

**UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION**

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

_____)	
In the Matter of)	Docket Nos. 52-012-COL
)	52-013-COL
NUCLEAR INNOVATION NORTH AMERICA LLC)	
)	
(South Texas Project Units 3 and 4))	September 23, 2011
_____)	

**NUCLEAR INNOVATION NORTH AMERICA LLC'S PROPOSED FINDINGS OF
FACT AND CONCLUSIONS OF LAW FOR CONTENTION CL-2**

Steven P. Frantz
John E. Matthews
Stephen J. Burdick
Charles B. Moldenhauer
Morgan, Lewis & Bockius LLP
1111 Pennsylvania Avenue, N.W.
Washington, D.C. 20004
Phone: 202-739-3000
Fax: 202-739-3001
E-mail: sfrantz@morganlewis.com

Counsel for Nuclear Innovation North America LLC

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Pursuant to 10 C.F.R. § 2.1209, Applicant Nuclear Innovation North America LLC (“NINA”)¹ hereby submits its Proposed Findings of Fact and Conclusions of Law (“Proposed Findings and Conclusions”). The Proposed Findings and Conclusions address Contention CL-2, and resolve all contested issues for that contention.

The Proposed Findings and Conclusions are based on the evidentiary record in this proceeding, and are submitted in the form of a proposed Partial Initial Decision by the Atomic Safety and Licensing Board (“Board”). The Proposed Findings and Conclusions are set out in numbered paragraphs, with corresponding citations to the record of this proceeding.

I. INTRODUCTION

1. On September 20, 2007, the Applicant submitted an application to the Nuclear Regulatory Commission (“NRC”) for combined licenses (“COLs”) under 10 C.F.R. Part 52 for STP Units 3 and 4, two Advanced Boiling Water Reactors (“ABWRs”) at the existing STP site

¹ The original lead applicant for South Texas Project (“STP”) Units 3 and 4 was the STP Nuclear Operating Company (“STPNOC”). NINA became the lead applicant in early 2011. The Proposed Findings and Conclusions refer to both NINA and STPNOC as the “Applicant.”

in Texas.² This Partial Initial Decision presents the Board’s Findings of Fact and Conclusions of Law relative to one admitted environmental contention proffered by the Intervenor—Contention CL-2 regarding estimating replacement power costs in the Severe Accident Mitigation Design Alternative (“SAMDA”) evaluation for STP Units 3 and 4.

2. For the reasons set forth below, in the face of the Intervenor’s environmental challenges as reflected in Contention CL-2, the Board finds that the NRC Staff and NINA have carried their respective burdens of proof to demonstrate the adequacy of the environmental review in accordance with 10 C.F.R. Part 51 with respect to this contention. The Board thus enters a ruling on the merits of the contention in favor of the Staff and NINA.

II. PROCEDURAL BACKGROUND

3. Following the Applicant’s submission of the COL Application in September 2007, the NRC accepted the Application for docketing on November 29, 2007, and published the Hearing Notice on February 20, 2009.³ The Hearing Notice stated that any person whose interest may be affected by this proceeding and who wishes to participate as a party must file a petition for leave to intervene within 60 days of the Hearing Notice (April 21, 2009).⁴

4. On April 21, 2009, the Sustainable Energy and Economic Development Coalition, the South Texas Association for Responsible Energy, Public Citizen, and several individuals (“Intervenor”) filed a “Petition for Intervention and Request for Hearing” (“Petition”), alleging 28 separate proposed contentions. The Petition included Contention 21, which claimed that the

² South Texas Project Nuclear Operating Company; Notice of Receipt and Availability of Application for a Combined License, 72 Fed. Reg. 60,394, 60,394 (Oct. 24, 2007).

³ South Texas Project Nuclear Operating Company; Acceptance for Docketing of an Application for Combined License for South Texas Project Units 3 and 4, 72 Fed. Reg. 68,597, 68,597 (Dec. 5, 2007); South Texas Project Nuclear Operating Company Application for the South Texas Project Units 3 and 4; Notice of Order, Hearing, and Opportunity to Petition for Leave to Intervene, 74 Fed. Reg. 7934, 7934 (Feb. 20, 2009) (“Hearing Notice”).

⁴ Hearing Notice, 74 Fed. Reg. at 7935.

Environmental Report (“ER”) for STP Units 3 and 4 failed to consider the impacts from severe radiological accident scenarios on the operation of other units at the STP site.⁵

5. The Board was established on May 1, 2009 to adjudicate the STP COL proceeding.⁶ The Board admitted Contention 21 on August 27, 2009.⁷

6. On November 11, 2009, the Applicant submitted a notification to the Board regarding Contention 21.⁸ That notification informed the Board that the Applicant had submitted a letter to the NRC identifying revisions to the ER for STP Units 3 and 4 on November 10, 2009.⁹ Specifically, the Applicant had created a new ER Section 7.5S that evaluated the impacts that a design basis accident or severe accident at one of the new or existing units at the STP site would have on the other units at the site.¹⁰ ER Section 7.5S.5 provided an evaluation of SAMDAs, assuming that a severe accident in one unit would result in extended shutdowns of the three co-located units at the STP site.

7. On November 30, 2009, the Applicant requested that the Board dismiss Contention 21 as moot based on the new ER Section 7.5S.¹¹ The Intervenors opposed this request, and instead requested that the Board modify Contention 21.¹²

⁵ Petition at 46.

⁶ South Texas Project Nuclear Operating Company; Establishment of Atomic Safety and Licensing Board, 74 Fed. Reg. 22, 184 (May 12, 2009).

⁷ *South Texas Project Nuclear Operating Co.* (South Texas Project Units 3 & 4), LBP-09-21, 70 NRC 581, 617-20 (2009).

⁸ Letter from S. Burdick, Counsel for STPNOC, to the Board, Notification of Filing Related to Contention 21 (Nov. 11, 2009) (“Notification Letter”), *available at* ADAMS Accession No. ML093150002.

⁹ Attachment to Notification Letter, Letter from S. Head, STPNOC, to NRC, Proposed Revision to Environmental Report (Nov. 10, 2009) (“ER Letter”), *available at* ADAMS Accession No. ML093150002.

¹⁰ ER Letter, Attachment, at 1-9.

¹¹ Applicant’s Motion to Dismiss Contention 21 as Moot, at 1, 5 (Nov. 30, 2009).

¹² Intervenors’ Response to Applicant’s Motion to Dismiss Contention 21 as Moot, at 1, 5 (Dec. 14, 2009).

8. On December 22, 2009, the Intervenor sought admission of four new contentions, Contentions CL-1 through CL-4, related to ER Section 7.5S.¹³ These new contentions were supported by a December 21, 2009 report prepared by Clarence L. Johnson, titled “Review of Replacement Power Costs for Unaffected Units at the STP Site” (“Johnson Report”).

9. The Applicant opposed the new and revised contentions and requested that the Board reject them.¹⁴ The NRC Staff agreed with the Applicant that the four new contentions and proposed revisions to Contention 21 should be rejected.¹⁵ On January 29, 2010, the Intervenor filed their response.¹⁶

10. The NRC Staff issued the Draft Environmental Impact Statement (“DEIS”) for STP Units 3 and 4 in March 2010.¹⁷ The Staff’s preliminary recommendation from an environmental perspective was that the COLs for STP Units 3 and 4 should be issued.¹⁸

11. The Board issued Memorandum and Order LBP-10-14 on July 2, 2010.¹⁹ Among other things, LBP-10-14 dismissed Contention 21, denied the Intervenor’s request to amend Contention 21, denied the Intervenor’s request to admit Contention CL-1, and admitted

¹³ Intervenor’s Contentions Regarding Applicant’s Proposed Revision to Environmental Report Section 7.5S and Request for Hearing, at 2-3 (Dec. 22, 2009).

¹⁴ Applicant’s Answer Opposing New and Revised Contentions Regarding Environmental Report Section 7.5S, at 2, 31 (Jan. 22, 2010).

¹⁵ NRC Staff’s Answer to the Intervenor’s Amended and New Accident Contentions, at 1, 29-30 (Jan. 22, 2010).

¹⁶ Intervenor’s Consolidated Response to NRC Staff’s Answer to the Intervenor’s New Accident Contentions and Applicant’s Answer Opposing New Contentions Regarding Applicant’s Environmental Report Section 7.5S (Jan. 29, 2010).

¹⁷ NUREG-1937, Draft Environmental Impact Statement for Combined Licenses (COLs) for South Texas Project Electric Generating Station Units 3 and 4, Draft Report for Comment, Vols. 1 & 2 (Mar. 2010), *available at* ADAMS Accession Nos. ML100700327 and ML100700333 (Excerpts from the DEIS are provided as Exhs. NRC000065 and INT000040).

¹⁸ *Id.* at 10-27.

¹⁹ *South Texas Project Nuclear Operating Co.* (South Texas Project Units 3 & 4), LBP-10-14, 72 NRC ___, slip op. at 1 (July 2, 2010).

Contention CL-2, which is a reformulation of proposed Contentions CL-2, CL-3, and CL-4.²⁰ In particular, the Board dismissed issues related to whether a severe accident at one of the STP units could cause an accident at a co-located unit.²¹ The Board also held that, even considering common mode events involving natural phenomena, the Application showed that external events and events involving low power and shutdown conditions at the STP site have a small contribution to risk and the Intervenors had not properly contested that showing.²²

12. As admitted by the Board, Contention CL-2 states:

The Applicant's calculation in ER Section 7.5S of replacement power costs in the event of a forced shutdown of multiple STP Units is erroneous because it underestimates replacement power costs and fails to consider disruptive impacts, including [Electric Reliability Council of Texas ("ERCOT")] market price spikes.²³

Therefore, Contention CL-2 pertains only to replacement power costs.

13. On July 22, 2010, the NRC Staff submitted a Motion for Summary Disposition of Contention CL-2 on the legal grounds that the SAMDA analysis for the ABWRs to be used at STP Units 3 and 4 has finality, and therefore issues related to SAMDAs are not open to litigation in this proceeding.²⁴ The Applicant supported that motion.²⁵

14. On September 14, 2010, the Applicant also filed a Motion for Summary Disposition of Contention CL-2, arguing that the material facts demonstrate that SAMDAs are

²⁰ *Id.* at 57.

²¹ *See id.* at 12-24.

²² *Id.* at 20-22.

²³ *Id.* at 30.

²⁴ NRC Staff Motion for Summary Disposition, at 14 (July 22, 2010).

²⁵ STP Nuclear Operating Company's Answer Supporting the NRC Staff Motion for Summary Disposition of Contention CL-2, at 1, 4 (July 29, 2010).

not cost-effective even after accounting for the factors identified by the Intervenors.²⁶ That motion was supported by the “Joint Affidavit of Jeffrey L. Zimmerly and Adrian Pieniazek.” The Intervenors opposed both the Applicant’s and Staff’s motions.²⁷ Intervenors’ opposition to the Applicant’s Motion for Summary Disposition of Contention CL-2 was supported by Mr. Johnson’s October 6, 2010 “Affidavit in Response to Motion for Summary Disposition.” The NRC Staff supported the Applicant’s motion,²⁸ and submitted the “Affidavit of James V. Ramsdell and David M. Anderson Concerning the Staff’s Review of STPNOC’s Updated SAMDA Evaluation” (“Staff Affidavit”).

15. Following oral argument on the motions for summary disposition,²⁹ the Board issued Memorandum and Order LBP-11-07 on February 28, 2011 that, among other things, denied the NRC Staff’s and Applicant’s motions for summary disposition.³⁰ In ruling on the Applicant’s Motion for Summary Disposition of Contention CL-2, the Board concluded “that genuine disputes over issues of material fact remain regarding whether Intervenors’ Contention CL-2 challenges are bounded by the Applicant’s SAMDA analysis conclusion . . . [and must be] resolved at hearing.”³¹

16. At about the same time that the Board issued LBP-11-07, the NRC Staff issued the Final Environmental Impact Statement (“FEIS”).³² As stated in the FEIS, the Staff’s

²⁶ STP Nuclear Operating Company’s Motion for Summary Disposition of Contention CL-2, at 27 (Sept. 14, 2010).

²⁷ Intervenors’ Response to Staff’s Motion for Summary Disposition (Aug. 11, 2010); Intervenors’ Response to Applicant’s Motion for Summary Disposition of Contention CL-2 (Oct. 8, 2010).

²⁸ NRC Staff Answer to Applicant’s Motion for Summary Disposition of Contention CL-2, at 13-14 (Oct. 7, 2010).

²⁹ See Board Notice (Regarding Oral Argument), at 1-2 (July 30, 2010) (unpublished).

³⁰ *Nuclear Innovation North America* (South Texas Project Units 3 & 4), LBP-11-07, 73 NRC ___, slip op. at 2, 74 (Feb. 28, 2011).

³¹ *Id.* at 20-21.

³² NUREG-1937, Environmental Impact Statement for Combined Licenses (COLs) for South Texas Project Electric Generating Station Units 3 and 4 (Feb. 2011) (Exhs. NRC00003A to NRC00003D).

“recommendation to the Commission related to the environmental aspects of the proposed action is that the COLs should be issued.”³³

17. During a prehearing conference call on March 8, 2011, all parties agreed to move forward with a hearing and to a schedule of evidentiary filings leading up to a hearing during August 2011.³⁴

18. In accordance with the March 11, 2011 Scheduling Order, the parties submitted pre-filed direct testimony, initial position statements,³⁵ and exhibits on May 9, 2011. On May 31, 2011, the parties submitted their rebuttal testimony, rebuttal position statements,³⁶ and exhibits.

19. On June 17, 2011, NINA and the NRC Staff filed motions in limine that sought to strike aspects of the Intervenors’ pre-filed direct and rebuttal testimony and exhibits.³⁷ The Intervenors did not agree that the information included in these motions with respect to Contention CL-2 should be excluded.³⁸ In those areas where the Intervenors’ did not agree to exclude testimony or exhibits, the Board denied the motions, stating that “[l]icensing boards are

³³ Exh. NRC00003C, at 10-29.

³⁴ Order (Establishing Schedule for Evidentiary Hearing) (Mar. 11, 2011) (unpublished).

³⁵ Nuclear Innovation North America LLC’s Initial Statement of Position on Contention CL-2 (May 9, 2011); NRC Staff Initial Statement of Position (May 9, 2011); Intervenors’ Initial Statements of Position in Support of Contentions CL-2 and DEIS-1 (May 9, 2011).

³⁶ Nuclear Innovation North America LLC’s Rebuttal Statement of Position on Contention CL-2 (May 31, 2011); NRC Staff Rebuttal Statement of Position (May 31, 2011); Intervenors’ Consolidated Response to Applicant’s and Staff’s Statements of Initial Positions (May 31, 2011).

³⁷ Nuclear Innovation North America’s Motion In Limine to Strike Portions of Intervenors’ Initial and Rebuttal Submissions (June 17, 2011); NRC Staff Motion *In Limine* to Exclude Portions of Testimony and Exhibits Filed by the Intervenors (June 17, 2011).

³⁸ See Intervenors’ Consolidated Response to Applicant’s & Staff’s Motions In Limine (June 27, 2011). Subsequently, the Intervenors filed an addendum clarifying issues raised by the Board during a conference call. See Corrected Intervenors’ Addendum to Intervenors’ Consolidated Response to Applicant’s and Staff’s Motions In Limine (July 1, 2011).

accustomed to weighing evidence and determining its relevance to the issues presented.”³⁹ In denying the motions in limine to strike, the Board was not making a finding that the subject testimony and exhibits were relevant to Contention CL-2.⁴⁰ As discussed later in this decision, we hold that the subject testimony and exhibits are not relevant and therefore accord them no weight.

20. On August 18 and 19, 2011, the Board held an evidentiary hearing on Contention CL-2 in Austin, Texas. At the hearing, the witnesses attested to the accuracy of their written testimony and responded to questions from the Board. Additionally, the Board admitted into evidence the exhibits proffered by the parties. The hearing was conducted in accordance with the provisions of Subpart L to 10 C.F.R. Part 2, and none of the parties requested an opportunity to conduct cross-examination. The Board closed the evidentiary record for Contention CL-2 on September 8, 2011.⁴¹

III. LEGAL STANDARDS

A. Law Governing Contested Hearings on Environmental Issues

21. The contention at issue here, Contention CL-2, arises under the National Environmental Policy Act of 1969 (“NEPA”) and the NRC regulations in 10 C.F.R. Part 51 implementing the agency’s responsibilities pursuant to NEPA.

22. The Board reviews contested issues *de novo*, applying the same substantive standard applicable to the NRC Staff’s NEPA review. According to the Commission: “[W]hen resolving contentions litigated through the adversary process, [boards must] bring their own ‘*de*

³⁹ Order (Ruling on Motions in Limine), at 3 (July 14, 2011) (unpublished).

⁴⁰ *See id.* at 3-4.

⁴¹ Memorandum and Order (Adopting Transcript Corrections and Partially Closing Evidentiary Record), at 2 (Sept. 8, 2011) (unpublished).

novo’ judgment to bear. In such cases, boards must decide, based on governing regulatory standards and the evidence submitted, whether the applicant has met its burden of proof (except where the NRC Staff has the burden).”⁴²

B. Law Governing Environmental Impacts Evaluated Under NEPA

23. NEPA requires that federal agencies, such as the NRC, prepare an EIS for “major Federal actions significantly affecting the quality of the human environment.”⁴³ NEPA does not mandate substantive results; rather, it imposes procedural restraints on agencies, requiring them to take a “hard look” at the environmental impacts of a proposed action and reasonable alternatives to that action.⁴⁴

24. This “hard look” is subject to the “rule of reason.”⁴⁵ This means that an “agency’s environmental review, rather than addressing every impact that could possibly result, need only account for those that have some likelihood of occurring or are reasonably foreseeable.”⁴⁶ Consideration of “remote and speculative” or “inconsequential small” impacts is not required.⁴⁷ As the Commission explained, “NEPA also does not call for certainty or precision, but an *estimate* of anticipated (not unduly speculative) impacts.”⁴⁸ When faced with

⁴² *Exelon Generation Co., LLC* (Early Site Permit for Clinton ESP Site), CLI-05-17, 62 NRC 5, 39 (2005).

⁴³ 42 U.S.C. § 4332(2)(C) (2006).

⁴⁴ *See La. Energy Servs., L.P.* (Claiborne Enrichment Ctr.), CLI-98-3, 47 NRC 77, 87-88 (1998); *see also Balt. Gas & Elec. Co. v. NRDC*, 462 U.S. 87, 97-98 (1983) (holding that NEPA requires agencies to take a “hard look” at environmental consequences prior to taking major actions).

⁴⁵ *La. Energy Servs., L.P.* (Nat’l Enrichment Facility), LBP-06-8, 63 NRC 241, 258-59 (2006) (citing *Long Island Lighting Co.* (Shoreham Nuclear Power Station), ALAB-156, 6 AEC 831, 836 (1973)); *see also Dep’t of Transp. v. Pub. Citizen*, 541 U.S. 752, 767-69 (2004) (stating that the rule of reason is inherent in NEPA and its implementing regulations).

⁴⁶ *Nat’l Enrichment*, LBP-06-8, 63 NRC at 258-59 (citing *Shoreham*, ALAB-156, 6 AEC at 836).

⁴⁷ *See Vt. Yankee Nuclear Power Corp.* (Vermont Yankee Nuclear Power Station), ALAB-919, 30 NRC 29, 44 (1989) (citing *Limerick Ecology Action, Inc. v. NRC*, 869 F.2d 719, 739 (3d Cir. 1989)).

⁴⁸ *La. Energy Servs. L.P.* (Nat’l Enrichment Facility), CLI-05-20, 62 NRC 523, 536 (2005).

uncertainty, NEPA only requires “reasonable forecasting.”⁴⁹ Similarly, the U.S. Supreme Court has held that NEPA does not require a “worst case analysis.”⁵⁰

25. Additionally, forecasts under NEPA are legally sufficient if they are reasonable.

The Commission stated in *Pilgrim*:

There is no NEPA requirement to use the best scientific methodology, and NEPA “should be construed in the light of reason if it is not to demand” virtually infinite study and resources. Nor is an environmental impact statement intended to be a “research document,” reflecting the frontiers of scientific methodology, studies and data. NEPA does not require agencies to use technologies and methodologies that are still “emerging” and under development, or to study phenomena “for which there are not yet standard methods of measurement or analysis.” And while there “will always be more data that could be gathered,” agencies “must have some discretion to draw the line and move forward with decisionmaking.” In short, NEPA allows agencies “to select their own methodology as long as that methodology is reasonable.”⁵¹

The Commission has stated that it asks “not whether every assumption contained in the FEIS was the best or whether it will turn out true but, ‘whether the economic assumptions . . . were so distorted as to impair fair consideration of . . . environmental effects.’”⁵² Similarly, in the context of power forecasts, the Appeal Board held in *Nine Mile Point* that “inherent in any forecast . . . is a substantial margin of uncertainty,” and therefore the forecast should be accepted if it is “reasonable.”⁵³ Therefore, forecasts are subject to substantial uncertainty and, as long as

⁴⁹ *Scientists’ Inst. for Pub. Info., Inc. v. AEC*, 481 F.2d 1079, 1092 (D.C. Cir. 1973).

