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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	Docket Nos. 50-247-LR and 50-286-LR
ENTERGY NUCLEAR OPERATIONS, INC.	)	March 30, 2012
(Indian Point Nuclear Generating Units 2 and 3)	)	

ENTERGY'S STATEMENT OF POSITION REGARDING CONSOLIDATED CONTENTION NYS-12C (SEVERE ACCIDENT MITIGATION ALTERNATIVES ANALYSIS)

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Pursuant to 10 C.F.R. § 2.1207(a)(1) and the Atomic Safety and Licensing Board's ("Board") Order Granting NRC Staff's Unopposed Time Extension Motion and Directing Filing of Status Updates,[1] Entergy Nuclear Operations, Inc. ("Entergy") submits this Statement of Position ("Statement") on Consolidated Contention NYS-12C ("NYS-12C") proffered by New York State ("NYS"). This Statement is supported by the Testimony of Applicant Witnesses Lori Potts, Kevin O'Kula, and Grant Teagarden Concerning Consolidated Contention NYS-12C (Severe Accident Mitigation Alternatives Analysis) ("Entergy Testimony") (ENT000450) and the exhibits thereto (ENT000004, ENT000005, ENT000007, and ENT000451 to ENT000477). As discussed below, NYS-12C lacks merit as a technical matter and as a legal matter. Accordingly, the contention should be resolved in favor of Entergy and the Nuclear Regulatory Commission ("NRC" or "Commission") Staff.

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Order Granting NRC Staff's Unopposed Time Extension Motion and Directing Filing of Status Updates (Feb. 16, 2012) (unpublished).

I. PRELIMINARY STATEMENT

NYS-12C is an environmental contention that challenges the adequacy of Entergy's severe accident mitigation alternatives ("SAMA") analysis for Indian Point Nuclear Generating Units 2 and 3 (respectively, "IP2" and "IP3," and collectively, "Indian Point Energy Center" or "IPEC"), as evaluated by the NRC Staff under the National Environmental Policy Act ("NEPA") and the NRC's 10 C.F.R. Part 51 NEPA regulations. Entergy performed its SAMA analysis using the MACCS2 computer code, which is a later version of the MELCOR Accident Consequence Code System ("MACCS") code and is unique in its capability for modeling the relevant severe accident phenomenology of interest and quantifying those consequences needed for nuclear power plant severe accident risk studies, including SAMA analyses. As the Commission recently stated: "The NRC uses MACCS2 to evaluate the potential offsite consequences of severe nuclear reactor accidents, and NRC-endorsed guidance on SAMA analysis endorses use of the MACCS2 code."[2] As the "most current, established code for NRC SAMA analysis,"[3] MACCS2 has been routinely applied by applicants since the inception of the NRC license renewal process.

NYS-12C alleges that Entergy has underestimated the economic costs associated with a postulated severe accident at IPEC by relying on MACCS2 code input values that are not tailored to the specific area surrounding IPEC, and which purportedly do not account for the size of radionuclide particles released during a severe reactor accident. NYS principally asserts that Entergy improperly relies on "default" input values contained in Sample Problem A of the

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2 *Entergy Nuclear Generation Co.* (Pilgrim Nuclear Power Station), CLI-12-01, 75 NRC __, slip op. at 3 (Feb. 9, 2012) (*citing Entergy Nuclear Generation Co.* (Pilgrim Nuclear Power Station), CLI-10-11, 71 NRC 287, 291 & n.11 (2010)).

3 *Entergy Nuclear Generation Co.* (Pilgrim Nuclear Power Station), CLI-10-22, 72 NRC 202, 208 (2010).

MACCS2 User's Guide.[4] NYS and its proffered expert, Dr. François Lemay of International Safety Research, Inc. ("ISR"), propose alternative values for certain MACCS2 input parameters, including decontamination time and decontamination cost.

The SAMA analysis is an environmental mitigation analysis under NEPA and is not part of the license renewal safety review. Thus, whether additional accident mitigation measures may be warranted to assure public health and safety is addressed through the NRC's ongoing regulatory oversight of existing plants. Further, the adequacy of an applicant's SAMA analysis, and the Staff's review thereof, is governed by NEPA's "rule of reason." As the Commission recently explained, "the proper question is not whether there are plausible alternative choices for use in the analysis, but whether the analysis that was done is *reasonable under NEPA*."[5] The Commission provided the following additional guidance on the purpose of SAMA analysis and the adjudication of SAMA contentions:

> We ourselves have stated that to require "worst case" analyses can easily lead to "limitless" NEPA analyses because it is always possible to introduce yet another "additional variable to a hypothetical scenario" to "conjure up a worse 'worst case.'"
>
> The same can be said for SAMA analyses. It always will be possible to conceive of yet another input or methodology that could have been used in the SAMA computer modeling, and many different inputs and approaches may all be reasonable choices. But our "adjudicatory hearings are not EIS editing sessions." The SAMA analysis is not a safety review performed under the Atomic Energy Act. The mitigation measures examined are supplemental to those we already require under our safety regulations for reasonable assurance of safe operation. Through our reactor oversight process, including generic safety issue reviews, we revisit whether additional mitigation measures should be imposed as a safety matter under 10 C.F.R. Part 50. And in

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4 NUREG/CR-6613, Code Manual for MACCS2, User's Guide, Vol. 1 (May 1998) ("MACCS2 User's Guide") (NYS000243).

5 *NextEra Energy Seabrook, LLC* (Seabrook Station, Unit 1), CLI-12-05, 75 NRC __ slip op. at 28-29 (Mar. 8, 2012); *see also FirstEnergy Nuclear Operating Co.* (Davis-Besse Nuclear Power Station, Unit 1), CLI-12-08, 75 NRC __, slip op. at 17-18 (Mar. 27, 2012) (same).

> response to the Fukushima accident in Japan, we currently are conducting a comprehensive safety review that involves, among other things, a review of the requirements and guidance associated with accident mitigation measures.[6]

The Commission further noted that there is questionable benefit to spending considerable agency resources in an attempt to fine-tune a NEPA mitigation analysis where, as here, an intervenor has failed to identify, through sufficiently probative evidence, a significant deficiency in the SAMA analysis; *i.e.*, a deficiency that could credibly render the SAMA analysis altogether unreasonable under NEPA standards.[7]

It is against this legal and regulatory backdrop that the merits of NYS-12C must be judged. And, as Entergy's expert testimony demonstrates, NYS-12C has no merit. As summarized herein, Entergy's experts fully explain why Entergy's inputs and assumptions related to decontamination costs in MACCS2 are both reasonable and appropriate for a SAMA analysis and comply with NEPA and related NRC requirements. They also demonstrate that Dr. Lemay's testimony and supporting report (the ISR Report), while abounding with technical data, are fraught with incorrect uses of that data, among other major shortcomings that include a pervasive lack of technical justification. Also, through various cited references, Dr. Lemay delves into technical details concerning particular decontamination methods, the exploration of which is not necessary or warranted under NEPA. Nonetheless, Entergy's experts rebut Dr. Lemay's claims, and, in doing so, make a compelling case for the dismissal of NYS-12C.

The reasons for dismissal of the contention are numerous. As a threshold matter, NYS and Dr. Lemay do not acknowledge that SAMA analysis makes use of probabilistic analysis

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[6] *Pilgrim*, CLI-12-01, slip op. at 24 (citations omitted); *see also Davis-Besse*, CLI-12-08, slip op. at 17 ("[I]t will always be possible to propose that the [MACCS2] analysis use one or more other inputs. But simply because a computer model also could have been run with alternate inputs does not suggest that the inputs used were unreasonable.").

[7] *Pilgrim*, CLI-12-01, slip op. at 25.

methods and focuses on long-term and spatially-averaged impacts from severe accidents for the purpose of making *reasonable* cost-benefit evaluations.[8] The SAMA analysis is intended to estimate average consequence results for the entire 50-mile radius region from the IPEC site, not just the comparatively small region of New York City, which comprises approximately 2% of the SAMA analysis region.[9] NYS and Dr. Lemay attempt to scale up certain cost estimates related to the New York City portion without including commensurate scaling down of estimates for the 98% of the SAMA analysis region that is outside New York City.[10] Thus, contrary to NEPA, they seek to overemphasize highly speculative harms and worst-case scenarios for only a small fraction of the considered area.

Furthermore, many of the studies and data sources relied upon by NYS and Dr. Lemay are irrelevant to the objectives of a nuclear power plant SAMA analysis. For example, several of the studies relied upon by NYS focus on postulated radiological releases from nuclear weapon or "dirty bomb" detonations and even a terrorist event with no radiological releases, and seek to assess the economic costs of a single release event at a single location (*e.g.*, New York City).[11] Entergy's experts explain that, because those studies are based on assumptions that have no applicability to a nuclear power plant SAMA analysis, they lend no support to NYS's contention.[12]

NYS's criticisms of Entergy's MACCS2 inputs also lack merit. It is true that certain of Entergy's MACCS2 inputs coincide with the inputs used in MACCS2 Sample Problem A. However, those inputs have been subject to extensive peer review since the late 1980s and

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8 Entergy Test. at A26 (ENT000450).

9 *Id*.

10 *See, e.g., id*. at A121.

11 *Id*. at A26.

12 *Id*.

continue to be used in licensee probabilistic risk assessments ("PRAs") and SAMA analyses and state-of-the-art severe accident analyses conducted by the NRC.[13] Contrary to NYS's claims, they are not arbitrarily-selected "default" values. Rather, they are values with a well-established technical pedigree that is widely recognized and accepted by the PRA community. In fact, they continue to be used today in PRA applications, including the NRC's State-of-the-Art Reactor Consequence Analyses ("SOARCA") project and licensee SAMA analyses.

