S. at 353) ("[B]ecause it is only procedural and not substantive in nature, NEPA does not require agencies to implement any of the mitigation measures discussed in the FEIS.").

for review of the Commission's decision to issue a renewed license for Entergy's Pilgrim plant.[136] The court stated unequivocally that "[t]o the extent [the petitioner] seeks to impose a substantive requirement that the NRC must require certain mitigation measures under NEPA, that is *foreclosed* by the fact that NEPA is not outcome driven."[137]

F. The IPEC SAMA Analysis Is a Site-Specific Mitigation Alternatives Analysis That Appropriately Accounts for the "Hyper-Dense" Population of New York City

41. A common thread running through New York's proposed findings is the claim that Entergy and NRC Staff "have ignored their obligation to conduct a site-specific SAMA analysis."[138] That argument, however, unravels upon even a cursory inspection. Importantly, New York's expert does not dispute that Entergy used numerous IPEC-specific inputs to its MACCS2-based SAMA analysis.[139] Those plant-specific inputs include, for example, IPEC-specific meteorological data (year 2000 data from the IPEC meteorological tower), the projected year 2035 population distribution within the 50-mile SAMA analysis region (based on year 2000 census data and state and county-level population projections), the IP2 and IP3 core radionuclide inventories, IP2 and IP3 source term and release characteristics, and region-specific economic data (*i.e.*, value of farm and nonfarm wealth).[140] Thus, the IPEC SAMA analysis is clearly site-specific in nature.

42. New York's contrary claim rests on two premises that are fundamentally flawed. The first is that the IPEC SAMA analysis underestimates severe accident costs because it relies

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136 *See Mass. v. NRC*, No. 12-1404, 12-1772, slip op. (1st Cir. Feb. 25, 2013).

137 *Id.* at 39 n.27 (citing *Robertson*, 490 U.S. at 353) (emphasis added). Notably, the Third Circuit's 1989 *Limerick* decision, which New York cites frequently in its proposed findings, similarly states that "NEPA's procedural requirement cannot be expanded upon by the courts either by requiring additional procedures or by requiring substantive outcomes."). *Limerick*, 869 F.2d at 730 n.9.

138 New York Proposed Findings at 1 (¶ 4).

139 *See* October 17, 2012 Tr. at 1945:6-1947:1 (Lemay).

140 *See id*. at 1947:15-1950:8, 2064:12-2066:23 (Teagarden).

"on data developed for a site in rural Virginia" (*i.e.*, the Surry site).[141] As stated in Entergy's proposed findings, the MACCS2 User's Guide indicates that Sample Problem A is based on input data obtained from NUREG-1150.[142] However, as Entergy's experts explained, the decontamination cost and time input values used in NUREG-1150 and later incorporated into Sample Problem A were not developed solely for the Surry site.[143] In fact, the NUREG-1150 study used the MACCS code (MACCS2's predecessor) and applied the same CHRONC economic inputs (except for the variables related to farm and nonfarm wealth, which are based on region-specific inputs) for each of the five study sites, including the Zion site with its urban environs.[144] NUREG-1150 thus applied the same CDNFRM and TIMDEC values used in Sample Problem A to *all* five of the NUREG-1150 study sites.[145] The NUREG-1150 authors did *not* view those values as being applicable only to the Surry site.[146]

43. During discussion of NUREG/CR-3763,[147] Mr. Teagarden reiterated this key point. Specifically, he testified that the CDNFRM values included in NUREG-1150 reflect a mixture of land uses.[148] He also noted that the NUREG-1150 nonfarm decontamination cost value was applied universally across the five different sites examined in that study, suggesting that "in the

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141 New York Proposed Findings at 1 (¶ 4).

142 Entergy Testimony at 59 (A75) (ENT000450) (citing NUREG/CR-6613, Vol. 1 at 4-3 (NYS000243)).

143 *See id*. at 61 (A77); Oct. 17, 2012 Tr. at 1951:9-10, 2070:7-10 (Teagarden).

144 Entergy Testimony at 52-53 (A71) (ENT000450). The now-decommissioned Zion plant is located just north of Chicago and had an emergency planning zone population density comparable to that of IPEC. Specifically, Zion had half of the total population but similar density to Indian Point due to its location on the shores of Lake Michigan. *See* Oct. 17, 2012 Tr. at 1968:19-21 (Jones); Oct. 18, 2012 Tr. at 2379:11-20 (Jones).

145 Entergy Testimony at 61 (A77) (ENT000450).

146 Oct. 17, 2012 Tr. at 1951:9-10 (Teagarden) ("In NUREG-1150, those same values were applied at all five plants."); *id.* at 2070:7-10 (Teagarden) ("But the values for NUREG-1150 . . . applied to all five of the NUREG-1150 sites. So you know, it wasn't viewed as specific to a rural environment.").

147 NUREG/CR-3673, "Economic Risks of Nuclear Power Reactor Accidents" (Apr. 1984) ("NUREG/CR-3673") (ENT000466).

148 Oct. 18, 2012 Tr. at 2169:24-2170:9 (Teagarden); *see also id.* at 2142:2-9 (Teagarden).

developer's minds, those values were sufficiently applicable to each of the sites."[149] Mr. Teagarden also stated that the CDNFRM value was intended to be a "global value" given that the NUREG-1150 study, like a SAMA analysis, examined regions encompassing approximately 7,800 square miles and multiple land uses.[150] As such, there is no factual basis for New York's claim that the IPEC SAMA analysis relies on "rural" data developed exclusively for the Surry site.[151]

44. New York's second major premise is that the IPEC SAMA analysis fails to adequately estimate decontamination costs for "the hyper-dense population area of New York City,"[152] with its "uniquely high building density, mostly consisting of high-rise buildings."[153] Entergy's and the Staff's experts explained why that is not the case. In short, the NUREG-1150 decontamination cost values are based upon levels of contamination and population rather than upon the region in which the contamination occurs.[154] MACCS2 applies the nonfarm economic inputs, including the nonfarm decontamination cost (CDNFRM), on a *per person* basis.[155] This approach inherently accounts for areas with high population densities and low population densities within the 50-mile IPEC SAMA analysis region.[156] Significantly, Dr. Lemay did not advocate a

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149 *Id*. at 2246:13-14 (Teagarden).

150 *Id*. at 2246:17-20 (Teagarden).

151 It also should be noted that "rural" data, in the form of farm property value and cost of farm decontamination, are specifically addresses by separate variables (VALWF and CDFRM, respectively) in MACCS2. *See* Entergy Testimony at 42 (A54, tbl. 2), 43 (A56), 49 (A66, tbl. 3), 49-50 (A67), 54 (A71, tbl. 4), 56-57 (A72) (ENT000450).

152 New York Proposed Findings at 87 (¶ 232).

153 *Id.* at 52 (¶ 137).

154 February 2008 RAI Response, Attach. 1 at 38 (ENT000460).

155 *See*, *e.g.*, NRC Staff Testimony at 41 (A35) (NRC00041); Entergy Testimony at 55-58 (A72) (ENT000450); Oct. 17, 2012 Tr. at 1949:23-1950:8 (Teagarden).

156 *See*, *e.g.*, Entergy Testimony at 58 (A72) (ENT000450).

different approach and, in fact, described the MACCS2 code's use of a per capita approach to calculating decontamination costs as a "brilliant insight."[157]

45. Accordingly, in MACCS2, the populations within the IPEC SAMA analysis region are multiplied by these per-person decontamination cost values, as appropriate, making the resulting decontamination cost estimate site-specific.[158] For the IPEC SAMA analysis, Entergy developed a year 2035 population estimate based on census data and population projections that are specific to the IPEC SAMA analysis region.[159] Therefore, the large population centers (including the New York City metropolitan area) are specifically accounted for in the SAMA analysis region.[160] As Mr. Jones and Dr. Bixler stated, "[b]y using a per-person basis, this approach takes into account the site-specific high population density of New York City and the correspondingly high density of buildings."[161]

46. Furthermore, New York's almost exclusive focus on New York City and its "hyper-dense population" must be put into perspective—*i.e.*, viewed within the context of SAMA analysis objectives and methodologies. A SAMA analysis is based on mean accident consequence values, averaged over many hypothetical severe accident scenarios that span a spectrum of potential initiating events, accident sequences, and severity of consequences.[162] As discussed in the Staff's proposed findings, Dr. Bixler examined the extent of contamination for each of the

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157 Oct. 18, 2012 Tr. at 2136:2-10 (Dr. Lemay).

158 *See* Oct. 17, 2012 Tr. at 1949:23-1950:8, 2040:8-14 (Teagarden); Entergy Testimony at 55-58 (A72) (ENT000450).

159 Entergy Testimony at 48 (A65) (ENT000450); Oct. 18, 2012 Tr. at 2139:18-2140:15 (Teagarden).

160 NRC Staff Testimony at 69 (A61) (NRC00041); Oct. 17, 2012 Tr. at 1950:4-8 (Teagarden).

161 NRC Staff Testimony at 41 (A35) (NRC00041); *see also id*. at 69 (A61) (NRC00041). Dr. Lemay agreed that the application of decontamination costs on a per person basis, as is done in MACCS2, is a valid approach. Oct. 18, 2012 Tr. at 2136:2-10 (Dr. Lemay) ("I think that whoever came up with the decontamination cost per person it's a brilliant insight . . . .").