⁵⁰ *Robertson v. Methow Valley Citizens Council*, 490 U.S. 332, 354-55, 359 (1989).

⁵¹ *Entergy Nuclear Generation Co.* (Pilgrim Nuclear Power Station), CLI-10-11, 71 NRC 287, 315-16 (2010) (citations omitted).

⁵² *Private Fuel Storage, LLC* (Indep. Spent Fuel Storage Installation), CLI-04-22, 60 NRC 125, 145 (2004).

⁵³ *Niagara Mohawk Power Corp.* (Nine Mile Point Nuclear Station, Unit 2), ALAB-264, 1 NRC 347, 365-67 (1975). The Commission has endorsed the *Nine Mile Point* rule. See *Carolina Power & Light Co.* (Shearon Harris Nuclear Power Plant, Units 1, 2, 3, & 4), CLI-79-5, 9 NRC 607, 609-10 (1979).

they are reasonable, they are not open to criticism because some other person has an opposing view.⁵⁴

26. The parties all agreed with the legal principles cited above.⁵⁵ However, in certain areas, they disagreed with the application of those principles to the facts in this proceeding.

C. Standard of Proof

27. An applicant generally has the burden of proof in a licensing proceeding.⁵⁶ In cases involving NEPA contentions, the burden shifts to the NRC Staff, because the NRC Staff, not the Applicant, has the burden of complying with NEPA.⁵⁷ However, because “the Staff, as a practical matter, relies heavily upon the Applicant’s ER in preparing the [Environmental Impact Statement (“EIS”)], should the Applicant become a proponent of a particular challenged position set forth in the EIS, the Applicant, as such a proponent, also has the burden on that matter.”⁵⁸

28. With respect to Contention CL-2, the Intervenors have the initial “burden of going forward,” that is, they must provide sufficient evidence to support the claims made in the

⁵⁴ See *Nw. Envtl. Advocates v. Nat’l Marine Fisheries Serv.*, 460 F.3d 1125, 1143-44 (9th Cir. 2006) (finding no merit in the petitioner’s argument that a multi-port analysis should have been included in the agency’s economic analysis, where the assumptions and overall conclusions of the agency’s economic analysis were “reasonable”); *S. La. Envtl. Council, Inc. v. Sand*, 629 F.2d 1005, 1014 (5th Cir. 1980) (rejecting plaintiffs’ argument that the estimate of fair rental value of equipment moving through a project’s waterways should have been calculated differently when the agency’s calculation was fair and reasonable).

⁵⁵ See Transcript of South Texas Project Units 3 and 4, Docket Nos. 52-012-COL and 52-013-COL, at 1556, 1659-61, 1665-68, 1672-73, 1676, 1679 (showing agreement among all parties that NEPA requires evaluation of whether a methodology is “reasonable”) (“Tr.”). The Board adopted all of the parties’ proposed transcript corrections. Memorandum and Order (Adopting Transcript Corrections and Partially Closing Evidentiary Record), at 1.

⁵⁶ 10 C.F.R. § 2.325.

⁵⁷ See, e.g., *Duke Power Co.* (Catawba Nuclear Station, Units 1 & 2), CLI-83-19, 17 NRC 1041, 1049 (1983).

⁵⁸ *La. Energy Servs., L.P.* (Claiborne Enrichment Center), LBP-96-25, 44 NRC 331, 338-39 (1996) (citing *Pub. Serv. Co. of N.H.* (Seabrook Station, Units 1 & 2), ALAB-471, 7 NRC 477, 489 n.8 (1978), *rev’d on other grounds*, CLI-97-15, 46 NRC 294 (1997)).

admitted contention.⁵⁹ If the Intervenors can make that showing, the Applicant has the burden of satisfying the Board that the Board should therefore reject the contention as a basis for denial of the license.⁶⁰

29. The Applicant's position must be supported by a preponderance of the evidence.⁶¹ Therefore, if the preponderance of the evidence shows that the Applicant's positions with respect to Contention CL-2 are reasonable, the Board will rule in favor of the Applicant. The same is true with respect to the NRC Staff.

D. Scope of a Contention

30. Parties are not permitted to change the scope of the contention admitted by the Board. As the Commission has stated: "Our longstanding practice requires adjudicatory boards to adhere to the terms of admitted contentions."⁶² Additionally, the Commission has stated that "[w]here an issue arises over the scope of an admitted contention, NRC opinions have long referred back to the bases set forth in support of the contention."⁶³

⁵⁹ *Consumers Power Co.* (Midland Plant, Units 1 & 2), ALAB-123, 6 AEC 331, 345 (1973) ("The ultimate burden of proof on the question of whether the permit or license should be issued is, of course, upon the applicant. But where, as here, one of the other parties contends that, for a specific reason . . . the permit or license should be denied, that party has the *burden of going forward* with evidence to buttress that contention. Once he has introduced sufficient evidence to establish a *prima facie* case, the burden then shifts to the applicant who, as part of his overall burden of proof, must provide a sufficient rebuttal to satisfy the Board that it should reject the contention as a basis for denial of the permit or license."). See also *Vt. Yankee Nuclear Power Corp. v. NRDC*, 435 U.S. 519, 554 (1978) (upholding this threshold test for intervenor participation in licensing proceedings); *Phila. Elec. Co.* (Limerick Generating Station, Units 1 & 2), ALAB-262, 1 NRC 163, 191 (1975) (holding that the intervenors had the burden of introducing evidence to demonstrate that the basis for their contention was more than theoretical).

⁶⁰ See, e.g., *La. Power & Light Co.* (Waterford Steam Electric Station, Unit 3), ALAB-732, 17 NRC 1076, 1093 (1983) (reiterating the well established principle that, after intervenors have made a *prima facie* showing, the burden shifts to the applicant) (citing *Midland*, ALAB-123, 6 AEC at 345).

⁶¹ See *Pac. Gas & Elec. Co.* (Diablo Canyon Nuclear Power Plant, Units 1 & 2), ALAB-763, 19 NRC 571, 577 (1984) ("In order to prevail . . . , the applicant's position must be supported by a preponderance of the evidence.").

⁶² *Claiborne*, CLI-98-3, 47 NRC at 105.

⁶³ *Duke Energy Corp.* (McGuire Nuclear Station, Units 1 & 2; Catawba Nuclear Station, Units 1 & 2), CLI-02-28, 56 NRC 373, 379 (2002); see also *Pub. Serv. Co. of N.H.* (Seabrook Station, Units 1 & 2), ALAB-899, 28 NRC

E. The Board's Decision Supplements and Amends the FEIS

31. In determining whether the FEIS should have contained additional information, the Board may consider the record as a whole. Established Commission precedent has held that the adjudicatory record and the Board decision become part of the FEIS.⁶⁴ In NRC licensing proceedings, “the ultimate NEPA judgments regarding a facility can be made on the basis of the entire record before a presiding officer, such that the EIS can be deemed to be amended *pro tanto*.”⁶⁵ The Commission has recently affirmed this principle in this proceeding.⁶⁶ Therefore, the Board may consider the full record before it, including the testimony to conclude that “the aggregate is sufficient to satisfy the agency’s obligation under NEPA” to take a “hard look” at the environmental consequences of issuing a COL.⁶⁷

IV. FACTUAL FINDINGS AND LEGAL CONCLUSIONS

A. Witnesses and Evidence Presented

1. NINA's Expert Witnesses

32. NINA presented two witnesses regarding Contention CL-2: (1) Mr. Adrian Pieniasek; and (2) Mr. Jeffrey L. Zimmerly. Messrs. Zimmerly and Mr. Pieniasek submitted

93, 97 & n. 11 (1988) (stating that the “intervenor is not free to change the focus of its admitted contention, at will, as the litigation progresses”), *aff'd in part and remanded in part on other matters sub nom., Massachusetts v. NRC*, 924 F.2d 311 (D.C. Cir.), *cert. denied*, 502 U.S. 899 (1991).

⁶⁴ See, e.g., *La. Energy Servs. (Nat'l Enrichment Facility)*, CLI-06-15, 63 NRC 687, 707 n. 91 (“Adjudicatory findings on NEPA issues, including our own in this decision, become part of the environmental ‘record of decision’ and in effect supplement the FEIS.”); *Claiborne*, CLI-98-3, 47 NRC at 89 (“In NRC licensing adjudications . . . it is the Licensing Board that compiles the final environmental ‘record of decision’ The adjudicatory record and Board decision . . . become, in effect, part of the FEIS.”).

⁶⁵ *La. Energy Svs., L.P. (Nat'l Enrichment Facility)*, LBP-05-13, 61 NRC 385, 404 (2005).

⁶⁶ *Nuclear Innovation North America LLC (South Texas Project, Units 3 and 4)*, CLI-11-06, 74 NRC ___, slip op. at 7-8 (Sept. 9, 2011) (stating that “the Staff’s review (the FEIS itself) and the adjudicatory record will become part of the environmental record of the decision”).

⁶⁷ *Nat'l Enrichment Facility*, LBP-06-8, 63 NRC at 285-86.

both direct and rebuttal testimony for this contention and gave oral testimony at the evidentiary hearing.⁶⁸

33. Mr. Zimmerly is an Environmental Engineer and the Corporate Quality Assurance Manager for Tetra Tech NUS, Inc. (“Tetra Tech”). He has more than 10 years of experience supporting various government, utility, and industrial clients in the areas of environmental impact assessment, radiological transportation risk assessment, accident analysis, human health and ecological risk assessment, air quality modeling and compliance, occupational and environmental health physics, and radioactive waste management. Mr. Zimmerly participated in the preparation of the ER for STP Units 3 and 4, including authoring and reviewing parts of the SAMDA evaluation. He also authored and reviewed portions of ER Section 7.5S that the Applicant submitted to the NRC on November 10, 2009. Mr. Zimmerly also has performed analyses and calculations to support ERs for other new reactor and license renewal applications.⁶⁹

34. Mr. Pieniazek is the Director of Market Policy for NRG Energy, Inc. (“NRG Energy”).⁷⁰ He has more than 27 years of experience in the energy industry and has been in his current position since 2003. Currently, Mr. Pieniazek represents NRG Energy’s interests at ERCOT and the Public Utility Commission of Texas, as well as providing analysis and policy recommendations to numerous NRG Energy business units, with a specific emphasis on wholesale electricity market design issues. Prior to his current position, Mr. Pieniazek was the

⁶⁸ Direct Testimony of Applicant Witnesses Jeffrey L. Zimmerly and Adrian Pieniazek Regarding Contention CL-2 (May 9, 2011) (“Zimmerly/Pieniazek Direct Testimony”) (Exh. STP000011); Rebuttal Testimony of Applicant Witnesses Jeffrey L. Zimmerly and Adrian Pieniazek Regarding Contention CL-2 (May 31, 2011) (“Zimmerly/Pieniazek Rebuttal Testimony”) (Exh. STP000030).

⁶⁹ Mr. Zimmerly’s resume is provided as Exh. STP000012. *See also* Zimmerly/Pieniazek Direct Testimony, at 1-3; *see generally* Tr. at 1470-549.

⁷⁰ NRG Energy is an owner of NINA.

Director of Asset Management for Reliant Energy, Inc. in Texas. Prior to that, he served as the Director of Generation Planning for City Public Service Board (“CPS Energy”), the municipal power utility serving San Antonio, Texas.⁷¹

35. Based on the foregoing, and the respective background and experience of Messrs. Zimmerly and Pieniazek, the Board finds that Messrs. Zimmerly and Pieniazek are qualified to testify as expert witnesses relative to the issues raised in Contention CL-2.

2. NRC Staff’s Expert Witnesses

36. The Staff presented three witnesses regarding Contention CL-2: (1) Mr. Richard L. Emch, Jr.; (2) Mr. Jeremy P. Rishel; and (3) Mr. David M. Anderson. Messrs. Emch, Rishel, and Anderson submitted both direct and rebuttal testimony for this contention and gave oral testimony at the evidentiary hearing.⁷²

37. Mr. Emch is a Senior Health Physicist who has been employed by the NRC for more than 36 years. Mr. Emch was a Director of the Protective Measures Team at the NRC’s Emergency Operations Center for 15 years and has been a supervisor in the areas of technical specifications, radiation protection, emergency preparedness, design basis accident dose analysis, probabilistic risk assessment, and operating reactor project management. Currently, he is assigned to the Environmental Technical Support Branch in the Division of Site and Environmental Reviews in the Office of New Reactors. Mr. Emch provides technical oversight of NRC Staff and contractors involved in the review of the environmental impacts of radiation protection and postulated accidents, including Severe Accident Mitigation Alternative

⁷¹ Mr. Pieniazek’s resume is provided as Exh. STP000002. *See also* Zimmerly/Pieniazek Direct Testimony, at 3-4; *see generally* Tr. at 1470-549.

⁷² Prefiled Direct Testimony of Richard L. Emch, Jr., Jeremy P. Rishel, and David M. Anderson Regarding Contention CL-2 (May 9, 2011) (“Emch/Rishel/Anderson Direct Testimony”) (Exh. NRCR00004); Prefiled Rebuttal Testimony of Richard L. Emch, Jr., Jeremy P. Rishel, and David M. Anderson Regarding Contention CL-2 (May 31, 2011) (“Emch/Rishel/Anderson Rebuttal Testimony”) (Exh. NRC000058).

(“SAMA”) analyses for COL applications. Since early 2002, Mr. Emch has been involved in the review of numerous SAMA analyses supporting license renewal and COL applications. For the STP COL proceeding, Mr. Emch was responsible for the technical oversight of NRC Staff and contractors involved in the review of the environmental impacts of radiation protection and postulated accidents, including the SAMA analysis. Mr. Emch helped prepare Section 5.11, “Environmental Impacts of Postulated Accidents,” of the draft and final versions of the STP EIS.⁷³

38. Mr. Rishel is a Technical Research Scientist employed by Pacific Northwest National Laboratory (“PNNL”). Mr. Rishel has been employed at PNNL for six years, and his previous experience includes four years working at the Los Alamos National Laboratory (“LANL”). For the last 10 years, he has been involved in the emergency operation centers at LANL and Hanford, providing consequence assessment modeling support in the event of a chemical, biological, or radiological release. Mr. Rishel has assisted in the development of atmospheric dispersion models and has performed meteorological and dispersion modeling to support emergency response at the Department of Energy’s (“DOE’s”) Hanford Unified Dose Assessment Center. Mr. Rishel is also a committee chair for DOE’s Consequence Assessment Modeling Working Group under the Subcommittee on Consequence Assessment and Protective Actions. Mr. Rishel’s current responsibilities include assisting the NRC Staff with environmental reviews for nuclear power plant licensing and license renewals in the areas of meteorology, design-basis and severe accidents, and SAMA analyses. Mr. Rishel is a lead

⁷³ Mr. Emch’s resume is provided as Exh. NRC000005. *See also* Emch/Rishel/Anderson Direct Testimony, at 1-5; *see generally* Tr. at 1597-643.

reviewer on several EIS's for nuclear reactor license renewal, early site permit ("ESP"), and COL applications in the areas of meteorology and accidents, which includes SAMDA reviews.⁷⁴

39. Mr. Anderson is a Senior Research Economist at PNNL, where he has been employed for 16 years. Mr. Anderson also worked for four years at the headquarters of Washington Mutual Bank. Mr. Anderson has been conducting economic impact studies for more than 20 years, and has been involved in assessing baseload power needs associated with nuclear power plants over the previous four years. Mr. Anderson contributed to the preparation of NUREG-1555, "Environmental Standard Review Plan—Standard Review Plans for Environmental Reviews for Nuclear Power Plants," ("ESRP") and subsequent revisions, and has prepared EIS sections on socioeconomics, benefits and costs, need for power, environmental justice and land use for a number of ESP and COL applications.⁷⁵

40. Based on the foregoing, and the respective background and experience of Messrs. Emch, Rishel, and Anderson, the Board finds that Messrs. Emch, Rishel, and Anderson are qualified to testify as expert witnesses relative to the issues raised in Contention CL-2.

3. Intervenors' Expert Witness

41. The Intervenors presented one witness regarding Contention CL-2: Mr. Clarence L. Johnson. Mr. Johnson submitted both direct and rebuttal testimony for this contention and gave oral testimony at the evidentiary hearing.⁷⁶

⁷⁴ Mr. Rishel's resume is provided as Exh. NRC000006. *See also* Emch/Rishel/Anderson Direct Testimony, at 1-5; *see generally* Tr. at 1597-643.

⁷⁵ Mr. Anderson's resume is provided as Exh. NRC000007. *See also* Emch/Rishel/Anderson Direct Testimony, at 1-6; *see generally* Tr. at 1597-643.

⁷⁶ Direct Testimony of Clarence L. Johnson (dated May 16, 2011) ("Johnson Direct Testimony") (Exh. INT000021); Rebuttal Testimony of Clarence L. Johnson (dated May 31, 2011) ("Johnson Rebuttal Testimony") (Exh. INTR20045).

42. Mr. Johnson is a self-employed consultant who provides technical analysis and advice regarding energy and utility regulatory issues. He has over 25 years of experience as a professional staff person for the Texas Office of Public Utility Counsel (“OPC”). As OPC’s Director of Regulatory Analysis, Mr. Johnson was the professional staff person with the primary responsibility for advising the OPC on economic and regulatory policy issues. His responsibilities included reviewing utility rate applications, recommending actions or positions to be taken by the OPC, preparing and presenting expert testimony, and working with other experts employed or retained by OPC to coordinate the agency’s technical evidentiary positions.⁷⁷

43. Based on the foregoing, and the respective background and experience of Mr. Johnson, the Board finds that Mr. Johnson is qualified in general to testify as an expert witness relative to Contention CL-2. The Board concludes, however, that Mr. Johnson has no education, training or experience regarding issues related to nuclear safety, and therefore does not have sufficient qualifications to testify on such issues, including the ramifications of the accident at the Fukushima power plant in Japan and evaluation of Core Damage Frequencies.⁷⁸ Accordingly, the Board gives no weight to his testimony or exhibits on such issues.

B. Overview of SAMDA Evaluation in ER Sections 7.3 and 7.5S

44. The primary technical evaluations that relate to Contention CL-2 are contained in ER Sections 7.3 and 7.5S. The FEIS does not address the issues raised by Contention CL-2, because the NRC Staff took the position that the only issue for consideration in this proceeding

⁷⁷ Mr. Johnson’s resume is provided as Exh. INT000022. *See also* Johnson Direct Testimony, at 3-5; *see generally* Tr. at 1553-97.

⁷⁸ *See* Tr. at 1582-88.

was whether the STP site characteristics fall within the site parameters in the SAMDA analysis for the ABWR.⁷⁹

45. Sections 7.3 and 7.5S of the ER for STP Units 3 and 4 present a site-specific analysis of SAMAs.⁸⁰ Section 7.3 provides a SAMA analysis for an accident at a single ABWR unit, and Section 7.5S provides a SAMA analysis for an accident at a single ABWR unit with multi-year outages at the other three co-located units.⁸¹

46. SAMAs consist of two types of alternatives: 1) SAMDAs; and 2) alternatives involving administrative controls, such as procedures and training.⁸² With respect to SAMAs involving administrative controls, ER Section 7.3.3 states that evaluation of specific administrative controls will occur when the design for STP Units 3 and 4 is finalized and plant administrative processes and procedures are being developed.⁸³ Under the licensing process established in 10 C.F.R. Part 52, procedures and training do not need to be finalized in order to obtain a COL and instead can be developed during construction.⁸⁴ Prior to fuel load, appropriate administrative controls on plant operations will be developed and incorporated into the

⁷⁹ Emch/Rishel/Anderson Direct Testimony, at 35.

⁸⁰ Zimmerly/Pieniazek Direct Testimony, at 7; Exh. STP000013, at 7.3-1; Emch/Rishel/Anderson Direct Testimony, at 28.

⁸¹ Exh. STP000013 §§ 7.3, 7.5S.

