

**UNITED STATES  
NUCLEAR REGULATORY COMMISSION**

**BEFORE COMMISSIONERS  
KRISTINE L. SVINICKI,  
WILLIAM C. OSTENDORFF, AND  
JEFF BARAN AND  
CHAIRMAN STEPHEN G. BURNS**

**ON PETITION FOR REVIEW OF  
LBP-13-13 PURSUANT TO 10 C.F.R. § 2.341**

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In re: Docket Nos. 50-247-LR; 50-286-LR  
  
License Renewal Application Submitted by ASLBP No. 07-858-03-LR-BD01  
  
Entergy Nuclear Indian Point 2, LLC, DPR-26, DPR-64  
Entergy Nuclear Indian Point 3, LLC, and  
Entergy Nuclear Operations, Inc. April 29, 2015  
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**STATE OF NEW YORK REPLY  
TO ENTERGY'S AND NRC STAFF'S RESPONSES TO  
COMMISSION ORDER CLI-15-2 REQUESTING  
FURTHER BRIEFING ON CONTENTION NYS-12C CONCERNING  
SITE-SPECIFIC SEVERE ACCIDENT MITIGATION ALTERNATIVES**

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## GLOSSARY OF TERMS, ACRONYMS, & ABBREVIATIONS

Board	Atomic Safety and Licensing Board
CDNFRM	MACCS2 input parameter for the nonfarmland decontamination cost
GEIS	Generic Environmental Impact Statement
Entergy Response	Entergy Nuclear Operations, Inc., Initial Brief in Response to Commission Questions in CLI-15-2 Concerning Contention NYS-12C (Mar. 30, 2015) (ML15089A544)
FSEIS	Ex. NYS00133A-J, Ex. NRC000004 <sup>1</sup> Final Supplemental Environmental Impact Statement NUREG-1437, <i>Volumes 1-3: Supplement 38: Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Regarding Indian Point Nuclear Generating Unit Nos. 2 and 3 – Final Report</i> (Dec. 2010)
ISR	International Safety Research, Inc.
LBP-13-13	Partial Initial Decision, <i>Entergy Nuclear Operations, Inc.</i> (Indian Point Nuclear Generating, Units 2 and 3), LBP-13-13, 78 N.R.C. 246 (Nov. 27, 2013) (ML13331B465).
Lemay Initial Test.	Ex. NYS000241, Pre-filed Testimony of NYS Expert François Lemay on Contention NYS-12C (Dec. 21, 2011)
Lemay Rebuttal Test.	Ex. NYS000420, Pre-filed Rebuttal Testimony of NYS Expert François Lemay on Contention NYS-12C (Jun. 29, 2012)
Luna's <i>Survey of Costs</i>	Ex. NYS000255, R. Luna, H. Yoshimura & M. Soo Hoo, <i>Survey of Costs Arising from Potential Radionuclide Scattering Events</i> , WM2008 Conference, Phoenix, AZ (Feb. 24-28, 2008).
MACCS2	MELCOR Accident Consequence Code Systems Version 2
MELCOR	Methods for Estimation of Leakages and Consequences of Releases
NRC	Nuclear Regulatory Commission

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<sup>1</sup> NRC000004 is a one-page exhibit that “[i]ncorporates New York Exhibit NYS000133A-J.”

## GLOSSARY OF TERMS, ACRONYMS, & ABBREVIATIONS

NRC Staff Response	NRC Staff’s Response to the Commission’s Memorandum and Order of February 18, 2015 (CLI-15-2), Regarding Contention NYS-12C (Mar. 30, 2015) (ML15089A181)
NUREG/CR-3673 or the 1984 report	Ex. NRC000058, NUREG/CR-3673, <i>Economic Risks of Nuclear Power Reactors Accidents</i> (May 1984)
NUREG-1150	Ex. NYS00252A-D, NUREG-1150, <i>Severe Accident Risks: An Assessment for Five U.S. Nuclear Power Plants</i> (Dec. 1990)
NYS-12C	Consolidated Contention NYS-12/12A/12B/12C
Os84	“Ostmeyer, R.M., and G.E. Runkle, An Assessment of Decontamination Costs and Effectiveness for Accident Radiological Releases, Albuquerque, N.M.: Sandia National Laboratories, to be published”
SAMA	Severe Accident Mitigation Alternatives
Sandia	Sandia National Laboratories
RAI	Request for Additional Information
<i>Sandia Site Restoration</i>	Ex. NYS000249, D. Chanin & W. Murfin, SAND96-0957, <i>Site Restoration: Estimation of Attributable Costs From Plutonium-Dispersal Accidents</i> (May 1996)
SOARCA	State-of-the-Art Reactor Consequence Analysis
Staff Test.	Ex. NRC000041, Pre-filed Testimony of NRC Staff Witnesses Bixler, Ghosh, Jones, and Harrison on NYS-12/16 (Mar. 30, 2012)
State Response	State of New York Response to Commission Order CLI-15-2 Requesting Further Briefing on Contention NYS-12C Concerning Site-Specific Severe Accident Mitigation Alternatives (Mar. 30, 2015) (ML15090A273)
TIMDEC	MACCS input parameter for the time required for completion of decontamination levels
Tr.	Transcript of Evidentiary Hearing before Atomic Safety and Licensing Board, Docket Nos. 50-247-LR & 50-286-LR, ASLBP No. 07-858-03-LR-BD01

Pursuant to the Commission’s Memorandum and Order, CLI-15-2, the State of New York provides this reply to NRC Staff’s and Entergy’s responses<sup>1</sup> to the Commission’s questions regarding the State’s petition for review of the Board’s Partial Initial Decision<sup>2</sup> as to Consolidated Contention NYS-12/12A/12B/12C (“NYS-12C”).

Both NRC Staff’s and Entergy’s responses contain lengthy discussions and legal argument beyond the scope of the questions posed by the Commissioners in CLI-15-2.<sup>3</sup> Those portions should be disregarded by the Commission. The State did not understand CLI-15-2 as inviting submissions beyond the listed questions. Given the page limitations and CLI-15-2, this reply does not respond to those legal arguments.

