April Rice
Manager
Nuclear Licensing

May 31, 2017
NND-17-0257
10 CFR 50.90
10 CFR 52.63

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

Virgil C. Summer Nuclear Station (VCSNS) Units 2 and 3
Combined License Nos. NPF-93 and NPF-94
Docket Nos. 52-027 & 52-028

Subject: LAR 16-10 R1 Revision to License Amendment and Exemption Request: Shield Building Roof Changes

References:
1. NND-16-0280 - South Carolina Electric & Gas Company (SCE&G) License Amendment and Exemption Request: Shield Building Roof Changes (LAR 16-10), November 21, 2016 [ML16326A394]
2. Revision to Staff's Comments Regarding Request For License Amendment and Exemption (LAR 16-10) For the Virgil C. Summer Nuclear Station Units 2 and 3: Shield Building Roof Changes (CAC NO. RG3022)

In accordance with the provisions of 10 CFR 50.90, South Carolina Electric & Gas Company (SCE&G), acting on behalf of itself and the South Carolina Public Service Authority (Santee Cooper), requests an amendment to the Virgil C. Summer Nuclear Station (VCSNS) Units 2 and 3 combined licenses (COLs) numbers NPF-93 and NPF-94, respectively. The requested amendment proposes to change the Shield Building Roof beam size, material, reinforcement and connection (some of the changes involve the Passive Containment Cooling Water Storage Tank (PCCWST)). The requested amendment proposes to depart from plant-specific Design Control Document (DCD) Tier 1 information with corresponding changes to the associated COL Appendix C information and Tier 2* information in the Updated Final Safety Analysis Report (UFSAR) (which includes the plant-specific DCD Tier 2 information). This activity has been determined to require prior NRC approval.

This letter revises LAR 16-10 in order to provide NRC a response to comments received per reference 2. Enclosure 6 addresses the comments to support review of reference 1. Enclosures 7-11 provide revisions to Enclosures 1-5 previously submitted to the NRC via reference 1. Where applicable in Enclosures 7-11, revision bars have been provided in the right hand margin, also a basis for the revisions can be found in Enclosure 6. **Similarly to Enclosure 2 & 5, Enclosure 8 & 11 respectively**, **contains portions of the LAR and proposed markups classified as security-related, also referred to as sensitive unclassified non-safeguards information (SUNSI), protected and requested to be withheld under the provisions of 10 CFR 2.390(d)**.

The revised information provided in this letter does not impact the scope or conclusions of the Technical Evaluation, Regulatory Evaluation (including the Significant Hazards Consideration Determination), or Environmental Considerations of the LAR.

This letter contains no regulatory commitments.

In accordance with 10 CFR 50.91, SCE&G is notifying the State of South Carolina of this LAR by transmitting a copy of this letter and publicly available enclosures to the designated State Official.

Should you have any questions, please contact Mrs. April Rice by telephone at (803) 941-9858, or by email at arice@scana.com.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on this 31st day of May, 2017.

Sincerely,

April Rice
Manager
Nuclear Licensing

MMD/ARR/mmd

Enclosure 1:	Revised by Enclosure 7- Previously submitted with Reference 1
Enclosure 2:	Revised by Enclosure 8- Previously submitted with Reference 1
Enclosure 3:	Revised by Enclosure 9- Previously submitted with Reference 1
Enclosure 4:	Revised by Enclosure 10- Previously submitted with Reference 1
Enclosure 5:	Revised by Enclosure 11- Previously submitted with Reference 1
Enclosure 6:	Virgil C. Summer Nuclear Station Units 2 and 3 – Response to NRC Comments (LAR 16-10 R1)
Enclosure 7:	Virgil C. Summer Nuclear Station Units 2 and 3 – Revision to Request for License Amendment Regarding Shield Building Roof Changes (LAR 16-10 R1)
Enclosure 8:	Virgil C. Summer Nuclear Station Units 2 and 3 – Revision to Protected Information for Request for License Amendment Regarding Shield Building Roof Changes (LAR 16-10 R1) – Security-Related Information – **Withhold from Public Disclosure Under 10 CFR 2.390(d)**
Enclosure 9:	Virgil C. Summer Nuclear Station Units 2 and 3 – Revision to Exemption Request Regarding Shield Building Roof Changes (LAR 16-10 R1)
Enclosure 10:	Virgil C. Summer Nuclear Station Units 2 and 3 – Revision to Proposed Changes to Licensing Basis Documents (LAR 16-10 R1)
Enclosure 11:	Virgil C. Summer Nuclear Station Units 2 and 3 – Revision to Proposed Changes to Licensing Basis Documents – Protected Information (LAR 16-10 R1) – Security-Related Information – **Withhold from Public Disclosure Under 10 CFR 2.390(d)**

c (with enclosures):
Billy Gleaves
Ruth Reyes
Chandu Patel
Paul Kallan
DCRM-EDMS@SCANA.COM

c (without enclosures):
Jennifer Dixon-Herrity
Susan E. Jenkins
Tom Fredette
Tomy Nazario
Catherine Haney
Jim Reece
Stephen A. Byrne
Jeffrey B. Archie
Ronald A. Jones
Alvis J. Bynum
Kathryn M. Sutton
April Rice
Nick Kellenberger
Matt Kunkle
Mory Diané
Bryan Barwick
Dean Kersey
Cynthia Lanier
Lisa Spears
Neil Haggerty
Paige Ridgway
Carl Churchman
Pat Young
Zach Harper
Brian McIntyre
Brian Bedford
Joseph Cole
Chuck Baucom
Lisa Alberghini
Curt Castell
William M. Cherry
Rhonda O'Banion
Frederick Willis
VCSummerMail@westinghouse.com
vcsummer2&3project@westinghouse.com
VCSNNDCorrespondence@scana.com

South Carolina Electric and Gas Company

Virgil C. Summer Nuclear Station (VCSNS) Units 2 and 3

NND-17-0257

Enclosure 6

Response to NRC Comments

(LAR 16-10 R1)

(This Enclosure consists of 4 pages, including this cover page)

The following are comments provided by the NRC Staff regarding License Amendment Request (LAR) 16-10, which was submitted via reference 1. This enclosure provides responses to all received comments.

1. Change Activity (CA) #1

a. The licensee is requested to add welding information from Figures 1 and 2 on Page 2 of 10, Enclosure 2, to the Built-up Beams in Figure 3H.5-11, Sheet 1 of 6 in Page 8 of 22, Enclosure 5. Figure 1 and 2 on Page 2 of 10, Enclosure 2 shall remain as is.

SCANA Response to Question 1a: Please see the updated markup of Figure 3H.5-11 Sheet 1 in SRI Enclosure 11. In addition to the two original proposed weld options (option A for PJP + reinforcement fillet, and option B for double fillet), the CJP weld is also added to the figure as the third option. The respective LAR discussion can be found in Enclosure 7 on pages 4, 19 and 20. The built-up girders with any of the weld options defined in the Figure 3H.5-11 Sheet 1 meet AISC N690 and AWS D1.1 requirements. A reference pertaining to the compliance to these codes has been added to Enclosure 7 on pages 4, 19 and to note 6 and 7 of Figure 3H.5-11, Sheet 1 of 6 in Enclosure 11 on page 12. The built-up girders dimension and weld details on Sheet 1 of Figure 3H.5-11 are shown in Enclosure 11 on page 13. Figures 1 and 2 mentioned in the text of Enclosure 7 on pages 4 and 5 are also updated in SRI Enclosure 8 on page 2 and 3 to match the welding information in Figure 3H.5-11 Sheet 1. The existing reference to specific code provisions for fabrication and erection of the built-up plate girders are also updated accordingly on pages 5 and 20 of Enclosure 7.

b. What is the specific welding process that will be utilized to build up the plate girders (i.e., GTAW, SMAW etc.)?

SCANA Response to Question 1b: The preferred welding process for the plate girder continuous double fillet welds or partial joint penetration with reinforcing fillet welds is GMAW (Gas Metal Arc Welding). The SAW (Submerged Arc Welding) process is proposed in the Tier 2 figure as an alternate option for the weld. Both GMAW and SAW are approved welding processes per AISC N690 reference to AWS D1.1, and they are prequalified processes as listed in AWS D1.1, Section 3.2.1.

c. What is the specific NDE technique to be utilized during fabrication of the built up girders?

SCANA Response to Question 1c: For flange-to-web weld options A and B as defined in Figure 3H.5-11 Sheet 1, the inspection of the built-up plate girders will be performed based on AISC N690 Section Q1.26 and AWS D1.1 Sections 6.1 through 6.15 as applicable: Visual Inspection (AWS D1.1 Section 6.9) and Magnetic Particle (MT) or Liquid Penetrant testing (PT) (AWS D1.1 Section 6.10).

If option C (CJP weld, as defined in Figure 3H.5-11 Sheet 1) is used, the NDE requirements are AISC N690 Sections Q1.26 and AWS D1.1 Section 6.1 through 6.17, and 6.19 through 6.26 and 6.28 through 6.33 as applicable: Visual Inspection (AWS D1.1 Section 6.9) and Radiographic Inspection (RT) (AWS D1.1 Section 6.12) or Ultrasonic Inspection (UT) (AWS D1.1 Section 6.13).

2. CA#3

a. The effect of the reinforcement changes on AIA has not been addressed in the LAR.

SCANA Response to Question 2a: Added the following clarification “The revised reinforcement in the PCCWST walls and shield building conical roof was confirmed by calculation to have larger area of steel reinforcement than the original design, and has negligible impact to the mass and stiffness of concrete section. Therefore the reinforcement changes do not change the results and conclusions of the AIA” on page 21 of Enclosure 7.

b. On Page 13 of 27, Enclosure 1 in Figure 3H .5-11, Sheet 3, the LAR indicates that the steel plates forming the lower portion of the air inlet structure are changed from ¾" to 1 ", and the change has been evaluated. Please explain if the methodology used for this evaluation is the same as the DCD methodology.

SCANA Response to Question 2b: This change is only for the purpose of ease of fabrication and construction, it does not change the methodology used for the shield building roof analysis and design. This statement is added on page 14 of Enclosure 7.

c. On Page 19 of 27, Enclosure 1, the LAR states that "the proposed design changes reflected in the changes to the figures and tables satisfy the requirements of AISC N690 and ACI 349." Please identify these figures and tables in this statement.

