

UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

BEFORE THE COMMISSION

In the Matter of

ENTERGY NUCLEAR OPERATIONS, INC.

(Indian Point Nuclear Generating  
Units 2 and 3)

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Docket Nos. 50-247-LR/286-LR

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NRC STAFF'S ANSWER TO APPLICANT'S PETITION  
FOR REVIEW OF LBP-11-17 GRANTING SUMMARY  
DISPOSITION OF CONSOLIDATED CONTENTION NYS-35/36

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August 11, 2011

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INTRODUCTION

Pursuant to 10 C.F.R. § 2.341(b)(3) and (f)(2), the NRC Staff ("Staff") hereby responds to the petition filed by Entergy Nuclear Operations, Inc. ("Entergy" or "Applicant") on July 29, 2011,<sup>1</sup> seeking Commission review of the Atomic Safety and Licensing Board's ("Board") "Memorandum and Order (Ruling on Motion and Cross-Motions for Summary Disposition of NYS-35/36)," LBP-11-17, (July 14, 2011).<sup>2</sup> The Staff respectfully submits that the Board's summary disposition ruling (its second ruling on this contention)<sup>3</sup> contravenes established Commission precedent and regulatory practice; raises significant and novel legal issues, the resolution of which would materially advance the orderly disposition of this proceeding; and affects the basic structure of this proceeding in a pervasive or unusual manner. For these

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<sup>1</sup> "Applicant's Petition for Review of LBP-11-17 Granting Summary Disposition of Consolidated Contention NYS-35/36" (July 29, 2011) ("Petition").

<sup>2</sup> *Entergy Nuclear Operations, Inc.* (Indian Point Nuclear Generating Units 2 and 3), LBP-11-17 ("Memorandum and Order (Ruling on Motion and Cross-Motions for Summary Disposition of NYS-35/36)," 74 NRC \_\_\_\_ (July 14, 2011) (slip op.) ("Order").

<sup>3</sup> See *Entergy Nuclear Operations, Inc.* (Indian Point Nuclear Generating Units 2 and 3), LBP-10-13, 71 NRC \_\_\_\_ ("Memorandum and Order (Ruling on the Admissibility of New York's New and Amended Contentions 12B, 16B, 35, and 36))" (June 30, 2010) (slip op.), *petitions for interlocutory review denied*, CLI-10-30, 72 NRC \_\_\_\_ (Nov. 30, 2010).

reasons, as set forth below, the Staff supports Entergy's Petition and recommends that the Commission undertake review of and reverse the Board's decision in LBP-11-17.<sup>4</sup>

## PROCEDURAL BACKGROUND

### Overview

This proceeding concerns the license renewal application ("LRA") for Indian Point Units 2 and 3 ("IP2 and IP3" or "Indian Point"), which Entergy submitted on April 23, 2007. The NRC published a notice of acceptance for docketing and notice of opportunity for hearing on the LRA, on August 1, 2007.<sup>5</sup> Petitions for leave to intervene were then timely filed by various petitioners, including the State of New York ("New York" or "NYS").<sup>6</sup> On July 31, 2008, the Board granted New York's petition to intervene and admitted numerous contentions, including two contentions (Contentions NYS-12 and NYS-16, neither of which is at issue here) challenging the Severe Accident Mitigation Alternatives ("SAMA") analysis contained in Entergy's Environmental Report ("ER").<sup>7</sup> Numerous late-filed contentions were filed thereafter, and it is expected that evidentiary hearings will commence on all admitted contentions (other than Contention NYS-35/36) in early to mid-2012.<sup>8</sup>

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<sup>4</sup> This Answer is filed pursuant to the Commission's Order of August 5, 2011, granting the Staff's request for a three-day extension of time.

<sup>5</sup> "Entergy Nuclear Operations, Inc., Indian Point Nuclear Generating Unit Nos. 2 and 3; Notice of Acceptance for Docketing of the Application and Notice of Opportunity for Hearing Regarding Renewal of Facility Operating License Nos. DPR-26 and DPR-64 for an Additional 20-Year Period," 72 Fed. Reg. 42,134 (Aug. 1, 2007).

<sup>6</sup> See "New York State Notice of Intention to Participate and Petition to Intervene" ("NY Petition") (Nov. 30, 2007).

<sup>7</sup> *Entergy Nuclear Operations, Inc.* (Indian Point Nuclear Generating Units 2 and 3), LBP-08-13, 68 NRC 43, 100-02, 110-13 (2008). Contention NYS-12 alleged that the SAMA analysis in Entergy's ER did not accurately reflect decontamination and clean-up costs (NY Petition at 140-45). Contention NYS-16 challenged the population estimates and air dispersion model used in Entergy's SAMA analysis (*Id.* at 163-67). These contentions will be addressed during evidentiary hearings.

<sup>8</sup> See "Amended Scheduling Order" (June 7, 2011) (unpublished); "Scheduling Order" (July 1, 2010) (unpublished). The actual dates for the submittal of testimony and the commencement of hearings depend upon the occurrence of certain other events, as set forth in the Board's scheduling orders.



Separately, the NRC's review of safety and environmental issues has progressed substantially since Entergy filed the IP2/IP3 LRA and is now nearly complete. The Staff issued its Safety Evaluation Report on August 11, 2009, in which it recommended approval of the LRA;<sup>9</sup> the Advisory Committee on Reactor Safeguards ("ACRS") issued a letter on September 23, 2009, recommending approval of the LRA;<sup>10</sup> and the Staff published its SER in November 2009, recommending approval of the LRA.<sup>11</sup>

With respect to environmental issues, in December 2008, the Staff published Draft Supplement 38<sup>12</sup> to the "Generic Environmental Impact Statement for License Renewal of Nuclear Plants,"<sup>13</sup> in which the Staff provided its draft evaluation of the site-specific environmental impacts of license renewal for IP2 and IP3.<sup>14</sup> Extensive public comments were filed concerning the Draft SEIS, which were duly considered by the Staff.<sup>15</sup> On December 3,

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<sup>9</sup> See NUREG-1930, "Safety Evaluation Report Related to the License Renewal of Indian Point Nuclear Generating Unit Nos. 2 and 3" (Nov. 2009) ("SER").

<sup>10</sup> See Letter from Mario V. Bonaca, Chairman, ACRS, to Gregory B. Jaczko, Chairman, NRC (Sept. 23, 2009), reproduced in SER Vol. 2, at 5-2.

<sup>11</sup> The Staff plans to issue an SER Supplement on or about August 19, 2011 to address certain new information the Staff has received; publication of the SER Supplement (or the filing of contentions thereon) will trigger the litigation milestones set out in the Board's hearing schedule. See Amended Scheduling Order" (June 7, 2011) (unpublished), at 1-3.

<sup>12</sup> "Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Supplement 38 Regarding Indian Point Nuclear Generating Unit Nos. 2 and 3, Draft Report for Comment," NUREG-1437, Supplement 38 (Dec. 2008) ("Draft SEIS" or "DSEIS").

<sup>13</sup> "Generic Environmental Impact Statement for License Renewal of Nuclear Plants," NUREG-1437 (May 1996) ("GEIS").

<sup>14</sup> In Chapter 5 of the Draft SEIS, the Staff provided an evaluation of the environmental impacts of postulated accidents, including both design-basis accidents ("DBAs") and severe accidents, as well as an evaluation of Entergy's SAMA analysis; in Appendix G to the Draft SEIS, the Staff presented a detailed evaluation of Entergy's SAMA analysis.

<sup>15</sup> In addition, various contentions were filed concerning the Draft SEIS, including five new or amended contentions filed by New York. See "State of New York Contentions Concerning NRC Staff's Draft Supplemental Environmental Impact Statement" (Feb. 27, 2009) ("DSEIS Contentions"). Included among these contentions were Amended Contentions 12-A and 16-A, concerning the DSEIS evaluation of Entergy's SAMA analysis. *Id.* at 2-14. The Board admitted a number of those contentions (including amended contentions NYS-12A and NYS-16A) in June 2009. See "Order (Ruling on New York State's New and Amended Contentions)" (June 16, 2009), at 3-7.

2010, the Staff issued its Final SEIS<sup>16</sup> – in which the Staff addressed the comments it had received<sup>17</sup> and presented its conclusion that “the adverse environmental impacts of license renewal for IP2 and IP3 are not so great that preserving the option of license renewal for energy planning decision makers would be unreasonable.”<sup>18</sup>

#### Contention NYS-35/36

In December 2009, one year after the Staff issued its Draft SEIS, Entergy submitted a revised SAMA analysis correcting the meteorological data inputs it had utilized in its earlier analysis.<sup>19</sup> Thereafter, on March 11, 2010, New York filed new Contentions NYS-35 and NYS-36,<sup>20</sup> in which it asserted, for the first time,<sup>21</sup> (a) that Entergy’s analysis of various “potentially cost-beneficial” SAMAs was incomplete in the absence of engineering project cost analyses, and (b) that any SAMAs that are “finally determined to be cost-effective” must be imposed as a condition for license renewal, or the Staff must provide a “rational basis” for not requiring such implementation.<sup>22</sup> Answers opposing the admission of Contentions NYS-35 and

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<sup>16</sup> “Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Supplement 38 Regarding Indian Point Nuclear Generating Unit Nos. 2 and 3, Final Report,” NUREG-1437, Supplement 38 (Dec. 2010) (“Final SEIS” or “FSEIS”).

<sup>17</sup> See FSEIS, Appendix A, § A.1 (“Comments Received on the Draft SEIS”), at A-2 to A-46 (providing an overview of the comments received); *Id.*, § A.2 (“Comments and Responses”), at A-46 to A-174 (summarizing the comments and responding thereto); *Id.*, at A-175 to A-1316 (providing the original comments, annotated with comment identification codes).

<sup>18</sup> FSEIS, § 9.3, at 9-8.

<sup>19</sup> See Letter from Fred Dacimo, Vice President/License Renewal (Entergy Nuclear Northwest), to NRC Document Control Desk (Dec. 11, 2009) (ADAMS Accession No. ML093580089). See *also* Letter from Paul Bessette, Esq. to the Board (Nov. 17, 2009), enclosing Letter from Fred Dacimo, Vice President/License Renewal (Entergy) to NRC Document Control Desk (Nov. 16, 2009) (ADAMS Accession No. ML093340049).

<sup>20</sup> “State of New York’s New and Amended Contentions Concerning the December 2009 [SAMA] Reanalysis” (March 11, 2010) (“SAMA Reanalysis Contentions”); see *also* “State of New York’s Motion for Leave to File New and Amended Contentions Concerning the December 2009 Reanalysis of [SAMAs]” (March 11, 2010). In this filing, New York also submitted amended Contentions NYS-12B and NYS-16B (amending Contentions NYS-12/12A and NYS-16/16A to apply to Entergy’s SAMA Reanalysis).

<sup>21</sup> See discussion *infra*, at n.24.

<sup>22</sup> SAMA Reanalysis Contentions, at 14, 15, 34, 40, and 41.

NYS-36 were then filed by the Staff and Entergy.<sup>23</sup>

On June 30, 2010, the Board issued its decision in LBP-10-13, admitting Contentions NYS-35 and NYS-36, and consolidating them into Contention NYS-35/36.<sup>24</sup> On July 15, 2010, both Entergy and the Staff filed petitions for interlocutory review of the Board's decision admitting Contention NYS-35/36.<sup>25</sup> On November 30, 2010, the Commission issued its decision in CLI-10-30, denying Entergy's and the Staff's petitions for interlocutory review of LBP-10-13, finding that the petitions did not meet the standard for interlocutory review.<sup>26</sup>

As discussed *supra*, at 3-4, the Staff published its Final SEIS on December 3, 2010. Therein, the Staff, *inter alia*, provided its evaluation of Entergy's SAMA analysis, as revised in Entergy's December 2009 SAMA Reanalysis;<sup>27</sup> further, in response to the issues raised in Contention NYS-35/36, and as required by the Board in LBP-10-13, the Staff provided an augmented explanation of its reasons for concluding that the potentially cost-beneficial SAMAs

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<sup>23</sup> See "NRC Staff's Answer to State of New York's New and Amended Contentions Concerning the December 2009 [SAMA] Reanalysis" (Apr. 5, 2010); "Applicant's Answer to New York State's New and Amended Contentions Concerning Entergy's December 2009 Revised SAMA Analysis" (Apr. 5, 2010). See also "State of New York's Combined Reply to Entergy and NRC Staff Answers to the State's New and Amended Contentions Concerning the December 2009 [SAMA] Reanalysis" (Apr. 12, 2010).

<sup>24</sup> *Entergy Nuclear Operations, Inc.* (Indian Point Nuclear Generating Units 2 and 3), LBP-10-13, 71 NRC \_\_\_\_ (June 30, 2010) ("Memorandum and Order (Ruling on the Admissibility of New York's New and Amended Contentions 12B, 16B, 35, and 36)"). The Staff and Entergy had opposed the admission of NYS Contentions 35 and 36 on the grounds, *inter alia*, that they failed to satisfy the timeliness and good cause requirements of 10 C.F.R. §§ 2.309(c) and 2.309(f)(2). In this regard, the DSEIS determined that "none of the potentially cost-beneficial SAMAs relate to adequately managing the effects of aging during the period of extended operation" and "[t]herefore, they need not be implemented as part of the license renewal pursuant to 10 CFR Part 54." DSEIS at 5-10. New York failed to challenge this determination in its DSEIS contentions; instead, it first raised this issue in its contentions challenging the Applicant's SAMA Reanalysis, almost one year later. See Staff Answer at 30-35. The Board rejected the Staff's and Applicant's assertions that the contentions were untimely. See LBP-10-13, slip op. at 27-28, 32, 34. While the Staff does not waive its arguments concerning those matters, the Staff does not here seek interlocutory review of the Board's rulings on those issues.

<sup>25</sup> See (1) "NRC Staff's Petition For Interlocutory Review of the Atomic Safety and Licensing Board's Decision Admitting New York State Contentions 35 and 36 on Severe Accident Mitigation Alternatives (LBP-10-13)" (July 15, 2010); and (2) "Applicant's Petition for Interlocutory Review of LBP-10-13" (July 15, 2010).

<sup>26</sup> *Entergy Nuclear Operations, Inc.* (Indian Point Nuclear Generating Units 2 and 3), CLI-10-30, 72 NRC \_\_\_, \_\_ (Nov. 30, 2010) (slip op. at 2 and 6-7).

<sup>27</sup> See FSEIS § 5.2, and FSEIS App. G (included in Attachment 2 to the Staff's Cross-Motion).

which were identified (none of which relate to managing the effects of aging), need not be implemented as a condition for license renewal of IP2 and IP3.<sup>28</sup> New York filed its motion for summary disposition of this contention on January 14, 2011,<sup>29</sup> and Entergy and the Staff filed cross-motions for summary disposition on February 3 and 7, 2011, respectively.<sup>30</sup>

On July 14, 2011, the Board issued its decision in LBP-11-17. Therein, the Board (a) granted New York's motion for summary disposition and "dispose[d] of NYS-35/36 as a matter of law"; (b) denied Entergy's and the Staff's cross-motions for summary disposition; and (c) effectively terminated all further proceedings on this contention.<sup>31</sup> The Board ruled:

[W]e grant New York's Motion and, in so doing, hold that, under NRC Regulations, the APA, and NEPA, Entergy's licenses cannot be renewed unless and until the NRC Staff reviews Entergy's completed SAMA analyses and either incorporates the result of these reviews into the FSEIS or, in the alternative, modifies its FSEIS to provide a valid reason for recommending the renewal of the licenses before the analysis of potentially cost-effective SAMAs is complete and for not requiring the implementation of cost-beneficial SAMAs.

LBP-11-17, slip op. at 17. On July 29, 2011, Entergy filed its petition seeking immediate Commission review of the Board's decision. As discussed below, the Staff submits that interlocutory review of the Board's decision in LBP-11-17 is warranted at this time.

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<sup>28</sup> See, e.g., FSEIS § 5.2 at 5-11 to 5-12; cf. Appendix G, at G-48 to G-49. The Staff attached a complete copy of its FSEIS evaluation of SAMA issues (including Chapter 5, Appendix G, and portions of Appendix A that contain the Staff's responses to public comments on SAMA issues) as Attachment 1 to the Staff's cross-motion for summary disposition of this contention. A portion of that Attachment, containing Chapter 5 of the FSEIS, is provided as Attachment 1 to this Answer.

<sup>29</sup> "State of New York's Motion for Summary Disposition of Consolidated Contention NYS-35/36 (Jan. 14, 2011) ("New York Motion"). New York sought summary disposition of Contention NYS-35/36 (which had been filed in March 2010, based on Entergy's December 2009 SAMA Reanalysis), without amending the contention to address the adequacy of the December 2010 FSEIS.

<sup>30</sup> "Applicant's Consolidated Memorandum in Opposition to New York State's Motion for Summary Disposition of Contention NYS-35/36 and in Support of Its Cross-Motion for Summary Disposition" (Feb. 3, 2011) ("Entergy Cross-Motion"); "NRC Staff's (1) Cross-Motion for Summary Disposition, and (2) Response to New York State's Motion for Summary Disposition, of Contention NYS-35/36 (Severe Accident Mitigation Alternatives)" (Feb. 7, 2011) ("Staff Cross-Motion").

<sup>31</sup> LBP-11-17, slip op. at 17.

### ARGUMENT

This is the second time the Commission has been asked to consider the Board's rulings on Contention NYS-35/36 in this proceeding. As the Commission is aware, in July 2010, the Applicant and the Staff sought interlocutory review of the Board's decision in LBP-10-13, admitting this contention for litigation. In November 2010, the Commission denied those petitions, finding that the Board's decision to admit the contention, *per se*, did not meet the standard for interlocutory review, in that the admission of a contention does not (a) threaten immediate and serious irreparable harm to a party that could not be alleviated on a later appeal, or (b) affect the basic structure of the proceeding in a pervasive or unusual manner. CLI-10-30, slip op. at 6-7. The Commission observed, however, that the Applicant's and Staff's arguments concerning the Board's importation of "Part 50 operating reactor oversight issues – going to the Indian Point reactors' current licensing basis – into a NEPA analysis and a Part 54 license renewal proceeding . . . are not without force. Portions of the Board's decision appear problematic, and may warrant our review later in the proceeding." *Id.* at 6.<sup>32</sup>

The Staff respectfully submits that the Board's grant of New York's motion for summary disposition of Contention NYS-35/36, and its denial of the Staff's and Applicant's cross-motions for summary disposition of the contention, affects the basic structure of this proceeding in a pervasive or unusual manner, and exceeds any impact that its earlier decision to admit this contention may have had. For this reason, as more fully discussed below, the Staff supports the Applicant's Petition and urges the Commission to undertake interlocutory review of LBP-11-17, in accordance with 10 C.F.R. § 2.341(f)(2).

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<sup>32</sup> As the Commission observed in CLI-10-30, the Staff's petition for review of LBP-10-13 expressed the Staff's concern that it had "already provided the Board with a 'detailed and rational explanation of why SAMA-based backfits to the CLB are not required for license renewal.'" CLI-10-30, slip op. at 7. As the Commission noted, "[t]he Staff's concern is that while it 'could provide the same type of explanation it provided previously,' the Board 'appears to have implicitly rejected this explanation.'" *Id.* The Commission then stated, "If the Board in fact ultimately rejects the Staff's arguments, the Staff will have the opportunity to appeal the final decision." *Id.*; emphasis added. The Staff files this Answer in support of the Applicant's Petition, in lieu of filing its own petition for review, as expressly permitted by 10 C.F.R. § 2.341(f)(2).

I. Interlocutory Review of LBP-11-17 Is Warranted at This Time.

In accordance with 10 C.F.R. § 2.341(f)(2), the Commission may grant interlocutory review of a Board decision where a party demonstrates that the issue for which it seeks review:

(i) Threatens the party adversely affected by it with immediate and serious irreparable impact which, as a practical matter, could not be alleviated through a petition for review of the presiding officer's final decision; or

(ii) Affects the basic structure of the proceeding in a pervasive or unusual manner.

The Commission has stated that it "disfavors review of interlocutory Board orders, which would result in unnecessary 'piecemeal interference with ongoing Licensing Board proceedings.'"<sup>33</sup>

Nonetheless, the Commission has indicated that it will undertake interlocutory review pursuant to 10 C.F.R. § 2.341(f)(2), where a party demonstrates that it is threatened with "serious and irreparable harm" that could not, as a practical matter, be alleviated through reversal of the Board's action at the end of the proceeding,<sup>34</sup> or where a Board's action may have a "pervasive or unusual" effect on the "basic structure of a proceeding."<sup>35</sup>

The Staff respectfully submits that interlocutory review of the Board's decision in LBP-11-17 is warranted, in that the Board's decision affects the basic structure of this

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<sup>33</sup> *Entergy Nuclear Operations, Inc.* (Pilgrim Nuclear Power Station), CLI-08-2, 67 NRC 31, 33-34 (2008), citing, *inter alia*, *Entergy Nuclear Operations Inc.* (Pilgrim Nuclear Power Station), CLI-07-2, 65 NRC 10, 12 (2007).

<sup>34</sup> *Pilgrim, supra*, CLI-08-2, 67 NRC at 35-36, citing *Duke Energy Corp.* (Catawba Nuclear Station, Units 1 and 2), CLI-04-6, 59 NRC 62, 71 (2004) (potential release of safeguards information); *Georgia Power Co.* (Vogtle Electric Generating Plant, Units 1 and 2), CLI-95-15, 42 NRC 181, 184 (1995) (disclosure of privileged information); *Private Fuel Storage, L.L.C.* (Independent Spent Fuel Storage Installation), CLI-02-8, 55 NRC 222, 224-25 (2002) (Board's planned inquiry into the internal financial affairs of a federally-recognized Indian Tribe).

<sup>35</sup> *Pilgrim, supra*, CLI-08-2, 67 NRC at 35. See also *Duke Cogema Stone & Webster* (Savannah River Mixed Oxide Fuel Fabrication Facility), CLI-02-7, 55 NRC 205, 213-14 & n.15 (2002) (challenge to the basic structure of a proceeding involving a two-step hearing for construction and operating authority); *Safety Light Corp.* (Bloomsburg Site Decontamination and License Renewal Denials), CLI-92-13, 36 NRC 79, 85-86 (1992) (an order consolidating an informal subpart L proceeding with a formal subpart G proceeding affected the "basic structure" of the proceeding a "pervasive and unusual manner").

proceeding in a pervasive or unusual manner.<sup>36</sup> In this regard, the Board has now definitively held that the operating licenses for IP2 and IP3 “cannot be renewed unless and until” the Staff reviews Entergy’s engineering project cost analyses and incorporates the results of that review into the FSEIS for license renewal of IP2/IP3 – “or, in the alternative, modifies its FSEIS to provide a valid reason” for recommending license renewal “before the analysis of potentially cost-effective SAMAs is complete and for not requiring the implementation of cost-beneficial SAMAs.” LBP-11-17, slip op. at 17; emphasis added. The Board’s definitive summary disposition ruling on Contention NYS-35/36 would require that the IP2/IP3 LRA be denied – while leaving in place a requirement that the parties proceed to hearing on 14 other complex contentions (with all the resource demands that a hearing and related litigation on those issues

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<sup>36</sup> In its Petition, the Applicant asserts three possible grounds for Commission review, citing (a) 10 C.F.R. § 2.341(b)(1) (review of “a full or partial initial decision . . . and . . . any other decision or action by a presiding officer with respect to which a petition for review is authorized”); (b) 10 C.F.R. § 2.341(f)(2) (interlocutory review); and (c) the Commission’s inherent authority to undertake *sua sponte* review. Petition at 6-8. While the Staff shares the Applicant’s view that the Board’s decision warrants immediate Commission review, the Staff believes that interlocutory review is most appropriate mechanism for such review to be undertaken.

Notwithstanding the Staff’s conclusion that interlocutory review under 10 C.F.R. § 2.341(f) is appropriate, the Staff notes that the Commission could decide to undertake review under 10 C.F.R. § 2.341(b)(4). Thus, under § 2.341(b)(4)(ii), (iii) and (v), review may be undertaken “giving due consideration to the existence of a substantial question” that “a necessary legal conclusion is without governing precedent or is a departure from or contrary to established law,” that “a substantial and important question of law, policy, or discretion has been raised,” or that “any other consideration [exists] which the Commission may deem to be in the public interest.” See, e.g., *Louisiana Energy Services, L.P.* (National Enrichment Facility), CLI-06-15, 63 NRC 687, 690 (2006) (accepting review of a Partial Initial Decision under §§ 2.341(b)(4)(iii) and (v), and affirming and supplementing the Board’s resolution of a novel environmental issue); accord, *Northeast Nuclear Energy Co.* (Millstone Nuclear Power Station, Unit 3), CLI-01-3, 53 NRC 22, 28 (2001) (accepting review under former § 2.786(b)(4)(ii), where the interpretation of a regulation involved a question of law that was raised before and had the potential to be raised again in other proceedings); but cf. *Indian Point*, CLI-10-30, slip op. at n.32 (noting that unreviewed Board decisions lack precedential effect in other proceedings). In addition, the Commission “may review a Board ruling pursuant to the inherent supervisory powers it exercises over agency adjudications.” *Entergy Nuclear Generation Co. and Entergy Nuclear Operations, Inc.* (Pilgrim Nuclear Power Station), CLI-08-2, 67 NRC 31, 33-34 (2008); *Entergy Nuclear Vermont Yankee, LLC and Entergy Nuclear Operations, Inc.* (Vermont Yankee Nuclear Power Station), CLI-07-1, 65 NRC 1, 4-5, nn.11-19 (2007) (*sua sponte* review may be undertaken to consider a “significant issue” that “may affect multiple pending or imminent licensing proceedings”, to provide guidance to the Board, or for other reasons); *Exelon Generation Co., LLC* (Early Site Permit for Clinton ESP Site), CLI-06-20, 64 NRC 15, 20-21 (2006) (*sua sponte* review may be undertaken to address “novel questions of potentially broad application”); but cf. *Indian Point*, CLI-10-30, slip op. at n.32, citing *Entergy Nuclear Operations, Inc.* (Indian Point Nuclear Generating Units 2 and 3), CLI-09-6, 69 NRC 128, 138 (2009) (“parties should not seek interlocutory review by invoking the grounds under which the Commission might exercise its supervisory authority”).

would entail)<sup>37</sup> -- which would be unnecessary if the Board's decision is upheld.