⁸² Zimmerly/Pieniazek Direct Testimony, at 7; Exh. STP000013, at 7.3-2 to -3.

⁸³ Zimmerly/Pieniazek Direct Testimony, at 7; Exh. STP000013, at 7.3-2 to -3.

⁸⁴ *See, e.g.*, 10 C.F.R. § 52.79(a)(10), (11), (13), (14), (15), (29), (33), (40), which require COL applications to provide a description of various operational and training programs and plans, as distinct from procedures themselves. As the Commission has stated, descriptions of operational programs are provided and reviewed by the Commission as part of the COL application and subsequently the more detailed procedures are implemented by the applicant and inspected by the NRC before plant operation. Power Reactor Security Requirements, 74 Fed. Reg. 13,926, 13,933 (Mar. 27, 2009). The Board has previously recognized this principle in this proceeding in the context of 10 C.F.R. § 52.80(d). *See South Texas Project Nuclear Operating Co.* (South Texas Project Units 3 & 4), LBP-10-2, 71 NRC 190, 210 (2010).

management systems for STP Units 3 and 4.⁸⁵ Therefore, because procedures and training materials have not and do not need to be developed at this time, and because appropriate procedures and training to mitigate accidents will be developed before fuel load, there is no further evaluation of alternative administrative controls that can fruitfully be conducted at this time.⁸⁶ The Intervenors did not contest this evaluation in ER Section 7.3.3, which applies equally to SAMA evaluations involving co-located units. As a result, only the evaluation of SAMDAs is addressed below.

47. To perform a SAMDA evaluation, the cost of each SAMDA is compared against the benefit of implementing the SAMDA.⁸⁷ As discussed in ER Section 7.3.1, a screening analysis is performed to determine the maximum benefit from averting all severe accidents.⁸⁸ If the maximum benefit from averting all severe accidents is lower than the lowest cost of the SAMDAs, then the SAMDAs are screened out and the analysis is complete.⁸⁹ However, if the maximum benefit from averting all severe accidents is greater than the cost of any of the SAMDAs, each of those SAMDAs is evaluated further.⁹⁰ The cost of each of those individual SAMDAs is evaluated against the benefit of implementing each of those individual SAMDAs.⁹¹ For example, if a SAMDA would eliminate 10% of the total risk of severe accidents, then the

⁸⁵ Zimmerly/Pieniazek Direct Testimony, at 7.

⁸⁶ Zimmerly/Pieniazek Direct Testimony, at 7-8.

⁸⁷ Zimmerly/Pieniazek Direct Testimony, at 8; Emch/Rishel/Anderson Direct Testimony, at 9.

⁸⁸ Zimmerly/Pieniazek Direct Testimony, at 8; Exh. STP000013, at 7.3-1 to -3; Emch/Rishel/Anderson Direct Testimony, at 10-11.

⁸⁹ Zimmerly/Pieniazek Direct Testimony, at 8.

⁹⁰ Zimmerly/Pieniazek Direct Testimony, at 8.

⁹¹ Zimmerly/Pieniazek Direct Testimony, at 8.

benefit of the SAMDA would be approximately 10% of the maximum averted cost of severe accidents.⁹²

48. The screening approach for SAMDAs is explicitly endorsed in ESRP Section 7.3.⁹³ The screening approach is also consistent with the Staff's environmental assessment for the SAMDA analysis for the ABWR,⁹⁴ is a common method for performing SAMDA evaluations,⁹⁵ and was also used by the NRC Staff in the SAMDA evaluation performed in its testimony.⁹⁶

49. The identities and costs of SAMDAs for designs certified under 10 C.F.R. Part 52 are determined as part of the design certification process.⁹⁷ For the ABWR, the SAMDAs and their costs were identified in the Technical Support Document ("TSD") submitted as part of the ABWR design certification application on December 21, 1994.⁹⁸ The TSD evaluated a wide variety of ABWR modifications as potential SAMDAs, but narrowed the list to 21 after excluding modifications already incorporated or not applicable.⁹⁹ The lowest-cost SAMDA for the ABWR was estimated to be \$100,000 (1991 dollars).¹⁰⁰ This lowest-cost corresponds to SAMDAs for improved vacuum breakers, drywell head flooding, and Reactor Building sprays.¹⁰¹

⁹² Zimmerly/Pieniazek Direct Testimony, at 8.

⁹³ Exh. STP000018, at 7.3-6.

⁹⁴ Emch/Rishel/Anderson Direct Testimony, at 34.

⁹⁵ Emch/Rishel/Anderson Direct Testimony, at 10-11.

⁹⁶ Emch/Rishel/Anderson Direct Testimony, at 60-61, 65.

⁹⁷ Zimmerly/Pieniazek Direct Testimony, at 8.

⁹⁸ Zimmerly/Pieniazek Direct Testimony, at 8; Exh. NRC00009A, at 1; Emch/Rishel/Anderson Direct Testimony, at 11.

⁹⁹ Zimmerly/Pieniazek Direct Testimony, at 9; Exh. NRC00009A, at 15, 19-24; Emch/Rishel/Anderson Direct Testimony, at 15-18.

¹⁰⁰ Zimmerly/Pieniazek Direct Testimony, at 10; Exh. NRC00009A, at 25-26.

¹⁰¹ Zimmerly/Pieniazek Direct Testimony, at 10; Exh. NRC00009A, at 25-26.

50. The benefits of SAMDAs are determined using a probabilistic-based approach for estimating the maximum averted cost-risk of the severe accidents.¹⁰² This approach accounts for exposure costs, cleanup costs, and replacement power costs associated with the postulated severe accident and corresponding outages, and factors in the likelihood of the severe accident as reflected in the reactor's Core Damage Frequency ("CDF").¹⁰³

51. In calculating the benefits of SAMDAs (*i.e.*, the maximum averted cost-risk) in ER Sections 7.3 and 7.5S, the Applicant conservatively assumed that each SAMDA would completely prevent all severe accidents.¹⁰⁴ Additionally, for purposes of the Applicant's SAMDA evaluation, accidents originating at STP Units 1 and 2 were not considered because there are no SAMDAs for STP Units 3 and 4 that could prevent or mitigate an accident at STP Units 1 and 2.¹⁰⁵

52. The SAMDA evaluation for an ABWR experiencing a severe accident is provided in ER Section 7.3, which does not address the economic impacts on co-located units. The SAMDA evaluation which considers the economic impacts on co-located units is provided in ER Section 7.5S.5. The replacement power costs used in these SAMDA evaluations followed NRC's guidance in NUREG/BR-0184, "Regulatory Analysis Technical Evaluation Handbook" (Jan. 1997).¹⁰⁶

¹⁰² Zimmerly/Pieniazek Direct Testimony, at 10; Exh. STP000013, at 7.3-1 to -2; Emch/Rishel/Anderson Direct Testimony, at 9.

¹⁰³ Zimmerly/Pieniazek Direct Testimony, at 10; Exh. STP000013, at 7.5S-6; Emch/Rishel/Anderson Direct Testimony, at 10.

¹⁰⁴ Zimmerly/Pieniazek Direct Testimony, at 10. This is conservative, because there are no SAMDAs that would prevent all severe accidents. Zimmerly/Pieniazek Direct Testimony, at 12.

¹⁰⁵ Zimmerly/Pieniazek Direct Testimony, at 13; Exh. STP000013, at 7.5S-1. This is supported by the Board's conclusion that "any allegations involving only STP Units 1 and 2 are outside the scope of this proceeding and cannot be considered by this Board, which is solely concerned with the licensing of proposed STP Units 3 and 4." *South Texas Project*, LBP-10-14, slip op. at 25 n.140.

¹⁰⁶ Zimmerly/Pieniazek Direct Testimony, at 15; Exh. STP000013, at 7.5S-6.

53. NUREG/BR-0184 states that typical short-term replacement power costs for a 910 MWe power plant are \$310,000 per day (1993 dollars).¹⁰⁷ To determine replacement power costs for the co-located units following a severe accident at the STP site, the ER first multiplied this value by the estimated outage duration of the co-located units to determine the generic replacement power costs.¹⁰⁸ For a hypothetical severe accident at an ABWR unit, the ER assumed that the outage duration at the co-located ABWR is six years and the outage duration at the co-located STP Units 1 and 2 is two years.¹⁰⁹

54. These generic replacement power costs were then used in an equation specified in NUREG/BR-0184 to calculate the net present value of replacement power costs over the life of the facility, based on a discount rate of 7% (and 3% in a sensitivity analysis).¹¹⁰ The ER then scaled up the net present value from a 910 MWe plant to a 1,350 MWe plant for the ABWR and 1,280 MWe each for STP Units 1 and 2.¹¹¹ Finally, the ER used the CDF for an ABWR (1.56×10^{-7} per year) to obtain the probability-weighted replacement power costs for use in the SAMDA evaluation.¹¹²

55. The CDF of 1.56×10^{-7} per year is for internal events at full power.¹¹³ As the Board previously stated in rejecting proposed Contention CL-1 Parts B and C, the risk of low

¹⁰⁷ Zimmerly/Pieniasek Direct Testimony, at 15; Exh. NRC00008B, at 5.51.

¹⁰⁸ Exh. STP000013, at 7.5S-6; Zimmerly/Pieniasek Direct Testimony, at 15-16; Emch/Rishel/Anderson Direct Testimony, at 31-32.

¹⁰⁹ Exh. STP000013, at 7.5S-6; Zimmerly/Pieniasek Direct Testimony, at 16; Emch/Rishel/Anderson Direct Testimony, at 31. These outage duration assumptions were used by the Intervenor in their support for Contention CL-2. *See* Zimmerly/Pieniasek Rebuttal Testimony, at 13.

¹¹⁰ Zimmerly/Pieniasek Direct Testimony, at 16-17; Exh. NRC00008B, at 5.21.

¹¹¹ Zimmerly/Pieniasek Direct Testimony, at 16-17; Exh. STP000013, at 7.5S-7.

¹¹² Zimmerly/Pieniasek Direct Testimony, at 16; Exh. STP000013, at 7.5S-4, 7.5S-6.

¹¹³ Zimmerly/Pieniasek Direct Testimony, at 16-17; Exh. STP000013, at 7.5S-4.

power and shutdown events is low and the impact from external events is small.¹¹⁴ Therefore, accounting for the probability of external events and low power and shutdown events would not have a material impact on the total CDF for STP Units 3 and 4.¹¹⁵

56. The replacement power costs calculated using the methodology in NUREG/BR-0184 were added to the other monetized impacts (*e.g.*, onsite exposure cost and onsite cleanup cost) to provide the total monetized impacts for each unit.¹¹⁶ The replacement power costs account for a majority of the impacts.¹¹⁷ Using this methodology, the ER determined that the lowest-cost SAMDA is much more costly than the total monetized impacts of the accident; therefore, the ER concluded that there are no cost-effective SAMDAs.¹¹⁸ As the NRC Staff testified, this result is not surprising, because the ABWR was designed using probabilistic risk assessment (“PRA”) techniques.¹¹⁹

C. Reasonableness of the Replacement Power Cost Estimates in the ER

57. As discussed above, economic forecasts are subject to substantial uncertainty, and NEPA only requires that they be reasonable.¹²⁰ Therefore, if the calculation of replacement power costs in ER Section 7.5S is reasonable, it satisfies the requirements of NEPA.

¹¹⁴ *South Texas Project*, LBP-10-14, slip op. at 20, 22.

¹¹⁵ Zimmerly/Pieniazek Direct Testimony, at 16; Exh. STP000013, at 7.5S-4.

¹¹⁶ Zimmerly/Pieniazek Direct Testimony, at 17; Exh. STP000013, at 7.5S-6; Emch/Rishel/Anderson Direct Testimony, at 31.

¹¹⁷ Zimmerly/Pieniazek Direct Testimony, at 17; Exh. STP000013, at 7.5S-9/10; Emch/Rishel/Anderson Direct Testimony, at 33.

¹¹⁸ Zimmerly/Pieniazek Direct Testimony, at 18; Exh. STP000013, at 7.3-1; Emch/Rishel/Anderson Direct Testimony, at 30.

¹¹⁹ Tr. at 1599-600 (stating that “the ABWR was designed with PRA in mind” and “it would be quite a surprise to [the Staff] if there were any cost beneficial SAMDAs at this stage”).

¹²⁰ See *Pilgrim*, CLI-10-11, 71 NRC at 316; *Private Fuel Storage*, CLI-04-22, 60 NRC at 145; *Nine Mile Point*, ALAB-264, 1 NRC at 365-67.

58. The Applicant took the position that the estimate of replacement power costs in ER Section 7.5S is reasonable.¹²¹ In that regard, the Applicant pointed to the fact that the ER SAMDA evaluation followed current NRC SAMDA analysis guidance. The ER used NUREG/BR-0184 to calculate replacement power costs, which provides NRC guidance for calculating such costs.¹²² The ESRP permits use of NUREG/BR-0184 for SAMDA evaluations.¹²³ Specifically, ESRP Section 7.3 states that “[r]egulatory positions and specific criteria necessary to meet the regulations” are provided in “NUREG/BR-0184 (NRC 1997b) with respect to the value impact methodology.”¹²⁴ Thus, NUREG/BR-0184 provides an accepted NRC methodology for use in SAMDA analyses.¹²⁵ NRC guidance documents are entitled to substantial weight.¹²⁶ Additionally, NUREG/BR-0184 specifies replacement power costs from a similar time period as the SAMDA analysis for the ABWR.¹²⁷ As noted above, the ABWR SAMDA costs from the TSD are provided in 1991 dollars.¹²⁸ The replacement power costs in NUREG/BR-0184 are provided in 1993 dollars.¹²⁹ Therefore, these costs are from similar years and can be compared.¹³⁰

¹²¹ Zimmerly/Pieniazek Direct Testimony, at 27-30; Tr. at 1517.

¹²² Zimmerly/Pieniazek Direct Testimony, at 27-28; Exh. STP000013, at 7.5S-6; Emch/Rishel/Anderson Direct Testimony, at 29, 34.

¹²³ Zimmerly/Pieniazek Direct Testimony, at 27; Exh. STP000018, at 7.3-3.

¹²⁴ Exh. STP000018, at 7.3-3.

¹²⁵ Zimmerly/Pieniazek Direct Testimony, at 13.

¹²⁶ See, e.g., *Private Fuel Storage, L.L.C.* (Indep. Spent Fuel Storage Installation), CLI-01-22, 54 NRC 255, 264 (2001) (“Where the NRC develops a guidance document to assist in compliance with applicable regulations, it is entitled to special weight.”).

¹²⁷ Zimmerly/Pieniazek Direct Testimony, at 28.

¹²⁸ Zimmerly/Pieniazek Direct Testimony, at 28.

¹²⁹ Zimmerly/Pieniazek Direct Testimony, at 28.

¹³⁰ Zimmerly/Pieniazek Direct Testimony, at 28.

59. In this regard, although the replacement power costs from NUREG/BR-0184 are somewhat lower than the ERCOT market prices, there is substantial uncertainty in trying to estimate replacement power 40 or more years in the future.¹³¹ Under such circumstances, there is value in using a generic replacement power cost provided in NRC guidance. As the Applicant's witness testified:

Predicting power costs two years from now is difficult. Sixty years would be impossible, in my opinion. I just – there's absolutely no way you could credibly do it, in my opinion. There's just too much that can happen in that amount of time frame.¹³²

60. While acknowledging that the guidance in NUREG/BR-0184 may not fully apply to regulated markets, the Staff concluded that parts of the guidance do apply and that it is the only guidance that is available.¹³³

61. The Intervenors claimed that reliance on NUREG/BR-0184 is unreasonable.¹³⁴ In large part, the criticisms of the Intervenors regarding the replacement power costs in NUREG/BR-0184 appear to be attributable to the fact that those costs are presented in 1993 dollars, whereas the Intervenors' references to ERCOT prices are in 2008 dollars. When the NUREG/BR-0184 replacement power costs are escalated to account for inflation (using a 1.45 producer price index-commodities Bureau of Labor Statistics multiplier), the replacement power cost estimates in 2009 dollars are substantially higher—\$20.72 per megawatt-hour (“MWh”) in NUREG/BR-0184 versus the 2009 ERCOT market prices of \$34.03 per MWh.¹³⁵ Furthermore,

¹³¹ Tr. at 1486, 1502, 1520-21.

¹³² Tr. at 1521.

¹³³ Tr. at 1621.

¹³⁴ Tr. at 1675-76.

¹³⁵ Zimmerly/Pieniazek Direct Testimony, at 28-29, 33. The Staff used a slightly lower inflation rate based on the Producer Price Index. Emch/Rishel/Anderson Direct Testimony, at 38-39. This was because the Staff used the escalation factor for “Electric Power,” while the Applicant used the more conservative escalation factor for

in some recent years, the ERCOT market prices have been as low as \$25.64 per MWh.¹³⁶ Given the uncertainty in economic forecasts, we decline the Intervenor’s invitation to find that the replacement power costs in NUREG/BR-0184 are unreasonable merely because they are somewhat different than the ERCOT market prices.

62. In the context of power forecasts, the Appeal Board held in *Nine Mile Point* that “inherent in any forecast . . . is a substantial margin of uncertainty,” and therefore the forecast should be accepted if it is “reasonable.”¹³⁷ Economic forecasts are subject to substantial uncertainty and, as long as they are reasonable, they are not open to criticism because some other person has an opposing view.¹³⁸

63. Based upon that principle, the Board finds by the preponderance of the evidence that the replacement power costs in the SAMDA evaluation in the ER are reasonable. Although the Intervenor has argued that the actual ERCOT prices may be higher than the replacement power costs in NUREG/BR-0184, they have not provided any evidence that the replacement power costs in NUREG/BR-0184 are unreasonably low. As discussed above, an economic forecast that is reasonable is not subject to attack on the grounds that another party has a different forecast.¹³⁹

“Industrial Electric Power.” Zimmerly/Pieniasek Rebuttal Testimony, at 5-6. This difference does not matter because the Applicant was conservative, and also used the higher ERCOT prices.

¹³⁶ Zimmerly/Pieniasek Direct Testimony, at 34-35.

¹³⁷ *Nine Mile Point*, ALAB-264, 1 NRC at 365-67. The Commission has endorsed the *Nine Mile Point* rule. See *Shearon Harris*, CLI-79-5, 9 NRC at 609-10.

¹³⁸ See *Nw. Env’tl. Advocates*, 460 F.3d at 1143-44 (finding no merit in the petitioner’s argument that a multi-port analysis should have been included in the agency’s economic analysis, where the assumptions and overall conclusions of the agency’s economic analysis were “reasonable”); *Sand*, 629 F.2d at 1014 (rejecting plaintiffs’ argument that the estimate of fair rental value of equipment moving through a project’s waterways should have been calculated differently when the agency’s calculation was fair and reasonable).

¹³⁹ See, e.g., *Pilgrim*, CLI-10-11, 71 NRC at 315-16; see also *Nw. Env’tl. Advocates*, 460 F.3d at 1143-44; *Sand*, 629 F.2d at 1014.

64. Although the Board finds that the ER replacement power costs are reasonable, in the following section the Board also evaluates all of the issues raised by the Intervenors. As shown below, consideration of the Intervenors' issues does not change the conclusion that there are no cost-effective SAMDAs.

D. Issues Raised by the Intervenors

65. The Intervenors raised the following issues relevant to Contention CL-2, which are organized according to issues related to SAMDA costs and issues related to the benefits of implementing SAMDAs:

- SAMDA Costs
 - Escalating the SAMDA costs for inflation
 - Accounting for risk reduction
- Benefits of Implementing SAMDAs
 - Appropriate discount rate for the SAMDA evaluation
 - Use of ERCOT pricing data for replacement power cost estimates
 - Impact of ERCOT market effects on replacement power cost estimates
 - Impacts to consumers from higher market prices
 - Impact of ERCOT price spikes
 - Impact of loss of the grid on replacement power cost estimates
 - Impact of the Fukushima accident on the SAMDA evaluation
 - Benefits of SAMDAs in mitigating severe accidents

66. Before we begin the evaluation of these individual issues, we note that, in general, the Intervenors did not provide estimates of the economic impacts of most of these issues, but instead argued that the Applicant should provide such estimates. For example, while the Intervenors did perform their own calculation to escalate the SAMDA costs from 1991 dollars to

2009 dollars, they did not perform a calculation of the benefit of the SAMDAs. Instead, in many cases, the Intervenors simply raised questions regarding the calculations performed by the Applicant and NRC Staff. Additionally, in some cases, the Intervenors' witness agreed with the approach of the Applicant and the Staff.¹⁴⁰ Therefore, as discussed in the following sections, for many of the issues raised by the Intervenors, there is no dispute in the record.