SCANA Response to Question 2c: The sentence in the LAR is updated to “The proposed design changes reflected in the changes to the UFSAR Tables 3H.5-9 & 3H.5-15 and Figure 3H.5-11 satisfy the requirements of AISC N690 and ACI 349” on page 21 of Enclosure 7.

d. On Page 6 of 27 of Enclosure 1, the LAR indicates that the changes in the demands of the shield building are due to the cumulative impact of changes in the nuclear island structure in other areas, including reinforced concrete (RC) to concrete filled steel plate module construction (SC) connections, auxiliary building roof to shield building wall connections, and auxiliary building wall changes. Page 20 of 27 of Enclosure 1 provides further description of these changes and indicates that these changes have only minor effect on mass and stiffness. Therefore, it is unclear to the staff how these small changes, located away from the shield building roof area, have resulted in significant changes to the seismic responses at the roof level, to a level as high as 25% to 40% as noticed in Table 3H.5-9 in the LAR. Therefore, the licensee is requested to explain how these changes, and *"the changes of the roof and tank wall reinforcement'* as stated on Page 20 of 27, have resulted in the large response changes at the roof level in the analysis.

SCANA Response to Question 2d: A thorough investigation/evaluation has been performed to look into the analysis model and calculations which support the UFSAR Table 3H.5-9. It is confirmed that there is no input change to the analysis model, including loading, geometry or load combinations. Furthermore, it is confirmed that the cumulative impact of changes in the nuclear island structure in other areas, including reinforced concrete (RC) to concrete filled steel plate module construction (SC) connections, auxiliary building roof to shield building wall connections, and auxiliary building wall changes are considered negligible to the seismic loading input applied in the supporting calculation. Therefore, there is no large response change in the roof analysis model. The changes in demands are caused by: a) the

update of analysis data post-process due to a few macro typographical errors resolved under the Corrective Action Process and evaluated in accordance with the QA program; and b) update of calculations to implement Note 2 in UFSAR Table 3.8.4-2 by using load combination factor of 0.9 for dead load when combined with upward seismic loads.

One quadrant of the shield building roof is modeled in the finite element software (ANSYS). Consistent with what is described in UFSAR Subsection 3G.2.3.1, the model is constructed with solid elements and shell element and contains structures from the exposed shield wall through the top of the shield building roof. To calculate equivalent roof and tension ring member forces, the nodal stresses from the ANSYS output files need to be post-processed at the section cuts (as defined in the UFSAR Table 3H.5-9) through the solid finite element model. Sectional forces and moments, to be used in the reinforcement analysis, were calculated by means of ANSYS macros. In this sectional calculation process, the post-process macros are updated to correct a few typos. The update of post-process macros is not considered as changes of methodology as it does not change the design input and code requirements, and it does not impact the design in other areas.

In addition, irrespective of the magnitude of each demand change, the demands were found to be smaller than the capacities, and the design meets the applicable provisions of AISC N690 and ACI 349. The updated Interaction Ratios (IRs) in Table 3H.5-9 are either much smaller than 1.0 (code requirement) or remain similar magnitude as previous IRs.

The text of Enclosure 1 is updated in Enclosure 7 on pages 6 and 21 to clarify that the changes to values of required reinforcement and other information in UFSAR Tables 3H.5-9 and 3H.5-15 are caused by update of the analysis data post-process macro and update of load combination factor for dead load when combined with upward seismic loads in addition to the changes caused by changes in the reinforcement design for the detailing requirements. Consequently the text of the LAR is updated to delete the discussions of the cumulative impacts from prior LARs on pages 6 and 21.

Some of the calculations are updated as the result of the investigation performed to address question 2d. The UFSAR Table 3H.5-9 and Table 3H.5-15 are updated to match the latest calculations. In addition, the UFSAR Figure 3H.5-11 Sheets 3, 5 and 6 are updated to match the changes made in the calculations for the purpose of facilitating construction. The corresponding changes are discussed in the text of the Enclosure 7 in Change Activity #3 and Change Activity #4A/4B/4H as well as in corresponding portions of SRI Enclosure 8.

3. CA#4

a. On page 10 of 10, Enclosure 2, the LAR states that the adequacy of shear connectors with revised length is proven through calculations. The licensee is requested to state code compliance.

SCANA Response to Question 3a: The code compliance information of “The roof girder connectors subjected to shear and tension forces are evaluated and qualified in accordance with ACI 349-01, Appendix B and AISC N690-94, Section Q1.11” is added on page 12 of SRI Enclosure 8.

South Carolina Electric and Gas Company

Virgil C. Summer Nuclear Station (VCSNS) Units 2 and 3

NND-17-0257

Enclosure 7

Revision to Request for License Amendment Regarding Shield Building Roof Changes (LAR 16-10 R1)

(This Enclosure consists of 28 pages, including this cover page)

Table of Contents

1.0 SUMMARY DESCRIPTION

2.0 DETAILED DESCRIPTION

3.0 TECHNICAL EVALUATION

4.0 REGULATORY EVALUATION

4.1. Applicable Regulatory Requirements/Criteria

4.2. Precedent

4.3. Significant Hazards Consideration Determination

4.4. Conclusions

5.0 ENVIRONMENTAL CONSIDERATION

6.0 REFERENCES

Pursuant to 10 CFR 52.98(c) and in accordance with 10 CFR 50.90, South Carolina Electric and Gas Company (SCE&G), acting on behalf of itself and the South Carolina Public Service Authority (Santee Cooper), Virgil C. Summer Nuclear Station (VCSNS) Units 2 and 3, requests an amendment to Combined License (COL) Numbers NPF-93 and NPF-94, for VCSNS Units 2 and 3, respectively.

1.0 SUMMARY DESCRIPTION

The requested amendment requires changes to Updated Final Safety Analysis Report (UFSAR) information, which involve changes to plant-specific Tier 1, and corresponding changes to COL Appendix C, and changes to Tier 2* information. This enclosure requests approval of the license amendment necessary to implement these changes.

Proposed change 1 is made on sizes of thirty-two radial beams spanning between the compression ring in the center of the shield building roof and the tension ring above the shield building wall. Proposed change 1 is made on the material of the radial and circumferential beams supporting the shield building roof, and also to allow the use of fabricated plate girders.

Proposed change 2 pertains to the Roof Beam Material Substitution and has been combined with Proposed change 1.

Proposed change 3 is made on reinforcement in the roof, the walls of the Passive Containment Cooling Water Storage Tank (PCCWST) supported by the shield building roof, and the design details of the shield building tension ring and air inlet structure.

Proposed change 4 is made on UFSAR tables, sketches and figures to reflect changes defined in proposed change 1 and 3, and to remove redundant information or excessive detail in those tables, sketches and figures.

Proposed change 5 is made to note that the design of the reinforcement in the roof and the design details of the tension ring and air inlets portions of the shield building can vary from these typical design details described in UFSAR. The shield building critical sections represents the key elements of the design of non-critical sections constructed using similar techniques. Proposed changes to the UFSAR are made to address changes to design details identified for critical sections.

Proposed change 6 is made to remove tie rods between the shield plate and the shield building roof beams in UFSAR and Plant specific Tier 1 (and associated Combined License Appendix C) Figures.

2.0 DETAILED DESCRIPTION

Change Activity No. 1 – Roof Beam Size Change and Roof Beam Material Substitution

Issue Description

Thirty-two radial beams span between the compression ring in the center of the shield building roof and the tension ring above the shield building wall. These beams support the concrete roof of the shield building. The size of these beams was identified as W36x393. The W36x393 size beam is no longer manufactured. The design of the roof beams must be changed to a size that can be procured.

The radial and circumferential beams supporting the shield building roof have a requirement for impact tests at very low temperatures (Charpy V-Notch impact tests) which is required by AISC N690 section Q1.4.1 for structures that may be subjected to suddenly applied impact loads (e.g. design basis tornado generated missiles, beyond design basis AIA). The rolled wide flange beams identified in the UFSAR figures are not generally available in a material that will satisfy the required impact testing.

Proposed Change

Change the size of the shield building roof beams to W36x395. This is a standard beam size and provides equal or better strength. The nominal size of the W36x395 beam is 0.60 inch greater from outside flange surface to outside flange surface.

Remove the size designation of the roof beam in UFSAR Subsection 3H.5.6.1. Revise the designation of the roof beam in UFSAR Table 3H.5-15, Figure 3H.5-11 to W36x395. Remove redundant references to beam size on UFSAR Figures 3H.5-11 Sheets 2, 3, and 4, 3H.5-14, and 3H.5-15. Remove redundant reference to circumferential beam size from UFSAR Figure 3H.5-11 Sheets 2, 4 and 5. On UFSAR Figure 3H.5-11 Sheet 1 the circumferential beam size of W36x135 is shown on the right side of the figure near the connection of the radial beam with the tension ring and midspan of the radial beam below the exterior wall of the PCCWST.