Second, the Board's grant of summary disposition in favor of New York had the effect of terminating the proceeding and closing the record on this contention. Therefore, even if the Staff and Applicant were to comply with the Board's requirements, in the absence of a pending contention, no issue remains to be litigated. Accordingly, unless the Board later reopens the record to consider whatever supplemental information might be submitted -- and there is no assurance that the Board would grant a request to reopen the record, having already rejected the Staff's detailed explanation of its reasons for recommending license renewal -- no further proceeding on this contention is possible.<sup>38</sup> Further, even if the Board were to grant a request to reopen the record, the outcome of any such reopening is far from certain, since LBP-11-17 provides no indication as to what the Board would consider to be "a valid reason" for renewing the IP2/IP3 licenses without requiring the implementation of non-aging related cost-beneficial SAMAs. See LBP-11-17, slip op. at 17. Thus, even if the Staff were to revise its already augmented explanation, to satisfy the Board's requirement that the Staff take further actions to

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<sup>37</sup> The Board has admitted 21 contentions, some of which were consolidated, resulting in a total of 15 admitted contentions. These are: (1) NYS-5 (aging management program ("AMP") for buried piping and tanks); (2) NYS 6/7 (AMP for inaccessible low and medium voltage cables); (3) NYS-8 (AMP for electrical transformers); (4) NYS-24 (AMP for containment structures); (5) NYS-25 (AMP for reactor pressure vessels and internals); (6) NYS-26B/Riverkeeper TC-1A (AMP for metal fatigue/cumulative usage factors greater than 1.0); (7) Riverkeeper TC-2 (AMP for flow-accelerated corrosion); (8) NYS-9/33/37 (environmental evaluation of energy alternatives within the "no-action" alternative); (9) NYS-12/12A/12B/12C (SAMA analysis decontamination and clean-up costs); (10) NYS-16/16A/16B (SAMA analysis population estimates and air dispersion modeling); (11) NYS-17/ 17A/17B (environmental impacts on property values); (12) Riverkeeper EC-3/Clearwater EC-1 (environmental impacts of spent fuel pool leaks); (13) Clearwater EC-3 (environmental justice); (14) Riverkeeper EC-8 (environmental impacts on endangered species); and (15) NYS-35/36 (SAMA engineering project cost analyses, and implementation/justification not to implement cost-beneficial SAMAs). The Board denied several motions for summary disposition filed by Entergy, with the result that all admitted contentions other than Contention NYS-35/36 are expected to go to hearing.

<sup>38</sup> The standard for reopening is strict. As set forth in 10 C.F.R. § 2.326(a), "a motion to reopen a closed record to consider additional evidence will not be granted" unless it satisfies the following criteria: (1) the motion "must be timely," (2) it must address a "significant safety or environmental issue," and (3) it "must demonstrate that a materially different result would be or would have been likely had the newly proffered evidence been considered initially." *Id.*, emphasis added.



satisfy its regulatory obligations,<sup>39</sup> and even if the record is reopened to consider that explanation, there is no way of knowing whether the Board would find that further explanation to be "valid."<sup>40</sup> Thus, the chance that the Board may agree to reopen the record to consider additional information in the future, offers no reliable basis upon which to defer review of LBP-11-17 while going forward with litigation on 14 other complex contentions.

Third, inasmuch as the Board has not indicated what it might find to be a "valid" reason for allowing the IP2/IP3 licenses to be renewed without a completed engineering project cost analysis and without imposing cost-beneficial SAMAs, it is unclear whether the Board would accept anything other than the submittal of completed engineering project cost analyses, revision of the FSEIS, and imposition of all finally-determined cost-beneficial SAMAs as a condition for license renewal. As discussed *infra* at 15-21, such actions are not required by the Commission's license renewal regulations where the cost-beneficial SAMAs do not relate to managing the effects of aging; further, the imposition of such requirements would be inconsistent with well-established Commission practice. Indeed, the Commission has previously approved the license renewal applications of 71 of the nation's 104 nuclear power plants (of which over 50 plants had identified potentially cost-beneficial SAMAs that were

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<sup>39</sup> The Staff notes that the Board lacks the authority to direct the Staff in the performance of its duties. See, e.g., *Shaw Areva MOX Services, LLC* (Mixed Oxide Fuel Fabrication Facility), CLI-09-2, 69 NRC 55, 63 (2009) ("Absent delegated authority, which is not present here, our licensing boards lack authority to direct the Staff's non-adjudicatory actions"); *Dominion Nuclear Connecticut, Inc.* (Millstone Nuclear Power Station, Units 2 and 3, CLI-05-24, 62 NRC 551, 570 (2005); *Duke Energy Corp.* (Catawba Nuclear Station, Units 1 and 2), CLI-04-6, 59 NRC 62, 74 (2004) ("NRC Staff reviews . . . fall under the direction of Staff management and the Commission itself, not licensing boards. . . . We have long held that licensing boards do not sit . . . to supervise or direct NRC Staff regulatory reviews"). Thus, unless otherwise directed by the Commission, the Staff is not inclined to expend agency resources on actions which the Staff firmly believes are not required by NRC regulations.

<sup>40</sup> The Staff has already explained to the Board, without success, that further refinement of the Applicant's analysis of the cost of implementing its SAMAs is unnecessary, since a refined estimate of implementation costs could not identify any additional cost-beneficial SAMAs. Staff Cross-Motion, at 32-33. Further, the Staff explained to the Board, without success, that the license renewal regulations do not require an applicant to implement cost-beneficial SAMAs as a condition for license renewal, unless the SAMAs relate to managing the effects of aging. These explanations are fundamental to the Staff's view of this matter, and would likely be recited by the Staff in any future iteration of its reasons for recommending approval of the Indian Point LRA – notwithstanding the likelihood that the Board would again reject that explanation as unacceptable.

unrelated to managing the effects of aging), without ever imposing such requirements.<sup>41</sup> The Staff's Cross-Motion presented unequivocal evidence of this consistent, established regulatory practice,<sup>42</sup> to no avail. Indeed, the Board nowhere addressed this demonstration of established NRC practice, stating only that it was "unwilling" to accept the Staff's position and thereby put its "imprimatur on an uninformed agency decision." LBP-11-17, slip op. at 17.

In sum, the Board's decision to grant New York's motion for summary disposition, and to deny the Staff's and Applicant's cross-motions for summary disposition, is irreconcilable with established precedent and regulatory practice, and presents an apparent impasse to the timely and efficient resolution of this contested proceeding. While the Staff could provide yet another iteration of its views on these matters, any such statement would necessarily reflect the Staff's views of the agency's regulatory requirements – which this Board has twice rejected and has clearly stated that it will not stamp with its "imprimatur." The Board's decision effectively places the course of this proceeding in limbo, requiring that the parties advance to hearing on all other contentions, while definitively stating that it will deny the license renewal application unless the Staff provides some additional (undefined) explanation of its reason for recommending license renewal. The Staff respectfully submits that Commission review of the Board's decision is warranted, to allow this proceeding to go forward in an orderly and efficient manner.<sup>43</sup>

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<sup>41</sup> Consistent with the Staff's endorsement of NEI 05-01 (discussed *infra*, at n.50), the Staff has not required license renewal applicants to submit engineering project cost analyses as part of their SAMA analyses. Nonetheless, the Staff notes that *if* the Applicant submits an amendment to its ER, containing a revised SAMA analysis that incorporates an engineering project cost analysis, the Staff would determine whether that submittal constitutes "new and significant" information that requires a supplement to the FSEIS. See 10 C.F.R. § 51.92(a)(2). Of course, the Staff would also implement any Commission determination that such analyses should be submitted.

<sup>42</sup> The Staff attached to its Cross-Motion excerpts from the FSEIS (or DSEIS) for each of the 35 license renewal proceedings (involving 53 reactors), where potentially cost-beneficial SAMAs had been identified. See Attachment 2 to the Staff's Cross-Motion (reproduced as Attachment 2 hereto). In each such instance, the FSEIS concluded – in terms substantially similar to (but much less detailed than) the terms used in the IP2/IP3 FSEIS – that cost-beneficial SAMAs which are unrelated to managing the effects of aging need not be implemented as a condition for license renewal. See Attachment 2, *passim*.

<sup>43</sup> See *Vermont Yankee*, CLI-07-01, 65 NRC at 9 (Commissioners Merrifield and McGaffigan, concurring) (Commission review undertaken, where the Board's decision might otherwise result in a "completely unnecessary exercise" and would be inconsistent with efficient conduct of the proceeding).

II. The Board's Grant of New York's Motion, and Its Denial of the Staff's and Applicant's Cross-Motions for Summary Disposition, Was Clearly Erroneous.

In LBP-11-17, the Board reviewed the Staff's evaluation of SAMAs in Appendix G to the FSEIS, presenting a Table of 20 SAMAs that had been found to be potentially cost-beneficial.<sup>44</sup> The Board took note of the Staff's position, in which the Staff stated that "these SAMAs do not relate to "adequately managing the effects of aging during the period of extended operation. Therefore they need not be implemented as part of license renewal pursuant to [10 C.F.R. Part 54]." LBP-11-17, slip op. at 13. The Board, however, rejected the Staff's explanation.

First, with respect to the need for an engineering project cost-benefit analysis, the Board found it "plausible" that that such an analysis "would provide the agency and the public with a more accurate sense of the costs and benefits of relicensing IP2 and IP3." *Id.* at 15. Accordingly, the Board ruled that the Staff had "prematurely concluded its review before receiving all the requisite information from Entergy," and "until the NRC Staff receives and analyzes that information, it necessarily cannot take the requisite hard look at Entergy's LRA that is required under NEPA." *Id.* at 15-16. Second, with respect to the need for backfit analyses and implementation of cost-beneficial SAMAs, the Board held as follows:

[T]he Staff has the option and the duty . . . to pursue modifications to Entergy's CLB at all periods during normal and extended operations through the backfit procedure if "there is a substantial increase in the overall protection of the public health and safety or the common defense and security to be derived from the backfit and that the direct and indirect costs of implementation for that facility are justified in view of this increased protection." Consequently, we disagree with the Staff as a matter of law that its citation to the aging management limitations of Part 54 constitutes the requisite rational basis for refusing to require implementation of SAMAs whose benefits, at this juncture and on this record, clearly outweigh their costs. Other than the Staff's misplaced citation to Part 54's limitations, we are left with no explanation at all for why it has decided not to require implementation of these cost-beneficial SAMAs by setting

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<sup>44</sup> LBP-11-17, slip op. at 12-13; *cf.* FSEIS App. G, Table G-6, at G-36 to G-38. In addition, two other (unnumbered) SAMAs were also been found to be potentially cost-beneficial. See FSEIS at 5-10.

conditions for the license renewal, by directing a backfit, or through some other procedure. Accordingly, we find that the FSEIS does not articulate a rational basis for not requiring Entergy to complete its SAMA review and for not requiring the implementation of cost-beneficial SAMAs prior to the relicensing of Indian Point Units 2 and 3. We further conclude, as a matter of law, that the FSEIS violates NRC regulations, NEPA, and the APA. Therefore, we grant New York's Motion and dispose of NYS-35/36 as a matter of law.

LBP-11-17, slip op. at 16-17.

The Applicant's Petition presents a detailed description of the errors committed by the Board in LBP-11-17 (Petition at 7-18), with which the Staff is in substantial agreement.<sup>45</sup> For the reasons stated by the Applicant, and as further discussed below, the Staff submits that the Board's determinations on both of these issues were clearly erroneous, and should be reversed.

A. There Is No Legal or Regulatory Basis to Require Engineering Project Cost-Benefit Analyses as a Condition for License Renewal.

NYS Contention 35 listed nine specific SAMAs (IP2-09, IP2-21, IP2-22, IP2-53, IP2-62, IP3-07, IP3-18, IP3-19, and IP3-53) which the Applicant or Staff had found to be "potentially

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<sup>45</sup> The Staff notes its disagreement with one aspect of the Applicant's Petition, insofar as it incorrectly states that in the FSEIS, "the NRC Staff explained that NRC lacks the authority, in connection with Part 54 renewal proceeding, to require implementation of cost-beneficial SAMAs if they are unrelated to aging management." Petition at 3, *citing* FSEIS, Vol. 1, at 5-11. In fact, the Staff did not address the NRC's "authority" to impose such a license condition; rather, the Staff stated only that NRC regulations do not require implementation of backfits that are unrelated to aging management as a condition for license renewal under 10 C.F.R. Part 54. See FSEIS § 5.2.6, at 5-11. The Staff believes that the Commission need not address the broad question of its authority to impose environmental protection requirements as a condition for license renewal, in order to resolve the pending appeal (see Petition at 11-13; LBP-11-17, slip op. at 10-11). In this regard, even if the Commission were to hold that it has authority to impose environmental protection conditions for license renewal (pursuant to § 54.33(c) or otherwise), that would not affect the outcome here – in light of the FSEIS's determination that the imposition of any of the cost-beneficial SAMAs at IP2/IP3 is not required for environmental protection purposes. Thus, the FSEIS observed that the probability of severe accidents was determined to be low, both generically and at IP2/IP3; "the probability-weighted radiological consequences of severe accidents" was determined on a generic basis in the GEIS to be "SMALL"; and no reason appeared why this generic determination would not apply to IP2 and IP3. FSEIS § 5.1, at 5-2 to 5-4; § 5.2.6, at 5-11 to 5-12. In other words, regardless of the question of the agency's authority to impose SAMAs as a condition for license renewal, the FSEIS concluded there is no reason to require such SAMAs for environmental protection purposes. Significantly, Contention NYS-35/36 nowhere challenges that conclusion, nor does it challenge similar, supporting statements which were made in sections 5.1 and 5.2 of the DSEIS. See SAMA Reanalysis Contentions, at 13-50.

cost-beneficial";<sup>46</sup> it asserted that the Applicant should be required to "finalize" its SAMA calculations by completing its planned "engineering project cost-benefit analysis"; and it asserted that the Commission "must", as a matter of law, impose those SAMAs as backfits to the current licensing basis<sup>47</sup> as a pre-condition to license renewal.<sup>48</sup> The Board admitted this issue in LBP-10-13, and resolved it in favor of New York in LBP-11-17.

The Staff respectfully submits that there is no legal or regulatory basis for the Board's view that engineering project cost-benefit analyses must be conducted by an applicant and evaluated in the Staff's FSEIS as a condition for license renewal. In this regard, the NRC is obliged, under the National Environmental Policy Act of 1969 ("NEPA"), 42 U.S.C. § 4321, to evaluate the environmental impacts of its licensing actions and reasonable alternatives thereto. In reviewing a nuclear power plant license renewal application, if SAMAs were not considered for the plant previously, the NRC includes in its EIS an evaluation of severe accident mitigation alternatives.<sup>49</sup> The Staff's FSEIS for license renewal of IP2 and IP3 manifestly satisfies this obligation. Here, the Applicant identified the full range of all "potentially cost-beneficial SAMAs"<sup>50</sup> for IP2 and IP3, establishing the complete set of SAMAs that might conceivably be

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<sup>46</sup> SAMA Reanalysis Contentions, at 22-23.

<sup>47</sup> The term "current licensing basis" or "CLB" is defined in 10 C.F.R. § 54.3(a) as "the set of NRC requirements applicable to a specific plant and a licensee's written commitments for ensuring compliance with and operations within applicable NRC requirements and the plant-specific design basis (including all modifications and additions to such commitments over the life of the license) that are docketed and in effect [at the time of the license renewal application]. . . ." The CLB "represents an 'evolving set of requirements and commitments for a specific plant that are modified as necessary over the life of a plant to ensure continuation of an adequate level of safety.'" *Florida Power and Light Co.* (Turkey Point Nuclear Plant, Units 3 and 4), CLI-01-17, 54 NRC 3, 9 (2001), *citing* Final Rule, "Nuclear Power Plant License Renewal; Revisions," 60 Fed. Reg. 22,461, 22,473 (May 8, 1995).

<sup>48</sup> *See, e.g.*, SAMA Reanalysis Contentions at 14-16, 23, 25, 28, 34, 39, 40, 42, and 46.

<sup>49</sup> *See* 10 C.F.R. § 51.53(c)(3)(ii)(L) (requiring the Staff to "consider" SAMAs in its EIS if SAMAs were not considered for the plant previously). Section § 51.53 does not require a "final" determination of "cost-beneficial" SAMAs, or the implementation of such SAMAs as a condition for license renewal.

<sup>50</sup> The term "potentially cost-beneficial" derives from regulatory guidance, issued by the Nuclear Energy Institute and endorsed by the Staff. *See* (1) "Severe Accident Mitigation Alternatives (SAMA) Analysis – Guidance Document," NEI 05-01, Rev. A, (Nov. 2005); and (2) "Final License Renewal Interim Staff Guidance LR-ISG-2006-03: Staff Guidance for Preparing Severe Accident Mitigation Alternatives

cost-beneficial; indeed, neither New York nor the Board expressed any concern that some plausible SAMA had not been identified. See LBP-11-17, slip op. at 12-14. Although detailed engineering project cost-benefit analyses might result in a refinement of the cost/benefit ratio of the SAMAs which had been found to be "potentially cost-beneficial", or the deletion of certain SAMAs as no longer cost-beneficial, they could not result in the identification of any other cost-beneficial SAMAs. Accordingly, such analyses would afford only little, if any, value in the agency's evaluation of environmental impacts as required by NEPA.

Moreover, inasmuch as none of the SAMAs relate to managing the effects of aging, the additional analyses would not provide a regulatory basis for imposing any of those SAMAs as a backfit to the CLB as a pre-condition to license renewal. Thus, in *McGuire/Catawba*,<sup>51</sup> the Commission rejected a contention that a refined SAMA analysis was required, where the Draft SEIS had already found that the specified mitigative measure "appear[ed] to be cost-beneficial," and it was "unclear what additional result or remedy would prove meaningful to the Intervenor[s]." *McGuire/Catawba*, CLI-02-28, 56 NRC at 388. Further, the Commission cited the Draft SEIS conclusion that "this SAMA does not relate to adequately managing the effects of aging during the period of extended operation," and "[t]herefore, it need not be implemented as part of license renewal pursuant to 10 CFR Part 54."<sup>52</sup>

In its subsequent *McGuire/Catawba* decision (CLI-03-17), the Commission explained its conclusion in CLI-02-28, stating as follows:

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Analyses" (Aug. 2007), at 1 (ADAMS Accession No. ML071640133). The NEI guidance states, "[s]ince the SAMA analysis is not a complete engineering project cost benefit analysis, the SAMAs that are cost beneficial after the Phase 2 analysis and sensitivity studies are only **potentially** cost-beneficial." NEI 05-01, at 33 (underlining added; bold in original).

<sup>51</sup> *Duke Energy Corp.* (McGuire Nuclear Station, Units 1 and 2; Catawba Nuclear Station, Units 1 and 2), CLI-02-28, 56 NRC 373, 387-88 (2002).

<sup>52</sup> *McGuire/Catawba*, CLI-02-28, 56 NRC at 388 n.77. The Commission concluded, the "need for plant design and procedural changes will be resolved as part of GSI-189 and addressed . . . as a current operating license issue. . . . Thus, the ultimate agency decision on whether to require facilities with ice condenser containments to implement any particular SAMA will fall under a Part 50 current licensing basis review." *Id.*

[T]he EISs at issue here *already find the backup capability cost-beneficial*, albeit under particular assumptions. While the cost-benefit discussion in the EISs may not be as detailed or unequivocal as BREDL would like, the Supreme Court has made clear that the underlying statute, NEPA, demands no “fully developed plan” or “detailed explanation of specific measures which *will* be employed” to mitigate adverse environmental effects.

Under NEPA, mitigation (and the SAMA issue is one of mitigation) need only be discussed in “sufficient detail to ensure that environmental consequences [of the proposed project] have been fairly evaluated.” Here, in a generic EIS the NRC has conducted a thorough NEPA evaluation of the probability and consequences of severe reactor plant accidents, and in plant-specific EISs the NRC staff has discussed at length possible mitigation measures. The mitigation analysis outlines relevant factors, discloses opposing viewpoints, and indicates particular assumptions under which the staff ultimately concludes that “providing backup power to hydrogen igniters is cost-beneficial.” The staff presented its analysis and conclusion based upon the “available technical information.” NEPA requires no more.

NRC adjudicatory hearings are not EIS editing sessions. Our busy boards do not sit to parse and fine-tune EISs. To litigate a NEPA claim, an intervenor must allege, with adequate support, that the NRC staff has failed to take a “hard look” at significant environmental questions – i.e., the staff has unduly ignored or minimized pertinent environmental effects. . . .<sup>53</sup>

The Commission further explained its views in the *Pilgrim* proceeding.<sup>54</sup> There, the Commission stated, “[t]he question is not . . . whether the SAMA analysis can be refined further.” *Pilgrim*, CLI-10-11, slip op. at 37. Further, NEPA does not demand “virtually infinite study and resources.” While “there ‘will always be more data that could be gathered,’” “agencies ‘must have some discretion to draw the line and move forward with decisionmaking.’” *Id.* The Commission concluded (*Id.* at 39):

Unless it looks genuinely plausible that inclusion of an additional factor or use of other assumptions or models may change the cost-benefit conclusions for the SAMA candidates evaluated, no

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<sup>53</sup> *Duke Energy Corp.* (McGuire Nuclear Station, Units 1 and 2; Catawba Nuclear Station, Units 1 and 2), CLI-03-17, 58 NRC 419, 431 (2003) (italics in original; underlining added; footnotes omitted).

<sup>54</sup> *Entergy Nuclear Generation Co. and Entergy Nuclear Operations, Inc.* (Pilgrim Nuclear Power Station), CLI-10-11, 71 NRC \_\_\_\_ (Mar. 26, 2010) (slip op.).

purpose would be served to further refine the SAMA analysis, whose goal is to determine what safety enhancements are cost-effective to implement.

Here, New York did not allege – and the Board did not find – that additional SAMAs should have been identified as potentially cost-beneficial, or that any significant errors were made in the Applicant's SAMA Reanalysis or the Staff's Final SEIS, such that "inclusion of an additional factor or use of other assumptions or models may change the cost-benefit conclusions for the SAMA candidates evaluated." Accordingly, the Board's conclusion that further analysis might "plausibl[y]" identify further information, fails to provide an adequate legal basis for requiring the Applicant to perform engineering project cost-benefit analyses and for requiring the Staff to evaluate those analyses in a supplement to the FSEIS.

The Staff and Applicant cited the Commission's decisions in *McGuire/Catawba* and *Pilgrim* in support of their cross-motions for summary disposition.<sup>55</sup> The Board, however, rejected the Commission's decisions as "inapposite," stating as follows:

In *McGuire/Catawba*, the Commission held that a SAMA need not be implemented during a particular plant's license renewal review where the Commission is concurrently resolving the safety improvement achieved by that SAMA through a generic process attached to the agency's review of all plants' current licensing bases. The Commission also admonished in *Pilgrim* that SAMAs unrelated to aging management need not be implemented pursuant to the NRC's license renewal safety review under Part 54.

Regardless, both are inapposite here. Specifically, the SAMAs identified in the FSEIS as potentially cost-beneficial have not been analyzed under the NRC's Part 54 license renewal safety review, having instead been analyzed under its Part 51 environmental review. Furthermore, the Staff has not indicated that issues raised by any of the subject SAMAs currently are being resolved generically across all plants through an agency review of their current licensing bases.

LBP-11-17, slip op. at 14 (emphasis in original; footnotes omitted). The Staff respectfully submits that the Board's holding in LBP-11-17 rests upon an incorrect and overly restrictive

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<sup>55</sup> See, e.g., Entergy Cross-Motion at 27-28; Staff Cross-Motion at 18-19, 21-23.



reading of the Commission's decisions in *McGuire/Catawba* and *Pilgrim*, that NEPA does not require refined estimates of mitigation costs, where mitigation measures have already been discussed in "sufficient detail to ensure that environmental consequences [of the proposed project] have been fairly evaluated."<sup>56</sup> The Board's requirement that engineering project cost-benefit analyses must be submitted, and evaluated by the Staff, should be reversed.

B. The Staff's Detailed FSEIS Explanation of the Reasons Supporting Its License Renewal Recommendation Are Consistent with NEPA, the APA, and NRC Regulations, and Warrant Reversal of LBP-11-17.

1. The Board's Decision Is Inconsistent with NEPA, Commission Precedent, and NRC Regulations.

The Board's decision in LBP-11-17 appears to rest upon a fundamental misreading of the regulatory framework underlying the Commission's requirements for license renewal. In this regard, the Board mistakenly concluded that SAMAs which are identified in an FSEIS as potentially cost-beneficial for NEPA purposes,<sup>57</sup> must be "pursue[d]" by the Staff as a condition for license renewal under 10 C.F.R. Part 54.<sup>58</sup> The Board opined as follows:

[T]he Staff has the option and the duty . . . to pursue modifications to Entergy's CLB at all periods during normal and extended operations through the backfit procedure if "there is a substantial increase in the overall protection of the public health and safety or the common defense and security to be derived from the backfit and that the direct and indirect costs of implementation for that facility are justified in view of this increased protection." Consequently, we disagree with the Staff as a matter of law that its citation to the aging management limitations of Part 54 constitutes the requisite rational basis for refusing to require implementation of SAMAs whose benefits, at this juncture and on this record, clearly outweigh their costs. Other than the Staff's misplaced citation to Part 54's limitations, we are left with no

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<sup>56</sup> *McGuire/Catawba*, CLI-03-17, 58 NRC at 431, quoting *Robertson v. Methow Valley Citizens Council*, 490 U.S. 332, 352 (1989).

<sup>57</sup> LBP-11-17, slip op. at 14, 16.

<sup>58</sup> This portion of the Board's decision derives from Contention NYS 36, which asserted that nine SAMAs (IP2-28, IP2-44, IP2-54, IP2-60, IP2-61, IP2-65, IP3-55, IP3-61, and IP3-62) identified in Entergy's SAMA Reanalysis as having "substantially greater benefits in excess of their costs," must be included as "conditions" in the renewed license. SAMA Reanalysis Contentions, at 36, 46.

explanation at all for why it has decided not to require implementation of these cost-beneficial SAMAs by setting conditions for the license renewal, by directing a backfit, or through some other procedure.

LBP-11-17, slip op. at 16. There is no legal basis for this ruling.

Although the Board did not directly require the implementation of cost-beneficial SAMAs as a condition for license renewal, its decision erroneously conflates 10 C.F.R. Part 54 license renewal requirements and Part 51 environmental reviews, with 10 C.F.R. Part 50 regulations governing backfits to an operating reactor's CLB,<sup>59</sup> on the theory that the Staff is authorized to pursue modifications to the CLB "at all periods during normal and extended operations through the backfit procedure." The Board failed to recognize, however, that the Staff's analysis of non-aging management-related backfits is conducted as part of its Part 50 reactor oversight process rather than as part of its Part 54 license renewal review, since such backfits would be important with respect to both the current operating license and a renewed license.<sup>60</sup>

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<sup>59</sup> The Commission's regulations impose strict requirements for the conduct of a backfit analysis, as set forth in 10 C.F.R. §§ 50.109(a)(2)-(4), (c) and (e). A backfit may be required without a backfit analysis if the Commission or staff determines that "a modification is necessary to bring a facility into compliance with a license or [the CLB]," or that action is necessary to ensure adequate protection of public health and safety and the common defense and security, 10 C.F.R. § 50.109(a)(4); otherwise, a backfit may be required when the Commission determines, based on a backfit analysis, "that there is a substantial increase in the overall protection of the public health and safety or the common defense and security to be derived from the backfit and that the direct and indirect costs of implementation for that facility are justified in view of this increased protection." 10 C.F.R. § 50.109(a)(3).

<sup>60</sup> In adopting its license renewal regulations, the Commission endorsed the principle that "issues that are material as to whether a nuclear power plant operating license may be renewed should be confined to those issues that are uniquely relevant to protecting the public health and safety and common defense and security during the renewal period." Final Rule, "Nuclear Power Plant License Renewal," 56 Fed. Reg. 64,943, 64,946 (Dec. 13, 1991). Only issues that are unique to the period of extended operation, such as "age-related degradation unique to license renewal" are to be addressed for license renewal. *Id.*, at 64,947. Other issues "that are relevant to both current plant operation and operation during the extended period must be addressed now within the present license term rather than at the time of renewal" -- which would assure that safety or security issues pertinent to current reactor operations are not left unresolved until a licensee seeks license renewal and the Commission issues its renewal decision. *Id.*, at 64,946. In sum, "the NRC's decision should normally be limited to whether actions have been identified and have been or will be taken to address age-related degradation unique to license renewal and whether the relevant [NEPA] requirements, as set forth in 10 CFR part 51, have been met." *Id.* at 64,960-61; *Turkey Point*, CLI-01-17, 54 NRC at 9-10; *Dominion Nuclear Connecticut, Inc.* (Millstone Nuclear Power Station, Units 2 and 3), CLI-05-24, 62 NRC 551, 560-61 (2005). This regulatory approach applies to both safety and environmental issues. See Final Rule, "Nuclear Power Plant License Renewal; Revisions," 60 Fed. Reg. 22,461, 22,481 (May 8, 1995).