NYS's criticisms of Entergy's decontamination modeling in the SAMA analysis focuses largely on two MACCS2 parameters: decontamination time (TIMDEC) and nonfarm decontamination cost (CDNFRM). But as Dr. O'Kula and Mr. Teagarden explain, Dr. Lemay fails to accurately portray the MACCS2 decontamination model. The primary goal of the decontamination plan as modeled in MACCS2 is to cost-effectively reduce doses to meet applicable land habitability criteria for a resident population in the region of interest to allow population resettlement. It is not intended to bound or account for all potential decontamination-related and site restoration activities that may arise in the years following a severe accident at a nuclear power plant (*e.g.*, decontamination of specific structures such as schools after population resettlement). Moreover, as applied in SAMA analyses, MACCS2 models the decontamination actions that may be taken during the long-term phase in the initial period of months after deposition of radioactive contamination, and subsequent to the end of the seven-day "emergency phase" following a severe accident. As a result, Dr. Lemay's proposed decontamination time values (up to 30 years) lack technical justification and are fundamentally inconsistent with the decontamination and interdiction modeling assumptions built into and applied by MACCS2.

[13] PRA is sometimes referred to as probabilistic safety assessment ("PSA"). The terms PRA and PSA generally are used interchangeably within the nuclear industry.

Dr. Lemay's proposed decontamination cost values also suffer from major flaws. His several proposed values—which vary by an order of magnitude—are unreasonable and inappropriate for use in a NEPA assessment. In short, Dr. Lemay's decontamination cost values are derived from cost data that are inapplicable to a nuclear power plant SAMA analysis and are based on selective and incorrect use of the data, without adequate technical justification. For example, Dr. Lemay relies heavily on the 1996 Site Restoration Report[14] (and other related papers), which presents cost estimates for remediation following a plutonium dispersal event and lacks relevance to a nuclear power plant SAMA analysis performed using MACCS2. In fact, in a decision issued only weeks ago, the Commission "discerned no suggestion [in the Site Restoration Report] that the MACCS2 code assumes inapplicable radionuclide particle sizes," and noted that the 1996 Site Restoration Report "predates issuance of the MACCS2 code User's Guide and does not appear to discuss the MACCS2 code at all."[15]

Significantly, Dr. Lemay could only accommodate his alternative, substantially larger decontamination time and cost values by altering the FORTRAN source code in MACCS2. As Entergy's experts explain, such modifications to the source code of a sophisticated, NRC-accepted and commonly-used software package to extend the range of established input variables are not prudent (due to quality assurance concerns), practical, reasonable, or warranted under NEPA. And the Commission agrees. In another recent decision, the Commission rejected 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 noted

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[14] D. Chanin and W. Murfin, Technadyne Eng'g Consultants, Inc., SAND96-0957, Site Restoration: Estimation of Attributable Costs from Plutonium-Dispersal Accidents (May 1996) ("1996 Site Restoration Report") (NYS000249).

[15] *Seabrook*, CLI-12-05, slip op. at 40.

that "NEPA does not require the NRC [or its licensees] to engage in an extensive revision of the MACCS2 code."[16]

NYS has thus failed to meet its burden of providing sufficient (or even reliable) evidence to support its claims and of showing that the NRC "could evaluate [SAMAs] more meaningfully than it has already done."[17] In contrast, Entergy's testimony shows that the decontamination cost-related values used in the IPEC SAMA analysis, which the Staff thoroughly evaluated and approved in the FSEIS, are reasonable and appropriate for a NEPA assessment.

II. PROCEDURAL HISTORY OF CONTENTION NYS-12C

A. Contention NYS-12

As filed over four years ago, NYS-12 alleged that Entergy's SAMA analysis is deficient because the MACCS2 computer code used by Entergy underestimates the costs associated with a severe accident due to its use of "decontamination and clean-up costs" that are based on "large-sized" radionuclides.[18] NYS asserted that a severe accident at a nuclear power plant likely would result in the dispersion of "small-sized radionuclides" that are more expensive to remove and clean up than large-sized radionuclide particles.[19] As principal support for this argument, NYS cited the 1996 Site Restoration Report issued by Sandia National Laboratories:

> In place of the outdated *decontamination cost figure contained in the MACCS2 code*, the SAMA analysis for IP2 and/or IP3 should incorporate the analytical framework contained in the 1996 Sandia National Laboratories report concerning site restoration costs as well as recent studies examining the cost consequences in the New York metropolitan area.[20]

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16 *Pilgrim*, CLI-12-01, slip op. at 29.

17 *N.J. Dept. of Envtl. Prot. v. NRC*, 561 F.3d 132, 144 (3d. Cir. 2009) (*citing Limerick Ecology Action, Inc. v. NRC*, 869 F.2d 719, 744 n.31 (3d Cir.1989)).

18 *See* New York State Notice of Intention to Participate and Petition to Intervene at 140-45 (Nov. 30, 2007) ("NYS Petition"), *available at* ADAMS Accession No. ML073400187.

19 *See id.* at 140-41.

20 *Id.* at 142 (*citing* 1996 Site Restoration Report (NYS000249)).

According to NYS, the 1996 Site Restoration Report recognized that earlier estimates (such as those incorporated within the MACCS2 code) of decontamination costs are incorrect because they are based on studies of nuclear weapons that produce large particles.[21] As cited by NYS, the 1996 Site Restoration Report also discusses decontamination factors ("DF") (*i.e.*, estimates of the effectiveness of clean up measures) after severe reactor accidents. The Board admitted NYS-12 in July 2008 to the extent that it "challenges the cost data for decontamination and cleanup used by MACCS2."[22]

B. Amended Contentions NYS-12A/12B/12C

NYS amended NYS-12 three separate times to "reassert" the contention and apply it to Staff's draft supplemental environmental impact statement ("DSEIS"),[23] Entergy's December 2009 revised SAMA analysis,[24] and the Staff's final SEIS ("FSEIS").[25] In the first two amendments, NYS-12A and NYS-12B, which Entergy did not oppose, NYS sought to apply NYS-12 to the Staff's DSEIS and Entergy's revised SAMA analysis, respectively. In both cases, NYS essentially repeated verbatim the supporting bases and evidence stated in its original contention. Thus, the scope of the contention did not change.[26]

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21 *See id.* at 143.

22 *See Entergy Nuclear Operations, Inc.* (Indian Point Nuclear Generating Units 2 & 3), LBP-08-13, 68 NRC 43, 102 (2008).

23 *See* State of New York Contentions Concerning NRC Staff's Draft Supplemental Environmental Impact Statement (Feb. 27, 2009) ("NYS DSEIS Contentions"), *available at* ADAMS Accession No. ML090690303.

24 *See* State of New York's New and Amended Contentions Concerning the December 2009 Reanalysis of Severe Accident Mitigation Alternatives (Mar. 11, 2010) ("Amended Contention NYS-12B"), *available at* ADAMS Accession No. ML100780366.

25 *See* State of New York New Contention 12-C Concerning NRC Staff's December 2010 Final Environmental Impact Statement and the Underestimation of Decontamination and Clean Up Costs Associated with a Severe Reactor Accident in the New York Metropolitan Area at 3-15 (Feb. 3, 2011) ("Amended Contention NYS-12C"), *available at* ADAMS Accession No. ML110680212; *see also* FSEIS (NYS00133A-J).

26 *See* Licensing Board Order (Ruling on New York State's New and Amended Contentions) at 3-4 (June 16, 2009) (unpublished) (admitting NYS-12A and stating that "[w]e see no issue with an intervenor proactively asking the Board to recognize that an admitted contention relative to the ER challenges the same issue when

In NYS-12C (the third and final version of the contention), NYS again sought to "update" its previously-admitted contentions, this time in response to the NRC Staff's FSEIS.[27] NYS-12C also sought to challenge the discussion in Section G.2.3 of the FSEIS as it applies to those contentions.[28] NYS and its former consultant, Mr. David Chanin, argued that the FSEIS (1) incorrectly accepts and applies cost data for moderate decontamination efforts in lieu of cost data for heavy contamination events, and (2) fails to "scale up" the 1996 Site Restoration Report decontamination cost data to a "hyper-density" urban area such as New York City.[29] Notably, the *only* MACCS2 input value explicitly challenged by Mr. Chanin in his report was the per capita cost of nonfarm heavy decontamination (CDNFRM, DF = 15),[30] for which Entergy used a value of $13,824 per person.[31]

Thus, as pled and admitted, and as reasonably construed, NYS-12C challenged the adequacy of Entergy's nonfarm decontamination cost value, principally vis-à-vis information contained in the 1996 Site Restoration Report and other studies cited by NYS. The Board recognized as much in admitting NYS-12C, noting that it mirrors the basic allegation found in

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included in the Draft SEIS."); *Entergy Nuclear Operations, Inc.* (Indian Point, Units 2 and 3), LBP-10-13, 71 NRC 673, 683 (2010) (noting " no material opposition … to admission of NYS-12B to the degree New York is relying on the *same analytic framework* that the Board accepted in admitting NYS-12/12A") (emphasis added).

27 *See* Amended Contention NYS-12B at 1, 10.

28 *See id.* at 1-2.

29 *See* Amended Contention NYS-12C at 7; *see also id*. Attach. (David I. Chanin, *Errors and Omissions in NRC Staff's Economic Cost Estimates of Severe Accident Mitigation Alternatives Analysis Contained in December 2010 Indian Point Final Supplemental Environmental Impact Statement (FSEIS), NUREG-1437, Supplement 38* at 1, 3 (Feb. 2011) ("Chanin Report")).

