Florida Power & Light Company, 6501 S. Ocean Drive, Jensen Beach, FL 34957

FPL

March 3, 2011

L-2011-075
10 CFR 50.90

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555

Re: St. Lucie Plant Unit 1
Docket No. 50-335
Renewed Facility Operating License No. DPR-67

Response to NRC Request for Additional Information (RAI) Regarding Extended Power Uprate License Amendment Request

References:

(1) R. L. Anderson (FPL) to U.S. Nuclear Regulatory Commission (L-2010-259), "License Amendment Request for Extended Power Uprate," November 22, 2010, Accession No. ML103560419.
(2) Email from T. Orf (NRC) to C. Wasik (FPL), "Requested St. Lucie Unit 1 EPU Information," January 13, 2011, Accession No. ML110130412.
(3) Westinghouse Report, CE-NPSD-683-A Task-1174, Revision 06, "Development of a RCS Pressure and Temperature Limits Report for the Removal of P-T Limits and LTOP requirements from the Technical Specifications," April 2001, Accession No. ML0113503871.

By letter L-2010-259 dated November 22, 2010 [Reference 1], Florida Power & Light Company (FPL) requested to amend Renewed Facility Operating License No. DPR-67 and revise the St. Lucie Unit 1 Technical Specifications (TS). The proposed amendment will increase the unit's licensed core thermal power level from 2700 megawatts thermal (MWt) to 3020 MWt and revise the Renewed Facility Operating License and TS to support operation at this increased core thermal power level.

By email from the NRC Project Manager dated January 13, 2011 [Reference 2], additional information regarding the analysis supporting proposed changes to the reactor coolant system pressure-temperature (P-T) limits was requested by the NRC staff in the Vessels and Internals Integrity Branch (CVIB) to support their review of the EPU LAR. The RAI identified that an exemption request related to the use of methodology contained within the Reference 3 topical report is required. The exemption request is provided in Attachment 1 to this letter.

A001
NRR

The Reference 2 RAI notes that, along with the exemption request, FPL will provide responses to the supplemental information questions listed in the Reference 3 topical report and/or identify which questions do not apply; however, in a subsequent telephone conference between FPL and the NRC on January 19, 2011, it was agreed that the response to the supplemental information questions would not be included with the exemption request, but would instead be submitted along with FPL's response to the other information requested in the Reference 2 RAI. The requested tabulation of stress intensity values used to generate the proposed P-T limits, along with responses to the supplemental information questions are being submitted to the NRC under separate cover.

In accordance with 10 CFR 50.91(b)(1), a copy of this letter is being forwarded to the Designated State of Florida official.

This submittal requires a revision to the No Significant Hazards Consideration previously submitted via FPL letter L-2010-259 [Reference 1]. The environmental assessment previously submitted by FPL letter L-2010-259 is not affected. The revised No Significant Hazards Consideration is provided as Attachment 2 to this letter and replaces Section 5.2.G of Attachment 1 to the EPU LAR [Reference 1] in its entirety.

This submittal contains no new commitments and no revisions to existing commitments.

Should you have any questions regarding this submittal, please contact Mr. Christopher Wasik, St. Lucie Extended Power Uprate LAR Project Manager, at 772-429-7138.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge.

Executed on March 3, 2011.

Very truly yours,

Richard L. Anderson
Site Vice President
St. Lucie Plant

Attachments

cc: Mr. William Passetti, Florida Department of Health

Attachment 1

Application for Exemption from Section IV.A.2 of Appendix G to 10 CFR 50 Requirements when Computing Pressure-Temperature Limits for St. Lucie Unit 1

Contents

1.0 Introduction

Appendix G to 10 CFR 50 establishes fracture toughness requirements to be applied to ferritic reactor coolant pressure boundary materials of light water nuclear power reactors. The purpose of such requirements is to ensure adequate margins of safety exist during any condition of normal operation, including anticipated operational occurrences and system hydrostatic tests, to which the pressure boundary may be subjected over its service lifetime.