Further, the NRC's NEPA-implementing regulations in Part 51 – like NEPA, itself – require only that the agency evaluate the environmental impacts of its licensing actions, and impose no duty to impose mitigation measures.<sup>61</sup> Thus, if the Staff determines that a backfit may be appropriate, it could undertake a backfit review under either an existing or a renewed license – and the results of that review would apply to any renewed license. That function, however, is totally separate from the Staff's review of license renewal applications. Contrary to the Board's reading of 10 C.F.R. Parts 51 and 54, nothing in those regulations requires the implementation of non-aging related cost-beneficial SAMAs as a condition for license renewal.

2. The FSEIS Provides an Adequate Evaluation and  
"Rational Basis" for the Staff's License Renewal  
Recommendation, as Required by NEPA and the APA.

In addition to resting upon an erroneous view of applicable legal requirements under NEPA and NRC regulations (discussed above), the Board's decision rests upon its conclusion that NEPA and/or the Administrative Procedure Act ("APA"), 5 U.S.C. § 551, *et seq.*, require a "rational basis" for the Staff's determination, beyond that which was provided in the Final SEIS. Significantly, as discussed *infra* at 22-23, the Board failed to consider that the Staff had provided an augmented legal and technical explanation of its views in § 5.2.6 of the Final SEIS, substantially supplementing the rationale given in § 5.2.6 of the DSEIS. Indeed, nowhere did the Board address the augmented portion of the Staff's explanation. There is thus no factual basis for the Board's pivotal determination that, "[o]ther than the Staff's misplaced citation to Part 54's limitations, we are left with no explanation at all for why it has decided not to require

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<sup>61</sup> See *Methow Valley*, 490 U.S. at 339, 350 (NEPA does not impose an obligation upon an agency to take any particular action, such as mitigation of environmental impacts, but "simply prescribes the necessary process"). Accord, *McGuire/Catawba*, CLI-03-17, 58 NRC at 431. In *Methow Valley*, the Court found a "fundamental distinction . . . between a requirement that mitigation be discussed in sufficient detail to ensure that environmental consequences have been fairly evaluated, on the one hand, and a substantive requirement that a complete mitigation plan be actually formulated and adopted, on the other." *Id.*, 490 U.S. at 352. The Court found no requirement in NEPA "that action be taken to mitigate the adverse effects of major federal actions," ruling that "it would be inconsistent with NEPA's reliance on procedural mechanisms — as opposed to substantive, result-based standards — to demand the presence of a fully developed plan that will mitigate environmental harm before an agency can act." *Id.* at 353.

implementation of these cost-beneficial SAMAs by setting conditions for the license renewal, by directing a backfit, or through some other procedure.” LBP-11-17, slip op. at 16; emphasis added. The Staff respectfully submits that the FSEIS provides a clear and rational basis for the Staff’s license renewal recommendation. No more is required by NEPA or the APA.

Specifically, in Chapter 5 and Appendix G of the FSEIS, the Staff provided a thorough evaluation of the Applicant’s SAMA analysis, as revised in Entergy’s SAMA Reanalysis. The Staff then addressed the issues raised in Contention NYS-35/36. In this regard, the Staff explained (as it had stated in the DSEIS) that its review of Entergy’s revised SAMA analysis found, *inter alia*, that the methodology used was “sound” and the SAMA cost-benefit evaluations were “reasonable and sufficient” for license renewal purposes. Further, the Staff agreed with Entergy’s identification of “areas in which risk can be further reduced in a cost-beneficial manner through the implementation of all or a subset of potentially cost-beneficial SAMAs,” and that “further evaluation of these SAMAs by Entergy is appropriate” – but because “none of the potentially cost-beneficial SAMAs relate to adequately managing the effects of aging during the period of extended operation, . . . they need not be implemented as part of IP2 and IP3 license renewal pursuant to 10 CFR Part 54.” FSEIS § 5.2.6 at 5-11.

Going further, the FSEIS expanded upon the DSEIS explanation of the legal bases for its determination, and added a summary of the technical bases for that determination. In this regard, the Staff explained that it had “provided a detailed discussion of SAMA costs and benefits in this SEIS, which satisfies the NRC’s obligation, under NEPA and related case law, to consider SAMAs in a license renewal proceeding.” *Id.* The Staff then provided a detailed explanation of the legal bases for its determination. *Id.*<sup>62</sup>

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<sup>62</sup> The Staff’s augmented explanation of the legal bases for its determination explained that “NEPA requires consideration of environmental impacts and alternatives, but does not require that SAMAs be imposed to redress environmental impacts.” FSEIS § 5.2.6 at 5-11 (*citing* LBP-10-13, slip op. at 29). The Staff further explained that potentially cost-beneficial SAMAs which are unrelated to license renewal requirements in 10 C.F.R. Part 54 (*i.e.*, managing the effects of aging), “would be considered, to the extent necessary or appropriate, under the agency’s oversight of a facility’s current operating license

Significantly, while the FSEIS discussion of applicable legal principles mirrored (and expanded upon) the explanation provided in the DSEIS, the Staff provided a further, technical basis for its conclusion (drawing upon other sections of the FSEIS), to provide a more complete summary of its reasons for not requiring Entergy to implement these SAMAs as a condition for license renewal. In this regard, § 5.2.6 of the FSEIS stated:

Finally, the NRC staff notes that SAMAs, by definition, pertain to severe accidents – i.e., those accidents whose consequences could be severe, but whose probability of occurrence is so low that they may be excluded from the spectrum of design basis accidents (“DBAs”) that have been postulated for a plant (see GEIS §§ 5.3.2, 5.3.3, 5.4); this is consistent with the conclusions reached in § 5.2.2 of this SEIS concerning severe accidents at IP2 and IP3. The Commission has previously concluded, as a generic matter, that the probability-weighted radiological consequences of severe accidents are SMALL. GEIS § 5.5.2; 10 CFR Part 51, App. B, Table B1. As stated in §§ 5.1.1 and 5.1.2 above, no significant new information has been identified that would remove IP2 and IP3 from these generic determinations. Thus, there is no regulatory basis to impose any of the potentially cost-beneficial SAMAs as a condition for license renewal of IP2 and IP3 – even if those potentially cost-beneficial SAMAs are “finally” found to be cost beneficial.

FSEIS § 5.2.6, at 5-11 to 5-12; emphasis added.

The statements presented in § 5.2.6 of the FSEIS substantially augment the explanation that had appeared in § 5.2.6 of the DSEIS, and provide a more complete explanation of both the legal and technical bases for the Staff’s determination not to require implementation of cost-beneficial SAMAs at Indian Point. Significantly, although the Board noted that the Staff had provided a technical basis for its SAMA determination,<sup>63</sup> it never addressed this explanation in its decision, and it provided no indication as to why this augmented explanation was not “valid”

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in accordance with 10 CFR Part 50 requirements, inasmuch as such matters would pertain not just to the period of extended operation but to operations under the current operating license term as well.” *Id.* The Staff concluded its legal analysis, stating, “there is no regulatory basis to suggest that potentially cost-beneficial SAMAs that are unrelated to Part 54 requirements must be imposed as a backfit to the CLB, as a condition for license renewal.” *Id.*

<sup>63</sup> See LBP-11-17, slip op. at 4 (“The NRC Staff also based its conclusion on its belief . . . that the environmental impacts of a severe accident at the Indian Point facility are small as a generic matter and thus are not relevant.”).

or acceptable to the Board.<sup>64</sup>

The Staff respectfully submits that its FSEIS for license renewal of IP2 and IP3, including the augmented explanation provided in FSEIS § 5.2.6, provides an “adequate” and “rational” explanation of the bases for the Staff’s determination not to require implementation of any potentially cost-beneficial SAMAs as a condition for license renewal of IP2 and IP3.<sup>65</sup> The Staff’s explanation of its rationale in the Indian Point FSEIS is fully consistent with the GEIS for license renewal, as well as the NRC’s license renewal regulations and the Commission decisions in *McGuire/Catawba*, *Pilgrim*, and other license renewal proceedings. Further, the FSEIS satisfies the agency’s obligation to evaluate the environmental impacts of license

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<sup>64</sup> Thus, the Board failed to address the following factors cited in the Staff’s augmented FSEIS explanation:

(a) SAMAs, by definition, address mitigation alternatives for “severe accidents.” See GEIS, § 5.4 (“Severe Accident Mitigation Design Alternatives (SAMDA)”); see Transcript of Indian Point Teleconference, April 19, 2010, Tr. at 853-54 (Turk).

(b) The probability of occurrence of severe accidents is so low that they are excluded from the spectrum of design basis accidents (“DBAs”) postulated for a plant. Tr. at 853-54 (Turk); See generally, GEIS, § 5.3.2 (“Design Basis Accidents”) and § 5.3.3 (“Probabilistic Assessment of Severe Accidents”). The Staff notes that the GEIS discussion of the environmental impacts of postulated accidents included explicit consideration of Indian Point. See, e.g., GEIS at 5-14, 5-15, 5-17, 5-22, 5-29, 5-34, 5-36, 5-38, 5-40, 5-43, 5-45, 5-47, 5-52, 5-85, 5-87, 5-88, and 5-97.

(c) The CDFs for severe accidents at IP2 and IP3 are quite low. As stated in the FSEIS, the baseline core damage frequency (“CDF”) for all of the postulated internally-generated severe accidents at Indian Point combined, is approximately  $1.79 \times 10^{-5}$  per year for IP2, and  $1.15 \times 10^{-5}$  per year for IP3. Entergy performed separate assessments of the CDF from external events, and accounted for the potential risk benefits associated with such events by multiplying the internally-initiated CDFs by a factor of approximately 3.8 for IP2 and 5.5 for IP3. FSEIS at 5-5. The CDFs for each specific initiating event are provided in FSEIS Table 5-3. See FSEIS at 5-6.

(d) The Commission has determined, as a generic matter, that the impacts of DBAs are of “SMALL” significance, and the probability-weighted radiological consequences of severe accidents, for all plants, are “SMALL”; 10 C.F.R. Part 51, App. B., Table B-1 (“Postulated Accidents”); GEIS, § 5.5.1 (“Impacts from Design-Basis Accidents”), and § 5.5.2 (“Impacts from Severe Accidents”).

(e) No significant, new information has been identified that would remove IP2 and IP3 from these generic determinations. FSEIS, § 5.1.1 at 5-3, § 5.1.2 at 5-3 to 5-4.

<sup>65</sup> Indeed, as shown in Attachment 2 hereto, the explanation provided in § 5.2.6 of the Indian Point FSEIS is entirely consistent with – and substantially more detailed than – the explanation provided in the FSEIS (or DSEIS) published in every other license renewal proceeding conducted to date, where the Staff determined not to require the implementation of cost-beneficial SAMAs that do not relate to managing the effects of aging.

renewal, as required by NEPA, and satisfies the agency's obligation to explain the "reasons or basis" for its findings and conclusions in an adjudicatory proceeding, as required by the APA.

In sum, the Board's decision in LBP-11-17 abrogates the Commission's carefully considered determination to limit the scope of license renewal proceedings to issues that are unique to license renewal, and improperly conflates Part 50 requirements with the safety requirements in 10 C.F.R. Part 54 and the environmental evaluation requirements in 10 C.F.R. Part 51, based upon an erroneous interpretation of applicable legal and regulatory requirements. Further, the Board ignored the FSEIS's augmented explanation of the Staff's reasons for not requiring the implementation of cost-beneficial SAMAs as a condition for license renewal of IP2 and IP3. The Staff respectfully submits that the Staff's augmented explanation of the reasons underlying its license renewal recommendation are consistent with NEPA, the APA, and NRC regulations, provide a sound and rational basis for the Staff's license renewal recommendation, and warrant the Commission's reversal of LBP-11-17.

#### CONCLUSION

The Board's decision in LBP-11-17 contravenes established Commission precedent and raises significant and novel legal issues, the resolution of which would materially advance the orderly disposition of this proceeding; further, the decision affects the basic structure of this proceeding in a pervasive or unusual manner. For these reasons, the Staff supports the Applicant's petition for Commission review, and recommends that the Commission undertake interlocutory review of LBP-11-17.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Sherwin E. Turk". The signature is fluid and cursive, with the first name "Sherwin" and last name "Turk" clearly distinguishable.

Sherwin E. Turk  
Counsel for NRC Staff

Dated at Rockville, Maryland  
this 11<sup>th</sup> day of August 2011

August 11, 2011

UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

BEFORE THE COMMISSION

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

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NRC STAFF'S ANSWER TO APPLICANT'S PETITION  
FOR REVIEW OF LBP-11-17 GRANTING SUMMARY  
DISPOSITION OF CONSOLIDATED CONTENTION NYS-35/36

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LIST OF ATTACHMENTS

Attachment 1	"Generic Environmental Impact Statement For License Renewal Of Nuclear Plants, NUREG 1437, Supplement 38 Regarding Indian Point Nuclear Generating Unit Nos. 2 And 3, Vol. 1, Final Report, Main Report And Comment Responses" (Dec. 2010) (Chapter 5)
Attachment 2	Supplements to "Generic Environmental Impact Statement for License Renewal of Nuclear Plants," NUREG-1437, in Which the NRC Staff Determined Not to Require the Implementation of Potentially Cost-Beneficial SAMAs as a Condition for License Renewal, Where the SAMAs Did Not Pertain to Managing the Effects of Aging (Partial Excerpts)



August 11, 2011

UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

BEFORE THE COMMISSION

In the Matter of	)	
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ENTERGY NUCLEAR OPERATIONS, INC.	)	Docket Nos. 50-247-LR/286-LR
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NRC STAFF'S ANSWER TO APPLICANT'S PETITION  
FOR REVIEW OF LBP-11-17 GRANTING SUMMARY  
DISPOSITION OF CONSOLIDATED CONTENTION NYS-35/36

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**ATTACHMENT 1**

"GENERIC ENVIRONMENTAL IMPACT STATEMENT FOR LICENSE  
RENEWAL OF NUCLEAR PLANTS, NUREG 1437, SUPPLEMENT 38  
REGARDING INDIAN POINT NUCLEAR GENERATING UNIT NOS. 2  
AND 3, VOL. 1, FINAL REPORT, MAIN REPORT AND COMMENT  
RESPONSES" (DEC. 2010) (CHAPTER 5)

(Excerpted from Attachment 1 to "NRC Staff's  
(1) Cross-Motion for Summary Disposition, and  
(2) Response to New York State's Motion for  
Summary Disposition, of Contention NYS-35/36  
(Severe Accident Mitigation Alternatives)"  
(February 7, 2011)

# **Generic Environmental Impact Statement for License Renewal of Nuclear Plants**

## **Supplement 38**

### **Regarding Indian Point Nuclear Generating Unit Nos. 2 and 3**

### **Final Report Main Report and Comment Responses**

Manuscript Completed: November 2010  
Date Published: December 2010

## ABSTRACT

The U.S. Nuclear Regulatory Commission (NRC) considered the environmental impacts of renewing nuclear power plant operating licenses for a 20-year period in NUREG-1437, Volumes 1 and 2, "Generic Environmental Impact Statement for License Renewal of Nuclear Plants" (hereafter referred to as the GEIS),<sup>(1)</sup> and codified the results in Title 10, Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions," of the *Code of Federal Regulations* (10 CFR Part 51). In the GEIS (and its Addendum 1), the NRC staff identified 92 environmental issues and reached generic conclusions related to environmental impacts for 69 of these issues that apply to all plants or to plants with specific design or site characteristics. Additional plant-specific review is required for the remaining 23 issues. These plant-specific reviews are to be included in a supplement to the GEIS.

This supplemental environmental impact statement (SEIS) has been prepared in response to an application submitted to the NRC by Entergy Nuclear Operations, Inc. (Entergy), Entergy Nuclear Indian Point 2, LLC, and Entergy Nuclear Indian Point 3, LLC (all applicants will be jointly referred to as Entergy) to renew the operating licenses for Indian Point Nuclear Generating Unit Nos. 2 and 3 (IP2 and IP3) for an additional 20 years under 10 CFR Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants." This SEIS includes the NRC staff's analysis which considers and weighs the environmental impacts of the proposed action, the environmental impacts of alternatives to the proposed action, and mitigation measures available for reducing or avoiding adverse impacts. It also includes the NRC staff's recommendation regarding the proposed action.

Regarding the 69 issues for which the GEIS reached generic conclusions, neither Entergy nor the NRC staff has identified information that is both new and significant for any issues that apply to IP2 and/or IP3. In addition, the NRC staff determined that information provided during the scoping process was not new and significant with respect to the conclusions in the GEIS. Therefore, the NRC staff concludes that the impacts of renewing the operating licenses for IP2 and IP3 will not be greater than the impacts identified for these issues in the GEIS. For each of these issues, the NRC staff's conclusion in the GEIS is that the impact is of SMALL<sup>(2)</sup> significance (except for the collective offsite radiological impacts from the fuel cycle and high-level waste and spent fuel, which were not assigned a single significance level).

Regarding the remaining 23 issues, those that apply to IP2 and IP3 are addressed in this SEIS. The NRC staff determined that several of these issues were not applicable because of the type of facility cooling system or other reasons detailed within this SEIS. For the remaining applicable issues, the NRC staff concludes that the significance of potential environmental impacts related to operating license renewal is SMALL, with three exceptions—entrainment, impingement, and heat shock from the facility's heated discharge. Overall effects from entrainment and impingement are likely to be MODERATE. Impacts from heat shock potentially

<sup>(1)</sup> The GEIS was originally issued in 1996. Addendum 1 to the GEIS was issued in 1999. Hereafter, all references to the "GEIS" include the GEIS and its Addendum 1.

<sup>(2)</sup> Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource.

## Abstract

range from SMALL to LARGE depending on the conclusions of thermal studies proposed by the New York State Department of Environmental Conservation (NYSDEC). Based on corrected data received since completing the draft SEIS, NRC staff concludes that impacts to the endangered shortnose sturgeon – which ranged from SMALL to LARGE in the draft SEIS – are likely to be SMALL.

The NRC staff's recommendation is that the Commission determine that the adverse environmental impacts of license renewals for IP2 and IP3 are not so great that preserving the option of license renewal for energy planning decision makers would be unreasonable. This recommendation is based on (1) the analysis and findings in the GEIS, (2) the environmental report and other information submitted by Entergy, (3) consultation with other Federal, State, Tribal, and local agencies, (4) the NRC staff's own independent review, and (5) the NRC staff's consideration of public comments received during the scoping process and in response to the draft SEIS.

### **Paperwork Reduction Act Statement**

This NUREG does not contain information collection requirements and, therefore, is not subject to the requirements of the Paperwork Reduction Act of 1995 (44 U.S.C. 3501 *et seq.*). These information collections were approved by the Office of Management and Budget (OMB), approval numbers 3150-0004, 3150-0155, 3150-0014, 3150-0011, 3150-0021, 3150-0132, and 3150-0151.

### **Public Protection Notification**

The NRC may not conduct or sponsor, and a person is not required to respond to, a request for information or an information collection requirement unless the requesting document displays a currently valid OMB control number.

## 5.0 ENVIRONMENTAL IMPACTS OF POSTULATED ACCIDENTS

Environmental issues associated with postulated accidents are discussed in NUREG-1437, Volumes 1 and 2, "Generic Environmental Impact Statement for License Renewal of Nuclear Plants" (hereafter referred to as the GEIS) (NRC 1996, 1999).<sup>(1)</sup> The GEIS includes a determination of whether the analysis of the environmental issues could be applied to all plants and whether additional mitigation measures would be warranted. Issues are then assigned a Category 1 or a Category 2 designation. As set forth in the GEIS, Category 1 issues are those that meet all of the following criteria:

- (1) The environmental impacts associated with the issue have been determined to apply either to all plants or, for some issues, to plants having a specific type of cooling system or other specified plant or site characteristics.
- (2) A single significance level (i.e., SMALL, MODERATE, or LARGE) has been assigned to the impacts (except for collective offsite radiological impacts from the fuel cycle and from high-level waste and spent fuel disposal).
- (3) Mitigation of adverse impacts associated with the issue has been considered in the analysis, and it has been determined that additional plant-specific mitigation measures are likely not to be sufficiently beneficial to warrant implementation.

For issues that meet the three Category 1 criteria, no additional plant-specific analysis is required unless new and significant information is identified.

Category 2 issues are those that do not meet one or more of the criteria for Category 1 and, therefore, additional plant-specific review of these issues is required.

This chapter describes the environmental impacts from postulated accidents that might occur during the license renewal term.

### 5.1 Postulated Plant Accidents

Two classes of accidents are evaluated in the GEIS. These are design-basis accidents (DBAs) and severe accidents, as discussed below.

#### 5.1.1 Design-Basis Accidents

In order to receive U.S. Nuclear Regulatory Commission (NRC) approval to operate a nuclear power facility, an applicant for an initial operating license must submit a safety analysis report (SAR) as part of its application. The SAR presents the design criteria and design information for the proposed reactor and comprehensive data on the proposed site. The SAR also discusses various hypothetical accident situations and the safety features that are provided to prevent and mitigate accidents. The NRC staff reviews the application to determine whether the plant design meets the Commission's regulations and requirements and includes, in part, the nuclear plant design and its anticipated response to an accident.

DBAs are those accidents that both the licensee and the NRC staff evaluate to ensure that the

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<sup>(1)</sup> The GEIS was originally issued in 1996. Addendum 1 to the GEIS was issued in 1999. Hereafter, all references to the GEIS include the GEIS and its Addendum 1.

## Environmental Impacts of Postulated Accidents

plant can withstand normal and abnormal transients, as well as a broad spectrum of postulated accidents, without undue hazard to the health and safety of the public. A number of these postulated accidents are not expected to occur during the life of the plant, but are evaluated to establish the design basis for the preventive and mitigative safety systems of the facility. The acceptance criteria for DBAs are described in Title 10, Part 50, "Domestic Licensing of Production and Utilization Facilities," of the *Code of Federal Regulations* (10 CFR Part 50) and 10 CFR Part 100, "Reactor Site Criteria."

The environmental impacts of DBAs are evaluated during the initial licensing process, and the ability of the plant to withstand these accidents is demonstrated to be acceptable before issuance of the operating license. The results of these evaluations are found in licensing documentation such as the applicant's final safety analysis report, the NRC staff's safety evaluation report, the final environmental statement (FES), and Section 5.1 of this draft supplemental environmental impact statement (SEIS). A licensee is required to maintain the acceptable design and performance criteria throughout the life of the plant, including any extended-life operation. The consequences for these DBAs are evaluated for the hypothetical maximally exposed individual. Changes in the plant's surroundings, including local population, will not affect the evaluation for the maximally exposed individual. Because of the requirements that continuous acceptability of the consequences and aging management programs be in effect for license renewal, the environmental impacts as calculated for DBAs should not differ significantly from initial licensing assessments over the life of the plant, including the period of extended operation. Accordingly, the design of the plant relative to DBAs during the extended period is considered to remain acceptable, and the environmental impacts of those accidents were not examined further in the GEIS.

The Commission has determined that the environmental impacts of DBAs are of SMALL significance for all plants because the plants were designed to successfully withstand these accidents. Therefore, for the purposes of license renewal, DBAs are designated as a Category 1 issue in Table B-1 of Appendix B to Subpart A, "Environmental Effect of Renewing the Operating License of a Nuclear Power Plant," of 10 CFR Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions." The early resolution of the DBAs makes them a part of the current licensing basis (CLB) of the plant; the CLB of the plant, which is maintained by the licensee under its current license, will continue to be maintained under a renewed license in accordance with 10 CFR 54.33, "Continuation of CLB and Conditions of Renewed License." Therefore, under the provisions of 10 CFR 54.30, "Matters Not Subject to a Renewal Review," the CLB is not subject to review under license renewal. This issue, applicable to Indian Point Nuclear Generating Unit Nos. 2 and 3 (IP2 and IP3), is listed in Table 5-1.

**Table 5-1. Category 1 Issues Applicable to Postulated Accidents during the Renewal Term**

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Sections
POSTULATED ACCIDENTS	
Design-basis accidents	5.3.2; 5.5.1

Based on information in the GEIS, the Commission found the following:

The NRC staff has concluded that the environmental impacts of design-basis accidents are of small significance for all plants.

Entergy Nuclear Operations, Inc. (Entergy), stated in the IP2 and IP3 environmental report (ER)

(Entergy 2007a) that it is not aware of any new and significant information associated with the renewal of the IP2 and IP3 operating licenses. The NRC staff has not identified any new and significant information during its independent review of the IP2 and IP3 ER, the site visit, the scoping process, or evaluation of other available information. Therefore, the NRC staff concludes that there are no impacts related to DBAs beyond those discussed in the GEIS.

### 5.1.2 Severe Accidents

Severe nuclear accidents are those that are more severe than DBAs because they could result in substantial damage to the reactor core, regardless of offsite consequences. In the GEIS, the NRC staff assessed the impacts of severe accidents using the results of existing analyses and site-specific information to conservatively predict the environmental impacts of severe accidents for each plant during the renewal period.

Severe accidents initiated by external phenomena, such as tornadoes, floods, earthquakes, fires, and sabotage, traditionally have not been discussed in quantitative terms in FESs and were not specifically considered for IP2 and IP3 in the GEIS. However, in the GEIS, the NRC staff did evaluate existing impact assessments performed by the NRC and by the industry at 44 nuclear plants in the United States and concluded that the risk from beyond-design-basis earthquakes at existing nuclear power plants is SMALL. The GEIS for license renewal documents a discretionary analysis of acts of sabotage in connection with license renewal, and concluded that the core damage and radiological release from such acts would be no worse than the damage and release expected from internally initiated events. In the GEIS, the Commission concluded that the risk from sabotage and beyond-design-basis earthquakes at existing nuclear power plants is small and, additionally, that the risks from other external events are adequately addressed by a generic consideration of internally initiated severe accidents (see Volume 1 of the GEIS, page 5-18).

Based on information in the GEIS, the Commission found the following:

The probability weighted consequences of atmospheric releases, fallout onto open bodies of water, releases to groundwater, and societal and economic impacts from severe accidents are small for all plants. However, alternatives to mitigate severe accidents must be considered for all plants that have not considered such alternatives.

Therefore, the Commission has designated mitigation of severe accidents as a Category 2 issue in 10 CFR Part 51, Subpart A, Appendix B, Table B-1. This issue, applicable to IP2 and IP3, is listed in Table 5-2.

**Table 5-2. Category 2 Issues Applicable to Postulated Accidents during the Renewal Term**

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Sections	10 CFR 51.53(c)(3)(ii) Subparagraph	SEIS Section
<b>POSTULATED ACCIDENTS</b>			
Severe accidents	5.3.3; 5.3.3.2; 5.3.3.3; 5.3.3.4; 5.3.3.5; 5.4; 5.5.2	L	5.2

The NRC staff has not identified any new and significant information with regard to the consequences from severe accidents during its independent review of the IP2 and IP3 ER

(Entergy 2007a), the site visit, the scoping process, or evaluation of other available information. Therefore, the NRC staff concludes that there are no impacts of severe accidents beyond those discussed in the GEIS. However, in accordance with 10 CFR 51.53(c)(3)(ii)(L), the NRC staff has reviewed severe accident mitigation alternatives (SAMAs) for IP2 and IP3. The results of its review are discussed in Section 5.2 of this draft SEIS.

