TENNESSEE VALLEY AUTHORITY

1101 Market Street, Chattanooga, Tennessee 37402

CNL-21-098

January 5, 2022

10 CFR 50.90

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555-0001

Watts Bar Nuclear Plant Unit 2
Facility Operating License No. NPF-96
NRC Docket No. 50-391

Subject: **Supplement to Response to Request for Additional Information Regarding Application to Modify Watts Bar Nuclear Plant, Unit 2 Technical Specifications Steam Generator Inspection/Repair Program Provisions and Unit 2 Facility Operating License Condition 2.C.(4) (WBN-TS-20-06) (EPID L-2021-LLA-0043)**

References:

1. TVA letter to NRC, CNL-21-013, "Application to Modify Watts Bar Nuclear Plant, Unit 2 Technical Specifications Steam Generator Inspection/Repair Program Provisions and Unit 2 Facility Operating License Condition 2.C.(4) (WBN-TS-20-06)," dated March 11, 2021 (ML21070A432)

2. TVA letter to NRC, CNL-21-070, "Response to Request for Additional Information Regarding Application to Modify Watts Bar Nuclear Plant, Unit 2 Technical Specifications Steam Generator Inspection/Repair Program Provisions and Unit 2 Facility Operating License Condition 2.C.(4) (WBN-TS-20-06) (EPID-L-2021-LLA-0043)," dated August 11, 2021 (ML21223A319 and ML21223A320)

In Reference 1, Tennessee Valley Authority (TVA) submitted a request for an amendment to Facility Operating License No. NPF-96 for Watts Bar Nuclear Plant (WBN), Unit 2, which revised the WBN Unit 2 Technical Specifications to delete requirements for steam generator (SG) tube inspection/repair methodologies that will no longer apply following installation of the replacement steam generators. In Reference 2, TVA responded to a Nuclear Regulatory Commission (NRC) request for additional information (RAI). Enclosure 1 to Reference 2 contained Westinghouse Letter Report, LTR-CDMP-21-44 P-Attachment, Revision 0, which contained information that Westinghouse considered to be proprietary in nature pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Section 2.390, "Public inspections, exemptions, requests for withholding," paragraph (a)(4). Enclosure 2 to Reference 2 contained a non-proprietary version of Enclosure 1 (Westinghouse Letter Report, LTR-CDMP-21-44 NP-Attachment, Revision 0).

Proprietary Information Withhold Under 10 CFR § 2.390
This letter is decontrolled when separated from Enclosure 1

The response to NRC RAI Question vii in Enclosures 1 and 2 to Reference 2 identified the dimension for the SG tubes outside diameter as being proprietary. However, TVA has determined this parameter was incorrectly marked as proprietary because the same parameter is also contained in the WBN dual-unit Final Safety Analysis Report. Additionally, the reference to "stainless steel" in the response to NRC RAI Question v in Enclosures 1 and 2 to Reference 2 was also incorrectly marked as proprietary. TVA has entered this error into the TVA corrective action program and, along with Westinghouse, reviewed the remaining information in Enclosures 1 and 2 to Reference 2 and determined that the remaining proprietary markings are correct. Additionally, the title of Figure 5 in Enclosures 1 and 2 to Reference 2 was revised from "Figure 5 - SG-1 Hot Leg Tube Map (Typical) (As Viewed from the Primary Side)" to "Figure 5 - SG-1 Tube Map (Typical) (As Viewed from the Primary Side)."

Therefore, TVA is supplementing Reference 2 to reflect the above changes. Enclosure 1 to this letter provides Westinghouse Letter Report, LTR-CDMP-21-44 P-Attachment Revision 1 reflecting the above changes. Enclosure 1 contains information that Westinghouse considers to be proprietary in nature pursuant to 10 CFR Section 2.390(a)(4). Enclosure 2 contains a non-proprietary version of Enclosure 1 (Westinghouse Letter Report, LTR-CDMP-21-44 NP-Attachment, Revision 1). Enclosure 3 provides the Westinghouse Application for Withholding Proprietary Information from Public Disclosure CAW-21-5249 affidavit supporting this proprietary withholding request. The affidavit sets forth the basis on which the information may be withheld from public disclosure by the NRC and addresses with specificity the considerations listed in paragraph (b)(4) of Section 2.390.