The material of the roof radial beams and roof circumferential beams should comply with the applicable material specifications (e.g. ASTM A572), and also satisfy the impact tests requirements. By using the materials which satisfy the specific requirements defined above, the roof radial beams and roof circumferential beams can be made with two options, option 1 is hot rolled shapes (W36x395 for roof radial beams, and W36x135 for roof circumferential beams), option 2 is built-up plate girders with section dimensions specified in UFSAR Figure 3H.5-11 Sheet 1. Note 6 is added to UFSAR Figure 3H.5-11 Sheet 1 to mention options 1 and 2 for the roof radial beams, and Note 7 is also added to mention options 1 and 2 for the roof circumferential beams. It is also clarified in both Note 6 and Note 7 that “The roof beams and weld design inspection meet the requirements of AISC N690 and AWS D1.1 as applicable.” A note is added to UFSAR Table 3H.5-15 to identify that the beams can be fabricated plate girders. In order to transfer the full girder web shear capacity to flange and allow the section to develop full bending capacity of the section, the flange-to-web welds in the plate girders can be any of the three options: option A - continuous Partial Joint Penetration (PJP) with reinforcing fillet welds, option B - continuous double fillet welds, or option C – continuous Complete Joint Penetration (CJP) welds. The three options of the welds of the built-up plate girders are provided in Figure 1 and 2 below, and are specified in the UFSAR Figure 3H.5-11 Sheet 1 as well. These built-up plate girders are proved through calculations to have a smaller demand to capacity ratio than the hot rolled shapes. The maximum demand to capacity ratio of the built-up plate girder for the roof radial beam is 0.72, and is governed by the axial and bending stress. It is worth noting that the similar information has been provided for the hot rolled shape of the roof radial beam in the UFSAR Table 3H.5-15 in the format of Reinforcement Ratio (1.33) which is the reciprocal of the demand to capacity ratio (= 1/1.33 =0.75). The maximum demand to capacity ratio of the built-up plate girder for the roof circumferential beam is 0.26, and is governed by the axial and bending stress. The maximum demand to capacity ratio of the hot rolled shape of the roof circumferential beam is 0.27, and is also governed by the axial and bending stress. The design of the built-up plate girders is based on AISC N690, sections Q1.4.1, Q1.5.1, Q1.5.3, Q1.5.6, Q1.5.7, Q1.6, Q1.8, Q1.9.1.2, Q1.10, Q1.11.1 through Q1.11.4, Q1.14.6, Q1.15.12 and Q1.15.13. The fabrication and erection of the built-up plate girders are based on ASTM A572, AISC N690, sections Q1.4.1, Q1.17, Q1.19, Q1.23 and Q1.24, and AWS

D1.1, sections 3.1 through 3.13, sections 4.1 through 4.11, 4.15 through 4.25, 4.30 through 4.32, 5.1 through 5.19, 5.21 through 5.24 and sections 5.26 through 5.31. The inspection of the built-up plate girders will be performed based on AISC N690 sections Q1.26 and AWS D1.1 section 6.

SRI

INSERT 1

Figure 1: Welding Sketches of Built-up Plate Girder of Roof Radial Beam

SRI

INSERT 2

Figure 2: Welding Sketches of Built-up Plate Girder of Roof Circumferential Beam

Change Activity No. 2 – Roof Beam Material Substitution (Combined with Change Activity No.1)

Change Activity No. 3 –Change to Reinforcement in PCCWST Walls and Shield Building Conical Roof and Air Inlet Structure

Issue Description

Design finalization and review of the reinforcement design for the shield building roof and PCCWST exterior and interior walls determined that changes to the reinforcement design are needed. As a result of lessons learned from previous corrective actions, changes to shear ties in the PCCWST wall are required to fully conform to the detailing requirements of American Concrete Institute (ACI) 349-01 Section 11.5.4. Other changes in the reinforcement in the PCCWST walls, in the area at the interface of the PCCWST walls with the shield building roof,

and in the shield building roof are required to be consistent with the changes in the shear ties, to satisfy ACI 349 detailing requirements, and to facilitate installation of the reinforcement.

In addition to changes resulting from changes in the reinforcement design for the detailing requirements, changes in the values of steel area required and ratios of required area to provided area of steel for the shield building roof on UFSAR Tables 3H.5-9 and 3H.5-15 are required due to: a) changes in the demands of the shield building roof resulting from updates of the analysis data post-process macros; and b) update of calculations to implement Note 2 in UFSAR Table 3.8.4-2 by using load combination factor of 0.9 for dead load when combined with upward seismic loads. The governing load combinations for the values reported in the table also change for some of the entries.

The air inlets structure is located at the top of the cylindrical wall portion of the shield building, beginning at approximately elevation 251′ and rising to approximately elevation 266′. The air inlets region is 4.5-feet thick with 1” thick steel plates on each face. Near the bottom of the air inlet structure, the thickness transitions to 3 feet thick with ¾” thick steel plates to connect with the shield building cylinder. In order to avoid a plate thickness transition within the air inlet structure at approximately elevation 251′ and for the ease of fabrication/construction purposes, the ¾” thick steel plates will be replaced with 1” thick plates

Proposed Change

SRI

INSERT 3

Table 1: Summary of Changes in UFSAR Figure 3H.5-11 Sheet 5

SRI

INSERT 4

SRI

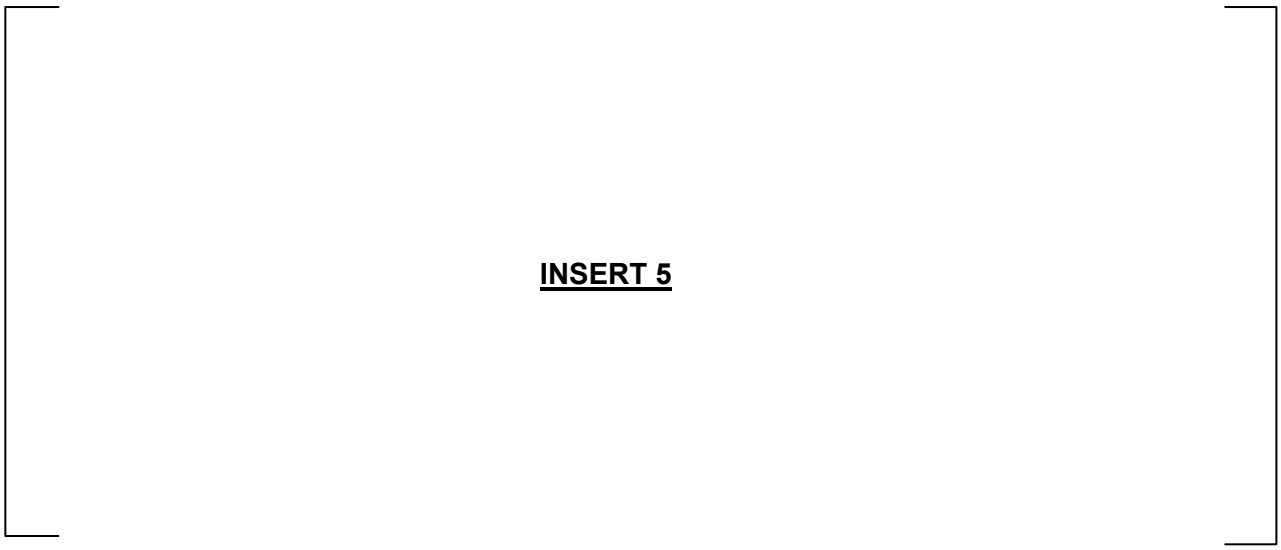

Figure 3-1: Current UFSAR Figure 3H.5-11 Sheet 5 with Item Labels

SRI

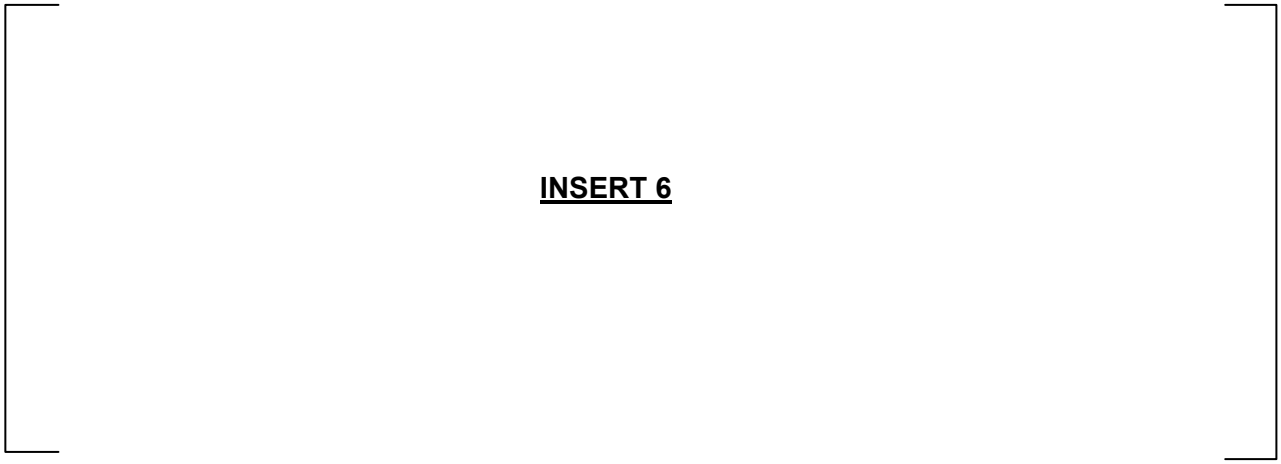

Figure 3-2: Proposed UFSAR Figure 3H.5-11 Sheet 5 with Item Labels

On UFSAR Figure 3H.5-11, Sheet 6 the following changes are made: the vertical reinforcement bars in the tank interior wall are changed from 1 #11 @ 3.6° to #8 @ 1.12°; the top radial reinforcement in the roof slab near the tank interior wall is changed from 1 #11 @ 7.2° to #11 @ 2.25° + #11 @ 2.25°; the bottom radial reinforcement in the roof slab near the tank interior wall is changed from 1 #11 @ 7.2° + 1 #11 @ 7.2° to #8 @ 1.12° + #8 @ 1.12°, and only one set of bottom reinforcement (#8 @ 1.12°) is connected to tank wall vertical reinforcement on the outer face and the other set of bottom reinforcement is developed into the tank wall without connecting the vertical reinforcement at inner face of the tank wall; the layout of 3 #11 @ 12″ hoops at the intersection of tank interior wall to roof is changed from 2 #11 (laid out horizontally) + 1 #11 to 2 #11 (laid out vertically) + 1 #11; the tie bars at the intersection of tank interior wall to roof are changed from 1 #5 @ 3.6° to #4 @ 3.75° x 12″ tie bars between radial roof beams and 3 #5 stirrups @ 6″ above radial roof beams; the dowels of vertical reinforcement at inner face of the tank interior wall are changed from 1 #11 @ 7.2° to #8 @ 1.12°, and the vertical reinforcement bars at inner face of the tank wall are all connected to the dowels instead of

partial connecting to dowels and partial connecting to the bottom radial reinforcement in the roof; the closed stirrups at the intersection of tank interior wall to roof are changed from #5 @ 3.6° to #6 @ 1.87° and enclose the hoop reinforcement on the side surface of the intersection area; the reinforcement of 1 #11 @ 0.9° represented for the top and bottom radial reinforcement in roof at half way between the PCS interior and exterior walls is removed as it is not applicable to this figure; the shear ties information in the roof slab is added the figure to match the design documents, including 4 #4 crossties @ 4.5° x 9″ between radial roof beams and 3 #5 stirrups @ 6″ above radial roof beams; the hairpin of #8 @ 3.75° is added to match the design documents; 3 #5 stirrups @ 1.87° (above the curved girder compression ring) are added in the intersection area. All changes meet the requirements of ACI 349. In order to better visualize the changes in UFSAR Figure 3H.5-11 Sheet 6 one by one, Table 2 is provided below to summarize the changes with item labels. The design elements in both current and proposed UFSAR Figure 3H.5-11 Sheet 6 are labeled with numbers in Figure 3-3, Figure 3-4 below.