## **5.2 Severe Accident Mitigation Alternatives**

As required by 10 CFR 51.53(c)(3)(ii)(L), license renewal applicants must consider alternatives to mitigate severe accidents if the staff has not previously evaluated SAMAs for the applicant's plant in an environmental impact statement (EIS), or related supplement, or in an environmental assessment. The purpose of this consideration is to ensure that plant changes (i.e., hardware, procedures, and training) with the potential for improving severe accident safety performance are identified and evaluated. SAMAs have not been previously considered for IP2 and IP3; therefore, the remainder of Chapter 5 addresses those alternatives.

### **5.2.1 Introduction**

This section presents a summary of the SAMA evaluation for IP2 and IP3, conducted by Entergy, and the NRC staff's review of that evaluation. The NRC staff performed its review with contract assistance from Information Systems Laboratories, Inc. and Sandia National Laboratory. The NRC staff's review is available in greater detail in Appendix G to this draft SEIS; the SAMA evaluation is available in Entergy's ER and subsequent submittals identified herein.

The SAMA evaluation for IP2 and IP3 was conducted using a four-step approach. In the first step, Entergy quantified the level of risk associated with potential reactor accidents using the plant-specific probabilistic safety assessment (PSA) and other risk models.

In the second step, Entergy examined the major risk contributors and identified possible ways (i.e., SAMAs) of reducing that risk. Common ways of reducing risk are changes to components, systems, procedures, and training. Entergy initially identified 231 and 237 potential SAMAs for IP2 and IP3, respectively. For each unit, Entergy performed an initial screening in which it eliminated SAMAs that are not applicable to IP2 and IP3 because of design differences, have already been implemented at IP2 and IP3, or are similar in nature and could be combined with another SAMA candidate. This screening reduced the list of potential SAMAs to 68 for IP2 and 62 for IP3.

In the third step, Entergy estimated the benefits and the costs associated with each of the remaining SAMAs. Estimates were made of how much each SAMA could reduce risk. Those estimates were developed in terms of dollars in accordance with NRC guidance for performing regulatory analyses (NRC 1997). The cost of implementing the proposed SAMAs also was estimated.

Finally, in the fourth step, the costs and benefits of each of the remaining SAMAs were compared to determine whether the SAMA was cost beneficial, meaning the benefits of the SAMA were greater than the cost (a positive cost benefit). Entergy concluded in its ER that several of the SAMAs evaluated for each unit are potentially cost beneficial (Entergy 2007b). However, in response to NRC staff inquiries regarding estimated benefits for certain SAMAs, the meteorological data used in the analysis, and lower cost alternatives, several additional potentially cost-beneficial SAMAs were identified (Entergy 2008a, Entergy 2009). The NRC staff identifies potentially cost-beneficial SAMAs in Section 5.2.5.



The potentially cost-beneficial SAMAs do not relate to adequately managing the effects of aging during the period of extended operation; therefore, they are not required to be implemented as part of license renewal pursuant to 10 CFR Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants." Entergy's SAMA analyses and the NRC's review are discussed in more detail below.

### **5.2.2 Estimate of Risk**

Entergy submitted an assessment of SAMAs for IP2 and IP3 as part of the ER (Entergy 2007b). This assessment was based on the most recent IP2 and IP3 PSA available at that time, a plant-specific offsite consequence analysis performed using the MELCOR Accident Consequence Code System 2 (MACCS2) computer program, and insights from the IP2 and IP3 individual plant examination (Con Ed 1992; NYPA 1994) and individual plant examination of external events (Con Ed 1995 and NYPA 1997).

The baseline core damage frequency (CDF) for the purpose of the SAMA evaluation is approximately  $1.79 \times 10^{-5}$  per year for IP2 and  $1.15 \times 10^{-5}$  per year for IP3. The CDF values are based on the risk assessment for internally initiated events. Entergy did not include the contributions from external events within the IP2 and IP3 risk estimates; however, it did perform separate assessments of the CDF from external events and did account for the potential risk reduction benefits associated with external events by multiplying the estimated benefits for internal events by a factor of approximately 3.8 for IP2 and 5.5 for IP3 (as discussed in Appendix G, Sections G.2.2, G.3.1, and G.6.2). The breakdown of CDF by initiating event for IP2 and IP3 is provided in Table 5-3.

**IP2 and IP3 Core Damage Frequency (Entergy, 2007a)**

Initiating Event	IP2		IP3	
	CDF (Per Year)	% Contribution to CDF	CDF (Per Year)	% Contribution to CDF
Loss of offsite power <sup>1</sup>	$6.7 \times 10^{-6}$	38	$1.2 \times 10^{-7}$	1
Internal flooding	$4.7 \times 10^{-6}$	26	$2.2 \times 10^{-6}$	20
Loss-of-coolant accident (LOCA)	$1.5 \times 10^{-6}$	8	$2.2 \times 10^{-6}$	19
Transients <sup>1</sup>	$1.2 \times 10^{-6}$	7	$8.5 \times 10^{-7}$	7
Anticipated transient without scram	$9.9 \times 10^{-7}$	6	$1.5 \times 10^{-6}$	13
Station blackout	$8.5 \times 10^{-7}$	5	$7.2 \times 10^{-7}$	6
Steam generator tube rupture	$7.2 \times 10^{-7}$	4	$1.6 \times 10^{-6}$	14
Loss of component cooling water	$5.8 \times 10^{-7}$	3	$1.1 \times 10^{-7}$	<1
Loss of nonessential service water	$3.0 \times 10^{-7}$	2	$2.8 \times 10^{-7}$	2
Interfacing systems LOCA	$1.5 \times 10^{-7}$	<1	$1.5 \times 10^{-7}$	1
Reactor vessel rupture	$1.0 \times 10^{-7}$	<1	$1.0 \times 10^{-7}$	<1
Loss of 125 volts direct current power	$5.8 \times 10^{-8}$	<1	$1.0 \times 10^{-6}$	9
Total loss of service water system	$4.4 \times 10^{-8}$	<1	$5.4 \times 10^{-7}$	5
Loss of essential service water	$1.9 \times 10^{-10}$	<1	$1.8 \times 10^{-6}$	<1
<b>Total CDF (internal events)</b>	<b><math>1.79 \times 10^{-5}</math></b>	<b>100</b>	<b><math>1.15 \times 10^{-5}</math></b>	<b>100</b>

<sup>1</sup>Contributions from SBO and ATWS events are noted separately and not included in the reported values for loss of offsite power or transients.

As shown in Table 5-3, for IP2, loss of offsite power sequences, including station blackout (SBO) events, and internal flooding initiators are the dominant contributors to CDF. For IP3, internal flooding initiators, loss-of-coolant accidents (LOCAs), steam generator tube rupture (SGTR) events, and anticipated transient without scram (ATWS) events are the dominant contributors to CDF. The differences in the CDF contributions are attributed, in large part, to several significant differences between the IP2 and IP3 units.

As shown in Table 5-4 below, Entergy's SAMA analysis, as revised, estimated the dose to the population within 80 kilometers (50 miles) of the IP2 and IP3 site to be approximately 0.87 person-sievert (Sv) (87 person-rem) per year for IP2, and 0.95 Sv (95 person-rem) per year for IP3 (Entergy 2009). The breakdown of the total population dose by containment failure mode is summarized in Table 5-4. SGTR events and late containment failures, caused by gradual overpressurization by steam and noncondensable gases, dominate the population dose risk for both units.

The NRC staff has reviewed Entergy's data and evaluation methods, as revised, and concludes that the quality of the risk analyses is adequate to support an assessment of the risk reduction potential for candidate SAMAs. Accordingly, the staff based its assessment of offsite risk on the CDFs and offsite doses reported by Entergy.

**Table 5-4. Breakdown of Population Dose by Containment Failure Mode (Entergy 2009)**

Containment Failure Mode	IP2		IP3	
	Population Dose (Person-Rem <sup>1</sup> Per Year)	% Contribution	Population Dose (Person-Rem <sup>1</sup> Per Year)	% Contribution
Intact Containment	<0.1	<1	<0.1	<1
Basemat Melt-through	4.1	5	2.4	3
Gradual Overpressure	28.3	32	16.8	18
Late Hydrogen Burns	3.6	4	2.1	2
Early Hydrogen Burns	8.6	10	3.2	3
In-Vessel Steam Explosion	0.6	<1	0.2	<1
Reactor Vessel Rupture	4.1	5	1.5	2
Interfacing System LOCA	6.6	8	4.2	4
SGTR	31.5	36	64.4	68
<b>Total</b>	<b>87.4</b>	<b>100</b>	<b>94.8</b>	<b>100</b>

<sup>1</sup>One person-rem = 0.01 person-sievert

### 5.2.3 Potential Plant Improvements

Once the dominant contributors to plant risk were identified, Entergy searched for ways to reduce that risk. In identifying and evaluating potential SAMAs, Entergy considered insights from the plant-specific PSA and SAMA analyses performed for other operating plants that have submitted license renewal applications. In its 2007 ER, Entergy identified 231 and 237 potential risk-reducing improvements (SAMAs) to plant components, systems, procedures, and training for IP2 and IP3, respectively.

As discussed in Entergy's ER, for IP2, Entergy removed all but 68 of the SAMAs from further consideration because they are not applicable to IP2 as a result of design differences, have already been implemented at IP2, or are similar in nature and could be combined with another SAMA candidate. For IP3, all but 62 of the SAMAs were removed from further consideration based on similar criteria. A detailed cost-benefit analysis was performed for each of the remaining SAMAs.

The staff has concluded that Entergy's ER SAMA analysis used a systematic and comprehensive process for identifying potential plant improvements for IP2 and IP3, and that the set of potential plant improvements identified by Entergy is reasonably comprehensive and, therefore, acceptable.

#### **5.2.4 Evaluation of Risk Reduction and Costs of Improvements**

In its ER, Entergy evaluated the risk-reduction potential of the remaining candidate SAMAs that were applicable to each unit (68 for IP2 and 62 for IP3). The SAMA evaluations were performed using realistic assumptions with some conservatism.

Entergy estimated the costs of implementing the candidate SAMAs through the application of engineering judgment and the use of other licensees' estimates for similar improvements. The cost estimates reported in the ER conservatively did not include the cost of replacement power during extended outages required to implement the modifications, nor did they account for inflation.

The staff reviewed Entergy's basis for calculating the risk reduction for the various plant improvements and concluded that the rationale and assumptions for estimating risk reduction are reasonable and generally conservative (i.e., the estimated risk reduction is higher than what would actually be realized). Accordingly, the staff based its estimates of averted risk for the various SAMAs on Entergy's risk reduction estimates.

The staff reviewed the basis for the applicant's cost estimates. For certain improvements, the staff also compared the cost estimates to estimates developed elsewhere for similar improvements, including estimates developed as part of other licensees' analyses of SAMAs for operating reactors and advanced light-water reactors. The staff found the cost estimates to be reasonable and generally consistent with estimates provided in support of other plants' analyses.

The staff concluded that the risk reduction and the cost estimates provided by Entergy are sufficient and appropriate for use in the SAMA evaluation.

#### **5.2.5 Cost-Benefit Comparison**

The cost-benefit analysis performed by Entergy was based primarily on NUREG/BR-0184, "Regulatory Analysis Technical Evaluation Handbook" (NRC 1997) and was executed consistent with this guidance. NUREG/BR-0058, "Regulatory Analysis Guidelines of the U.S. Nuclear Regulatory Commission" (NRC 2004), has recently been revised to reflect the agency's revised policy on discount rates. Revision 4 of NUREG/BR-0058 states that two sets of estimates should be developed—one at 3 percent and one at 7 percent (NRC 2004). Entergy provided both sets of estimates (Entergy 2007b).

As described in Section G.6.1, Entergy identified 10 potentially cost-beneficial SAMAs (5 for IP2 and 5 for IP3) in the baseline analysis (using a 7-percent discount rate) and sensitivity analysis (using a 3-percent discount rate) contained in the ER. Based on consideration of analysis uncertainties, Entergy identified two additional potentially cost-beneficial SAMAs for IP2 in the ER (IP2 SAMAs 44 and 56).

In response to an NRC staff request, Entergy provided the results of a revised uncertainty analysis in which the impact of lost tourism and business was accounted for in the baseline analysis (rather than as a separate sensitivity case) (Entergy 2008a). The revised uncertainty analysis resulted in the identification of two additional potentially cost-beneficial SAMAs for IP2 (IP2 SAMAs 9 and 53) and one additional potentially cost-beneficial SAMA for IP3 (IP3 SAMA 53), as reported in the draft Supplemental Environmental Impact Statement (DSEIS). Subsequent to issuance of the DSEIS, in response to NRC staff questions, Entergy identified an error in the Indian Point site meteorological file used to calculate offsite consequences of severe accidents, and submitted a SAMA re-analysis based on corrected meteorological data (Entergy 2009). The SAMA re-analysis resulted in identification of three additional potentially cost-beneficial SAMAs for IP2 (IP2 SAMAs 21, 22, and 62) and three additional potentially cost-beneficial SAMAs for IP3 (IP3 SAMAs 7, 18, and 19).

The potentially cost-beneficial SAMAs for IP2 include the following:

- SAMA 9 – Create a reactor cavity flooding system to reduce the impact of core-concrete interaction from molten core debris following core damage and vessel failure.
- SAMA 21 – Install additional pressure or leak monitoring instrumentation to reduce the frequency of interfacing system loss of coolant accidents.
- SAMA 22 – Add redundant and diverse limit switches to each containment isolation valve. This modification would reduce the frequency of an interfacing system loss of coolant activity.
- SAMA 28 – Provide a portable diesel-driven battery charger to improve direct current (dc) power reliability. Safety-related disconnect would be used to change a selected battery. This modification would enhance the long-term operation of the turbine-driven auxiliary feed water (AFW) pump on battery depletion.
- SAMA 44 – Use fire water as backup for steam generator inventory to increase the availability of steam generator water supply to ensure adequate inventory for the operation of the turbine-driven AFW pump during SBO events.
- SAMA 53 – Keep both pressurizer power-operated relief valve block valves open. This modification would reduce the CDF contribution from loss of secondary heat sink by improving the availability of feed and bleed.
- SAMA 54 – Install a flood alarm in the 480-volt (V) alternating current (ac) switchgear room to mitigate the occurrence of internal floods inside the 480-V ac switchgear room.
- SAMA 56 – Keep residual heat removal (RHR) heat exchanger discharge valves, motor-operated valves 746 and 747, normally open. This procedure change would reduce the CDF contribution from transients and LOCAs.
- SAMA 60 – Provide added protection against flood propagation from stairwell 4 into the 480-V ac switchgear room to reduce the CDF contribution from flood sources within stairwell 4 adjacent to the 480-V ac switchgear room.
- SAMA 61 – Provide added protection against flood propagation from the deluge room into the 480-V ac switchgear room to reduce the CDF contribution from flood sources within the deluge room adjacent to the 480-V ac switchgear room.

## Environmental Impacts of Postulated Accidents

- SMA 62 – Provide a hard-wired connection to a safety injection (SI) pump from the alternate safe shutdown system (ASSS) power supply. This modification would reduce the CDF from events that involve loss of power from the 480V vital buses.
- SAMA 65 – Upgrade the alternate safe shutdown system to allow timely restoration of reactor coolant pump seal injection and cooling from events that cause loss of power from the 480-V ac vital buses.

The potentially cost-beneficial SAMAs for IP3 include the following:

- SAMA 7 – Create a reactor cavity flooding system. This modification would enhance core debris cooling and reduce the frequency of containment failure due to core-concrete interaction.
- SAMA 18 – Route the discharge from the main steam safety valves through a structure where a water spray would condense the steam and remove fission products.
- SAMA 19 – Install additional pressure or leak monitoring instrumentation to reduce the frequency of interfacing system loss of coolant accidents.
- SAMA 30 – Provide a portable diesel-driven battery charger to improve dc power reliability. A safety-related disconnect would be used to change a selected battery. This modification would enhance the long-term operation of the turbine-driven AFW pump on battery depletion.
- SAMA 52 – Proceduralize opening the city water supply valve for alternative AFW system pump suction to enhance the availability of the AFW system.
- SAMA 53 – Install an excess flow valve to reduce the risk associated with hydrogen explosions inside the turbine building or primary auxiliary building.
- SAMA 55—Provide the capability of powering one safety injection pump or RHR pump using the Appendix R diesel (MCC 312A) to enhance reactor cooling system injection capability during events that cause loss of power from the 480-V ac vital buses.
- SAMA 61 – Upgrade the alternate safe-shutdown system to allow timely restoration of reactor coolant pump seal injection and cooling from events that cause loss of power from the 480-V ac vital buses.
- SAMA 62 – Install a flood alarm in the 480-V ac switchgear room to mitigate the occurrence of internal floods inside the 480-V ac switchgear room.

In response to an NRC staff inquiry regarding estimated benefits for certain SAMAs and lower cost alternatives, Entergy identified one additional potentially cost-beneficial SAMA (regarding a dedicated main steam safety valve gagging device for SGTR events in both units; this was unnumbered for each unit because the applicant did not initially identify them) (Entergy 2008b); and Entergy determined that one SAMA that was previously identified as potentially cost beneficial was no longer cost beneficial based on correction of an error in the ER (IP3 SAMA 30) (Entergy 2008a, Entergy 2009).

Based on its review of Entergy's SAMA analysis, as revised, the staff concludes that, with the exception of the potentially cost-beneficial SAMAs discussed above, the costs of the SAMAs evaluated would be higher than their associated benefits.

## 5.2.6 Conclusions

The NRC staff reviewed Entergy's analysis, as revised, and concludes that the methods used, and the implementation of those methods, were sound. The treatment of SAMA benefits and costs support the general conclusion that the SAMA evaluations performed by Entergy are reasonable and sufficient for the license renewal submittal. Although the treatment of SAMAs for external events was somewhat limited, the likelihood of there being cost-beneficial enhancements in this area was minimized by improvements that have been realized as a result of the IPEEE process and inclusion of a multiplier to account for external events.

Based on its review of the SAMA analysis, as revised, the staff concurs with Entergy's identification of areas in which risk can be further reduced in a cost-beneficial manner through the implementation of all or a subset of potentially cost-beneficial SAMAs. Given the potential for cost-beneficial risk reduction, the staff considers that further evaluation of these SAMAs by Entergy is appropriate. However, none of the potentially cost-beneficial SAMAs relate to adequately managing the effects of aging during the period of extended operation. Therefore, they need not be implemented as part of IP2 and IP3 license renewal pursuant to 10 CFR Part 54.

In a decision issued on June 30, 2010, the Atomic Safety and Licensing Board ("Board") admitted two contentions for litigation, which had been filed by the State of New York in the Indian Point Units 2 and 3 license renewal adjudicatory proceeding. Entergy Nuclear Operations, Inc. (Indian Point Nuclear Generating Units 2 and 3), LBP-10-13, 71 NRC \_\_\_\_ (2010). These contentions generally assert that the NRC staff must reach a final determination of the cost-beneficial SAMAs, from the slate of SAMAs that have been found to be potentially cost-beneficial, and that (a) the cost-beneficial SAMAs must be imposed as a "backfit" on the plants' current licensing basis ("CLB"), as a condition for license renewal, or (b) the staff must provide a sufficient explanation for not imposing such a license renewal condition. In this regard, the NRC staff has provided a detailed discussion of SAMA costs and benefits in this SEIS, which satisfies the NRC's obligation, under NEPA and related case law, to consider SAMAs in a license renewal proceeding such as the IP2 and IP3 proceeding. Indeed, as the Board found, while NEPA requires consideration of environmental impacts and alternatives, it does not require that SAMAs be imposed to redress environmental impacts. LBP-10-13, slip op. at 29.

Moreover, the NRC staff has determined that none of the potentially cost-beneficial SAMAs are related to the license renewal requirements in 10 CFR Part 54 (i.e., managing the effects of aging) (SEIS § 5.2.6). Under the NRC's regulatory system, any potentially cost-beneficial SAMAs that do not relate to 10 CFR Part 54 requirements would be considered, to the extent necessary or appropriate, under the agency's oversight of a facility's current operating license in accordance with 10 CFR Part 50 requirements, inasmuch as such matters would pertain not just to the period of extended operation but to operations under the current operating license term as well. Thus, there is no regulatory basis to suggest that potentially cost-beneficial SAMAs that are unrelated to Part 54 requirements must be imposed as a backfit to the CLB, as a condition for license renewal.

Finally, the NRC staff notes that SAMAs, by definition, pertain to severe accidents – i.e., those accidents whose consequences could be severe, but whose probability of occurrence is so low that they may be excluded from the spectrum of design basis accidents ("DBAs") that have been postulated for a plant (see GEIS §§ 5.3.2, 5.3.3, 5.4); this is consistent with the conclusions reached in § 5.2.2 of this SEIS concerning severe accidents at IP2 and IP3. The Commission has previously concluded, as a generic matter, that the probability-weighted radiological consequences of severe accidents are SMALL. GEIS § 5.5.2; 10 CFR Part 51, App. B, Table B

1. As stated in §§ 5.1.1 and 5.1.2 above, no significant new information has been identified that would remove IP2 and IP3 from these generic determinations. Thus, there is no regulatory basis to impose any of the potentially cost-beneficial SAMAs as a condition for license renewal of IP2 and IP3 – even if those potentially cost-beneficial SAMAs are “finally” found to be cost-beneficial.

### 5.3 References

10 CFR Part 50. Code of Federal Regulations, Title 10, *Energy*, Part 50, “Domestic Licensing of Production and Utilization Facilities.”

10 CFR Part 51. Code of Federal Regulations, Title 10, *Energy*, Part 51, “Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions.”

10 CFR Part 54. Code of Federal Regulations, Title 10, *Energy*, Part 54, “Requirements for Renewal of Operating Licenses for Nuclear Power Plants.”

10 CFR Part 100. Code of Federal Regulations, Title 10, *Energy*, Part 100, “Reactor Site Criteria.”

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August 11, 2011

UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

BEFORE THE COMMISSION

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

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NRC STAFF'S ANSWER TO APPLICANT'S PETITION  
FOR REVIEW OF LBP-11-17 GRANTING SUMMARY  
DISPOSITION OF CONSOLIDATED CONTENTION NYS-35/36

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**ATTACHMENT 2**

SUPPLEMENTS TO "GENERIC ENVIRONMENTAL IMPACT  
STATEMENT FOR LICENSE RENEWAL OF NUCLEAR PLANTS,"  
NUREG-1437, IN WHICH THE NRC STAFF DETERMINED NOT  
TO REQUIRE THE IMPLEMENTATION OF POTENTIALLY COST-  
BENEFICIAL SAMAS AS A CONDITION FOR LICENSE RENEWAL,  
WHERE THE SAMAS DID NOT PERTAIN TO MANAGING THE  
EFFECTS OF AGING (PARTIAL EXCERPTS)

(Originally Filed as Attachment 2 to "NRC Staff's  
(1) Cross-Motion for Summary Disposition, and  
(2) Response to New York State's Motion for  
Summary Disposition, of Contention NYS-35/36  
(Severe Accident Mitigation Alternatives)"  
(February 7, 2011)

1. NUREG-1437, Supplement 1	Calvert Cliffs	FSEIS	October 1999
2. NUREG-1437, Supplement 3	Arkansas (ANO) 1	FSEIS	April 2001
3. NUREG-1437, Supplement 8	McGuire 1 and 2	FSEIS	December 2002
4. NUREG-1437, Supplement 9	Catawba 1 and 2	FSEIS	December 2002
5. NUREG-1437, Supplement 12	Fort Calhoun 1	FSEIS	August 2003
6. NUREG-1437, Supplement 13	H.B. Robinson 2	FSEIS	December 2003
7. NUREG-1437, Supplement 14	R.E. Ginna	FSEIS	January 2004
8. NUREG-1437, Supplement 16	Quad Cities 1 and 2	FSEIS	June 2004
9. NUREG-1437, Supplement 17	Dresden 2 and 3	FSEIS	June 2004
10. NUREG-1437, Supplement 18	J.M. Farley 1 and 2	FSEIS	March 2005
11. NUREG-1437, Supplement 19	Arkansas (ANO) 2	FSEIS	April 2005
12. NUREG-1437, Supplement 20	D.C. Cook 1 and 2	FSEIS	May 2005
13. NUREG-1437, Supplement 22	Millstone 2 and 3	FSEIS	July 2005
14. NUREG-1437, Supplement 23	Point Beach 1 and 2	FSEIS	August 2005
15. NUREG-1437, Supplement 24	Nine Mile Point 1 & 2	FSEIS	May 2006
16. NUREG-1437, Supplement 25	Brunswick 1 and 2	FSEIS	April 2006
17. NUREG-1437, Supplement 26	Monticello	FSEIS	October 2006
18. NUREG-1437, Supplement 27	Palisades	FSEIS	October 2006
19. NUREG-1437, Supplement 28	Oyster Creek	FSEIS	January 2007
20. NUREG-1437, Supplement 29	Pilgrim	FSEIS	July 2007
21. NUREG-1437, Supplement 30	Vermont Yankee	FSEIS	August 2007
22. NUREG-1437, Supplement 31	J.A. FitzPatrick	FSEIS	January 2008
23. NUREG-1437, Supplement 32	Wolf Creek	FSEIS	May 2008
24. NUREG-1437, Supplement 33	Shearon Harris 1	FSEIS	August 2008
25. NUREG-1437, Supplement 34	Vogtle 1 and 2	FSEIS	December 2008
26. NUREG-1437, Supplement 35	Susquehanna 1 & 2	FSEIS	March 2009
27. NUREG-1437, Supplement 36	Beaver Valley 1 & 2	FSEIS	May 2009
28. NUREG-1437, Supplement 37	Three Mile Island 1	FSEIS	June 2009
29. <b>NUREG-1437, Supplement 38</b>	<b>Indian Point 2 and 3</b>	<b>FSEIS</b>	<b>December 2010</b>
30. NUREG-1437, Supplement 39	Prairie Island 1 and 2	Draft SEIS	October 2009
31. NUREG-1437, Supplement 40	Kewaunee	FSEIS	August 2010
32. NUREG-1437, Supplement 41	Cooper	FSEIS	July 2010
33. NUREG-1437, Supplement 42	Duane Arnold	FSEIS	October 2010
34. NUREG-1437, Supplement 43	Palo Verde [1, 2 & 3]	FSEIS	January 2011
35. NUREG-1437, Supplement 45	Hope Creek 1 and 2	Draft SEIS	October 2010

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No potentially cost-beneficial SAMAs were identified in NUREG-1437, Supplement 2 (Oconee), Supplement 4 (Hatch), Supplement 5 (Turkey Point), Supplement 6 (Surry), Supplement 7 (North Anna), Supplement 10 (Peach Bottom), Supplement 11 (St. Lucie), Supplement 15 (Sumner), or Supplement 21 (Browns Ferry). Supplement 44 has not yet been issued.

**NUREG-1437**  
**Supp. 1**

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# **Generic Environmental Impact Statement for License Renewal of Nuclear Plants**

## **Supplement 1**

### **Regarding the Calvert Cliffs Nuclear Power Plant**

#### **Final Report**

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The SAMA has a positive net value under bounding risk reduction assumptions when AOSCs are included. However, the level of risk reduction assumed in the bounding case does not appear to be achievable, given that all AFW hardware and human-action-related failures would not realistically be eliminated through this change. In this regard, BGE's best estimate of risk reduction appears more representative of the level of risk reduction that might be achieved. Under best-estimate risk reduction assumptions, the SAMA has a negative net value, even when AOSCs are included.