#### **I. REPLY TO NRC STAFF AND ENTERGY’S RESPONSE TO QUESTIONS**

- 1) The Board in LBP-13-13 stated that the “genesis” of the decontamination time values used in the Indian Point SAMA analysis can be traced to a 1984 report (NUREG/CR-3673) that concluded that a 90-day decontamination time period represents “an average time to complete decontamination efforts following the most severe reactor accident.”<sup>4</sup>**

**Address the underlying support and reasoning (if available) behind the report’s conclusion that a 90-day time period is an “average” period of time for completing decontamination for “the most severe type of reactor accident.”**

Neither NRC Staff nor Entergy have demonstrated that “Economic Risks of Nuclear Power Reactor Accidents” NUREG/CR-3673 (May 1984) (Ex. NRC000058) provides support and/or reasoning for NRC’s conclusion that a 90-day time period is an “average” period of time

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<sup>1</sup> NRC Staff’s Response to the Commission’s Memorandum and Order of February 18, 2015 (CLI-15-2), Regarding Contention NYS-12C (Mar. 30, 2015) (ML15089A181) (“NRC Staff Response”); Entergy Nuclear Operations, Inc., Initial Brief in Response to Commission Questions in CLI-15-2 Concerning Contention NYS-12C (Mar. 30, 2015) (ML15089A544) (“Entergy Response”).

<sup>2</sup> *Entergy Nuclear Operations, Inc.* (Indian Point Nuclear Generating, Units 2 and 3), Partial Initial Decision (Ruling on Track 1 Contentions), LBP-13-13, 78 N.R.C. 246 (Nov. 27, 2013) (ML13331B465) (“LBP-13-13”).

<sup>3</sup> See NRC Response at 1-12; Entergy Response at 1-9.

<sup>4</sup> LBP-13-13, 78 N.R.C. at 469.



for completing decontamination for “the most severe type of reactor accident.”

NRC Staff’s Response consists nothing more than speculation about what the 90 day value may have been based on or how it may have been vetted.<sup>5</sup> Instead of showing underlying documentary support for the 90-day value, Staff simply concludes that “[t]he lack of the document’s availability some 30-plus years later is not sufficient to cast doubt on the careful conclusions made at the time.”<sup>6</sup> This assertion is utterly unreasonable and runs afoul of the National Environmental Policy Act’s (“NEPA’s”) scientific integrity requirement.<sup>7</sup> Likewise, Entergy’s assertion that its “experts concluded that the 60-day and 120-day TIMDEC values used in NUREG-1150 and the IPEC SAMA analysis represent  $\pm 30$ -day sensitivity cases when compared to the 90-day base case from NUREG/CR-3673 and early (circa 1987) MACCS code documentation” is not corroborated by any documentary evidence in NUREG-1150, NUREG/CR-3673, or anywhere else.

Because there is no available underlying rationale for the 90-day decontamination time in the 1984 document, NRC Staff’s Response provides a general, off-topic discussion of “the use of the mean and its implications.”<sup>8</sup> Likewise, Entergy focuses on a discussion of the term

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<sup>5</sup> See, e.g., NRC Staff’s Response at 12, n.65 (“NUREG prior to publishing typically receive internal and external vetting similar to the type of vetting performed for NUREG-1150. See Tr. at 2370-72.”).

<sup>6</sup> NRC Staff Response at 13, n.66.

<sup>7</sup> An environmental impact statement must contain “high quality” information and “accurate scientific analysis,” be “supported by credible scientific evidence,” and uphold “scientific integrity.” 40 C.F.R. §§ 1500.1(b), 1502.22(b)(4), 1502.24. See, e.g., *Native Ecosystems Council v. U.S. Forest Serv.*, 418 F.3d 953, 964 (9th Cir. 2005) (discussing scientific integrity requirement that “an agency may not rely on incorrect assumptions or data in an EIS”). Additionally, NRC has committed itself to the “highest technical . . . competence,” the use of “best available knowledge,” and “high quality” decisionmaking. NRC, *Principles of Good Regulation and Organizational Values*, <http://www.nrc.gov/about-nrc/values.html> (last updated Jan. 31, 2014).

<sup>8</sup> NRC Staff Response at 13.

“average.”<sup>9</sup> Staff references “a chart showing the area requiring decontamination for each source term used in the Indian Point SAMA analysis,” and then, without citation, asserts that “[t]his same type of analysis resulted in NUREG/CR-3673’s conclusion that 90 days represented the mean for severe accident decontamination.”<sup>10</sup> Such a discussion is wholly inadequate to answer the Commission’s question. Furthermore, as discussed in the State’s Response to Question 5, because the more severe release categories make the largest contribution to the total economic costs, the values for input parameters should more closely align with the accidents that are relatively more severe rather than inputs that align with the least severe accidents.<sup>11</sup>

Entergy provides a discussion of “staged implementation,” and points out that some areas would be decontaminated faster than others,<sup>12</sup> but these statements do not answer the Commission’s question and do not provide support for an average 90-day decontamination time in light of the State’s evidence regarding Fukushima. As the State’s expert explained, the TIMDEC parameter represents the average time from evacuation of a population to return to their original home.<sup>13</sup> “[I]t doesn’t matter if the people are away because they were temporarily relocated, because decontamination took time, or because there was interdiction following the decontamination. Whatever the cause of the delay for people returning to their house, that’s what drives the cost associated with TIMDEC.”<sup>14</sup>

Again without addressing the Commission’s question, NRC Staff claims, “The Staff’s

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<sup>9</sup> Entergy Response at 10-11.

<sup>10</sup> NRC Staff Response at 13-14.

<sup>11</sup> State Response at 21-25 and citations to exhibits and testimony therein.

<sup>12</sup> Entergy Response at 13-14.

<sup>13</sup> Ex. NYS000420, Lemay Rebuttal Test. at 50.

