



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

September 30, 2015

Mr. Jon A. Franke
Site Vice President
Susquehanna Nuclear, LLC
769 Salem Boulevard
NUCSB3
Berwick, PA 18603-0467

SUBJECT: SUSQUEHANNA STEAM ELECTRIC STATION, UNITS 1 AND 2 - ISSUANCE OF AMENDMENTS RE: REVISIONS TO TECHNICAL SPECIFICATION 3.4.10, "RCS PRESSURE AND TEMPERATURE (P/T) LIMITS" (TAC NOS. MF4597 AND MF4598)

Dear Mr. Franke:

The Commission has issued the enclosed Amendment No. 263 to Renewed Facility Operating License No. NPF-14, and Amendment No. 244 to Renewed Facility Operating License No. NPF-22 for the Susquehanna Steam Electric Station, Units 1 and 2. These amendments consist of changes to the Renewed Facility Operating Licenses in response to your application dated August 11, 2014, as supplemented by letters dated April 6, 2015, and July 16, 2015.

These amendments change Technical Specification 3.4.10, "RCS [Reactor Coolant System] Pressure and Temperature (P/T) Limits," specifically revising the P/T Limits curves.

A copy of the related safety evaluation is also enclosed. Notice of Issuance will be included in the Commission's Biweekly *Federal Register* Notice.

Sincerely,

A handwritten signature in black ink that reads "Jeffrey A. Whited".

Jeffrey A. Whited, Project Manager
Plant Licensing Branch I-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-387 and 50-388

Enclosures:

1. Amendment No. 263 to Renewed NPF-14
2. Amendment No. 244 to Renewed NPF-22
3. Safety Evaluation

cc w/enclosures: Distribution via Listserv



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NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SUSQUEHANNA NUCLEAR, LLC

ALLEGHENY ELECTRIC COOPERATIVE, INC.

DOCKET NO. 50-387

SUSQUEHANNA STEAM ELECTRIC STATION, UNIT 1

AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No. 263
Renewed License No. NPF-14

1. The Nuclear Regulatory Commission (the Commission) has found that:
 - A. The application for the amendment filed by Susquehanna Nuclear, LLC, dated August 11, 2014, as supplemented by letters dated April 6, 2015, and July 16, 2015, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;
 - B. The facility will operate in conformity with the application, the provisions of the Act, and the regulations of the Commission;
 - C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;
 - D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and
 - E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

Enclosure 1

2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment and paragraph 2.C.(2) of Renewed Facility Operating License No. NPF-14 is hereby amended to read as follows:

(2) Technical Specifications and Environmental Protection Plan

The Technical Specifications contained in Appendix A, as revised through Amendment No. 263 and the Environmental Protection Plan contained in Appendix B are hereby incorporated in the license. Susquehanna Nuclear, LLC shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

3. This license amendment is effective as of its date of issuance and shall be implemented within 30 days.

FOR THE NUCLEAR REGULATORY COMMISSION



Douglas A. Broaddus, Chief
Plant Licensing Branch I-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Attachment:
Changes to the Technical Specifications
and Renewed Facility Operating License

Date of Issuance: September 30, 2015

ATTACHMENT TO LICENSE AMENDMENT NO. 263

RENEWED FACILITY OPERATING LICENSE NO. NPF-14

DOCKET NO. 50-387

Replace the following page of the Renewed Facility Operating License with the attached revised page. The revised page is identified by amendment number and contains marginal lines indicating the areas of change.

REMOVE
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INSERT
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Replace the following pages of the Appendix A Technical Specifications with the attached revised pages. The revised pages are identified by amendment number and contain marginal lines indicating the areas of change.

REMOVE
TS / 3.4-30
TS / 3.4-30a
TS / 3.4-30b

INSERT
TS / 3.4-30
TS / 3.4-30a
TS / 3.4-30b

- (3) Susquehanna Nuclear, LLC, pursuant to the Act and 10 CFR Parts 30, 40, and 70, to receive, possess, and use at any time any byproduct, source and special nuclear material as sealed neutron sources for reactor startup, sealed neutron sources for reactor instrumentation and radiation monitoring equipment calibration, and as fission detectors in amounts as required;
- (4) Susquehanna Nuclear, LLC, pursuant to the Act and 10 CFR Parts 30, 40, and 70 to receive, possess, and use in amounts as required any byproduct, source or special nuclear material without restriction to chemical or physical form, for sample analysis or instrument calibration or associated with radioactive apparatus or components; and
- (5) Susquehanna Nuclear, LLC, pursuant to the Act and 10 CFR Parts 30, 40, and 70 to possess, but not separate, such byproduct and special nuclear materials as may be produced by the operation of the facility.

C. This license shall be deemed to contain and is subject to the conditions specified in the Commission's regulations set forth in 10 CFR Chapter I and is subject to all applicable provisions of the Act and to the rules, regulations and orders of the Commission now or hereafter in effect; and is subject to the additional conditions specified or incorporated below:

(1) Maximum Power Level

Susquehanna Nuclear, LLC is authorized to operate the facility at reactor core power levels not in excess of 3952 megawatts thermal in accordance with the conditions specified herein. The preoperational tests, startup tests and other items identified in License Conditions 2.C.(36), 2.C.(37), 2.C.(38), and 2.C.(39) to this license shall be completed as specified.

(2) Technical Specifications and Environmental Protection Plan

The Technical Specifications contained in Appendix A, as revised through Amendment No. 263 and the Environmental Protection Plan contained in Appendix B are hereby incorporated in the license. Susquehanna Nuclear, LLC shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

For Surveillance Requirements (SRs) that are new in Amendment 178 to Facility Operating License No. NPF-14, the first performance is due at the end of the first surveillance interval that begins at implementation of Amendment 178. For SRs that existed prior to Amendment 178, including SRs with modified acceptance criteria and SRs whose frequency of performance is being extended, the first performance is due at the end of the first surveillance interval that begins on the date the Surveillance was last performed prior to implementation of Amendment 178.