## 5.2.7 Conclusions

BGE completed a comprehensive effort to identify and evaluate potential cost-beneficial plant enhancements to reduce the risk associated with severe accidents at CCNPP. As a result of this assessment, BGE identified and committed to pursue one enhancement in accordance with the CCNPP modification process. This involves the installation of a watertight door between the service water pump room and the adjacent fan room to reduce the likelihood of core damage from internal flooding events. BGE also committed to further evaluate the adequacy of CCNPP procedures regarding response to internal floods following resolution of the hardware flooding enhancement. BGE concluded that no additional mitigation alternatives are cost-beneficial and warrant implementation at CCNPP.

Based on the staff's review of SAMAs for CCNPP, several SAMAs appear to be cost-beneficial when evaluated using the guidance in NUREG/BR-0184 (NRC 1997b). Three SAMAs (36, 48a, and 74) have a positive net value under both bounding and best-estimate risk reduction assumptions when AOSCs are included. The most risk-significant enhancement, SAMA 48a, has a CDF reduction of approximately 30 percent under bounding assumptions, and 10 percent under best-estimate assumptions. All remaining SAMAs have either a very small negative net value, or offer minimal risk reduction (i.e., a reduction of only a few percent) under best estimate risk reduction assumptions.

Although a limited number of SAMAs (four) appear to be cost beneficial and to offer a level of risk reduction, those SAMAs do not relate to adequately managing the effects of aging during the period of extended operation. Therefore, they need not be implemented as part of license renewal pursuant to 10 CFR Part 54.

## 5.3 References

10 CFR 50.59, "Changes, tests, and experiments."

10 CFR Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions."

10 CFR 51.53, "Postconstruction environmental reports."

# **Generic Environmental Impact Statement for License Renewal of Nuclear Plants**

## **Supplement 3**

## **Regarding the Arkansas Nuclear One, Unit 1**

### **Final Report**

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Including replacement power costs, Entergy estimated the benefit of this SAMA to be in the range of \$51,000 to \$77,000 without doubling for external events. Entergy did not provide a formal cost estimate for this SAMA, but indicated that the cost would be less than twice the benefit. If the costs associated with this training are comparable to implementing a procedure change (estimated by Entergy to be \$30,000 or more), then this action would have a positive net value.

Although not age-related, Entergy further evaluated this SAMA from a training perspective and concluded that this operator action was already adequately addressed in the operations training cycle (Entergy 2001). Specifically, the task of shifting the ECCS suction to the reactor building sump is already included in ANO's operator training program. The task is covered in the Reactor Operator Program in the simulator malfunction guide for LOCAs, and is intrinsic in the performance of the Emergency Operating Procedure for an ESAS actuation as part of the requalification process. There is also a Job Performance Measure for specifically evaluating the performance of shifting the ECCS suction to the sump, to evaluate the trainee's performance of the task. Although this task is not drilled routinely due to time constraints, ANO does perform training on the task as part of the coverage of different portions of the Emergency Operating Procedures as necessary.

Based on the updated cost-benefit and sensitivity analyses, the staff finds the cost-benefit comparison methods sound and the results reasonable.

## 5.2.7 Conclusions

Entergy completed an extensive effort to identify and evaluate potential cost-beneficial plant enhancements to reduce the risk associated with severe accidents at ANO-1. A list of candidate SAMAs was compiled from a review of the ANO-1 IPE submittal, the updated PSA, and the IPEEE for plant-specific enhancements, reviews of SAMA analyses submitted in support of original licensing and license renewal activities for other operating nuclear power plants and advanced light water reactor plants, and reviews of other NRC and industry documentation discussing potential plant improvements. The staff concluded that the SAMA candidate identification efforts were reasonable and that the list of candidate SAMAs was sufficient.

After screening out SAMA candidates that were not applicable to ANO-1 or had already been implemented, Entergy performed a second screening based on the potential costs and benefits. The risk-reduction benefits were determined using the ANO-1 PSA (an updated version of the ANO-1 IPE) supplemented with a MACCS2 analysis to determine the offsite consequences and economic impacts. The ANO-1 PSA does not include an analysis of the risk associated with external initiating events. To compensate for this situation, Entergy bounded the potential

## Postulated Accidents

benefits by doubling the results from the ANO-1 PSA. While unorthodox, the NRC staff concluded that this method was sufficient for the purposes of SAMA evaluation.

The original risk-reduction benefit analysis followed the guidance of NUREG/BR-0184 (NRC 1997c), except that Entergy did not include replacement power costs as part of the averted onsite costs. In this analysis, Entergy concluded that only one SAMA was marginally cost-beneficial. Replacement power costs can have a significant influence on the cost-benefit analysis.

At the request of the staff, Entergy provided a revised assessment of the appropriate SAMAs with replacement power costs included. As a result of this reassessment, the "marginally" cost-beneficial SAMA 129 became more cost-beneficial. All other SAMA candidates retained negative net values. SAMA 129 involves improvements in training and awareness associated with operator actions required to swapover from the injection phase to low-pressure recirculation during a large LOCA. This SAMA does not relate to adequately managing the effects of aging during the period of extended operation and based on further information provided by Entergy, appears to be adequately addressed within the current operations training cycle. Therefore, no further action is necessary as part of license renewal pursuant to 10 CFR Part 54.

## 5.3 References

10 CFR Part 51, Subpart A, Appendix B, Table B-1, "Summary of Findings on NEPA Issues for License Renewal of Nuclear Power Plants."

10 CFR 51.53(c), "Operating license renewal stage."

10 CFR Part 54, "Requirements for renewal of operating licenses for nuclear power plants."

Arkansas Power and Light (APL). 1981. *ANO Emergency Plan*. Russellville, Arkansas.

Entergy Operations, Inc. 1993. Letter from James J. Fisicaro (Entergy) to U.S. Nuclear Regulatory Commission, Subject: Arkansas Nuclear One - Unit 1, Docket No. 50-313, License No. DPR-51, Individual Plant Examination for Severe Accident Vulnerabilities, Generic Letter 88-20 (TAC No. M74376), April 29, 1993.

Entergy Operations, Inc. 1996. Letter from Dwight C. Mims (Entergy) to U.S. Nuclear Regulatory Commission, Subject: Individual Plant Examination of External Events (IPEEE) and Unresolved Safety Issue A-46 Summary Reports for Arkansas Nuclear One, Unit 1 (ANO-1), May 31, 1996.



# **Generic Environmental Impact Statement for License Renewal of Nuclear Plants**

## **Supplement 8**

### **Regarding McGuire Nuclear Station, Units 1 and 2**

## **Final Report**

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## Environmental Impacts of Postulated Accidents

back-up power to the air-return fans is not needed. This further supports the position that the benefits are large and that a hydrogen-related SAMA may be cost-beneficial.

- The effect of implementing the SAMA in the near term rather than delaying implementation until the start of the license renewal period (i.e., use of a 40-year rather than a 20-year, period in the value impact analyses) is bounded by the sensitivity study that assumed a 3-percent discount rate.
- The Revision 3 PRA results would reduce the averted risk benefits by about half. While this is a substantial reduction, it does not eliminate the generic concern that the benefits of additional hydrogen control are large.

The NRC has recognized that ice condenser containments like McGuire's are vulnerable to hydrogen burns in the absence of power to the hydrogen ignitor system. This issue is sufficiently important for all PWRs with ice condenser containments that NRC has made the issue a Generic Safety Issue (GSI), GSI-189 – Susceptibility of Ice Condenser and Mark III Containments to Early Failure from Hydrogen Combustion During a Severe Accident (NRC 2002b). As part of the resolution of GSI-189, NRC is evaluating potential improvements to hydrogen control provisions in ice condenser plants to reduce their vulnerability to hydrogen-related containment failures in SBO. This will include an assessment of the costs and benefits of supplying igniters from alternate power sources, such as a back-up generator, as well as containment analyses to establish whether air-return fans also need an ac-independent power source, as part of this modification. The need for plant design and procedural changes will be resolved as part of GSI-189 and addressed for McGuire and other ice condenser plants as a current operating license issue.

### 5.2.7 Conclusions

Duke completed a comprehensive effort to identify and evaluate potential cost-beneficial plant enhancements to reduce the risk associated with severe accidents at McGuire. As a result of this assessment, Duke concluded that no additional mitigation alternatives are cost-beneficial and warrant implementation at McGuire.

Based on its review of SAMAs for McGuire, the staff concurs that none of the candidate SAMAs are cost-beneficial with the possible exception of one SAMA related to hydrogen control in SBO events. This conclusion is consistent with the low level of risk indicated in the McGuire PRA and the fact that Duke has already implemented numerous plant improvements identified from previous plant-specific risk studies. Duke's position is that SAMAs that provide hydrogen control in SBO events are not cost-effective because back-up power would also need to be supplied to the air-return fans from ac-independent power sources in order to ensure mixing of the containment atmosphere; the cost of powering both the igniters and the air-return fans would exceed the expected benefit. However, based on available technical information, it is not clear that operation of an air-return fan is necessary to provide effective hydrogen control. If

## Environmental Impacts of Postulated Accidents

only the igniters need to be powered during SBO, a less-expensive option of powering a subset of igniters from a back-up generator, addressed by Duke in responses to RAIs (Duke 2002a; NRC 2002a), is within the range of averted risk benefits and would warrant further consideration. Even if air-return fans are judged to be necessary to ensure effective hydrogen control in SBOs, the results of sensitivity studies suggest that this combined SAMA might also be cost-beneficial.

The staff concludes that one of the SAMAs related to hydrogen control in SBO sequences (supplying existing hydrogen igniters with back-up power from an independent power source during SBO events) is cost-beneficial under certain assumptions, which are being examined in connection with resolution of GSI-189. However, this SAMA does not relate to adequately managing the effects of aging during the period of extended operation. Therefore, it need not be implemented as part of license renewal pursuant to 10 CFR Part 54. The need for plant design and procedural changes will be resolved as part of GSI-189 and addressed for McGuire and all other ice condenser plants as a current operating license issue.

### 5.3 References

- | 10 CFR Part 50. Code of Federal Regulations, Title 10, *Energy*, Part 50, "Domestic Licensing of Production and Utilization Facilities."
- | 10 CFR Part 51. Code of Federal Regulations, Title 10, *Energy*, Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions."
- | 10 CFR Part 54. Code of Federal Regulations, Title 10, *Energy*, Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants."
- | 10 CFR Part 100. Code of Federal Regulations, Title 10, *Energy*, Part 100, "Reactor Site Criteria."

Duke Power Company (Duke Power). 1991. Letter from T. C. McMeekin, DPC to NRC. Subject: Evaluation of the McGuire Units 1 and 2 Individual Plant Examination (IPE) – Internal Events, dated November 4, 1991.

Duke Power Company (Duke Power). 1994. Letter from T. C. McMeekin, DPC to NRC. Subject: Individual Plant Examination of External Events (IPEEE) Submittal, McGuire Nuclear Station, dated June 1, 1994.

Duke Energy Corporation (Duke). 1998. Probabilistic Risk Assessment, Individual Plant Examination, McGuire Nuclear Station, dated March 19, 1998.

# **Generic Environmental Impact Statement for License Renewal of Nuclear Plants**

## **Supplement 9**

### **Regarding Catawba Nuclear Station, Units 1 and 2**

## **Final Report**

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U.S. Nuclear Regulatory Commission  
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## Environmental Impacts of Postulated Accidents

1 The NRC has recognized that ice-condenser containments like Catawba's are vulnerable to  
2 hydrogen burns in the absence of power to the in-place hydrogen ignitor system. This is  
3 sufficiently important for all PWRs with ice-condenser containments that NRC has made the  
4 issue a Generic Safety Issue, GSI-189 - Susceptibility of Ice-Condenser and Mark III  
5 Containments to Early Failure from Hydrogen Combustion During a Severe Accident  
6 (NRC 2002b). As part of the resolution of GSI-189, NRC is evaluating potential improvements  
7 to hydrogen control provisions in ice-condenser plants to reduce their vulnerability to hydrogen-  
8 related containment failures in SBO. This will include an assessment of the costs and benefits  
9 of supplying igniters from alternate power sources, such as a back-up generator, as well as  
10 containment analyses to establish whether air-return fans also need an ac-independent power  
11 source, as part of this modification. The need for plant design and procedural changes will be  
12 resolved as part of GSI-189 and addressed for Catawba and other ice-condenser plants as a  
13 current operating license issue.

### 14 5.2.7 Conclusions

15 Duke completed a comprehensive effort to identify and evaluate potential cost-beneficial plant  
16 enhancements to reduce the risk associated with severe accidents at Catawba. As a result of  
17 this assessment, Duke concluded in the ER that no additional mitigation alternatives are cost-  
18 beneficial and warrant implementation at Catawba. Based on its review of SAMAs for Catawba,  
19 the staff concludes that two of the SAMAs are cost-beneficial under certain assumptions.  
20 These SAMAs involve installing a watertight wall around the 6900/4160 V transformers and  
21 providing back-up power to the hydrogen igniters for SBO events.

22 Based on the analyses presented, the staff concludes that installing a watertight wall around the  
23 transformer is cost-beneficial. However, as this SAMA does not relate to adequately managing  
24 the effects of aging during the period of extended operation, it need not be implemented as part  
25 of license renewal pursuant to 10 CFR Part 54. The staff intends to pursue this matter as a  
26 current operating license issue. By letter dated August 8, 2002, Duke committed to designing  
27 and scheduling the installation of flood protection for the 6900/4160 V transformers  
28 (Duke 2002c).

29 Duke's position, regarding the SAMA that would establish hydrogen control in SBO events by  
30 providing back-up power to igniters, is that this SAMA is not cost-effective because back-up  
31 power would need to be supplied to the air-return fans from ac-independent power sources in  
32 order to ensure mixing of the containment atmosphere, and the cost of powering both the  
33 igniters and the air-return fans would exceed the expected benefit. However, based on  
34 available technical information, it is not clear that operation of air-return fans is necessary to  
35 provide effective hydrogen control. If only the igniters need to be powered during SBO, a less-  
36 expensive option of powering a subset of igniters from a back-up generator, addressed by Duke  
37 in responses to RAIs (Duke 2002a; NRC 2002a), is within the range of the averted risk benefits

1 and would warrant further consideration. Even if air-return fans are judged to be necessary to  
2 ensure effective hydrogen control in SBOs, the results of sensitivity studies suggest that this  
3 combined SAMA might also be cost-beneficial.

4  
5 The staff concludes that the SAMA that would establish hydrogen control in SBO events by  
6 providing back-up power to igniters is cost-beneficial under certain assumptions, which are  
7 being examined in connection with resolution of GSI-189. However, this SAMA does not relate  
8 to adequately managing the effects of aging during the period of extended operation.  
9 Therefore, it need not be implemented as part of license renewal pursuant to 10 CFR Part 54.  
10 The need for plant design and procedural changes will be resolved as part of GSI-189 and  
11 addressed for Catawba and all other ice-condenser plants as a current operating license issue.  
12

### 13 5.3 References

14  
15 10 CFR Part 50, Code of Federal Regulations, Title 10, *Energy*, Part 50, "Domestic Licensing of  
16 Production and Utilization Facilities."

17  
18 10 CFR Part 51, Code of Federal Regulations, Title 10, *Energy*, Part 51, "Environmental  
19 Protection Regulations for Domestic Licensing and Related Regulatory Functions."

20  
21 10 CFR Part 54, Code of Federal Regulations, Title 10, *Energy*, Part 54, "Requirements for  
22 Renewal of Operating Licenses for Nuclear Power Plants."

23  
24 10 CFR Part 100, Code of Federal Regulations, Title 10, *Energy*, Part 100, "Reactor Site  
25 Criteria."

26  
27 Duke Energy Corporation (Duke). 2001a. *Applicant's Environmental Report—Operating*  
28 *License Renewal Stage Catawba Nuclear Station Units 1 and 2*. Charlotte, North Carolina.

29  
30 Duke Energy Corporation (Duke). 2001b. Probabilistic Risk Assessment Revision 2b, Catawba  
31 Nuclear Station, dated April 18, 2001.

32  
33  
34 Duke Energy Corporation (Duke). 2002a. Letter from M. S. Tuckman of Duke Energy  
35 Corporation to U.S. Nuclear Regulatory Commission. Subject: Response to Request for  
36 Additional Information in Support of the Staff Review of the Application to Renew The Facility  
37 Operating Licenses of McGuire Nuclear Station Units 1 and 2 and Catawba Nuclear Station  
38 Units 1 and 2, February 1, 2002.  
39

**Generic Environmental  
Impact Statement for  
License Renewal of  
Nuclear Plants**

**Supplement 12**

**Regarding  
Fort Calhoun Station, Unit 1**

**Final Report**

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## Postulated Accidents

external-event risk profile at Fort Calhoun Station, Unit 1, any additional benefits that might accrue due to external events would be relatively small.

- Risk-reduction and cost estimates were generally found to be conservative. As such, uncertainty in the costs of any of the contemplated SAMAs would not likely have the effect of making them cost-beneficial.
- Sensitivity calculations were performed with respect to the discount rate (as low as 3 percent) and various MACCS2 parameters, including evacuation speed, meteorological data, and fission-product release. Using the 3-percent discount rate, two additional SAMA candidates, SAMAs 4 and 54, were introduced as cost-beneficial. SAMA 4 was added to the list of SAMA improvements, while SAMA 54 was dismissed on other sound technical grounds. The results of the MACCS2 parameter sensitivity studies showed that none of the risk benefits were increased by more than about 10 percent. Since this is less than the margin between cost and benefit for the SAMAs considered, the uncertainties in these parameters would not alter the conclusions.

### 5.2.7 Conclusions

The OPPD compiled a list of 190 SAMA candidates using the SAMA analyses, as submitted in support of licensing activities for other nuclear power plants; NRC and industry documents discussing potential plant improvements; and the plant-specific insights from the OPPD IPE, IPEEE, and current PRA model. A qualitative screening removed SAMA candidates that (1) had already been implemented at Fort Calhoun Station, Unit 1, (2) modified features not applicable to Fort Calhoun Station, Unit 1, (3) would involve major plant design and/or structural changes that would clearly be well in excess of the MAB, (4) would provide only minimal risk reduction, or (5) duplicated other SAMAs or could be consolidated with one or more other SAMAs being considered. A total of 170 SAMA candidates was eliminated based on the above criteria, leaving 20 SAMA candidates for further evaluation.

Using guidance in NUREG/BR-0184 (NRC 1997b), the current PRA model, and a Level 3 analysis developed specifically for SAMA evaluation, an MAB of about \$784,000 was calculated, representing the total present-dollar-value equivalent associated with completely eliminating severe accidents at Fort Calhoun Station, Unit 1. Of the 20 SAMAs, 14 were screened from further evaluation because the implementation costs were greater than this MAB or exceeded twice the estimated benefit for that specific SAMA. The factor of 2 was used to account for uncertainties in the analysis and the potential impact of external events on the results of the SAMA evaluations. The end result was that six SAMA candidates were determined to be cost-beneficial. Upon completion of a 3-percent discount rate sensitivity study, one additional SAMA candidate was determined to be sufficiently cost-beneficial to be added to the list. The OPPD plans to implement these seven cost-beneficial SAMAs by 2005.



However, these SAMAs do not relate to adequately managing the effects of aging during the period of extended operation; therefore, they are not required as part of license renewal pursuant to 10 CFR Part 54.

The staff reviewed the OPPD analysis and concluded that the methods used and the implementation of those methods were sound. The treatment of SAMA benefits and costs; the generally large, negative net benefits; and the inherently small baseline risks support the general conclusion that the SAMA evaluations performed by the OPPD are reasonable and sufficient for the license renewal submittal. The unavailability of an external-event PRA model precluded a quantitative evaluation of SAMAs specifically aimed at reducing the risk of external-event initiators; however, significant improvements have been realized as a result of the IPEEE process at Fort Calhoun Station, Unit 1 that would minimize the likelihood of identifying cost-beneficial enhancements in this area.

Based on its review of the OPPD SAMA analyses, the staff concurs that, with the exception of the seven candidate SAMAs identified for implementation, none of the remaining candidate SAMAs are cost-beneficial. This is based on a conservative treatment of costs and benefits. This conclusion is consistent with the low residual level of risk indicated in the Fort Calhoun Station, Unit 1 PRA and the fact that Fort Calhoun Station, Unit 1 has already implemented plant improvements identified from the IPE and IPEEE process to reduce plant risk.

### 5.3 References

10 CFR Part 51. Code of Federal Regulations, Title 10, *Energy*, Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions."

10 CFR Part 54. Code of Federal Regulations, Title 10, *Energy*, Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants."

Gates, W. G. 1993. Letter from W. G. Gates, Vice-President, Omaha Public Power District, to Document Control Desk, U.S. Nuclear Regulatory Commission. Subject: "NRC Generic Letter 88-20 Submittal for Fort Calhoun Station, Individual Plant Examination for Severe Accident Vulnerabilities." December 1, 1993.

Kenyon, T. J. 2002a. Letter from T. J. Kenyon, U.S. Nuclear Regulatory Commission, to R. T. Ridenoure, Omaha Public Power District. Subject: "Request for Additional Information Related to the Staff's Review of Severe Accident Mitigation Alternatives for Ft. Calhoun." July 16, 2002.

Kenyon, T. J. 2002b. Note to Docket File from T. J. Kenyon, U.S. Nuclear Regulatory Commission. Subject: "Clarification to Omaha Public Power District's (OPPD's) Response to

NUREG-1437  
Supplement 13

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# **Generic Environmental Impact Statement for License Renewal of Nuclear Plants**

## **Supplement 13**

**Regarding  
H.B. Robinson Steam Electric Plant, Unit No. 2**

## **Final Report**

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CP&L estimated the cost of replacing the cast-iron RHR valve yokes (to increase their seismic capacity) to be \$105K with additional replacement power costs of \$240K to \$1.2M depending on the particular outage in which the replacement is performed. CP&L concluded that replacement of the cast-iron RHR valve yokes was not cost-beneficial because the benefits of averted offsite economic costs would be approximately \$40K based on the seismic hazard estimates provided in EPRI NP6395-D (NRC 2003). The staff estimated the potential contribution to CDF and large early release frequency (LERF) from seismically-induced failure of the valves to be about  $2 \times 10^{-6}$  per year based on Livermore seismic hazard estimates for the Robinson site reported in NUREG-1488 (NRC 1993), and estimates that elimination of the offsite costs associated with such a failure would have a benefit of approximately \$1M. Both the EPRI and Livermore hazard estimates are considered by the staff to be useful for decision making. The staff concludes that modification of the RHR valves to increase their seismic capacity would be cost-beneficial depending on the assumed seismic hazard estimates and the particular outage during which the modification would be implemented.

CP&L's evaluation of the radiant heat shield on the electrical conduit to the shutdown diesel generator showed a benefit of over \$150K and a cost of under \$50K. CP&L is evaluating possible designs for the radiant heat shield. The staff concludes that installation of the heat shield would be cost-beneficial.

### 5.2.6 Conclusions

The staff reviewed the CP&L SAMA analysis and concluded that the methods used and the implementation of those methods were sound. The treatment of SAMA benefits and costs, the generally large negative net benefits, and the inherently small baseline risks support the general conclusion that the SAMA evaluations performed by CP&L are reasonable and sufficient for the license renewal submittal. However, the staff identified two cost-beneficial SAMAs - modification of RHR valve yokes to reduce the risk from seismically-induced ISLOCAs and installation of a radiant heat shield on the dedicated shutdown diesel generator electrical conduit to reduce the risk from fire-induced SBO events.

Based on its review of the CP&L SAMA analysis, the staff concludes that none of the candidate SAMAs are cost-beneficial, except as noted above for the RHR valves and dedicated shutdown diesel generator conduit heat shield. This is based on conservative treatment of costs and benefits. This conclusion is consistent with the low residual level of risk indicated in the Robinson PSA and the fact that RNP has already implemented many plant improvements identified from the IPE and IPEEE process. The staff concludes that installation of the heat shield would be cost-beneficial, and that modification of the RHR valves to increase their seismic capacity would also be cost-beneficial depending on the assumed seismic hazard estimates and the particular outage during which the modification would be implemented.

## Postulated Accidents

However, these SAMAs do not relate to adequately managing the effects of aging during the period of extended operation. Therefore, they need not be implemented as part of license renewal pursuant to 10 CFR Part 54. CP&L is further evaluating these two SAMAs and has not made any commitment to implement them. NRC will further evaluate the need for implementation of these SAMAs as a current operating plant issue.

## 5.3 References

- | 10 CFR 50. Code of Federal Regulations, Title 10, *Energy*, Part 50, "Domestic Licensing of Production and Utilization Facilities."
- | 10 CFR 51. Code of Federal Regulations, Title 10, *Energy*, Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions."
- | 10 CFR 54. Code of Federal Regulations, Title 10, *Energy*, Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants."
- | 10 CFR 100. Code of Federal Regulations, Title 10, *Energy*, Part 100, "Reactor Site Criteria."

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# **Generic Environmental Impact Statement for License Renewal of Nuclear Plants**

## **Supplement 14**

### **Regarding R.E. Ginna Nuclear Power Plant**

## **Final Report**

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## Environmental Impacts of Postulated Accidents

The staff reviewed calculation methods and logic arguments used by RG&E in the final cost-benefit comparisons and agreed with their conclusion that two of the original approximately 200 SAMAs are cost beneficial.

### 5.2.6 Conclusions

The staff reviewed the SAMA analysis provided by RG&E and concluded that the methods used and the implementation of those methods were sound. The treatment of SAMA benefits and costs, the generally large negative net benefits, and the inherently small baseline risks support the general conclusion that the SAMA evaluations performed by RG&E are reasonable and sufficient for the license renewal submittal.

Based on its review of the RG&E SAMA analysis, the staff concludes that two of the candidate SAMAs are cost-beneficial. This is based on conservative treatment of costs and benefits. This conclusion is consistent with the low residual level of risk indicated in the Ginna PSA and the fact that Ginna has already implemented many plant improvements identified from the IPE and IPEEE process. Although two SAMA candidates appear to be cost beneficial, they do not relate to adequately managing the effects of aging during the period of extended operation. Therefore, they need not be implemented as part of the license renewal pursuant to 10 CFR Part 54. RG&E stated that it will consider implementation of these SAMAs through its current plant change process.

### 5.3 References

10 CFR Part 50. Code of Federal Regulations, Title 10, *Energy*, Part 50, "Domestic Licensing of Production and Utilization Facilities."

10 CFR Part 51. Code of Federal Regulations, Title 10, *Energy*, Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions."

10 CFR Part 54. Code of Federal Regulations, Title 10, *Energy*, Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants."

10 CFR Part 100. Code of Federal Regulations, Title 10, *Energy*, Part 100, "Reactor Site Criteria."

Rochester Gas & Electric Corporation (RG&E). 1994. Letter from R. C. Mecredy, RG&E, to the U.S. Nuclear Regulatory Commission. Subject: Generic Letter 88-20. March 15, 1994.

# **Generic Environmental Impact Statement for License Renewal of Nuclear Plants**

## **Supplement 16**

### **Regarding Quad Cities Nuclear Power Station, Units 1 and 2**

## **Final Report**

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from further consideration. Therefore, Exelon's final conclusion was that there were no cost-beneficial SAMAs (Exelon 2003b).