<sup>14</sup> Tr. 2208:4-10 (Lemay); *see also* Tr. 2240:10-15 (Teagarden).

experts and Entergy’s experts provided uncontroverted testimony that altering the input variables does not increase the benefit by a similar amount and may not result in any appreciable change in the benefit.”<sup>15</sup> First, the testimony cited by Staff for its unsupported assertion actually shows that NRC Staff’s witness agreed with the State that an increase in severe accident costs would make SAMA candidates more cost-beneficial—not that there would be no appreciable change.<sup>16</sup> Entergy witnesses testified that the effect of increasing severe accident costs on SAMA candidates would be “SAMA-specific” and would require additional analysis.<sup>17</sup> Thus, NRC Staff has mischaracterized testimony which in reality acknowledges that increasing severe accident costs, resulting from changing MACCS2 inputs, would affect the SAMA analysis. Second, neither Entergy nor Staff performed a sensitivity analysis to determine the effect that changing cost inputs would have on the SAMA analysis as they did for NYS-16B.<sup>18</sup>

**2) Identify from the record any peer review or similar vetting of the NUREG-1150 values for the decontamination cost inputs for nonfarm land and property (CDNFRM) and the decontamination time inputs (TIMDEC) used in the MACCS2 computer code.**

The State’s Response explained, in detail, the lack of peer review of similar vetting of the NUREG-1150 values for TIMDEC and CDNFRM.<sup>19</sup> Neither Staff nor Entergy provide evidence that either of these cost parameters were peer reviewed. Instead, NRC Staff and Entergy focus on the peer review of NUREG-1150 as a whole, which does not respond to the Commission’s specific question. NRC Staff unsuccessfully attempts to compare the area

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<sup>15</sup> NRC Staff Response at 14 (citing Tr. at 2333, 2525-28).

<sup>16</sup> Tr. at 2333:9-24 (Liberatore/Ghosh) (NRC Staff witness agreed that an increase in severe accident costs would render SAMA candidates more cost-beneficial).

<sup>17</sup> Tr. 2526:16-19, 24-25 (Liberatore/Potts); Tr. 2527:9-12 (Teagarden) (“[E]ach SAMA candidate has its own unique footprint of how it impacts the risk. So it’s something that would need to be evaluated.”).

<sup>18</sup> See State Response at 16. Moreover, as discussed in Question 4, Staff admits that it did not perform a sensitivity analysis.

<sup>19</sup> State Response at 5-10.

surrounding Indian Point to some of the five plants studied in NUREG-1150, but this comparison is contrived and misleading.<sup>20</sup> NRC is well aware of the differences between the area surrounding Indian Point and all other sites in the U.S., having explained in the 1996 Generic Environmental Impact Statement (“GEIS”) for license renewal:<sup>21</sup>

*Typically, nuclear power plant sites and the surrounding area are flat-to-rolling countryside in wooded or agricultural areas. More than 50 percent of the sites have 80-km (50-mile) population densities of less than 200 persons per square mile, and over 80 percent have 80-km (50-mile) densities of less than 500 persons per square mile. The most notable exception is the Indian Point Station, located within 80 km (50 miles) of New York City, which has a projected 1990 population density within 80 km (50 miles) of almost 2000 persons per square mile.*

Staff states that the NUREG-1150/ Sample Problem A decontamination cost value is based on “Os84.” Since Os84 is missing, there is no way for anyone (including NRC Staff and Entergy) to represent that those values were developed in a way that accounted for the high building density or other unique and iconic aspects of the area surrounding Indian Point.

Although the Board did not mention the State-of-the-Art Reactor Consequence Analysis (“SOARCA”) study,<sup>22</sup> Entergy and Staff cite this newer document as evidence of the continued validity of their CDNFRM and TIMDEC values.<sup>23</sup> SOARCA, however, is not a SAMA analysis and is not site-specific to Indian Point. The SOARCA project (Draft NUREG-1935) makes it clear that while “[v]alues from NUREG-1150 provide the basis for decontamination parameters,

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<sup>20</sup> NRC Staff Response at 16. For example, Mr. Jones’ testified that two of the five sites studied in NUREG-1150 are not unlike Indian Point with respect to the population density within the 10-mile radius Emergency Planning Zone (Tr. 1968:15-24 (Jones)), but Mr. Jones’ comparison is of no consequence because the SAMA analysis cost estimates are for the 50-mile radius surrounding Indian Point, not just the 10-mile Emergency Planning Zone.

<sup>21</sup> Ex. NYS000131A, GEIS at 2-2 (emphasis added). Entergy projects that the surrounding population will grow to 19.2 million people by 2035—the end of the proposed relicensing period for Unit 3. Ex. NYS000211 at 2-6.

<sup>22</sup> Ex. ENT000455, NUREG-1935, SOARCA Draft Report for Public Comment (Jan. 2012).

<sup>23</sup> Staff Response at 16; Entergy Response at 18-19.

. . . . [t]his report does not consider costs associated with a reactor accident.”<sup>24</sup> Thus, SOARCA is not a peer review of the CDNFRM and TIMDEC values. Instead, SOARCA used the MACCS2 model with these input parameters in a limited way to determine “whether contaminated areas can be restored to habitability and therefore affect predicted doses and risk of health effects.”<sup>25</sup> SOARCA does not support the use of the NUREG-1150/ Sample Problem A CDNFRM and TIMDEC values for Indian Point and does not represent a vetting of those values justifying their use in the Indian Point SAMA analysis.

**3) Providing references to the record, discuss the underlying reasons behind the Staff and Entergy experts’ opinion that the NUREG-1150 CDNFRM and TIMDEC values continue to reflect reasonable estimates for severe accident decontamination times and costs today, including for the heavier (DF of 15) decontamination effort.**

The State’s Response explained that neither Entergy nor NRC Staff have provided evidence showing that the NUREG-1150 CDNFRM and TIMDEC values continue to reflect reasonable estimates for severe accident decontamination times and costs today, including for the heavier (DF of 15) decontamination effort.<sup>26</sup> Both Staff and Entergy support these values by tracing them back to NUREG-1150, which the State previously explained does not justify their continued use.

Entergy relies heavily on its response to NRC Staff’s request for additional information (“RAI”) to supply a rational basis for the continued use of NUREG-1150/Sample Problem A values.<sup>27</sup> The RAI response is conclusory, stating merely that the values “have been used by

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<sup>24</sup> Ex. ENT000455, Draft NUREG-1935 at 63.

<sup>25</sup> *Id.*

<sup>26</sup> State Response at 10-15.