The American Society of Mechanical Engineers Boiler and Pressure Vessel (ASME) Code forms the basis for the requirements promulgated in Appendix G to 10 CFR Part 50. ASME Section XI, Division 1, "Rules for Inservice Inspection of Nuclear Power Plant Components" were used when developing pressure and temperature limits for the beltline region of the St. Lucie Unit 1 reactor vessel. The sections, editions and addenda of the ASME Boiler and Pressure Vessel Code, and any limitations and modifications thereof, which are approved by the staff for use in developing pressure and temperature limits, are specified in 10 CFR 50.55a.

The methodology developed by Combustion Engineering to calculate RCS pressure-temperature (P-T) curves, heatup and cooldown limits and low temperature overpressure protection (LTOP) requirements is documented in topical report CE NPSD-683-A (Reference 1). The staff noted in its March 16, 2001 safety evaluation (Reference 5) for this report that "the CE NSSS [nuclear steam supply system] methodology does not invoke the methods in the 1995 edition of Appendix G to the Code for calculating K_{IM} factors, and instead applies FEM methods for estimating the K_{IM} factors for the RPV shell ... the staff has determined that the K_{IM} calculation methods apply FEM modeling that is similar to that used for the determination of the K_{IT} factors (as codified in the ASME Code, Section XI, Appendix G). The staff has also determined that there is only a slight non-conservative difference between the P-T limits generated from the 1989 edition of Appendix G to the Code and those generated from CE NSSS methodology as documented in Evaluation No. 063-PENG-ER-096, Revision 00 (Reference 6). The staff considers this difference to be reasonable and should be consistent with the expected improvements in P-T generation methods that have been incorporated into the 1995 edition of Appendix G to the Code. The staff therefore concludes that the CE NSSS methodology for generating P-T limits is equivalent to the current methodology in the 1995 edition of Appendix A to the Code, and is acceptable for P-T limit applications." The staff has extended this conclusion to the Section XI, Appendix G methodology of Code Editions through the 2004 Edition as documented in Reference 4.

The staff has advised licensees to specify whether membrane stress intensity factors due to pressure loading, K_{IM}, are determined by obtaining a closed-form solution (per the ASME Code, Section XI, Appendix G) or determined by applying finite element modeling methods (per CE NPSD-683-A, Revision 6). Stress intensity values, K_{IM}, for St. Lucie Unit 1 are calculated using the CE NSSS finite element modeling methods. Therefore, Florida Power and Light (FPL) requests an exemption from the requirements of Appendix G to 10 CFR Part 50 to apply this model when calculating the applicable St. Lucie Unit 1 P-T curves.

2.0 Exemption Request

The reactor coolant system P-T curves and LTOP limits for St. Lucie Unit 1 are based on the specific methodology developed by Combustion Engineering in CE NPSD-683-A and approved by the NRC (Reference 5). Results produced by this method are only slightly less conservative than the use of K_{IM} stress intensity factors and the linear elastic fracture mechanics methodology promulgated in Appendix G to 10 CFR Part 50. Specifically, Section IV.A.2 of Appendix G to 10 CFR Part 50 establishes the following criterion for generating plant-specific P-T limits:

- The P-T limits for an operating plant must be at least as conservative as those that would be generated if the methods of analysis and the margins of safety of Appendix G to Section XI of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code were applied.

Pursuant to 10 CFR 50.12, FPL hereby applies for an exemption from the requirements of the above 10 CFR 50, Appendix G, criterion. This exemption is requested since the specific RCS P-T limits developed for St. Lucie Unit 1 employ a finite element modeling methodology developed by Combustion Engineering and applied to CE NSSS plants for calculating K_{IM} stress intensity values.

FPL addresses and satisfies the criteria of 10 CFR 50.12 in this exemption request. As required by 10 CFR 50.12(a)(1), and as more fully discussed below, this exemption is authorized by law, does not present an undue risk to the public health and safety, and is consistent with the common defense and security. Further, in accordance with 10 CFR 50.12(a)(2), the request demonstrates that special circumstances support issuance of the exemption.

3.0 Exemption Discussion

Exemptions from the requirements of 10 CFR 50 Appendix G may be granted by the Commission in accordance with 10 CFR 50.12. For the reasons discussed below, the exemption criteria in Section 50.12 are satisfied by this application.