162 *Pilgrim*, CLI-12-15, slip op. at 5, 11, 19, 28; *see also* Entergy Testimony at 18 (A31) (ENT000450); NRC Staff Testimony at 25-26 (A19) (NRC000041); Oct. 17, 2012 Tr. at 1927:16-24 (Teagarden).

source term groups used by Entergy in its SAMA analysis.[163] His analysis showed that the vast majority of accidents result in relatively low contamination over small areas.[164] It bears emphasis that the New York City area is between 24 and 40 miles from the IPEC site and, geographically speaking, accounts for only two to four percent of the 7,854 square-mile SAMA analysis region.[165]

47. Further, accident consequences at a particular site will vary significantly depending upon weather patterns, and MACCS2 calculates potential offsite consequences over an extensive array of potential weather scenarios in a 50-mile radius around the plant.[166] New York claims that "[a]t the hearing, Entergy agreed that for the area surrounding Indian Point, the wind blows predominantly from the north to the south."[167] That is not accurate. Dr. O'Kula actually stated: "On average, the wind would be blowing north to south. But it can be balanced seasonally."[168] Alluding to the IPEC site wind rose, he further stated that "[i]t is bar-bell shape, and there is some, also some preference based on seasonality, *of going in the opposite direction*."[169] This is consistent with the discussion of wind directions in the FSEIS.[170] This fact, along with the time- and spatially-averaged nature of a SAMA analysis, must be kept in mind when considering New York's repeated references to New York City.[171]

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163 *See* NRC Staff Proposed Findings at 25-26 (¶ 5.47) (citing NRC Staff Testimony at 90 (A81) (NRC000060)).

164 *See id.*

165 *See* Entergy Testimony at 128 (A160) (ENT000450).

166 *See* Oct. 18, 2012 Tr. at 2153:24-2155:3 (O'Kula).

167 New York Proposed Findings at 95 (¶ 255 n.54).

168 Oct. 18, 2012 Tr. at 2294:12-14 (O'Kula).

169 *Id.* at 2294:18-20 (O'Kula) (emphasis added).

170 *See* FSEIS, Vol. 1 at 2-28 (NYS00133A) ("Wind velocities are moderate. The north-south Hudson River Valley has a marked effect on the lighter winds, and in the warm months, average wind direction is usually southerly. For the most part, the winds at Buchanan have northerly and westerly components.").

171 *See* Oct. 17, 2012 Tr. at 1927:16-24 (Teagarden) ("It's important to recognize that a SAMA analysis is a spatially average[d] and time averaged analysis [that] … looks at a range, a spectrum, of postulated releases that

48. In summary, there is no basis in the record for New York's claims that the IPEC SAMA analysis is not site-specific and fails to account for hyper-dense population in the New York City metropolitan area. The IPEC SAMA analysis made use of extensive site-specific inputs.[172] In addition, by applying the selected nonfarm decontamination cost (CDNFRM) values on a per-person basis (within MACCS2), Entergy accounted for the region-specific population, including New York City's population and its correspondingly higher building density.[173] Entergy's methodologies are consistent with NRC-approved guidance and Commission precedent. They also are reasonable, especially in the context of a SAMA analysis, which is a probabilistic analysis that considers "a multitude of clean-up scenarios" over a sizable geographic region.[174]

G. The NUREG-1150 Nonfarm Decontamination Cost Values Used As Inputs to the IPEC SAMA Analysis Have an Established Technical Basis and Are Rationally-Related to the IPEC Site

49. New York claims that NUREG-1150 contains a "gaping hole" because the source of the decontamination cost values in NUREG-1150 (and, by association, the source of the decontamination cost parameters used in Sample Problem A) "simply does not exist."[175] It further asserts that "the decontamination cost estimates in Sample Problem A are based upon a reference that was never published, nor peer-reviewed."[176] According to New York, "[r]eliance upon such data is unreasonable under NEPA, and undermines its fundamental goal of ensuring that

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could occur using meteorology, a whole year of meteorology, looking at different weather sequences and determining an average result from all of those.").

172 *See* Entergy Proposed Findings at 56 (¶ 113) (listing "population distribution, meteorological data, land use data, and economic data" as examples of site-specific data).

173 *Id.* at 67-68 (¶ 137).

174 *See* Oct. 18, 2012 Tr. at 2139:11-21 (Teagarden); NRC Staff Testimony at 90 (A81) (NRC000041).

175 New York Proposed Findings at 59 (¶ 158).

176 *See id.* at 3 (¶ 9*); see also id.* at 60 (¶ 161). As discussed below, New York itself relies on a document (Draft NUREG/CR-5148 (NYS00424A-BB)) that was never published in final form or peer-reviewed.

environmental values are fully considered in the agency's decision-making process."[177] Citing CEQ regulations, New York also asserts than an EIS must contain "high quality" information and "accurate scientific analysis."[178]

50. By way of background, the NUREG-1150 CDNFRM values challenged by New York can be traced to NUREG/CR-3673 (also referred to as "Burke").[179] NUREG/CR-3673 states that it developed and employed "improved models to estimate the economic risks from unanticipated events which occur during U.S. LWR operation."[180] As part of this effort, the study estimated the offsite costs of post-accident population protective measures and public health impacts for severe LWR accidents that result in a release of radioactive material to the environment.[181] Those costs included nonfarm area decontamination costs.[182]

51. NUREG/CR-3673 states that "[t]he cost estimates used in this study for various levels of decontamination effort in an area are taken from a detailed review of decontamination effectiveness and costs performed at Sandia National Laboratories (SNL)."[183] The "detailed review" apparently is documented in an unpublished report by Robert Ostmeyer and Gene Runkle

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177 New York Proposed Findings at 118 (¶ 320).

178 *Id.* at 22-23 (¶ 74) (citing 40 C.F.R. § 1500.1(b); *Lands Council v. Powell*, 395 F.3d 1019, 1031-32 (9th Cir. 2005); *Conservation Northwest v. Rey*, 674 F. Supp. 2d 1232, 1249 (W.D. Wash. 2009); *Ctr. for Biological Diversity v. U.S. Forest Serv.*, 349 F.3d 1157, 1167 (9th Cir. 2003)).

179 *See* Entergy Testimony at 57 (A72) (ENT000450) (citing NUREG/CR-3673 § 4 (ENT000466)). *See also* NUREG/CR-4691, MELCOR Accident Consequence Code System (MACCS) Model Description, Vol. 2 at 1-9, 4-1 (Feb. 1990) (NYS000288) ("The economic effect models in MACCS are intended to estimate the offsite costs resulting from a reactor accident. The models used were assessed and selected by Burke [Bu84]. . . . The following costs are treated in the economic models implemented in the MACCS code: . . . decontamination costs for property that can be returned to use if decontaminated.").

180 NUREG/CR-3673 at EX-1 (ENT000466).

181 NUREG/CR-3673 states that offsite costs associated with population evacuation and temporary relocation, agricultural product disposal, land and property decontamination, land interdiction, and public health impacts and medical care costs are included in the new economic consequence models. *Id*.

182 *See* NUREG/CR-3673 at 4-15 to 4-17 (ENT000466).

183 New York Rebuttal Testimony at 23:17-22 (NYS000420) (quoting NUREG/CR-3673 at 4-15 (ENT000466)). *See also* Oct. 17, 2012 Tr. at 2005:2-24 (Lemay).

entitled "An Assessment of Decontamination Costs and Effectiveness for Accident Radiological Releases" ("Ostmeyer report").[184] Despite their best efforts, none of the parties or their experts could locate a copy of the report.[185]

52. As discussed at length in Entergy's proposed findings, the record evidence does not support New York's claims, particularly when they are evaluated under the rubric of NEPA. As Dr. Ghosh noted, the NUREG/CR-3673 authors presumably had access to the Ostmeyer report when they prepared NUREG/CR-3673.[186] Moreover, NUREG/CR-3673 expressly states that Dr. Robert Ostmeyer, co-author of the referenced report, provided technical assistance and advice during the preparation of NUREG/CR-3673.[187] Therefore, it can be reasonably presumed that they reviewed the Ostmeyer report's contents in preparing NUREG/CR-3673.

53. Contrary to New York's argument, the Ninth Circuit recently ruled that NEPA imposes "no legal requirement that a methodology be peer-reviewed and published in a credible source."[188] The Ostmeyer report's unavailability thus does not render reliance on the NUREG-1150 decontamination cost values "altogether unreasonable" under NEPA.[189] Moreover, as discussed in Entergy's proposed findings, NUREG/CR-3673 (which is a final, NRC-approved document) contains useful insights into the nonfarm decontamination cost estimates included in NUREG-1150 and used in the IPEC SAMA analysis (after being escalated to 2005 dollars). It

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184 *See* NUREG/CR-3673 at 4-15, 8-8 (ENT000466).

185 Oct. 17, 2012 Tr. at 2005:16-17 (Lemay), 2009:24-2011:5 (Jones, Ghosh).

186 Oct. 17, 2012 Tr. at 2010:17-25 (Ghosh).

187 *See* NUREG/CR-3673 at xix (ENT000466).