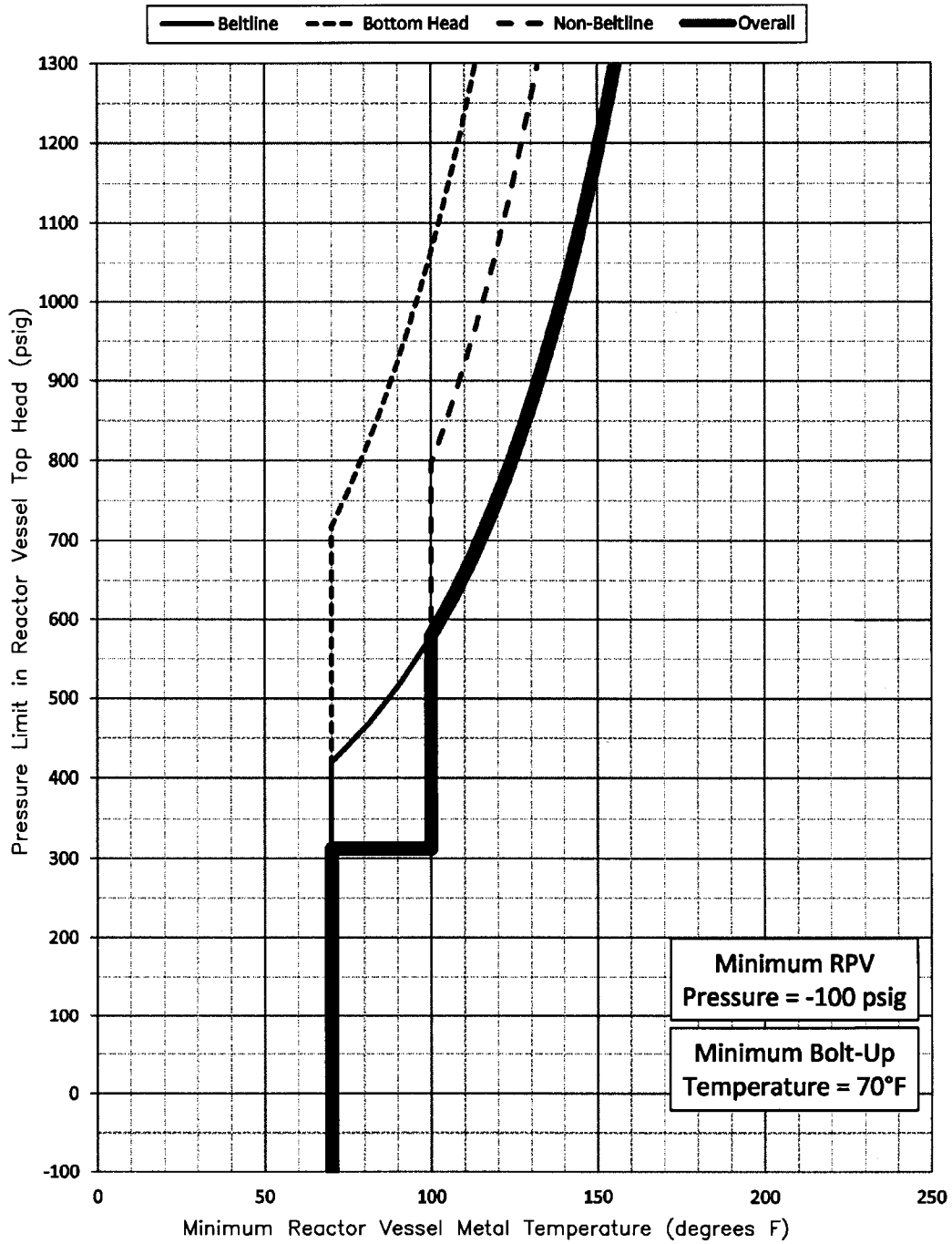


FIGURE 3.4.10-1
 System Hydrotest Limit with Fuel in Vessel for 40 EFY
 (Curve A)

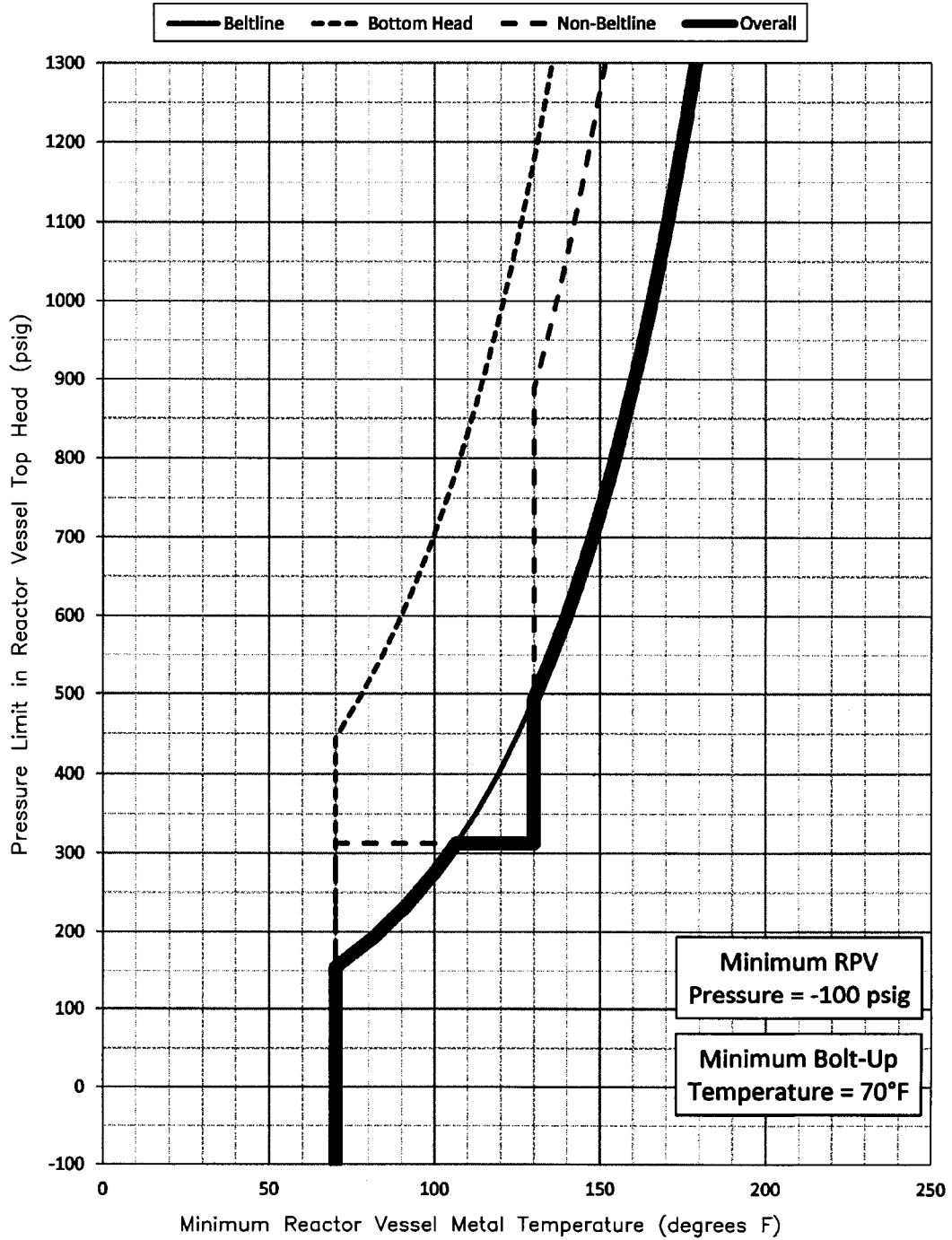


FIGURE 3.4.10-2
 Non-Nuclear Heating Limit for 40 EFY
 (Curve B)