30 In MACCS2, decontamination/clean-up cost is entered as two parameters, CDFRM (farmland decontamination cost-not applicable here) and CDNFRM (nonfarm decontamination cost). *See* MACCS2 User's Guide at 7-11 (NYS000243). The State has not challenged Entergy's farmland decontamination cost figure in the prefiled testimony of Dr. Lemay or in prior submissions by its former consultant, Mr. Chanin.

31 *See* Chanin Report at 3, 8, 16 (stating that the 1996 Site Restoration Report and other studies cited by Mr. Chanin "should be considered conclusive proof that [Entergy's and] NRC's use of $13,824/person for cleanup of the Indian Point area results in a gross underestimation of costs"); Amended Contention NYS-12C at 14 (same).

the original contention, and that the "overarching aspect of this contention, including its citation to the 1996 Site Restoration Report, has *not differed significantly*" in four years.[32]

C. New York State's Prefiled Testimony and Related Filings

On December 21, 2011, NYS filed its statement of position, written testimony, and supporting exhibits for contention NYS-12C. As noted above, NYS's testimony is sponsored by Dr. François Lemay, Vice President of International Safety Research, Inc. (ISR). His professional experience includes experience with the MACCS/MACCS2 codes and other computer codes.

NYS and Dr. Lemay allege that Entergy has underestimated the economic costs associated with a severe accident at IPEC by using certain MACCS2 "Sample Problem A" inputs from the MACCS2 User's Guide in lieu of site-specific inputs. In doing so, Dr. Lemay proposes alternative values, as described in his testimony and the ISR Report, for a number of MACCS2 input parameters.

D. Entergy's Motion in Limine and the Board's Ruling

On January 30, 2012, Entergy filed a Motion in Limine to exclude certain portions of Dr. Lemay's testimony, report and supporting exhibits on the ground that NYS's prefiled testimony discussed issues and challenged MACCS2 parameters beyond the scope of the admitted contention.[33] Specifically, Entergy contended that Dr. Lemay's testimony improperly takes issue with numerous other Entergy inputs to the MACCS2 economic cost mode other than nonfarm

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[32] Licensing Board Memorandum and Order (Ruling on Pending Motions for Leave to File New and Amended Contentions) at 7-8 (July 6, 2011 ("July 2011 Board Amended Contentions Order") (emphasis added).

[33] Applicant's Motion in Limine to Exclude Portions of the Prefiled Testimony, Report, and Exhibits Filed by New York State and Dr. Francois LeMay in Support of Consolidated Contention NYS-12C (Jan. 30, 2012).

decontamination cost (CDNFRM).[34] The NRC Staff supported Entergy's Motion in Limine,[35] and NYS opposed it.[36] As explained in Entergy's Motion in Limine, the Commission has held that intervenors are not permitted to change the scope of a contention as admitted by the Board. For example, the Commission has emphasized that the scope of a contention is limited to admitted issues of law and fact pled with particularity in the intervention petition, including its stated bases.[37]

The Board denied Entergy's Motion in Limine on March 6, 2012, noting that Boards "admit contentions, not bases," and finding that the additional contested MACCS2 inputs "go to the core of the question of property values and how they might be affected by a radionuclide-releasing accident at IPEC and the resulting decontamination process."[38] The Board further stated that Dr. Lemay's MACCS2 source code modifications "illustrate the effect of varying MACCS2's assumptions to address alternative inputs," as "conceptualized" by the original contention admitted by the Board.[39]

Shortly after the Board denied Entergy's Motion in Limine, the Commission issued an order in the *Seabrook* license renewal proceeding rejecting several admitted contentions—

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34 Those additional MACCS2 parameters include decontamination time (TIMDEC), value of nonfarm wealth (VALWNF), societal discount rate of property (DSRATE), fraction of nonfarm property due to improvements (FRNFIM), depreciation rate (DPRATE), and relocation costs (POPCST).

35 *See* NRC Staff's Answer to Applicant's Motion in Limine to Exclude Portions of the Prefiled Testimony, Report, and Exhibits Filed by New York State and Dr. Francois Lemay in Support of Consolidated Contention NYS-12C (Feb. 9, 2012).

36 State of New York's Answer to Entergy's Motion in Limine to Exclude Portions of Pre-Filed Testimony and Exhibits for Consolidated Contention NYS-12C (Feb. 17, 2012) ("NYS Answer to Motion in Limine").

37 *S. Nuclear Operating Co.* (Early Site Permit for Vogtle ESP Site), CLI-10-5, 71 NRC 90, 100 (2010); *see also Pilgrim,* CLI-10-11, 71 NRC at 311 ("NRC adjudicatory proceedings would prove endless if parties were free . . . to introduce entirely new claims which they either originally opted not to make or which simply did not occur to them at the outset.") (*quoting La. Energy Servs*., *L.P.* (Nat'l Enrichment Facility), CLI-05-28, 62 NRC 721, 727-28 (2005)).

38 Licensing Board Order (Granting in Part and Denying in Part Applicant's Motions *in Limine*) at 6-7 (Mar. 6, 2012) (unpublished).

39 *Id.* at 7.

including a portion of a SAMA contention that raised MACCS2 decontamination cost issues very similar to those raised in NYS-12C.[40] The *Seabrook* Board had similarly stated that it "admits contentions . . . and not their supporting bases."[41] Consistent with Entergy's arguments in its motion, the Commission rejected this statement, because "an admitted contention *is defined by its bases*."[42] The Commission also reminded Boards "of the need to specify each basis relied upon for admitting a contention."[43]

While Entergy acknowledges the Board's ruling on its Motion in Limine, in view of the Commission's recent *Seabrook* decision, it respectfully submits that NYS's challenges to numerous CHRONC input values other than the nonfarm decontamination cost value (*i.e.*, CDNFRM) constitute new bases not relied upon by NYS or the Board in admitting the contention. Further, in light of the Commission's recent *Pilgrim* ruling, Entergy reiterates that Dr. Lemay's modifications to the MACCS2 source code are improper both in the context of the admitted contention (which foreclosed challenges to the MACCS2 code) and NEPA's requirements (which do not warrant modifications of widely-used and NRC-accepted computer codes like MACCS2). In any event, as summarized below, Entergy's experts address and fully refute NYS's various new arguments in their testimony.

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40 *See Seabrook*, CLI-12-05, slip op. at 36-47; *see also Davis-Besse*, CLI-12-08, slip op. at 32-34 (citing CLI-12-05 and reversing the Board's admission of a similar MACCS2 decontamination cost-related contention).

41 *NextEra Energy Seabrook, LLC* (Seabrook Station, Unit 1), LBP-11-02, 73 NRC __, slip op. at 31 (Feb. 15, 2011).

42 *Seabrook*, CLI-12-05, slip op. at 11 n.50 (emphasis added).

43 *Id*.

III. BACKGROUND

A. Regulatory Background

The NRC's GEIS[44] provides an evaluation of severe accident impacts that applies to all U.S. nuclear power plants.[45] A severe accident is defined as a beyond-design-basis accident that could result in substantial damage to the reactor core, whether or not there are serious offsite consequences.[46] Severe accidents are thus events whose probability of occurrence is so low that they are excluded from the spectrum of design-basis accidents postulated for a plant by the Commission's regulations.[47]

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*."[48] The NRC 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.[49] As the Commission has observed: "Because the GEIS provides a severe accident impacts analysis that envelopes the potential impacts at all existing plants, the environmental impacts of severe accidents during the license renewal term already have been

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44 NUREG-1437, Generic Environmental Impact Statement for License Renewal of Nuclear Plants (May 1996) ("GEIS") (NYS00131A-I).

45 *See Pilgrim*, CLI-10-11, 71 NRC at 316; GEIS at 5-114 to -116.

46 *See* FSEIS at 5-3 (NYS00133B).

47 *See id.* at 5-2 to -3, 5-11 (NYS00133B-C).

48 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).

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

addressed generically in bounding fashion."[50] Thus, NRC SAMA analyses are not a substitute for, and do not represent, the NRC NEPA analysis of potential impacts of severe accidents.[51]

Nonetheless, Part 51 states that if the Staff has not previously considered SAMAs for a license renewal applicant's plant in an EIS or in an environmental assessment, then the applicant must complete an evaluation of alternatives that may mitigate severe accidents.[52] The purpose of a SAMA analysis is to identify potential changes to a nuclear power plant, or its operations, that (1) could further reduce the already very low risk of severe reactor accident scenarios postulated in the GEIS, and (2) may be cost-beneficial to implement.[53]

The Nuclear Energy Institute ("NEI") has issued a guidance document, NEI 05-01, Revision A, to assist NRC license renewal applicants in preparing SAMA analyses.[54] The Staff has approved and recommended the use of NEI 05-01, Rev. A by license renewal applicants.[55] NEI 05-01, Rev. A states that the MACCS2 code, which the Commission recently described as "the most current, established code for NRC SAMA analysis,"[56] may be used to calculate the offsite consequences of a severe accident, and provides guidance on the input data.[57]

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50 *Pilgrim*, CLI-10-11, slip op. at 38.

51 *Id*. at 37.

52 10 C.F.R. § 51.53(c)(3)(ii)(L); *see also id.* Pt. 51, Subpt. A, App. B, Tbl. B-1.

53 *See Pilgrim*, CLI-10-11, slip op. at 3.

54 *See* NEI 05-01, Rev. A, Severe Accident Mitigation Alternatives (SAMA) Analysis, Guidance Document at i (Nov. 2005) ("NEI 05-01, Rev. A") (NYS000287).