The staff reviewed Exelon's calculation methods and logic arguments in the final cost-benefit comparisons and concluded that Exelon's original benefit estimates should be increased by a factor of 10 to fully account for the potential impact of uncertainties and external events, especially fires. As a result, the staff concluded that four SAMAs were cost-beneficial: SAMA 6, develop procedures for locally starting equipment during a 125-V DC bus failure; SAMA 8, develop procedures to control feedwater flow without 125-V DC power; SAMA 10, develop procedures to terminate reactor depressurization at a high enough pressure to keep the reactor core isolation cooling system operable; and SAMA 14, develop procedures to control containment venting within a narrow band of pressure. The staff concluded that two additional SAMAs could be cost-beneficial if a more detailed evaluation of the external events benefits or the uncertainties were performed: SAMA 1, develop procedures to provide alternate safe shutdown makeup pump room cooling; and SAMA 2, develop procedures to use the fire protection system as a source of water for the drywell spray system. The numbered SAMAs (1 through 17) are the 17 SAMAs that were included in the final cost-benefit analysis after Exelon increased the benefit estimates by a factor of five in response to staff RAIs.

## 5.2.6 Conclusions

The staff reviewed the Exelon SAMA analysis and concluded that the methods used and the implementation of those methods were sound. The treatment of SAMA benefits and costs, the generally large negative net benefits, and the inherently small baseline risks support the general conclusion that the SAMA evaluations performed by Exelon are reasonable and sufficient for the license renewal submittal. However, the staff concluded that four SAMAs were cost-beneficial: SAMA 6, develop procedures for locally starting equipment during a 125-V DC bus failure; SAMA 8, develop procedures to control feedwater flow without 125-V DC power; SAMA 10, develop procedures to terminate reactor depressurization at a high enough pressure to keep the reactor core isolation cooling system operable; and SAMA 14, develop procedures to control containment venting within a narrow band of pressure. The staff concluded that two additional SAMAs could be cost-beneficial if a more detailed evaluation of the external events benefits or the uncertainties were performed: SAMA 1, develop procedures to provide alternate safe shutdown makeup pump room cooling; and SAMA 2, develop procedures to use the fire protection system as a source of water for the drywell spray system. However, none of the six SAMAs relate to adequately managing the effects of aging during the period of extended operation. Therefore, they need not be implemented as part of license renewal pursuant to 10 CFR Part 54.

The staff concludes that none of the other candidate SAMAs are cost-beneficial. This conclusion is consistent with the low residual level of risk indicated in the Quad Cities PRA and



## Postulated Accidents

the fact that Quad Cities has already implemented many plant improvements identified from the IPE and IPEEE process.

## 5.3 References

- | 10 CFR Part 50. Code of Federal Regulations, Title 10, *Energy*, Part 50, "Domestic Licensing of Production and Utilization Facilities."
- | 10 CFR Part 51. Code of Federal Regulations, Title 10, *Energy*, Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions."
- | 10 CFR Part 54. Code of Federal Regulations, Title 10, *Energy*, Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants."
- | 10 CFR Part 100. Code of Federal Regulations, Title 10, *Energy*, Part 100, "Reactor Site Criteria."
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- | Exelon Generation Company, LLC (Exelon). 2003a. *Applicant's Environmental Report—Operating License Renewal Stage, Quad Cities Nuclear Power Station Units 1 and 2*. License Nos. DPR-29 and DPR-30. Exelon Generation Company, LLC. Warrenville, Illinois. January 2003.
- | Exelon Generation Company, LLC (Exelon). 2003b. Letter from Jeffrey A. Benjamin, Exelon, to U.S. Nuclear Regulatory Commission. Subject: Quad Cities Nuclear Power Station, Units 1 and 2, Facility Operating License Nos. DPR-29 and DPR-30, NRC Docket Nos. 50-254 and 50-265, Response to Request for Additional Information—License Renewal Environmental Report for Quad Cities Nuclear Power Station, Units 1 and 2. July 17, 2003.
- | U.S. Nuclear Regulatory Commission. 1996. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants*. NUREG-1437, Volumes 1 and 2, Washington, D.C., 1996.

**Generic Environmental  
Impact Statement for  
License Renewal of  
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**Supplement 17**

**Regarding  
Dresden Nuclear Power Station, Units 2 and 3**

**Final Report**

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events analysis appropriately represent the potential (realistic) benefit rather than the maximum benefit, and revised the estimated averted costs and implementation costs accordingly. As a result of this reassessment, the cost-benefit analysis showed that none of the candidate SAMAs were cost-beneficial. Therefore, Exelon's final conclusion was that there were no cost-beneficial SAMAs (Exelon 2003b).

The staff reviewed Exelon's calculation methods and logic arguments in the final cost-benefit comparisons and concluded that Exelon's original benefit estimates should be increased by a factor of five to account for the potential impact of external events. Based on this evaluation, and the use of realistic estimates of averted costs and implementation costs, none of the SAMAs appear to be cost-beneficial. However, two SAMAs could be cost-beneficial given a more detailed evaluation of the external events benefits or when uncertainties are taken into account: SAMA 3b, development of procedures to use a cross connect to the other unit's low pressure coolant injection system as an alternate source of water for containment spray; and SAMA 11, procedural changes to align low pressure coolant injection or core spray to the condensate storage tank on loss of suppression pool cooling.

#### 5.2.6 Conclusions

The staff reviewed the Exelon SAMA analysis and concluded that the methods used and the implementation of those methods were sound. The treatment of SAMA benefits and costs, the generally large negative net benefits, and the inherently small baseline risks support the general conclusion that the SAMA evaluations performed by Exelon are reasonable and sufficient for the license renewal submittal. However, the staff concluded that two SAMAs could be cost-beneficial given a more detailed evaluation of the external events benefits or when uncertainties are taken into account: SAMA 3b, development of procedures to use a cross connect to the other unit's low pressure coolant injection system as an alternate source of water for containment spray; and SAMA 11, procedural changes to align low pressure coolant injection or core spray to the condensate storage tank on loss of suppression pool cooling. However, these SAMAs do not relate to adequately managing the effects of aging during the period of extended operation. Therefore, they need not be implemented as part of license renewal pursuant to 10 CFR Part 54. Exelon has not made any commitment to implement these two SAMAs.

The staff concludes that none of the other candidate SAMAs are cost-beneficial. This conclusion is consistent with the low residual level of risk indicated in the Dresden PRA and the fact that Dresden has already implemented many plant improvements identified from the IPE and IPEEE process.

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# **Generic Environmental Impact Statement for License Renewal of Nuclear Plants**

## **Supplement 18**

### **Regarding Joseph-M. Farley Nuclear Plant, Units 1 and 2**

## **Final Report**

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### 5.2.5 Cost-Benefit Comparison

The cost-benefit analysis performed by SNC was based primarily on NUREG/BR-0184 (NRC 1997b) and was executed consistent with this guidance. The total benefit associated with each of the 21 SAMAs was evaluated by SNC. These values were determined for the various averted costs based on the estimated annual reductions in CDF and person-rem dose. Based on a revised assessment (SNC 2004a), the estimated benefits were then tripled to account for additional risk reduction in external events.

In response to an RAI, SNC considered the uncertainties associated with the internal events CDF. Since SNC does not currently have an uncertainty analysis for the Farley PRA, SNC estimated the uncertainty distribution by reviewing representative distributions for similar plants (SNC 2004a). To provide an upper bound estimate of the uncertainties in the CDF for internal and external events, the baseline benefit, which includes a factor of three for external events, was increased by an additional factor of two, yielding an MAB of \$4.2M. As a result, SNC found three of the 21 SAMAs to be potentially cost beneficial:

- SAMA 7: Increase the charging pump lube oil capacity by adding a supplemental lube oil reservoir for each charging pump;
- SAMA 11: Use existing hydro test pump for reactor coolant pump (RCP) seal injection;
- SAMA S166: Proceduralize local manual operation of auxiliary feedwater (AFW) when control power is lost.

In addition to the above SAMAs, the staff questioned SNC about lower cost alternatives to some of the SAMAs evaluated, including the use of portable battery chargers and a direct-drive diesel AFW pump (NRC 2003). In response (SNC 2004b), SNC estimated that the costs for each of these modifications would easily exceed the \$500,000 estimated benefit. Based on these estimates, SNC concluded that neither of these alternatives would be cost beneficial. The staff concurs with SNC's conclusion.

The staff concludes that, with the exception of the three potentially cost-beneficial SAMAs, the costs of the SAMAs would be higher than the associated benefits. This conclusion is supported by uncertainty assessment and sensitivity analysis. Risk reduction and cost estimates were found to be reasonable, and generally conservative.

### 5.2.6 Conclusions

The staff reviewed SNC's SAMA analysis and concluded that the methods used and the implementation of those methods were sound. Based on its review of the SNC SAMA analysis, the staff concurs that out of the 124 candidate SAMAs only SAMAs 7, 11 and 166 are potentially cost beneficial. This is based on conservative treatment of costs and benefits. This

## Environmental Impacts of Postulated Accidents

conclusion is consistent with the low residual level of risk indicated in the Farley PRA and the fact that Farley has already implemented all of the plant improvements identified from the IPE and IPEEE processes. Given the potential risk reduction and the relatively modest implementation costs of the three SAMAs identified above, the staff concludes that further evaluation to determine whether the SAMAs are cost beneficial. In response to an RAI, SNC stated that it planned to implement SAMA S166 (SNC has since implemented this SAMA), and will evaluate SAMAs 7 and 11 for implementation (SNC 2004b). However, these SAMAs do not relate to adequately managing the effects of aging during the period of extended operation. Therefore, they need not be implemented as part of license renewal pursuant to 10 CFR Part 54.

### 5.3 References

10 CFR 50. Code of Federal Regulations, Title 10, *Energy*, Part 50, "Domestic Licensing of Production and Utilization Facilities."

10 CFR 51. Code of Federal Regulations, Title 10, *Energy*, Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions."

10 CFR 54. Code of Federal Regulations, Title 10, *Energy*, Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants."

10 CFR 100. Code of Federal Regulations, Title 10, *Energy*, Part 100, "Reactor Site Criteria."

Southern Nuclear Operating Company (SNC). 1993. Letter from J.D. Woodard (SNC) to U.S. NRC Document Control Desk. Subject: *Joseph M. Farley Nuclear Plant, Results of Individual Plant Examination for Severe Accident Vulnerabilities (Generic Letter 88-20)*, June 14, 1993.

Southern Nuclear Operating Company (SNC). 1995. Letter from D. Morey (SNC) to U.S. NRC Document Control Desk. Subject: *Joseph M. Farley Nuclear Plant, Generic Letter 88-20, Supplement 4, "Individual Plant Examination for External Events for Severe Accident Vulnerabilities,"* June 28, 1995.

Southern Nuclear Operating Company (SNC). 2003. *Joseph M. Farley Nuclear Plant Application for License Renewal, Appendix D—Applicant's Environmental Report*. Birmingham, Alabama.

Southern Nuclear Operating Company (SNC). 2004a. Letter from L.M. Stinson, SNC, to U.S. NRC Document Control Desk. Subject: *Joseph M. Farley Nuclear Plant Units 1 and 2, Application for License Renewal, December 12, 2003, Requests for Additional Information*, February 26, 2004.

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Supplement 19

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# **Generic Environmental Impact Statement for License Renewal of Nuclear Plants**

## **Supplement 19**

### **Regarding Arkansas Nuclear One, Unit 2**

#### **Final Report**

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## Postulated Accidents

The staff reviewed Entergy's bases for calculating the risk reduction for the various plant improvements and concluded that the rationale and assumptions for estimating risk reduction were reasonable and generally conservative. Therefore, the staff based its estimates of averted risk for the various SAMAs on Entergy's risk reduction estimates. However, the staff concluded that the benefit estimates should be increased by a factor of five to account for the potential impacts of external events.

The staff reviewed the cost estimates and concluded that the cost ranges provided by Entergy were reasonable and appropriate for use in the SAMA evaluation.

### 5.2.5 Cost-Benefit Comparison

For the 93 candidate SAMAs identified through the screening process, a more detailed assessment and cost estimate were developed. Entergy applied a multiplier of two to the averted cost estimates (for internal events) for each SAMA to account for external events. As a result of this assessment, the cost-benefit analysis showed that none of the candidate SAMAs were cost-beneficial. Therefore, Entergy concluded that there were no cost-beneficial SAMAs (Entergy 2004).

The staff reviewed Entergy's calculation methods and logic arguments in the final cost-benefit comparisons and concluded that Entergy's original benefit estimates should be increased by a factor of five to account for the potential impact of external events. Based on this evaluation, and the use of more realistic estimates of risk reduction and/or implementation costs, two of the SAMAs appear to be cost-beneficial: SAMA AC/DC-16, which involves development of procedures to emphasize the steps in plant recovery following station blackout, and SAMA CW-06, which involves procedural changes to shed component cooling water (CCW) loads to extend the CCW heat-up time in the event of a loss of essential raw cooling water. Additionally, two SAMAs could be cost-beneficial when uncertainties are taken into account. These SAMAs involve (1) installing backwash filters in place of the existing raw cooling water system strainers (SAMA CW-27) and (2) replacing either containment sump valve 2CV-5649-1 or 2CV-5650-2 with an air-operated valve (SAMA CC-20).

### 5.2.6 Conclusions

The staff reviewed the Entergy SAMA analysis and concluded that the methods used and the implementation of those methods were sound. The treatment of SAMA benefits and costs, the generally large negative net benefits, and the inherently small baseline risks support the general conclusion that the SAMA evaluations performed by Entergy are reasonable and sufficient for the license renewal submittal. However, the staff concluded that two SAMAs appear to be cost-beneficial: SAMA AC/DC-16, development of procedures to emphasize the steps in plant recovery following station blackout; and SAMA CW-06, procedural changes to



shed CCW loads to extend the CCW heat-up time in the event of a loss of essential raw cooling water. Additionally, two SAMAs could be cost-beneficial when uncertainties are taken into account: (1) SAMA CW-27, installation of backwash filters in place of the existing raw cooling water system strainers, and (2) SAMA CC-20, replacing either containment sump valve 2CV-5649-1 or 2CV-5650-2 with an air-operated valve. However, these SAMAs do not relate to adequately managing the effects of aging during the period of extended operation. Therefore, they need not be implemented as part of license renewal pursuant to 10 CFR Part 54. Entergy has not made any commitment to implement these SAMAs.

The staff concludes that none of the other candidate SAMAs are cost-beneficial. This conclusion is consistent with the low residual level of risk indicated in the ANO-2 PSA and the fact that ANO-2 has already implemented many plant improvements identified from the IPE and IPEEE process.

### 5.3 References

10 CFR Part 50. Code of Federal Regulations, Title 10, *Energy*, Part 50, "Domestic Licensing of Production and Utilization Facilities."

10 CFR Part 51. Code of Federal Regulations, Title 10, *Energy*, Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions."

10 CFR Part 54. Code of Federal Regulations, Title 10, *Energy*, Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants."

10 CFR Part 100. Code of Federal Regulations, Title 10, *Energy*, Part 100, "Reactor Site Criteria."

Entergy Operations, Inc. (Entergy). 1992. Letter from Entergy to NRC Document Control Desk. Subject: Arkansas Nuclear One, Units 1 and 2, Results of Individual Plant Examination for Severe Accident Vulnerabilities (Generic Letter 88-20), August 1992.

Entergy Operations, Inc. (Entergy). 1996. Letter from Entergy to NRC Document Control Desk. Subject: Arkansas Nuclear One, Units 1 and 2, Generic Letter 88-20, Supplement 4, "Individual Plant Examination for External Events for Severe Accident Vulnerabilities," May 31, 1996.

Entergy Operations, Inc. (Entergy). 2003. *Applicant's Environmental Report – Operating License Renewal Stage, Arkansas Nuclear One, Unit 2*. Russellville, Arkansas. October 2003.

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**Generic Environmental  
Impact Statement for  
License Renewal of  
Nuclear Plants**

**Supplement 20**

**Regarding  
Donald C. Cook Nuclear Plant, Units No. 1 and 2**

**Final Report**

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## Environmental Impacts of Operation

- Minimize Consequences of AC Bus Failures,
- Improve Recovery from ISLOCA Events.

The staff questioned the use of a factor of two to account for uncertainties in the evaluation, and requested additional justification (NRC 2004). In its response, I&M considered the uncertainties associated with the calculated CDF and the impact of other analysis assumptions on the results of the SAMA assessment, and provided additional justification for its use of a factor of two to account for the evaluation uncertainties. The staff concludes that the use of the factor of two to account for uncertainties, coupled with the fact that the calculated benefits and the estimated implementation costs are generally conservative, provides a reasonable treatment of uncertainties and is adequate for the SAMA evaluation.

The staff concludes that, with the exception of the potentially cost-beneficial SAMAs identified in five different areas, the costs of the SAMAs would be higher than the associated benefits. This conclusion is supported by uncertainty assessment and sensitivity analysis.

One of the potentially cost-beneficial SAMAs involves providing a backup AC power source for the distributed hydrogen ignition system. The NRC staff is currently evaluating a potential requirement for a similar enhancement as part of the resolution of Generic Safety Issue 189 (GSI-189), "Susceptibility of Ice Condenser and Mark III Containments to Early Failure from Hydrogen Combustion During a Severe Accident."

### 5.2.6 Conclusions

The staff reviewed I&M's SAMA analysis and concluded that the methods used and the implementation of those methods were sound. Based on its review of the I&M SAMA analysis, the staff concurs that out of the 194 candidate SAMAs, there are five areas in which risk may be further reduced in a cost-beneficial manner through the implementation of a subset of the 16 identified potentially cost-beneficial SAMAs. Given the potential for cost-beneficial risk reduction in these five areas, the staff agrees with I&M that further evaluation of these SAMAs by I&M is warranted. However, none of the potentially cost-beneficial SAMAs relate to adequately managing the effects of aging during the period of extended operation. Therefore, they need not be implemented as part of license renewal pursuant to 10 CFR Part 54.

## 5.3 References

10 CFR Part 50. Code of Federal Regulations, Title 10, *Energy*, Part 50, "Domestic Licensing of Production and Utilization Facilities."

10 CFR Part 51. Code of Federal Regulations, Title 10, *Energy*, Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions."

# **Generic Environmental Impact Statement for License Renewal of Nuclear Plants**

## **Supplement 22**

### **Regarding Millstone Power Station, Units 2 and 3**

## **Final Report**

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## Environmental Impacts of Postulated Accidents

As stated in the ER, Dominion is addressing SAMA 3 as part of a comprehensive industry initiative in response to Generic Safety Issue 23, "Reactor Coolant Pump Seal Failure." The

SAMA is being addressed as a current operating license issue and is anticipated to be implemented before the period of extended operation (Dominion 2004a).

In response to an RAI, Dominion assessed the applicability and feasibility for Unit 2 of several SAMAs considered by another Combustion Engineering plant. As a result, Dominion eliminated all of the SAMAs in question except one—adding a capability to flash the field on the emergency diesel generator (EDG) using a portable generator to enhance SBO event recovery. Dominion stated that this SAMA is not expected to be cost beneficial because it would likely require a plant modification to install a disconnect to allow the connection of a portable generator, as well as development of a new SAMG. However, Dominion stated that if this SAMA can be accomplished via a SAMG without a hardware modification, the SAMA could be cost-beneficial and will be implemented prior to the period of extended operation (Dominion 2004b).

For Unit 3, Dominion identified no cost-beneficial SAMAs. In response to an RAI regarding the costs of SAMA 112 (proceduralize local manual operation of AFW when control power is lost), Dominion assessed the applicability and feasibility of a procedure for manual operation of the turbine-driven AFW pump when control power is lost. Dominion stated that this SAMA would likely require a plant modification to provide the level indication that would be necessary during SBO, in addition to a new procedure. However, Dominion stated that if this SAMA can be accomplished via a SAMG, without a hardware modification, then the SAMA could be cost beneficial and will be implemented prior to the period of extended operation (Dominion 2004b).

The staff concludes that, with the exception of the one cost-beneficial SAMA (SAMA 3 for Unit 2) and the two SAMAs that would be cost-beneficial if they can be implemented by SAMG changes without hardware modifications, the costs of the SAMAs would be higher than the associated benefits. This conclusion is supported by uncertainty assessment and sensitivity analysis.

### 5.2.6 Conclusions

The staff reviewed the Dominion analyses and concluded that the methods used and the implementation of those methods were sound. The treatment of SAMA benefits and costs, the generally large negative net benefits, and the inherently small baseline risks support the general conclusion that the SAMA evaluations performed by Dominion are reasonable and sufficient for the license renewal submittal.

Based on its review of the Dominion SAMA analysis, the staff concludes that none of the candidate SAMAs are cost-beneficial, except for SAMA 3 for Unit 2. Two additional SAMAs, one SAMA involving adding a capability to flash the field on the EDG using a portable generator to enhance SBO event recovery on Unit 2 and SAMA 112 (proceduralize local manual operation of AFW when control power is lost) on Unit 3, are potentially cost beneficial if they can be implemented by a SAMG without hardware modifications. This is based on conservative treatment of costs and benefits. This conclusion is consistent with the low residual level of risk indicated in the PRA for both units and the fact that Millstone has already implemented many of the plant improvements identified from the IPE and IPEEE processes.

Dominion plans to implement SAMA 3 on Unit 2 before the period of extended operation (Dominion 2004a). The other two SAMAs will be implemented prior to the period of extended operation if they can be accomplished as discussed above (Dominion 2004b). None of these SAMAs relate to adequately managing the effects of aging during the period of extended operation. Therefore, they need not be implemented as part of license renewal pursuant to 10 CFR Part 54.

### 5.3 References

10 CFR Part 50. Code of Federal Regulations, Title 10, *Energy*, Part 50, "Domestic Licensing of Production and Utilization Facilities."

10 CFR Part 51. Code of Federal Regulations, Title 10, *Energy*, Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions."

10 CFR Part 54. Code of Federal Regulations, Title 10, *Energy*, Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants."

10 CFR Part 100. Code of Federal Regulations, Title 10, *Energy*, Part 100, "Reactor Site Criteria."

Dominion Nuclear Connecticut, Inc. (Dominion). 2004a. *Applicant's Environmental Report—Operating License Renewal Stage, Millstone Power Station, Units 2 and 3*. Dominion Nuclear Connecticut, Inc., Richmond, Virginia. January 2004.

Dominion Nuclear Connecticut, Inc. (Dominion). 2004b. Letter from Leslie N. Hartz, Dominion, to United States Nuclear Regulatory Commission (NRC) Document Control Desk. Subject: Millstone Power Station, Units 2 and 3, Response to Request for Additional Information, License Renewal Applications. (August 13, 2004).

# **Generic Environmental Impact Statement for License Renewal of Nuclear Plants**

## **Supplement 23**

### **Regarding Point Beach Nuclear Plant Units 1 and 2**

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## Environmental Impacts of Postulated Accidents

The staff has reviewed NMC's calculation methods and assumptions and concluded that they were sound. Based on this evaluation, none of the SAMAs are cost-beneficial in the baseline analysis. However, the staff has concluded that one SAMA could be cost-beneficial when uncertainties or alternative discount rates are taken into account. This SAMA involves providing a portable generator to power the auxiliary feedwater turbine after battery depletion (SAMA 169).

The staff concludes that, with the exception of this SAMA, the costs of implementing the SAMAs would be higher than the associated benefits. This conclusion is supported by uncertainty assessment and sensitivity analysis.

### 5.2.6 Conclusions

The staff has reviewed the NMC analysis and concluded that the methods used and the implementation of those methods were sound. The treatment of SAMA benefits and costs, the generally large negative net benefits, and the inherently small baseline risks support the general conclusion that the SAMA evaluations performed by NMC are reasonable and sufficient for the license renewal submittal.

Although none of the SAMAs appear cost-beneficial in the baseline analysis, the staff has concluded that one SAMA could be cost-beneficial when uncertainties or alternative discount rates are taken into account. This SAMA involves providing a portable generator to power the auxiliary feedwater turbine after battery depletion (SAMA 169). However, this SAMA does not relate to adequately managing the effects of aging during the period of extended operation. Therefore, it need not be implemented as part of license renewal pursuant to 10 CFR Part 54.

The staff concludes that none of the other candidate SAMAs is cost-beneficial. This conclusion is consistent with the low residual level of risk indicated in the PRA for both units and the fact that PBNP has already implemented many of the plant improvements identified from the IPE and IPEEE processes.

## 5.3 References

10 CFR Part 50. Code of Federal Regulations, Title 10, *Energy*, Part 50, "Domestic Licensing of Production and Utilization Facilities."

10 CFR Part 51. Code of Federal Regulations, Title 10, *Energy*, Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions."

10 CFR Part 54. Code of Federal Regulations, Title 10, *Energy*, Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants."



# **Generic Environmental Impact Statement for License Renewal of Nuclear Plants**

## **Supplement 24**

### **Regarding Nine Mile Point Nuclear Station, Units 1 and 2**

#### **Final Report**

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### 5.2.6 Conclusions

The staff reviewed the NMPNS analyses and concluded that the methods used and the implementation of those methods were sound. The treatment of SAMA benefits and costs, the generally large negative net benefits, and the inherently small baseline risks support the general conclusion that the SAMA evaluations performed by NMPNS are reasonable and sufficient for the license renewal submittal. The inclusion of external events afforded the quantitative evaluation of SAMAs specifically aimed at reducing risk from external events.

Based on its review of the NMPNS SAMA analysis, the staff concurs with NMPNS's identification of areas in which risk can be further reduced in a cost-beneficial manner through the implementation of all or a subset of the identified, potentially cost-beneficial SAMAs. Given the potential for cost-beneficial risk reduction, the staff agrees that further evaluation of these SAMAs by NMPNS is warranted. However, none of the potentially cost-beneficial SAMAs relate to adequately managing the effects of aging during the period of extended operation. Therefore, they need not be implemented as part of the license renewal pursuant to 10 CFR Part 54.

### 5.3 References

10 CFR Part 50. Code of Federal Regulations, Title 10, *Energy*, Part 50, "Domestic Licensing of Production and Utilization Facilities."

10 CFR Part 51. Code of Federal Regulations, Title 10, *Energy*, Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions."

10 CFR Part 54. Code of Federal Regulations, Title 10, *Energy*, Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants."

10 CFR Part 100. Code of Federal Regulations, Title 10, *Energy*, Part 100, "Reactor Site Criteria."

Niagara Mohawk Power Corporation (NMPC). 1992. Letter from J. F. Firlit, NMPC, to U.S. Nuclear Regulatory Commission Document Control Desk. Subject: *Nine Mile Point Unit 2, Docket No. 50-410, NPF-69, Individual Plant Examination (IPE) Final Report*. July 30, 1992.

Niagara Mohawk Power Corporation (NMPC). 1993. Letter from C. D. Terry, NMPC, to U.S. Nuclear Regulatory Commission Document Control Desk. Subject: *Nine Mile Point Unit 1, Docket No. 50-220, DPR-63, Individual Plant Examination, Generic Letter 88-20*. July 27, 1993.

Niagara Mohawk Power Corporation (NMPC). 1995. Letter from C. D. Terry, NMPC, to U.S. Nuclear Regulatory Commission Document Control Desk. Subject: *Nine Mile Point Unit 2, Docket No. 50-410, NPF-69, Individual Plant Examination of External Events (IPEEEs) Severe*

# **Generic Environmental Impact Statement for License Renewal of Nuclear Plants**

## **Supplement 25**

### **Regarding Brunswick Steam Electric Plant, Units 1 and 2**

## **Final Report**

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Manuscript Completed: March 2006  
Date Published: April 2006

Division of License Renewal  
Office of Nuclear Reactor Regulation  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555-0001



## 5.2.6 Conclusions

The staff reviewed CP&L's analysis and concluded that the methods used and the implementation of those methods were sound. The treatment of SAMA benefits and costs support the general conclusion that the SAMA evaluations performed by CP&L are reasonable and sufficient for the license renewal submittal. Although the treatment of SAMAs for external events was somewhat limited by the unavailability of an external event PSA, the likelihood of there being cost-beneficial enhancements in this area was minimized by (1) including several candidate SAMAs related to dominant fire events, (2) implementing plant improvements as a result of the IPEEE process, and (3) increasing the estimated SAMA benefits for internal events by a factor of two to account for potential benefits in external events.