188 *Lands Council v. Martin*, 529 F.3d 1219, 1226 (9th Cir. 2008) ("We find no legal requirement that a methodology be 'peer-reviewed or published in a credible source.' Plaintiffs cite 40 C.F.R. §§ 1500.1(b) and 1502.24, but those regulations contain no such requirements and do not even mention peer review or publication.").

189 *Pilgrim*, CLI-12-01, slip op. at 25.

indicates that Entergy's CDNFRM values account for multiple land uses and decontamination methods, and that NUREG-1150's "average" values are reasonable for estimating decontamination costs for the very large and varied geographic region considered in a SAMA analysis.[190]

54. Additionally, Dr. O'Kula and Mr. Teagarden testified that standard MACCS2 modeling for NRC assessments (including SAMA analysis) uses NUREG-1150 input values due to their well-established pedigree within the PRA community.[191] On this point, Dr. O'Kula emphasized that NUREG-1150 was made available for public comment and subjected to multiple peer reviews that involved an "unprecedented" level of technical scrutiny.[192]

55. Entergy's experts further testified that there is no NRC- and industry-accepted alternative to the NUREG-1150 values, and that to their knowledge, all license renewal applicants have used these NUREG-1150 values (as escalated) in their SAMA analyses.[193] Mr. Teagarden explicitly stated, to augment a point made by Dr. O'Kula, that "we believe these values represent the best values that are available for a SAMA analysis. We know of no technically superior values to use for the MACCS code input for these [parameters]."[194] Dr. O'Kula and Mr. Teagarden also cited the NRC's use of the NUREG-1150 values in the recently-completed SOARCA project as further evidence of their continued applicability and suitability for use in SAMA analyses.[195]

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190 *See* Oct. 17, 2012 Tr. at 2044:22-2045:10 (Harrison) (citing NUREG/CR-3673 at 4-17 (ENT000466)).

191 Entergy Testimony at 72 (A95) (ENT000450); Oct. 17, 2012 Tr. at 1951:21-1952:1 (Teagarden).

192 Oct. 18, 2012 Tr. at 2370:2-2372:9 (O'Kula); *see also* Entergy Testimony at 21-22 (A35), 55 (A72) (ENT000450); NRC Staff Testimony at 46 (A39) (NRC000041); NUREG-1150, Vol. 1 at 1-2 (NYS000252A) (summarizing the public comment and peer review processes for NUREG-1150).

193 Oct. 17, 2012 Tr. at 1951:13-16 (Teagarden).

194 *Id*. at 2040:2-5 (Teagarden); *id.* at 2043:24-2044:4 (Ms. Potts).

195 Entergy Testimony at 62 (A78) (ENT000450) (citing NUREG-1935, State-of-the-Art Reactor Consequence Analyses (SOARCA) Report, Draft Report for Public Comment, at 61, 63 (Jan. 2012) ("Draft NUREG-1935") (ENT000455)); Oct. 17, 2012 Tr. at 1951:17-21 (Teagarden). The final version of NUREG-1935 was published

56. The Staff's experts—three of whom were involved in the SOARCA project—also testified that Entergy's CDNFRM values, as derived from NUREG-1150, have a long history of use for exactly this kind of analysis (*i.e.*, SAMA analysis) and continue to be used by the NRC in current state-of-the-art consequence assessments (like the SOARCA project).[196] Thus, the Staff's experts viewed their use as inputs to the IPEC SAMA analysis as reasonable.[197]

57. New York argues that "[b]ecause the SOARCA project did not examine [the economic] costs associated with a severe accident, it was not a SAMA analysis."[198] That is true. However, the SOARCA project team explained that the MACCS2 decontamination parameters "do affect decisions on whether contaminated areas can be restored to habitability and therefore affect predicted doses and risk of health effects."[199] It further stated that "[v]alues from NUREG-1150 provide the basis for decontamination parameters, which consist of two levels of decontamination, just as in NUREG-1150."[200] Thus, the SOARCA project team still viewed the NUREG-1150 input values challenged by New York as reasonable for use in their assessment, which is likely to have much broader application than a license renewal SAMA analysis. For example, the SOARCA report states that it communicates the NRC's current understanding of severe-accident-related aspects of nuclear safety to stakeholders, including Federal, State, and

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in November 2012, after the hearing on NYS-12C was held. The final report does not reflect any significant substantive changes from the draft report. *See* NUREG-1935, State-of-the-Art Reactor Consequence Analyses (SOARCA) Report (Nov. 2012), *available at* ADAMS Accession Nos. ML12332A057 and ML12332A058.

196 Oct. 18, 2012 Tr. at 2158:13-2161:25 (Harrison); *id.* at 2251:13-24 (Jones) (stating that "the exercise of reviewing the alternative input parameters has given [the Staff] a great degree of confidence that the original [NUREG-1150] values are reasonable").

197 *Id.* at 2251:13-24 (Jones)

198 New York Proposed Findings at 72 (¶ 193).

199 Draft NUREG-1935 at 63 (ENT000455).

200 *Id.*

local authorities, licensees, and the general public.[201] It also states that the SOARCA study "will be a resource for future modeling improvements and verification efforts."[202] Notably, the SOARCA report reflects an overall positive view of the NUREG-1150 study.[203]

58. As stated above, Entergy's and the Staff's experts further explained that because the CDNFRM values are applied on a per-person basis by MACCS2, they allow for site-specific decontamination cost estimates that account for high-population areas within the SAMA analysis region, including New York City. Accordingly, Entergy's and the NRC Staff's reliance on the NUREG-1150 CDNFRM values (as escalated for time) is reasonable under NEPA standards.

59. Thus, there is no record support for New York's claim that by accepting Entergy's nonfarm decontamination values, the NRC Staff has failed to ensure that the FSEIS contains high-quality and accurate scientific information.[204] To the contrary, the record does not show that there is any scientific or regulatory consensus supporting the use of values other than those based on NUREG-1150. Both Entergy and Staff experts experienced in the use of MACCS2 and the conduct of SAMA analyses testified that Entergy's decontamination cost and time values are based on the highest quality and most accurate scientific information currently available (*i.e.*, NUREG-1150 and other NRC-approved documents supporting its development) and are reasonable for use in a SAMA analysis.[205] As the U.S. Supreme Court has stated, and the

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201 *Id*. at xv.

202 *Id.* at 1.

203 *See id.* at 6-7 ("The improved PRA methodology used in the NUREG-1150 study greatly enhanced the understanding of risk at NPPs and is considered a significantly updated and improved revision to the Reactor Safety Study."); *id.* at 33 ("The insights from the NUREG-1150 study have been used in several areas of reactor regulation, including the development of alternative radiological source terms for evaluating design-basis accidents at nuclear reactors.").

204 *See* New York Proposed Findings at 117 (¶¶ 317-318).

205 Entergy Testimony at 13-16 (A26), 38 (A51), 52 (A70) (ENT000450); NRC Testimony at 46 (A39), 86 (A77), 89-90 (A81) (NRC000041).

Commission has echoed: "When specialists express conflicting views, an agency must have discretion to rely on the reasonable opinions of its own qualified experts, even if a court may find contrary views more persuasive."[206]

60. Finally, NEPA does not require federal agencies to resolve all uncertainties.[207] And NEPA certainly does not require time-consuming or resource-intensive research programs or studies—of the type apparently contemplated by New York—to resolve uncertainties when impacts are small.[208] As one court explained:

> Detailed analysis is required only where impacts are likely…. Where adverse impacts are not likely, expensive and time consuming studies are unnecessary. *So long as the environmental impact statement identifies areas of uncertainty, the agency has fulfilled its mission under NEPA.*[209]

61. As discussed above, for nuclear power plant license renewal reviews, the NRC already has concluded that the probability-weighted consequences of severe accidents are small

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206 *Marsh v. Or. Natural Res. Council*, 490 U.S. 360, 378 (1989); *see also Pac. Gas & Elec. Co.* (Diablo Canyon Power Plant Indep. Spent Fuel Storage Installation), CLI-08-26, 68 NRC 509, 518 n.50 (2008); *see also Salmon River Concerned Citizens v. Robertson,* 32 F.3d 1346, 1359 (9th Cir. 1994) (citation omitted) ("NEPA does not require that we decide whether an [EIS] is based on the best scientific methodology available, nor does NEPA require us to resolve disagreements among various scientists as to methodology.") (alternations in original omitted); *City of Carmel-By-The-Sea v. U.S. Dep't of Transp.,* 123 F.3d 1142, 1151 (9th Cir. 1997) (stating that NEPA does not require "unanimity of opinion, expert or otherwise").

207 *See Baltimore Gas*, 462 U.S. 87, 102 (1983) (holding that the NRC's promulgation of Table S-3 did not violate NEPA and stating that the NRC had "estimate[d] its impacts conservatively, based on the best available information and analysis"); *Sierra Club v. Lynn*, 502 F.2d 43, 61 (5th Cir. 1974) (holding that the mere fact that certain factors in a cost-benefit analysis are generally imprecise or unquantifiable does not render the result inadequate).