67. When accounting for the factors raised by the Intervenors, the NRC Staff and the Applicant agreed that there are no cost-effective SAMDAs.¹⁴¹ Furthermore, the Intervenors did not dispute that there are no cost-effective SAMDAs, when consideration is given to the risk-reduction that would be achieved by each SAMDA rather than assuming that each SAMDA fully prevents all severe accidents.¹⁴² Therefore, most of the issues raised by the Intervenors have no material effect on the conclusion that there is no cost-effective SAMDA.

¹⁴⁰ See, e.g., Tr. 1556, 1568 (accepting the Applicant's consideration of price spikes and grid outages).

¹⁴¹ Zimmerly/Pieniazek Rebuttal Testimony, at 19; Emch/Rishel/Anderson Direct Testimony, at 59-69; Emch/Rishel/Anderson Rebuttal Testimony, at 9. Although the assumptions used in the analyses of the NRC Staff and Applicant were slightly different in several areas, such as the net electrical output for STP Units 3 and 4, the effect of those differences is relatively minor. For example, the Staff stated that the Applicant should have used 1,300 MWe instead of 1,350 MWe for the net electrical output of the ABWR units in the replacement power cost calculations. Staff Affidavit, at 2. The value of 1,350 MWe approximates the gross electrical output of each ABWR unit, not the net electrical output (which is approximately 1,300 MWe). Zimmerly/Pieniazek Direct Testimony, at 16. The Staff agrees with the Applicant, however, that use of 1,350 MWe is conservative because it results in higher replacement power cost estimates. Staff Affidavit, at 2. Additionally, the ER used a replacement power cost estimate based upon a capacity factor of 60 to 65% directly from NUREG/BR-0184. Zimmerly/Pieniazek Direct Testimony, at 30. The Staff, on the other hand, would assume a 90-95% capacity factor. Staff Affidavit, at 3-4; Emch/Rishel/Anderson Direct Testimony, at 39-40. The Applicant addressed this difference by multiplying the replacement power cost values from NUREG/BR-0184 by the ratio of the higher capacity factor (conservatively 95%) and the lower capacity factor (conservatively 60%). Zimmerly/Pieniazek Direct Testimony, at 30. The Applicant also multiplied the replacement power costs by a ratio of the net electrical output assumed by ERCOT for STP Units 1 and 2 (1,362 MW) and the net electrical output assumed in the ER SAMDA evaluation (1,280 MW). Zimmerly/Pieniazek Direct Testimony, at 31; Exh. STP000006, at 15. The Applicant has fully accounted for these differences with the Staff.

¹⁴² See Johnson Rebuttal Testimony, at 15-18.

1. SAMDA Costs

(a) Escalating the SAMDA Costs for Inflation

68. As discussed above, SAMDA costs for the ABWR were determined during the design certification process and are listed in the TSD. The lowest-cost SAMDA for the ABWR was estimated to be \$100,000 (1991 dollars). The ER did not escalate the TSD SAMDA costs because it also did not escalate replacement power costs.¹⁴³

69. The Applicant initially suggested that the SAMDA costs could be converted from 1991 dollars to both 2008 or 2009 dollars using a multiplication factor of 1.58 from the consumer price index of the Bureau of Labor Statistics (“CPI”).¹⁴⁴ The CPI is a widely accepted methodology for escalating costs that is a reasonable method for NEPA purposes.¹⁴⁵ Use of the CPI also is consistent with OMB Circular A-94 and the approach used in the TSD.¹⁴⁶

70. Mr. Johnson stated that “[t]he CPI is not the only available measure of inflation, nor is it necessarily the best measure.”¹⁴⁷ He also stated: “A weakness of the CPI is that it is based on fixed proportions of expenditure components and does not account for households’ ability to change those proportions over time in response to price or other factors.”¹⁴⁸ The Board finds that Mr. Johnson’s criticism is not applicable to escalation of SAMDA costs, because the issue of whether households can change proportions over time does not directly apply to the

¹⁴³ Zimmerly/Pieniazek Direct Testimony, at 19; *see* Exh. NRC00009B, at 33.

¹⁴⁴ Zimmerly/Pieniazek Direct Testimony, at 19.

¹⁴⁵ Zimmerly/Pieniazek Direct Testimony, at 19.

¹⁴⁶ Zimmerly/Pieniazek Direct Testimony, at 19; Exh. NRC00009B, at 47.

¹⁴⁷ Johnson Direct Testimony, at 15.

¹⁴⁸ Johnson Direct Testimony, at 15.

escalation of SAMDA costs, which are largely manufacturing costs.¹⁴⁹ In any event, Mr. Johnson did not disagree that the CPI is a reasonable method for calculating inflation.

71. In place of the CPI, Mr. Johnson suggested use of the Core Personal Consumption Expenditures (“PCE”) price index.¹⁵⁰ The CPI and the PCE are the two primary indices for tracking the prices paid by consumers for goods and services in the United States.¹⁵¹ While there are some differences in their purpose and their calculations, they generally track the same prices.¹⁵² Use of these two indices results in similar SAMDA costs.¹⁵³ Use of the PCE index provides for a lower rate of inflation (and therefore a lower SAMDA cost in 2009 dollars) and bounds the issues raised by the Intervenors.¹⁵⁴

72. Mr. Johnson also stated that the cost escalation should account for the Regional Cost of Living Index.¹⁵⁵ However, the Board finds that the regional price differences are not material.¹⁵⁶ The TSD conservatively used lower bounding costs, and therefore accounts for regional price differences.¹⁵⁷ Furthermore, SAMDAs involve components that can be manufactured anywhere in the United States, not just in the region of Texas in which the plant is

¹⁴⁹ Zimmerly/Pieniazek Direct Testimony, at 21.

¹⁵⁰ Johnson Direct Testimony, at 16.

¹⁵¹ Zimmerly/Pieniazek Direct Testimony, at 20; Exh. STP000019, at 26 n.1.

¹⁵² Zimmerly/Pieniazek Direct Testimony, at 21.

¹⁵³ Zimmerly/Pieniazek Direct Testimony, at 21.

¹⁵⁴ Zimmerly/Pieniazek Direct Testimony, at 4; Zimmerly/Pieniazek Direct Testimony, at 20-22.

¹⁵⁵ Johnson Direct Testimony, at 17-18.

¹⁵⁶ Zimmerly/Pieniazek Direct Testimony, at 21; *see also* Emch/Rishel/Anderson Rebuttal Testimony, at 3.

¹⁵⁷ Zimmerly/Pieniazek Direct Testimony, at 21; Exh. NRC00009B, at 47-52.

located.¹⁵⁸ Thus, use of a Regional Cost of Living Index in Texas would not be appropriate for components that are manufactured elsewhere.¹⁵⁹

73. Using the PCE, Mr. Johnson estimated SAMDA costs of \$141,300 and \$143,700 in 2008 and 2009 dollars, respectively.¹⁶⁰ Using a regional cost index of approximately 0.91 for the part of Texas that encompasses the STP site, Mr. Johnson concluded that the SAMDA cost in 2009 dollars would be approximately \$131,000.¹⁶¹ In other words, Mr. Johnson would use a factor of approximately 1.31 to escalate the TSD SAMDA costs from 1991 dollars to 2009 dollars.

74. On this topic, the NRC Staff stated: “The Staff believes that the Bureau of Economic Analysis’ Gross Domestic Product [“GDP”] Implicit Price Deflator for Nonresidential Structures . . . is a more appropriate index to use to adjust the cost of SAMDAs for inflation because SAMDAs relate to structural alternatives in plant design and the GDP deflators are more specific to private capital investment than other inflation indexes such as the Consumer Price Index or the Producer Price Index.”¹⁶² The Staff concluded using its index that the lowest-cost SAMDA (without accounting for any risk reduction by individual SAMDAs) would be approximately \$225,000 in 2009 dollars.¹⁶³ Although it acknowledged that some of the SAMDAs are not purely structural in nature, the Staff stated that the SAMDAs would be treated as parts of the expected costs covered by the full capital investment in the project, and therefore

¹⁵⁸ Zimmerly/Pieniazek Direct Testimony, at 21-22.

¹⁵⁹ Zimmerly/Pieniazek Direct Testimony, at 22.

¹⁶⁰ Johnson Direct Testimony, at 16.

¹⁶¹ Johnson Direct Testimony, at 18.

¹⁶² Emch/Rishel/Anderson Direct Testimony, at 37; *see also* Tr. at 1603-19.

¹⁶³ Emch/Rishel/Anderson Direct Testimony, at 37.

this index is appropriate for all SAMDAs.¹⁶⁴ The Applicant agreed that the GDP Implicit Price Deflator for Nonresidential Structures provides the most appropriate escalation rate for SAMDA costs.¹⁶⁵ Mr. Johnson similarly agreed with “the staff on the point that a consumer expenditure index is probably not the most reflective index.”¹⁶⁶

75. Mr. Johnson suggested that if the GDP Implicit Price Deflator is to be used, the entire Gross Private Domestic Index should be used.¹⁶⁷ Mr. Johnson acknowledged, however, that he has not performed any calculations using this index.¹⁶⁸ Additionally, the Gross Private Domestic Index includes a “Residential” component and an “Equipment and Software” component, which would not apply to SAMDAs.¹⁶⁹ For example, the definition for the “Equipment and Software” component states that it “[e]xcludes certain types of equipment that are integral parts of structures and that are included in the value of structures,” while the definition for the “Structures” component states that it “[i]ncludes certain types of equipment (such as plumbing and heating systems and elevators) that are considered an integral part of the structure.”¹⁷⁰ Both the Staff and Applicant testified that the SAMDAs fall within the definition of Structures rather than Equipment and Software,¹⁷¹ while Mr. Johnson stated that he was

¹⁶⁴ Emch/Rishel/Anderson Direct Testimony, at 37; Tr. at 1619-20.

¹⁶⁵ Zimmerly/Pieniazek Direct Testimony, at 22-23; Zimmerly/Pieniazek Rebuttal Testimony, at 4-5; Tr. at 1482-83.

¹⁶⁶ Tr. at 1581.

¹⁶⁷ Johnson Rebuttal Testimony, at 7-8.

¹⁶⁸ Tr. at 1590.

¹⁶⁹ Exh. NRC000018; Tr. at 1615-16.

¹⁷⁰ Exh. NRC000022, Tbl. 6.1.

¹⁷¹ Tr. at 1482-84; 1603-20.

unsure of how the SAMDAs fit into the various definitions of the components within the indices.¹⁷²

76. The Board finds by the preponderance of the evidence that the GDP Implicit Price Deflator for Nonresidential Structures is reasonable and is the best method for escalating the costs of SAMDAs from 1991 dollars to current dollars. The personal consumption indices used by the Intervenors and Applicant (*i.e.*, the PCE and CPI) are conservative when applied to SAMDAs. Therefore, the Board finds that the lowest cost SAMDA would be \$225,000 when escalated from 1991 dollars to 2009 dollars.

77. In any event, to be conservative, the Applicant used Mr. Johnson's 1.31 factor to escalate SAMDA costs from 1991 dollars to 2009 dollars.¹⁷³ As discussed below and shown in the Appendix to this decision, the conclusion that there are no cost-effective SAMDAs holds even if Mr. Johnson's cost escalation methodology is used.¹⁷⁴

(b) Risk Reduction

78. As discussed above, the ER evaluation compares the benefit (maximum averted cost-risk) of implementing the SAMDAs to the cost of each individual SAMDA.¹⁷⁵ For this comparison, the ER evaluation assumes that the benefit of implementing each of the SAMDAs reduces the severe accident risk to zero.¹⁷⁶ The ER evaluation is extremely conservative, because no SAMDA would reduce the risk of severe accidents to zero.¹⁷⁷

¹⁷² See Tr. at 1581-82.

¹⁷³ Zimmerly/Pieniazek Direct Testimony, at 22; Tr. at 1548.

¹⁷⁴ Zimmerly/Pieniazek Direct Testimony, at 22.

¹⁷⁵ Zimmerly/Pieniazek Direct Testimony, at 23; Emch/Rishel/Anderson Direct Testimony, at 9.

¹⁷⁶ Zimmerly/Pieniazek Direct Testimony, at 23-24.

¹⁷⁷ Zimmerly/Pieniazek Direct Testimony, at 24.

79. The actual risk reduction can be factored into the SAMDA evaluation by accounting for the specific reduction in CDF that could be achieved by implementing a specific SAMDA.¹⁷⁸ For example, if implementing a SAMDA would only reduce the CDF by 2%, then the maximum averted cost-risk is reduced by a factor of approximately 50 to perform the cost-benefit analysis with this particular SAMDA.¹⁷⁹

80. When risk-reduction is taken into account, the lowest cost SAMDA is not necessarily the SAMDA that comes closest to being cost-effective. In fact, both the Staff and Applicant showed that the SAMDA that comes closest to being cost-effective is not the lowest cost SAMDA when risk reduction is taken into account.¹⁸⁰

81. The Applicant and the Staff took slightly different approaches to calculating the SAMDA that comes closest to being cost-effective. However, as discussed below, their approaches were substantively similar.

82. The Applicant evaluated the individual SAMDAs listed in the TSD, determined the degree of reduction in CDF that would be achieved by the individual SAMDAs, and then adjusted the cost of the SAMDAs to account for the percent reduction in CDF achieved by the SAMDA. The Applicant then compared the risk-adjusted costs of the SAMDAs and identified the “risk-adjusted lowest-cost SAMDA.”¹⁸¹ This SAMDA may be considered to be the SAMDA that comes closest to being cost-effective.

¹⁷⁸ Zimmerly/Pieniazek Direct Testimony, at 24; Emch/Rishel/Anderson Direct Testimony, at 11.

¹⁷⁹ Zimmerly/Pieniazek Direct Testimony, at 24.

¹⁸⁰ Zimmerly/Pieniazek Direct Testimony, at 24-27; Emch/Rishel/Anderson Direct Testimony, at 17, 69.

¹⁸¹ Zimmerly/Pieniazek Direct Testimony, at 23-27.

83. In this regard, the TSD provides the reduction in CDF for many of the ABWR SAMDAs.¹⁸² The lowest-cost SAMDA for which CDF reduction information is not explicitly provided in the TSD is SAMDA 3d (Improved Bottom Head Penetration Design), which costs \$750,000 in 1991 dollars.¹⁸³ Based upon the TSD, each of the SAMDAs that costs less than \$750,000 would achieve only a small reduction in CDF—at most, only a 14% reduction in CDF (for SAMDA 2b that costs \$598,600 in 1991 dollars), and the remainder would all achieve a reduction in CDF of less than 10%. Thus, once the actual risk reduction of the SAMDAs is taken into account, the Applicant determined that all of the SAMDAs have a risk-adjusted cost higher than \$750,000.¹⁸⁴ Therefore, the Applicant concluded that the risk-adjusted lowest-cost SAMDA is SAMDA 3d.¹⁸⁵ This cost for SAMDA 3d conservatively does not account for any risk reduction.¹⁸⁶ If risk reduction were taken into account for all of the SAMDAs, the Applicant concluded that the cost of the risk-adjusted lowest cost SAMDA would be even higher.¹⁸⁷

84. This \$750,000 cost for SAMDA 3d is in 1991 dollars. Using Mr. Johnson's methodology, the Applicant escalated the SAMDA cost by a factor of 1.31 to convert the SAMDA cost from 1991 dollars to 2009 dollars.¹⁸⁸ Therefore, the Applicant's risk-adjusted lowest cost SAMDA in 2009 dollars is \$982,500.¹⁸⁹ This cost would be substantially higher

¹⁸² Zimmerly/Pieniasek Direct Testimony, at 24.

¹⁸³ Zimmerly/Pieniasek Direct Testimony, at 24.

¹⁸⁴ Zimmerly/Pieniasek Direct Testimony, at 25; *see also* Tr. at 1526-27. The risk-adjusted cost of a SAMDA is the actual cost of the SAMDA divided by the percent of the CDF eliminated by the SAMDA. Thus, if a SAMDA actually costs \$100,000 and would achieve a reduction in CDF of 10%, the risk-adjusted cost of the SAMDA would be \$100,000 divided by 0.10, or \$1,000,000.

¹⁸⁵ Zimmerly/Pieniasek Direct Testimony, at 25.

¹⁸⁶ Zimmerly/Pieniasek Direct Testimony, at 27.

¹⁸⁷ Zimmerly/Pieniasek Direct Testimony, at 27.

¹⁸⁸ Zimmerly/Pieniasek Direct Testimony, at 27.

¹⁸⁹ Zimmerly/Pieniasek Direct Testimony, at 27.

using the GDP Implicit Price Deflator of 2.25, which the Board has found to be the best method for escalating SAMDA costs from 1991 dollars to 2009 dollars.

85. The Staff also accounted for the reduction in CDF achieved by a SAMDA, but did so in the benefit side of the equation rather than the cost side of the equation. In particular, the Staff reduced the benefit of a SAMDA to account for the percent reduction in CDF achieved by the SAMDA, and then selected the SAMDA that comes closest to being cost-effective through a comparison of cost-benefit ratios for the group of SAMDAs.¹⁹⁰ The Staff concluded that SAMDA 9b (Alternate Pump Power Source) with a cost of \$2,686,500 (2009 dollars) is the SAMDA that is the closest to being cost beneficial.¹⁹¹

86. The Applicant and Staff selected different SAMDAs as the SAMDA that comes closest to being cost-effective, based upon their different approaches with the TSD. As discussed above, the Applicant accounted for risk-reduction only for those SAMDAs for which the TSD explicitly identified a reduction in CDF. In contrast, the Staff assumed that a SAMDA had no reduction in CDF where the TSD stated that a SAMDA had \$0 averted onsite cost and did not explicitly provide a reduction in CDF.¹⁹² This was because the TSD explained that it only estimated averted onsite costs for SAMDAs that reduce CDF.¹⁹³ The Applicant agreed that the approach used by the Staff was appropriate.¹⁹⁴

87. Whether SAMDA 3d (Applicant's SAMDA that comes closest to being cost-effective) or SAMDA 9b (Staff's SAMDA that comes closest to being cost-effective) is selected

¹⁹⁰ Emch/Rishel/Anderson Direct Testimony, at 69.

¹⁹¹ Emch/Rishel/Anderson Direct Testimony, at 67.

¹⁹² Emch/Rishel/Anderson Direct Testimony, at 18 n.(d).

¹⁹³ Emch/Rishel/Anderson Direct Testimony, at 18 n.(d); Exh. NRC00009A, at 15.

¹⁹⁴ Zimmerly/Pieniazek Rebuttal Testimony, at 7-8.

has no material effect on the conclusions. As discussed below, the cost of either of those SAMDAs far exceeds the benefit (averted cost) of the SAMDA.

88. The Intervenors did not present any evidence regarding the proper approach for accounting for risk reduction.¹⁹⁵ Furthermore, the Intervenors did not controvert the approaches of either Applicant or the NRC Staff.

89. Instead of controverting the evidence of the Staff and Applicant, the Intervenors argued that the Applicant should prepare a new cost estimate for SAMDAs, because the SAMDA cost estimate for the ABWR design certification is 20 years old and some SAMDAs did not pass through the screening test using the Intervenors' assumptions.¹⁹⁶ However, issues related to the costs of SAMDAs (except for escalation of costs from 1991 dollars to current dollars) are not relevant to Contention CL-2, which pertains to replacement power costs. Furthermore, the age of the cost-estimates of the SAMDAs has no bearing on the risk reduction achieved by the SAMDAs. Therefore, there is no logical basis for the Intervenors to tie these two concepts together.

90. Furthermore, the Intervenors' claim represents a challenge to the finality of the ABWR design certification. The ABWR TSD identifies the SAMDAs and their costs in 1991 dollars.¹⁹⁷ Those costs are generic costs, and are not dependent upon site-specific factors. As such, those costs have finality in accordance with the ABWR design certification rule in 10 C.F.R. Part 52, Appendix A.VI.B.7 and cannot be challenged per 10 C.F.R. § 52.63(a)(5) (which provides that in making its COL findings, the Commission will treat as resolved those matters

¹⁹⁵ See Johnson Rebuttal Testimony, at 15-18.

¹⁹⁶ Johnson Rebuttal Testimony, at 17-18.

¹⁹⁷ See Exh. NRC00009A at 25-26.

resolved in the issuance of a design certification rule).¹⁹⁸ Therefore, according to 10 C.F.R. § 2.335, Intervenor's argument regarding SAMDA costs is an impermissible attack on the design certification rule. Under 10 C.F.R. § 2.335, NRC rules and regulations are not subject to attack in an adjudicatory proceeding unless a party submits a petition for waiver or exception, which the Intervenor has not submitted.