Table 2: Summary of Changes in UFSAR Figure 3H.5-11 Sheet 6

Item	Element	Current Figure 3H.5-11 Sheet 6 (Figure 3-3)	Proposed Figure 3H.5-11 Sheet 6 (Figure 3-4)	Reasons of the Changes	LAR Change Activities (CA)
1	PCS Tank Interior Wall - Vertical Reinforcement	1 #11 @ 3.6°	#8 @ 1.12°	The amount of the reinforcement is changed due to design finalization.	CA#3
2	PCS Tank Interior Wall - Hoop Reinforcement	1 #9 @ 6″	#9 @ 6″	No changes.	-
3	Roof Slab near PCS Tank Interior Wall - Top Radial Reinforcement	1 #11 @ 7.2°	#11 @ 2.25° + #11 @ 2.25°	The amount of the reinforcement is changed due to design finalization.	CA#3
4	Roof Slab PCS Tank Interior Wall - Bottom Radial Reinforcement	1 #11 @ 7.2° + 1 #11 @ 7.2° & One set of # 11 @ 7.2° is connected to the vertical reinforcement at the outer face of PCS tank wall, and the other set is connected to the vertical reinforcement at the inner	#8 @ 1.12° + #8 @ 1.12° & Only one set of #8 @ 1.12° is connected to the vertical reinforcement at the outer face of PCS tank wall, the other set is developed into the PCS tank wall.	The amount of the reinforcement is changed due to design finalization. The detailing of the reinforcement is revised for ease of construction and does not impact the design of the structure. The development length of the reinforcement meets requirements of	CA#3

Item	Element	Current Figure 3H.5-11 Sheet 6 (Figure 3-3)	Proposed Figure 3H.5-11 Sheet 6 (Figure 3-4)	Reasons of the Changes	LAR Change Activities (CA)
		face of PCS tank wall		ACI 349.	
5	PCS Tank Interior Wall to Roof Intersection – Top and Bottom Hoop Reinforcement	3 #11 @ 12″ Hoop & 3 #11 = 2 #11 (laid out horizontally) + 1 #11	3 #11 @ 12″ Hoop & 3 #11 = 2 #11 (laid out vertically) + 1 #11	The amount of reinforcement remains unchanged. The 2 #11 is laid out vertically instead of horizontally as it eases installation of reinforcement.	-
6	PCS Tank Interior Wall to Roof Intersection – Tie Bars	Tie Bars 1 #5 @ 3.6°	#4 @ 3.75° x 12″ TIE BARS (BETWEEN RADIAL ROOF BEAMS), 3 #5 STIRRUPS @ 6″ (ABOVE RADIAL ROOF BEAMS)	The amount of the reinforcement is changed due to design finalization and ease of reinforcement installation.	CA#3
7	PCS Tank Interior Wall – Dowels of Vertical Reinforcement at Inner Face of the Tank	1 #11 @ 7.2° & Half of the vertical reinforcement in the tank interior wall is developed through the dowel, and the other half set is connected to the bottom radial reinforcement in the roof slab.	#8 @ 1.12° & All of the vertical reinforcement in the tank wall is developed through the dowel.	To correspond to the changes made in item 1. All vertical reinforcement at the inner face of the PCS tank wall are developed through the dowels for ease of construction and does not impact the design of the structure.	CA#3
8	PCS Tank Interior Wall to Roof Intersection – Hoop Reinforcement	1# 11 @ 6″	#11 @ 6″	No changes.	-

Item	Element	Current Figure 3H.5-11 Sheet 6 (Figure 3-3)	Proposed Figure 3H.5-11 Sheet 6 (Figure 3-4)	Reasons of the Changes	LAR Change Activities (CA)
	on the side surface				
9	PCS Tank Interior Wall to Roof Intersection – Closed Stirrups	#5 @ 3.6°	#6 @ 1.87° & The stirrups enclosed the hoop reinforcement on the side surface of PCS tank interior wall to roof intersection	The amount of the reinforcement is changed due to design finalization and ease of reinforcement installation. The detailing is improved for better configuration and ease of construction, and does not impact the design of the structure.	CA#3
10	Roof Slab - Top and Bottom Radial Reinforcement	1 #11 @ 0.9°	Removed	It represents roof radial reinforcement at half way between the PCS interior and exterior walls, and is not applicable to this detail.	CA#3
11, 12, 13	Detailed Information	See Figure 3-3	Removed	The information is beyond the level of detail of the UFSAR figure.	CA#4C
14	Roof Slab - Crossties	None	4 #4 CROSSTIES @ 4.5° x 9″ (BETWEEN RADIAL ROOF BEAMS), 3 #5 STIRRUPS @ 6″ (ABOVE RADIAL ROOF BEAMS)	The crossties in the roof slab are part of the design and always exist in the design documents. The UFSAR figure is updated to match the design documents.	CA#3

Item	Element	Current Figure 3H.5-11 Sheet 6 (Figure 3-3)	Proposed Figure 3H.5-11 Sheet 6 (Figure 3-4)	Reasons of the Changes	LAR Change Activities (CA)
15	Intersection – Hairpin	None	#8 @ 3.75° HAIRPIN	The hairpin is added to the UFSAR figure to match the design documents.	CA#3
16	Intersection – Stirrups	None	3 #5 STIRRUPS @ 1.87° (ABOVE CURVED GIRDER COMPRESSION RING)	The stirrups in the intersection above the curved girder compression ring is added to the UFSAR figure to match the design documents.	CA#3