3.1 The Exemption is Authorized by Law

Title 10 CFR 50.12(a)(1) requires a demonstration that an exemption from NRC regulations is authorized by law. This demonstration is found in 10 CFR 50.60 which defines acceptance criteria for fracture prevention measures for normal operation of light water nuclear power reactors.

Paragraph (a) of 10 CFR 50.60 requires that St. Lucie Unit 1 meet the fracture toughness and material surveillance program requirements for the reactor coolant pressure boundary set forth in 10 CFR 50 Appendices G and H. Paragraph (b) of 10 CFR 50.60 discusses that proposed alternatives to the described requirements in 10 CFR 50 Appendices G and H may be used when an exemption is granted by the Commission pursuant to 10 CFR 50.12. Accordingly, this exemption request is authorized by law, as required by Section 50.12(a)(1).

3.2 Granting this Exemption Will Not Present an Undue Risk to the Public Health and Safety

Title 10 CFR 50.12(a)(1) requires a demonstration that the granting of an exemption from the requirement in question will not present an undue risk to the public health and safety. As demonstrated below, this exemption request fully satisfies this criterion.

Requirements to monitor and control the pressure and temperature imposed on the St. Lucie Unit 1 reactor coolant system pressure boundary during heatup, cooldown, testing and normal operation remain unchanged as a result of this exemption request. Further, any risk would be equivalent to that inherent in any other license application where an exemption request to apply the CE NPSD-683-A, Revision 6 methodology was permitted by the staff. See Section 4.0, Precedent, below.

The NRC has concluded (References 4 and 5) that the difference between the P-T limits generated using the Appendix G Code methods and those generated using the CE NSSS methodology are reasonable and consistent with the expected improvements in P-T generation methods that have been incorporated into Appendix G of the Code and that the CE NSSS methodology is acceptable for P-T limit application.

Based on the foregoing, granting the requested exemption will not present an undue risk to the health and safety of the public.

3.3 Granting this Exemption is Consistent with the Common Defense and Security

NRC requirements relating to maintaining the integrity of the reactor coolant system pressure boundary are fully met by this exemption request. The exemption requested does not affect the security or safeguards features or programs at St. Lucie Unit 1. Such features and programs will remain in full effect during the term of the unit's operating license. Accordingly, granting the requested exemption is consistent with the common defense and security.

3.4 Special Circumstances Support the Issuance of an Exemption

Title 10 CFR 50.12(a)(2) requires demonstrating that at least one of six "special circumstances" exist to support issuance of a requested exemption. One of the special circumstances identified in Section 50.12(a)(2) applies to this request. That is, the application of the regulation in the particular circumstances is not necessary to achieve the underlying purpose of the rule.

The underlying purpose of the regulations in 10 CFR Part 50, Appendix G, is to provide an acceptable margin of safety against brittle failure of the RCS during any condition of normal operation to which the pressure boundary may be subjected over its service lifetime. Special circumstances, pursuant to 10 CFR 50.12(a)(2)(ii) apply to this exemption request in that continued operation of St. Lucie Unit 1 with the P-T limit curves developed in accordance with the ASME Code, Section XI, Appendix G is not necessary to accomplish the underlying purpose of the rule. Application of the calculational methodology documented in CE NPSD-683-A, Revision 6, in lieu of the calculational methodology specified in the ASME Code, Section XI, Appendix G, provides an acceptable alternative evaluation methodology that will continue to meet the underlying purpose of 10 CFR Part 50, Appendix G.

Therefore, FPL requests an exemption based on the special circumstances of 10 CFR 50.12(a)(2)(ii), "Application of the regulation in the particular circumstances would not serve the underlying purpose of the rule or is not necessary to achieve the underlying purpose of the rule."

4.0 Precedent

By letter dated February 19, 2009 (Reference 2), as supplemented by letter dated December 22, 2009 (Reference 3), Arizona Public Service (APS) submitted a request for exemption from 10 CFR Part 50, Appendix G regarding the P-T limits calculation, and a license amendment request to revise Technical Specification (TS) 3.4, "Reactor Coolant System (RCS)," to relocate the P-T limits and the low temperature overpressure protection (LTOP) system enable temperatures from the Technical Specifications to a licensee-controlled document, the Pressure and Temperature Limits Report (PTLR). Although FPL is not requesting that the Technical Specification P-T limits be relocated to a PTLR, the APS precedent is applicable because it documents NRC's granting of an exemption request regarding use of CE NPSD-683-A, Revision 6 methodology as is being requested by FPL.