<sup>27</sup> Entergy Response at 19-20; Ex. ENT000460, RAI Response (Feb. 2008), Attach. 1 at 25-26; *see also* Ex. ENT000477, RAI Response (May 2008) (); FSEIS, Vol. 3, App. G at G-21, G-43, G-45 to G-46 (NYS001331).

other license renewal applicants” and that they were escalated using the Consumer Price index.<sup>28</sup> The RAI response also refers to the Sample Problem A values as “default values,” and does not provide any benchmarking, support, or rationale for their continued use.<sup>29</sup>

Additionally, Staff and Entergy focus on averaging and the more likely, less severe accidents,<sup>30</sup> but as the State explained time and time again, including in Response to Question 5, these accidents do not drive the cost calculation and, thus, the values for input parameters should more closely align with the accidents that are relatively more severe.

To support TIMDEC, Staff contends that the MACCS2 code’s modeling “lends credibility to the selected TIMDEC.”<sup>31</sup> This assertion, however, ignores the realities of decontamination. While Staff is correct that “[i]f the levels of contamination are large enough to require decontamination, it applies the first decontamination effort, DF of 3. . . . regardless of the level of decontamination required,” Staff oversimplifies decontamination in asserting that “[u]nder actual accident conditions . . . the decontamination efforts would be more closely matched to the contamination levels.”<sup>32</sup> The State’s expert’s example of decontaminating a building that contains brick and glass shows that decontamination is more complicated than Staff contends, and supports TIMDEC values longer than 90 days.<sup>33</sup> What is more, neither Staff nor Entergy address the State’s Fukushima evidence on decontamination time, other than dismissing it as “worst-case” when it is well within the range of accidents Entergy chose to model.

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<sup>28</sup> Ex. ENT000460 at 37-38.

<sup>29</sup> *Id.*

<sup>30</sup> Staff Response at 18-19; Entergy Response at 21-25.

<sup>31</sup> Staff Response at 19.

<sup>32</sup> *Id.* at 20.

<sup>33</sup> *See* State Response at 15; Ex. NYS000420, Lemay Rebuttal Test at 52-53.

To support CDNFRM, Staff relies on the per capita nature of the input.<sup>34</sup> However, NRC Staff's analysis fails to take into account differing building densities and type. In short, Staff argues that population density is sufficient to make the analysis site-specific while the State argues that the population density, building density, and the type of buildings need to be considered to make the analysis site-specific. As building density increases and the type of buildings change from single-family homes to high rise buildings, decontamination becomes more complex and costs begin to escalate in a non-linear fashion.<sup>35</sup> At the hearing, Judge Kennedy recognized the effect building type and density have on decontamination costs.<sup>36</sup> Also, NRC Staff witness Dr. Bixler admitted that site-specific decontamination cost parameters could take such attributes into account.<sup>37</sup> Thus, the per capita nature of the CDNFRM values is not enough to justify their continued use in light of the State's evidence showing that site-specific values for Indian Point are consistently higher using a variety of available data sources.

Staff's criticism of the State's evidence<sup>38</sup> is unconvincing and wrong. Because the data source for the CDNFRM input values is not available or explained in any reference, the State's experts benchmarked Entergy and Staff's values against values it developed with different

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<sup>34</sup> Staff Response at 21-22.

<sup>35</sup> See Tr. 2136:2-15 (Lemay) (explaining that a correlation between population and decontamination costs may work for "a site with individual dwellings[,] . . . [but] where you start to question the approach is when you start to get into big buildings, high rise and the kind of city we have in New York and then you say, 'Hm. You can't just keep extrapolating.'").

<sup>36</sup> Tr. 2128:2-6 (J. Kennedy) ("I'm almost concerned that somewhere between the 25 story or 100 story high rise and the one or two story building with a complexity of decontamination that I don't know how that's accounted for in this.").

<sup>37</sup> Tr. 2128:15-17 (Bixler) ("I think the way that you would account for it in terms of applying the code is simply the way the number that come up with for the decontamination cost [CDNFRM].").

<sup>38</sup> Staff Response at 22-23.

sources of relevant, available data.<sup>39</sup> Dr. Lemay’s rebuttal testimony addressed, in detail, NRC Staff and Entergy’s criticisms regarding the CDNFRM calculations.<sup>40</sup> A more detailed reply to Staff and Entergy’s criticisms is provided in response to Questions 7 and 8 below.

**4) Discuss the appropriateness of performing sensitivity analyses to account for uncertainties in the estimated decontamination times and non-farm decontamination costs, including what might be reasonable CDNFRM and TIMDEC inputs to use in sensitivity analyses for the Indian Point SAMA analysis.**

NRC Staff and Entergy admit that they failed to perform any sensitivity analyses to account for uncertainties in the estimated decontamination times and non-farm decontamination costs.<sup>41</sup> Entergy sidesteps the question by claiming that sensitivity analyses are not appropriate here because “the decontamination factor, cost, and time form a ‘suite of variables’ . . . such that the code user should not alter one of these variables without evaluating the impact of the change on the other, related variables.”<sup>42</sup> In fact, while two different CDNFRM values and two different TIMDEC values are entered for light and heavy decontamination respectively, CDNFRM and TIMDEC are used in separate MACCS2 code calculations.<sup>43</sup> The offsite economic cost output by the code is the sum of decontamination costs (calculated using CDNFRM), interdiction costs (calculated using TIMDEC), and condemnation costs (calculated using other input values). Thus, Entergy’s explanation for failing to perform a sensitivity analysis is not accurate.

Staff also faults the State for not “show[ing] that the Staff’s SAMA analysis might identify additional potentially cost-beneficial mitigation measures if its suggested changes to the

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<sup>39</sup> See Ex. NYS000420, Lemay Rebuttal Test. at 5; Ex. NYS000430 (updating certain ISR tables).

<sup>40</sup> See Ex. NYS000420, Lemay Rebuttal Test. at 35-47.

<sup>41</sup> See Staff Response at 28; Entergy Response at 25. NRC Staff’s response to this question also focuses on uncertainties, which the State addresses in Question 7 below.

<sup>42</sup> Entergy Response at 25-26.