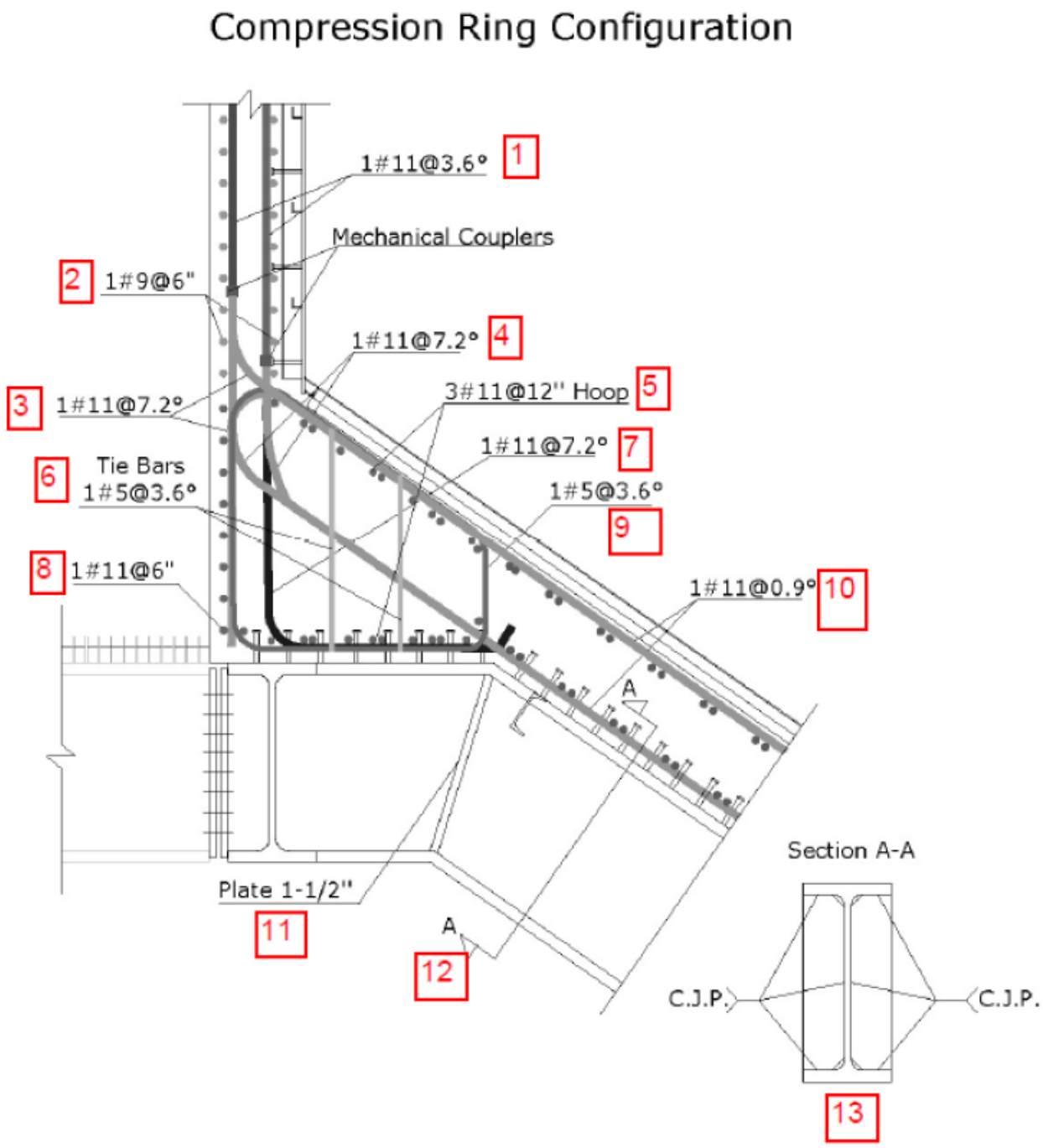

Figure 3-3: Current UFSAR Figure 3H.5-11 Sheet 6 with Item Labels

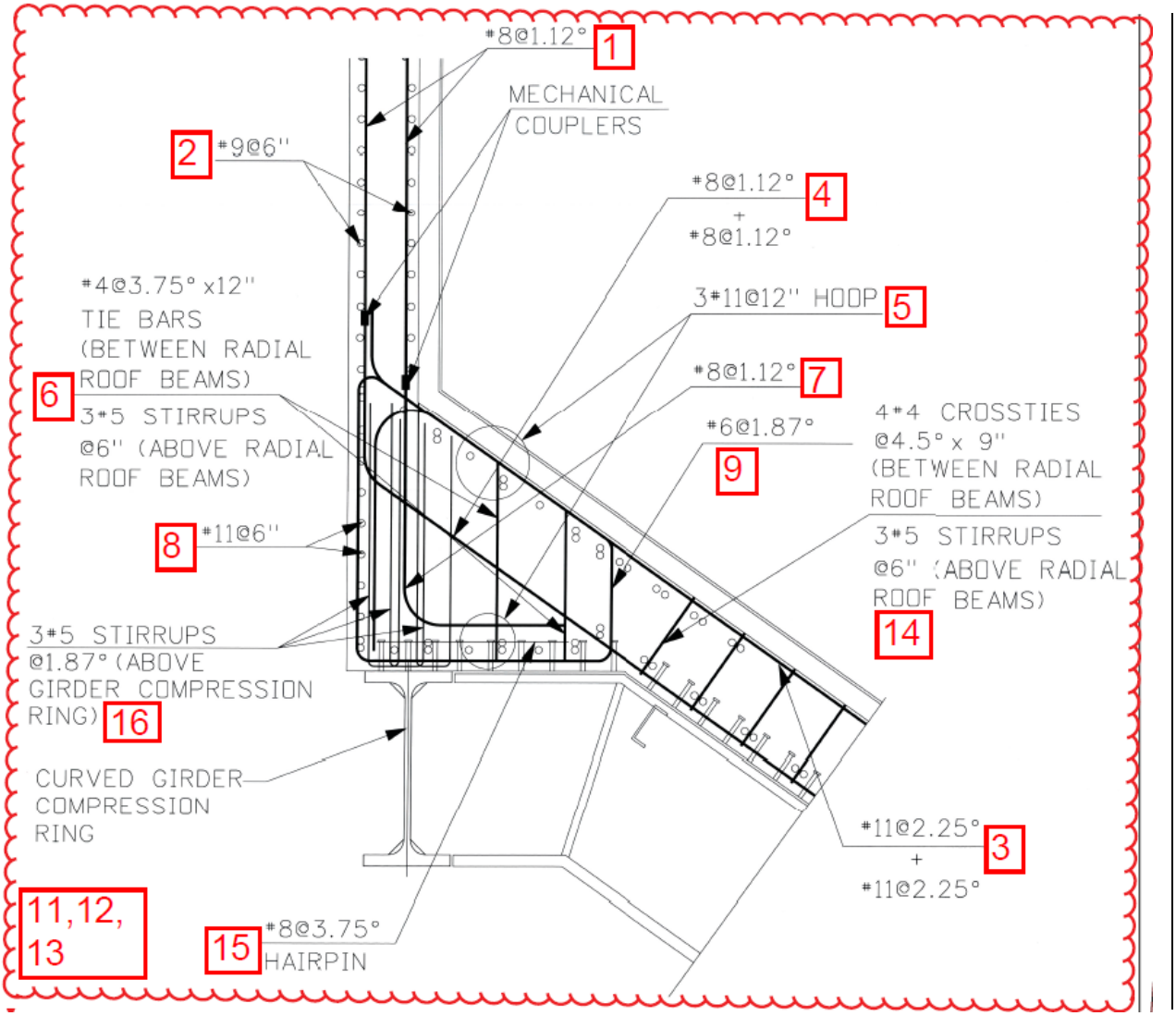

Figure 3-4: Proposed UFSAR Figure 3H.5-11 Sheet 6 with Item Labels

Revise the values in UFSAR Table 3H.5-9 Sheet 1 for the tension ring for maximum stress at specified location and maximum overall, the steel required, and the ratio of required over provided. Revise the values in UFSAR Table 3H.5-9 Sheets 2a, 2b and 2c for the air inlet structure for maximum steel area required at specified locations and maximum overall, steel area provided, and design limit for reinforcement ratios. Revise the values in UFSAR Table 3H.5-9 Sheet 3 for the wall of the PCCWST for maximum required reinforcement, provided reinforcement and design limit for reinforcement ratios. In some cases governing load combinations identified in the table are changed. On UFSAR Table 3H.5-15, revise the values for required reinforcement, provided (minimum) vertical and radial reinforcement, and reinforcement ratio for the shield building roof reinforcement. The changes to the table are required to make the values consistent with the proposed reinforcement design changes to satisfy detailing requirements and changes to demands in the structural analysis. The calculations are performed based on updated loads and meet the requirements of applicable codes. Irrespective of the magnitude of each load change, the demands were found to be

smaller than the capacities. The design of the shield building roof with the changes to the reinforcement and roof beams satisfies applicable provisions of AISC N690 and ACI 349. It is also worth noting that the updated Interaction Ratios (IRs) in Table 3H.5-9 are either much smaller than 1.0 (code requirement) or remain similar magnitude as previous IRs. The criteria and requirements of ACI 349 and AISC N690 provide a margin of safety to structural failure, therefore the proposed changes do not raise any safety concerns of the structure.

On UFSAR Figure 3H.5-11, Sheet 3, change the steel plates forming the lower portion of the air inlet structure from ¾" to 1" to achieve uniform steel plates thickness within the area, so that the transition is to be performed on the bottom joint to the underneath SC panel portion. This change is only for the purpose of ease of fabrication and construction, it does not change the methodology used for the shield building roof analysis and design. The change has been evaluated to have negligible impact on the shield building.

The PCCWST wall and shield building roof design using the revised reinforcement design satisfies the requirements of ACI 349.

The change in reinforcement design does not significantly change the nuclear island seismic model or the demands of other portions of the nuclear island. The dimensions of the tank walls and tank liner are not changed so the volume of the PCCWST is not changed. Piping and instrumentation connections to the tank and leak chase design are not changed in size or location.

Change Activity No. 4 – Figure and Sketch Design Finalization Changes

Issue Description

Design finalization of the shield building roof, tension ring, and air inlets has resulted in minor changes to design to facilitate fabrication and construction and satisfy requirements in ACI 349 and AISC N690. These changes result in small changes to the UFSAR sketches and figures. Additionally the sketches and figures include information that is redundant or has excessive detail for a UFSAR figure.

A. Locator sketches are included with UFSAR Table 3H.5-9, Sheet 1 and Sheet 2b to show the location of the sections through which stresses are identified in the table. The sketches include information such as dimensions of design features not needed for a locator figure. Section names and elevations are sufficient to locate the design features of interest. Some of these dimensions are inconsistent with the dimensions in UFSAR Figure 3H.5-11 and are not needed to locate the sections through which the stresses are considered. The sketches include information about the angular location of some sections. This information is written in very small print and is not clear because it uses information from calculations not defined in the change package.
B. UFSAR Figure 3H.5-11 shows shear connectors located on the shield building roof, but does not clarify their locations (whether the shear connectors are on the roof radial beams or on the steel plates between roof radial beams) or different sizes of shear connectors at various locations. The shear connectors on roof beams are updated in the design finalization.
C. UFSAR Figure 3H.5-11, Sheet 3 includes construction detail that is not part of the structural design. UFSAR Figure 3H.5-11, Sheet 5 includes design and fabrication details such as concrete cover, lap splice length, lap splice detailing, layer designation, and tank liner detailing that are inconsistently dimensioned and shown in the figure. UFSAR Figure 3H.5-

11, Sheet 6 includes a section showing detail beam stiffener fabrication details that are not needed for the reinforcement design shown on Sheet 6.

D. UFSAR Figure 3H.5-11 includes redundant information including beam size and information related to the internal construction of the tension ring and air inlet structure on multiple sheets of the figure. UFSAR Figure 3H.5-11, Sheets 2, 3, 4, and 5 and UFSAR Figures 3H.5-14 and 3H.5-15 include beam size information that is redundant with the information on UFSAR Figure 3H.5-11 Sheet 1. UFSAR Figure 3H.5-11, Sheet 1 and 3 both provide detail design information on internal construction of the tension ring and air inlet structure.
E. The dimensions for the spacing of reinforcement include an excessive number of digits which suggests a level of precision in constructing reinforcement that is not possible.
F. The designations for the steel beams in the shield building roof are not consistent in Table 3H.5-15, Figure 3H.5-11, Figure 3H.5-14 and Figure 3H.5-15. The designation of passive containment cooling water storage tank on Sheet 1 of Figure 3H.5-11 is not consistent with the one in other locations of the licensing basis.
G. The “curved girder” specified in UFSAR section 3.8.4.1.1 and 3H.2.2 has not been identified in any of the figures of UFSAR.
H. On UFSAR Figure 3H.5-11, Sheet 3, some structural elements are not identified or changed in the design finalization at roof and air inlet interface. On UFSAR Figure 3H.5-11, Sheet 3, the way of identifying roof hoop reinforcement is not consistent with the design documents.

Proposed Change

A. Remove the dimensions from the locator sketches on UFSAR Table 3H.5-9. The dimensional information is available on UFSAR Figure 3H.5-11 and is not needed on the locator sketches. Identify location of sections on sketches relative to roof beams. The sections are located at 0° and 5.62° which correspond to the centerline of a radial beam and the midpoint between two beams. Replace Section 8 with Section 7 in UFSAR Table 3H.5-9 Sheet 2a and 2c to match the design documents. Identify Section 7 in the sketch on UFSAR Table 3H.5-9 Sheet 2b as the corresponding values are reported in Table 3H.5-9.

B. SRI

INSERT 7

C. On UFSAR Figure 3H.5-11, Sheet 3 remove FLP 1/2″-18″. On UFSAR Figure 3H.5-11, Sheet 5 remove the dimensions that show concrete cover. Remove the dimensions that show the lap splice length and the lap slice detailing. The dimensions of the splice lengths are removed because they are changed for the revision of reinforcement size and splice lengths are controlled by the requirements of ACI 349. Remove the layer designation and liner details. This information is needed for reinforcement fabrication and concrete placement. These dimensions are consistent with ACI 349 code requirements and are not needed to show reinforcement design. On UFSAR Figure 3H.5-11, Sheet 6 remove the section that shows the fabrication details and the plate size for the beam stiffeners.
D. Remove dimensions and annotations for the tension ring and air inlet structure, including faceplate thickness and through wall tie plate dimensions, on UFSAR Figure 3H.5-11, Sheet 1 that are redundant with information on Sheet 3. Remove redundant beam size information on UFSAR Figure 3H.5-11, Sheets 2, 3, 4, and 5 and UFSAR Figures 3H.5-14 and 3H.5-15. Remove detail design dimensions for air inlet structure, tension ring and connection of roof beams to tension ring on UFSAR Figure 3H.5-11, Sheet 1 that are included on Sheet 3.