91. The Intervenor also took issue with the methodology of accounting for risk reduction of individual SAMDAs, arguing that the methodology does not comport with the method used in the ER.¹⁹⁹ That argument is without merit. This methodology was not new. It is specified in ESRP Section 7.3, and ER Section 7.3 described this methodology.²⁰⁰ Additionally, the Applicant and Staff presented their risk reduction methodologies in their direct testimony. Had the Intervenor disputed the methodology, then they could have challenged it in their rebuttal testimony. They did not do so. Therefore, to the extent that the Intervenor are contending that they did not have an appropriate opportunity for challenging the risk-reduction methodologies of the Applicant and the staff, such an argument is baseless.

92. In any event, as discussed in Section III.E above, the decision of this Board has the effect of supplementing and amending the EIS. Therefore, even if the risk reduction methodology had not been discussed in the ER, the Board would not be precluded from basing its decision on the Applicant's and Staff's testimonies related to that methodology.

¹⁹⁸ In that regard, the costs of SAMDAs are different than the costs of severe accidents, which are dependent upon site-specific factors and do not have finality unless the site characteristics are bounded by the site parameters in the ABWR TSD. *See, e.g., South Texas Project*, LBP-11-07, slip op. at 24-25.

¹⁹⁹ Revised Intervenor's Consolidated Response to Applicant's and Staff's Statements of Initial Positions, at 5 (June 1, 2011); Johnson Rebuttal Testimony, at 16.

²⁰⁰ Exh. STP000018, at 7.3-6; Exh. STP000013, at 7.3-1 to 7.3-2. Additionally, this methodology was discussed by Judge Arnold in his dissenting opinion in LBP-11-07, at 4.

93. The Board finds that it is appropriate to account for the risk reduction that would be achieved by individual SAMDAs, rather than assuming that each SAMDA completely prevents all severe accidents. Accounting for risk reduction is a standard technique in SAMDA analysis, is explicitly included in the methodology discussed in the ER for STP Units 3 and 4, and is endorsed by NRC guidance, as discussed above. Furthermore, there is no legal or factual basis for Intervenor's claim that the Applicant should recalculate the cost of SAMDAs just because the Applicant accounted for risk reduction.

94. The Board finds that the SAMDA that comes closest to being cost-effective is SAMDA 9b with a cost of \$2,686,500 (2009 dollars), as shown by the Staff, agreed by the Applicant, and uncontested by the Intervenor. As discussed below, this cost far exceeds the benefit of the SAMDAs when risk reduction is taken into account.

95. Furthermore, as discussed below and shown in the Appendix to this decision, when reasonable and appropriate assumptions are made regarding the other issues raised by the Intervenor, there is no cost-effective SAMDA even if risk-reduction is not taken into account.

2. Benefits of Implementing SAMDAs

(a) Discount Rate

96. A postulated accident could occur at any time during the 40-year lifetime of STP Units 3 and 4.²⁰¹ Therefore, replacement power costs attributable to an accident also could occur at any time during that 40-year life. In order to determine the net present value of these replacement power costs, the analyses of the Applicant and the NRC Staff applied a discount rate to the replacement power costs.²⁰² A discount rate discounts future cash flows to the present

²⁰¹ Tr. at 1478.

²⁰² Zimmerly/Pieniazek Direct Testimony, at 10-12; Emch/Rishel/Anderson Direct Testimony, at 42.

day.²⁰³ A discount rate is used because (1) resources that are invested will normally earn a positive return, so current consumption is more expensive than future consumption since the investor is giving up an expected return on investment, and (2) postponed benefits have a cost because people generally prefer present consumption to future consumption.²⁰⁴ All parties agreed that it is appropriate to apply a discount rate in calculating replacement power costs.

97. As noted above, the Applicant's calculation of replacement power costs used a long-term 7% discount rate, and a 3% discount rate as part of a sensitivity analysis.²⁰⁵ Similarly, the NRC Staff testified that use of a 7% discount rate, with a 3% discount rate as a sensitivity analysis, is appropriate.²⁰⁶ The Intervenors claim that a 3% discount rate should be used.²⁰⁷

98. Use of a 7% discount rate is consistent with both NRC and other federal government guidance and expectations. Section 5.7 of NUREG/BR-0184 states that a 7% discount rate, and 3% discount rate sensitivity analysis, should be used.²⁰⁸ This approach is consistent with Office of Management and Budget ("OMB") guidance in Circular A-94, "Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs."²⁰⁹ The NRC has provided additional guidance in NUREG/BR-0058, "Regulatory Analysis Guidelines of the U.S. Nuclear Regulatory Commission" (Rev. 4, Sept. 2004), which also states that a 7% discount rate with a 3% discount rate sensitivity analysis should be performed.²¹⁰

²⁰³ Tr. at 1477-78, 1573-76.

²⁰⁴ Exh. NRC000060, at 31-32; Exh. STP000016, at 4; Tr. 1573-76.

²⁰⁵ Zimmerly/Pieniazek Direct Testimony, at 10-11.

²⁰⁶ Tr. at 1624; *see also* Emch/Rishel/Anderson Rebuttal Testimony, at 3-4.

²⁰⁷ Johnson Direct Testimony, at 18-19.

²⁰⁸ Exh. NRC00008B, at 5.21.

²⁰⁹ Zimmerly/Pieniazek Direct Testimony, at 11; Exh. NRC00008B, at 5.21; Exh. STP000016; Emch/Rishel/Anderson Rebuttal Testimony, at 4-6.

²¹⁰ Zimmerly/Pieniazek Direct Testimony, at 11-12; Exh. NRC000010, at 32.

99. Additionally, Section 8.b of the OMB Circular A-94 states that a 7% real discount rate should be used as part of regulatory analyses, while it recommends that discount rates for cost-effectiveness analyses be based upon the rates of treasury bills.²¹¹ Although Mr. Johnson conceded that OMB indicates that 7% is the default discount rate for cost-benefit analyses, he claimed that the OMB discount rates based upon treasury bills for cost-effectiveness analyses should be used, and are in the 3% range.²¹² Contrary to the arguments of Mr. Johnson, the SAMDA evaluation is a cost-benefit analysis, not a cost-effectiveness analysis.²¹³ OMB defines “cost-effectiveness” as “[a] systematic quantitative method for comparing the costs of alternative means of achieving the same stream of benefits or a given objective.”²¹⁴ The SAMDA evaluation does not meet this definition because it is not comparing alternatives against each other using the same stream of benefits; instead, it is evaluating the costs and benefits of each SAMDA.²¹⁵

100. Mr. Johnson also stated that, because a DOE loan guarantee is being sought for financing STP Units 3 and 4, a discount rate below normal interest rates for corporate borrowing is appropriate.²¹⁶ The rate for the DOE loan guarantee for financing construction, however, is not relevant to the discount rate for the SAMDA analysis.²¹⁷ The discount rate is not used to calculate the cost of the SAMDAs (which instead is fixed by the TSD and escalated from 1991

²¹¹ Zimmerly/Pieniazek Rebuttal Testimony, at 15-16; Zimmerly/Pieniazek Direct Testimony, at 11; Exh. STP000016.

²¹² Johnson Direct Testimony, at 18-19.

²¹³ Zimmerly/Pieniazek Rebuttal Testimony, at 16; Emch/Rishel/Anderson Rebuttal Testimony, at 6-7.

²¹⁴ Zimmerly/Pieniazek Rebuttal Testimony, at 16; Exh. STP000016, at 18.

²¹⁵ Zimmerly/Pieniazek Rebuttal Testimony, at 16.

²¹⁶ Johnson Direct Testimony, at 19.

²¹⁷ Zimmerly/Pieniazek Rebuttal Testimony, at 16; Emch/Rishel/Anderson Rebuttal Testimony, at 6-7.

dollars to current dollars).²¹⁸ Instead, in the SAMDA analysis for STP Units 3 and 4, the discount rate is used to calculate the net present value of future replacement power costs.²¹⁹ The replacement power costs (and the discount rate for replacement power costs) are independent of the rate of the DOE loan guarantee for financing construction.²²⁰

101. The Board finds, by the preponderance of the evidence, that use of a 7% discount rate is reasonable. Such a rate is recommended by both NRC Staff guidance and the OMB.

102. In any event, use of a 3% discount rate would not change the conclusions of the SAMDA evaluation. As discussed above, ER Section 7.5S estimates replacement power costs using both 7% and 3% discount rates.²²¹ In their testimonies, the Applicant and the NRC Staff also assume both a 7% and a 3% discount rate.²²² They both demonstrate that, whether the 7% or the 3% discount rate is used, there are no cost-effective SAMDAs.²²³ This conclusion is further supported by the Appendix to this decision, which shows the effect of using 7% and 3% discount rates.

(b) ERCOT Pricing Data

103. The Intervenors argue that rather than using the values in NUREG/BR-0184 to calculate replacement power costs, the ER should have used ERCOT pricing data.²²⁴

²¹⁸ Zimmerly/Pieniazek Rebuttal Testimony, at 16.

²¹⁹ Zimmerly/Pieniazek Rebuttal Testimony, at 16.

²²⁰ Zimmerly/Pieniazek Rebuttal Testimony, at 16.

²²¹ Zimmerly/Pieniazek Direct Testimony, at 12; Exh. STP000013, at 7.5S-9/10.

²²² Zimmerly/Pieniazek Direct Testimony, at 12; Emch/Rishel/Anderson Direct Testimony, at 42.

²²³ Zimmerly/Pieniazek Direct Testimony, at 12; Emch/Rishel/Anderson Direct Testimony, at 42.

²²⁴ Johnson Direct Testimony, at 7-8.

104. ERCOT pricing data is available for all of 2010 and for previous years.²²⁵ The Applicant focused on the 2009 ERCOT prices instead of the 2010 prices for a number of reasons.²²⁶ First, the 2009 and 2010 ERCOT prices are very similar (approximately \$35 per MWh).²²⁷ Second, the wholesale market design was changed during 2010, and so the 2010 ERCOT prices are not all from the same market design.²²⁸

105. Even if the replacement power costs in the ER were increased to account for the 2009 ERCOT pricing data, it was undisputed that the resulting total monetized impacts would still be well below the cost of the SAMDA that comes closest to being cost-effective (and less than the lowest-cost SAMDA).²²⁹

106. In order to determine the sensitivity of the above conclusion to changes in ERCOT prices, the Applicant and the NRC Staff performed a sensitivity analysis using ERCOT pricing data from the year with the highest prices since the ERCOT market was deregulated in 2002, which was 2008.²³⁰ The average price of electricity in the ERCOT market in 2008 was approximately \$80 per MWh, which is more than twice the price in 2009-2010.²³¹ The elevated 2008 energy prices were attributable to significant transmission congestion, and the inefficient way by which congestion was relieved in ERCOT's zonal market structure, coupled with relatively high natural gas prices.²³² ERCOT's change to a nodal dispatch model in 2010

²²⁵ Zimmerly/Pieniazek Direct Testimony, at 32. For example, 2009 pricing data is provided in Exh. STP000020 and 2008 pricing data is provided in Exh. STP000022.

²²⁶ Zimmerly/Pieniazek Direct Testimony, at 34.

²²⁷ Zimmerly/Pieniazek Direct Testimony, at 33-34.

²²⁸ Zimmerly/Pieniazek Direct Testimony, at 34.

²²⁹ See Appendix to this decision, Tbl. 2, Scenario 1; Zimmerly/Pieniazek Direct Testimony, at 36.

²³⁰ Zimmerly/Pieniazek Direct Testimony, at 36; Emch/Rishel/Anderson Direct Testimony, at 46.

²³¹ Zimmerly/Pieniazek Direct Testimony, at 34-35.

²³² Zimmerly/Pieniazek Direct Testimony, at 37; Exh. STP000021.

significantly improves transmission congestion relief processes, and therefore helps to avoid a repeat of the high 2008 prices.²³³

107. Nonetheless, even if the ER's replacement power costs are increased to account for the 2008 ERCOT prices, it was undisputed that there is a substantial margin between the monetized impacts and the cost of the SAMDA that comes closest to being cost-effective (and less than the lowest-cost SAMDA).²³⁴ Therefore, the conclusion that there are no cost-effective SAMDAs is unaffected even if the highest ERCOT prices (*i.e.*, from 2008) are used to calculate the replacement power costs.²³⁵

108. Mr. Johnson claimed that "natural gas prices are likely to escalate faster than inflation over the long term," and that this in turn will affect ERCOT market prices.²³⁶ The Applicant agreed that ERCOT's energy prices have been closely correlated to the price of natural gas, and 2009 and 2010 both had lower average natural gas prices than the highest energy price years, 2005 and 2008.²³⁷ In particular, the average price of natural gas in 2008 was \$9.00 per mmBTU, and then dropped to between \$4 and \$5 per mmBTU in 2009-2010.²³⁸ Because of recent developments in shale gas formations, however, the U.S. Energy Information Administration ("EIA") forecasts natural gas prices for energy production to remain below \$6.00 per mmBTU through 2026 and below \$7.00 per mmBTU through 2035.²³⁹ Therefore, the

²³³ Zimmerly/Pieniazek Direct Testimony, at 37.

²³⁴ See Appendix to this decision, Tbl. 2, Scenario 2; Zimmerly/Pieniazek Direct Testimony, at 39; Emch/Rishel/Anderson Direct Testimony, at 46.

²³⁵ See Appendix to this decision, Tbl. 2, Scenario 2; Zimmerly/Pieniazek Direct Testimony, at 39; Emch/Rishel/Anderson Direct Testimony, at 46.

²³⁶ Johnson Rebuttal Testimony, at 11.

²³⁷ Zimmerly/Pieniazek Direct Testimony, at 34.

²³⁸ Exh. STP000021.

²³⁹ Zimmerly/Pieniazek Direct Testimony, at 34; Exh. STP000021.

ERCOT energy prices for 2009 and 2010 are indicative of an overall stable and relatively low outlook of energy prices in the next 10 to 15 years, if not longer, and the price of natural gas through 2035 is expected to be less than the price in 2008.²⁴⁰

109. The annual ERCOT market prices have tended to fluctuate by as much as a factor of two or more from year to year.²⁴¹ During the last two years, the average prices have been relatively stable, at about \$35 per MWh. Furthermore, as stated above, ERCOT energy prices are tied to natural gas prices, and natural gas prices are predicted by EIA to be relatively stable for the foreseeable future (and well below the price in 2008). Therefore, to the extent that ERCOT market prices are used to calculate replacement power costs, the Board finds by the preponderance of the evidence that it is reasonable to use \$35 per MWh. Nevertheless, as discussed above, there is no cost-effective SAMDA even if 2008 ERCOT prices are used.

110. The Intervenors claimed that the replacement power costs using ERCOT prices “are roughly 3 to 3.8 times the \$430 thousand/day cost used by the Applicant,” or \$60.01 to \$63.19 per MWh in 2020-2025.²⁴² Additionally, the Intervenors claimed that a value of \$68.39 per MWh²⁴³ or \$87.75 per MWh (in 2030)²⁴⁴ should be used.²⁴⁵ Even if the replacement power

²⁴⁰ Zimmerly/Pieniazek Direct Testimony, at 34; Tr. at 1503-04. Mr. Johnson also claims that the “economic feasibility of the project depends on high gas prices.” Johnson Rebuttal Testimony, at 11-12. This argument is unrelated to replacement power costs, and therefore does not affect the resolution of Contention CL-2. Additionally, Mr. Pieniazek testified that the price of natural gas is just one of many factors regarding cost justification of the new units. Tr. at 1548-49.

²⁴¹ Zimmerly/Pieniazek Direct Testimony, Tbl. 6.

²⁴² Zimmerly/Pieniazek Direct Testimony, at 39.

²⁴³ The Intervenors also propose an average cost of electricity from NRG’s 2010 Annual Report and SEC Form 10-K by taking NRG’s total operating revenues (\$3.057 billion) and dividing them by the total net generation (44.7 million MWh), and arriving at an average cost of \$68.39 per MWh. Johnson Rebuttal Testimony, at 10. This calculation is deficient for a number of reasons. Tr. at 1518-20. First, in addition to Energy Revenues of \$2.85 billion in Texas, NRG also had various other revenues, such as capacity revenues, that combine for the total of \$3.057 billion. Exh. INTR00050, Form 10-K, at 15. Additionally, the Energy Revenues are not solely due to the sale of electricity from NRG plants. For example, Energy Revenues include revenues from the settlement of financial instruments, revenues from the resale of purchase power, and bilateral sales. Exh. INTR00050, Form 10-K, at 54, 117. Therefore, it is not possible to determine the cost of power on the ERCOT

cost values proposed by the Intervenors were used, they would not impact the conclusions in the SAMDA analysis.²⁴⁶ When the Intervenors' values are converted to current dollars, those values are less than the 2008 ERCOT prices used in the Applicant's and Staff's sensitivity analyses.²⁴⁷ Therefore, acceptance of the Intervenors' position that the ER's estimated replacement power costs were up to 3.8 times too low or acceptance of the Intervenors' other proposed values would not affect the conclusion that there are no cost-effective SAMDAs.²⁴⁸

111. The 2008 ERCOT prices were abnormally high, and reflect the unusually high price of natural gas that year plus inefficient congestion management techniques on the transmission grid (which since has been alleviated through ERCOT's transition to a nodal dispatch method). Therefore, the Board finds, by the preponderance of the evidence, that use of the 2008 ERCOT prices is conservative, and bounds the other prices proffered by the Intervenors. As discussed above, both the Applicant and the NRC Staff used 2008 ERCOT prices in their sensitivity analyses, and demonstrated that there still is no cost-effective SAMDA.

112. In summary, the Board finds by the preponderance of the evidence that, as an alternative to the replacement power costs in NUREG/BR-0184, the 2009-2010 ERCOT market prices are reasonable for use in the SAMDA analysis. In any event, use of any of the prices

market by dividing the Energy Revenues by the total megawatt-hours generated by NRG plants in Texas. Mr. Johnson acknowledges that \$68.39 per MWh "may not be the exact number." Tr. at 1564. Nonetheless, this market price is bounded by the higher 2008 market prices, and would not impact the SAMDA evaluation.

²⁴⁴ As shown in the document providing the \$87.75 per MWh value, this projected price varies from \$34.41 per MWh in 2010 to \$73.69 per MWh in 2023. Exh. INTR00055, at 7. The Applicant and the Staff used the 2008 ERCOT average balancing market price of approximately \$80 per MWh. Therefore, if instead of using the 2030 value, a value for the year 2008 (or any year prior to 2023) were used, then the projected price would be lower than that used by the Applicant and the NRC Staff. It would not be appropriate to compare a 2030 energy price to a 2009 SAMDA cost given the effects of inflation.

²⁴⁵ Johnson Rebuttal Testimony, at 12; Tr. at 1505.

²⁴⁶ Zimmerly/Pieniazek Direct Testimony, at 40.

²⁴⁷ Zimmerly/Pieniazek Direct Testimony, at 41.

²⁴⁸ Zimmerly/Pieniazek Direct Testimony, at 41.

proposed by the Intervenors is bounded by the 2008 ERCOT prices used by the Applicant and NRC Staff in their sensitivity analyses. The Applicant and Staff have both demonstrated that use of the 2008 ERCOT prices does not affect the conclusion that there are no cost-effective SAMDAs, and the Intervenors did not dispute that conclusion.²⁴⁹

(c) **ERCOT Market Effects**

113. The Intervenors claimed that the replacement power costs should include the “higher costs imposed on the overall market because the STP outages fundamentally change the supply-demand relationship in the energy market.”²⁵⁰ The Intervenors, however, did not quantify the change in replacement power costs due to these market effects.²⁵¹

114. The Applicant and the NRC Staff performed qualitative and quantitative analyses of the impacts of an outage of the four STP units. The Applicant’s witness testified that, for a number of reasons, the loss of the STP units would not have significant long-term market effects in the ERCOT region, and would not dramatically increase annualized replacement power costs.²⁵² First, the combined capacity of the four STP units (approximately 5,324 MWe) is less than the generation capacity represented by the 13.75% ERCOT planning reserve margin for peak load conditions.²⁵³ Additionally, during most of the year, ERCOT also operates well below the peak hour demand.²⁵⁴ Furthermore, the potential multi-year outages for the STP units would

²⁴⁹ See Appendix to this decision, Tbl. 2, Scenario 2; Zimmerly/Pieniazek Direct Testimony, at 39; Emch/Rishel/Anderson Direct Testimony, at 46.