55 *See* Final License Renewal Interim Staff Guidance LR-ISG-2006-03: Staff Guidance for Preparing Severe Accident Mitigation Alternatives Analyses (Aug. 2, 2007) ("LR-ISG-2006-03") (ENT000451); *see also* Notice of Availability of the Final License Renewal Interim Staff Guidance LR-ISG-2006-03: Staff Guidance for Preparing Severe Accident Mitigation Alternatives Analyses, 72 Fed. Reg. 45,466 (Aug. 14, 2007).

56 *Pilgrim*, CLI-10-22, 72 NRC at 208*; see also Entergy Nuclear Generation Co.* (Pilgrim Nuclear Power Station), LBP-07-13, 66 NRC 131, 142 (2007) (stating that the MACCS2 code "has been widely used and accepted as an appropriate tool in a large number" of SAMA analyses).

57 *See* NEI-05-01, at 13; *see also Pilgrim*, CLI-10-11, slip op. at 4 ("NRC guidance documents conclude that the MACCS2 code (a version of the MELCOR Accident Consequence Code System code) is acceptable for performing SAMA analyses, and NRC licensees commonly use the MACCS2 code for performing SAMA analyses." (citation omitted)).

B. Technical Background

Entergy relied on the NRC-endorsed guidance in NEI 05-01, Rev. A in preparing the IPEC SAMA analysis and, in accordance with that guidance, used MACCS2 to calculate the offsite consequences. MACCS2 is divided into three primary modules—ATMOS, EARLY, and CHRONC—and supports dispersion and transport on a radial-polar grid (16 compass sectors over a 50-mile radius).[58] Plant-specific input to MACCS2 includes the PRA-based and related source terms for each source term release category and the reactor core radionuclide inventory, site-specific meteorological data, projected population distribution, and economic data.[59]

ATMOS performs all calculations pertaining to atmospheric transport, dispersion, and deposition of radioactive material, and to radioactive decay of that material both before and after its release into the atmosphere.[60] It calculates air and ground concentrations, plume size, and timing information for all plume segments as a function of downwind distance.[61] The results of the ATMOS calculations are then used by the other MACCS2 modules. Specifically, EARLY and CHRONC use the calculated air and ground concentrations, plume size, and timing information for all plume segments calculated by ATMOS and other inputs (*e.g.*, population) to calculate consequences due to radiation exposure in the emergency phase (first seven days from the time of release in IPEC's SAMA analysis) and the long-term doses due to exposure after the emergency phase (beginning at the end of the seven-day emergency phase and extending for a period of 30 years in most SAMA analyses, including IPEC's), respectively.[62]

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58 *See* MACCS2 User's Guide at 2-1, 2-3 (NYS000243).

59 *See id.* at 2-1 to 2-3.

60 *See id.* at 2-2.

61 *See id.*

62 *See id.*

Relevant here, CHRONC calculates the estimated long-term population dose and the offsite economic consequences of a severe accident.[63] The offsite economic consequences largely arise from the protective actions taken (such as evacuation and relocation of people away from contaminated areas) to limit radiation exposure of the public during and after plume passage.[64] The CHRONC module uses the radioactivity concentrations determined in the initial ATMOS module, as well as extensive economic cost data inputs and parameters, to determine long-term offsite population dose and long-term economic costs.[65] Long-term consequences are calculated for the period from after the end of the seven-day emergency phase and extending approximately thirty years.[66] In addition to population data, numerous economic cost inputs are used, including, for example, average county-wide value of farm wealth and of non-farm wealth, average cost of labor to perform decontamination, population relocation costs, and daily cost for an evacuated person.[67] The numerous economic cost parameters and inputs used in the SAMA analysis in the CHRONC module phase help to translate the plume modeling results into the estimated long-term monetary costs and dose of a severe accident.[68]

The primary results developed by MACCS2 for use in the SAMA analysis are two values from a distribution of potential results for each release category include: (1) the mean population dose and (2) the mean economic costs. 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

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63 *See id.* at 7-1.

64 *See id.*

65 *See id.*

66 *See Seabrook*, CLI-12-01, slip op. at 5.

67 *See id.*; *see also* NEI 05-01, Rev. A, at 13-14. The MACCS2 code will invoke user-specified condemnation if dose criteria are not met following decontamination/interdiction efforts. With respect to loss of use and return on property, as part of interdiction, costs the MACCS2 code provides for (1) a depreciation rate on property improvements to account for loss of value, of buildings and other structures, and (2) an expected rate of return from land, building, equipment, etc. *See* MACCS2 User's Guide at 7-13 (NYS000243).

68 *See Seabrook*, CLI-12-01, slip op. at 5

dose risk ("PDR") expressed in units of person-rem/year,[69] and offsite economic cost risk ("OECR") expressed in dollars/year.[70] The PDR and OECR are the mean annual risk metrics and represent the *mean cumulative impacts* from postulated severe accidents (*i.e.*, dose or economic costs) to all individuals and land within a 50-mile radius of the plant.[71]

C. NRC Staff Assessment of Contention-Related Issues in the FSEIS

When the Staff issued its FSEIS in December 2010, it included a new technical analysis in Section G.2.3 to address directly the allegations made in NYS-12/12A/12B.[72] As an initial matter, the Staff emphasized that it does *not* consider the methodology for clean-up of a nuclear weapons accident relevant to the clean-up that would be necessary following a nuclear power plant severe accident.[73] Nonetheless, the Staff asked Sandia, an NRC technical contractor, to review the inputs and assumptions regarding particle size distribution and decontamination costs used in the IPEC SAMA analysis, and to perform a comparison of the decontamination cost factors derived from Sandia's 1996 Site Restoration Report cited by NYS to those used in the IPEC SAMA analysis.[74] According to the FSEIS, the approach used by Sandia included identifying basic considerations of each type of accident (*e.g.*, contaminants, half life of contaminants, and health and safety considerations), identifying the decontamination methods

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69 A "rem" is a unit of radiation dose and "person" refers to the number of people exposed to the particular amount of rem. These two factors are multiplied to obtain the population dose in person-rem. Under NRC practice, for a particular weather sequence, SAMA analysis calculates the total population dose, the sum of the estimated dose commitments to populations located in all the sectors on a spatial grid-map out to a defined distance (usually 50 miles) from the plant. *See Pilgrim*, CLI-10-11, slip op. at 22 n.88, 38-39.

70 *See Pilgrim*, CLI-10-11, slip op at 22 & n.86.

71 *See id.* at 38-39.

72 *See* FSEIS G at G-22 to -24 (NYS00133I).

73 *See id.* at G-23.

74 *See id.* The FSEIS states that the NRC Staff and Sandia performed a comprehensive review of relevant documents and references, including the ER, the draft SEIS, the MACCS2 input decks for Indian Point and associated documentation, the NYS contentions and supporting documents and references, the Board's rulings on the contentions, and other relevant filings in the adjudicatory proceeding. *See id*. at G-22.

required, and comparing the 1996 Site Restoration Report cost values (as applied to the urban area of New York City) to those used in Entergy's SAMA analysis.[75]

Based upon that evaluation, the Staff and Sandia provided the following key observations and conclusions:

- The MACCS2 dispersion model does *not* assume that the dispersion will consist of large-sized radionuclide particles. In the MACCS2 input files, Entergy used a dry deposition velocity value of 0.01 meters per second (m/s) for all aerosol particles. This corresponds to a 5 to 10-micron radius particle (*i.e.*, small particle based on NYS's definition),[76] based on gravitational settling of small spheres in dilute laminar flow fields.[77]

- The primary constituent in weapons grade plutonium, Plutonium- 239 ("Pu239"), is an alpha emitter, whereas the primary contaminant from a nuclear power plant accident, Cesium-137 ("Cs137"), is a gamma emitter. Pu239 is more difficult and expensive to characterize and verify in the field than gamma emitters like Cs137. In addition, Pu239 is primarily an inhalation hazard with half-life of 24,000 years, whereas Cs137 is primarily an external health hazard with half-life of about 30 years. The need for evacuating the public is much greater with plutonium because, if inhaled, the health consequences can be severe.[78]

- The 1996 Site Restoration Report provides cost estimates for remediation of light contamination (decontamination factor or "DF" = 2 to 5), moderate contamination (DF = 5 to 10), and heavy contamination (DF > 10). Appendix F of the 1996 Site Restoration Report describes the decontamination methods for light, moderate, and heavy contamination caused by plutonium. In view of the decontamination activities described in the 1996 Site Restoration Report and the differences in health hazards posed by Pu239 and Cs137, the activities required to support clean-up of moderate plutonium contamination align more closely with clean-up activities for heavy cesium contamination. Thus, Sandia performed a comparison of decontamination cost values on this basis.[79]

- In the MACCS2 input files, Entergy used decontamination cost parameters that were typically higher than the MACCS2 "Sample Problem A" values by a factor of 1.7. As described in the ER, the values were obtained by adjusting the generic "Sample Problem

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75 *See id.* at G-23.

76 NYS defines large-sized particles as ranging in size from "tens to hundreds of microns" and defines small particles as ranging in size from "a fraction of a micron to a few microns." Amended Contention 12C at 10; *see also* FSEIS App. G at G-23 (NYS00133I).

77 *See* FSEIS, Vol. 3, App. G at G-23.

78 *See id.*

79 *See id.* at G-24.