208 For example, New York suggests that because the Entergy and the NRC have expended "considerable effort" to verify the source term and core damage frequency used in accident assessment as part of the Level-1 and Level-2 PRA processes, they must engage in a similar level of effort in determining appropriate decontamination cost inputs to MACCS2. *See* New York Proposed Findings at 121-22 (¶¶ 328-32). Also, New York suggests that the NRC can and should undertake a study similar to that undertaken by Tawil in Draft NUREG/CR-5148. *See id.* at 120 (¶ 325) ("Thus, a site-specific analysis was not only required under NEPA and NRC's regulations, but eminently possible and had been completed in conjunction with Tawil 1990 (NUREG/CR-5148).")

209 *Izaak Walton League of AM. v. Marsh*, 655 F.2d 346, 377 (D.C. Cir.), *cert. denied*, 454 U.S. 1092 (1981) (emphasis added).

for all plants.[210] Additionally, as discussed in Entergy's proposed findings, the IPEC SAMA analysis accounts for uncertainties through various means, including external events and uncertainty multipliers, sensitivity cases, and numerous conservative assumptions.[211] Contrary to New York's claim, and as Dr. Ghosh explained, these aspects of the SAMA analysis add significant margin that can accommodate uncertainties, including those associated with the decontamination cost and time inputs to MACCS2-based portion of the SAMA analysis.[212] Moreover, based upon her review of the IPEC SAMA analysis, including the specific SAMA candidates determined by Entergy to be potentially cost-beneficial, Dr. Ghosh stated her expert opinion that a number of those SAMA candidates essentially are redundant because they act on the same accident sequences.[213]

62. New York's objections to Dr. Ghosh's testimony concerning the "existing margin" in the IPEC SAMA analysis as "conclusory" also are unfounded.[214] Dr. Ghosh is well versed in PRA-type analyses, including those performed in support of license renewal SAMA analyses and the SOARCA project. At hearing, she provided a reasoned basis for her expert opinion that "existing margin" in the IPEC SAMA analysis can accommodate uncertainties of the type posited by New York. Specifically, Dr. Ghosh noted that the theoretical benefit of actually implementing all of the IP2 and IP3 SAMAs identified by Entergy as potentially cost-beneficial would exceed the maximum attainable benefit (*i.e.*, eliminate the baseline risks of plant operation) for IP2 and

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210 *See supra* at ¶ 37.

211 *See* Entergy Proposed Findings at 61-62 (¶ 124), 120-22 (¶¶ 237-40) (including testimony cited therein).

212 *See* Oct. 18, 2012 Tr. at 2235:5-10 (Ghosh) ("You're right that my fundamental point is that the ISR New York State analysis introduces some uncertainty and into particular elements of the benefit calculation. And I believe that the existing margin in the analysis can accommodate this uncertainty already.").

213 *Id.* at 2164:24-2165:1 ("There are multiple SAMAs that are already identified to mitigate the same types of accidents."); *id*. at 2223:11-21 (Ghosh).

214 *See* New York Proposed Findings at 126-27 (¶¶ 343-346).

IP3, and, in the case of IP2, eliminate the baseline risks twice over.[215] This reflects the fact that a SAMA analysis is done on a per SAMA candidate basis, and that many of the SAMA candidates are acting on the same accident sequences.[216] Therefore, she explained, as the lower-cost alternatives for mitigating the dominant accident sequences are implemented, the baseline risk, as recalculated, is reduced.[217] This reduces the likelihood that other SAMA candidates acting on the same accident sequences will remain, or become, potentially cost-beneficial.[218]

H. Draft NUREG/CR-5148 (Tawil 1990) Is Not a Site-Specific Decontamination Cost Analysis for Indian Point

63. Citing Draft NUREG/CR-5148 (which New York refers to as "Tawil 1990"),[219] New York asserts that the results of that report "disclose that NRC has actually conducted a site-specific analysis of the decontamination costs associated with a severe accident at Indian Point, without using NUREG-1150 values, and, therefore, without relying upon Sample Problem A."[220]

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215 *See* Oct. 18, 2012 Tr. at 2163:10-2166:8 (Ghosh).

216 *See id*. at 2164:24-2165:1 ("There are multiple SAMAs that are already identified to mitigate the same types of accidents."); *id.* at 2223:11-21 (Ghosh).

217 *Id.* at 2165:21-2166:2 (Ghosh).

218 *Id*. at 2224:22-2225:2 (Ghosh) ("[W]e don't believe we're going to come up with any more SAMAs that would be potentially cost beneficial and that they would be cheaper alternatives to mitigating the same types of accidents that were already looking at mitigating with the list that we have."); *see also id.* at 2235:19-2236:8 (Ghosh) ("[I]t's hard to imagine that they would really become cost beneficial since there is already alternatives on the table to mitigate those same types of accident sequences.").

219 Tawil, J.J. & Bold, F.C., NUREG/CR-5148 (PNL-6350), Property-Related Costs of Radiological Accidents (Feb. 1990) ("Draft NUREG/CR-5148") (NYS00424A-BB). There is no indication that the document was ever reviewed, approved, and published by the NRC as a final document. Unlike other NUREG series reports, including the contemporaneously-prepared NUREG-1150, Draft NUREG/CR-5148 contains no manuscript completion date or the publication date in the front matter of the report. The inclusion of those dates on final NUREG series reports is standard NRC practice. New York and Dr. Lemay acknowledged that Draft NUREG/CR-5148 was "never published" as a final document. *See* New York Proposed Findings at 3 (¶ 10).

220 New York Proposed Findings at 74 (¶ 202). New York also claims, based on an e-mail communication with Dr. Tawil (one of Draft NUREG/CR-5148 authors), that that "NRC Staff was concerned about the results of a site-specific study at Indian Point." *Id.* at 74 (¶ 200). Dr. Tawil stated in his e-mail that "I *think* the NRC was a little shocked at the magnitude of the off-site consequences of an SST-5 at Indian Point and decided not to publish the report." *Id*. As Entergy noted in its Motion in Limine, Dr. Tawil's statement is sheer speculation and unreliable as such. Furthermore, the history of the DECON code, the NRC's imputed motive for not publishing Draft NUREG/CR-5148, or any other statements made by Dr. Tawil are not relevant or material to the Board's finding

It further argues Entergy's use of CDNFRM values derived from NUREG-1150 is unreasonable because a "site-specific" analysis of decontamination costs is "eminently possible and had been completed in conjunction with Tawil 1990 (NUREG/CR-5148)."[221] New York also claims that the NRC Staff violated NEPA by not acknowledging or discussing this document in the FSEIS.[222]

64. By way of background, Draft NUREG/CR-5148 purports to be an "extensive revision" to NUREG/CR-3413, Off-Site Consequences of Radiological Accidents: Methods, Costs and Schedules for Decontamination (Aug. 1985) (NYS000425), that was prompted by the April 1986 Chernobyl accident.[223] Among other things, NUREG/CR-3413 describes a database and computer program called DECON developed by an NRC contractor "for conducting a decontamination analysis of a large, radiologically contaminated area."[224] Draft NUREG/CR-5148 sought to supplement the decontamination database with additional data, and to make certain augmentations to the DECON code methodology.[225] Relevant here, Draft NUREG/CR-5148 purported to demonstrate the capabilities of the DECON code "with a sequence of hypothetical accident scenarios at the Indian Point reactor site in New York State."[226]

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as to "whether the [SAMA] analysis that was done is reasonable under NEPA." *Seabrook*, CLI-12-05, slip op. at 28-29.

221 New York Proposed Findings at 120 (¶ 325).

222 *See id.* at 120 (¶ 327). New York accuses of Entergy and the Staff of ignoring Draft NUREG/CR-5148. As New York should know by now, Entergy and the Staff were unaware of the document's existence until New York disclosed it. There is no basis for New York's claim that Entergy or the NRC Staff should have been aware of the existence of Draft NUREG/CR-5148, much less have disclosed it or discussed it in the FSEIS.

223 Draft NUREG/CR-5148 at v (NYS00424A).

224 NUREG/CR-3413 at iii, 1 (NYS00425A).

225 *See* Draft NUREG/CR-5148 at v-viii (NYS00424A).

226 *Id.* at iii.

65. The record evidence shows that none of New York's arguments related to Draft NUREG/CR-5148 has merit. As discussed at hearing, Draft NUREG/CR-5148 is not the "site-specific" analysis New York and Dr. Lemay claimed it to be. The draft report itself states:

> The results that are reported should *not* be considered as representative of reactor accident consequences either for pressurized water reactors (PWR) in general or for the Indian Point reactors, since the plume direction was selected to maximize the offsite consequences in an area having a particularly high population density.[227]

There are numerous critical differences between Draft NUREG/CR-5148 and an NRC-compliant SAMA analysis like the one performed for IPEC license renewal. For example, these differences include the following:

- The source terms used in the IPEC "case study" in Draft NUREG/CR-5148 were generic source terms used in a 1982 Sandia reactor siting study.[228] They are not plant-specific source terms based on a plant-specific PRA analysis, like the source terms used in the IPEC SAMA analysis.[229]

- Draft NUREG/CR-5148 applied six sets of constant weather (stability and wind speed) in the direction of the New York City metropolitan area to maximize consequences.[230] The IPEC SAMA analysis evaluated 155 randomly-selected weather sequences from the calendar year 2000 (postulated to occur in each of the 16 principal compass sector directions and for the associated population distributions) for each source term, and weighted them by their probability of occurrence.[231]

- Draft NUREG/CR-5148 used the now-retired CRAC2 and DECON codes.[232] The IPEC SAMA analysis used the MACCS2 code, the "most current, established code for NRC SAMA analysis."[233]

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227 *Id.* at 1.11 (NYS00424B) (emphasis added).