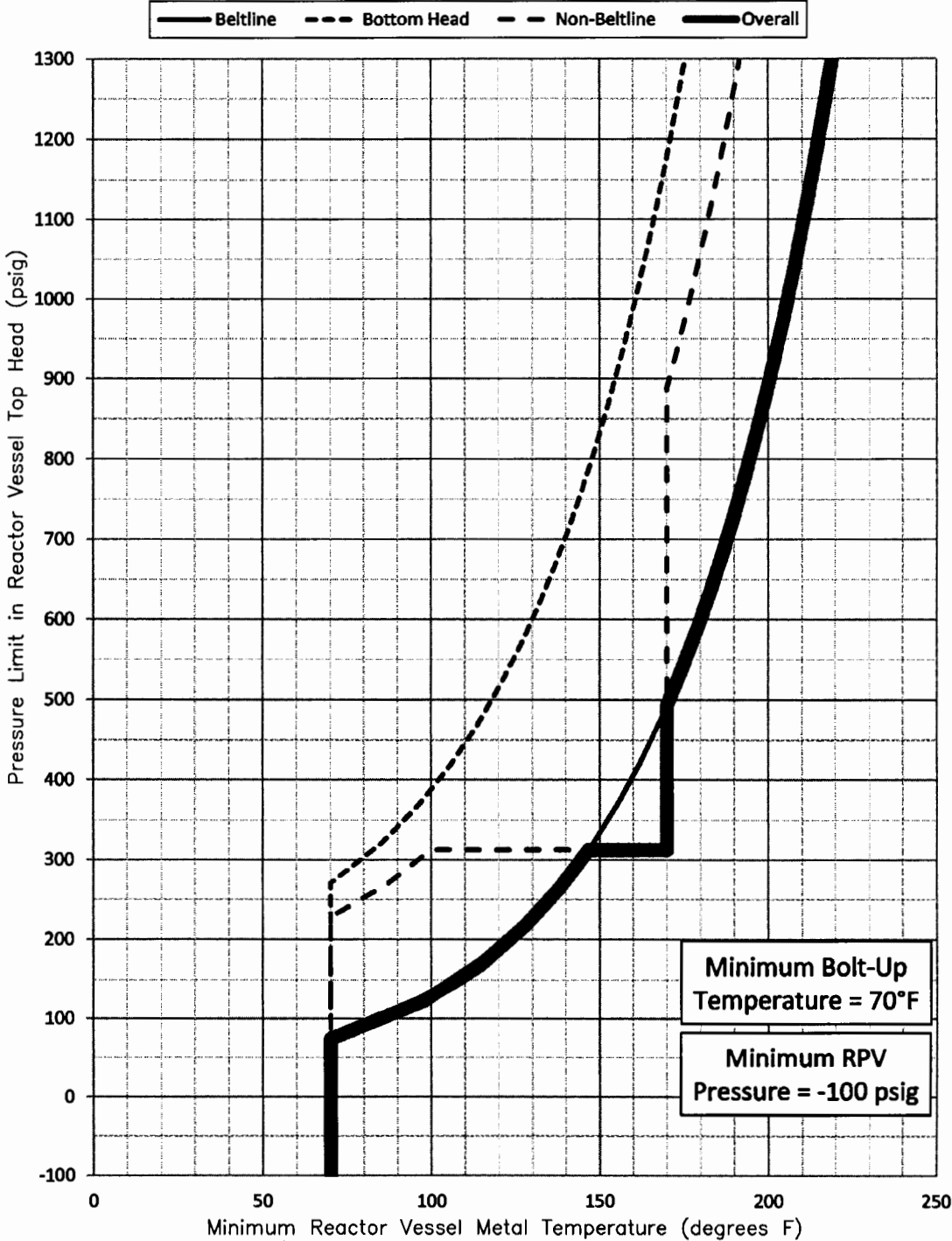


FIGURE 3.4.10-3
Nuclear (Core Critical) Limit for 40 EFY
(Curve C)



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SUSQUEHANNA NUCLEAR, LLC

ALLEGHENY ELECTRIC COOPERATIVE, INC.

DOCKET NO. 50-388

SUSQUEHANNA STEAM ELECTRIC STATION, UNIT 2

AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No. 244
Renewed License No. NPF-22

1. The Nuclear Regulatory Commission (the Commission) has found that:
 - A. The application for the amendment filed by Susquehanna Nuclear, LLC, dated August 11, 2014, as supplemented by letters dated April 6, 2015, and July 16, 2015, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;
 - B. The facility will operate in conformity with the application, the provisions of the Act, and the regulations of the Commission;
 - C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;
 - D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and
 - E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

Enclosure 2

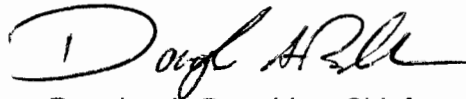
2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment and paragraph 2.C.(2) of the Renewed Facility Operating License No. NPF-22 is hereby amended to read as follows:

(2) Technical Specifications and Environmental Protection Plan

The Technical Specifications contained in Appendix A, as revised through Amendment No. 244, and the Environmental Protection Plan contained in Appendix B, are hereby incorporated in the license. Susquehanna Nuclear, LLC shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

3. This license amendment is effective as of its date of issuance and shall be implemented within 30 days.

FOR THE NUCLEAR REGULATORY COMMISSION



Douglas A. Broaddus, Chief
Plant Licensing Branch I-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Attachment:
Changes to the Technical Specifications
and Renewed Facility Operating License

Date of Issuance: September 30, 2015

ATTACHMENT TO LICENSE AMENDMENT NO. 244

RENEWED FACILITY OPERATING LICENSE NO. NPF-22

DOCKET NO. 50-388

Replace the following page of the Renewed Facility Operating License with the attached revised page. The revised page is identified by amendment number and contains marginal lines indicating the areas of change.

REMOVE
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INSERT
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Replace the following pages of the Appendix A Technical Specifications with the attached revised pages. The revised pages are identified by amendment number and contain marginal lines indicating the areas of change.

REMOVE
TS / 3.4-30
TS / 3.4-30a
TS / 3.4-30b

INSERT
TS / 3.4-30
TS / 3.4-30a
TS / 3.4-30b

- (3) Susquehanna Nuclear, LLC, pursuant to the Act and 10 CFR Parts 30, 40, and 70, to receive, possess, and use at any time any byproduct, source and special nuclear material as sealed neutron sources for reactor startup, sealed neutron sources for reactor instrumentation and radiation monitoring equipment calibration, and as fission detectors in amounts as required;
- (4) Susquehanna Nuclear, LLC, pursuant to the Act and 10 CFR Parts 30, 40, and 70, to receive, possess, and use in amounts as required any byproduct, source or special nuclear material without restriction to chemical or physical form, for sample analysis or instrument calibration or associated with radioactive apparatus or components; and
- (5) Susquehanna Nuclear, LLC, pursuant to the Act and 10 CFR Parts 30, 40, and 70, to possess, but not separate, such byproduct and special nuclear materials as may be produced by the operation of the facility.