A" economic data with the consumer price index of 195.3, which accounts for inflation between 1986 and 2005. Farm and nonfarm values for IPEC were based on site-specific data and were not extrapolated from Sample Problem A.[80]

- The decontamination cost from the 1996 Site Restoration Report ($14,900 per person) is not significantly different than the value used by Entergy in the SAMA analysis ($13,824 per person). Even if the 1996 Site Restoration Report values were escalated to 2005 dollars, as were the values used in the SAMA analysis, the difference would be greater, but still would be within a factor of about 2.[81]

- Considering the uncertainties inherent in such predictions, Entergy's decontamination cost estimates appear reasonable, acceptable, and consistent with the estimates used in prior NRC-approved SAMA analyses for other nuclear power plants.[82]

IV. APPLICABLE LEGAL AND REGULATORY STANDARDS

A. Burden of Proof

At the hearing stage, an intervenor has the initial "burden of going forward"; *i.e.*, it must provide sufficient evidence to support the claims made in the admitted contention.[83] The mere admission of the contention does not satisfy that burden. Moreover, an intervenor cannot meet its burden by relying on unsupported allegations and speculation.[84] Rather, it must introduce sufficient evidence during the hearing phase to establish a *prima facie* case. If it does so, then

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80 *See id.* at G-23.

81 *See id.* at G-24.

82 *Id.*

83 *Oyster Creek*, CLI-09-7, 69 NRC at 269 (*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."); *see also Vt. Yankee Nuclear Power Corp. v. NRDC*, 435 U.S. 519, 554 (1978) (upholding this threshold test for intervenor participation in licensing proceedings); *Phila. Elec. Co.* (Limerick Generating Station, Units 1 & 2), ALAB-262, 1 NRC 163, 191 (1975) (holding that the intervenors had the burden of introducing evidence to demonstrate that the basis for their contention was more than theoretical).

84 *See Oyster Creek*, CLI-09-07, 69 NRC 268-70; *see also Phila. Elec. Co.* (Limerick Generating Station, Units 1 & 2), ALAB-857, 25 NRC 7, 13 (1987) (stating that an intervenor may not merely assert a need for more current information without having raised any questions concerning the accuracy of the applicant's submitted facts).

the burden shifts to the applicant to provide sufficient evidence to rebut the intervenor's contention.[85] While the NRC Staff, not the applicant, has the burden of complying with NEPA,[86] the applicant also has the burden of proof in licensing proceedings if it becomes a proponent of the challenged portion of the Staff's FSEIS.[87] Ultimately, a preponderance of the evidence must support the applicant's position.[88]

B. Controlling NEPA Principles

1. NEPA's "Rule of Reason"

SAMA analysis is a NEPA-derived requirement, and consequently, the consideration of mitigation alternatives is governed by NEPA's "rule of reason."[89] NEPA requires a reasonably complete discussion of possible mitigation measures,[90] but gives federal agencies discretion as to how to meet this mandate.[91] It grounds an agency's duty "in evaluation of scientific opinion rather than in the framework of a conjectural worst case analysis"[92] that overemphasizes highly

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

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

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

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

89 *Duke Energy Corp.* (McGuire Nuclear Station, Units 1 & 2; Catawba Nuclear Station, Units 1 & 2), CLI-02-17, 56 NRC 1, 12 (2002) (*citing Vt. Yankee*, 435 U.S. at 551; *Citizens Against Burlington v. Busey*, 938 F.2d 190, 195) (D.C. Cir. 1991).

90 *Robertson v. Methow Valley Citizens Council*, 490 U.S. 332, 352 (1989); *see also Laguna Greenbelt, Inc. v. U.S. Dep't of Transp.*, 42 F.3d 517, 528 (9th Cir. 1994) ("NEPA does not require a fully developed plan that will mitigate all environmental harm before an agency can act; NEPA requires only that mitigation be discussed in sufficient detail to ensure that environmental consequences have been fully evaluated.").

91 *Sierra Club v. U.S. Dep't of Transp*., 753 F.2d 120, 128 (D.C. Cir. 1985) (*citing Ethyl Corp. v. EPA*, 541 F.2d 1, 12 & n. 16 (D.C. Cir.), *cert. denied*, 426 U.S. 941 (1976)).

92 *Methow Valley* at 354-55.

speculative harms.[93] An EIS must only furnish such information as appears to be reasonably necessary under the circumstances for evaluation of the project.[94]

NEPA's rule of reason applies to NRC SAMA analyses. As the Commission explained earlier this month in the *Seabrook* license renewal proceeding:

> Given the quantitative nature of the SAMA analysis, where the analysis rests largely on selected inputs, it may always be possible to conceive of alternative and more conservative inputs, whose use in the analysis could result in greater estimated accident consequences. But the proper question is not whether there are plausible alternative choices for use in the analysis, but whether the analysis that was done is *reasonable under NEPA*.[95]

Thus, NRC SAMA analysis is neither a worst-case nor a best-case impacts analysis.[96] Rather, it involves an averaging of potential consequences. It is NRC practice to utilize the *mean values* of the consequence distributions for each postulated release scenario or category—the mean estimated value for predicted total population dose and predicted offsite economic costs (as weighted by the probability of many weather sequences and plume directions).[97] Thus, for example, SAMA analysis is not intended to be a worst-case estimate of the population dose or economic costs for a specific location or area (*e.g.*, New York City). Instead, the estimated impacts are averaged both over the entire area within 50 miles of the site and over the expected variations in meteorological patterns.[98]

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93 *Id.* at 356.

94 *Lee v. U.S. Air Force*, 354 F.3d 1229, 1245 (10th Cir. 2004)

95 *Seabrook*, CLI-12-05, slip op. at 28.

96 *Pilgrim*, CLI-10-11, slip op. at 38.

97 *Id.* at 38-39.

98 *Pilgrim*, CLI-12-01, slip op. at 19.

2. Agency Discretion in Choosing an Appropriate Methodology

Under NEPA's rule of reason, an agency is permitted to select its own methodology as long as that methodology is reasonable.[99] NEPA, therefore, does not dictate adherence to a particular analytic protocol[100] or require agencies to use the best scientific methodology.[101] Furthermore, "[w]hen specialists express conflicting views, an agency must have discretion to rely on the reasonable opinions of its own qualified experts."[102] Courts generally will not second-guess methodological choices made by an agency in its area of expertise.[103]

The Commission has applied these principles in NRC proceedings involving SAMA contentions. In the *Pilgrim* license renewal proceeding, the Commission recently stated:

> The question is not whether there are "plainly better" . . . models or whether the SAMA analysis can be refined further. There is no NEPA requirement to use the best scientific methodology, and NEPA "should be construed in the light of reason if it is not to demand" virtually infinite study and resources. Nor is an environmental impact statement intended to be a "research document," reflecting the frontiers of scientific methodology, studies and data. NEPA does not require agencies to use technologies and methodologies that are still "emerging" and under development, or to study phenomena "for which there are not yet standard methods of measurement or analysis." And while there "will always be more data that could be gathered," agencies "must have some discretion to draw the line and move forward with

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99 *Pilgrim*, CLI-10-11, 71 NRC at 316 (quoting *Town of Winthrop v. FAA*, 535 F.3d 1, 13 (1st Cir. 2008)).

100 *Ass'n of Pub. Agency Customers, Inc. v. Bonneville Power Admin.*, 126 F.3d 1158, 1188 (9th Cir. 1997).

101 *Pilgrim*, CLI-10-11, 71 NRC at 315 (*citing Hells Canyon Alliance v. U.S. Forest Serv*., 227 F.3d 1170, 1185 (9th Cir. 2000)).

102 *Pac. Gas & Elec. Co.* (Diablo Canyon Power Plant Indep. Spent Fuel Storage Installation), CLI-08-26, 68 NRC 509, 518 (2008) (*quoting Marsh v. Or. Natural Res. Council*, 490 U.S. 360, 378 (1989)).

103 *See Marsh*, 490 U.S. at 376, 378 ("When specialists express conflicting views, an agency must have discretion to rely on the reasonable opinions of its own qualified experts . . . ."); *Browning-Ferris Indus. of S. Jersey, Inc. v. Muszynski*, 899 F.2d 151, 160 (2d Cir. 1990) ("Courts should be particularly reluctant to second-guess agency choices involving scientific disputes that are in the agency's province of expertise."); *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").

> decisionmaking." In short, NEPA allows agencies "to select their own methodology as long as that methodology is reasonable."[104]

The NRC Staff 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 certain SAMAs (22 in the case of IPEC) are potentially cost-beneficial.[105] According to the Commission, "NEPA requires no more."[106] As explained below, Entergy and the Staff have fully met their respective NEPA obligations here.

3. The Intervenor's Burden Under NEPA

As stated above, intervenors in NRC proceedings have the burden of going forward with sufficient evidence at hearing to support the claims made in their contention. 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.[107]

Additionally, courts also will uphold an agency's methodology against a complaint that it was improperly applied when the evidence shows that there is only a disagreement among experts.[108]

The Commission also has applied this settled NEPA principle in the context of contentions challenging a SAMA analysis. Specifically, it has held that, where an intervenor

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104 *Pilgrim*, CLI-10-11, 71 NRC at 315-16 (citations omitted).

105 *See Duke Energy Corp.*, (McGuire Nuclear Station, Units 1 & 2; Catawba Nuclear Station, Units 1 & 2) CLI-03-17, 58 NRC 419, 431 (2003).