228 *See* Oct. 18, 2012 Tr. at 2258:21-24 (Teagarden).

229 *See* NRC Staff Testimony at 24 (A18) (NRC000041).

230 Draft NUREG/CR-5148 at 5.3 (NYS00424H); *see also id.* at 1.2 (NYS00424B) ("[T]he plume direction was selected in all cases to maximize the property-related losses; hence, the case study does not provide representative results.").

231 Entergy Testimony at 32-33 (A47) (ENT000450).

232 Draft NUREG/CR-5148 at 5.1-.2 (NYS00424H).

233 *Pilgrim,* CLI-10-22, 72 NRC at 208.

- Draft NUREG/CR-5148 used the "DECON Reference Database" (scaled from early 1980s to 1986 reference year).[234] The IPEC SAMA analysis decontamination effectiveness, time, and cost values derived from the 1990 NUREG-1150 study, as adjusted to 2005 dollars using the Consumer Price Index method.[235]

- The Indian Point region-specific data used in the Draft NUREG-5148/DECON "Site Database" are from the 1986 time frame. The IPEC SAMA analysis used contemporaneous population, land fraction, watershed class, regional economic data, agricultural data, and emergency response information.

66. Thus, the analyses presented in Draft NUREG/CR-5148 (Tawil 1990) are not representative of the IPEC site and cannot be accurately characterized as "site-specific."[236] It is clear that this unpublished report does not meet the principal objective of a SAMA analysis. That objective is to estimate the mean annual offsite population dose and economic costs over the entire SAMA analysis region based on plant-specific information "for the limited purpose of identifying [potentially cost-beneficial] mitigation alternatives."[237] Significantly, Dr. Lemay conceded this fact, stating that "many of the parameters that are in [Draft NUREG/CR-5148] are wrong," and that "I'm *not* advocating this particular example *as a NEPA-type and site-specific analysis for Indian Point*."[238] These statements by Dr. Lemay simply cannot be reconciled with New York's claim that the NRC Staff's alleged failure to disclose Draft NUREG/CR-5148 or to discuss it in the FSEIS "violates" NEPA.[239] Furthermore, Dr. Lemay did not explain how this "example"

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234 Draft NUREG/CR-5148 at 5.5-.9 (NYS00424H).

235 Entergy Testimony at 52-53 (A71) (ENT000450).

236 Mr. Teagarden described Draft NUREG/CR-5148 as a "stylized assessment" performed to demonstrate the functionality of a code (DECON) that, to his knowledge, is no longer available or operable. Oct. 18, 2012 Tr. at 2258:9-12 (Teagarden); *see also* Draft NUREG/CR-5148 at 1.11 (NYS00424B) ("The purpose of this chapter is to illustrate the uses of DECON and the interpretation of its output.").

237 *See Pilgrim*, CLI-12-15, slip op. at 5, 15 (stating that a SAMA analysis is a site-specific "mitigation analysis").

238 Oct. 18, 2012 Tr. at 2257:8-14 (Lemay) (emphasis added).

239 New York Proposed Findings at 120 (¶¶ 326-27).

study or the since-retired DECON code described therein could be used to develop a site-specific decontamination cost estimate that is suitable for use in MACCS2.[240]

67. As stated in Entergy's proposed findings, even assuming more detailed or localized decontamination cost estimates could be developed, there is no evidence that they would be better suited for use in a SAMA analysis.[241] More fundamentally, because the evidence shows that the nonfarm decontamination cost values used by Entergy are reasonable for use in a SAMA analysis, such an undertaking is not required by NEPA. The case law is clear on this point:

> That there may be a range of conceivable choices among inputs used in the SAMA analysis goes without saying, and many alternative inputs may be reasonable choices—reflecting reasonable predictions—even though some may be more conservative and others less so. A NEPA mitigation alternatives analysis need not reflect the most conservative—or worst case—analysis. There always will be myriad alternate ways a NEPA analysis could have been done.[242]

NRC adjudicatory proceedings, in other words, "are not EIS editing sessions."[243]

68. The Commission has applied these principles in NRC adjudications involving SAMA contentions.[244] In the *Pilgrim* proceeding, the Commission emphasized that "[t]he question is not whether there are 'plainly better' . . . models or whether the SAMA analysis can be refined further."[245] The Commission reiterated that NEPA does not require agencies to use technologies and methodologies that are still "emerging" and under development, but that is

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240 *See* Oct. 18, 2012 Tr. at 2299:2-5 (Teagarden) ("What we're talking about is what gets rolled up into the cost for non-farm decontamination, CDNFRM, and the associated dose reduction factor."); *id.* at 2303:18-21 (Lemay) ("MACCS2 has no way of specifying techniques or anything at that level of detail. It has only one aggregate value, the cost of decontamination per person.").

241 Entergy Proposed Findings at 81-82 (¶ 161).

242 *Pilgrim*, CLI-12-10, slip op. at 10.

243 *Pilgrim*, CLI-12-01, slip op. at 24 (quoting *Duke Energy Corp.* (McGuire Nuclear Station, Units 1 & 2; Catawba Nuclear Station, Units 1 & 2), CLI-03-17, 58 NRC 419, 431 (2003)).

244 *Id.*

245 *Pilgrim*, CLI-10-11, 71 NRC at 315-16.

exactly what New York is advocating here.[246] It further noted that an EIS is not intended to be a research document, and that agencies "must have some discretion to draw the line and move forward with decisionmaking."[247]

I. Dr. Lemay's Flawed Decontamination Cost Estimates Do Not Constitute Appropriate "Benchmarks" for the NUREG-1150 Values Used in the IPEC SAMA Analysis

69. New York criticizes Entergy and the Staff for not "benchmarking" the NUREG-1150-based nonfarm decontamination cost values used as inputs to the IPEC SAMA analysis, and purports to have performed benchmarking of its own.[248] Dr. Lemay defined "benchmarking" as "establishing points of reference by comparing one's current practices with what others in the field are doing."[249] He further stated that benchmarking "provides for an important exchange of information amongst experts in the field, leading to the use of the best data and methodologies."[250]

70. Under this definition, it is clear that Entergy and the NRC Staff have, in fact, "benchmarked" the NUREG-1150 values challenged by New York and shown that they are reasonable for use in a SAMA analysis. As discussed above, the NUREG-1150 values have long been used in severe accident consequence analyses—including all SAMA analyses performed to date.[251] The PRA community continues to view them as acceptable values.[252]

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246 *See also Pilgrim*, CLI-12-15, slip op. at 31 (quoting *Pilgrim*, CLI-12-06, 75 NRC __, slip op. at 32) ("NEPA, however, does not 'require that we wait until inchoate information matures into something that [possibly] might affect our review.' It requires us to conduct our review with the "'best information now.'"); *Pilgrim*, CLI-10-11, 71 NRC at 315-16; *Town of Winthrop v. FAA*, 535 F.3d 1, 11-13 (1st Cir. 2008); *see also Mass. v. NRC*, 708 F.3d 63,76 (1st Cir. 2013) (holding that an agency may select its own methodology as long as it is reasonable).

247 *Pilgrim*, CLI-10-11, 71 NRC at 315 (quoting *Town of Winthrop*, 535 F.3d at 11).

248 *See*, *e.g.*, New York Proposed Findings at 77 (¶ 207) ("Neither Entergy nor NRC Staff performed any bounding or benchmarking to determine whether relying upon Sample Problem A was scientifically reasonable.").

249 New York Rebuttal Testimony at 7:9-11 (NYS000420).

250 *Id.* at 7:12-14.

251 *See* Oct. 17, 2012 Tr. at 1951:6-16 (Teagarden) (stating that the CDNFRM values used in the IPEC SAMA analysis for the two decontamination factors (DF = 3 and 15) are derived from NUREG-1150 and, to the knowledge of Entergy's witnesses, have been used in all prior NRC license renewal SAMA analyses).

71. Insofar as New York suggests that Entergy and the Staff are required to perform some type of quantitative comparison or world-wide benchmarking exercise,[253] no such requirement exists under NEPA.[254] Moreover, given the inapplicable information sources and incorrect assumptions underlying Dr. Lemay's decontamination cost estimates (*i.e.*, ISR Approaches A through D), those estimates cannot reasonably be regarded as reasonable and appropriate "benchmarks."

72. The term "benchmarking" connotes a comparison of alternative results or outcomes based on *similar* test conditions, field data, and/or experiments.[255] For reasons explained by Entergy's and Staff's experts, Dr. Lemay's four cost estimating methodologies fail to meet this important criterion.[256] In brief, the principal sources of information on which Dr. Lemay relied in developing his ISR Approach A and B decontamination cost estimates are inapplicable to nuclear power plant severe accidents. That is, they focus principally on cleanup and decontamination following (1) a plutonium dispersal event (*e.g.*, detonation of a nuclear weapon) and (2) detonation of a radiological dispersion device, both of which differ in major respects from cleanup of fission products from a severe reactor accident.[257] Indeed, Dr. Lemay himself described them as "not

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252 Entergy Testimony at 72 (A95) (ENT000450); Oct. 17, 2012 Tr. at 1951:21-1952:1 (Teagarden) ("So Entergy used values that are per person values, have been well vetted in the PRA community, have been used consistently through time, used in the latest study [SOARCA] and then those values are applied to the population distribution.").