²⁵⁰ Johnson Direct Testimony, at 7.

²⁵¹ See Johnson Direct Testimony, at 6-7.

²⁵² Zimmerly/Pieniazek Direct Testimony, at 42.

²⁵³ Zimmerly/Pieniazek Direct Testimony, at 43; Tr. at 1570; *see also* Tr. at 1474-75 (Mr. Pieniazek testifying that if you lost all four STP units, then you should still have enough margin to meet load and have some reserve). Additionally, ERCOT would quickly restore the reserves that were being used following the loss of the STP units. Tr. at 1475-76.

²⁵⁴ Zimmerly/Pieniazek Direct Testimony, at 43.

stimulate new generation sources to enter the market.²⁵⁵ ERCOT has indicated that 5,505 MW of mothballed capacity will exist in 2016, which could be brought back into service and be used to offset some of the lost generation from STP Units 3 and 4.²⁵⁶ For these reasons, ERCOT should have enough reserve margin to supply demand, even if all four STP units were to be off-line.²⁵⁷ As discussed below, the Applicant's qualitative conclusions were confirmed by the Applicant's and Staff's quantitative evaluations.

115. The Applicant and the NRC Staff calculated the market effects by using a dispatch model that determines the difference between the ERCOT prices if it is assumed that all four STP units are operating and the ERCOT prices if all four STP units are shut down for the entire year.²⁵⁸ The impact was relatively minor—an increase of \$2.37 to \$5.23 per MWh, relative to average ERCOT prices of \$35 to \$80 per MWh in 2009 and 2008, respectively.²⁵⁹

²⁵⁵ Zimmerly/Pieniazek Direct Testimony, at 44. Mr. Johnson states that the Applicant is overly optimistic in stating that a new combustion turbine generator could be installed in one year, and that two years is more appropriate based upon a report by the EIA. Johnson Direct Testimony, at 22. Table 8.2 of the cited EIA Report identifies times for bringing various types of new generating units online, assuming an order in 2009. For combustion turbine generators, that table shows an online date of 2011 (or two years). However, Footnote 8 of that table explains: "Combustion turbine units can be built by the model prior to 2011 if necessary to meet a given region's reserve margin." Thus, the EIA Report supports the conclusion that a combustion turbine generator could be brought online in about one year if warranted based upon the ERCOT market. Zimmerly/Pieniazek Rebuttal Testimony, at 19; Exh. INT000030. Additionally, based on Mr. Pieniazek's personal experience, a simple cycle generation unit could be brought online in about a year. Zimmerly/Pieniazek Rebuttal Testimony, at 19; Zimmerly/Pieniazek Direct Testimony, at 44. Regardless, both the Applicant and NRC Staff assume that there would be market effects, and demonstrate that there would be no cost-effective SAMDAs even if the costs of such market effects are taken into account. Zimmerly/Pieniazek Direct Testimony, at 51-52; Emch/Rishel/Anderson Direct Testimony, at 52-53. Therefore, even if it were assumed that the Intervenor's are correct about the time needed to bring a combustion turbine generator online, it would not affect the conclusion that there are no cost-effective SAMDAs.

²⁵⁶ Zimmerly/Pieniazek Direct Testimony, at 44.

²⁵⁷ Zimmerly/Pieniazek Direct Testimony, at 43. Mr. Johnson criticizes reliance on the reserve margin for determining the available capacity, and claims that the amount of operating reserves is the more relevant measure. Johnson Direct Testimony, at 21. As discussed below, both operating reserves and the reserve margin are relevant. *See* Zimmerly/Pieniazek Direct Testimony, at 17-18.

²⁵⁸ Zimmerly/Pieniazek Direct Testimony, at 45; Zimmerly/Pieniazek Rebuttal Testimony, at 8-10; Emch/Rishel/Anderson Direct Testimony, at 48-53; *see also* Tr. at 1484-86. The underlying model to evaluate these market effects relies upon information from Exh. STP000023.

²⁵⁹ Zimmerly/Pieniazek Direct Testimony, at 50; Zimmerly/Pieniazek Rebuttal Testimony, at 8, 10.

This cost differential is well within the annual fluctuations in ERCOT prices.²⁶⁰ When the Applicant and the Staff added the economic impact from this change in the market prices to the replacement power costs using the conservative 2008 ERCOT pricing data, they determined that the total monetized impacts are still well below the cost of the SAMDA that comes closest to being cost-effective (and less than the lowest-cost SAMDA).²⁶¹ Therefore, the Applicant and the Staff concluded that acceptance of the Intervenor's position that the ER's estimated replacement power costs should account for market effects does not affect the conclusion that there are no cost-effective SAMDAs.²⁶²

116. Mr. Johnson raised a few issues with the model used to determine the impact of these market effects.²⁶³ The Staff, while concluding that these questions are not unreasonable, states that they are "based on questioning model assumptions that ultimately have little effect on replacement power costs."²⁶⁴

117. First, Mr. Johnson stated that the "model's treatment of ancillary services appears simplistic."²⁶⁵ However, the model accounts for ancillary services (*e.g.*, generation resources that are held in reserve to ensure reliable service) by including the ancillary services in the hourly

²⁶⁰ As shown in Zimmerly/Pieniazek Direct Testimony, at 35, the fluctuation in annual ERCOT prices has often ranged from \$20 to \$40 per MWh.

²⁶¹ See Appendix to this decision, Tbl. 2, Scenario 3; Zimmerly/Pieniazek Direct Testimony, at 51; Emch/Rishel/Anderson Direct Testimony, at 52-53.

²⁶² See Appendix to this decision, Tbl. 2, Scenario 3; Zimmerly/Pieniazek Direct Testimony, at 51; Emch/Rishel/Anderson Direct Testimony, at 52-53.

²⁶³ The Staff also noted that the original dispatch model failed to account for 177 hours of load and cost data. Emch/Rishel/Anderson Direct Testimony, at 50. The Applicant re-ran the dispatch model after incorporating the missing information, and determined that the error was in the conservative direction, and therefore had no impact on the conclusion. Zimmerly/Pieniazek Rebuttal Testimony, at 8-9.

²⁶⁴ Emch/Rishel/Anderson Direct Testimony, at 49.

²⁶⁵ Johnson Direct Testimony, at 23.

loads evaluated in the model.²⁶⁶ This makes the dispatch model more conservative.²⁶⁷

Additionally, the Staff concluded that “[e]ven significant changes in these prices would have only a negligible effect on overall average prices.”²⁶⁸

118. Second, Mr. Johnson claimed that the model’s “assumption that no market power will affect power prices is unrealistic.”²⁶⁹ The Applicant testified that Mr. Johnson was correct that the model assumes perfect competition. However, consideration of market power would have minimal effect on the results, because the model calculates the differences in costs of two scenarios (one with operation of STP units and one without operation of the STP units). Because the model calculates a differential cost, any assumptions regarding market power would affect both scenarios, and the net effect on the differential cost would be minimal.²⁷⁰ Additionally, ERCOT has never made a finding of market power abuse and has programs to detect such abuse, and abuse of market power is illegal in Texas.²⁷¹ Furthermore, there is no practical method to estimate the impacts of abuse of market power, since such abuse would occur as a result of intentional wrongdoing by a supplier that cannot be predicted in advance.²⁷² The Staff concluded that “[a]ssumptions regarding exercising of market power cannot be handled reliably

²⁶⁶ Zimmerly/Pieniazek Direct Testimony, at 46.

²⁶⁷ Tr. at 1486-87.

²⁶⁸ Emch/Rishel/Anderson Direct Testimony, at 50.

²⁶⁹ Johnson Direct Testimony, at 23.

²⁷⁰ Zimmerly/Pieniazek Direct Testimony, at 47-48.

²⁷¹ See Zimmerly/Pieniazek Direct Testimony, at 48; Tr. 1522-23. Mr. Johnson does not dispute that no ERCOT generator has ever been found guilty of market abuse, but claims that in most cases a settlement has been reached in response to enforcement actions for market manipulation. Johnson Rebuttal Testimony, at 14. Mr. Johnson identifies an agreement by Luminant to pay a \$15 million fine for alleged market manipulation during a series of winter price spikes in 2005. Johnson Rebuttal Testimony, at 14. Mr. Johnson does not explain the impact of this fine on the evaluation of market effects, and states that he agrees “with the Applicant that market power impacts cannot be quantified precisely.” Johnson Rebuttal Testimony, at 14-15. Nonetheless, even if this \$15 million fine were added to the monetization of the market effects, the impacts would be negligible once the very low CDF of 1.56×10^{-7} /year is accounted for. This would not affect the SAMDA evaluation in any manner.

²⁷² Zimmerly/Pieniazek Direct Testimony, at 48.

in a simplified spreadsheet model of economic dispatch using publically available data.”²⁷³ Even Mr. Johnson did not offer an estimate of the impact of market power.²⁷⁴ Therefore, the Board concludes that an assumption that a supplier would attempt to abuse market power is speculative and inappropriate under NEPA and NRC case law, and therefore further consideration of such a possibility is not needed.²⁷⁵ Furthermore, the Staff concluded “that the ERCOT pricing data already reflect the effects of market power being wielded, as it reasonably can be assumed that this behavior is understood to occur in a deregulated market such as ERCOT.”²⁷⁶ In other words, to the extent that certain generators may be pivotal during conditions of high demand, the dispatch model accounts for that by using ERCOT prices.

119. Finally, Mr. Johnson claimed that Applicant’s assumptions regarding wind capacity factor are too high.²⁷⁷ However, because the model compares two scenarios that include the same wind capacity factors, any effect tends to be offset.²⁷⁸ In any event, NINA’s witness reran the model conservatively assuming that the wind capacity factor is zero.²⁷⁹ The assumption of a 0% capacity factor for wind increased the market effects of an STP outage slightly (about

²⁷³ Emch/Rishel/Anderson Direct Testimony, at 50.

²⁷⁴ See Johnson Direct Testimony, at 23; Tr. at 1560-61.

²⁷⁵ See, e.g., *Vt. Yankee*, ALAB-919, 30 NRC at 44 (citing *Limerick Ecology Action*, 869 F.2d at 739) (holding that consideration of “remote and speculative” impacts is not required); *Nat’l Enrichment Facility*, CLI-05-20, 62 NRC at 536 (holding that NEPA does not require consideration of speculative impacts).

²⁷⁶ Emch/Rishel/Anderson Direct Testimony, at 50.

²⁷⁷ Johnson Direct Testimony, at 22-23.

²⁷⁸ Zimmerly/Pieniazek Direct Testimony, at 49.

²⁷⁹ Zimmerly/Pieniazek Direct Testimony, at 49.

\$0.59 per MWh).²⁸⁰ Even using that conservative assumption, there are no cost-effective SAMDAs.²⁸¹

120. Overall, Mr. Johnson concluded that the dispatch model would tend to underestimate the price of electricity.²⁸² However, that conclusion was belied by the results of the model. In actuality, the Applicant's dispatch model calculated an ERCOT market price that was slightly *higher* than actual ERCOT prices.²⁸³ Thus, if anything, the dispatch model generates conservative results.

121. For the reasons described above, the Board finds that, by the preponderance of the evidence, the dispatch models used by the Applicant and NRC Staff are reasonable and conservative. Furthermore, the Board finds that the Applicant's and NRC Staff's evaluations of market effects on replacement power costs are reasonable and fully address all of the issues raised by the Intervenors. It was undisputed that consideration of these market effects does not affect the conclusion that there are no cost-effective SAMDAs. As shown in the Appendix to this decision, the maximum averted cost of severe accidents is less than \$100,000, even when the replacement power costs are based upon 2008 ERCOT prices and consider the market effects of an outage of the four STP units.²⁸⁴

²⁸⁰ Zimmerly/Pieniazek Rebuttal Testimony, at 6-7; Emch/Rishel/Anderson Direct Testimony, at 49; Zimmerly/Pieniazek Direct Testimony, at 49-50.

²⁸¹ Zimmerly/Pieniazek Direct Testimony, at 51.

²⁸² Tr. at 1559.

²⁸³ Zimmerly/Pieniazek Direct Testimony, at 50; Tr. at 1487.

²⁸⁴ See Appendix to this decision, Tbl. 2, Scenario 3; Zimmerly/Pieniazek Direct Testimony, at 51; Emch/Rishel/Anderson Direct Testimony, at 52-53.

(d) Consumer Impacts

122. The Intervenors stated that the SAMDA evaluation should not just account for the cost of replacement power, but should also account for the impacts to consumers due to the higher market prices.²⁸⁵ The Intervenors did not provide an estimate of this impact.

123. As a legal and factual matter, the Board finds that such an evaluation is not required by NRC guidance and is outside the scope of Contention CL-2. NRC guidance for SAMDA evaluations in ESRP Section 7.3 does not require such an evaluation.²⁸⁶ Furthermore, both the Applicant and the NRC Staff agreed that the impact to consumers should not be included in the SAMDA evaluation as part of the replacement power costs.²⁸⁷ The impact on consumers due to an increase in ERCOT electricity prices does not affect the replacement power costs.²⁸⁸ Replacement power costs are the costs that are paid by the owners of a unit experiencing an outage, not the costs paid by consumers.²⁸⁹ Mr. Johnson agreed that the impacts to consumers are not a cost that is directly paid by the owners.²⁹⁰ Therefore, because Contention CL-2 is limited to replacement power costs, the issue of consumer impacts is outside its scope, is not required by NRC guidance to be considered as a replacement power cost, and is not required to be considered in resolution of the contention.

124. Nevertheless, the impact on the SAMDA evaluation from these consumer impacts was determined by the Applicant and NRC Staff by using the incremental market cost of energy

²⁸⁵ Johnson Direct Testimony, at 6-7.

²⁸⁶ See Exh. STP000018.

²⁸⁷ Tr. at 1490-91, 1623.

²⁸⁸ Tr. at 1490.

²⁸⁹ Tr. at 1490-91.

²⁹⁰ Tr. at 1563.

from losing the four STP units and multiplying it by the total energy generation in ERCOT.²⁹¹ The Intervenor did not controvert the Applicant's or Staff's estimates. When the costs to consumers are included in the total monetized cost, the costs are still below the cost of the SAMDA that comes closest to being cost-effective.²⁹² Therefore, acceptance of the Intervenor's position that the ER's estimated replacement power costs should account for impacts to consumers does not affect the conclusion that there are no cost-effective SAMDAs.²⁹³

125. For the reasons described above, the Board finds that the consumer impacts are not replacement power costs, and therefore need not be considered as part of Contention CL-2. In any event, if they are considered, the Board finds that the Applicant's and NRC Staff's evaluations of the impact on consumers are reasonable and fully address all of the issues raised by the Intervenor. Consideration of these consumer impacts does not affect the conclusion that there are no cost-effective SAMDAs.

(e) **ERCOT Price Spikes**

126. The Intervenor stated that the ER SAMDA evaluation is inadequate because it does not account for additional spikes in ERCOT prices that may occur as a result of an outage of the four STP units.²⁹⁴ The Intervenor did not quantify the costs due to these price spikes, but state that price spikes increased ERCOT average prices in 2008 by 20%.²⁹⁵

²⁹¹ Zimmerly/Pieniazek Direct Testimony, at 52; Emch/Rishel/Anderson Direct Testimony, at 53-54; *see also* Tr. at 1492. The total generation in ERCOT was derived from Exh. STP000024.

²⁹² Zimmerly/Pieniazek Direct Testimony, at 53; Emch/Rishel/Anderson Direct Testimony, at 53-54.

²⁹³ *See* Appendix to this decision, Tbl. 2, Scenario 4; Zimmerly/Pieniazek Direct Testimony, at 53; Emch/Rishel/Anderson Direct Testimony, at 53-54.

²⁹⁴ *See* Johnson Direct Testimony, at 10-11.

²⁹⁵ Johnson Direct Testimony, at 10-11; Emch/Rishel/Anderson Direct Testimony, at 55.

127. Price spikes are defined as when the price of energy in ERCOT exceeds a specified threshold.²⁹⁶ Price spikes occur in ERCOT every year.²⁹⁷ The price spikes are of short duration.²⁹⁸ The short duration is due to ERCOT carrying responsive reserves, regulation reserves, and non-spin reserves, all of which are carried 24 hours a day to handle contingencies.²⁹⁹ The impact of these price spikes on average prices was estimated by the Independent Market Monitor for ERCOT to be between 10% and 20% from 2006 through 2009.³⁰⁰ This price impact is already accounted for by ERCOT's average prices used in the evaluations discussed above.³⁰¹

128. One recent high-profile price spike event occurred on February 2, 2011, when ERCOT ordered 4,000 MW of firm load to be shed from the grid following a record breaking arctic cold front that disabled 50 generating units representing more than 7,000 MW (*i.e.*, more than the capacity of the four STP units combined).³⁰² Even during this event, the price spikes were short lived.³⁰³

129. As a legal and factual matter, the Board finds that an evaluation of the impact of price spikes on consumers is not required by NRC guidance and is outside the scope of Contention CL-2. NRC guidance for SAMDA evaluations in ESRP Section 7.3 does not require

²⁹⁶ Zimmerly/Pieniazek Direct Testimony, at 53; Tr. at 1492-93.

²⁹⁷ Zimmerly/Pieniazek Direct Testimony, at 53.

²⁹⁸ Zimmerly/Pieniazek Direct Testimony, at 54.

²⁹⁹ Zimmerly/Pieniazek Direct Testimony, at 54.

³⁰⁰ Zimmerly/Pieniazek Direct Testimony, at 54.

³⁰¹ Zimmerly/Pieniazek Direct Testimony, at 54; Emch/Rishel/Anderson Direct Testimony, at 54.

³⁰² Zimmerly/Pieniazek Direct Testimony, at 54; Tr. at 1506-07.

³⁰³ Zimmerly/Pieniazek Direct Testimony, at 54.

such an evaluation.³⁰⁴ The impact on consumers due to an increase in ERCOT electricity prices does not affect the replacement power costs.³⁰⁵ Replacement power costs are the costs that are paid by the owners of a unit experiencing an outage, not the costs paid by consumers.³⁰⁶ Therefore, because Contention CL-2 is limited to replacement power costs, the issue of consumer impacts due to these price spikes is outside its scope, is not required by NRC guidance to be considered as a replacement power cost, and is not required to be considered in resolution of the contention.

130. In any event, the potential for increases in ERCOT average market prices due to additional price spikes attributable to outages of the STP units would be limited by many of the same factors that would minimize other market effects of shutting down the four STP units, such as market adjustment, restoring mothballed capacity, reserve margins,³⁰⁷ and demand response.³⁰⁸ Mr. Johnson agrees that over time the price spikes would begin to approach more normal levels as the market adjusts, but did not offer any opinion regarding the duration of the price spikes.³⁰⁹ Additionally, many of the historical price spikes have been due to inefficient

³⁰⁴ See Exh. STP000018.

³⁰⁵ Tr. at 1490.

³⁰⁶ Tr. at 1490-91.

³⁰⁷ In this regard, Mr. Johnson states that the amount of operating reserves, and not the ERCOT target reserve margin, is the more relevant factor in evaluating the impact of price spikes and grid outages. Johnson Direct Testimony, at 21. Both operating reserves and the reserve margin are relevant. In fact, the two are related, because ERCOT's target reserve margin, which is calculated at the peak hour of the year, increases the ability of having adequate operating reserves every day and every minute of the year. The amount of operating reserves is important in the period immediately after the loss of a large amount of generation. If the operating reserves are not sufficient to cover the amount of lost generation, there could be temporary price spikes. However, in response to those price spikes, idle generating plants (as reflected by the reserve margin) would enter the market to take advantage of the increases in prices. The Applicant assumes that price spikes last for one year. That period is very conservative relative to the period until idle generating plants reflected by the reserve margin would start up. Thus, the reserve margin is important for limiting the period in which price spikes would occur. Zimmerly/Pieniasek Rebuttal Testimony, at 17.

³⁰⁸ Zimmerly/Pieniasek Direct Testimony, at 55.