106 *Id.*

107 Daniel R. Mandelker, *NEPA Law and Litigation* § 10.45 (1984 & 2011 Supp.)

108 *Id.* (*citing Nashvillians Against I-440 v. Lewis*, 524 F. Supp. 962 (M.D. Tenn. 1981) (holding traffic count data for highway to be adequate).

challenges the SAMA analysis methodology or assumptions, it must provide adequate support[109] and a reasoned evaluation of whether and to what extent the petitioner's allegations credibly could or would alter the applicant's SAMA analysis conclusions on which SAMAs are cost-beneficial to implement.[110] The Commission has further held that a petitioner must identify some direct connection between the factual information on which it relies and the SAMA analysis cost-benefit results.[111] Importantly, a petitioner's "own *unsupported* reasoning and computations" are not sufficient to meet this obligation.[112]

V. ARGUMENT

A. Entergy's Witnesses

Entergy's testimony on NYS-12C is provided by the following witnesses:

1. Ms. Lori Ann Potts

Ms. Potts is a senior consulting engineer to Entergy in the areas of SAMA analysis and fire probabilistic risk assessment in Russellville, Arkansas. As indicated in her testimony,[113] Ms. Potts has over 30 years of experience as a technical professional in the nuclear industry in the areas of safety analysis, PRA, deterministic and probabilistic accident and consequence analysis, materials aging management, reactor engineering, and systems engineering. Ms. Potts' experience includes performing PRA and severe accident analysis of reactor, emergency system, and containment phenomena under accident conditions. She has participated directly in the SAMA analyses for eight nuclear plants, including the SAMA analysis for IP2 and IP3 and has peer reviewed the SAMA analyses for three additional nuclear plants. Ms. Potts is also one of

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

110 *Pilgrim*, CLI-10-22, 72 NRC at 208-09.

111 *See Pilgrim*, CLI-10-11, 71 NRC at 311 n.121.

112 *Id* at 315 (emphasis added).

113 *See* Entergy Test. at A2-4 (ENT000450).

the authors of the industry guidance document for performing SAMA analyses – NEI 05-01, Rev. A (NYS000287). Ms. Potts has a Bachelor's of Science ("B.S.") degree in Nuclear Engineering from The Pennsylvania State University.

2. Dr. Kevin R. O'Kula

Dr. O'Kula is an Advisory Engineer with URS Safety Management Solutions LLC in Aiken, South Carolina. As indicated in his testimony,[114] Dr. O'Kula has over 29 years of experience as a technical professional and manager in the areas of safety analysis methods and guidance development, computer code validation and verification, PRA, deterministic and probabilistic accident and consequence analysis applications for reactor and non-reactor nuclear facilities, source term evaluation, risk management, software quality assurance, and shielding. In addition, he has over 20 years of experience using, applying, and providing training on the MACCS and the MACCS2 computer codes, which are used to evaluate the potential impacts of severe accidents at nuclear power plants on the surrounding public. Dr. O'Kula obtained his B.S. in Applied and Engineering Physics from Cornell University in 1975, and his Master's of Science ("M.S.") degree and Ph.D. in Nuclear Engineering from the University of Wisconsin in 1977 and 1984, respectively. He also is a member of the State-of-the-Art Reactor Consequence Analyses ("SOARCA") Project Peer Review Committee.

3. Mr. Grant A. Teagarden

Mr. Teagarden is the Manager for Consequence Analysis for ERIN Engineering & Research, Inc. in Campbell, California. As indicated in his testimony,[115] Mr. Teagarden has 14 years of experience in the nuclear field, including 10 years as a manager and technical professional in the areas of PRA, source term analysis, consequence analysis, and nuclear power

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[114] *See id*. at A6-9.

[115] *See id*. at A11-13.

plant security risk assessment. His is also a member of the American Nuclear Society ("ANS") and Vice Chair of the writing committee for ANSI/ANS-58.25, *Standard for Radiological Accident Offsite Consequence Analysis (Level 3 PRA) to Support Nuclear Installation Applications*. Mr. Teagarden has substantial experience using MACCS2 and developing MACCS2 models for commercial nuclear power plants in the United States. He has developed or managed the development of MACCS2 models in support of SAMA analyses for ten nuclear power plant sites. Mr. Teagarden obtained his B.S. degree in Mechanical Engineering from University of Miami in 1990 and completed the Bettis Reactor Engineering School at the Bettis Atomic Power Laboratory as part of his training in the U.S. Navy nuclear program.

B. Entergy's Evidence

Entergy's experts will testify about the basis for Entergy's offsite economic cost inputs to the MACCS2 code and the underlying assumptions, and why the inputs Entergy selected are both reasonable and appropriate for a SAMA analysis and in compliance with NEPA. As summarized below, Entergy's experts also will explain why NYS's criticisms of Entergy's inputs and assumptions are meritless.

1. NYS's Arguments Are Fundamentally Inconsistent with the Purpose of a SAMA Analysis, As Required by NEPA and 10 C.F.R. Part 51

As a threshold matter, in arguing that Entergy has underestimated decontamination costs in its SAMA analysis, NYS overlooks the fact that SAMA analysis makes use of probabilistic analysis methods and focuses on long-term and spatially-averaged impacts from severe accidents for the purpose of making reasonable cost-benefit evaluations.[116] The IPEC SAMA analysis, in particular, estimates average consequence results for the *entire* 50-mile radius region around the IPEC site (an area of approximately 7,854 square miles), not just the comparatively small region

[116] *See id*. at A26.

of New York City, which comprises approximately 2% of the much broader SAMA analysis region.[117] For example, NYS and its expert, Dr. Lemay, attempt to scale up certain cost estimates related to the New York City portion without including commensurate scaling down of estimates for the 98% of the SAMA analysis region that is outside of New York City.[118] They also rely on studies or reports related to the economic costs resulting from the detonation of dirty bombs or nuclear weapon in a specific metropolitan area, including New York City.[119] Such studies or reports do not provide valid or useful points of reference for a SAMA analysis that considers the postulated release of radionuclides over a 50-mile radius region from a nuclear power plant severe accident.[120]

It bears emphasis that MACCS2 is the standard tool used in the U.S. to support quantification of offsite population dose and economic cost consequences from postulated reactor accidents, as is done in a SAMA analysis.[121] Among the U.S. consequence codes that are publicly available, MACCS2 is unique in its capability for modeling the primary phenomena associated with atmospheric releases of radiological material from postulated severe accidents and estimating the consequences of interest for PRA studies, including SAMA analyses.[122] Other U.S. codes are available to assess dose and dose pathways, recovery options, and recovery strategies, but only MACCS2 can evaluate these consequences and potential economic impacts in the context of a PRA-based, SAMA cost-benefit analysis.[123] Indeed, all NRC license renewal

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117 *Id*.

118 *See*, *e.g.*, *id.* at A125.

119 *Id*. at A26.

120 *See id*.

121 *Id*. at A39.

122 *Id*. at A38.

123 *Id*. at A26.

SAMA analyses performed to date, including several for plants located near major urban areas, have utilized the MACCS2 code.[124]

2. NYS Incorrectly Claims That Entergy Has Improperly Relied on Inapplicable "Default" Values in MACCS2 Sample Problem A

NYS and Dr. Lemay incorrectly portray the IPEC MACCS2 analysis cost parameters as being arbitrarily based on the MACCS2 Sample Problem A distributed with the MACCS2 code.[125] Although the cost parameters used in the IPEC analysis are consistent with Sample Problem A, these parameter inputs were utilized based on their development and use for NUREG-1150 analyses conducted by the NRC and Sandia.[126] These values have a long-established and appropriate technical basis, are widely accepted within the PRA community, and continue to be used today in PRAs and SAMA analyses.[127]

3. NYS's and Dr. LeMay's Arguments Are Incompatible With the MACCS2 Decontamination Model

Another critical flaw in NYS's case is its failure to accurately portray the MACCS2 decontamination model. The primary goal of the decontamination plan as modeled in MACCS2 is to cost-effectively reduce doses to meet applicable land habitability criteria for a resident population in the region of interest to allow population resettlement.[128] It is not intended to bound or account for all potential decontamination-related activities that may arise in the years following a severe accident at a nuclear power plant (*e.g.*, decontamination of specific structures

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124 *See id*. at A42-43.

125 *See* Lemay Test. at 20-21 (NYS000241).

126 *See* Entergy Test. at A76 (ENT000450).

127 *Id*.

128 *Id*. at A26.

such as schools after population resettlement). NYS and Dr. Lemay incorrectly suggest otherwise.[129]

As applied in SAMA analyses, MACCS2 models the decontamination actions that may be taken during the initial period after deposition of radioactive contamination at the end of the "emergency phase" following a severe accident.[130] The decontamination model input data define the strategies that are possible, their effectiveness, and their cost.[131] Up to three "decontamination levels" may be defined in MACCS2, where a given decontamination level represents a combination of decontamination activities that reduce the projected long-term doses by a factor called the dose reduction factor ("DRF").[132] Based on the defined habitability criteria and costs for each decontamination level, MACCS2 determines if decontamination is needed and, if so, how long to employ a given strategy to limit a projected dose to inhabitants, *i.e.*, such that the affected area will meet a habitability criterion, generally established by federal or state agencies.[133] This approach is consistent with NRC-endorsed guidance, has been applied in all NRC-approved license renewal SAMA analyses to date, and also has been applied by the NRC in its SOARCA project.[134]

Notably, Dr. Lemay does not distinguish between decontamination factor ("DF") and DRF, which are two related but fundamentally different terms used in connection with radiological decontamination.[135] Radiological remediation may involve *removing* deposited contaminants or, alternatively, leaving those contaminants in place but *reducing the dose*

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129 *Id*.

130 *Id*.

131 *Id*.

132 *Id*.

133 *Id*.

134 *Id*.