The cost-benefit analyses showed that seven of the SAMA candidates were potentially cost-beneficial in the baseline analysis (SAMAs 1, 15, 17, 19, 25, 29, and 36). CP&L performed additional analyses to evaluate the impact of parameter choices and uncertainties on the results of the SAMA assessment. As a result, eight additional SAMAs were identified as potentially cost-beneficial (SAMAs 6, 13, 16, 18, 30, 31, 32, and 34). CP&L has committed to further evaluate SAMA 1 and SAMAs that may remain potentially cost-beneficial if SAMA 1 is implemented (SAMAs 6, 15, 16, 17, 18, 25, 29, 30, 31, 32, and 34). The staff concluded all of these SAMAs are potentially cost-beneficial. In addition, the staff concluded that SAMAs 13, 19, and 36 are potentially cost-beneficial and may remain so even if SAMA 1 is implemented.

Based on its review of the SAMA analysis, the staff concurs with CP&L's identification of areas in which risk can be further reduced in a cost-beneficial manner through the implementation of all or a subset of the identified, potentially cost-beneficial SAMAs. Given the potential for cost-beneficial risk reduction, the staff agrees that further evaluation of these SAMAs by CP&L is warranted. However, none of the potentially cost-beneficial SAMAs identified relate to adequately managing the effects of aging during the term of extended operation. Therefore, they need not be implemented as part of the license renewal pursuant to 10 CFR Part 54.

## 5.3 References

10 CFR 50. Code of Federal Regulations, Title 10, *Energy*, Part 50, "Domestic Licensing of Production and Utilization Facilities."

10 CFR 51. Code of Federal Regulations, Title 10, *Energy*, Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions."

10 CFR 54. Code of Federal Regulations, Title 10, *Energy*, Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants."

**Generic Environmental  
Impact Statement for  
License Renewal of  
Nuclear Plants**

**Supplement 26**

**Regarding  
Monticello Nuclear Generating Plant**

**Final Report**

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**Manuscript Completed: August 2006  
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**Division of License Renewal  
Office of Nuclear Reactor Regulation  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555-0001**



## Environmental Impacts of Postulated Accidents

- SAMA 28—develop a procedure to refill the condensate storage tank with fire service water system.
- SAMA 37—develop guidance to allow local, manual control for reactor core isolation cooling system operation.

Since the ER was submitted, NMC has implemented the six recommended SAMAs (SAMAs 2, 11, 12, 28, 36, and 37), and has reassessed the value of the remaining SAMAs. Implementation of the six recommended SAMAs reduces the benefit of the remaining SAMAs (including SAMA 9, which was identified as a result of the uncertainty analysis), such that only one SAMA that has not been implemented yet, remains potentially cost-beneficial. SAMA 16 (passive overpressure relief for containment) becomes even more cost-beneficial because the set of SAMAs implemented by NMC shifts the risk to categories influenced by containment venting, which could be mitigated by SAMA 16. NMC stated that the improvement is being pursued to determine if cost-effective modifications can be implemented (NMC 2005b).

The staff concludes that, with the exception of the one potentially cost-beneficial SAMA discussed above, the costs of the SAMAs evaluated would be higher than the associated benefits.

### 5.2.6 Conclusions

The staff reviewed NMC's analysis and concluded that the methods used and the implementation of those methods were sound. The treatment of SAMA benefits and costs support the general conclusion that the SAMA evaluations performed by NMC are reasonable and sufficient for the license renewal submittal. Although the treatment of SAMAs for external events was somewhat limited by the unavailability of an external event PSA, the likelihood of there being cost-beneficial enhancements in this area was minimized by including several candidate SAMAs related to dominant fire events, and increasing the estimated SAMA benefits for internal events by a factor of two to account for potential benefits in external events.

Based on its review of the SAMA analysis, and on the implementation of the six recommended low-cost SAMAs by NMC, the staff concurs with NMC's identification of areas in which risk can be further reduced in a cost-beneficial manner through the implementation of one potentially cost-beneficial SAMA. Given the potential for cost-beneficial risk reduction, the staff agrees that further evaluation of this SAMA by NMC is warranted. However, this potentially cost-beneficial SAMA does not relate to adequately managing the effects of aging during the period of extended operation. Therefore, it need not be implemented as part of the license renewal pursuant to 10 CFR Part 54.

# **Generic Environmental Impact Statement for License Renewal of Nuclear Plants**

## **Supplement 27**

### **Regarding Palisades Nuclear Plant**

#### **Final Report**

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Manuscript Completed: October 2006  
Date Published: October 2006

**Division of License Renewal  
Office of Nuclear Reactor Regulation  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555-0001**



## Environmental Impacts of Operation

NMC noted in its ER that while the above results are believed to accurately reflect areas for improvement at the plant, additional engineering reviews are necessary to determine ultimate implementation. NMC stated that it will implement or continue to consider the six SAMAs identified in the analysis through the appropriate Palisades design process (SAMAs 3, 10, 13, 16, 22, and 23). In response to requests for additional information by the NRC staff (NMC 2005b, 2005c), NMC also committed to further evaluate possible lower cost alternatives for two SAMAs originally eliminated in the Phase 1 screening analysis (SAMAs 1 and 18), and to further evaluate two additional SAMAs determined to be applicable to Palisades but not yet evaluated by NMC (adding capability to flash the field on the EDG and replacing an existing air-operated containment sump valve with a motor-operated valve). NMC has entered these 10 potentially cost-beneficial items into the Palisades corrective action system for further review. If determined to be cost-beneficial, these alternatives will be evaluated for possible implementation in accordance with Palisades plant design processes.

The NRC staff, therefore, concludes that with the exception of the 10 potentially cost-beneficial SAMAs discussed above, the costs of the SAMAs evaluated would be higher than the associated benefits.

### 5.2.5 Conclusions

The NRC staff reviewed NMC's analysis and concluded that the methods used and the implementation of those methods were sound. The treatment of SAMA benefits and costs supports the general conclusion that the SAMA evaluations performed by NMC are reasonable and sufficient for the license renewal submittal. Although the treatment of SAMAs for external events was limited by the unavailability of an external event PSA, the likelihood of there being cost-beneficial enhancements in this area was minimized by including several candidate SAMAs related to dominant seismic and fire events and increasing the estimated SAMA benefits for internal events by a factor of 2 to account for potential benefits in external events.

Based on its review of the SAMA analysis, the NRC staff concurs with NMC's identification of areas in which risk can be further reduced in a cost-beneficial manner through the implementation of all or a subset of the identified, potentially cost-beneficial SAMA. Given the potential for cost-beneficial risk reduction, the NRC staff agrees that further evaluation of these SAMAs by NMC is warranted. However, none of the potentially cost-beneficial SAMAs directly relate to adequately managing the effects of aging during the period of extended operation. Therefore, they need not be implemented as part of the license renewal pursuant to 10 CFR Part 54.



# **Generic Environmental Impact Statement for License Renewal of Nuclear Plants**

## **Supplement 28**

### **Regarding Oyster Creek Nuclear Generating Station**

#### **Final Report - Main Report**

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Manuscript Completed: December 2006  
Date Published: January 2007

Division of License Renewal  
Office of Nuclear Reactor Regulation  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555-0001



## Environmental Impacts of Postulated Accidents

- SAMA 132 – modify procedures to allow switching of the combustion turbines to OCNGS while running.

AmerGen performed additional analyses to evaluate the impact of parameter choices and uncertainties on the results of the SAMA assessment (AmerGen 2005). If the benefits are increased by a factor of 2.5 to account for uncertainties, six additional SAMAs were determined to be potentially cost-beneficial (SAMAs 84, 106, 124, 125C, 129, and 138).

AmerGen recognized that a combination of low-cost SAMAs could provide much of the risk reduction associated with higher-cost SAMAs, and may act synergistically to yield a combined risk reduction greater than the sum of the benefits of each SAMA if implemented individually (AmerGen 2005). AmerGen assessed various combinations of the seven potentially cost-beneficial SAMAs identified in the baseline case. On the basis of this assessment, AmerGen identified a subset of four SAMAs, along with a priority for implementation based on individual maximum net values. In order of implementation priority, they are SAMAs 109/125A, 134, 125B, and 127. AmerGen concluded that if these four SAMAs are implemented, then the remaining SAMAs identified as cost-beneficial in the baseline analysis (i.e., SAMAs 91, 99, and 130) will no longer be cost-beneficial (AmerGen 2005).

The NRC staff noted that several SAMAs that are cost-beneficial at the upper bound (95th percentile) may remain cost-beneficial at the upper bound, even after implementing the four aforementioned SAMAs. Therefore, the staff asked AmerGen to provide an assessment of the upper bound net values for these SAMAs (i.e., SAMAs 10, 84, 106, 124, 125C, 129, 132, and 138), assuming that the four cost-beneficial SAMAs noted above are implemented (NRC 2005). In its response, AmerGen provided the upper bound net values for these SAMAs (AmerGen 2006). With the exception of SAMAs 84 and 138, these SAMAs remained individually cost-beneficial at the upper bound.

The NRC staff concludes that, with the exception of the potentially cost-beneficial SAMAs discussed above, the costs of the SAMAs evaluated would be higher than the associated benefits.

### 5.2.6 Conclusions

The NRC staff reviewed AmerGen's analysis and concluded that the methods used and the implementation of those methods were sound. The treatment of SAMA benefits and costs support the general conclusion that the SAMA evaluations performed by AmerGen are reasonable and sufficient for the license renewal submittal. Although the treatment of SAMAs for external events was somewhat limited by the unavailability of an external event PRA, the likelihood of there being cost-beneficial enhancements in this area was minimized by including

several candidate SAMAs related to dominant seismic, fire, and wind events, and by increasing the estimated SAMA benefits for internal events by a factor of 2 to account for potential benefits in external events.

On the basis of its review of the SAMA analysis, the NRC staff concurs with AmerGen's identification of areas in which risk can be further reduced in a cost-beneficial manner through the implementation of all or a subset of potentially cost-beneficial SAMAs. Given the potential for cost-beneficial risk reduction, the staff considers that further evaluation of these SAMAs by AmerGen is warranted. However, none of the potentially cost-beneficial SAMAs relate to adequately managing the effects of aging during the period of extended operation. Therefore, they need not be implemented as part of the license renewal pursuant to 10 CFR Part 54.

### 5.3 References

10 CFR Part 50. *Code of Federal Regulations*, Title 10, *Energy*, Part 50, "Domestic Licensing of Production and Utilization Facilities."

10 CFR Part 51. *Code of Federal Regulations*, Title 10, *Energy*, Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions."

10 CFR Part 54. *Code of Federal Regulations*, Title 10, *Energy*, Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants."

10 CFR Part 73. *Code of Federal Regulations*, Title 10, *Energy*, Part 73, "Physical Protection of Plants and Materials."

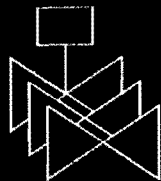
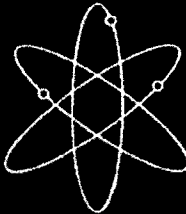
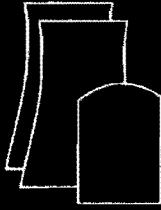
10 CFR Part 100. *Code of Federal Regulations*, Title 10, *Energy*, Part 100, "Reactor Site Criteria."

AmerGen Energy Company, LLC (AmerGen). 2005. *Applicant's Environmental Report – Operating License Renewal Stage, Oyster Creek Generating Station*. Docket No. 50-219. Forked River, New Jersey. (July 22, 2005).

AmerGen Energy Company, LLC (AmerGen). 2006. Letter from P.B. Cowan, AmerGen Energy Company, LLC, Kennett Square, Pennsylvania, to U.S. Nuclear Regulatory Commission, Document Control Desk, Rockville, Maryland, Subject: "Response to NRC Request for Additional Information Related to Severe Accident Mitigation Alternatives (SAMAs) for Oyster Creek Generating Station (TAC No. MC7625)." (January 9, 2006).

GPU Nuclear, Inc. 1992. Oyster Creek Nuclear Generating Station (OCNGS), Operating License No. DPR-16, Docket No. 50-219, Response to Generic Letter 88-20, "Individual Plant Examinations for Severe Accident Vulnerabilities (IPE)." (August 14, 1992).

NUREG-1437, Supplement 29  
Vol. 1



# **Generic Environmental Impact Statement for License Renewal of Nuclear Plants**

**Supplement 29**

**Regarding  
Pilgrim Nuclear Power Station**

**Final Report – Main Report**

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**Division of License Renewal  
Office of Nuclear Reactor Regulation  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555-0001**

## Environmental Impacts of Postulated Accidents

- Control containment venting with a narrow pressure band (SAMA 53), and
- Use the security diesel generator to extend the life of the 125 volt DC batteries (a new SAMA).

The staff concludes that, with the exception of the potentially cost-beneficial SAMAs discussed above, the costs of the SAMAs evaluated would be higher than the associated benefits.

### 5.2.6 Conclusions

The staff reviewed Entergy's analysis and concluded that the methods used and the implementation of those methods were sound. The treatment of SAMA benefits and costs support the general conclusion that the SAMA evaluations performed by Entergy are reasonable and sufficient for the license renewal submittal. Although the treatment of SAMAs for external events was somewhat limited by the unavailability of an external event PSA, the likelihood of there being cost-beneficial enhancements in this area was minimized by improvements that have been realized as a result of the IPEEE process, and increasing the estimated SAMA benefits for internal events by a factor of five to account for potential benefits in external events.

Based on its review of the SAMA analysis, the staff concurs with Entergy's identification of areas in which risk can be further reduced in a cost-beneficial manner through the implementation of all or a subset of potentially cost-beneficial SAMAs. Given the potential for cost-beneficial risk reduction, the staff considers that further evaluation of these SAMAs by Entergy is warranted. However, none of the potentially cost-beneficial SAMAs relate to adequately managing the effects of aging during the period of extended operation. Therefore, they need not be implemented as part of the license renewal pursuant to 10 CFR Part 54.

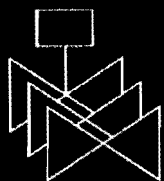
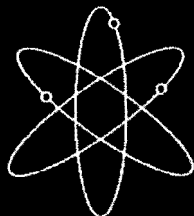
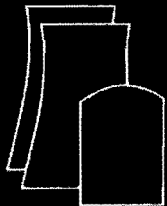
### 5.3 References

10 CFR Part 50. Code of Federal Regulations, Title 10, *Energy*, Part 50, Appendix I, "Numerical Guides for Design Objectives and Limiting Conditions for Operations to Meet the Criterion 'As Low As Reasonably Achievable' for Radiological Material in Light-Water-Cooled Nuclear Power Reactor Effluents."

10 CFR Part 51. Code of Federal Regulations, Title 10, *Energy*, Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions."

10 CFR Part 54. Code of Federal Regulations, Title 10, *Energy*, Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants."

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# **Generic Environmental Impact Statement for License Renewal of Nuclear Plants**

**Supplement 30**

**Regarding  
Vermont Yankee Nuclear Power Station**

**Final Report – Main Report**

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**Division of License Renewal  
Office of Nuclear Reactor Regulation  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555-0001**

### 5.2.6 Conclusions

The NRC staff reviewed Entergy's analysis and concluded that the methods used and the implementation of those methods were sound. The treatment of SAMA benefits and costs support the general conclusion that the SAMA evaluations performed by Entergy are reasonable and sufficient for the license renewal submittal. Although the treatment of SAMAs for external events was somewhat limited by the unavailability of an external event PSA, the likelihood of there being cost-beneficial enhancements in this area was minimized by improvements that have been realized as a result of the IPEEE process, and increasing the estimated SAMA benefits for internal events by a multiplier to account for potential benefits in external events.

Based on its review of the SAMA analysis, the NRC staff concurs with Entergy's identification of areas in which risk can be further reduced in a cost-beneficial manner through the implementation of all or a subset of potentially cost-beneficial SAMAs. Given the potential for cost-beneficial risk reduction, the NRC staff considers that further evaluation of these SAMAs by Entergy is warranted. However, none of the potentially cost-beneficial SAMAs relate to adequately managing the effects of aging during the period of extended operation. Therefore, they need not be implemented as part of the license renewal pursuant to 10 CFR Part 54.

### 5.3 References

10 CFR Part 50. *Code of Federal Regulations*, Title 10, *Energy*, Part 50, "Domestic Licensing of Production and Utilization Facilities."

10 CFR Part 51. *Code of Federal Regulations*, Title 10, *Energy*, Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions."

10 CFR Part 54. *Code of Federal Regulations*, Title 10, *Energy*, Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants."

10 CFR Part 73. *Code of Federal Regulations*, Title 10, *Energy*, Part 73, "Physical Protection of Plants and Materials."

10 CFR Part 100. *Code of Federal Regulations*, Title 10, *Energy*, Part 100, "Reactor Site Criteria."

Entergy Nuclear Vermont Yankee, LLC and Entergy Nuclear Operations, Inc. (Entergy). 2006a. *Applicant's Environmental Report – Operating License Renewal Stage, Vermont Yankee Nuclear Power Station*. Docket No. 50-271. Brattleboro, Vermont. (January 25, 2006). ADAMS No. ML060300086.

# **Generic Environmental Impact Statement for License Renewal of Nuclear Plants**

## **Supplement 31**

### **Regarding James A. FitzPatrick Nuclear Power Plant**

### **Final Report**

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Date Published: January 2008



In supplemental information to the ER, Entergy provided a revised assessment based on a separate accounting of uncertainties (Entergy 2006b). The revised assessment resulted in identification of the same potentially cost-beneficial SAMAs. However, based on further consideration of potentially cost-beneficial SAMAs at other plants, Entergy identified one additional potentially cost-beneficial SAMA (Entergy 2006b). This alternative involves use of a portable generator (to power battery chargers) to extend the coping time in loss of AC power events.

The NRC staff concludes that, with the exception of the potentially cost-beneficial SAMAs discussed above, the costs of the SAMAs evaluated would be higher than the associated benefits.

### 5.2.6 Conclusions

The NRC staff reviewed Entergy's analysis and concluded that the methods used and the implementation of those methods were sound. The treatment of SAMA benefits and costs support the general conclusion that the SAMA evaluations performed by Entergy are reasonable and sufficient for the license renewal submittal. Although the treatment of SAMAs for external events was somewhat limited by the unavailability of an external event PSA, the likelihood of there being cost-beneficial enhancements in this area was minimized by improvements that have been realized as a result of the IPEEE process and increasing the estimated SAMA benefits for internal events by a multiplier to account for potential benefits in external events.

Based on its review of the SAMA analysis, the NRC staff concurs with Entergy's identification of areas in which risk can be further reduced in a cost-beneficial manner through the implementation of all or a subset of potentially cost-beneficial SAMAs. Given the potential for cost-beneficial risk reduction, the NRC staff considers that further evaluation of these SAMAs by Entergy is warranted. However, none of the potentially cost-beneficial SAMAs relate to adequately managing the effects of aging during the period of extended operation. Therefore, they need not be implemented as part of the license renewal pursuant to 10 CFR Part 54.

### 5.3 References

10 CFR Part 50. *Code of Federal Regulations*, Title 10, *Energy*, Part 50, "Domestic Licensing of Production and Utilization Facilities."

10 CFR Part 51. *Code of Federal Regulations*, Title 10, *Energy*, Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions."

10 CFR Part 54. *Code of Federal Regulations*, Title 10, *Energy*, Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants."

# **Generic Environmental Impact Statement for License Renewal of Nuclear Plants**

## **Supplement 32**

### **Regarding Wolf Creek Generating Station**

#### **Final Report**

Manuscript Completed: May 2008  
Date Published: May 2008

The Staff concludes that, with the exception of the potentially cost-beneficial SAMAs discussed above, the costs of the SAMAs evaluated would be higher than the associated benefits.

### 5.2.6 Conclusions

The Staff reviewed WCNO's analysis and concluded that the methods used and the implementation of those methods were sound. The treatment of SAMA benefits and costs support the general conclusion that the SAMA evaluations performed by WCNO are reasonable and sufficient for the license renewal submittal. Although the treatment of SAMAs for external events was somewhat limited by the unavailability of an external event PSA, the likelihood of there being cost-beneficial enhancements in this area was minimized by improvements that have been realized as a result of the IPEEE process, and increasing the estimated SAMA benefits for internal events by a factor of two to account for potential benefits in external events.

Based on its review of the SAMA analysis, the Staff concurs with WCNO's identification of areas in which risk can be further reduced in a cost-beneficial manner through the implementation of all or a subset of potentially cost-beneficial SAMAs. Given the potential for cost-beneficial risk reduction, the Staff considers that further evaluation of these SAMAs by WCNO is warranted. However, none of the potentially cost-beneficial SAMAs relate to adequately managing the effects of aging during the period of extended operation. Therefore, they need not be implemented as part of the license renewal pursuant to 10 CFR Part 54.

## 5.3 References

10 CFR Part 50. Code of Federal Regulations, Title 10, *Energy*, Part 50, "Domestic Licensing of Production and Utilization Facilities."

10 CFR Part 51. Code of Federal Regulations, Title 10, *Energy*, Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions."

10 CFR Part 54. Code of Federal Regulations, Title 10, *Energy*, Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants."

10 CFR Part 73. Code of Federal Regulations, Title 10, *Energy*, Part 73, "Physical Protection of Plants and Materials."

10 CFR Part 100. Code of Federal Regulations, Title 10, *Energy*, Part 100, "Reactor Site Criteria."

# **Generic Environmental Impact Statement for License Renewal of Nuclear Plants**

## **Supplement 33**

### **Regarding Shearon Harris Nuclear Power Plant, Unit 1**

### **Final Report**

Manuscript Completed: July 2008  
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Office of Nuclear Reactor Regulation

CP&L identified one potentially cost-beneficial SAMA in the baseline analysis contained in the ER (using a three percent discount rate). The potentially cost-beneficial SAMAs is:

SAMA 9 - Proceduralize actions to open emergency diesel generator (EDG) room doors and implement portable fans on loss of heating ventilation and air-conditioning (HVAC).

CP&L performed additional analyses to evaluate the impact of parameter choices and uncertainties on the results of the SAMA assessment (Progress Energy 2006). If the benefits are increased by a factor of 1.5 to account for uncertainties, two additional SAMA candidates were determined to be potentially cost-beneficial:

SAMA 6 - Waterproof motor operators for valves 1SW-274 and 1SW-275 to mitigate floods caused by service water line breaks

SAMA 8 - Provide the capability to align a direct feed to the 1B3-SB transformer to preclude battery depletion, and to align the "C" charging/safety injection pump (CSIP) for seal injection

The staff concludes that, with the exception of the potentially cost-beneficial SAMAs discussed above, the costs of the SAMAs evaluated would be higher than the associated benefits.

#### 5.2.6 Conclusions

The staff reviewed CP&L's analysis and concluded that the methods used and the implementation of those methods were sound. The treatment of SAMA benefits and costs support the general conclusion that the SAMA evaluations performed by CP&L are reasonable and sufficient for the license renewal submittal. Although the treatment of SAMAs for external events was somewhat limited by the unavailability of an external event PSA, the likelihood of there being cost-beneficial enhancements in this area was minimized by improvements that have been realized as a result of the IPEEE process, and increasing the estimated SAMA benefits for internal events by a factor of two to account for potential benefits in external events.

Based on its review of the SAMA analysis, the staff concurs with CP&L's identification of areas in which risk can be further reduced in a cost-beneficial manner through the implementation of all or a subset of potentially cost-beneficial SAMAs. Given the potential for cost-beneficial risk reduction, the staff considers that further evaluation of these SAMAs by CP&L is warranted. However, none of the potentially cost-beneficial SAMAs relate to adequately managing the effects of aging during the period of extended operation. Therefore, they need not be implemented as part of the license renewal pursuant to 10 CFR Part 54.

# **Generic Environmental Impact Statement for License Renewal of Nuclear Plants**

## **Supplement 34**

### **Regarding Vogtle Electric Generating Plant, Units 1 and 2**

### **Final Report**

Manuscript Completed: November 2008  
Date Published: December 2008

percent (NRC 2004). SNC provided both sets of estimates (SNC 2007a, SNC 2007b, SNC 2008).

SNC identified two potentially cost-beneficial SAMAs in the baseline analysis contained in the ER (using a three percent discount rate). The potentially cost-beneficial SAMAs are:

- SAMA 2 – Maintain full-time black start capability of the Plant Wilson combustion turbines.
- SAMA 4 – Prepare procedures and operator training for cross-tying an opposite unit diesel generator.

SNC performed additional analyses to evaluate the impact of parameter choices and uncertainties on the results of the SAMA assessment (SNC 2007a). If the benefits are increased by a factor of 2 to account for uncertainties, two additional SAMA candidates were determined to be potentially cost-beneficial:

- SAMA 6 – Implementation of a bypass line for the cooling tower return isolation valves.
- SAMA 16 – Enhance procedures for Interfacing Systems Loss of Coolant Accidents (ISLOCA) response.

However, based on more realistic estimates of implementation costs and benefits, SNC determined that the latter two SAMAs would not be cost-beneficial (SNC 2007b). The Staff concludes that, with the exception of the potentially cost-beneficial SAMAs discussed above, the costs of the SAMAs evaluated would be higher than the associated benefits.

#### 5.2.6 Conclusions

The Staff reviewed SNC's analysis and concluded that the methods used and the implementation of those methods were sound. The treatment of SAMA benefits and costs support the general conclusion that the SAMA evaluations performed by SNC are reasonable and sufficient for the license renewal submittal. Although the treatment of SAMAs for external events was somewhat limited by the unavailability of an external event PRA, the likelihood of there being cost-beneficial enhancements in this area was minimized by improvements that have been realized as a result of the IPEEE process, and increasing the estimated SAMA benefits for internal events by a factor of two to account for potential benefits in external events. Based on its review of the SAMA analysis, the Staff concurs with SNC's identification of areas in which risk can be further reduced in a cost-beneficial manner through the implementation of all or a subset of potentially cost-beneficial SAMAs. Given the potential for cost-beneficial risk reduction, the Staff considers that further evaluation of the two potentially cost-beneficial SAMAs by SNC is warranted. However, none of the potentially cost-beneficial SAMAs relate to

## Postulated Accidents

adequately managing the effects of aging during the period of extended operation. Therefore, they need not be implemented as part of the license renewal pursuant to 10 CFR Part 54.

## 5.3 References

10 CFR Part 50. Code of Federal Regulations, Title 10, *Energy*, Part 50, "Domestic Licensing of Production and Utilization Facilities."

10 CFR Part 51. Code of Federal Regulations, Title 10, *Energy*, Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions."

10 CFR Part 54. Code of Federal Regulations, Title 10, *Energy*, Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants."

10 CFR Part 73. Code of Federal Regulations, Title 10, *Energy*, Part 73, "Physical Protection of Plants and Materials."

10 CFR Part 100. Code of Federal Regulations, Title 10, *Energy*, Part 100, "Reactor Site Criteria."

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# **Generic Environmental Impact Statement for License Renewal of Nuclear Plants**

## **Supplement 35**

### **Regarding Susquehanna Steam Electric Station, Units 1 and 2**

## **Final Report**

Manuscript Completed: March 2009  
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Office of Nuclear Reactor Regulation

states that two sets of estimates should be developed – one at three percent and one at seven percent (NRC 2004). PPL provided both sets of estimates (PPL 2006).