³⁰⁹ Tr. at 1561-62.

zonal management techniques rather than outages of generation stations, and those grid management techniques no longer existed beginning December 1, 2010, when ERCOT implemented a nodal market design.³¹⁰ A nodal market design provides improved dispatch efficiencies and unit specific management of transmission congestion, a significant improvement over the pre-December 2010 zonal market design.³¹¹

131. However, the Applicant and the Staff accounted for the impact to consumers by assuming that additional price spikes due to an outage of the STP units would increase ERCOT prices for one year by an additional 20% beyond the 20% impact already accounted for in the average ERCOT prices for 2008.³¹² Mr. Johnson accepted this manner for accounting for price spikes.³¹³ The Applicant and Staff showed that, even if the conservative 2008 ERCOT *annual prices* are conservatively increased by 20% to account for additional price spikes, and after accounting for the additional ERCOT market effects and impacts to consumers discussed above, the total monetized impacts are still below the cost of the SAMDA that comes closest to being cost-effective.³¹⁴ Therefore, even when the potential impacts of price spikes are taken into account in a very conservative manner, there are no cost-effective SAMDAs.³¹⁵

132. For the reasons described above, the Board finds that the consumer impacts from price spikes are not replacement power costs, and therefore need not be considered as part of Contention CL-2. Additionally, the Board finds that the Applicant's and NRC Staff's

³¹⁰ Zimmerly/Pieniasek Direct Testimony, at 55-56; Tr. at 1500.

³¹¹ Zimmerly/Pieniasek Direct Testimony, at 55-56; Tr. at 1500-01.

³¹² Zimmerly/Pieniasek Direct Testimony, at 56; Emch/Rishel/Anderson Direct Testimony, at 55-56.

³¹³ Tr. at 1562.

³¹⁴ Zimmerly/Pieniasek Direct Testimony, at 56; Emch/Rishel/Anderson Direct Testimony, at 56.

³¹⁵ See Appendix to this decision, Tbl. 2, Scenario 5; Zimmerly/Pieniasek Direct Testimony, at 57; Emch/Rishel/Anderson Direct Testimony, at 56; Tr. at 1496-97.

evaluations of price spikes are conservative and fully address all of the issues raised by the Intervenors. Additionally, the Intervenors have accepted the approach used by the Applicant and NRC Staff to account for price spikes. Furthermore, the Board finds that consideration of price spikes does not affect the conclusion that there are no cost-effective SAMDAs.

(f) Loss of the Grid

133. Mr. Johnson stated that the simultaneous loss of four STP units “could increase the likelihood of outages on the ERCOT grid which result in load shedding, or even uncontrolled blackouts.”³¹⁶ Although the Intervenors did not quantify the change in costs due to these grid outages, they stated that the grid outages will increase the economic costs.³¹⁷

134. As a legal and factual matter, the Board finds that an evaluation of loss of the grid is not required by NRC guidance and is outside the scope of Contention CL-2. Both the Applicant and the NRC Staff agreed that the impacts of a grid outage should not be included in the SAMDA evaluation as part of the replacement power costs.³¹⁸ The impact on society due to a grid outage does not affect the replacement power costs. Replacement power costs are the costs that are paid by the owners of a unit experiencing an outage, not the costs paid by society. Therefore, because Contention CL-2 is limited to replacement power costs, the issue of a grid outage is outside its scope, is not required by NRC guidance to be considered as a replacement power cost, and is not required to be considered in resolution of the contention.³¹⁹

135. It was undisputed that the loss of the grid as a result of an outage of the four STP units is unlikely. As Mr. Johnson stated, the probability of an ERCOT grid outage following a

³¹⁶ Johnson Direct Testimony, at 11.

³¹⁷ See Johnson Direct Testimony, at 11-12.

³¹⁸ Tr. at 1509, 1603, 1623.

³¹⁹ Emch/Rishel/Anderson Direct Testimony, at 57.

shutdown of all four STP units “may not be high.”³²⁰ Mr. Johnson also testified that a grid outage has “a fairly low probability.”³²¹ The Applicant and NRC Staff both conservatively assumed that the probability was less than 0.1.³²² Furthermore, the NRC Staff testified that an unanticipated shutdown of a nuclear plant has never caused the loss of the grid in the United States.³²³

136. ERCOT is responsible for running the grid reliably and avoiding the loss of load.³²⁴ In addition, since the Northeast United States Blackout of 2003, ERCOT, as well as all other electricity regions in the United States, are under strict federally enforced reliability standards.³²⁵ These rigorous standards are monitored and enforced by the Texas Reliability Entity, which has the responsibility of ensuring the reliability of the bulk power system in ERCOT as per the requirements of the North American Electric Reliability Corporation (“NERC”).³²⁶

137. As explained in the Final Safety Analysis Report (“FSAR”) Section 8.2.2.3 for STP Units 3 and 4,³²⁷ the ERCOT grid is designed to simultaneously lose the two largest generators without a loss of the grid.³²⁸ In the event of a severe accident at one STP unit, the other units would be shut down in an orderly fashion, *i.e.*, all four units would not be taken off

³²⁰ Johnson Direct Testimony, at 12.

³²¹ Tr. at 1562.

³²² Zimmerly/Pieniazek Direct Testimony, at 60; Emch/Rishel/Anderson Direct Testimony, at 58.

³²³ Tr. at 1600-01.

³²⁴ Zimmerly/Pieniazek Direct Testimony, at 58.

³²⁵ Zimmerly/Pieniazek Direct Testimony, at 58.

³²⁶ Zimmerly/Pieniazek Direct Testimony, at 58.

³²⁷ Zimmerly/Pieniazek Direct Testimony, at 58; *see also* Exh. STP000027.

³²⁸ Zimmerly/Pieniazek Direct Testimony, at 58.

the grid simultaneously.³²⁹ Given the orderly shutdown, ERCOT would have time to adjust to the loss of the four units and to bring other generation sources online, invoke certain demand response programs, and shed load in a controlled manner, if necessary.³³⁰

138. Additionally, the low probability for loss of the grid also would be limited by many of the same factors that would minimize other market effects and price spikes due to shutting down the four STP units, such as market adjustment, restoring mothballed capacity, reserve margins, and demand response.³³¹ Given all of the protective measures established by ERCOT, the Texas Reliability Entity, and NERC, as discussed above, it is extremely unlikely that a shutdown of all four STP units would result in a loss of the ERCOT grid.³³² In fact, the protective measures have been successful in the past, and there has never been a loss of the entire ERCOT grid due to any event.³³³

139. This conclusion is bolstered by the recent February 2011 severe weather event. During that event, the quantity of generation disabled by cold and ice was greater than 7,000

³²⁹ Zimmerly/Pieniasek Direct Testimony, at 58.

³³⁰ Zimmerly/Pieniasek Direct Testimony, at 58. For example, Exh. STP000025 provides guides for ensuring adequate system frequency. The Applicant accounted for load shedding in its dispatch model on the market effects of an outage of the four STP units. Zimmerly/Pieniasek Direct Testimony, at 45.

³³¹ Zimmerly/Pieniasek Direct Testimony, at 59. The operating reserves are also important for preventing a grid outage. When a generating unit is lost from the grid, the generating units and/or load resources carrying reserves at the time need to respond. The operating reserves are designed to ensure that the grid can handle the instantaneous loss of the two largest generating units. With respect to the scenario postulated for STP, a severe accident in one of the ABWR units would not cause an accident in the other STP units. Following the accident at one of the ABWR units, the other units would be shut down in a controlled manner (unless one or more of the units were already shut down for other reasons). This controlled sequence would help prevent adverse impacts on the grid. ERCOT would have time to adjust, and could even shed load if necessary to prevent loss of the grid. As indicated by the events in February 2011, when a large number of generating plants in ERCOT were forced off line due to extreme cold weather (the lost capacity exceeded the capacity of the four STP units), other plants and load resources, reflected by the reserve margin started up and helped ensure a stable grid. Therefore, it is appropriate to account for the reserve margin as well as the operating reserves in determining whether a grid outage would occur. Zimmerly/Pieniasek Rebuttal Testimony, at 18. In any event, the Applicant conservatively assumes that an outage of the four STP units could cause a loss of the grid, and accounts for the costs of such a grid outage. A similar method is followed by the Staff.

³³² Zimmerly/Pieniasek Direct Testimony, at 57.

³³³ Zimmerly/Pieniasek Direct Testimony, at 57.

MW, which exceeds the capacity of all four STP units combined.³³⁴ While the February event did result in a controlled process of shedding 4,000 MW of load, at no time during the extended emergency was the entire grid in peril of collapsing.³³⁵ This event provides a real-life example of how a complete loss of the entire grid is a remote possibility, even when generating capacity larger than the four STP units is lost.³³⁶

140. Although it is difficult to quantify a probability for loss of the ERCOT grid due to shutdown of the four STP units, it is undisputed that the probability is far less than 0.1.³³⁷ As discussed above, the CDF for the ABWR is 1.56×10^{-7} per year.³³⁸ Thus, the probability of a severe accident at one of the ABWR units at the STP site, followed by a shutdown of the other three STP units, followed by a loss of the ERCOT grid, is far less than 10^{-8} per year.³³⁹

141. Given the very low probability of a severe accident, times the low probability that the STP shutdown would result in a loss of the grid, the Board finds that the loss of the grid is a remote and speculative event. Consideration of such “remote and speculative” impacts is not required by NEPA.³⁴⁰ In the *Calvert Cliffs* COL proceeding, the licensing board stated that, under NEPA’s rule of reason, a probability of 10^{-6} per year is the “threshold above which accident scenarios must be evaluated for NEPA considerations.”³⁴¹ The probability of the grid outage is much lower than 10^{-6} .

³³⁴ Zimmerly/Pieniasek Direct Testimony, at 59.

³³⁵ Zimmerly/Pieniasek Direct Testimony, at 59; Exh. STP000025 § 4.5; Tr. at 1506-08.

³³⁶ Zimmerly/Pieniasek Direct Testimony, at 60; Tr. at 1506-07.

³³⁷ Zimmerly/Pieniasek Direct Testimony, at 60; Emch/Rishel/Anderson Direct Testimony, at 57.

³³⁸ Zimmerly/Pieniasek Direct Testimony, at 60.

³³⁹ Zimmerly/Pieniasek Direct Testimony, at 60; Emch/Rishel/Anderson Direct Testimony, at 57-58.

³⁴⁰ See *Vt. Yankee*, ALAB-919, 30 NRC at 44.

³⁴¹ *Calvert Cliffs 3 Nuclear Project, LLC* (Calvert Cliffs Nuclear Power Plant, Unit 3), LBP-09-4, 69 NRC 170, 209 (2009).

142. Mr. Johnson argued that a loss of the grid should be considered despite its low probability, because of the high consequences of such an event.³⁴² However, it is well established that NEPA does not require a worst-case analysis.³⁴³ The Commission has noted that the purpose of an EIS is to “inform the decisionmaking agency and the public of a broad range of environmental impacts that will result, with a fair degree of likelihood, from a proposed project, rather than to speculate about ‘worst-case’ scenarios and how to prevent them.”³⁴⁴ Similarly, the Commission stated in *Pilgrim* that “[a]s a mitigation analysis, NRC SAMA analysis is neither a worst-case nor a best-case impacts analysis.”³⁴⁵

143. Furthermore, even if the impact of grid outages caused by the shutdown of the STP units is considered, it would not change the conclusions in the SAMDA evaluation.³⁴⁶ The Applicant is the only party that attempted to calculate the actual impact of a grid outage in the ERCOT region. Assuming an outage lasting one day and the highest allowed market price of electricity in ERCOT, the Applicant calculated an impact of approximately \$3.42 billion.³⁴⁷

144. Additionally, the Applicant and the NRC Staff conservatively estimated the impact due to grid outages by assuming that a grid outage similar to the 2003 Northeast blackout occurs with a \$10 billion impact as estimated by Mr. Johnson (which is at the high end of the range of estimates for that blackout, and which was far less according to some of Mr. Johnson’s

³⁴² Tr. at 1562.

³⁴³ *Robertson*, 490 U.S. at 359; *Private Fuel Storage, LLC* (Indep. Spent Fuel Storage Installation), CLI-02-25, 56 NRC 340, 352 (2002).

³⁴⁴ *Private Fuel Storage*, CLI-02-25, 56 NRC at 347.

³⁴⁵ *Pilgrim*, CLI-10-11, 71 NRC at 316.

³⁴⁶ Zimmerly/Pieniazek Direct Testimony, at 62; Emch/Rishel/Anderson Direct Testimony, at 59.

³⁴⁷ Zimmerly/Pieniazek Direct Testimony, at 60; Emch/Rishel/Anderson Direct Testimony, at 57.

sources).³⁴⁸ If this \$10 billion impact is added to the replacement power costs using the conservative 2008 ERCOT pricing data, and accounting for the consumer impacts due to market effects and increases in price spikes, then the total monetized impacts are still below the cost of the SAMDA that comes closest to being cost-effective.³⁴⁹ Therefore, acceptance of the Intervenor's position that the ER's estimated replacement power costs should account for grid outages does not affect the conclusion that there are no cost-effective SAMDAs.³⁵⁰

145. The Intervenor argued that the economic impacts (\$45 billion) of the California energy crises should be considered.³⁵¹ However, the value of \$45 billion is based upon a combination of high prices and rolling blackouts in the 2000/2001 California energy crisis.³⁵² Of that \$45 billion, only \$0 to \$5 billion came from blackouts, which is less than the \$10 billion cost assumed for the Northeast blackout.³⁵³ Additionally, Mr. Johnson agreed that the situation in California was not caused by circumstances similar to the hypothetical outage of four STP units.³⁵⁴ However, even if the impact of \$45 billion is added to the replacement power costs using the conservative 2008 ERCOT pricing data, and accounting for the consumer impacts due to market effects and increases in price spikes, then the total monetized impacts are still below

³⁴⁸ Zimmerly/Pieniasek Direct Testimony, at 60-61; Johnson Direct Testimony, at 12; Emch/Rishel/Anderson Direct Testimony, at 59. One of the Intervenor's exhibits states that the economic cost of the blackout is estimated to be between \$7 and \$10 billion (Exh. INT000033, at 2), and another one of their exhibits shows that it was \$4.5 to \$8.2 billion (Exh. INT000032). Therefore, the Intervenor appears to have exaggerated the cost of the Northeast blackout. Nevertheless, the Applicant conservatively used the upper end of this range.

³⁴⁹ Zimmerly/Pieniasek Direct Testimony, at 62; Emch/Rishel/Anderson Direct Testimony, at 59.

³⁵⁰ See Appendix to this decision, Tbl. 2, Scenario 6; Zimmerly/Pieniasek Direct Testimony, at 62; Emch/Rishel/Anderson Direct Testimony, at 59.

³⁵¹ Johnson Direct Testimony, at 12; Exh. STP000026, at 3-4.

³⁵² Johnson Direct Testimony, at 12.

³⁵³ Zimmerly/Pieniasek Direct Testimony, at 61.

³⁵⁴ Tr. at 1569-73.

the cost of the SAMDA that comes closest to being cost-effective.³⁵⁵ Therefore, acceptance of the Intervenor's position does not affect the conclusion that there are no cost-effective SAMDAs.³⁵⁶

146. For the reasons described above, the Board finds that the impacts of a grid outage are not replacement power costs, and therefore need not be considered as part of Contention CL-2. The Board also finds that loss of the grid is remote and speculative and therefore need not be considered under NEPA. In any event, if the impacts of a grid outage are considered, the Board finds that the Applicant's and NRC Staff's evaluations of the impacts of a grid outage are reasonable and fully address all of the issues raised by the Intervenor. Additionally, Mr. Johnson testified that he has not challenged the Applicant's quantification of these impacts.³⁵⁷ The Board finds that consideration of the impacts of a grid outage does not affect the conclusion that there are no cost-effective SAMDAs.

(g) Fukushima Accident

147. Mr. Johnson stated that, based on the experience at Fukushima, it should be assumed that all STP units would be shut down permanently in the event of a severe accident.³⁵⁸ This is contrary to ER Section 7.5S.5, which assumed 1) that there would be an accident at one of the ABWRs at STP Units 3 and 4, and that the accident would not adversely affect the structures, systems, and components at the other STP units (except for some contamination, which would be cleaned up), and 2) that the accident would result in the permanent shutdown of the unit experiencing the accident, a shutdown of the other ABWR unit for six years (similar to

³⁵⁵ Zimmerly/Pieniazek Direct Testimony, at 63.

³⁵⁶ See Appendix to this decision, Tbl. 2, Scenario 7; Zimmerly/Pieniazek Direct Testimony, at 63.

³⁵⁷ Tr. at 1568.

³⁵⁸ Johnson Direct Testimony, at 6, 14-15.

the period of shutdown of Three Mile Island (“TMI”) Unit 1 following the severe accident at TMI Unit 2 in 1979), and a shutdown of STP Units 1 and 2 for two years.³⁵⁹

148. In the Johnson Report submitted in support of Contention CL-2, Mr. Johnson used those same shutdown assumptions.³⁶⁰ Furthermore, in response to Applicant’s motion for summary disposition of Contention CL-2,³⁶¹ the Intervenors did not contest Statement of Material Fact No. III.D, which stated that the six year and two year periods are reasonable estimates of outage durations based upon the experience at TMI.³⁶²

149. In any event, there is nothing related to Fukushima that affects the basis for the outage duration assumed in ER Section 7.5S.5.³⁶³ Each of the units at Fukushima experienced accidents. The situation at Fukushima is dissimilar to the situation postulated in Contention CL-2, where an accident is assumed to occur at one unit and the other units do not experience an accident.³⁶⁴ Mr. Johnson agreed that the postulated STP accident is more similar to the Chernobyl accident than the Fukushima accident.³⁶⁵ The co-located Chernobyl units restarted following the Chernobyl accident after a much shorter period than assumed in ER Section 7.5S for the co-located STP units.³⁶⁶

³⁵⁹ Zimmerly/Pieniazek Rebuttal Testimony, at 12-13; Exh. STP000013.

³⁶⁰ Johnson Report at 3.

³⁶¹ STP Nuclear Operating Company’s Motion for Summary Disposition of Contention CL-2 (Sept. 14, 2010).

³⁶² *See* Intervenors’ Response to Applicant’s Statement of Material Facts Pursuant to 10 C.F.R. § 2.710 (Oct. 8, 2010).

³⁶³ Zimmerly/Pieniazek Rebuttal Testimony, at 13-14.

³⁶⁴ Zimmerly/Pieniazek Rebuttal Testimony, at 12-13.

³⁶⁵ Tr. at 1585-87.

³⁶⁶ Tr. at 1587-88.

150. Additionally, it is not reasonable to postulate that a situation similar to Fukushima would occur at STP resulting in accidents in multiple units.³⁶⁷ The accidents at Fukushima were caused by natural phenomena involving an earthquake and tsunami.³⁶⁸ As indicated in ER Section 7.5S.3, external events (such as natural phenomena) at the STP site have a small contribution to risk.³⁶⁹ Accordingly, accounting for the probability of those categories of events would not have a material impact on the results of the SAMDA evaluation.³⁷⁰

151. In fact, the Board rejected a proposed contention that argued that the ER should evaluate external events and accidents at all four STP units as part of the SAMDA evaluation.³⁷¹ The Board concluded “that Intervenors have failed to raise a genuine dispute with the Applicant on a material issue of fact because the Applicant has, in fact, evaluated both accidents initiated by external events and a simultaneous accident impacting all four units on the STP site.”³⁷² Thus, a situation involving accidents at all four STP units is not relevant to Contention CL-2 and is outside the scope of the contention.³⁷³

152. Furthermore, even if it were assumed that all four STP units were permanently shut down following a severe accident, this would not change the conclusion that there are no

³⁶⁷ Zimmerly/Pieniasek Rebuttal Testimony, at 14.

³⁶⁸ Zimmerly/Pieniasek Rebuttal Testimony, at 14.

³⁶⁹ Zimmerly/Pieniasek Rebuttal Testimony, at 14.

³⁷⁰ Zimmerly/Pieniasek Rebuttal Testimony, at 14.

³⁷¹ *South Texas Project*, LBP-10-14, slip op. at 22.

³⁷² *Id.*

³⁷³ *See, e.g., Pilgrim*, CLI-10-11, 71 NRC at 308-11 (stating that “Intervenors therefore may not freely change the focus of an admitted contention at will to add a host of new issues and objections that could have been raised at the outset” (internal quotation marks omitted)); *Claiborne*, CLI-98-3, 47 NRC at 105 (“Our own longstanding practice requires adjudicatory boards to adhere to the terms of admitted contentions.”); *Seabrook*, ALAB-899, 28 NRC at 97 & n. 11 (stating that the “intervenor is not free to change the focus of its admitted contention, at will, as the litigation progresses”).

cost-effective SAMDAs.³⁷⁴ This is due to the large margin between the maximum averted cost and the cost of the SAMDA that comes closest to being cost-effective.³⁷⁵ Even if it were assumed that all four STP units were permanently shut down with a resultant increase in the replacement power costs, the maximum averted cost would still be well under the cost of the SAMDA that comes closest to being cost-effective, and there still would be no cost-effective SAMDA.³⁷⁶

153. The Intervenors also alleged that lessons learned from the Fukushima Daiichi nuclear incident should cause NINA to change its “reliance upon the CDRs [sic] used in this application.”³⁷⁷ However, issues related to the frequency of accidents are not relevant to Contention CL-2, which pertains to replacement power costs, not the CDF.³⁷⁸ Furthermore, as the Board stated above, Mr. Johnson has not demonstrated expertise to address issues related to nuclear safety, including CDF. Therefore, we are giving no weight to his testimony on such matters.³⁷⁹

154. For the reasons described above, the Board concludes that the Intervenors did not contest the assumptions regarding outage durations in either their original contention or in

³⁷⁴ Zimmerly/Pieniazek Rebuttal Testimony, at 14-15.