253 New York Proposed Findings at 77 (¶ 207).

254 *See Pilgrim*, CLI-12-06, slip op. at 20-21 (holding that the proposal of an alternate methodology is not sufficient to show a NEPA analysis is unreasonable).

255 New York Proposed Findings at 77 (¶ 207).

256 *See generally* Entergy Proposed Findings at 87-103 (¶ 172-201).

257 *See* Entergy Testimony at 25 (A40), 68-69 (A90) (ENT000450); NRC Staff Testimony at 13 (A6a), 77-78 (A69) (NRC000041).

ideal."[258] As Staff witness Mr. Jones explained, Dr. Lemay's ISR Approach C and D decontamination cost estimates are unreliable because they fail to account for mass conservation principles, as applied in MACCS2, and the non-uniform nature of contamination within a building (among other deficiencies identified by Entergy's and the Staff's experts).[259]

73. With regard the last point (mass conservation), New York first asserts that "[t]here is no evidence to suggest that Mr. Jones has experience running the MACCS2 code, developing MACCS2 inputs, or reviewing SAMA analyses."[260] Mr. Jones never testified that he is a MACCS2 expert. Rather, he stated: "I am testifying as an expert witness in the area of radiological decontamination. Specifically, I am addressing the cost estimating, decontamination techniques, and technologies for decontamination after a nuclear power plant accident."[261] Mr. Jones' testimony is consistent with his self-described areas of expertise and focus. Insofar as he opined on the reasonableness of the MACCS2 methodology for estimating decontamination costs, he did so based on his review of relevant MACCS2 technical documentation, including NUREG/CR-6613 and NUREG/CR-4451.[262] Additionally, insofar as Mr. Jones testified on errors and deficiencies in Dr. Lemay's testimony and the ISR report, he did so based upon his review of the relevant supporting documentation submitted by New York.[263] He also consistently explained the technical bases for his opinions and conclusions.[264]

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258 Oct. 17, 2012 Tr. at 2012:11-13 (Lemay). Dr. Lemay also made unsupported technical assumptions that are integral to his cost estimates, including the assumption that cesium decontamination costs always equal or exceed plutonium decontamination costs. *See* Entergy Proposed Findings at 92-94 (¶¶ 180-83); NRC Staff Proposed Findings at 29-30 (¶ 5.53).

259 NRC Staff Testimony at 78 (A69), 83 (A74) (NRC000041).

260 New York Proposed Findings at 37 (¶ 106).

261 NRC Staff Testimony at 6 (A4.c) (NRC00041).

262 *See id.* at 9-11 (A5.c).

263 *See id.*

264 *See id.* at 40-48 (A35-A40), 51-52 (A46), 57-84 (A50-A75), 86-89 (A78-A79), 91-93 (A83) (NRC000041).

74. For example, Mr. Jones explained that mass balance is important because MACCS2 calculates an amount of contamination per unit area as if the contamination is being deposited on a flat plane, such as a perfectly horizontal surface.[265] He further explained that applying additional multipliers that effectively increase the base areas used in MACCS2—without equally reducing the amount of contamination in this area—results in artificially high decontamination cost estimates. Dr. Bixler, Dr. O'Kula, and Mr. Teagarden, all of whom are MACCS2 experts, fully agreed with Mr. Jones on these points.[266] Mr. Jones also explained how he accounted for mass balance by redoing the CONDO-related calculation provided by Dr. Lemay in Annex C of the ISR Report for heavy decontamination (where the New York City metropolitan area is considered urban and the remainder of the region is considered semi-urban).[267]

75. In any event, Dr. Lemay conceded that MACCS2 accounts for mass balance of contamination.[268] Faced with this significant admission, counsel for New York seeks to rehabilitate Dr. Lemay's testimony through a confusing and extraneous discussion of deposition velocity.[269] The thrust of New York's argument is contained in the following statement:

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265 *Id.* at 79-80 (A71); *see also* Oct. 18, 2012 Tr. at 2117:25-2118:12 (Jones).

266 *See* Oct. 18, 2012 Tr. at 2143:19-2145:2, 2147:8-12 (Bixler); *id*. at 2152:14-2156:15 (O'Kula); *id*. at 2167:19-2169:3 (Teagarden).

267 *See* NRC Staff Testimony at 8-832 (A73) (NRC000041).

268 Oct. 18, 2012 Tr. at 2176:24-2177:3 (Lemay). In its proposed findings, New York states: "Mr. Jones argued that ISR's use of CONDO does not follow the rules of conservation of mass, and essentially decontaminates more radiation than is deposited on buildings." New York Proposed Findings at 96 (¶258). In reality, Mr. Jones explained that Dr. Lemay's methodology assumes the decontamination of more cesium than is modeled by MACCS2 to be released and deposited based on the plant-specific source term inputs to the code, such that the principle of mass conservation is violated.

269 *See* New York Proposed Findings at 96-99 (¶¶ 258-263). In its proposed findings, New York states that Dr. Lemay and ISR "derived decontamination costs using CONDO, a software tool for estimating the consequences of decontamination options," and that "Dr. Lemay's testimony describe how ISR used CONDO to calculate CDNFRM values for the New York City Metropolitan Area." *Id.* at 90 (¶ 240), 91 (¶ 243). These statements are misleading because Dr. Lemay conceded that he did not actually run the CONDO computer code, but instead manipulated data contained in CONDO code documentation in self-generated spreadsheets. *See* Oct. 18, 2012 Tr. at 2376:14-20 (Lemay).

> ISR was justified in using the CONDO methodology to estimate the decontamination costs of interior and exterior surfaces of buildings because decontamination of buildings is more complicated, and costlier, than decontamination of a field or residential dwellings; and furthermore, in reality there is more to decontaminate in an urban setting because the deposition velocity is greater and, thus, more contamination is deposited over urban areas.[270]

76. New York's argument lacks technical and evidentiary support. In essence, New York argues that in an urban setting, a greater deposition velocity results in the deposition of more radiological contamination requiring cleanup.[271] NYS misses the point of Mr. Jones' critique, which is that there is only a finite amount of radioactive contamination present, and it cannot be deposited in equal quantities on all interior and exterior surfaces; to assume so violates conservation of mass principles.[272]

77. Further, Dr. Lemay's discussion of "how decontamination of a building would likely occur" is not "real world"—it is conjecture by a witness who has no demonstrated expertise in decontamination of radiologically-contaminated structures.[273] Dr. Lemay assumed uniform distribution of contamination on the inside of a building, and that all surfaces would be decontaminated equally (*i.e.*, in bulk).[274] By using this assumption, and also selecting the highest labor-cost procedure for decontamination activities, Dr. Lemay subjectively and artificially inflated the estimated decontamination costs.[275] However, for the reasons explained by Mr. Jones (who does have actual decontamination experience), there is no technical basis for assuming

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270 New York Proposed Findings at 96-97 (¶ 259).

271 *Id.*at 97-98 (¶ 261).

272 *See* NRC Staff Testimony at 78 (A69) (NRC000041); Oct. 18, 2012 Tr. at 2116:20-2117:1, 2117:25-2118:12 (Jones).

273 New York Proposed Findings at 97 (¶ 260).

274 *See* NRC Staff Testimony at 79-81 (A71) (NRC000041); Entergy Testimony at 118-20 (A143-44) (ENT000450).

275 *See* Entergy Testimony at 119-20 (A144) (ENT000450).

uniform distribution of contamination on either the interior or exterior surfaces of a building.[276] He further explained that decontamination efforts would focus on the most contaminated surfaces (*e.g.,* on the ground floor of a building and near ventilation systems, where contamination is more likely to enter the building) with the goal of restoring habitability.[277]

78. With regard to deposition velocity, Dr. Bixler reviewed Entergy's deposition velocity and surface roughness inputs to the MACCS2 code.[278] Dr. Bixler testified that Entergy's assumed deposition velocity (1 cm/s) is actually conservative because it produces more deposition and, therefore, requires more decontamination within the 50-mile SAMA analysis region than would be the case if Entergy had assumed a smaller deposition velocity (and thus smaller particle size).[279]

79. In summary, given the demonstrated reasonableness of using the NUREG-1150 decontamination cost values (as escalated for time) as inputs to MACCS2, there is no need for Entergy or the Staff to undertake further "benchmarking" of those values (beyond the technical justification already provided by Entergy's and the Staff's MACCS2 experts). Dr. Lemay's proposed decontamination cost estimates, which are based on inapplicable data and technically unsupported assumptions, do not provide reasonable or valid points of comparison. Nothing in the New York's proposed findings can change this fact.

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276 *See* NRC Staff Testimony at 83-84 (A74-75) (NRC000041).

277 *See id.* at 83 (A74).

278 *See id*. at 54-57 (A49).

279 *Id.* at 49 (A41), 50 (A43).