<sup>43</sup> See Ex. NYS000242, ISR Report at 11-12; see also Ex. NYS000420, Lemay Rebuttal Test. at 51 (explaining that TIMDEC is only a factor in the decrease in property value during decontamination).



input values, TIMDEC and CDNFRM, where made.”<sup>44</sup> NRC Staff, however, cannot shift this burden onto the State.<sup>45</sup> The State’s evidence is more than sufficient to establish a prima facie case that there are realistic and readily-available economic cost inputs that can be used to develop a site-specific SAMA analysis; thus, the burden is on NRC Staff to prove by a preponderance of the evidence that it complied with the requirements of NEPA.<sup>46</sup> Furthermore, when the State attempted to inquire about the effect of its inputs on the SAMA cost-benefit analysis, the applicant informed the State that more analysis would be required.<sup>47</sup>

Additionally, the Commission should reject NRC Staff’s attempt to rewrite NYS-12C to challenge “the reasonableness of the cost-benefit analysis” and to somehow not focus on severe accident costs.<sup>48</sup> In admitting the contention, the Board found that “the contention challenges the cost data for decontamination and clean up used by MACCS2.”<sup>49</sup> The Board further found that the State “is questioning whether ‘specific inputs’ and ‘assumptions’ made in [the] MACCS2

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<sup>44</sup> Staff Response at 25.

<sup>45</sup> See *Harlem Val. Transp. Ass’n v. Stafford*, 500 F.2d 328, 336 (2d Cir. 1974) (An agency cannot be “content to place the burden on intervenors whose resources might be limited to challenge any environmental statements that the [applicants] might make in their applications . . .”); *Greene County Planning Board v. Federal Power Comm’n*, 455 F.2d 412, 419-20 (2d Cir. 1972), *cert. denied*, 409 U.S. 849 (1972) (a federal agency cannot abdicate its responsibility to independently evaluate federal actions proposed to it by other, non-federal entities).

<sup>46</sup> See *Progress Energy Florida, Inc.*, (Combined License Application, Levy County Nuclear Power Plant, Units 1 and 2), Nuclear Reg. Rep. P 31605, 2010 WL 87737, \*5 (2010); *Duke Power Co.* (Catawba Nuclear Station, Units 1 and 2), CLI-83-19, 17 N.R.C. 1041, 1049 (1983); *cf. Louisiana Power and Light Co.* (Waterford Steam Electric Station, Unit 3), 17 N.R.C. 1076, 1093 (1983) (quoting *Consumers Power Co.* (Midland Plant, Units 1 and 2), ALAB-123, 6 A.E.C. 331, 345 (1973) (“Once [intervener] 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.”)).

<sup>47</sup> State Response at 17.

<sup>48</sup> *Id.* at 26.

<sup>49</sup> *Entergy Nuclear Operations, Inc.* (Indian Point Nuclear Generating Units 2 and 3), LBP-08-13 at 82-83, 68 N.R.C. 43, 64 (Jul. 31, 2008) (ML082130436).

SAMA analyses are correct for the area surrounding Indian Point.”<sup>50</sup> NRC Staff cannot rewrite the contention to suite its current needs.

NRC Staff also argues that “it is simply not enough to take issue with a particular aspect of the SAMA analysis, an intervenor challenging the SAMA analysis must show that it was unreasonable on the whole,”<sup>51</sup> but this is not an accurate summary of the Commission’s stance on SAMA contentions. In *Entergy Nuclear Generation Co. (Pilgrim Nuclear Power Station)*, CLI-12-1, 75 N.R.C. 39, 56 (2012), the Commission was concerned that *pro se* intervenors had never “provided any basis or support for its challenge to the SAMA methodology,” which is not the case here. Unlike *pro se* intervors in *NextEra Energy Seabrook, LLC (Seabrook Station, Unit 1)*, CLI-12-05, 75 N.R.C. 301, 323-37 (2012) who often failed to provide minimal factual and expert support, the State challenged specific input parameters used by Entergy and disclosed in an expert report various methods and calculations for developing site-specific values that would comply with the requirement to complete a site-specific SAMA analysis.

**5) Would it be appropriate to treat decontamination times and decontamination costs (and related decontamination factors) from an uncertainty analysis standpoint, using a range of values—e.g., smaller values for smaller release accident categories and larger values for the larger release categories? Why or why not?**

The State’s Response explained that it is possible and appropriate to use smaller values for accident categories with smaller releases and larger values for accident categories with larger releases.<sup>52</sup> Alternatively, it is also appropriate to select the same decontamination time and cost

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<sup>50</sup> *Id.* In admitting NYS-12C, The Board reiterated “the basic allegation found in the consolidated contention that NYS-12C [sought] to amend – namely, that Entergy’s and NRC Staff’s use of the MACCS2 code leads to an underestimation of the cleanup costs from a severe accident” and characterized it as the “overarching aspect of this contention.” *Entergy Nuclear Operations, Inc. (Indian Point Nuclear Generating Units 2 and 3)*, Order, NYS-12-C, 7-8 (July 6, 2011) (unpublished) (ML111870344).

<sup>51</sup> Staff Response at 27.

<sup>52</sup> State Response at 21-25.

input parameters for all release categories as long as those values align with the more severe accidents modeled in the SAMA analysis since the result will be indistinguishable from the calculation using the first method above.<sup>53</sup> Contrary to Staff’s argument, the State did not “urge[] the Board to essentially ignore the impact from the more likely accidents with lower consequences and utilize only inputs that reflected the high consequence events that are considerably less likely.”<sup>54</sup> Instead of focusing solely on the most severe release category, the State provided a thorough, reasoned analysis showing the contribution of each accident category to overall economic costs—categories of accidents selected by Entergy that are within the range of real-world severe accidents such as Fukushima and not theoretical worst-case scenarios.