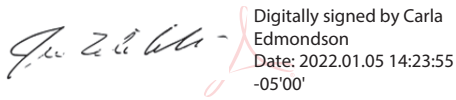
TVA requests that the information, which is proprietary to Westinghouse, be withheld from public disclosure in accordance with 10 CFR Section 2.390. Correspondence with respect to the copyright or proprietary aspects of the items listed above or the supporting Westinghouse affidavit should reference CAW-21-5249 and should be addressed to Zachary S. Harper, Manager, Licensing Engineering, Westinghouse Electric Company, 1000 Westinghouse Drive, Suite 165, Cranberry Township, Pennsylvania 16066.

This letter does not change the no significant hazards considerations or the environmental considerations contained in Reference 1. Additionally, in accordance with 10 CFR 50.91(b)(1), TVA is sending a copy of this letter and the enclosure to the Tennessee Department of Environment and Conservation.

There are no new regulatory commitments associated with this submittal. Please address any questions regarding this request to Kimberly D. Hulvey, Senior Manager, Fleet Licensing, at (423) 751-3275.

I declare under penalty of perjury that the foregoing is true and correct. Executed on this 5th day of January 2022.

Respectfully,



James T. Polickoski
Director, Nuclear Regulatory Affairs

Enclosures:

1. Revised Response to NRC Request for Additional Information (Proprietary), Westinghouse Letter Report, LTR CDMP-21-44 P-Attachment, Revision 1
2. Revised Response to NRC Request for Additional Information (Non-Proprietary), Westinghouse Letter Report, LTR-CDMP-21-44 NP-Attachment, Revision 1
3. Westinghouse Electric Company LLC Application for Withholding Proprietary Information from Public Disclosure (Affidavit CAW-21-5249)

cc: (Enclosures):

NRC Regional Administrator – Region II
NRC Project Manager – Watts Bar Nuclear Plant
NRC Senior Resident Inspector – Watts Bar Nuclear Plant
Director, Division of Radiological Health – Tennessee State Department of Environment and Conservation

Enclosure 1

Revised Response to NRC Request for Additional Information (Proprietary)

Westinghouse Letter Report, LTR CDMP-21-44 P-Attachment, Revision 1

Enclosure 2

Revised Response to NRC Request for Additional Information (Non-Proprietary)

Westinghouse Letter Report, LTR CDMP-21-44 NP-Attachment, Revision 1

Westinghouse Electric Company

LTR-CDMP-21-44 NP-Attachment
Revision 1

Watts Bar Nuclear Plant Unit 2 - Response to NRC Request for Additional Information from the Application to Modify Watts Bar Nuclear Plant, Unit 2 Technical Specifications Steam Generator Inspection/Repair Program Provisions and Unit 2 Facility Operating License Condition 2.C.(4) (WBN-TS-20-06)

December 2021

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Electronically approved records are authenticated in the Electronic Document Management System.

Response to NRC Request for Additional Information (RAI) from the Application to Modify Watts Bar Nuclear Plant, Unit 2 Technical Specifications Steam Generator Inspection/Repair Program Provisions and Unit 2 Facility Operating License Condition 2.C.(4) (WBN-TS-20-06)

Background

The Watts Bar Unit 2 Replacement Steam Generators (RSGs) are Westinghouse Model 68AXP nuclear steam generators which are vertically oriented U-tube heat exchangers. Secondary feedwater enters the shell side through the feedwater distribution box into the preheater section of the tube bundle (see Figure 1). The remainder of the tube bundle functions as a recirculating steam generator where the recirculation flow enters the tube bundle at the hot side near the tubesheet and the cold side just above the preheater. The secondary fluid rises through the evaporator section and enters the primary separators where liquid and vapor are separated by centrifugal action. The liquid exiting the primary separators returns to the downcomer annulus to complete the recirculation flow path. The vapor phase exits the primary separators and passes through the steam dryers where additional moisture is removed, and the dry steam leaves the steam generator through the steam outlet nozzle. On the primary side, hot pressurized water enters the primary inlet nozzle and is distributed to the tube side where it transfers heat to the secondary fluid before exiting to the primary outlet head and outlet nozzle.

Revision 1 of this document removed proprietary markings in two locations as identified by revision bars. Additionally, the title for Figure 5 has been updated.