In the license amendment request, APS referenced Combustion Engineering (CE) Owners Group Topical Report CE NPSD-683- A, Revision 6, "Development of a RCS Pressure and Temperature Limits Report (PTLR) for the Removal of P-T Limits and LTOP Requirements from the Technical Specifications," (Reference 1), as the NRC approved methodology that was referenced in Specification 5.6.9 of the Palo Verde Nuclear Generating Station (PVNGS), Units 1, 2, and 3 Technical Specifications. The NRC staff evaluated the specific methodology in CE NPSD-683-A, Revision 6.

The NRC's evaluation of CE NPSD-683-A, Revision 6 was documented in the NRC Safety Evaluation (SE) of March 16, 2001 (Reference 5), which specified twenty-six (26) additional information items that are necessary to support a licensee's adoption of CE NPSD-683-A, Revision 6. Item 21 requires licensees to request an exemption from requirements of Section IV.A.2. of Appendix G to Part 50 to apply the CE NSSS methods to their P-T curves if the CE methods for calculating K_{IM} and K_{IT} factors, as stated in Section 5.4 of CE NPSD-683-A, Revision 6, are being used as the basis for generating the P-T limits for their facilities. Additionally, the NRC's approval of the APS exemption request (Reference 4), stated that an exemption was required since the methodology for the calculation of K_{IM} values in CE NPSD-683-A, Revision 6, could not be shown to be conservative with respect to the methodology for the determination of K_{IM} provided in editions and addenda of the ASME Code, Section XI, Appendix G through the 2004 Edition.

During the NRC staff's review of CE NPSD-683-A, Revision 6, the staff evaluated the K_{IM} calculational methodology of that report versus the methodologies for calculating K_{IM} given in the ASME Code, Section XI, Appendix G. In the NRC's March 16, 2001 SE, the staff noted, "The CE NSSS methodology does not invoke the methods in the 1995 edition of Appendix G to the Code for calculating K_{IM} factors, and instead applies FEM methods for estimating the K_{IM} factors for the RPV shell ... the staff has determined that the K_{IM} calculation methods apply FEM modeling that is similar to that used for the determination of the K_{IT} factors (as codified in the ASME Code, Section XI, Appendix G). The staff has also determined that there is only a slight non-conservative difference between the P-T limits generated from the 1989 edition of Appendix G to the Code and those generated from CE NSSS methodology as documented in CE/ABB Evaluation 063-PENG-ER-096, Revision 00, 'Technical Methodology Paper Comparing ABB/CE PT Curve to ASME Section III, Appendix G.' The staff considers this difference to be reasonable and that it will be consistent with the expected improvements in P-T generation methods that have been incorporated into the 1995 Edition of Appendix G to the Code. The staff therefore concludes that the CE NSSS methodology for generating P-T limits is equivalent to the current methodology in the 1995 edition of Appendix G to the Code, and is acceptable for P-T limit applications." In granting the APS exemption request (Reference 4), the NRC stated, "This conclusion regarding the comparison between the CE NSSS methodology and the 1995 Edition of the ASME Code, Section XI, Appendix G methodology also applies to the 2004 Edition of the ASME Code, Section XI, Appendix G methodology because the evolution of the ASME Code Section XI, Appendix G methodology does not affect the K_{IM} calculation significantly."

In summary, the APS exemption was granted because the staff concluded that P-T curves developed using the CE NPSD-683-A, Revision 6 methodology would be adequate for protecting the RPVs of PVNGS Units 1, 2 and 3 from brittle fracture under all normal operating and hydrostatic/leak test conditions.

5.0 Conclusion

Title 10 CFR 50.60(b) permits licensees to use alternatives to the requirements of Appendix G to Part 50 if an exemption is granted by the Commission pursuant to the provisions and exemption acceptance criteria of 10 CFR 50.12. The staff has previously granted an exemption to APS to apply finite element methods in CE NPSD-683-A, Revision 6, to the calculation of plant-specific P-T limits (Reference 4).