**6) Discuss whether, and, if so, how, the SAMA analysis should account for the possibility of potential decontamination times longer than one year.**

By comparing Entergy’s inputs to Fukushima and Chernobyl, the State’s Response explains that TIMDEC inputs of 60 and 120 days exceeds all objective credibility and cannot be accepted as reasonable.<sup>55</sup> Decontamination times would likely exceed one year in the event of a severe accident at Indian Point. Although NEPA requires scientific integrity and reasoned analysis, Entergy and Staff are inviting the Commission to ignore real-world data showing decontamination times greater than one year. As the State’s response explains, TIMDEC values beyond one year hardly require “an extensive revision of the MACCS2 code,” but that minor code modification is necessary to perform a site-specific analysis for Indian Point.<sup>56</sup>

Lastly, neither Staff nor Entergy explains why TIMDEC values greater than one year are

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<sup>53</sup> *Id.*

<sup>54</sup> NRC Staff Response at 30.

<sup>55</sup> State Response at 25-30.

<sup>56</sup> *Id.* at 28.

unreasonable when the MACCS2 code (as written) adopts interdiction time periods up to 30 years.<sup>57</sup> If these long interdiction periods are reasonable, it should also be reasonable to consider long decontamination times.

**7) Discuss whether the Indian Point analysis contains conservatisms that bound or otherwise compensate for the uncertainty in the decontamination times and non-farm decontamination costs inputs used in the analysis.**

As the State's Response explained, there is no support for the notion the Indian Point analysis contains conservatisms that bound or otherwise compensate for the uncertainty in the decontamination times and cost inputs used in the analysis—including errors in estimating the CDNFRM and/or TIMDEC.<sup>58</sup> The State's discussion addressed the uncertainty factors of 2.1 and 1.4 for IP2 and IP3 as well as the multipliers of 3.8 and 5.5 for IP2 and IP3 and explained why these do not compensate for NRC Staff and Entergy's SAMA errors.<sup>59</sup>

Although NRC Staff contends there is “[a]n additional level of conservatism” because “Entergy assumed the population present during any accident was the maximum population during the modeled time period,”<sup>60</sup> Staff has provided no support for this confusing statement. Although Staff claims to be citing its pre-filed testimony on NYS-12C, Staff is actually citing testimony on another contention, NYS-16B, which challenged population estimates. That said, the NYS-16B testimony does not support NRC Staff's claim—the cited pages merely explain how Entergy estimated population.<sup>61</sup> Using the population from the end of the relicensing

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<sup>57</sup> Ex. NYS000243, MACCS2 User Guide at 7-4.

<sup>58</sup> State Response at 30-34.

<sup>59</sup> *Id.*

<sup>60</sup> NRC Staff's Response at 35 (citing Ex. NRC000041, Staff Test. at 94-95).

<sup>61</sup> Staff Test. at 94-95.

period<sup>62</sup> does not somehow excuse plain errors in other inputs in the analysis.<sup>63</sup> This is true for the other examples of conservatism cited by Staff and Entergy.<sup>64</sup>

In fact, although they attempt to uncover every last conservatism in the code, Entergy and Staff fail to note all of the reasons why the MACCS2 code is *not* conservative. For example, the code fails to take into account medical expenses, adverse health effects, permanent income loss, costs of disposal of contaminated wastes, and economic impact of losing a resource—including the loss of drinking water and replacement for reservoirs during interdiction—all of which cause economic costs to be underestimated.<sup>65</sup>

Entergy also tries to claim credit for its use of mean consequence values,<sup>66</sup> but this has no bearing on the cost-benefit analysis. The testimony of NRC Staff witness Tina Ghosh cited by NRC Staff and Entergy is replete with purported generalities, speculation, and unsupported conclusions.<sup>67</sup> All of these assertions fail to substantiate how the ultimate cost/benefit

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<sup>62</sup> Entergy Response at 34.

<sup>63</sup> See *S. Carolina Elec. & Gas Co.* (Summer Nuclear Station, Unit 1), ALAB-663, 14 N.R.C. 1140, 1163 (1981) (“in all circumstances the Board has the right, indeed the duty, to satisfy itself that the conclusions expressed by expert witnesses on significant safety or environmental questions have a solid foundation”); Cf. *Amorgianos v. Amtrak*, 303 F.3d 256, 266 (2d Cir. 2002) (“Thus, when an expert opinion is based on data, a methodology, or studies that are simply inadequate to support the conclusions reached, . . . [the testimony is] unreliable opinion testimony.”).

<sup>64</sup> For example, NRC Staff and Entergy claim that the modeling of no evacuation also made the analysis generally more conservative, but fails to explain how the no evacuation accounts for errors in the SAMA cost inputs. See NRC Staff’s Response at 35-36; Entergy Response at 34-35.

<sup>65</sup> See, e.g., Tr. 2278:7-8 (Bixler) (MACCS2 code “does not consider the migration through the ground water.”); Tr. 2284:6-10 (Bixler) (MACCS2 code “does not account any economic value to the loss of the water. I think what would probably happen in reality is that people would buy bottled water in that area, and consume that. . . . [but it] is not factored in.”); Tr. 2285:5-8 (Ghosh) (“[A]re we accounting for the economic impact of losing some resource? I just want to comment on that. Certainly, MACCS does not do that.”); Tr. 1975:9-20 (J. McDade/Bixler) (While an input parameter called per capita cost of long-term relocation (POPCST) does address unemployment for 20 weeks under Sample Problem A, it does not address permanent salary loss.).

<sup>66</sup> Entergy Response at 35-36.

<sup>67</sup> See State Response at 30-31.

comparison of the SAMA analysis can account for errors in estimating the *costs* of a severe accident using inputs to the MACCS2 code that are not site-specific to Indian Point.

Entergy claims that the deposition velocity it selected resulted in conservatisms,<sup>68</sup> but Entergy's interpretation of the factors that change the deposition velocity is selective. Deposition velocity changes with the size of the particles, as Entergy claims, but also as a function of the type of surface, and the surface roughness.<sup>69</sup> These last two factors are critical for the calculation of the contamination in an urban or hyper-urban environment since the deposition velocity is much greater in an urban setting than in a rural environment—as NRC Staff well knows.<sup>70</sup> Since MACCS2 uses a single average value of the deposition velocity in the 50 mile radius around the plant, it means that the deposition velocity used by MACCS2 is too high in rural areas, and too low in urban areas.<sup>71</sup> The net effect is that the calculation of the cost of decontamination carried out by the State's expert is realistic, unlike the alternate calculations proposed by Entergy and Staff.<sup>72</sup>

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<sup>68</sup> Entergy Response at 36.