C. This license shall be deemed to contain and is subject to the conditions specified in the Commission's regulations set forth in 10 CFR Chapter I and is subject to all applicable provisions of the Act and to the rules, regulations and orders of the Commission now or hereafter in effect; and is subject to the additional conditions specified or incorporated below:

(1) Maximum Power Level

Susquehanna Nuclear, LLC is authorized to operate the facility at reactor core power levels not in excess of 3952 megawatts thermal in accordance with the conditions specified herein. The preoperational test, startup tests and other items identified in License Conditions 2.C.(20), 2.C.(21), 2.C.(22), and 2.C.(23) to this license shall be completed as specified.

(2) Technical Specifications and Environmental Protection Plan

The Technical Specifications contained in Appendix A, as revised through Amendment No. 244, and the Environmental Protection Plan contained in Appendix B, are hereby incorporated in the license. Susquehanna Nuclear, LLC shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

For Surveillance Requirements (SRs) that are new in Amendment 151 to Facility Operating License No. NPF-22, the first performance is due at the end of the first surveillance interval that begins at implementation of Amendment 151. For SRs that existed prior to Amendment 151, including SRs with modified acceptance criteria and SRs whose frequency of performance is being extended, the first performance is due at the end of the first surveillance interval that begins on the date the Surveillance was last performed prior to implementation of Amendment 151.

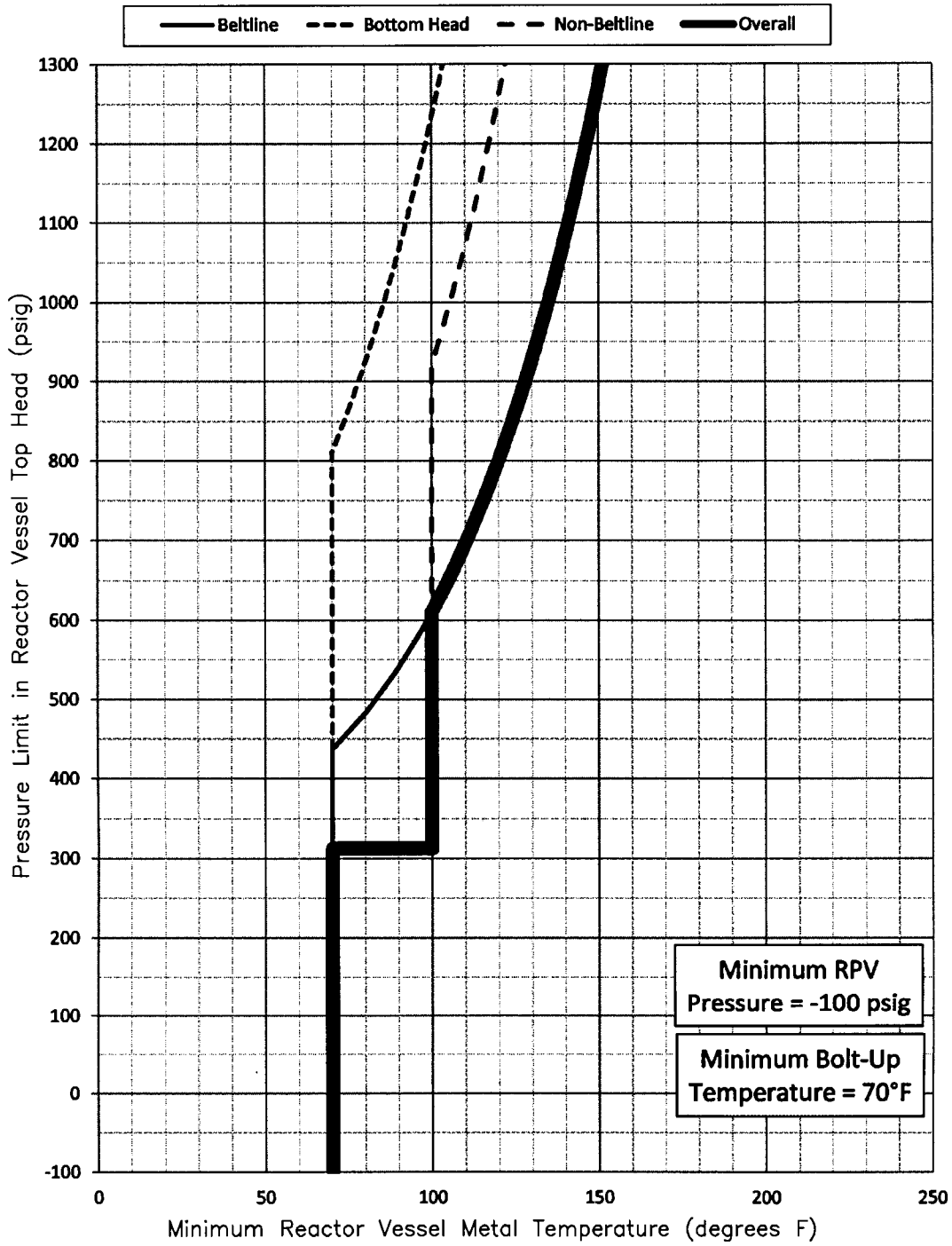


Figure 3.4.10-1
 System Hydrotest Limit with Fuel in Vessel for 40 EFY
 (Curve A)