J. The NUREG-1150 TIMDEC Values Used as Inputs to the IPEC SAMA Analysis Have an Established Technical Basis and Are "Rationally Related" to the IPEC Site

80. With regard to Entergy's decontamination time (TIMDEC) input to MACCS2, New York asserts that it "is not reasonable for Entergy and NRC Staff to ignore real-world experience in favor of the Sample Problem A values of 60 days for light and 120 days for heavy decontamination following a severe accident."[280] It further contends that the NUREG-1150 values "create an unrealistic decontamination scenario," such that their use in the IPEC SAMA analysis is unjustified.[281] New York states that Dr. Lemay reached this conclusion "[b]y comparing Entergy's inputs to two actual [reactor] severe accidents—Fukushima and Chernobyl."[282]

81. There is no doubt that the Chernobyl and Fukushima severe accidents resulted from truly unique circumstances.[283] In arguing that decontamination times (actual or projected) associated with these two accidents are appropriate reference points, New York and Dr. Lemay again overlook the nature and purpose of a SAMA analysis. A SAMA analysis examines the *mean annual consequences of numerous postulated accident scenarios*, spanning a spectrum of potential initiating events, accident sequences, and severity of consequences—and for the entire 50-mile radius region surrounding a plant.[284] It does not seek to "exactly mimic a real-life scenario,"[285] model highly localized and variable decontamination activities, or provide detailed cleanup costs associated with a single, specific accident (*e.g.*, Chernobyl or Fukushima).[286]

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280 New York Proposed Findings at 103 (¶ 272).

281 *Id.*

282 *Id.* at 99 (¶ 264).

283 *See* NRC Staff Testimony at 91-93 (A83) (NRC000041) ("[T]hese 2 accidents are very unique and are not appropriate comparison for postulated accident decontamination timelines at Indian Point.").

284 *See* Entergy Testimony at 18 (A31) (ENT000450); *Pilgrim*, CLI-12-15, slip op. at 5.

285 Oct. 18, 2012 Tr. at 2189:13-20 (Teagarden) ("So there's this element of MACCS [that] looks at these strategies together in the time frames that are represented are not meant to exactly mimic or the order is not meant to

82. Drawing from the substantial record evidence, Section IV.G of Entergy's proposed findings explain why Entergy's two decontamination factors (DF = 3 and DF = 15) and associated decontamination time values (60 and 120 days) are reasonable for a SAMA analysis performed to comply with NEPA. In brief, these values are consistent with the MACCS2 code's staged approach to decontamination and re-habitation of interdicted areas.[287] They also are consistent with the NUREG-1150 values and have been applied in Level-3 type PRA analyses (including SAMA analyses and the SOARCA project) for many years.[288] Further, the TIMDEC values used in the IPEC SAMA analysis were designed to be reflective of "average" values that take into account the entire spectrum of severe accident scenarios examined in a plant's SAMA analysis. In the case of the IPEC SAMA analysis, the MACCS2 analysis reflects mean average offsite dose and economic consequences over an approximately 7,800 square mile region.[289]

83. Thus, it is Dr. Lemay's proposed TIMDEC values (one to fifteen years for light decontamination and two to thirty years for heavy decontamination) that "create an unrealistic decontamination scenario" when viewed within the framework of the MACCS2 code.[290] Entergy's and the Staff's proposed findings describe the detailed evidence supporting this conclusion.[291] The fundamental point is that Dr. Lemay's proposed decontamination time values

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exactly mimic a real-life scenario. It's meant to put these strategies together in a way that can computationally be addressed in a manner for – in a probabilistic manner where averages are in view.").

286 *See* NRC Staff Testimony at 90 (A81) ("As with any modeling effort, it is likely that an actual decontamination effort would depart from the modeled inputs based on the extent of the accident, environmental conditions during the clean-up, and actual resources expended during the clean-up.").

287 *See* Entergy Testimony at 80-86 (A105-06) (ENT000450).

288 *See* Entergy Proposed Findings at 105-06 (¶ 207).

289 *See* NRC Staff Testimony at 89-90 (A81) (NRC000041); Oct. 17, 2012 Tr. at 1907:3-9 (Teagarden); Oct. 18, 2012 Tr. at 2359:20-2360:1 (Lemay).

290 *See* New York Proposed Findings at 103 (¶ 272).

291 *See* Entergy Proposed Findings at 110-113 (¶¶ 217-221); NRC Staff Proposed Findings at 30-36 (¶¶ 5.55-5.63).

are so inordinately large that they are inconsistent with the MACCS2 code's internal logic and outside the code's accepted input range.[292] Indeed, only by making alterations to the MACCS2 source code could Dr. Lemay use values exceeding one year as inputs to the MACCS2 software.[293] The Staff succinctly explained why Dr. Lemay's TIMDEC values are untenable:

> The MACCS2 code allows for values of TIMDEC to range between 0 days to 1 year. In order to input values outside of this range, Dr. Lemay modified the MACCS2 code. This modification upsets the delicate balance between decontamination decisions, timing, and dislocation costs incurred by the displaced persons. This fundamentally causes the MACCS2 code to make inefficient and illogical decisions regarding decontamination. The costs for decontamination would be spread over a number of years but because MACCS2 was designed to incur all the decontamination costs in the first year it does not properly discount costs beyond the first year. Dr. Lemay's fundamental change to the logical decision process of the MACCS2 code renders the results he generates unreasonable because he failed to account for all the consequences that directly flow from allowing out-of-range inputs.[294]

Importantly, the Commission has deemed such fundamental code alterations as "far beyond NEPA requirements."[295]

84. As the foregoing discussion suggests, and as Dr. Bixler and Mr. Teagarden explained, the TIMDEC and CDNFRM parameters are interrelated.[296] The decontamination factor, cost, and time form a "suite of variables" that reflect how MACCS2 models

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292 *See* Entergy Testimony at 77-80 (A102-03) (ENT000450); NRC Staff Testimony at 89-90 (A81) (NRC000041).

293 *See* Entergy Testimony at 73-75 (A98-A99) (ENT000450); Oct. 18, 2012 Tr. at 2199:25-2202:5, 2273:3-2274:4 (Bixler).

294 NRC Staff Proposed Findings at 30-31 (¶ 5.56) (internal citations to record omitted).

295 *See Pilgrim*, CLI-12-01, slip op. at 29 (rejecting an intervenor's demand that the MACCS2 code be rewritten to contain an alternative atmospheric transport and dispersion plume model as "far beyond NEPA requirements" and explicitly noting that "NEPA does not require the NRC [or its licensees] to engage in an extensive revision of the MACCS2 code").

296 *See* Oct. 18, 2012 Tr. at 2200:15-2201:5, 2209:6-20 (Bixler), 2227:8-16 (Teagarden) ("CDNFRM and TIMDEC are related to one another.").

decontamination.[297] Therefore, the code user should not arbitrarily alter one of these variables without evaluating the impact of the change on the other, related variables.[298] Dr. Lemay did precisely that and, in the process, compromised the code's ability to make reasonable decisions regarding decontamination versus condemnation of affected properties.[299] That is, the use of Dr. Lemay's out-of-range values inappropriately precludes MACCS2 from modeling the successful decontamination of properties and instead results in the condemnation of those properties.[300]

K. Contrary to NEPA's Requirements, New York Proposes the Use of Certain Worst-Case Assumptions

85. New York agrees that NEPA does not require analysis of worst-case scenarios.[301] It also agrees that a SAMA analysis is a best-estimate analysis.[302] Nevertheless, Dr. Lemay makes certain assumptions that can fairly be described as worst-case.[303] For example, at the hearing, Dr. Lemay initially denied that his calculations were biased towards the worst case,[304] but then stated that "of course, we spent more scrutiny on the *worst case* accidents," particularly in selecting decontamination time (TIMDEC) values.[305] Dr. Lemay's testimony on this point is inconsistent, but the following passage from his prefiled rebuttal testimony confirms his intent:

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297 *See id.* at 2247:10-14 (Teagarden) ("So [] the cost is linked to the time, which is linked to the dose reduction factor achieved."). In this regard, the DF, CDNFRM, and TIMDEC values used in NUREG-1150, the IPEC SAMA analysis, and the SOARCA study were, in fact, developed as a "suite" of parameters and designed to be consistent with the MACCS2 habitability decisionmaking model.

298 *Id.* at 2248:5-9 (Teagarden); *see also id.* at 2269:15-22 (Teagarden).

299 *See* NRC Staff Proposed Findings at 34 (¶ 5.61).

300 *See* Entergy Proposed Findings at 111-12 (¶ 218); NRC Staff Proposed Findings at 32-33 (¶ 5.59).

301 *See* New York Proposed Findings at 21 (¶ 71).

302 *See id.* at 54 (¶ 141) ("Entergy and the State agree with a 'best estimate' approach to developing MACCS2 input values."); Oct. 17, 2012 Tr. at 1937:2-3 (Teagarden), 1937:18-19 (Lemay).

303 *See* New York Proposed Findings at 104 (¶ 278).

304 Oct. 18, 2012 Tr. at 2179:17-20 (Lemay).

305 *Id.* at 2180:7-15 (Lemay).