Responses to Request for Additional Information

In order to complete the review of the License Amendment Request (LAR), the Nuclear Regulatory Commission (NRC) Staff requests the following information:

1. Reference: RAI Question i.

   The tubesheet thickness (with and without the cladding).

   Response:

   The tubesheet base metal thickness is [ ]^{a,c,e}. The primary side of the tubesheet is overlaid with [ ]^{a,c,e} weld deposit with a minimum thickness of [ ]^{a,c,e}.

2. Reference: RAI Question ii.

   The method used to expand the tubes into the tubesheet and the extent of expansion.

   Response:

   The RSG tubes were hydraulically expanded to maximize mechanical strength and to minimize the tube-to-tubesheet crevice. The tubes were hydraulically expanded through the entire thickness of the tubesheet such that a nominal crevice depth of [

]^{a,c,e} was achieved at the secondary face of the tubesheet. The length of the expansion mandrel was determined by the thickness of the tubesheet. The procedure included fine tuning of mandrel length to account for local variations of tubesheet thickness. The hydraulic seals of the expansion mandrel were made from [ ]^{a,c,e} and designed so that no metal parts were impressed upon the inside surface of the tube when hydraulic pressure was applied. The position of the seal at the secondary face of the tubesheet was controlled to ensure that expansion of the tube is as close as possible to the secondary face of the tubesheet without going past the secondary face.

3. Reference: RAI Question iii.

   The extent to which some tube rows were stress relieved following bending.

   Response:

   For straight tubes, all tubes were thermally treated at temperatures between [ ]^{a,c,e}. Normal heat-up time to the minimum temperature of [ ]^{a,c,e} was [ ]^{a,c,e}. [ ]^{a,c,e} to support the cool down following achievement of the required hold time. Cooling to [ ]^{a,c,e} required [ ]^{a,c,e}. Following application of the U-bend, all tubes with a centerline bend radius of [ ]^{a,c,e} were stress relieved [ ]^{a,c,e}. Heat-up and cooling were the same as for straight tubes. For all tubes, the maximum total soak time for heat treatment and stress relief was [ ]^{a,c,e}.

4. Reference: RAI Question iv.

   The bend radius of the smallest radius tube bends.

   Response:

   The smallest tube bend radius is [ ]^{a,c,e} of the tube bundle.

5. Reference: RAI Question v.

   The horizontal tube support structure size and shape, material of construction, and hole configuration (including the flow distribution baffle, if any).

   Response:

   The RSG design uses advanced tube support grids (ATSGs) manufactured from [ ]^{a,c,e} for horizontal, straight-leg tube support. The ATSGs are composed of [ ]^{a,c,e}. The [ ]^{a,c,e} results in limited contact length between the tube and the support while providing [

]^{a,c,e} for each tube. The [ ]^{a,c,e} slots in the strips are cut at a [ ]^{a,c,e}, which allows them to simultaneously fit tightly and be assembled easily. The grid is bounded by [ ]^{a,c,e} at the outer diameter. The ATSGs were fabricated using a [ ]^{a,c,e} which assures dimensional compatibility within close tolerances. The essential features include 1) low flow resistance that promotes a higher circulation ratio and reduced potential for local dry-out, 2) minimum tube-to-support contact that reduces potential for intergranular attack (IGA) or stress corrosion cracking (SCC) to occur or exceed critical flaw size, 3) effective vibration restraint and fretting resistance, 4) low tendency to accumulate deposits compared to a broached or drilled plate, and 5) elimination of denting potential due to the use of stainless steel. Figure 2 shows 1) the basic elements of the ATSG with respect to tube interface and 2) a full view of the full and partial ATSGs installed in the secondary shell prior to tubing installation.

The ATSGs provide support for the straight portion of the tubes. Tie rods provide spacing of the ATSGs and the periphery of the ATSG is fixed to the shroud. In the preheater area, the ATSGs are made in two halves with the secondary divider plate between them. Near the U-bend area, a "partial" ATSG, which only interacts with tubes in rows [ ]^{a,c,e}, provides spacing control for the upper bundle support (UBS) diagonal strips [ ]^{a,c,e}. Figure 3 shows the basic arrangement of the full, half, and partial ATSGs in the tube bundle.