<sup>69</sup> See State of New York's Proposed Findings of Fact and Conclusions of Law for Contention NYS-12/12A/12B/12C ("NYS-12C") ¶ 261 (Mar. 22, 2013) (ML13081A757).

<sup>70</sup> *Id.* ¶ 262.

<sup>71</sup> *Id.*

<sup>72</sup> *Id.* ¶¶ 262-63.

- 8) **The Indian Point SAMA analysis states that the methodology for cleaning up a nuclear weapons accident that was described in a 1996 Sandia National Laboratory study is “not relevant to clean-up following” a nuclear reactor accident.<sup>73</sup> Nonetheless, the SAMA analysis goes on to describe a comparison of decontamination cost values derived from the study with the decontamination cost values used in the Indian Point analysis. Address to what extent (if any) the comparison to the weapons accident study explains or otherwise substantiates the decontamination cost parameters used in the Indian Point analysis.**

Sandia *Site Restoration*<sup>74</sup> is a valid source of relevant data showing that Entergy and NRC Staff vastly underestimated site-specific CDNFRM values used in the Indian Point SAMA analysis.<sup>75</sup> Although NRC Staff’s response misunderstands the differences between a nuclear weapons accident and a reactor accident (*i.e.*, plutonium and cesium), the State’s *Site Restoration* analysis did take in account differences between these two radionuclides.<sup>76</sup>

NRC Staff’s comparison of decontamination costs between Sandia *Site Restoration* and Entergy’s SAMA inputs—in Appendix G of the Final Supplemental Environmental Impact Statement for Indian Point (“FSEIS”) and its Response to the Commission’s questions—of \$14,900 per person based on *Site Restoration* and Entergy’s value of \$13,824 per person<sup>77</sup> is based on a misapprehension of *Site Restoration*.<sup>78</sup> As the State’s experts explained, Sandia *Site Restoration* used historical data from various actual releases of plutonium and other radionuclides to derive the costs of a cleanup following plutonium dispersal in Albuquerque,

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<sup>73</sup> See Ex. NYS00133I, FSEIS at G-23 (referencing Ex. NYS000249, “Site Restoration: Estimation of Attributable Costs from Plutonium-Dispersal Accidents,” SAND96-0957 (May 1996)).

<sup>74</sup> Ex. NYS000249, D. Chanin & W. Murfin, SAND96-0957, *Site Restoration: Estimation of Attributable Costs From Plutonium-Dispersal Accidents* (May 1996).

<sup>75</sup> State Response at 34-38.

<sup>76</sup> See *id.* and citations to exhibits and testimony therein.

<sup>77</sup> Ex. NYS00133I, FSEIS at G-24. See also NRC Staff Response at 39-40.

<sup>78</sup> See Ex. NYS000242, ISR Report at Annex A, 39-40; Ex. NYS000241, Lemay Initial Test. at 68-69.

New Mexico—a geographic area it labeled as “urban.”<sup>79</sup> In *Site Restoration*, Sandia specifically recognized that hyper-dense population areas such as New York City would be underestimated by using Albuquerque as the reference point.<sup>80</sup> A later study, Luna’s *Survey of Costs*,<sup>81</sup> used the *Site Restoration* analysis as a basis for calculating the cost of cleanup of the New York City, which is crucial to complete a site-specific SAMA analysis for the area surrounding Indian Point.<sup>82</sup> *Survey of Costs* takes both building density and population density into account.<sup>83</sup> The State’s experts modified the analysis in *Survey of Costs* and *Site Restoration* using U.S. Census data to better account for the actual building density of New York City as explained in detail in the State’s expert report and expert testimony.<sup>84</sup> The State’s experts addressed all of NRC Staff and Entergy’s questions concerning this methodology in its rebuttal testimony.<sup>85</sup>

By contrast, NRC Staff’s comparison of Entergy’s values with Sandia *Site Restoration* ignores the differences between New York City and Albuquerque resulting in a vastly underestimated CDNFRM comparison value that is inapplicable to the area surrounding Indian Point.<sup>86</sup> NRC Staff simply took *Site Restoration*’s reported value of \$178.4 million/km<sup>2</sup> for cleanup of moderate plutonium contamination in urban areas (*i.e.*, Albuquerque) and divided that

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<sup>79</sup> Ex. NYS000241, Lemay Initial Test. at 34; Ex. NYS000242, ISR Report at 39-40.

<sup>80</sup> *Id.*

<sup>81</sup> Ex. NYS000255, R. Luna, H. Yoshimura & M. Soo Hoo, *Survey of Costs Arising from Potential Radionuclide Scattering Events*, WM2008 Conference, Phoenix, AZ (Feb. 24-28, 2008).

<sup>82</sup> Ex. NYS000241, Lemay Initial Test. at 34-35; Ex. NYS000242, ISR Report at 16-18.

<sup>83</sup> The average building density for the five NYC boroughs is 13,980 buildings/mi<sup>2</sup>, compared to 1,557 buildings/mi<sup>2</sup> for Albuquerque. Ex. NYS000242, ISR Report at 16.

<sup>84</sup> Ex. NYS000241, Lemay Initial Test. at 34-40; Ex. NYS000242, ISR Report at 16-18.

<sup>85</sup> Ex. NYS000420, Lemay Rebuttal Test. at 31-32, 37-42; Ex. NYS000430 (revised tables reflecting updates to the State’s expert calculations).