³⁷⁵ Zimmerly/Pieniazek Rebuttal Testimony, at 15.

³⁷⁶ Zimmerly/Pieniazek Rebuttal Testimony, at 15. The Johnson Rebuttal Testimony further argues that consideration should be given to natural phenomena that could create “the potential for a common mode event which could affect the ABWR and other generating units in ERCOT at the same time.” Johnson Rebuttal Testimony, at 12. As discussed above, these issues, which address common mode accidents involving all four STP units, or an accident at one STP unit that results in the permanent shutdown of all four units, are not relevant to Contention CL-2.

³⁷⁷ Johnson Rebuttal Testimony, at 18.

³⁷⁸ See *Duke Energy Corp.*, CLI-02-28, 56 NRC at 378-81 (with respect to an admitted contention on SAMAs, intervenors were not allowed to litigate the frequency of an accident because accident frequency was not part of the SAMA original contention or its bases).

³⁷⁹ See *Duke Power Co.* (William B. McGuire Nuclear Station, Units 1 and 2), ALAB-669, 15 NRC 453, 475 (1982).

response to the Applicant’s motion for summary disposition, and therefore it is too late in the day for the Intervenors to attempt to raise this issue during the hearings. In any event, the Board finds by the preponderance of the evidence that the assumptions used by the Applicant for the outage durations of the co-located STP units following the accident are reasonable. Furthermore, the Board finds that, even if it were assumed that all four STP units were shut down permanently following an accident, there still would be no cost-effective SAMDA.

(h) Benefits of SAMDAs in Mitigating Accidents

155. The Intervenors questioned whether SAMDAs would have a benefit in mitigating accidents, and whether such benefit was taken into account in the analyses of the Applicant and NRC Staff. The Intervenors themselves did not present any substantive testimony on this issue.³⁸⁰

156. Both the Applicant and the NRC Staff accounted for the benefit that a SAMDA may have in mitigating the consequences of severe accidents, albeit with slightly different approaches. In calculating the maximum averted cost of SAMDAs, the Applicant calculated the onsite and offsite exposure costs and cleanup costs, which the Applicant referred to as “non-replacement power costs.” The Applicant assumed that the SAMDAs would completely avert (or mitigate) these non-replacement power costs.³⁸¹ The Applicant then used those same values for these non-replacement power costs throughout its analyses, without reducing those costs to account for the limited amount of protection achieved by individual SAMDAs.³⁸² The NRC Staff also accounted for the mitigative benefit of SAMDAs (*e.g.*, averted offsite costs) in its screening analysis, but then reduced those benefits when it accounted for the risk reduction that

³⁸⁰ Johnson Rebuttal Testimony, at 18.

³⁸¹ Zimmerly/Pieniazek Direct Testimony, at 10-11.

³⁸² *See. e.g.*, Zimmerly/Pieniazek Direct Testimony, at 17 and Tbls. 2, 4, 5, 7, 8, and 10.

would be achieved by individual SAMDAs.³⁸³ The Staff further explained that the “overwhelmingly large contributor” in the SAMDA benefits is the replacement power costs, and in order to impact those costs there must be a change in CDF.³⁸⁴

157. In summary, it is undisputed that both the Applicant and NRC Staff accounted for the benefit of SAMDAs in mitigating severe accidents. Therefore, the Board finds that the Applicant’s and Staff’s analyses have adequately addressed the issue raised by the Intervenors related to the benefits of mitigation.

E. Conclusions and Conservatism

158. The Applicant and NRC Staff fully evaluated the issues that were raised by the Intervenors regarding the SAMDA evaluation. They evaluated all of the issues, notwithstanding that they did not agree that many of the issues were necessary to be evaluated as part of a SAMDA evaluation. Even after accounting for all of these issues, the Applicant and NRC Staff demonstrated that there are no cost-effective SAMDAs.

159. This conclusion is highlighted in the Appendix to this decision, which provides a table for SAMDA costs and a table for SAMDA benefits. The first table identifies the various proffered costs of SAMDAs, including the lowest cost SAMDAs from the Intervenors, the Applicant, and the NRC Staff, and the costs of the most-cost-effective SAMDAs identified by the Applicant and the NRC Staff. The second table compares the SAMDA costs with the total monetized impacts (benefits) proffered by the Applicant and the Staff after accounting for the issues raised by the Intervenors (the Intervenors did not identify the monetized impacts). As shown in these tables:

³⁸³ Emch/Rishel/Anderson Direct Testimony, at Tbls. 13 and 14; Tr. at 1632-43.

³⁸⁴ Tr. at 1643.

- There are no cost-effective SAMDAs when the GDP Implicit Price Deflator for Nonresidential Structures is used to escalate SAMDA costs from 1991 dollars to 2009 dollars. This conclusion holds, even using a 3% discount rate and 2008 ERCOT prices, and after accounting for consumer impacts, price spikes, and grid outages, and *without taking into account the risk reduction achieved by individual SAMDAs*.
- Even if the conservative 2008 ERCOT market prices are used to calculate replacement power costs,³⁸⁵ there are no cost-effective SAMDAs, even if the PCE Price Index and the Regional Cost of Living Index are used to escalate SAMDA costs from 1991 dollars to 2009 dollars. This conclusion holds, even using a 3% discount rate and *without taking into account the risk reduction achieved by individual SAMDAs*.
- There are no cost-effective SAMDAs, if a 7% discount rate is used and either the PCE or CPI is used to escalate SAMDA costs from 1991 dollars to 2009 dollars. This conclusion holds, after accounting for consumer impacts and price spikes (but not remote and speculative grid outages), and *without taking into account the risk reduction achieved by individual SAMDAs*.
- When the risk-reduction achieved by individual SAMDAs is taken into account, there are no cost-effective SAMDAs, even using a 3% discount rate and 2008 ERCOT prices, and accounting for consumer impacts, price spikes, and grid outages.

These tables show that a SAMDA would be cost-effective only if: 1) the PCE Price Index and the Regional Cost of Living Index are used to escalate SAMDA costs from 1991 dollars to 2009 dollars; and 2) impacts to consumers from market effects, price spikes, and grid outages are

³⁸⁵ This excludes impacts to consumers due to market effects, price spikes, and grid outages, which are outside the scope of Contention CL-2 and are not required to be considered by the ESRP.

considered; and 3) no consideration is given to the limited amount of risk reduction achieved by individual SAMDAs. As discussed above, the Board finds that the Intervenors' inflation methodology using the PCE Price Index and the Regional Cost of Living Index is not the most appropriate method for escalating SAMDA costs. Additionally, the Board finds that the impacts to consumers from market effects, price spikes, and grid outages are outside the scope of Contention CL-2, which pertains to replacement power costs. Finally, the Board finds that it is reasonable to account for the limited risk reduction that would be achieved by individual SAMDAs. Therefore, the Board concludes that none of the three factors listed above is appropriate, and that a cost-effective SAMDA does not exist for STP Units 3 and 4.

160. Additionally, the Applicant's and the NRC Staff's testimony on the Intervenors' issues include substantial conservatisms.³⁸⁶ For example:

- The Applicant's evaluation only accounted for actual risk reduction for the SAMDAs that cost less than \$750,000 (1991 dollars); other SAMDAs are assumed to prevent all severe accidents;³⁸⁷
- Both the Applicant's and Staff's evaluations used the SAMDA costs provided in the TSD, which are biased on the low side, and are lower than expected actual plant costs;³⁸⁸
- The Applicant based the replacement power costs on the gross electrical output of the STP units, rather than the net electrical output;³⁸⁹
- The Applicant used the PCE and regional price indices to escalate SAMDA costs from 1991 dollars to 2009 dollars, which provides a much more conservative escalation rate than the more appropriate GDP Implicit Price Deflator for Nonresidential Structures;³⁹⁰
- The Applicant used conservative capacity factors for the STP units;³⁹¹

³⁸⁶ Zimmerly/Pieniazek Direct Testimony, at 65.

³⁸⁷ Zimmerly/Pieniazek Direct Testimony, at 24.

³⁸⁸ *See, e.g.*, Zimmerly/Pieniazek Direct Testimony, at 19; Emch/Rishel/Anderson Direct Testimony, at 17.

³⁸⁹ Zimmerly/Pieniazek Direct Testimony, at 16.

³⁹⁰ Zimmerly/Pieniazek Direct Testimony, at 22, 27.

³⁹¹ Zimmerly/Pieniazek Direct Testimony, at 30-31.

- The Applicant's and Staff's dispatch models used conservative assumptions;³⁹²
- The Applicant and Staff assumed that the impact on consumers from an outage of four STP units lasted six years, even though it is reasonable to assume that two of the units would restart after two years;³⁹³
- Both evaluations included a sensitivity analysis for the replacement power cost estimates based on a 3% discount rate, which is more conservative than the 7% discount rate typically used;³⁹⁴
- Both evaluations used the 2008 ERCOT pricing data (highest prices since the ERCOT market was deregulated in 2002) as the basis for the replacement power cost estimates;³⁹⁵
- In using the 2008 ERCOT prices, the Applicant used the price from the ERCOT Houston zone, which was more than \$5 MWh higher than the price for the ERCOT region as a whole;³⁹⁶
- Both evaluations assumed that price spikes would occur due to the outages of the STP units (even though historical price spikes have often been due to grid congestion and not station outages) and that the price spikes from the STP outages would increase the annual market price by an additional 20% (even though any actual price spikes would likely be limited in duration);³⁹⁷
- Both evaluations assumed that a grid outage due to shutting down the STP units is equivalent to the cost of the 2003 Northeast blackout or the cost of deregulation of the California electricity markets, even though the Applicant demonstrated that the cost of a grid outage in Texas would be a fraction of those costs,³⁹⁸ and
- Both evaluations assumed no discount rate when estimating the consumer impacts from market effects, price spikes, and grid outages.³⁹⁹

³⁹² For example, the Applicant's dispatch model is conservative because it assumes a wind capacity factor of zero, and the Applicant's and Staff's dispatch models are conservative because they use the higher 2008 data rather than 2009 data. Zimmerly/Pieniazek Rebuttal Testimony, at 7, 9; Emch/Rishel/Anderson Direct Testimony, at 51-53.

³⁹³ Zimmerly/Pieniazek Direct Testimony, at 52; Emch/Rishel/Anderson Direct Testimony, at 53.

³⁹⁴ Zimmerly/Pieniazek Rebuttal Testimony, at 11; Emch/Rishel/Anderson Direct Testimony, at 60.

³⁹⁵ Zimmerly/Pieniazek Direct Testimony, at 36-39; Emch/Rishel/Anderson Direct Testimony, at 46.

³⁹⁶ Zimmerly/Pieniazek Direct Testimony, at 37-38.

³⁹⁷ Zimmerly/Pieniazek Direct Testimony, at 53-57; Emch/Rishel/Anderson Direct Testimony, at 54-56.

³⁹⁸ Zimmerly/Pieniazek Direct Testimony, at 57-63; Emch/Rishel/Anderson Direct Testimony, at 56-59.

³⁹⁹ Zimmerly/Pieniazek Direct Testimony, at 52, 56, 62; Emch/Rishel/Anderson Direct Testimony, at 53, 56, 59.

The Board finds that these conservatisms go beyond the requirements of NEPA, which only requires that an evaluation be reasonable and does not require that a SAMDA analysis use conservative assumptions.⁴⁰⁰ These conservatisms, however, provide additional assurance for the conclusion that there are no cost-effective SAMDAs.

V. SUMMARY FINDINGS OF FACT AND CONCLUSIONS OF LAW

Based upon a review of the entire hearing record and the foregoing discussion, the Board concludes as follows:

1. Applicant's evaluation of replacement power costs in ER Section 7.5S is reasonable under NEPA.
2. It is undisputed that there are no cost-effective SAMDAs for STP Units 3 and 4, when the risk reduction that would be achieved by individual SAMDAs is taken into account.
3. NINA and the NRC Staff have met their burden of proof as to Contention CL-2, and thus Contention CL-2 is resolved in favor of the NRC Staff and NINA.

VI. ORDER

WHEREFORE, IT IS ORDERED, pursuant to 10 C.F.R. §§ 2.1210 and 51.104(a)(3), that the Intervenors' Contention CL-2 is resolved on the merits in favor of the NRC Staff and Nuclear Innovation North America, LLC.

IT IS FURTHER ORDERED, this Partial Initial Decision will constitute a final decision of the Commission forty (40) days from the date of issuance (or the first agency business day following that date if it is a Saturday, Sunday, or federal holiday, *see* 10 C.F.R. § 2.306(a)), unless a petition for review is filed in accordance with 10 C.F.R. § 2.1212, or the Commission directs otherwise.

⁴⁰⁰ *See, e.g., Pilgrim*, CLI-10-11, slip op. at 37.

IT IS FURTHER ORDERED that any party wishing to file a petition for review on the grounds specified in 10 C.F.R. § 2.341(b)(4) must do so within fifteen (15) days after service of this Partial Initial Decision. The filing of a petition for review is mandatory for a party to have exhausted its administrative remedies before seeking judicial review. Within ten (10) days after service of a petition for review, parties to the proceeding may file an answer supporting or opposing Commission review. Any petition for review and any answer shall conform to the requirements of 10 C.F.R. § 2.341(b)(2)-(3).

Although this ruling resolves all matters before the Board in connection with Contention CL-2, Staff issuance of COLs under 10 C.F.R. Part 52 relative to those facilities must abide, among other things, the resolution of admitted Contention DEIS-1-G and issuance by the Commission of a decision regarding the uncontested, mandatory hearing portion of this proceeding.

Respectfully submitted,

Signed (electronically) by Steven P. Frantz

Steven P. Frantz

John E. Matthews

Stephen J. Burdick

Charles B. Moldenhauer

Morgan, Lewis & Bockius LLP

1111 Pennsylvania Avenue, N.W.

Washington, D.C. 20004

Phone: 202-739-3000

Fax: 202-739-3001

E-mail: sfrantz@morganlewis.com

Counsel for Nuclear Innovation North America LLC

Dated in Washington, D.C.
this 23rd day of September 2011

Appendix – SAMDA Costs and Benefits

Table 1 – Costs of Various SAMDAs (2009 Dollars)

Characteristics	Cost of SAMDA
Intervenor’s Evaluation using Core Personal Consumption Expenditures (PCE) Price Index and Regional Cost of Living Index as applied to those SAMDAs costing \$100,000 in 1991 dollars -- Not accounting for risk reduction.	\$131,000
PCE or CPI as applied to those SAMDAs costing \$100,000 in 1991 dollars ¹ -- Not accounting for risk reduction	\$143,700 to \$158,000
GDP Implicit Price Deflator as applied to those SAMDAs costing \$100,000 in 1991 dollars -- Not accounting for risk reduction	\$225,000
Applicant’s Evaluation of SAMDA coming closest to being cost-effective after accounting for risk reduction and using PCE Price Index and Regional Cost of Living Index (SAMDA 3d)	\$982,500
NRC Staff’s Evaluation of SAMDA coming closest to being cost-effective after accounting for risk reduction and using GDP Implicit Price Deflator (SAMDA 9b)	\$2,686,500

¹ Zimmerly/Pieniasek Direct Testimony, at 21.

Table 2 – Total Monetized Impacts (Benefits)

Scenario	Characteristics	Total Monetized Impacts			Cost-Effective SAMDA?	Comments
		7% Discount Rate		3% Discount Rate		
		Applicant ²	Staff ³	Applicant ⁴		
1	2009 ERCOT Pricing Data	\$24,831	\$21,909	\$41,145	\$36,504	N/A
2	2008 ERCOT Pricing Data	\$51,462	\$52,080	\$83,280	\$84,208	N/A
3	2008 ERCOT Pricing Data Plus Market Effects on Replacement Power Costs	\$54,352	\$55,397	\$87,853	\$89,452	N/A
4	2008 ERCOT Pricing Data Plus Market Effects and Consumer Impacts	\$111,672	\$131,768	\$143,490	\$165,824	The Board finds that a 3% discount rate and the Intervenor's inflation methodology using the PCE Price Index and accounting for the regional cost of living are not the most appropriate assumptions. Additionally, the Board finds that consumer impacts are outside the scope of Contention CL-2. Furthermore, the Board finds that it is reasonable to account for risk reduction of individual SAMDAs.
5	2008 ERCOT Pricing Data Plus Market Effects, Consumer Impacts, and Price Spikes	\$143,504	\$169,973	\$175,322	\$204,028	The Board finds that the PCE Price Index and accounting for the regional cost of living are not the most appropriate assumptions. Additionally, the Board finds that consumer impacts and price spikes are outside the scope of Contention CL-2. Furthermore, the Board finds that it is reasonable to account for risk reduction of individual SAMDAs.

² Zimmerly/Pieniazek Rebuttal Testimony, at 11.

³ Emch/Rishel/Anderson Direct Testimony, at 42, 46, 52-54, 56, 59.

⁴ Zimmerly/Pieniazek Rebuttal Testimony, at 11.

⁵ Emch/Rishel/Anderson Direct Testimony, at 42, 46, 52-54, 56, 59.

Scenario	Characteristics	Total Monetized Impacts				Cost-Effective SAMDA?	Comments
		7% Discount Rate		3% Discount Rate			
		Applicant ²	Staff ³	Applicant ⁴	Staff ⁵		
6	2008 ERCOT Pricing Data Plus Market Effects, Consumer Impacts, Price Spikes, and Grid Outages (Northeast Blackout)	\$149,744	\$176,213	\$181,562	\$210,268	None, unless Intervenor's inflation methodology is used and risk reduction is not taken into account	The Board finds that the PCE Price Index and accounting for the regional cost of living are not the most appropriate assumptions. Additionally, the Board finds that consumer impacts, price spikes, and grid outages are outside the scope of Contention CL-2 (and that grid outages are remote and speculative). Furthermore, the Board finds that it is reasonable to account for risk reduction of individual SAMDAs.
7	2008 ERCOT Pricing Data Plus Market Effects, Consumer Impacts, Price Spikes, and Grid Outages (California)	\$171,584	Not Calculated	\$203,402	Not Calculated	None, unless Intervenor's inflation methodology is used and risk reduction is not taken into account	The Board finds that the PCE Price Index and accounting for the regional cost of living are not the most appropriate assumptions. Additionally, the Board finds that consumer impacts, price spikes, and grid outages are outside the scope of Contention CL-2 (and that grid outages are remote and speculative). Furthermore, the Board finds that it is reasonable to account for risk reduction of individual SAMDAs.

Sara Kirkwood
Michael Spencer
Anthony Wilson
Jody Martin
Andrea Silvia
Anita Ghosh
Office of the General Counsel
U.S. Nuclear Regulatory Commission
Mail Stop O-15D21
Washington, DC 20555-0001
E-mail: Sara.Kirkwood@nrc.gov
Michael.Spencer@nrc.gov
Anthony.Wilson@nrc.gov
Jody.Martin@nrc.gov
Andrea.Silvia@nrc.gov
Anita.Ghosh@nrc.gov

Robert V. Eye
Brett A. Jarmer
Counsel for the Intervenors
Kauffman & Eye
112 SW 6th Ave., Suite 202
Topeka, KS 66603
E-mail: bob@kauffmaneye.com
brett@kauffmaneye.com

Office of Commission Appellate Adjudication
U.S. Nuclear Regulatory Commission
Mail Stop: O-16C1
Washington, DC 20555-0001
E-mail: ocaamail@nrc.gov

Signed (electronically) by Steven P. Frantz

Steven P. Frantz
Morgan, Lewis & Bockius LLP
1111 Pennsylvania Avenue, N.W.
Washington, D.C. 20004
Phone: 202-739-3000
Fax: 202-739-3001
E-mail: sfrantz@morganlewis.com

Counsel for Nuclear Innovation North America LLC