SRI

INSERT 8

And the #6 tie bar is renamed as ¾″ tie bar in Table 3H.5-9 Sheet 2c for consistency.

E. Reduce the number of digits in angular dimensions for spacing of tie bars and other design elements on Figure 3H.5-11 Sheets 2 and 4.
F. Use "roof beam" as the standard designation for steel beams in the shield building roof. On Table 3H.5-15, change the critical section name "Conical Roof Steel Beams" to "Conical Roof Beams," in Note 1 change "Steel beams" and "roof steel beams" to "roof beams". On Figure 3H.5-11, Sheet 3 change "ROOF GIRDER" to "Roof Beam". On Figure 3H.5-14 and Figure 3H.5-15, change "Roof Girder" to "Roof Beam". Change "PCCS water storage tank" on Sheet 1 of Figure 3H.5-11 to "PCS water storage tank".
G. On UFSAR Figure 3H.5-11, Sheet 6 identify "Curved Girder" specified in UFSAR section 3.8.4.1.1 and 3H.2.2 with designation of "Curved Girder Compression Ring".

SRI

H.

INSERT 9

On UFSAR Figure 3H.5-11, Sheet 3, the identification circle of roof hoop reinforcement is updated to match the design documents.

Change Activity No. 5 – Design Variances with Critical Sections

Issue Description

UFSAR Figure 3H.5-11 shows the typical design of critical sections in the shield building air inlet region, tension ring, and conical roof. In the vicinity of obstructions including openings, penetrations, and embedded pipe and conduit the reinforcement design varies from that shown in the figure. Embedments and other internal design elements are required for connections; component, piping, and conduit supports; and other design elements. The penetrations, embedments and other obstructions can require local reconfiguration of the reinforcement design in the roof or walls or the removal or shifting of tie bars or other design elements internal to the tension ring and air inlet structure. The roof beams provide support for structures, including the passive containment cooling system (PCS) valve room, stairs and walkway located under the shield building roof and above the containment vessel. The critical section figures do not include the design elements connecting the roof beams to these structures.

Proposed Change

Revise the description of the critical sections for the shield building roof and connections in UFSAR Subsections 3H.5.6, 3H.5.6.1, 3H.5.6.2 and 3H.5.6.3 to specify that the design details near interferences can vary from that shown in the figure. Revise the critical section figure, UFSAR Figure 3H.5-11, to add notes about variations in the roof, tension ring, and air inlets structure design. Remove "Weep hole" from UFSAR Figure 3H.5-11, Sheet 3, as it is considered as variation of typical/critical section for the tension ring constructability. The weep holes are provided as one of the quality inspectable attributes and will act as verification that

concrete has filled all voids in the tension ring. The removal of "weep hole" from UFSAR Figure 3H.5-11 does not affect the construction quality as the weep holes will still be used in the construction and are well defined in construction drawings. Add a note to identify that reinforcement size and spacing are based on the requirements in ACI 349, and additional reinforcement can be provided for detailing purposes. Add a note to UFSAR Figure 3H.5-11 to address variation and requirements for the design of the beam supports for the radial roof beams. Stiffeners and attachments to the beams are included in the design to address concentrated loads and connections to other structures. Add a note to UFSAR Figure 3H.5-11 about the connections to beams supporting other structures.

Change Activity No. 6 – Removal of Tie Rods

Issue Description

Located below the chimney through the PCCWST is a shield plate, constructed of steel and concrete, that provides radiation shielding for the area of the chimney. The shield plate is supported by structural shapes connected to the shield building roof compression ring. The original design of the shield plate included tie rods connecting the radial beams supporting the shield building conical roof to the shield plate to stabilize the shield plate. The structural analysis of the shield building has shown that these tie rods are not needed and they are removed from the design of the support of the shield plate. The shield building general arrangement figures, UFSAR Figures 1.2-13 and 1.2-14, include the tie rods. Other figures based on the general arrangement include the tie rods. UFSAR Figure 3H.5-1 is the locator figure for auxiliary building critical sections and includes the tie rods.

Proposed Change

Remove the tie rods from UFSAR Figures 1.2-13, 1.2-14, 3.7.2-12 Sheet 8, 3H.5-1 Sheet 3, 6.2.4-13, and 9A-1 Sheet 10 and 11. Remove the tie rods from Figures 3.3-1 and 3.3-2 of Appendix C of the COL (and associated plant specific Tier 1).

Licensing Basis Change Descriptions

The change activity for each change is designated by CA#X (Where X is the Change Activity number in the write-up above.)

COL Appendix C (and associated plant specific Tier 1) Figures 3.3-1 and 3.3-2 (SUNSI)

- Remove the tie rods connecting the shield plate to the radial roof beam from the figures. CA#6

UFSAR Figures 1.2-13 and 1.2-14 (SUNSI)

- Remove the tie rods connecting the shield plate to the radial roof beam from the figure. CA#6

UFSAR Figures 3.7.2-12, Sheet 8 (SUNSI)

- Remove the tie rods connecting the shield plate to the radial roof beam from the figure. CA#6

UFSAR Subsections 3H.5.6, 3H.5.6.1, 3H.5.6.2, and 3H.5.6.3

1. Add reference to variations in detail design due to openings, interferences, and obstructions. CA#5
2. Remove size of beam in UFSAR Subsection 3H.5.6.1. CA#1

UFSAR Table 3H.5-9

1. Revise values in table and the numbers of governing load combinations. CA#3
2. Remove dimensions from the locator figures. CA#4A
3. Add a legend to the table sketches to identify the location of the sections. Replace Section 8 with Section 7 in UFSAR Table 3H.5-9 Sheet 2a and 2c to match the design documents. Identify Section 7 in the sketch on Sheet 2b of the table. CA#4A
4. The tie bar is renamed. CA#4D

UFSAR Table 3H.5-15

1. Revise the values for provided minimum reinforcement for the radial reinforcement of the conical roof near tension ring. CA#3
2. Change the size of radial roof beam. CA#1
3. Include the use of fabricated plate girders. CA#1
4. Change roof beam designation. CA#4F

UFSAR Figure 3H.5-1 (SUNSI)

- Remove tie rods that connect shield plate to roof beams. CA#6

UFSAR Figure 3H.5-11 (SUNSI)

1. Change size of radial beam to W36x395 on Sheet 1. CA#1
2. Change identification of studs to shear connectors and change nominal length of shear connectors on radial roof beams on Sheet 1. Add shear connector size and spacing information for steel plates between radial roof beams on Sheet 3. Change the shear connectors on top of the curved girder compression ring from two rows to three rows on Sheets 1&6. CA#4B
3. Remove reference to radial beam size on Sheets 2, 3, and 4. CA#1
4. Remove reference to circumferential beam size on Sheets 2, 4, and 5. CA#1
5. Remove dimensions for internal items including tie bars and tie plates and selected elevations from tension ring and air inlet structure portion of the figure on Sheet 1. Remove dimensions for design elements for connection of radial beams to tension ring on Sheet 1. Move detailed design information from UFSAR Figure 3H.5-11, Sheet 1 to Sheet 3. CA#4D
6. Revise reinforcement design details on Sheet 5. CA#3, CA#4C
7. Revise reinforcement design details on Sheet 6. CA#3, CA#4C
8. Dimensions are rounded to two decimal places. CA#4E
9. Change roof beam designation on Sheet 3. Change “PCCS water storage tank” to “PCS water storage tank” on Sheet 1. CA#4F
10. Identify “Curved Girder Compression Ring” on Sheet 6. CA#4G
11. Remove construction detail on Sheet 3. CA#4C
12. Identify structural elements on Sheet 3, and add clarification information to the annotation on Sheet 3. CA#4H
13. Update reinforcement sizes on Sheet 3, and update the identification circle of roof hoop reinforcement on Sheet 3. CA#4H

14. Change the steel plates forming the lower portion of the air inlet structure from ¾" to 1" on Sheet 3. CA#3
15. Remove "Weep hole" on Sheet 3. CA#5
16. Add notes to the figure to provide the following information.
    A. Identify that details shown are representative of critical sections. Include reference to Subsection 3H.5.6 and other notes for additional information about design details and variations. CA#5
    B. Identify that the reinforcement and design elements shown are for locations away from openings, penetrations, and other obstructions. Identify that reinforcement and design elements can vary. CA#5
    C. Identify that reinforcement size and spacing are based on the requirements in ACI 349. Identify that additional reinforcement can be provided for detailing purposes. CA#5
    D. Identify that the design of beam supports satisfies the requirements of AISC N690 and are based on loading and local geometry considerations. CA#5
    E. Identify that the design of connections to the beams satisfies the requirements of AISC N690 and are based on loading and local geometry considerations. CA#5
    F. Identify that roof radial beams can be fabricated with two options (hot rolled shapes or built-up plate girders), and the roof beams and weld design and inspection meet the requirements of AISC N690 and AWS D1.1 as applicable. CA#1
    G. Identify that roof circumferential beams can be fabricated with two options (hot rolled shapes or built-up plate girders), and the roof beams and weld design and inspection meet the requirements of AISC N690 and AWS D1.1 as applicable. CA#1
17. Add sketches with dimension information of the built-up plate girders, and the welding options for flange-to-web welds of the built-up girders. CA#1

UFSAR Figure 3H.5-14

- Remove reference to beam size. CA#1
- Change roof beam designation. CA#4F

UFSAR Figure 3H.5-15

- Remove reference to beam size. CA#1
- Change roof beam designation. CA#4F

UFSAR Figure 6.2.4-13 (SUNSI)

- Remove the tie rods connecting the shield plate to the radial roof beam from the figure. CA#6

UFSAR Figure 9A-1 Sheets 10 & 11 (SUNSI)

- Remove the tie rods connecting the shield plate to the radial roof beam from the figure. CA#6

Note: Figures identified above as Sensitive Unclassified Non-Safeguards Information (SUNSI) contain security-related information and are withheld from public disclosure in accordance with 10 CFR 2.390(d).