135 *Id*. at A91.

associated with those contaminants (*e.g.*, by burying the contaminants).[136] MACCS2 applies the second definition (*i.e.,* DRF), which focuses on reducing projected doses below the long-term dose criterion.[137]

Thus, when Entergy enters values in the MACCS2 CHRONC input file for the IPEC SAMA analysis for the decontamination effectiveness that is achieved for a given cost, it is entering a DRF, *not* a DF.[138] NYS and Dr. Lemay, however, make a fundamental error by relying on sources and data that invoke the definition of DF, not DRF. Removing contaminants will be reflected in both the DF and the DRF, but remediation actions like burying contaminants or sealing a road will only be reflected in the DRF due to the associated dose reduction.[139] (The DF for such remediation actions that do not physically remove the contamination remains a value of 1.0.)[140] Thus, conflating the two terms can lead to invalid and misleading comparisons, as in NYS's testimony on NYS-12C.

4. NYS's Proposed Decontamination Time Values Lack Technical Justification and Are Not Reasonable and Appropriate for a SAMA Analysis Using MACCS2

Dr. Lemay's proposed decontamination time values also are incompatible with the MACCS2 decontamination model. In MACCS2, the decontamination time variable, TIMDEC, represents the time period during which persons are temporarily interdicted (*i.e.*, kept away from their residences) while decontamination activities are completed to reduce the dose by the

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136 *Id*.

137 *Id*. In fact, in discussing the CHRONC variable DSRFCT, the MACCS2 User's Guide states that this variable: "Defines the effectiveness of the various decontamination levels in reducing the dose. A dose reduction factor of 3 means that the resulting population dose at that location will be reduced to one-third of what it would be without decontamination." *See id*.

138 *Id*.

139 *Id*.

140 *Id*.

specified dose reduction factor.[141] Once the time period modeled by TIMDEC is completed, MACCS2 models the relocation of persons back to their residences if the specified habitability criteria are satisfied.[142] Thus, TIMDEC establishes the minimum time that an individual is relocated due to dose constraints.[143]

Dr. Lemay proposes TIMDEC values so large that they are outside the accepted input range of the MACCS2 code.[144] In doing so, Dr. Lemay fails to recognize that:

- The TIMDEC values used by Entergy in the IPEC SAMA analysis have a long, established history of use, beginning with their development by Sandia under the sponsorship of the NRC.
- TIMDEC sets the minimum time that individuals are relocated and a long TIMDEC value can defeat MACCS2 internal decontamination optimization scheme regarding resettlement of temporarily relocated persons.
- TIMDEC is not intended to represent the time until the cessation of all decontamination activities. Continued decontamination activities following population resettlement as modeled by TIMDEC is not incongruous with other code assumptions or actual post-accident decontamination experience.
- TIMDEC is an "average" decontamination time with some activities expected to be completed prior to this time and some completed subsequent to this time.[145]

The alternative decontamination times proposed by Dr. Lemay in the ISR Report—which range from 2 to 30 years—are fundamentally inconsistent with the decontamination and interdiction modeling assumptions integral to MACCS2. Specifically, forcing a long decontamination period in the MACCS2 analysis via the variable TIMDEC, as proposed by Dr. Lemay, distorts the dose reduction resettlement optimization strategy inherent in MACCS2.[146]

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141 *Id*. at A102.

142 *Id*.

143 *Id*.

144 *Id*. at A97-98.

145 *See id*. at A159.

146 *Id*. at A102.

For example, if a value of 10 years is used for TIMDEC, MACCS2 will not return any impacted individuals to their residence locations until 10 years have passed.[147] This is not appropriate for the modeling of a severe accident event, because many individuals will be able to return to their residences following modest decontamination activities.[148] Indeed, Dr. Lemay could only accommodate his alternative, much larger TIMDEC values by altering the FORTRAN source code in MACCS2.[149] As Entergy's experts explain, modifying the source code of a sophisticated software package like MACCS2 to extend the range of selected inputs variables is not prudent from a quality assurance perspective, practical, reasonable, or warranted under NEPA.[150]

5. NYS's Proposed Nonfarm Decontamination Cost Values Lack Technical Justification and Are Not Reasonable and Appropriate for a SAMA Analysis Using MACCS2

NYS also claims that Entergy's nonfarm decontamination cost (CDNFRM) values are too low and proposes substantially larger values of its own.[151] But NYS and its expert err again on both counts. As an initial matter, the nonfarm decontamination cost values used by Entergy are reasonable and appropriate for a SAMA analysis. Specifically, Entergy used CDNFRM values consistent with those used in NUREG-1150 and adjusted them to 2005 (the basis year for the IPEC SAMA analysis) dollars in accordance with NRC-approved guidance.[152] As Entergy's experts explain, based on the pedigree of NUREG-1150 related data sources from Entergy's decontamination cost values are derived, they know of no more appropriate data that are readily

147 *Id*.

148 *Id*.

149 *Id*. at A98.

150 *Id*. at A99.

151 *See* Lemay Test. at 30 (NYS000241).

152 Entergy Test. at A111 (ENT000450).

available to licensees to use in a SAMA analysis to satisfy the purposes of NEPA.[153] Although other decontamination data sources may exist, such data sources are not readily applicable in the U.S. context and are not readily assessed or processed for inclusion in MACCS2 analyses.[154]

This fact is evident from the four principal data sources on which Dr. Lemay relies and the alternative CDNFRM values he proposes based on those sources. His proposed values are unreasonable and inappropriate because they are derived from cost data that are inapplicable to a nuclear power plant SAMA analysis, are based on selective and incorrect use of the data, and lack adequate technical justification. These major flaws are summarized below.

a. Site Restoration Report/Luna Paper (ISR Approach A)

NYS and Dr. Lemay rely heavily on data contained in the Sandia 1996 Site Restoration Report to develop alternative decontamination cost estimates but fail to properly or accurately account for key attributes of that study that render it inapplicable to a SAMA analysis.[155] The *Site Restoration Report* serves to develop cost estimates for remediation of a *plutonium* dispersal event.[156] This focus on plutonium significantly increases the decontamination/remediation costs estimated in the report, because the report's authors assume that any area requiring a DRF greater than 10 would require complete demolition of contaminated structures.[157] This runs counter to actual remediation experience associated with Chernobyl, where DRFs of up to 15 were obtained without resorting to complete demolition.[158]

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153 *Id*. at A72.

154 *Id*.

155 *See* ISR Report at 16-18 (NYS000242).

156 Entergy Test. at A90 (ENT000450).

157 *Id*.

158 *Id*. at A92.

Furthermore, the 1996 Site Restoration Report focused on relatively small areas for remediation and did not fully investigate attributes that would be pursued for a significantly larger-scale cleanup effort (where complete demolition of all structures is not a viable option), such as segregating non-radiological waste from radiological waste, employing waste volume reduction techniques, and minimizing the costs for associated with on-site disposal.[159] The report thus does not take into account "economy of scale" attributes that likely would be associated with decontamination over a broader area, as would be expected in the case of a nuclear power plant severe accident.[160] The 1996 Site Restoration Report explicitly acknowledges this point:

> In order to derive the cost estimates presented, we assumed that the size of the affected area could range from a few hundred square meters to a few square kilometers. *Our choice of the potential size of the affected area should not be used to predict the costs of accidents*. Those predictions require detailed data on the masses of material at risk, accident phenomenology, release fractions, accident location, local terrain, and meteorological conditions, *which are outside the scope of this report*. For average weather conditions and flat terrain, even for HE [high explosive] detonation, the size of the affected area might be only a very few square kilometers.[161]

In ISR Approach A, Dr. Lemay also relies on data contained in a brief technical paper by Luna et al. (Luna Paper) that purports to survey efforts to estimate the clean-up costs for radiological dispersion events associated with radiological dispersion devices ("RDDs") or "dirty bombs."[162] Dr. Lemay's reliance on this paper is misplaced in multiple respects. For example, like the 1996 Site Restoration Report, the Luna Paper concerns small-scale dispersion events

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159 *Id*. at A133.

160 *Id*.

161 1996 Site Restoration Report at 7-1 to -2 (emphasis added) (NYS000249).

162 *See* ISR Report at 16-18 (NYS000242).

and, therefore, lacks applicability in the present context.[163] In fact, as Entergy's experts explain, most of the data sets surveyed by Luna implicitly incorporate the Sandia 1996 Site Restoration Report economic model.[164] Consequently, references to the Luna Paper to substantiate the magnitude of the cost estimates generated using the Sandia 1996 Site Restoration Report also is a circular argument.

In addition, based on the Luna Paper, Dr. Lemay attempts to scale up projected decontamination costs associated with postulated decontamination for New York City.[165] However, he fails to apply his methodology consistently and scale *down* the decontamination costs associated with the remaining 98% of the 50-mile radius SAMA analysis area.[166] As Dr. O'Kula and Mr. Teagarden explain, given that the area outside the New York City region contributes approximately 90% of the ISR-calculated value for CDNFRM, this is a major oversight in Dr. Lemay's analysis that undermines its reliability.[167]

b. Reichmuth Paper (ISR Approach B)

Dr. Lemay also relies on data contained in a brief paper by Reichmuth as well as brief references to another paper by Reichmuth that is not publicly available or provided by NYS.[168] Again, NYS and its expert fail to properly and accurately account for key aspects of the papers on which they rely in estimating decontamination costs. For example, the Reichmuth Paper's estimated costs for radiological cleanup following an RDD detonation in New York City is based on costs associated with the September 11, 2001 attacks on the World Trade Center, an attack

163 Entergy Test. at A119 (ENT000450).

164 *Id*.

165 *Id*. at A120.

166 *Id*. at A121.

167 *Id*.