The ATSG is an improved version of the "eggcrate" grid design employed typically in prior Combustion Engineering (CE) RSG designs and the recent series of plants in operation or under construction in South Korea. The ATSG was developed specifically for the Sequoyah Unit 1 RSG where the tube size and pitch selected for the Sequoyah Unit 1 RSG design afforded the opportunity to optimize the grid design to minimize the line contact between tubes and supports. This configuration has been tested in a prototypical arrangement of tubes and support spacing to verify acceptable vibration characteristics. The ATSG design was adopted for the Sequoyah Unit 2 RSG and Watts Bar Units 1 and 2 RSGs. For the full-size ATSGs, design and fabrication details are identical to the Sequoyah Unit 1 RSG since the tube size and pitch are the same. For the "partial" ATSG and half-size ATSGs, design and fabrication details are identical to the Watts Bar Unit 1 RSG.

The RSG axial flow preheater contains a flow distribution plate which is designed to develop a uniform upward and axial flow along the tubes in the preheater section. The flow distribution plate is [ ]^{a,c,e} and is manufactured from [ ]^{a,c,e}. The plate contains [ ]^{a,c,e}. The plate is installed on the feedwater cold leg side at the entrance to the preheater section (see Figures 1 and 3).

6. Reference: RAI Question vi.

The U-bend support structure size and shape, material of construction and the depth of penetration of the supports.

Response:

The RSG design includes an upper bundle support (UBS) system designed to 1) support the U-bends against harmful wear and vibration, 2) minimize the potential for sludge deposition, and 3) promote circulation. The design configuration is a refinement of the design employed for the Sequoyah Unit 1 RSGs.

The UBS features [ ]^{a,c,e} which provide full depth (including Row 1) support to the U-bends against flow-induced vibration (FIV), seismic loads, transportation loads, and handling and assembly loads during fabrication. Figure 4 shows a typical diagonal/vertical strip assembly. These assemblies are fabricated from [ ]^{a,c,e} which limit the line contact length between tubes and adjacent strips. This feature minimizes the potential for local dry-out and associated potential for IGA and SCC. [

]^{a,c,e}.

The UBS is integral with the U-bends of the tube bundle and will move with the tube bundle during heat-up and cooldown. The vertical deadweight of the UBS assembly is nominally transferred to the bundle through the [ ]^{a,c,e}. The out-of-plane support of the U-bends is provided by the [ ]^{a,c,e} external to the bundle. In addition, there are [ ]^{a,c,e} that provide support during [ ]^{a,c,e}, shipping, and seismic events.

The vertical pitch of the U-bend and the [ ]^{a,c,e} of the diagonal/vertical strips provide a low resistance flow path through the upper bundle. This promotes overall circulation and reduces peak steam quality on the hot side of the tube bundle. The [ ]^{a,c,e} promote local washing of tube surfaces and thereby minimize the potential for local tube wear, deposit accumulation, ionic impurity accumulation, and associated IGA and SCC.

Prevention of excessive FIV and fretting wear is achieved by a combination of design, analysis, and testing. The UBS is arranged to meet the design limits established for fluid elastic instability (FEI) and for response to turbulence. The key criterion is to maintain clearances between tubes and the UBS assemblies at a nominal radial design value of [ ]^{a,c,e}. This is achieved by close control of the tolerances on the diagonal and vertical strips and by control of the bending process for tubes. This clearance criterion is substantiated by testing.

7. Reference: RAI Question vii.

The tube pitch (e.g., 1.0 triangular).

Response:

The 0.75 inch outside diameter (OD) tubes are arranged on a [ ]^{a,c,e} such that approximately [ ]^{a,c,e} of installed wetted heat transfer surface area is included within the tube bundle. This surface area compensates for the change in the heat transfer coefficient associated with the Alloy 690 tube material and supports the specified tube plugging margin.

8. Reference: RAI Question viii.

The tube and steam generator fabricator. In addition, provide a tubesheet map and a schematic of the steam generator showing the tube support naming convention.