> The suggestion by NRC Staff that it is acceptable to average input parameters over all release categories is wrong. . . . If Entergy and NRC Staff insist on using a single value for the input parameters related to the cost of decontamination, it would be appropriate to use input parameters that more closely align *with the more severe end of the release spectrum* because the three most severe release categories make the largest contribution to the total OECR.[306]

86. As Dr. O'Kula explained, a SAMA analysis considers a broad spectrum of release categories, including those that involve minimal or no failure of the containment (and thus lower accident source terms).[307] It is not concerned only with the most severe release category; *i.e.*, the "Early High" release category. In a similar vein, the Staff's experts testified that source term groups produce a wide variety of contamination levels over the modeled area.[308] For IPEC, the more probable accident events result in minimal contamination over a small area (13 square miles at 6.4 x 10^{-7} incidents per year).[309] Even the larger events are relatively smaller on a frequency-weighted basis.[310] Thus, TIMDEC values need to be representative of accidents with Fukushima-like source terms, but also accidents with much smaller source terms, such as the Three Mile Island Unit 2 ("TMI-2") partial core meltdown;[311] *i.e.*, it must represent all of the modeled

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306 New York Rebuttal Testimony at 16:1-12 (NYS000420); *see also* Oct. 18, 2012 Tr. at 2196:21-24 (Lemay) ("So I would argue that we can't average the time it takes to decontaminate a trivial or benign accident with the time it takes to decontaminate these more severe accidents.").

307 Oct. 18, 2012 Tr. at 2153:24-2155:3 (O'Kula) ("So the basis of the SAMA analysis is to reflect on a spectrum of potential source terms, model each one randomly in terms of the meteorological conditions. . . . A minor, small portion of those may make it as far as the New York City metropolitan area. Many others would not.").

308 *See* NRC Staff Proposed Findings at 25-27 (¶ 5.47 & Tbl. 1), 35 (¶ 5.62).

309 *See id.* at 35 (¶ 5.62) (citing Fraction of Land Contaminated by Each Source Term Group (STG) at 21(Mar. 2012) (NRC000060)).

310 *See id.* (citing Fraction of Land Contaminated by Each Source Term Group (STG) at 6 (Mar. 2012) (NRC000060)).

311 *See* Oct. 18, 2012 Tr. at 2182:17-2183:10 (Lemay) (responding to questions from Judge Wardwell regarding TMI-2. Unlike the Chernobyl and Fukushima accidents, the TMI-2 containment building remained intact and held almost all of the accident's radioactive material. The approximately 2 million people around TMI-2 during the accident are estimated to have received an average radiation dose of only about 1 millirem above the usual background dose, which is less than the exposure from a chest X-ray. *See* NRC Backgrounder, Three Mile

accidents.[312] Dr. Lemay's self-acknowledged focus on the "more severe end of the release spectrum" is inconsistent with the goals of a best-estimate SAMA analysis and established NEPA principles.[313]

L. The NRC Staff Has Met Its Burden Under NEPA By Taking a "Hard Look" at Entergy's SAMA Analysis

87. In its proposed findings, New York repeatedly claims that the NRC Staff has not taken a "hard look" at Entergy's SAMA analysis, as required by NEPA.[314] But the record tells a different story.

88. The First Circuit recently described how an agency meets the "hard look" requirement in a decision arising from the *Pilgrim* license renewal proceeding:

> [T]he process and reasoning provided by the NRC … demonstrates that the "hard look" requirement was plainly met: information proffered by [the petitioner] was considered before the ASLB and NRC, the agency obtained opinions from the NRC staff, and from experts outside the agency, including those of [the petitioner] and Entergy. The NRC also offered a reasoned explanation. This meets the requirement of taking a "hard look" at such information.[315]

89. In the SAMA analysis context, the Commission has held that NEPA requires only that the NRC provide a "reasonable" mitigation alternatives analysis, containing "reasonable"

Island Accident, *available at* http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/3mile-isle.html#summary.

312 *See* Oct. 18, 2012 Tr. at 2153:24-2155:3 (O'Kula); NRC Staff Testimony at 90 (A81) (NRC000041).

313 *See Pilgrim*, CLI-12-01, slip op. at 24 (rejecting intervenor's argument that NEPA requires a cost-benefit mitigation analysis to be based on the 95th percentile accident consequence level, and stating that at NEPA does not require a "worst case" inquiry).

314 That NEPA requires a hard look at the environmental impacts of a major federal action, as well as alternatives to that action, is not in dispute. *See*, *e.g., Pac. Gas & Elec. Co.* (Diablo Canyon Power Plant Independent Spent Fuel Storage Installation), CLI-08-26, 68 NRC 509, 514 (2008); *McGuire*, CLI-03-17, 58 NRC at 431.

315 *Mass. v. NRC*, slip op. at 30-31 (citing *Hughes River Watershed Conservancy v. Johnson*, 165 F.3d 283, 288 (4th Cir. 1999) (obtaining opinions from agency's own experts, outside experts, giving scientific scrutiny, and offering responses to legitimate concerns as evidence of a sufficiently "hard look"); *Marsh v. Or. Natural Res. Council*, 490 U.S. 360, 378-85 (1989)).

estimates, including, where appropriate, full disclosures of any information and significant uncertainties, and a reasoned evaluation of whether and to what extent these or other considerations credibly could or would alter the SAMA analysis conclusions on which SAMAs are cost-beneficial to implement.[316]

90. These are precisely the actions taken by the NRC Staff in *this* proceeding, including the hearing on this contention. As documented in the Staff's FSEIS, hearing testimony, and proposed findings, the Staff has fully considered the information offered by the other parties and their experts as part of the LRA review and adjudicatory processes. The Staff has explained why Entergy's SAMA analysis inputs are reasonable and acceptable, discussed both uncertainties and conservatisms associated with the SAMA analysis, directly responded to the criticisms raised by New York and its consultants, and provided a reasoned explanation as to why those criticisms do not credibly alter the SAMA analysis conclusions. "NEPA requires no more."[317]

91. New York, in contrast, has not met its burden under NEPA. Intervenors in NRC proceedings have the burden of going forward with sufficient evidence at hearing to support the claims made in their contention.[318] NEPA contentions are no exception. As a leading treatise on NEPA law and litigation explains:

> Because a consensus is usually lacking on the state of the art in environmental methodology, the courts have usually accepted the methodology used by an agency in analyzing environmental impacts. They put the burden of proof on plaintiffs to prove that the methodology was unacceptable.[319]

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316 *See also McGuire,* CLI-03-17, 58 NRC at 431 (holding that NRC meets its obligations under NEPA when, based upon the available technical information, the mitigation analysis outlines relevant factors, discloses opposing viewpoints, and indicates particular assumptions under which the Staff ultimately concludes that specific SAMAs are potentially cost-beneficial).

317 *Id.*

318 *Oyster Creek,* CLI-09-7, 69 NRC at 269.

319 Daniel R. Mandelker, *NEPA Law and Litigation* § 10.45 (1984 & 2012 Supp.).

The Commission also has applied this settled NEPA principle in the context of contentions challenging a SAMA analysis.[320] Specifically, it has held that "[t]he burden is on the proponent of a contention to show that the Staff's analysis or methodology is unreasonable or insufficient."[321] For the reasons explained by Entergy's and the Staff's experts, and summarized in those parties' proposed findings, New York has not met its burden with respect to NYS-12C.

III. CONCLUSION

92. For the reasons stated above and in their proposed findings, the NRC Staff and Entergy have carried their respective burdens of proof and, based on the entire evidentiary record of this proceeding, the Staff has satisfied its NEPA obligations under 10 C.F.R. Part 51 with respect to NYS-12C. In summary, the preponderance of the evidence shows that the Staff has independently reviewed Entergy's SAMA analysis, including Entergy's economic inputs to the MACCS2 code. The preponderance of the evidence further shows that the Staff has provided a reasoned evaluation of whether and to what extent the issues raised in NYS-12C credibly could or would alter the Entergy's SAMA analysis conclusions on which SAMAs are cost-beneficial to implement.[322] The Staff is justified in finding that Entergy's selected decontamination cost and time inputs to the IPEC SAMA analysis are reasonable in light of the purpose of the modeling performed, the scope of modeled accidents, and IPEC site-specific considerations. Therefore, the Board should resolve NYS-12C in favor of the NRC Staff and Entergy.

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320 Of course, the quantum of evidence required to make this showing is different at the contention admissibility and evidentiary hearing stages of the proceeding.

321 *Pilgrim*, CLI-12-06, slip op. at 21 ("Although Massachusetts suggested a different methodology for performing the SAMA analysis, it ultimately failed to show how the PRA methodology that is currently used is inadequate to satisfy NEPA's 'hard look' requirement."); *see also Pilgrim,* CLI-10-11, 71 NRC at 315-16 (quoting *Town of Winthrop,* 535 F.3d at 13). ("In short, NEPA allows agencies 'to select their own methodology as long as that methodology is reasonable.'").

322 *Pilgrim*, CLI-10-22, 72 NRC at 208.

Respectfully submitted,

Executed in Accord with 10 C.F.R. § 2.304(d)

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Dated in Washington, D.C.
this 3rd day of May 2013

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)	)	
	)	May 3, 2013

CERTIFICATE OF SERVICE

Pursuant to 10 C.F.R. § 2.305 (as revised), I certify that, on this date, copies of "Entergy's Reply to New York State's Proposed Findings of Fact and Conclusions of Law For Contention NYS-12C (Severe Accident Mitigation Alternatives Analysis Decontamination Costs)" were served upon the Electronic Information Exchange (the NRC's E-Filing System), in the above-captioned proceeding.

Signed (electronically) by Lance A. Escher

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