3. TECHNICAL EVALUATION

Change Activity No. 1 – Roof Beam Size Change and Roof Beam Material Substitution

The shield building roof design using W36X395 beams satisfies the requirements of American Institute for Steel Construction (AISC) N690 as demonstrated in the design calculations. The change in beam size does not significantly change the shield building seismic model and is included in the design calculations.

The section dimensions of the built-up plate girders are specified to in the markup of Figure 3H.5-11 Sheet 1. The built-up plate girders provide equal or better responses to design basis seismic loads as the rolled structural shapes. The material of the roof radial beams and roof circumferential beams complies with the applicable material specifications (e.g. ASTM A572), and also satisfies the impact tests requirements. The applicable material specifications (e.g. ASTM A572) are previously approved for use in the nuclear island structures, and included on UFSAR Table 3.8.4-6. In order to transfer the full girder web shear capacity to flange and allow the section to develop full bending capacity of the section, the flange-to-web welds in the plate girders can be any of the three options: option A - continuous PJP with reinforcing fillet welds, option B - continuous double fillet welds, or option C – continuous CJP welds. The welds of the built-up plate girders are provided in Figure 1 and 2 as shown in the Detailed Description of Change Activity No. 1, and are specified in the UFSAR Figure 3H.5-11 Sheet 1 as well. The maximum demand to capacity ratio of the built-up plate girder for the roof radial beam is 0.72, and is governed by the axial and bending stress. It is worth noting that the similar information has been provided for the hot rolled shape of the roof radial beam in the UFSAR Table 3H.5-15 in the format of Reinforcement Ratio (1.33) which is the reciprocal of the demand to capacity ratio (= 1/1.33 =0.75). The maximum demand to capacity ratio of the built-up plate girder for the roof circumferential beam is 0.26, and is governed by the axial and bending stress. The maximum demand to capacity ratio of the hot rolled shape of the roof circumferential beam is 0.27, and is also governed by the axial and bending stress. The design of the built-up plate girders is based on AISC N690, sections Q1.4.1, Q1.5.1, Q1.5.3, Q1.5.6, Q1.5.7, Q1.6, Q1.8, Q1.9.1.2, Q1.10, Q1.11.1 through Q1.11.4, Q1.14.6, Q1.15.12 and Q1.15.13. The fabrication and erection of the built-up plate girders are based on ATM A572, AISC N690, sections Q1.4.1, Q1.17, Q1.19, Q1.23 and Q1.24, and AWS D1.1, sections 3.1 through 3.13, sections 4.1 through 4.11, 4.15 through 4.25, 4.30 through 4.32, 5.1 through 5.19, 5.21 through 5.24 and sections 5.26 through 5.31. The inspection of the built-up plate girders will be performed based on AISC N690 sections Q1.26 and AWS D1.1 section 6.

Because the built-up plate girders were confirmed by calculations to have properties equal or better to the ones of hot rolled shapes, the use of built-up plate girders for the roof beams does not change the results and conclusions of the Aircraft Impact Assessment.

Change Activity No. 2 – Roof Beam Material Substitution (Combined with Change Activity No.1)

Change Activity No. 3 – Change to Reinforcement in PCCWST Walls and Shield Building Conical Roof and Air Inlet Structure

As the result of lessons learned from a past corrective action resolved under the Corrective Action Process and was evaluated in accordance with the QA program, the spacing of shear ties in the PCCWST wall is changed to conform to the detailing requirements of American Concrete Institute (ACI) 349-01 Section 11.5.4. The PCCWST walls and shield building roof

design using the revised reinforcement design satisfy the requirements of ACI 349. The steel design satisfies AISC N690. The compliance with ACI 349 and AISC N690 is demonstrated in the design calculations. The design calculations are performed based on revised demands. The proposed design changes reflected in the changes to the UFSAR Tables 3H.5-9 & 3H.5-15 and Figure 3H.5-11 satisfy the requirements of AISC N690 and ACI 349. The change in mass of the shield building roof is negligible and the change in reinforcement design does not significantly change the shield building seismic model or the demands of other structures on the nuclear island. The dimensions of the tank walls and tank liner are not changed so the volume of the PCCWST is not changed. Piping and instrumentation connections to the tank and the tank leak chase design are not changed in size or location.

Changes to information on UFSAR Tables 3H.5-9, Sheet 3 and 3H.5-15 are required because of the changes in the reinforcement design for the PCCWST walls and shield building roof. Additionally changes to UFSAR Tables 3H.5-9 and 3H.5-15 are required due to: a) changes to the demands of the shield building roof resulting from updates of the analysis data post-process macros; and b) update of calculations to implement Note 2 in UFSAR Table 3.8.4-2 by using load combination factor of 0.9 for dead load when combined with upward seismic loads. The changes to the required reinforcement and the reinforcement design reflected in UFSAR Tables 3H.5-9 and 3H.5-15 do not change the conformance of the roof design with ACI 349.

The revised reinforcement in the PCCWST walls and shield building conical roof was confirmed by calculation to have larger area of steel reinforcement than the original design, and has negligible impact to the mass and stiffness of concrete section, therefore the reinforcement changes do not change the results and conclusions of the AIA.

Change Activity No. 4 – Figure and Sketch Design Finalization Changes

Redundant dimensions and detailed fabrication information removed from Figure 3H.5-11 are provided in other sheets, figures or text or is not needed for review of the design.

Change Activity No. 5 – Design Variances with Critical Sections

The design of the PCCWST walls, shield building roof, tension ring, and air inlets design require local variation in detail design at penetrations and other obstructions. These variations include reconfiguration of reinforcement in the area of the obstruction or shifting, removing, and redesigning design elements such as tie bars internal to the design of the tension ring and air inlet structure. The weep holes in the tension ring are considered as variation of typical/critical section for the tension ring constructability. The weep holes are provided as one of the quality inspectable attributes and will act as verification that concrete has filled all voids in the tension ring. The removal of “weep hole” from UFSAR Figure 3H.5-11 does not affect the construction quality as the weep holes will still be used in the construction and are well defined in construction drawings. The design of these structures with the variations in design is in conformance with design and analysis requirements for the structures identified in the UFSAR including the requirements of AISC N690 and ACI 349. The variations in detail design do not significantly change the shield building seismic model. The design variances do not change the configuration or size of the air inlets or alter the design air flow through the inlets. The design of the stiffeners and attachments to the beams, and other design elements included in the design to address concentrated loads and connections to the beams to support other structures is in conformance with AISC N690.

Change Activity No. 6 – Removal of Tie Rods

The shield plate is fully supported by the steel truss hung from the curved girder compression ring, where the verticals of the truss are moment connected to the compression ring and the cross bracings of the truss provide the horizontal restraints to the shield plate, therefore the tie rods are not needed to support the shield plate. The tie rods are not included in the structural models and seismic analysis of the shield building roof and are removed from the UFSAR as well as COL Appendix C (and associated plant specific Tier 1). The design and structural analyses of the shield building roof and support of the shield plate do not include the tie rods. Removal of the tie rods does not change the shield plate size and composition, and does not impact the shielding function of the shield plate. Removal of the tie rods does not impact the flow of air out of the shield building chimney in the center of the PCCWST.

Change Conclusions

The changes to the design of the shield building roof and PCCWST including the use of built up plate girders for the roof beams and design variances do not change the results and conclusions of the Aircraft Impact Assessment. The changes described are to the design details of the structures and do not adversely impact the design or response of the containment vessel and shield building. There is no change to protection of plant structures, systems, and components against aircraft impact provided by the design of the shield building. There is no change to the design of any of the key design features as described in UFSAR Appendix 19F. These designs are consistent with the analysis summary information provided in UFSAR Subsection 19F.4.1. The activities described do not change the overall configuration or construction of the shield building.

The proposed changes do not change the function, design, and operation of the systems and components supported by and located within the shield building. There is no change to the number, size, or shape of the air inlets. There is no change to the design or support for the air baffle between the shield building and containment or to the design of the chimney through the PCCWST on the roof of the shield building. The proposed changes do not change the function, design, and operation of the containment vessel and passive containment cooling system including the components located in the PCS valve room. The proposed changes do not affect the prevention and mitigation of abnormal events, e.g., accidents, anticipated operational occurrences, earthquakes, floods and external missiles, or their safety or design analyses. The proposed changes do not involve, nor interface with, any structure, system or component accident initiator or initiating sequence of events, and thus, the probabilities of the accidents evaluated in the plant-specific DCD or UFSAR are not affected.

The shield building roof, tension ring, and air inlets do not interface with or affect safety-related equipment inside containment or a fission product barrier. No system or design function or equipment qualification would be adversely affected by the proposed changes. The changes do not result in a new failure mode, malfunction or sequence of events that could adversely affect a radioactive material barrier or safety-related equipment. The proposed changes do not allow for a new fission product release path, result in a new fission product barrier failure mode, or create a new sequence of events that would result in significant fuel cladding failures.

The proposed changes do not adversely affect any safety-related system or component, equipment, design code, design code allowable value, function or design analysis, nor do they adversely affect any safety analysis input or result, or design/safety margin.

The proposed activity has no adverse effect on the ex-vessel severe accident. The design, geometry, and strength of the containment internal structures are not changed. The design and material selection of the concrete floor beneath the reactor vessel is not altered. The response of the containment to a postulated reactor vessel failure, including direct containment heating, ex-vessel steam explosions, and core concrete interactions is not altered by the changes to the detail design of the shield building roof. The design of the reactor vessel and the response of the reactor vessel to a postulated severe accident are not altered by the changes to the detail design of the shield building roof.

The proposed changes associated with this license amendment request include a change in the detail design of the shield building. The proposed changes do not affect the radiological source terms (i.e., amounts and types of radioactive materials released, their release rates and release durations) used in the accident analyses, thus, the consequences of accidents are not affected. These changes do not affect the containment, control, channeling, monitoring, processing or releasing of radioactive and non-radioactive materials. The location and design of penetrations and the permeability of the concrete structures is not changed. No effluent release path is affected. The types and quantities of expected effluents are not changed. The functionality of the design and operational features that are credited with controlling the release of effluents during plant operation is not diminished. Therefore, neither radioactive nor non-radioactive material effluents are affected.