168 *See* ISR Report at 18-19 (NYS000242).

that did not involve any radiological material.[169] The details of how Reichmuth estimated "preliminary" costs for an RDD event (with essentially no physical damage) from the attacks on the World Trade Center are not presented in the Reichmuth Paper for critical review.[170] Further, the Reichmuth sources appear to use the same cost model as the 1996 Site Restoration Report and, therefore, lack applicability to the IPEC SAMA analysis for the same reasons summarized above and explained by Dr. O'Kula and Mr. Teagarden in their testimony.[171]

With regard to the second Reichmuth paper, which is briefly discussed in a Congressional Research Services (CRS) report but otherwise unavailable to the Board and parties, Dr. Lemay relies on a graphical presentation of cost estimates for a Cs137 attack on Vancouver (as apparently extracted from the second Reichmuth paper and presented in the CRS report).[172] Review of the figure on which Dr. Lemay bases his cost estimate, however, confirms that 85% of the costs included in Dr. Lemay's estimate are outside the scope of the MACCS2 nonfarm decontamination cost (CDNFRM) parameter; *i.e.*, they are totally unrelated to radiological cleanup costs.[173] Thus, Dr. Lemay's assessment suffers from serious flaws.

c. CONDO Report (ISR Approach C)

NYS and Dr. Lemay also rely on data related to the European CONDO software tool for estimating decontamination costs in the United Kingdom.[174] However, Dr. Lemay's use of the CONDO dataset is not objective and unreasonably skews the analysis results in favor of higher

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169 Entergy Test. at A135 (ENT000450).

170 *Id*.

171 *See generally, id*. at A118-A134.

172 *Id.* at A136.

173 *Id*.

174 *See* ISR Report at 19-21 (NYS000242).

estimated decontamination technique costs.[175] Therefore, his CONDO-related cost estimate also is unreliable.

For example, despite the availability of 61 decontamination techniques to apply from the CONDO database, Dr. Lemay appears to weight his results predominantly on decontamination of *internal* walls in buildings, and relies on a *single* decontamination technique in all of his spreadsheet calculations.[176] That is, one technique ("vacuuming, cleaning and washing") is a dominant contributor for the semi-urban, urban and "hyper-urban" population densities areas described in the ISR Report.[177] With an internal wall weighting factor developed in the ISR spreadsheets, this single decontamination technique controls the outcome of the individual spreadsheets for the Approach C analyses.[178] This is not reasonable because building interiors are expected to be less contaminated than the building exteriors in the event of a nuclear power plant severe accident.[179]

Additionally, the CONDO datasets present data for three different population category ranges (*i.e.*, rural, semi-urban, and urban).[180] Dr. Lemay invents a fourth population category called "hyper-urban." Specifically, he develops a hyper-urban category to account for a population density of greater than 10,000 persons/km^2 for the New York City region, but this category is not supported by the CONDO report land use and housing indices: rural (< 25 persons/km^2), semi-urban (> 25 but ≤ 1,000 persons/km^2), and urban (> 1,000 persons/km^2).[181]

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175 *See* Entergy Test. at A143 (ENT000450).

176 *Id*.

177 *Id*.

178 *Id*.

179 *Id*.

180 *Id*. at A144.

181 *Id*.

In addition, for some cost estimates, Dr. Lemay ignores the CONDO cost category definitions and applies a higher cost category than would apply based on the population densities in the IPEC SAMA analysis region. He characterizes the New York City metropolitan area as either urban or hyper-urban by population density, and the area outside the NYC metropolitan area (but still in the 50-mile SAMA analysis region) as either semi-urban or urban.[182] However, the 50-mile (80-km) SAMA analysis polar grid indicates that only *one* of eighty 22.5-degree sector elements (1.8% of the total SAMA grid area) meets the ISR definition of hyper-urban (10,000 persons per km^2), and that 68 of the remaining grid elements (81.5% of the total SAMA grid area) would not meet the definition of an urban area.[183]

In short, Dr. Lemay appears to have chosen decontamination techniques without an objective, sound technical basis and outside the context of the CONDO software application, and then relied on one decontamination technique to arrive at his estimated decontamination costs. Importantly, whether the same results would be obtained in the CONDO code itself is unknown, because Approach C relies on ISR-generated spreadsheets (not the code itself) that are presented by NYS and Dr. Lemay without adequate explanation or technical justification.

d. Risø Report (ISR Approach D)

To develop a fourth and final decontamination cost estimate, NYS and Dr. Lemay also rely on data contained in a report prepared by Denmark's Risø National Laboratory.[184] As Entergy's experts explain, Dr. Lemay's development of this cost estimate is not technically justified or even presented in sufficient detail to permit an adequate and objective evaluation.[185] While a spectrum of decontamination effectiveness levels is documented in the Risø report, ISR

[182] Lemay Test. at 43-44 (NYS000241).

[183] Entergy Test. at A144 (ENT000450).

[184] Lemay Test. at 46-48 (NYS000241).

[185] Entergy Test. at A148 (ENT000450).

infers that the report only supports "light decontamination" work.[186] Also, labor cost information is not presented in the Risø report, and it is unclear from the limited information presented in the ISR what labor cost data Dr. Lemay is applying in his assessment.[187] Finally, Dr. Lemay chooses decontamination techniques from the Risø Report that most closely correlated to those selected in the CONDO analysis, which as discussed above, suffers from significant flaws.[188]

6. Summary of Arguments and Evidence

In summary, Entergy followed the prescriptive guidance in the NRC-approved industry guidance document NEI 05-01, Rev. A to perform its SAMA analyses for IP2 and IP3 and appropriately used MACCS2, the only NRC-recognized computer code available in the U.S. that is capable of meeting all of the offsite consequence requirements of a SAMA analysis, including those of calculating population dose and economic cost consequences. In addition, Entergy's MACCS2 inputs and assumptions relating to decontamination costs and times are based on NUREG-1150 values that have been well-vetted by the nuclear industry, the national laboratories, and the NRC. Those values are both reasonable and appropriate for a SAMA analysis and comply with NEPA and related NRC requirements.

In contrast, the decontamination time and cost values proposed by NYS and its expert are neither technically justified nor reasonable and appropriate for a NEPA-based SAMA analysis. It is noteworthy that NYS's proposed decontamination cost estimates (ISR Approaches A to D) for "light decontamination" (which range from $19,000 – $272,000) and "heavy decontamination" (which range from $90,000 – $898,000) vary by an *order of magnitude* in each

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186 *Id*.

187 *Id*. at A149.

188 *Id*. at A148.

case. Such widely differing values demonstrate the importance of MACCS2 analysts using well-vetted and widely-accepted values of the type used by Entergy in the IPEC SAMA analysis.

Further, Dr. Lemay modified the MACCS2 FORTRAN source code to accept his larger, out-of-range of allowed input values for TIMDEC and CDNFRM values. Entergy's experts and most nuclear safety professionals would strongly advise against this practice. Computer code use for PRA applications as well as those supporting NEPA applications necessitates consistency and quality assurance standards in the development, maintenance and use of software. User training and understanding of the allowed data ranges in the inputs to PRA and severe accident software such as the MACCS2 code is required of all users. Dr. Lemay's alteration of the MACCS2 source code to accept user-preferred, out-of-range input values, and executing the modified code without seeking *independent* verification of proper code functionality, departs from accepted industry practices, including adherence to software quality assurance principles followed by all of the nuclear industry. And, as the Commission's recent Pilgrim ruling makes clear, it also runs counter to NEPA requirements and principles.

VI. CONCLUSION

For the reasons stated above and detailed in Entergy's testimony, the NRC Staff correctly concluded in its FSEIS that Entergy's decontamination cost estimates are reasonable, appropriate, and consistent with estimates used in prior NRC-approved SAMA analyses. As the Commission has held, the relevant inquiry here is whether the analysis in question, including the methodology used, is "reasonable under NEPA."[189] It is "not whether there are plausible alternative choices for use in the analysis."[190]

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189 *Seabrook*, CLI-12-05, slip op. at 46-47.

190 *Id*. at 28.

NYS has not met its burden to prove that the SAMA analysis methodology and assumptions used by Entergy and approved by the NRC Staff are unreasonable under NEPA. In fact, NYS has failed even to provide plausible alternative choices. By relying on information that has no demonstrated applicability to a nuclear power plant SAMA analysis, NYS has not established the requisite "direct connection" between the factual information on which it relies and the IPEC SAMA analysis cost-benefit results.[191] Further, as Entergy's testimony demonstrates, NYS and its expert rely on "unsupported reasoning and computations" that yield widely-varying and dubious results.[192] Accordingly, under controlling NEPA principles applied by the Commission in proceedings involving similar SAMA contentions, NYS-12C should be dismissed for lack of merit.

[191] *See Pilgrim*, CLI-10-11, 71 NRC at 311 n.121.

[192] *Id.* at 315 (emphasis added).

Respectfully submitted,

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Dated in Washington, D.C.
this 30th day of March 2012

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.	)	ASLBP No. 07-858-03-LR-BD01
(Indian Point Nuclear Generating Units 2 and 3)	)	March 30, 2012

CERTIFICATE OF SERVICE

I certify that, on March 30, 2012, a copy of "Entergy's Statement of Position Regarding Consolidated Contention NYS-12C (Severe Accident Mitigation Alternatives Analysis)," "Testimony of Applicant Witnesses Lori Potts, Kevin O'Kula, and Grant Teagarden Concerning Consolidated Contention NYS-12C (Severe Accident Mitigation Alternatives Analysis)," and supporting exhibits was served electronically with the Electronic Information Exchange on the following recipients:

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