<sup>86</sup> Ex. NYS000241, Lemay Initial Test. at 68-69; Ex. NYS000242, ISR Report at 39-40.



value by the population density for New York City.<sup>87</sup> Thus, without providing any explanation, the values from NRC Staff’s comparison are based on the unsound assumption that the cost of decontamination for a given area would be the same regardless of whether that area is in Albuquerque or New York City, ignoring building density’s effect on decontamination.<sup>88</sup>

Entergy’s assertion that *Site Restoration* “has no direct relevance to any nuclear power plant SAMA analysis, as the Commission explicitly recognized in the Seabrook license renewal proceeding”<sup>89</sup> is incorrect. Entergy misrepresents *Seabrook*. Instead, the Commission merely pointed out the fact that *Site Restoration* focused on plutonium dispersal and concluded that the Seabrook *pro se* intervenor did not provide enough support to admit its contention that the MACCS2 code employs an inapplicable particle size.<sup>90</sup> Thus, the Commission in *Seabrook* did not address *Site Restoration* generally or the specific issue in the Commission’s Question 8.<sup>91</sup>

NRC Staff grossly mischaracterizes hearing testimony in its Response. NRC Staff’s assertion that “[t]he Staff has consistently indicated in its testimony and its discussion in the FSEIS that a weapons accident is not a good analogue for developing reactor accident clean-up CDNFRM values”<sup>92</sup> NRC Staff and Entergy provided conflicting and speculative testimony on this point, ultimately conceding that the source of the NUREG-1150 values was likely not

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<sup>87</sup> *Id.*

<sup>88</sup> *Id.*

<sup>89</sup> Entergy Response at 37.

<sup>90</sup> *NextEra Energy Seabrook, LLC* (Seabrook Station Unit 1), CLI-12-5, 75 N.R.C. 301, 331-32 (2012).

<sup>91</sup> CLI-15-2 at 4 (Question 8). Moreover, the State respectfully submits that the poorly presented arguments of *pro se* litigants in other proceedings stand in stark contrast to the State’s evidence and arguments here.

<sup>92</sup> NRC Staff Response at 37 (citing FSEIS, Ex. NYS00133, at G-23; Staff’s Testimony on NYS-12C, Ex. NRC000041, at 27-28, 46-49).

reactor accidents and cesium decontamination.<sup>93</sup> Likewise, NRC Staff's assertion that "New York's own expert agreed with the staff's experts and Entergy's experts that weapon's accidents do not provide a good analogue for estimating decontamination costs or times"<sup>94</sup> is also wholly incorrect. First off, the transcript page cited by Staff does not include any testimony from the State's expert. Secondly, at the hearing, although the State's expert did explain that *Sandia Site Restoration* is not a perfect data source, Dr. Lemay also explained why it is an important source of important information to consider when developing site-specific inputs for Indian Point:<sup>95</sup>

JUDGE KENNEDY: And is that reference [*Sandia Site Restoration*] applicable to reactor-type accidents, in your opinion?

DR. LEMAY: It's not ideal, but it's a very well put together description of decontamination techniques. It describes in great detail how you go about assessing the cost of decontamination by looking at buildings, looking at streets, and it explains how you do that. Obviously, it would be ideal if it was dealing with decontamination activities near Indian Point, but it's not.

NRC Staff and Entergy's dismissal of *Sandia Site Restoration* is untenable, especially in light of NRC Staff and Entergy's chosen alternative, the missing "Os84" and Sample Problem A.<sup>96</sup>

In sum, the State's experts used *Sandia Site Restoration* as "a point of reference in a benchmarking exercise that illustrates various approaches to determining the cost of decontamination ( $\$/\text{km}^2$ ) and the resulting CDNFRM ( $\$/\text{person}$ )."<sup>97</sup> The resulting *Sandia Site*

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<sup>93</sup> State Response at 38 (citing Tr. 2025:20-2026:14 (J. McDade/Jones); Tr. 2037:1-2038:1 (O'Kula/Harrison); Tr. 2100:16-18 (Jones)).

<sup>94</sup> NRC Staff Response at 37 (citing Tr. at 2102).

<sup>95</sup> Tr. 2012:11-20 (J. Kennedy/Lemay). This testimony reflects a correction to the transcript adopted by the Board. See Dec. 27, 2012 Board Order at 22. See also Tr. 2108:5-8 (Lemay) ("The site restoration report gives a very complete and very descriptive way of calculating the cost of decontamination but it is for plutonium so that is a weakness of that method.").

<sup>96</sup> Ex. NYS000420, Lemay Rebuttal Test. at 39-40. The State's calculations are "site-specific value[s] . . . based on the kind of mix of building and building density that we observe in New York" as opposed to the Sample Problem A value "that nobody knows where it comes from." Tr. 2137:21-25 (Lemay).

<sup>97</sup> Ex. NYS000420, Lemay Rebuttal Test. at 40.

*Restoration*, as modified by Luna’s *Survey of Costs*, was one of four approaches used by the State to develop reasonable, site-specific ranges of CDNFRM values based on available data, and the State’s appropriate use of this robust data source stands in stark contrast to the unsubstantiated, generic values used by Entergy and NRC Staff. The burden of complying with NEPA lies with NRC alone.<sup>98</sup> NRC Staff must “independently evaluate and be responsible for the reliability of all information used in the draft environmental impact statement.”<sup>99</sup> Its curt, indefensible analysis in the FSEIS does not comply with NEPA.

## II. CONCLUSION

For the foregoing reasons, the reasons set forth in the State’s petitions for review, replies in support of the petitions for review, and initial responses to the Commission’s questions, the Commission should resolve NYS-12C in favor of the State.

Respectfully submitted,

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<sup>98</sup> See, e.g., *Progress Energy Florida, Inc.*, (Levy Cty. Nuclear Power Plant, Units 1 and 2), CLI-10-02, 71 N.R.C. 27, 34 (2010); *Duke Power Co.* (Catawba Nuclear Station, Units 1 and 2), CLI-83-19, 17 N.R.C. 1041, 1049 (1983).

<sup>99</sup> 10 C.F.R. § 51.70(b).

**UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION**

**ATOMIC SAFETY AND LICENSING BOARD**

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In re: Docket Nos. 50-247-LR and 50-286-LR  
  
License Renewal Application Submitted by ASLBP No. 07-858-03-LR-BD01  
  
Entergy Nuclear Indian Point 2, LLC, DPR-26, DPR-64  
Entergy Nuclear Indian Point 3, LLC, and  
Entergy Nuclear Operations, Inc. April 29, 2015  
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**CERTIFICATE OF SERVICE**

I hereby certify that on April 29, 2015, copies of the State of New York's Reply to Entergy's and NRC Staff's Responses to Commission Order CLI-15-2 Requesting Further Briefing on Contention NYS-12C Concerning Site-Specific Severe Accident Mitigation Alternatives were served electronically via the NRC's Electronic Information Exchange on the following recipients:

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