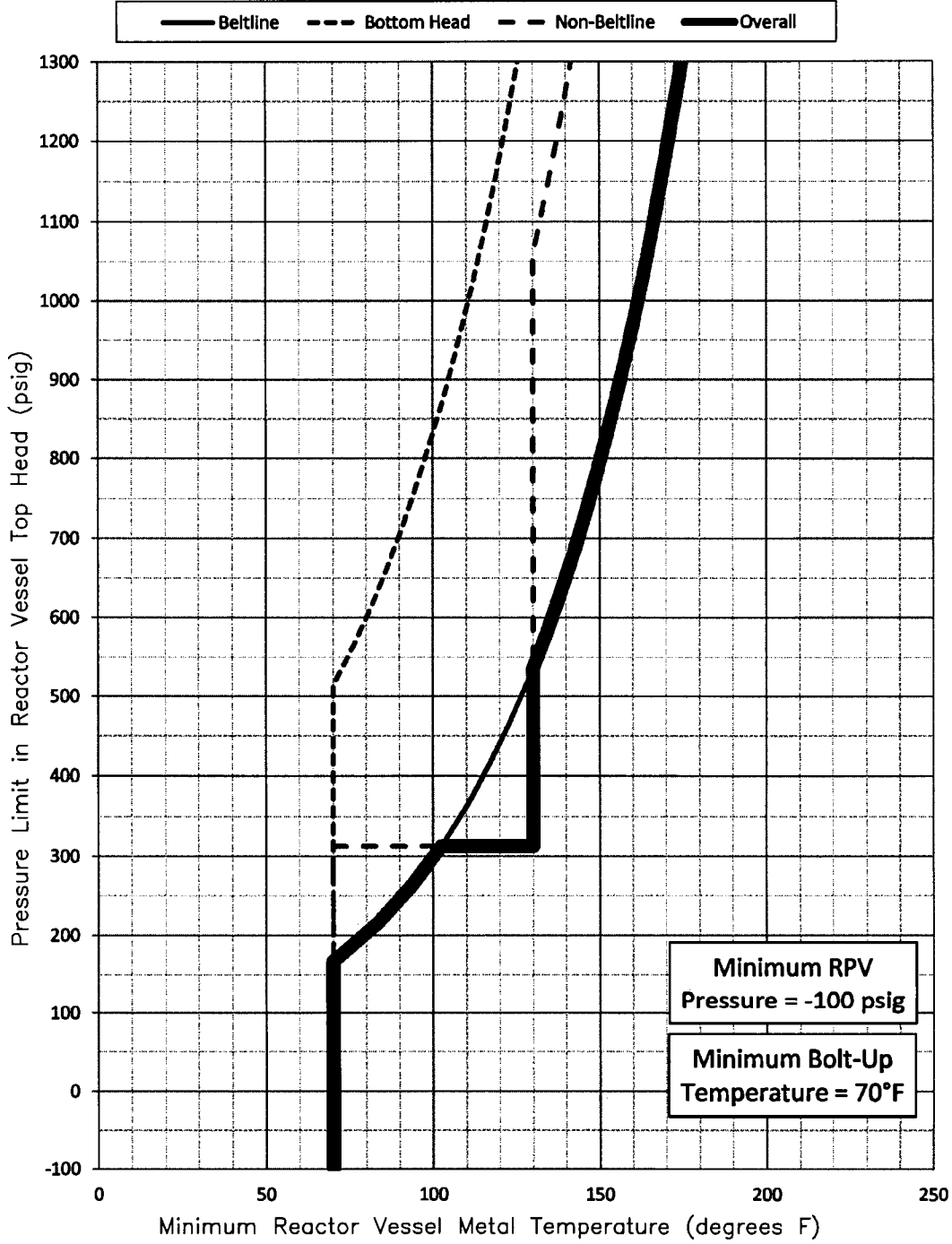


Figure 3.4.10-2
 Non-Nuclear Heating Limit for 40 EFPY
 (Curve B)

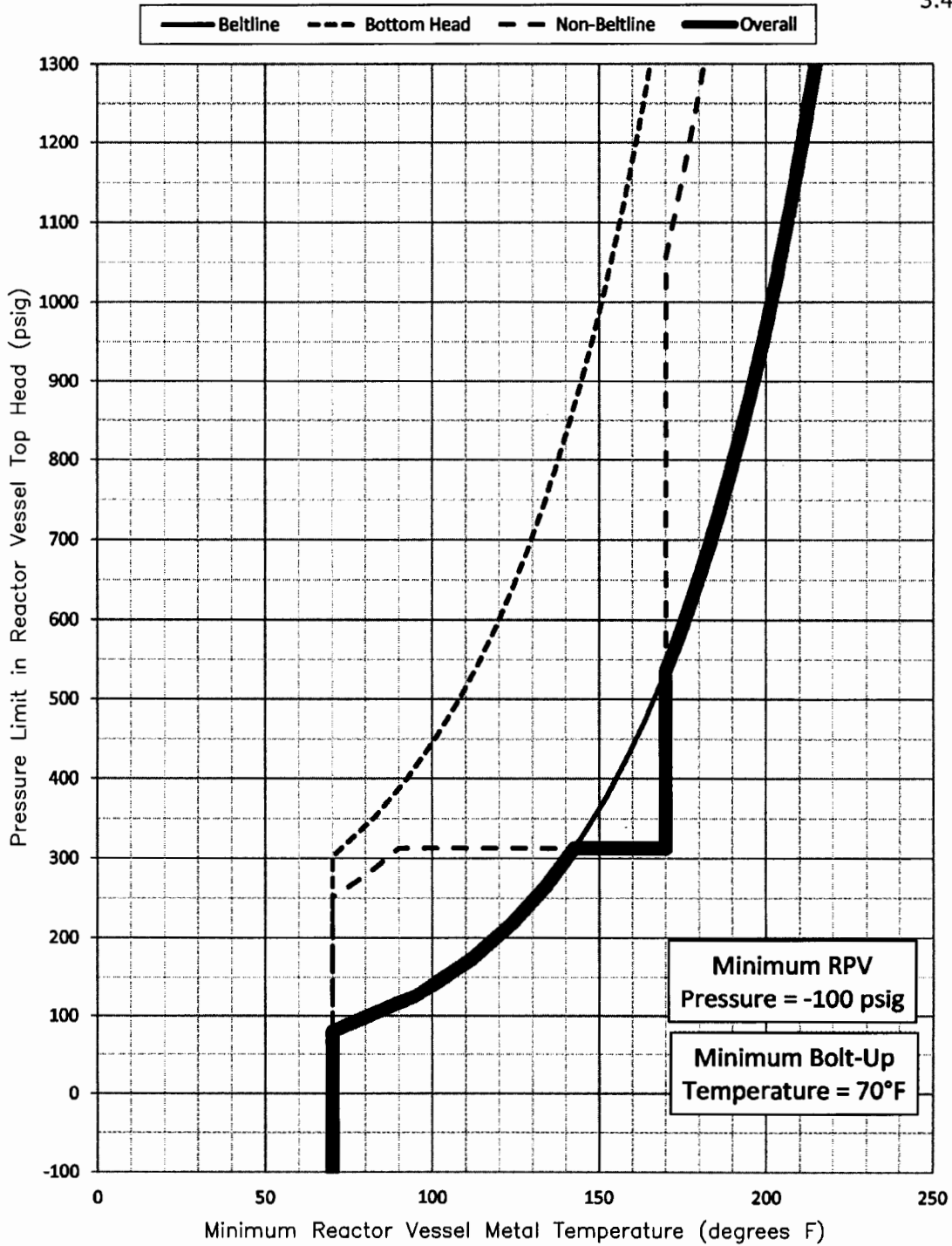


FIGURE 3.4.10-3
 Nuclear (Core Critical) Limit for 40 EFPY
 (Curve C)



UNITED STATES
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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
RELATED TO AMENDMENT NO. 263 TO RENEWED FACILITY OPERATING
LICENSE NO. NPF-14 AND AMENDMENT NO. 244
TO RENEWED FACILITY OPERATING LICENSE NO. NPF-22
SUSQUEHANNA NUCLEAR, LLC
ALLEGHENY ELECTRIC COOPERATIVE, INC.
SUSQUEHANNA STEAM ELECTRIC STATION, UNITS 1 AND 2
DOCKET NOS. 50-387 AND 50-388

1.0 INTRODUCTION

By application dated August 11, 2014 (Reference 1), as supplemented by letters dated April 6, 2015 (Reference 2), and July 16, 2015 (Reference 3), Susquehanna Nuclear, LLC (Susquehanna, the licensee) submitted a license amendment request (LAR) proposing changes to the Technical Specifications (TSs) for the Susquehanna Steam Electric Station, Units 1 and 2 (SSES-1 and 2).