PPL identified two potentially cost-beneficial SAMAs in the baseline analysis contained in the ER (using a three percent discount rate). The potentially cost-beneficial SAMAs are:

- SAMA 2a – Install minimal hardware changes and modify procedures to provide a cross-tie capability between the 4 kilovolt (kV) alternating current (AC) emergency buses.
- SAMA 6 – Procure an additional portable 480 volt (V) AC station diesel generator to power battery chargers in scenarios where AC power is unavailable.

PPL performed additional analyses to evaluate the impact of parameter choices and uncertainties on the results of the SAMA assessment (PPL 2006). Three additional SAMA candidates were determined to be potentially cost-beneficial, if the benefits were increased by a factor of 2.1 to account for uncertainties:

- SAMA 2b – Improve the cross-tie capability between 4 kV AC emergency buses, i.e., between A or D emergency buses and B or C emergency buses (a more flexible cross-tie option than SAMA 2a).
- SAMA 3 – Modify procedures to stagger reactor pressure vessel (RPV) depressurization when fire protection system injection is the only available make-up source.
- SAMA 5 – Modify portable station diesel generator to automatically align to 125 V direct current (DC) battery chargers.

After reviewing PPL's SAMA analysis, the NRC staff concludes that the costs of all other SAMAs evaluated are greater than their associated benefits.

### **5.2.6 Conclusions**

The NRC staff reviewed PPL's analysis and concluded that the methods used and the implementation of those methods were sound. The treatment of SAMA benefits and costs support the general conclusion that the SAMA evaluations performed by PPL are reasonable and sufficient for the license renewal submittal. Although the treatment of SAMAs for external events was somewhat limited by the unavailability of an external event PRA, the likelihood of there being cost-beneficial enhancements in this area was minimized by improvements that have been realized as a result of the IPEEE process and increasing the estimated SAMA benefits for internal events by a factor of two to account for potential benefits in external events.

Based on its review of the SAMA analysis, the NRC staff concurs with PPL's identification of areas in which risk can be further reduced in a cost-beneficial manner through the implementation of all or a subset of potentially cost-beneficial SAMAs. Given the potential for cost-beneficial risk reduction, the NRC staff considers that further evaluation of these SAMAs by PPL is warranted. However, none of the potentially cost-beneficial SAMAs relate to adequately managing the effects of aging during the period of extended operation. Therefore, they need not be implemented as part of the license renewal pursuant to 10 CFR Part 54.

### 5.3 References

10 CFR Part 50. *Code of Federal Regulations*, Title 10, *Energy*, Part 50, "Domestic Licensing of Production and Utilization Facilities."

10 CFR Part 51. *Code of Federal Regulations*, Title 10, *Energy*, Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions."

10 CFR Part 54. *Code of Federal Regulations*, Title 10, *Energy*, Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants."

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# **Generic Environmental Impact Statement for License Renewal of Nuclear Plants**

## **Supplement 36**

### **Regarding Beaver Valley Power Station, Units 1 and 2**

## **Final Report**

Manuscript Completed: May 2009  
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Office of Nuclear Reactor Regulation

**5.2.6 Conclusions**

The NRC staff reviewed the FENOC analysis and concluded that the methods used and the implementation of those methods were sound. The treatment of SAMA benefits and costs support the general conclusion that the SAMA evaluations performed by FENOC are reasonable and sufficient for the license renewal submittal.

Based on its review of the SAMA analysis, the NRC staff concurs with the FENOC identification of areas in which risk can be further reduced in a cost-beneficial manner through the implementation of all or a subset of potentially cost-beneficial SAMAs. Given the potential for cost-beneficial risk reduction, the NRC staff considers that FENOC should further evaluate these SAMAs. However, none of the potentially cost-beneficial SAMAs relate to adequately managing the effects of aging during the period of extended operation. Therefore, they need not be implemented as part of the license renewal pursuant to 10 CFR Part 54.

**5.3 References**

10 CFR Part 50. *Code of Federal Regulations*, Title 10, *Energy*, Part 50, "Domestic Licensing of Production and Utilization Facilities."

10 CFR Part 51. *Code of Federal Regulations*, Title 10, *Energy*, Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions."

10 CFR Part 54. *Code of Federal Regulations*, Title 10, *Energy*, Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants."

10 CFR Part 73. *Code of Federal Regulations*, Title 10, *Energy*, Part 73. "Physical Protection of Plants and Materials."

10 CFR Part 100. *Code of Federal Regulations*, Title 10, *Energy*, Part 100, "Reactor Site Criteria."

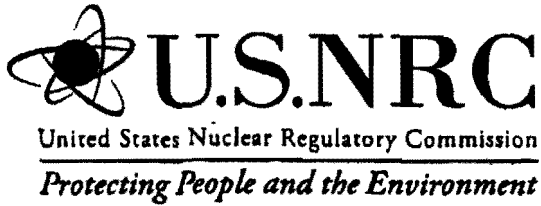
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Duquesne Light Company (DLC). 1997. "Beaver Valley Unit 2 Probabilistic Risk Assessment, Individual Plant Examination of External Events," September 1997.

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Supplement 37

# **Generic Environmental Impact Statement for License Renewal of Nuclear Plants**

## **Supplement 37**

### **Regarding Three Mile Island Nuclear Station, Unit 1**

## **Final Report**

Manuscript Completed: June 2009  
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The staff concludes that, with the exception of the potentially cost-beneficial SAMAs discussed above, the costs of the SAMAs evaluated would be higher than the associated benefits when they are considered independently.

### 5.3.6 Conclusions

The staff reviewed Exelon Generation's analysis and concluded that the methods used and the implementation of those methods were sound. The treatment of SAMA benefits and costs support the general conclusion that the SAMA evaluations performed by Exelon Generation are reasonable and sufficient for the license renewal submittal.

Based on its review of the SAMA analysis, the staff concurs with Exelon Generation's identification of areas in which risk can be further reduced in a cost-beneficial manner through the implementation of all or a subset of potentially cost-beneficial SAMAs. Given the potential for cost-beneficial risk reduction, the staff considers that further evaluation of these SAMAs by Exelon Generation is warranted. However, none of the potentially cost-beneficial SAMAs relate to adequately managing the effects of aging during the period of extended operation. Therefore, they need not be implemented as part of the license renewal pursuant to 10 CFR Part 54.

### 5.4 References

AmerGen (AmerGen Energy Company, LLC). 2008a. "Three Mile Island Nuclear Station, Applicant's Environmental Report, License Renewal Operating Stage." Kennett Square, Pennsylvania. ADAMS Accession Nos. ML080220255, ML080220257, ML080220261, and ML080220282.

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GPU (GPU Nuclear Corporation). 1993. Letter from T. G. Broughton, GPU, to U.S. NRC. Subject: Three Mile Island Nuclear Generation Station, Unit 1 (TMI-1), Operating License No. DPR-50, Docket No. 50-289, Response to Generic Letter 88-20, "Individual Plan Examinations for Severe Accident Vulnerabilities (IPE)". May 20, 1993.

GPU (GPU Nuclear Corporation). 1994. Letter from R. W. Keaten, GPU, to U.S. NRC. Subject: Three Mile Island Nuclear Generation Station, Unit 1 (TMI-1), Operating License No. DPR-50, Docket No. 50-289, Response to Generic Letter 88-20, Supplement 4, "Individual Plan Examination of External Events (IPEEE) for Severe Accident Vulnerabilities". December 29, 1994.

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# **Generic Environmental Impact Statement for License Renewal of Nuclear Plants**

## **Supplement 38**

### **Regarding Indian Point Nuclear Generating Unit Nos. 2 and 3**

### **Final Report Main Report and Comment Responses**

Manuscript Completed: November 2010  
Date Published: December 2010



## 5.2.6 Conclusions

The NRC staff reviewed Entergy's analysis, as revised, and concludes that the methods used, and the implementation of those methods, were sound. The treatment of SAMA benefits and costs support the general conclusion that the SAMA evaluations performed by Entergy are reasonable and sufficient for the license renewal submittal. Although the treatment of SAMAs for external events was somewhat limited, the likelihood of there being cost-beneficial enhancements in this area was minimized by improvements that have been realized as a result of the IPEEE process and inclusion of a multiplier to account for external events.

Based on its review of the SAMA analysis, as revised, the staff concurs with Entergy's identification of areas in which risk can be further reduced in a cost-beneficial manner through the implementation of all or a subset of potentially cost-beneficial SAMAs. Given the potential for cost-beneficial risk reduction, the staff considers that further evaluation of these SAMAs by Entergy is appropriate. However, none of the potentially cost-beneficial SAMAs relate to adequately managing the effects of aging during the period of extended operation. Therefore, they need not be implemented as part of IP2 and IP3 license renewal pursuant to 10 CFR Part 54.

In a decision issued on June 30, 2010, the Atomic Safety and Licensing Board ("Board") admitted two contentions for litigation, which had been filed by the State of New York in the Indian Point Units 2 and 3 license renewal adjudicatory proceeding. Entergy Nuclear Operations, Inc. (Indian Point Nuclear Generating Units 2 and 3), LBP-10-13, 71 NRC \_\_\_\_ (2010). These contentions generally assert that the NRC staff must reach a final determination of the cost-beneficial SAMAs, from the slate of SAMAs that have been found to be potentially cost-beneficial, and that (a) the cost-beneficial SAMAs must be imposed as a "backfit" on the plants' current licensing basis ("CLB"), as a condition for license renewal, or (b) the staff must provide a sufficient explanation for not imposing such a license renewal condition. In this regard, the NRC staff has provided a detailed discussion of SAMA costs and benefits in this SEIS, which satisfies the NRC's obligation, under NEPA and related case law, to consider SAMAs in a license renewal proceeding such as the IP2 and IP3 proceeding. Indeed, as the Board found, while NEPA requires consideration of environmental impacts and alternatives, it does not require that SAMAs be imposed to redress environmental impacts. LBP-10-13, slip op. at 29.

Moreover, the NRC staff has determined that none of the potentially cost-beneficial SAMAs are related to the license renewal requirements in 10 CFR Part 54 (i.e., managing the effects of aging) (SEIS § 5.2.6). Under the NRC's regulatory system, any potentially cost-beneficial SAMAs that do not relate to 10 CFR Part 54 requirements would be considered, to the extent necessary or appropriate, under the agency's oversight of a facility's current operating license in accordance with 10 CFR Part 50 requirements, inasmuch as such matters would pertain not just to the period of extended operation but to operations under the current operating license term as well. Thus, there is no regulatory basis to suggest that potentially cost-beneficial SAMAs that are unrelated to Part 54 requirements must be imposed as a backfit to the CLB, as a condition for license renewal.

Finally, the NRC staff notes that SAMAs, by definition, pertain to severe accidents – i.e., those accidents whose consequences could be severe, but whose probability of occurrence is so low that they may be excluded from the spectrum of design basis accidents ("DBAs") that have been postulated for a plant (see GEIS §§ 5.3.2, 5.3.3, 5.4); this is consistent with the conclusions reached in § 5.2.2 of this SEIS concerning severe accidents at IP2 and IP3. The Commission has previously concluded, as a generic matter, that the probability-weighted radiological consequences of severe accidents are SMALL. GEIS § 5.5.2; 10 CFR Part 51, App. B, Table B

1. As stated in §§ 5.1.1 and 5.1.2 above, no significant new information has been identified that would remove IP2 and IP3 from these generic determinations. Thus, there is no regulatory basis to impose any of the potentially cost-beneficial SAMAs as a condition for license renewal of IP2 and IP3 – even if those potentially cost-beneficial SAMAs are “finally” found to be cost-beneficial.

### 5.3 References

10 CFR Part 50. Code of Federal Regulations, Title 10, *Energy*, Part 50, “Domestic Licensing of Production and Utilization Facilities.”

10 CFR Part 51. Code of Federal Regulations, Title 10, *Energy*, Part 51, “Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions.”

10 CFR Part 54. Code of Federal Regulations, Title 10, *Energy*, Part 54, “Requirements for Renewal of Operating Licenses for Nuclear Power Plants.”

10 CFR Part 100. Code of Federal Regulations, Title 10, *Energy*, Part 100, “Reactor Site Criteria.”

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Entergy Nuclear Operations, Inc. (Entergy). 2009. Letter from Fred Dacimo to U.S. Nuclear Regulatory Commission, Subject: License Renewal Application – SAMA Reanalysis Using Alternate Meteorological Tower Data, NL-09-165, December 11, 2009. ADAMS Accession No.

# **Generic Environmental Impact Statement for License Renewal of Nuclear Plants**

## **Supplement 39**

### **Regarding Prairie Island Nuclear Generating Plant, Units 1 and 2**

## **Draft Report for Comment**

Manuscript Completed: September 2009  
Date Published: October 2009

into the Corrective Action Program for further evaluation after the PRA has been updated with improved methodology for modeling pipe breaks (NSP 2009b).  
The staff concludes that, with the exception of the potentially cost-beneficial SAMAs discussed above, the costs of the SAMAs evaluated would be higher than the associated benefits.

### 5.3.6 Conclusions

The staff reviewed NSP=s analysis related to SAMAs and concluded that the methods used and the implementation of those methods were sound. The treatment of SAMA benefits and costs support the general conclusion that the SAMA evaluations performed by NSP are reasonable and sufficient for the license renewal submittal.

Based on its review of the SAMA analysis, the staff concurs with NSP=s identification of areas in which risk can be further reduced in a cost-beneficial manner through the implementation of all or a subset of potentially cost-beneficial SAMAs. Given the potential for cost-beneficial risk reduction, the staff considers that further evaluation of these SAMAs by NSP is warranted. However, none of the potentially cost-beneficial SAMAs relate to adequately managing the effects of aging during the period of extended operation. Therefore, they need not be implemented as part of the license renewal pursuant to 10 CFR Part 54.

### 5.4 Environmental Justice Issues Related to Severe Accidents, as submitted by the PIIC

The following information is provided by the Prairie Island Indian Community (PIIC). The information below does not represent the opinion of the NRC staff.

The evaluation of severe accidents, within the environmental justice analysis is of paramount importance to the Prairie Island Indian Community.

The Prairie Island Indian Community believes that the NRC, as part of its environmental justice review, should evaluate the potential risk associated with accidents that may have a disproportionate impact on minority populations. The Prairie Island Indian Community is the closest community to the PINGP 1 and 2. This concept of risk includes the potential consequences of a reactor accident. Mitigation of severe accidents is an integral part of the NRC's Severe Accident Mitigation Alternatives (SAMA) analysis. The Tribe does not believe, however, that the SAMA process can provide a realistic or acceptable treatment of the risk to the Tribe's unique status as an Indian Tribe and minority Community. Therefore, the Tribe believes that the risk from an accident and mitigating measures must be specifically analyzed by the NRC as part of its Environmental Justice analysis. In the case of the continued operation of PINGP, the consequences of an accident would have a disproportionate impact on the Tribe, given its close proximity to PINGP 1 and 2 and its unique identity as a federally-recognized Indian tribe.

Members of our community and our ancestors have lived on Prairie Island for countless generations. There is also a unique relationship between our culture and this specific location. Prairie Island is our only home and the location of our business (which can only be located on our reservation), which is our primary means of providing services (including income) to our community. Not all impacts to the tribe would be economic—if there was an accident at PINGP, our



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# **Generic Environmental Impact Statement for License Renewal of Nuclear Plants**

## **Supplement 40**

### **Regarding Kewaunee Power Station**

#### **Final Report**

Manuscript Completed: July 2010  
Date Published: August 2010

SAMA individually, the implementation cost could be reduced. Based on the evaluation of similar SAMAs involving improvements in room cooling and ventilation, DEK concluded that the following three additional SAMAs involving diesel room cooling improvements would be cost beneficial:

- SAMA 81 - Add an EDG room high temperature alarm or redundant louver and thermostat
- SAMA 166 - Open doors for alternate diesel generator room cooling
- SAMA 167 - Proceduralize actions to open EDG room doors on loss of heating, ventilation, and air conditioning (HVAC) and implement portable fans

Finally, DEK reviewed the analysis of the K107Aa PRA, prepared subsequent to the SAMA evaluation documented in the ER, and found one new contributor to risk that could be impacted by a candidate SAMA. DEK concluded that a new SAMA addressing this contributor, loss of screenhouse ventilation, could be cost-effectively combined with similar SAMAs 81, 82, 83, 160, 166, 167, 170, and 171.

- Implementation of temporary screenhouse ventilation, including installing additional temperature detectors

DEK committed to further review these SAMAs for implementation as part of DEK's ongoing performance improvement program (DEK, 2008), (DEK, 2009).

The staff concludes that, with the exception of the potentially cost-beneficial SAMAs discussed above, the costs of the SAMAs evaluated would be higher than the associated benefits.

#### 5.2.6 Conclusions

The staff reviewed DEK's analysis and concluded that the methods used and the implementation of those methods is sound. The treatment of SAMA benefits and costs support the general conclusion that the SAMA evaluations performed by DEK are reasonable and sufficient for the license renewal submittal.

Based on its review of the SAMA analysis, the staff concurs with DEK's identification of areas in which risk can be further reduced in a cost-beneficial manner through the implementation of all or a subset of potentially cost-beneficial SAMAs. Given the potential for cost-beneficial risk reduction, the staff considers that further evaluation of these SAMAs by DEK is warranted. However, none of the potentially cost-beneficial SAMAs relate to adequately managing the effects of aging during the period of extended operation. Therefore, they need not be implemented as part of the license renewal pursuant to 10 CFR Part 54.

#### 5.3 REFERENCES

10 CFR 50. *Code of Federal Regulations*, Title 10, *Energy*, Part 50, "Domestic Licensing of Production and Utilization Facilities."

10 CFR 51. *Code of Federal Regulations*, Title 10, *Energy*, Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions."

# **Generic Environmental Impact Statement for License Renewal of Nuclear Plants**

## **Supplement 41**

### **Regarding Cooper Nuclear Station**

#### **Final Report**

Manuscript Completed: July 2010  
Date Published: July 2010

## Environmental Impacts of Postulated Accidents

- SAMA 68 – Revise procedures to allow the ability to cross-connect the circulating water pumps and the service water going to the turbine equipment cooling (TEC) heat exchangers, which allow continued use of the power conversion system after service water is lost.
- SAMA 78 – Improve training on alternate injection via the fire water system, increasing the availability of alternate injection.
- SAMA 79 – Revise procedures to allow use of the residual heat removal service water (RHRSW) system without a service water booster pump, increasing availability of the RHRSW system.

NPPD performed additional analyses to evaluate the impact of parameter choices and uncertainties on the results of the SAMA assessment (NPPD, 2008). If the benefits are increased by an additional factor of 3 to account for uncertainties, three additional SAMA candidates were determined to be potentially cost-beneficial:

- SAMA 14 – Provide a portable generator to supply DC power to individual panels during a station blackout (SBO), increasing the time available for AC power recovery.
- SAMA 64 – Revise procedures to allow use of a fire pumper truck to pressurize the fire water system, increasing availability of the fire water system.
- SAMA 75 – Implement Generation Risk Assessment (trip and shutdown risk modeling) into plant activities, decreasing the probability of trips/shutdown.

NPPD indicated that detailed engineering project cost-benefit analyses have been initiated for the 11 potentially cost-beneficial SAMAs (NPPD, 2008), (NPPD, 2009a).

Based on the staff's review and the supplemental information provided by NPPD, the NRC staff concludes that, with the exception of the potentially cost-beneficial SAMAs discussed above, the costs of the SAMAs evaluated would be higher than the associated benefits.

### 5.3.6 Conclusions

The staff reviewed NPPD's analysis and concluded that the methods used and the implementation of those methods were sound. The treatment of SAMA benefits and costs support the general conclusion that the SAMA evaluations performed by NPPD are reasonable and sufficient for the license renewal submittal.

Based on its review of the SAMA analysis, the staff concurs with NPPD's identification of areas in which risk can be further reduced in a cost-beneficial manner through the implementation of all, or a subset of potentially cost-beneficial SAMAs. Given the potential for cost-beneficial risk reduction, the staff considers that further consideration of these SAMAs by NPPD is warranted. However, none of the potentially cost-beneficial SAMAs relate to adequately managing the effects of aging during the period of extended operation (i.e., none of the potentially cost-beneficial SAMAs would reduce the frequency or risk associated with aging-related failures). Therefore, they need not be implemented as part of the license renewal pursuant to 10 CFR Part 54.



# **Generic Environmental Impact Statement for License Renewal of Nuclear Plants**

## **Supplement 42**

### **Regarding Duane Arnold Energy Center**

#### **Final Report**

Manuscript Completed: October 2010  
Date Published: October 2010

The Staff concludes that, with the exception of the potentially cost-beneficial SAMAs discussed above, the costs of the SAMAs evaluated would be higher than the associated benefits.

### 5.3.6 Conclusions

The Staff reviewed FPL-DA's analysis and concluded that the methods used and the implementation of those methods are sound. The treatment of SAMA benefits and costs support the general conclusion that the SAMA evaluations performed by FPL-DA are reasonable and sufficient for the license renewal submittal.

Based on its review of the SAMA analysis, the Staff concurs with FPL-DA's identification of areas in which risk can be further reduced in a cost-beneficial manner through the implementation of all, or a subset of, potentially cost-beneficial SAMAs. Given the potential for cost-beneficial risk reduction, the Staff considers that further evaluation of these SAMAs by FPL-DA is warranted. The Staff considered the mitigating benefits of implementing the SAMAs. However, none of the SAMAs listed above are specifically related to an aging management review conducted under the license renewal safety review pursuant to 10 CFR Part 54. The applicant has not made a final determination to implement these SAMAs.

## 5.4 REFERENCES

10 CFR Part 50. *Code of Federal Regulations*, Title 10, *Energy*, Part 50, "Domestic Licensing of Production and Utilization Facilities."

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# **Generic Environmental Impact Statement for License Renewal of Nuclear Plants**

## **Supplement 43**

### **Regarding Palo Verde Nuclear Generating Station**

## **Final Report**

Manuscript Completed: December 2010  
Date Published: January 2011

## Environmental Impacts of Postulated Accidents

states that two sets of estimates should be developed: one at 3 percent and one at 7 percent (NRC 2004). APS provided both sets of estimates (APS 2008a).

The cost-benefit analysis, as revised in response to NRC staff RAIs, showed that one of the SAMA candidates was potentially cost-beneficial in the baseline analysis (i.e., SAMA 6). APS performed additional analyses to evaluate the impact of parameter choices and uncertainties on the results of the SAMA assessment (APS 2009). As a result, two additional SAMAs were identified as potentially cost-beneficial (SAMAs 17 and 23). In response to another NRC staff RAI regarding the method used to assess the fire-related population dose and offsite economic cost reduction for certain SAMAs, APS identified one additional potentially cost-beneficial SAMA (SAMA 8).

The potentially cost-beneficial SAMAs are:

- SAMA 6 – Develop procedures to guide recovery actions for spurious electrical protection faults.
- SAMA 17 – Modify the procedures to preclude reactor coolant pump operations that would clear the water seals in the cold leg after core damage.
- SAMA 23 – Enhance procedures to direct steam generator flooding for release scrubbing.
- SAMA 8 – Add auto start/load capability to the gas turbine generators.

APS has committed to implement the first three SAMAs (SAMA 6, 17, and 23) and also indicated that they will further consider the last SAMA (SAMA 8) for potential implementation (APS 2010).

The staff concludes, with the exception of the potentially cost-beneficial SAMAs discussed above, the costs of the SAMAs evaluated would be higher than the associated benefits.

### 5.3.6 Conclusions

The staff reviewed APS's analysis and concluded that the methods used and the implementation of those methods was sound. The treatment of SAMA benefits and costs support the general conclusion that the SAMA evaluations performed by APS are reasonable and sufficient for the license renewal submittal.

Based on its review of the SAMA analysis, the staff concurs with APS's identification of areas in which risk can be further reduced in a cost-beneficial manner through the implementation of all or a subset of potentially cost-beneficial SAMAs. Given the potential for cost-beneficial risk reduction, the staff considers that further evaluation of these SAMAs by APS is warranted. However, none of the potentially cost-beneficial SAMAs relate to adequately managing the effects of aging during the period of extended operation. Therefore, they need not be implemented as part of the license renewal pursuant to 10 CFR Part 54.

# **Generic Environmental Impact Statement for License Renewal of Nuclear Plants**

## **Supplement 45**

### **Regarding Hope Creek Generating Station and Salem Nuclear Generating Station, Units 1 and 2**

### **Draft Report for Comment Main Report**

Manuscript Completed: October 2010  
Date Published: October 2010

1 **5.3.6 Conclusions**

2 The staff reviewed PSEG's analysis and concluded that the methods used and the  
3 implementation of those methods were sound. The treatment of SAMA benefits and costs  
4 support the general conclusion that the SAMA evaluations performed by PSEG are  
5 reasonable and sufficient for the license renewal submittal.

6 Based on its review of the SAMA analysis, the staff concurs with PSEG's identification of  
7 areas in which risk can be further reduced at both SGS and HCGS in a cost-beneficial  
8 manner through the implementation of all, or a subset of potentially cost-beneficial SAMAs.  
9 Given the potential for cost-beneficial risk reduction, the staff considers that further  
10 consideration of these SAMAs by PSEG is warranted. However, none of the potentially  
11 cost-beneficial SAMAs relate to adequately managing the effects of aging during the period  
12 of extended operation for SGS or HCGS. Therefore, they need not be implemented as part  
13 of the license renewal pursuant to 10 CFR Part 54.

14 **5.4 REFERENCES**

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16 Licensing of Production and Utilization Facilities."
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18 Protection Regulations for Domestic Licensing and Related Regulatory Functions."
- 19 10 CFR Part 54. *Code of Federal Regulations*, Title 10, *Energy*, Part 54, "Requirements for  
20 Renewal of Operating Licenses for Nuclear Power Plants."
- 21 10 CFR Part 100. *Code of Federal Regulations*, Title 10, *Energy*, Part 100, "Reactor Site  
22 Criteria."
- 23 NRC (U.S. Nuclear Regulatory Commission). 1996. Generic Environmental Impact  
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25 Washington, D.C. ADAMS Accession No. ML061770605
- 26 NRC (U.S. Nuclear Regulatory Commission). 1997. Regulatory Analysis Technical  
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31 NRC, to Thomas Joyce, PSEG. Subjec: Revised Request for Addition Information  
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35 NRC, to Thomas Joyce, PSEG. Subjec: Revised Request for Addition Information  
36 Regarding Severe Accident Mitigation Alternatives for Hope Creek Generating Station. May  
37 2010. ADAMS Accession No. ML101310058

UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

BEFORE THE COMMISSION

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

CERTIFICATE OF SERVICE

I hereby certify that copies of the foregoing "NRC STAFF'S ANSWER TO APPLICANT'S PETITION FOR REVIEW OF LBP-11-17 GRANTING SUMMARY DISPOSITION OF CONSOLIDATED CONTENTION NYS-35/36," dated August 11, 2011, have been served upon the following through deposit in the NRC's internal mail system, with copies by electronic mail, or by deposit in the U.S. Postal Service, as indicated by an asterisk, with copies by electronic mail, this 11<sup>th</sup> day of August, 2011:

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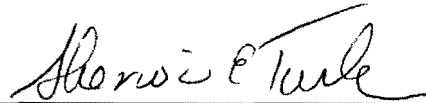
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