Analytical procedures employed by Westinghouse to develop the St. Lucie Unit 1 reactor vessel P-T limits use the finite element analysis methods of CE NPSD-683-A, Revision 6 and the guidance found in Appendix G of ASME Section XI. Use of the CE NPSD-683-A, Revision 6 methodology to establish P-T limits for St. Lucie Unit 1 is consistent with Section XI of the 2004 Edition of the ASME Code. The justification presented in this application provides sufficient justification for the issuance of the requested exemption.

As required by Section 50.12 of the Code of Federal Regulations, the exemption sought is authorized by law, presents no undue risk to public health and safety, is consistent with the common defense and security, and is supported by special circumstances. The NRC has concluded that the difference between the P-T limits generated using the Appendix G Code methods and those generated using the CE NSSS methodology are reasonable and consistent with the expected improvements in P-T generation methods that have been incorporated into Appendix G of the Code and that the CE NSSS methodology is acceptable for P-T limit application. Accordingly, FPL respectfully requests that the NRC grant the requested exemption from the requirements of Section IV.A.2 of Appendix G to 10 CFR Part 50 as applicable to the development of RCS P-T limits for St. Lucie Unit 1.

6.0 References

1. Combustion Engineering Owners Group Topical Report CE NPSD-683-A, Revision 6, "Development of a RCS Pressure and Temperature Limits Report for the Removal of P-T Limits and LTOP Requirements from the Technical Specifications," April 2001 (ADAMS Accession No. ML011350387).
2. Letter from Arizona Public Service (APS) to the NRC, "Palo Verde Nuclear Generating Station (PVNGS) Units 1, 2 and 3, Docket Nos. STN 50-528, 50-529 and 50-530, Request for Technical Specification Amendment and Exemption from 10 CFR 50, Appendix G, to Relocate the Reactor Coolant System Pressure and Temperature Limits and the Low Temperature Overpressure Protection Enable Temperatures," February 19, 2009 (ADAMS Accession No. ML090641014).
3. Letter from Arizona Public Service (APS)to the NRC, " Palo Verde Nuclear Generating Station (PVNGS) Ubits 1, 2 and 3, Docket Nos. STN 50-528, 50-529 and 50-530, Response to Request for Additional Information for Technical Specification Amendment and Exemption from 10 CFR 50, Appendix G, to Relocate the Reactor Coolant System Pressure and Temperature Limits and the Low Temperature Overpressure Protection Enable Temperatures," December 22, 2009 (ADAMS Accession No. ML100040069).
4. Letter, J. Hall (NRC) to R. Edington (APS), "Palo Verde Nuclear Generating Station, Units 1, 2 and 3 – Exemption from the Requirements of Appendix G to 10 CFR 50," February 24, 2010 (TAC Nos. ME0703, ME0704 and ME0705).
5. NRC Letter, S. A. Richards to R. Bernier, "Safety Evaluation of Topical Report CE NPSD-683, Revision 6, 'Development of a RCS Pressure and Temperature Limits Report (PTLR) for the Removal of P-T Limits and LTOP Requirements from the Technical Specifications,' (TAC No. MA9561), March 16, 2001.
6. Evaluation No. 063-PENG-ER-096, Revision 00, "Technical Methodology Paper Comparing ABB/CE PT Curve to ASME Section III, Appendix G," ABB Combustion Engineering Nuclear Power Operations, January 22, 1998, (ADAMS Accession No. ML100500514).

Attachment 2

No Significant Hazards Consideration –

Replacement for Section 5.2.G to St. Lucie Unit 1 EPU LAR

Attachment 1

Reactor Coolant System Pressure–Temperature Limits and Low Temperature Overpressure Protection (LTOP)

The current pressure-temperature (P-T) limit curves are being replaced with new curves that support operation to 54 effective full power years (EFPY). The revised P-T limit curves provide new temperature requirements for adjusting PORV setpoints to support LTOP and eliminate the need to isolate the high pressure safety injection pump headers when using the charging pumps for reactivity control in Modes 5 and 6. The proposed change includes use of the analytical methods described in the NRC-approved Topical Report CE NPSD-683-A.