The amendments change SSES-1 and 2 TS 3.4.10, "RCS [Reactor Coolant System] Pressure and Temperature (P/T) Limits," specifically revising the P/T Limits curves. The revision provides P/T Limits curves that extend into the vacuum region (e.g., below 0 pounds per square inch gauge (psig)) to mitigate the risk of a level transient during startup, account for updated surveillance material and fluence data for the reactor vessel (RV) beltline materials, and replace the current 35.7 and 30.2 effective full power year (EFPY) P/T Limits curves for SSES-1 and 2, respectively, with new curves that are valid for 40 EFPY. The updated analysis provided by the licensee addresses considerations included in Regulatory Information Summary (RIS) 2014-11, "Information on Licensing Applications for Fracture Toughness Requirements for Ferritic Reactor Coolant Pressure Boundary Components," dated October 14, 2014 (Reference 4).

The supplemental letters dated April 6, 2015, and July 16, 2015, provided additional information that clarified the application, expanded the scope of the application as originally noticed, and changed the U.S. Nuclear Regulatory Commission (NRC) staff's original proposed no significant hazards consideration determination as published in the *Federal Register* on November 25, 2014 (79 FR 70217). As such, the NRC staff published a subsequent notice in the *Federal Register* on July 30, 2015 (80 FR 45559).

This LAR was submitted by PPL Susquehanna, LLC; however, on June 1, 2015 (Reference 5), the NRC staff issued an amendment changing the name on the SSES license from PPL Susquehanna, LLC to Susquehanna Nuclear, LLC. This amendment was issued subsequent to an order issued on April 10, 2015 (Reference 6), to SSES, approving an indirect license transfer of the SSES license to Talen Energy Corporation.

2.0 REGULATORY EVALUATION

The NRC has established requirements in Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50 to protect the integrity of the reactor coolant pressure boundary (RCPB) in nuclear power plants. The NRC staff evaluates the acceptability of a facility's P/T Limits based on the following NRC regulations and guidance:

- Appendix G, "Fracture Toughness Requirements," to 10 CFR Part 50;
- Appendix H, "Reactor Vessel Material Surveillance Program Requirements," to 10 CFR Part 50;
- Regulatory Guide (RG) 1.99, Revision 2, "Radiation Embrittlement of Reactor Vessel Materials" (Reference 7);
- Generic Letter (GL) 92-01, Revision 1, "Reactor Vessel Structural Integrity" (Reference 8); and
- GL 92-01, Revision 1, Supplement 1, "Reactor Vessel Structural Integrity" (Reference 9).

Appendix G to 10 CFR Part 50 requires that facility P/T Limits for the RV be at least as conservative as those obtained by applying the linear elastic fracture mechanics methodology of Appendix G to Section XI of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code). Appendix H to 10 CFR Part 50 establishes requirements related to facility RV material surveillance programs. RG 1.99, Revision 2, contains methodologies for determining the increase in transition temperature and the decrease in upper shelf energy resulting from neutron irradiation.

Further, in 10 CFR Section 50.36, "Technical specifications," the NRC established its regulatory requirements related to the content of TSs. Pursuant to 10 CFR 50.36, TSs are required to include items in the following five specific categories related to station operation: (1) safety limits, limiting safety system settings, and limiting control settings; (2) limiting conditions for operation; (3) surveillance requirements; (4) design features; and (5) administrative controls.

In References 1 and 2, the licensee provided revised TS Bases pages to be implemented with the associated TS changes. These pages were provided for information only and will be revised in accordance with the TS Bases Control Program.

3.0 TECHNICAL EVALUATION

3.1 Licensee Evaluation

In Reference 1, the licensee proposes the following changes to the TS Figures 3.4.10-1, 3.4.10-2, and 3.4.10-3, which show the P/T Limits curves for in-service leakage and hydrostatic

testing, nonnuclear heatup and cooldown, and criticality, respectively, for SSES-1 and 2 P/T Limits:

- The pressure axes are revised to extend below 0 psig to bound RCS conditions to support vacuum-assist fill of the RCS loops.

The pressure axes are extended one additional scaled unit of measure (100 psig each) below 0 psig to bound RCS conditions to support vacuum-assist fill of the RCS loops. Section 4.0 of the LAR states, in part: "The absolute maximum vacuum is assumed to be no greater than 15 psig. This assumes the possibility of drawing a near perfect vacuum on the vessel, coupled with a 0.5 psig containment pressure."

In Reference 2, the licensee further updated the P/T Limits curves based on an updated analysis that addresses considerations included in RIS 2014-11. The new curves account for updated surveillance material and fluence data for the RV beltline materials and would replace the current 35.7 and 30.2 EFPY P/T Limits curves for SSES-1 and 2, respectively, with new curves that are valid for 40 EFPY.

3.2 Staff Evaluation

Regarding ferritic RCPB components that are not part of the RV beltline shell region, 10 CFR Part 50, Appendix G, paragraph IV.A, states: "The pressure-retaining components of the reactor coolant pressure boundary that are made of ferritic materials must meet the requirements of the ASME Code [Section III], supplemented by the additional requirements set forth below [paragraph IV.A.2, "Pressure-Temperature Limits and Minimum Temperature Requirements"]..."

Therefore, 10 CFR Part 50, Appendix G, requires that P/T Limits be developed for the ferritic materials in the RV beltline, as well as ferritic materials not in the RV beltline. Further, 10 CFR Part 50, Appendix G, requires that all ferritic RCPB components meet the applicable ASME Code, Section III, requirements. The relevant ASME Code, Section III, requirements that will affect the P/T Limits are the lowest service temperature requirement of paragraph NB-2332, "Material for Piping, Pumps, and Valves, Excluding Bolting Material," subparagraph (b) for piping, pumps, and valves, and the fracture toughness requirements of paragraph NB-3211, "Requirements for Acceptability," subparagraph (d) for vessels.

RV nozzles, penetrations, and other discontinuities may exhibit significantly higher stresses than those for the RV beltline shell region. These higher stresses can potentially result in more restrictive P/T Limits, even if the reference temperature (RT_{NDT}) for these components is not as high as that of RV beltline shell materials that have simpler geometries. Therefore, in Request for Additional Information (RAI) 1, issued by letter dated January 30, 2015 (Reference 10), the NRC staff requested that the licensee describe how the P/T Limits curves, and the methodology used to develop these curves considered RV materials, are consistent with the requirements of Appendix G to 10 CFR Part 50.