The changes are internal to the shield building structure and the configuration, thickness, and density of the shield building roof, wall, and shield plate are not changed. The thickness of the walls and floors and the density of the concrete are not changed; therefore, there is no adverse change to the shielding provided by the shield building. There is no change to plant systems or the response of systems to postulated accident conditions. There is no change to the predicted radioactive releases due to normal operation or postulated accident conditions. Plant radiation zones, controls under 10 CFR Part 20, and expected amounts and types of radiologically controlled materials are not affected by the proposed changes. Therefore, individual and cumulative radiation exposures do not change.

The change activity has no impact on the emergency plans or the physical security evaluation since there are no changes to the external configuration of walls, doors, or access to the Nuclear Island.

Summary

The proposed changes would revise plant-specific Tier 1 information and Tier 2* information and associated Tier 2 information in the UFSAR in regard to requirements for detail design of the beams supporting the roof of the shield building, the reinforcement in the roof and the walls of the Passive Containment Cooling Water Storage Tank (PCCWST) supported by the roof, and the design details of the shield building tension ring and air inlet structure. COL Appendix C (and associated plant specific Tier 1) and UFSAR Figures are revised to remove tie rods between the shield plate and the shield building roof beams. The proposed changes do not adversely affect the strength or response of the nuclear island seismic Category I structures.

The above proposed changes do not adversely affect any safety-related equipment or function, design function, radioactive material barrier or safety analysis.

4.0 REGULATORY EVALUATION

4.1 Applicable Regulatory Requirements/Criteria

10 CFR 52.98(f) requires NRC approval for any modification to, addition to, or deletion from the terms and conditions of a COL. This activity involves a departure from plant-specific Tier 1 information, and a corresponding change to COL Appendix C, Inspections, Tests, Analyses and Acceptance Criteria information; therefore, this activity requires an amendment to the COL. Accordingly, NRC approval is required prior to making the plant-specific changes in this license amendment request.

10 CFR Part 52, Appendix D, VIII.B.6 and VIII.B.5.a, require prior NRC approval for departure from Tier 2* information and for Tier 2 information departures that involve changes to Tier 2* information, respectively. The proposed amendment includes changes to design details for the design of the beams supporting the roof, reinforcement in the roof, and the design details of the tension ring and air inlets portions of the shield building, removal of tie rods for the shield plate, and description and figures depicting Category I structures which constitute UFSAR Tier 2* information changes. Therefore, a license amendment request (LAR) (as supplied herein) is required.

10 CFR Part 50, Appendix A, General Design Criterion (GDC) 1 requires that structures be designed, fabricated, erected, constructed, tested, and inspected to quality standards commensurate with the importance of the safety functions to be performed. The proposed change does not change the criteria for the design, analysis, and construction of the shield plate, roof, tension ring, and air inlet structure portions of the shield building. These structures remain in conformance with the code requirements identified and supplemented in the UFSAR.

10 CFR Part 50, Appendix A, GDC 2 requires that structures withstand the effects of earthquakes and appropriate combinations of the effects of normal and accident conditions, including the effects of environmental loadings, such as earthquakes and other natural phenomena. The proposed changes have no impact on the seismic motions to which the nuclear island structures are subjected and no impact on the response of the nuclear island structures to seismic motions.

10 CFR Part 50, Appendix A, GDC 4 requires that systems structures and components can withstand the dynamic effects associated with missiles, pipe whipping, and discharging fluids, excluding dynamic effects associated with pipe ruptures, the probability of which is extremely low under conditions consistent with the design basis for the piping. The proposed changes do not change the configuration of the walls and floors which provide separation between sources and potential targets. The proposed change has no impact on the capability of the systems, structures, and components to withstand dynamic effects associated with missiles, pipe whipping, and discharging fluids as required by this criterion. The proposed change does not change the requirements for anchoring safety related components and supports to seismic Category I structures.

4.2 Precedent

No precedent is identified.

4.3 Significant Hazards Consideration Determination

The proposed amendment would require changes to the plant-specific Tier 1 and corresponding changes to COL Appendix C, the plant-specific Design Control Document (DCD) Tier 2* and associated Tier 2 material incorporated into the Updated Final Safety Analysis Report (UFSAR), by revising the design details for construction of the roof, tension ring, and air inlet structure portions of the shield building.

An evaluation to determine whether or not a significant hazards consideration is involved with the proposed amendment was completed by focusing on the three standards set forth in 10 CFR 50.92, "Issuance of Amendment," as discussed below:

4.3.1 Does the proposed amendment involve a significant increase in the probability or consequences of an accident previously evaluated?

Response: No

The design functions of the nuclear island structures are to provide support, protection, and separation for the seismic Category I mechanical and electrical equipment located in the nuclear island. The nuclear island structures are structurally designed to meet seismic Category I requirements as defined in Regulatory Guide 1.29.

The change of the design details for the shield building roof, tension ring, and air inlets and removal of the tie rods do not have an adverse impact on the response of the nuclear island structures to safe shutdown earthquake ground motions or loads due to anticipated transients or postulated accident conditions. The changes do not impact the support, design, or operation of mechanical and fluid systems. There is no change to plant systems or the response of systems to postulated accident conditions. There is no change to the predicted radioactive releases due to normal operation or postulated accident conditions. The plant response to previously evaluated accidents or external events is not adversely affected, nor does the change described create any new accident precursors.

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

4.3.2 Does the proposed amendment create the possibility of a new or different kind of accident from any accident previously evaluated?

Response: No

The proposed change is to revise design details for the shield building roof, tension ring, and air inlets and remove tie rods. The clarification and changes to the design details for the shield building roof, tension ring, and air inlets do not change the design requirements of the nuclear island structures. The changes do not change the design function, support, design, or operation of mechanical and fluid systems. The changes do not result in a new failure mechanism for the nuclear island structures or new accident precursors. As a result, the design function of the nuclear island structures is not adversely affected by the proposed change. Therefore, the proposed amendment does not create the possibility of a new or different kind of accident from any accident previously evaluated.

4.3.3 Does the proposed amendment involve a significant reduction in a margin of safety?

Response: No

No safety analysis or design basis acceptance limit/criterion is challenged or exceeded by the proposed changes, thus, no margin of safety is reduced. The acceptance limits for the design of seismic Category I structures are included in the codes and standards used for the design, analysis, and construction of the structures. The two primary codes for the seismic Category I structures are American Institute of Steel Construction (AISC) N690 and American Concrete Institute (ACI) 349. The design of the shield building roof with the changes to the reinforcement and roof beams satisfies applicable provisions of AISC N690 and ACI 349. The welding of the plate girders used for roof beams meets the requirements of AISC N690 and AWS D1.1. Therefore, the proposed amendment does not involve a significant reduction in a margin of safety.

Based on the above, it is concluded that the proposed amendment does not involve a significant hazards consideration under the standards set forth in 10 CFR 50.92(c), and, accordingly, a finding of "no significant hazards consideration" is justified.

4.4 Conclusions

In conclusion, based on the considerations discussed above, (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public. Pursuant to 10 CFR 50.92, the requested change does not involve a Significant Hazards Consideration.

5.0 ENVIRONMENTAL CONSIDERATION

The details of the proposed changes are provided in Sections 2 and 3 of this licensing amendment request.

The proposed amendment revises the plant-specific Tier 1 information and corresponding changes to COL Appendix C, plant-specific Design Control Document (DCD) Tier 2* and associated Tier 2 material incorporated into the Updated Final Safety Analysis Report (UFSAR),

by revising the design details for the shield building roof, tension ring, and air inlets and removing tie rods.

A review has determined that the proposed amendment would 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, or would change an inspection or surveillance requirement. However, facility construction and operation following implementation of the proposed amendment does not involve (i) a significant hazards consideration, (ii) a significant change in the types or a significant increase in the amounts of any effluents that may be released offsite, or (iii) a significant increase in individual or cumulative occupational radiation exposure. Accordingly, the proposed amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9), in that:

(i) There is no significant hazards consideration.

As documented in Section 4.3, Significant Hazards Consideration Determination, of this license amendment request, an evaluation was completed to determine whether or not a significant hazards consideration is involved by focusing on the three standards set forth in 10 CFR 50.92, “Issuance of amendment.” The Significant Hazards Consideration determined that (1) the proposed amendment does not involve a significant increase in the probability or consequences of an accident previously evaluated; (2) the proposed amendment does not create the possibility of a new or different kind of accident from any accident previously evaluated; and (3) the proposed amendment does not involve a significant reduction in a margin of safety. Therefore, it is concluded that the proposed amendment does not involve a significant hazards consideration under the standards set forth in 10 CFR 50.92(c), and accordingly, a finding of “no significant hazards consideration” is justified.

(ii) There is no significant change in the types or significant increase in the amounts of any effluents that may be released offsite.

The proposed amendment involves changes unrelated to any aspect of plant construction or operation that would introduce any change to effluent types (e.g., effluents containing chemicals or biocides, sanitary system effluents, and other effluents), or affect any plant radiological or non-radiological effluent release quantities. Furthermore, the proposed changes do not affect any effluent release path or diminish the functionality of any design or operational features that are credited with controlling the release of effluents during plant operation. Therefore, it is concluded that the proposed amendment does not involve a significant change in the types or a significant increase in the amounts of any effluents that may be released offsite.

(iii) There is no significant increase in individual or cumulative occupational radiation exposure.

The proposed amendment involves changes to design details for the shield building roof, tension ring, and air inlets but, does not change walls, floors, or other structures which provide shielding in the containment structure. Plant radiation zones are not affected, nor are there any changes to the controls required under 10 CFR Part 20 that preclude a significant increase in occupational radiation exposure. Consequently, these changes have no effect on individual or cumulative occupational radiation exposure during plant

operation. Therefore, it is concluded that the proposed amendment does not involve a significant increase in individual or cumulative occupational radiation exposure.

Based on the above review of the proposed amendment, it has been determined that anticipated construction and operational impacts of the proposed amendment do not involve (i) a significant hazards consideration, (ii) a significant change in the types or significant increase in the amounts of any effluents that may be released offsite, or (iii) a significant increase in the individual or cumulative occupational radiation exposure. Accordingly, the proposed amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the proposed amendment.

6.0 REFERENCES

None