1. Does the proposed change involve a significant increase in the probability or consequences of an accident previously evaluated?

   The revised P-T limit curves have been determined in accordance with NRC-approved methodologies that provide adequate margin of safety to ensure that the reactor vessel will withstand the effects of normal startup and shutdown cyclic loads due to system temperature and pressure changes, as well as the loads associated with reactor trips. The P-T limit curves are conservatively generated in accordance with the fracture toughness requirements of the ASME Code Section XI, Appendix G. The margins of safety against fracture provided by the P-T limits using the requirements of 10 CFR 50 Appendix G are equivalent to those recommended in ASME Section XI, Appendix G. In its March 16, 2001 Safety Evaluation of Topical Report CE NPSD-683-A, Revision 6, the NRC concluded that the CE NSSS methodology for generating P-T limits is equivalent to the current methodology in the1995 edition of Appendix G to 10 CFR 50, and is acceptable for P-T limit applications. The adjusted reference temperature values are based on the guidance of Regulatory Guide (RG) 1.99, Revision 2.

   The revised P-T limit curves were calculated to meet the regulations of 10 CFR 50, Appendix A, Design Criterion 14 and Design Criterion 31. These design criteria require that the reactor coolant pressure boundary be designed, fabricated, erected and tested in order to have an extremely low probability of abnormal leakage, of rapid propagating failure, and of gross rupture. The criteria also require that the reactor coolant pressure boundary be designed with sufficient margin to assure that when stressed under operating, maintenance and testing the boundary behaves in a non-brittle manner and the probability of rapidly propagating fracture is minimized. The regulations of 10 CFR 50 Appendix A, Design Criteria 14 and 31 remain satisfied.

   The proposed changes will not result in physical changes to the SSCs or to event initiators or precursors. Changing the heatup and cooldown curves and the PORV setpoints to reflect 54 EFPY does not affect the ability to control the RCS at low temperatures such that the integrity of the reactor coolant pressure boundary would be compromised by violating the P-T limits.

   The proposed changes will not impact assumptions and conditions previously used in the radiological consequence evaluations, nor affect mitigation of these consequences due to accidents described in the UFSAR. Also, the proposed changes will not impact a plant system, such that previously analyzed SSCs might be more likely to fail. The initiating conditions and assumptions for accidents described in the UFSAR remain as analyzed.

Therefore, the proposed change does not involve a significant increase in the probability or consequences of an accident previously evaluated.

2. Does the proposed change create the possibility of a new or different kind of accident from any accident previously evaluated?

   The revised P-T limit curves continue to ensure that the regulations of 10 CFR 50 Appendix A, Design Criteria 14 and 31 remain satisfied. The revised P-T limit curves are based on a later edition of ASME Code Section XI that incorporates current industry standards for P-T curves. The margins of safety against fracture provided by the P-T limits using the requirements of 10 CFR 50 Appendix G are equivalent to those recommended in ASME Section XI, Appendix G. The CE NPSD-683-A, Revision 6 methodology used for generating P-T limits is equivalent to the current methodology in the1995 edition of Appendix G to the ASME Section XI Code, and is acceptable for P-T limit applications. The revised curves are based on reactor vessel irradiation damage predictions using RG 1.99, Revision 2 methodology.

   Revising the P-T limit curves and using the CE NPSD-683-A, Revision 6 methodology used for generating P-T limits does not create a new or different kind of accident. No new failure modes are identified nor are any SSCs required to be operated outside of their design bases.

   Therefore, the proposed change does not create the possibility of a new or different kind of accident from any previously evaluated.

3. Does the proposed change involve a significant reduction in a margin of safety?

   The proposed P-T curves continue to maintain the safety margins of 10 CFR 50, Appendix G by defining the limits of operation which prevent non-ductile failure of the reactor pressure vessel. Analyses have demonstrated that the fracture toughness requirements are satisfied and that conservative operating restrictions are maintained for the purpose of LTOP. The P-T limit curves provide assurance that the RCS pressure boundary will behave in a ductile manner and that the probability of a rapidly propagating facture is minimized.

   Therefore, the proposed change does not involve a significant reduction in a margin of safety.