In its response to RAI-1 submitted in Reference 2, the licensee provided revised P/T Limits curves to replace the P/T Limits curves submitted as TS Figures 3.4.10-1, 3.4.10-2, and

3.4.10-3 in Reference 1. The P/T Limits curves were revised based on analysis provided in Reference 2 and further detailed below. In addition, the P/T Limits curves were revised for 40 EFY for SSES-1 and 2.

Susquehanna is a participating utility in development of the NRC-approved Boiling Water Reactor (BWR) Owners' Group (BWROG) Licensing Topical Report (LTR) BWROG-TP-11-023-A, "Linear Elastic Fracture Mechanics Evaluation of General Electric Boiling Water Reactor Water Level Instrument [WLI] Nozzles for Pressure-Temperature Curve Evaluations" (Reference 11). LTR BWROG-TP-11-023-A containing Structural Integrity Associates (SIA) Report No. 0900876.401, Revision 0-A, provides a fracture mechanics solution for a partial penetration WLI nozzle for an internal pressure load case and a 100 degrees-Fahrenheit per-hour ($^{\circ}\text{F/hr}$) thermal load case.

RG 1.99, Revision 2, contains methodologies for calculating the adjusted reference temperature (ART) due to neutron irradiation. The ART is defined as the sum of the initial (unirradiated) RT_{NDT} , the mean value of the adjustment in reference temperature caused by irradiation (ΔRT_{NDT}), and a margin term. The ΔRT_{NDT} is a product of a chemistry factor (CF) and a fluence factor. The CF is dependent upon the amount of copper and nickel in the material and may be determined from tables in RG 1.99, Revision 2, or from surveillance data.

The licensee developed the proposed 40 EFY P/T Limits curves using updated neutron fluence calculations. The licensee stated that the neutron fluence calculations were based on the NRC-approved Radiation Analysis Modeling Application (RAMA) neutron fluence methodology and that the RAMA neutron fluence methodology has been benchmarked using RG 1.190, "Calculational and Dosimetry Methods for Determining Pressure Vessel Fluence" (Reference 12). The RAMA neutron fluence calculations were applied to the RV beltline region, defined as the region near the core where the neutron fluence exceeds $1.0 \times 10^{17} \text{ n/cm}^2$ ($E > 1.0 \text{ MeV}$).

Appendix G to 10 CFR Part 50 provides fracture toughness requirements for ferritic materials in the RCPB, including requirements for calculating P/T Limits for the plant. These P/T Limits curves are established to ensure the structural integrity of the ferritic components of the RCPB during any condition of normal operation, including anticipated operational occurrences and hydrostatic tests. Section IV.A.2 of 10 CFR Part 50, Appendix G, requires that the P/T Limits be at least as conservative as those that would be generated if the methods of calculation in the ASME Code, Section XI, Appendix G, were used to calculate the P/T Limits. The rule also requires that the P/T Limits calculations account for the effects of neutron irradiation on the RV beltline materials and incorporate any relevant RV surveillance capsule data that are required to be reported as part of the licensee's implementation of its 10 CFR Part 50, Appendix H, RV materials surveillance program. The licensee provided data from BWRVIP-135, "BWR Vessel and Internals Project Integrated Surveillance Program (BWRVIP ISP) Data Source Book and Plant Evaluations." The BWRVIP-135 source book is used by the industry in compliance with BWRVIP-86, Revision 1, "BWR Vessel and Internals Project Updated BWR Integrated Surveillance Program Implementation Plan" (Reference 13), to meet the requirements of Appendix H to 10 CFR Part 50.

The licensee provided information detailing the determination process for evaluating beltline components. Attachment 2 to Reference 2, states, in part:

For SSES Unit 1, the fitted CF for the target beltline plate (Heat No. C2433-1), which is based on credible surveillance data, bounds the RG 1.99 CF.

Based on its review of the licensee's submittals, the NRC staff concluded that the fitted CF should be used in assessing the target beltline plate. For the SSES-1 representative surveillance weld material, the material heat does not match the BWRVIP ISP target weld material. The surveillance weld, however, does match the heat number for a beltline weld. There is no data that identifies the weld wire heat associated with each specific beltline weld. Since the fitted CF bounds the CF calculated using RG 1.99, Revision 2, the NRC staff concluded that the fitted CF for the representative weld material should be used in the calculation of ART values for all SSES-1 welds. The representative plate weld (Heat No. B0673-1) for SSES-2 is contained in the Duane Arnold capsules and Supplemental Surveillance Program (SSP) Capsule F. The representative weld material (Heat No. BP6756) is contained in the River Bend Capsules and SSP Capsules C, F, and H. The representative plate and weld materials do not match any material heats in the SSES-2 beltline; therefore, the NRC staff concluded that the CF should be calculated using RG 1.99, Revision 2, tables to determine the ART values for the SSES-2 target plate and weld materials.

To evaluate the proposed SSES-1 and 2 RV beltline P/T Limits curves, the NRC staff reviewed and confirmed the licensee's identification of limiting materials. The NRC staff reviewed and confirmed the ART calculations for 40 EFPY for the RV beltline materials in Tables 7 and 8 of Reference 2 for SSES-1 and 2, respectively. The licensee provided calculated ART values for the one-quarter of the RPV wall thickness (1/4T) location. Corresponding parameters at three-quarter of the RPV wall thickness (3/4T) were not provided in the attachments. Instead, the licensee applied the maximum tensile stress for both heatup and cooldown at the 1/4T location. This approach is conservative, as the 1/4T material toughness is lower than that in the 3/4T locations. This analysis is consistent with the methods of calculation in the ASME Code, Section XI, Appendix G.

In addition to the evaluation of the analyses of the limiting beltline shell material, the impact of the WLI nozzle and feedwater (FW) nozzles were included in Attachment 2 to Reference 2. These components were considered when evaluating the non-beltline RV components. The WLI nozzle is located in the lower-intermediate shell beltline plates. The licensee noted that the WLI nozzles were not fabricated from ferritic materials. The licensee included calculational values of the applied stress intensity factors due to pressure and thermal stresses, K_{IP} and K_{IT} , for the WLI nozzles. The NRC staff determined that the K_{IP} and K_{IT} calculations for the WLI nozzles are acceptable because they are based on the appropriate 1/4T postulated flaw, plant-specific instrument nozzle configuration, and bounding pressure and thermal loading conditions. This is consistent with the NRC-approved methodology in SIA Report No. 0900876.401, Revision 0-A.

The NRC staff confirmed that the licensee's analysis of the FW nozzles was based on an NRC-approved methodology, SIA Report SIR-05-044-A, "Pressure-Temperature Limits Report Methodology for Boiling Water Reactors," Revision 0 (Reference 14). SIR-05-044-A indicates

that the FW nozzles should be analyzed for determining the highest stress intensities for the upper RPV (non-beltline) region. The NRC staff verified that the applied pressure and thermal stress intensity factors for the FW nozzle with the postulated 1/4T inside corner flaw were appropriately calculated based on a stress distribution output from a finite element analysis of the nozzle using the fracture mechanics model prescribed in SIR-05-044-A. The methodology in SIR-05-044-A is consistent with the requirements of ASME Code, Section XI, Appendix G.

Based on its review, the NRC staff determined that the licensee's P/T Limits calculations for the beltline and non-beltline RV components are consistent with the NRC-approved methodologies and resolve RAI-1. Therefore, the NRC staff finds that the P/T Limits calculations meet the criteria of ASME Code, Section XI, Appendix G, as required by 10 CFR Part 50, Appendix G, and are, therefore, acceptable.

Reference 1 proposed changes to the TS Figures 3.4.10-1, 3.4.10-2, and 3.4.10-3 for the P/T Limits curves for SSE-1 and 2, extending the pressure below 0 psig. The revisions clarify that pressure limits are considered to be met for pressures that are below 0 psig (i.e., up to and including full vacuum conditions). Certain operating practices, such as vacuum fill operations for the RCS, are common practice in both boiling water reactors and pressurized-water reactors and can result in system pressures below 0 psig. Although the RV is not specifically evaluated for negative pressures, the magnitude of the negative pressure is limited to one atmosphere and thus is not expected to result in significant stresses. A perfect vacuum on the vessel would be -14.7 psig. Because the P/T Limits curve figures were revised to extend to -100 psig, the NRC staff asked RAI-2 to the licensee to provide a justification for extending the curves beyond -15 psig. In Reference 2, the licensee provided analyses to demonstrate that the RV cylinder, bottom head and top head locations, have adequate structural margin for values of negative pressure in excess of -100 psig, which significantly exceeds the vacuum pulled on the RV. The licensee noted that during vacuum fill conditions, the maximum drywell pressure of approximately 2 psig should be considered as well for a total of -16.7 psig. While this is the practical limit, the NRC staff concluded that the calculations demonstrated that the RV cylinder, bottom head and top head locations, have structural margin for values in excess of -100 psig. In its response to RAI-2, the licensee stated, in part:

[T]he extension of the P/T curves to -100 psig matches the scale and format of the existing P/T curves (i.e., pressure values are in increments of 100 psig).

Based on its review of the licensee's submittals, the NRC staff approves the extension of the P/T Limits curves by an additional unit of scale on the pressure axis. The NRC staff determined that although there is a practical restriction to the absolute maximum vacuum of approximately -16.7 psig, adequate structural margin for values of negative pressure in excess of -100 psig exists. Therefore, the NRC staff finds the revisions to SSES-1 and 2 TSs addressing pressures below 0 psig by one unit of scale to be acceptable. This resolves RAI-2.

3.3 Conclusion

Based on the NRC staff's review of the information provided in References 1, 2, and 3, the NRC staff concludes that SSES-1 and 2 RV P/T Limits curves satisfy the requirements of Appendix G to Section XI of the ASME Code and Appendix G to 10 CFR Part 50. Therefore, the NRC staff

concludes that the proposed 40 EFPY P/T Limits curves, submitted by Reference 2, are acceptable for incorporation into SSES-1 and 2 TSs. In addition, the NRC staff concludes that the proposed changes to SSES-1 and 2, TS 3.4.10, "RCS Pressure and Temperature (P/T) Limits," to address vacuum fill operations of the RCS, meet the requirements of 10 CFR Part 50, Appendix G. Therefore, the changes to the TSs are acceptable.

4.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Pennsylvania State official was notified of the proposed issuance of the amendments. The State official had no comments.

5.0 ENVIRONMENTAL CONSIDERATION

The amendments change a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20. The NRC staff has determined that the amendments involve no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendments involve no significant hazards consideration, and there has been no public comment on such finding (80 FR 45559). Accordingly, the amendments meet the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendments.

6.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) there is reasonable assurance that such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendments will not be inimical to the common defense and security or to the health and safety of the public.

7.0 REFERENCES

1. Susquehanna Steam Electric Station, Units 1 and 2, "Revise Technical Specification 3.4.10, "RCS Pressure and Temperature (P/T) Limits," August 11, 2014 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML14223A780).
2. Susquehanna Steam Electric Station, Units 1 and 2, "Response to Request for Additional Information on Technical Specification Changes to RCS Pressure and Temperature (P/T) Limits," April 6, 2015 (ADAMS Accession No. ML15097A386).
3. Susquehanna Steam Electric Station, Units 1 and 2, "Supplemental Information to License Amendment Request for Changes in RCS Pressure and Temperature (P/T) Limits," July 16, 2015 (ADAMS Accession No. ML15197A256).

4. NRC RIS 2014-11, "Information on Licensing Applications for Fracture Toughness Requirements for Ferritic Reactor Coolant Pressure Boundary Components," October 14, 2014 (ADAMS Accession No. ML14149A165).
5. NRC Letter "Susquehanna Steam Electric Station, Units 1 And 2 – Issuance of Conforming Amendment Re: Indirect Transfer of Renewed Facility Operating Licenses to Susquehanna Nuclear, LLC," June 1, 2015 (ADAMS Accession No. ML15054A066).
6. NRC Order Approving Transfer of Licenses and Conforming Amendments Related to the Susquehanna Steam Electric Station, Units 1 and 2, April 10, 2015 (ADAMS Accession No. ML15058A073).
7. RG 1.99, "Radiation Embrittlement of Reactor Vessel Materials," Revision 2, May 1988 (ADAMS Accession No. ML003740284).
8. GL 92-01, Revision 1, "Reactor Vessel Structural Integrity."
9. GL 92-01, Revision 1, Supplement 1, "Reactor Vessel Structural Integrity," May 19, 1995 (NUDOCS Accession No. 9505090312).
10. NRC Letter Request for Additional Information Re: Request to Revise Technical Specification 3.4.10, "RCS Pressure and Temperature (P/T) Limits," January 30, 2015 (ADAMS Accession No. ML15008A470).
11. NRC Letter Final Safety Evaluation for Boiling Water Reactors Owners' Group Topical Report BWROG-TP-11-023, Revision 0, November 2011, "Linear Elastic Fracture Mechanics Evaluation of General Electric Boiling Water Reactor Water Level Instrument Nozzles For Pressure-Temperature Curve Evaluations," March 14, 2013 (ADAMS Accession No. ML13056A157).
12. RG 1.190, "Calculational and Dosimetry Methods for Determining Pressure Vessel Neutron Fluence," March 2001 (ADAMS Accession No. ML010890301).
13. BWRVIP-86NP, Revision 1, "BWR Vessel and Internals Project, Updated BWR Integrated Surveillance Program (ISP) Implementation Plan," July 2008 (ADAMS Accession No. ML090300556).
14. NRC Letter Final Safety Evaluation for the Boiling Water Reactor Owners' Group (BWROG) Structural Integrity Associates Topical Report (TR) SIR-05-044, "Pressure Temperature Report Methodology for Boiling Water Reactors," February 6, 2007, (ADAMS Accession No. ML070180483).

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