Response:

The WBN Unit 2 RSG tubing was manufactured by Sandvik Materials Technology (Sandviken, Sweden). Sandvik is a recognized tubing supplier for the global nuclear market and for the United States RSG market. The WBN Unit 2 RSGs were manufactured by Doosan Heavy Industries and Construction Company (DHICO – Changwon, South Korea). DHICO was responsible for RSG material procurement and fabrication, including tubesheet forgings, primary and secondary head forgings, secondary shell and cone forgings, pressure boundary welding and internal assembly, hydrostatic testing, American Society of Mechanical Engineers (ASME) NPT Stamp, and preparation for shipment. DHICO is a fully qualified ASME nuclear component supplier and has significant experience with supply of nuclear steam supply system (NSSS) components for the South Korean domestic market based on technology developed by Westinghouse and other NSSS designers. DHICO previously supplied RSGs for Sequoyah Units 1 and 2 and Watts Bar Unit 1. A typical RSG tubesheet map is shown in Figure 5.The tube support naming convention is shown in Figure 3.

a,c,e

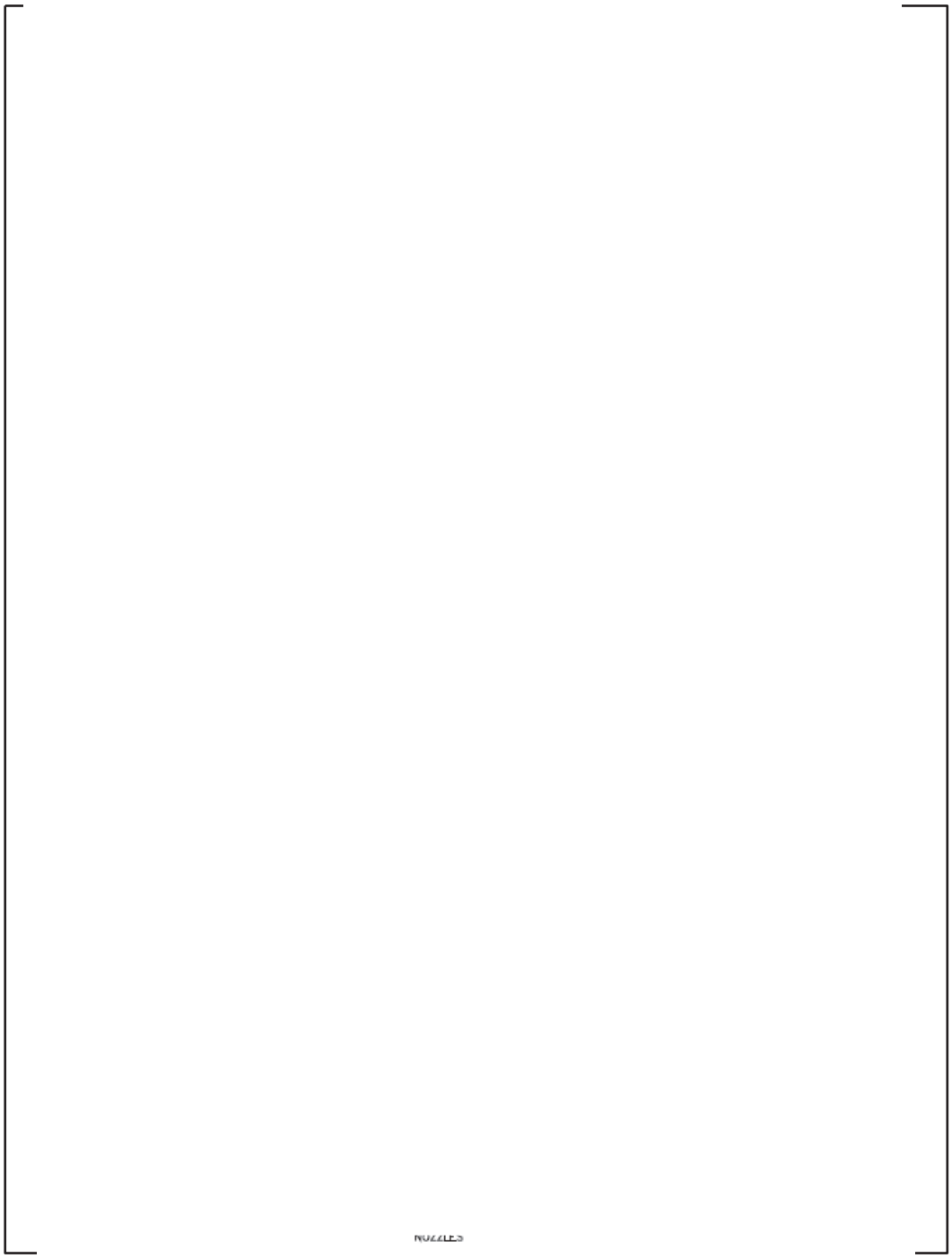

Figure 1 - RSG Arrangement and Main Features

a,c,e

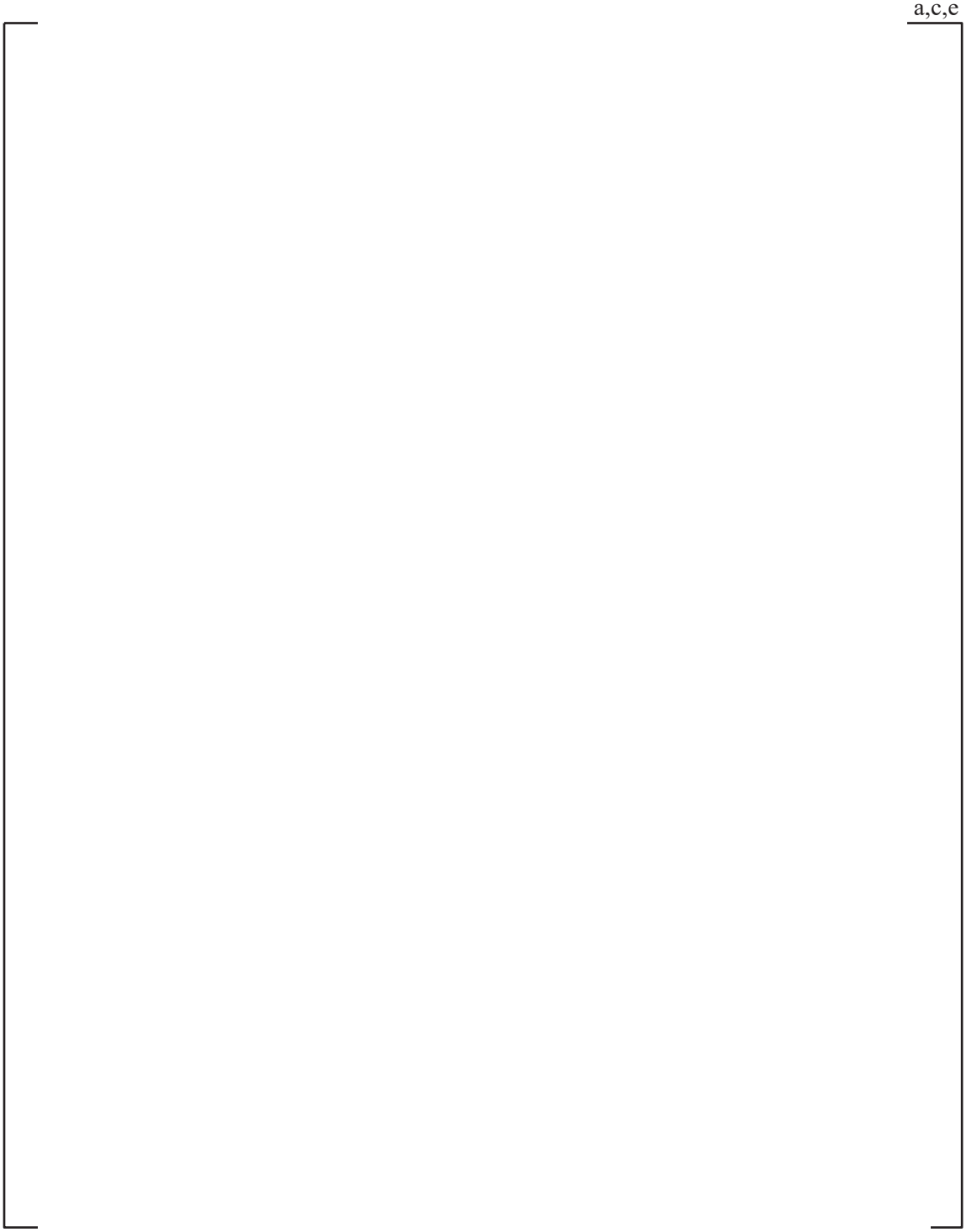

Figure 2 - RSG "ATSG" Tube Support

a,c,e

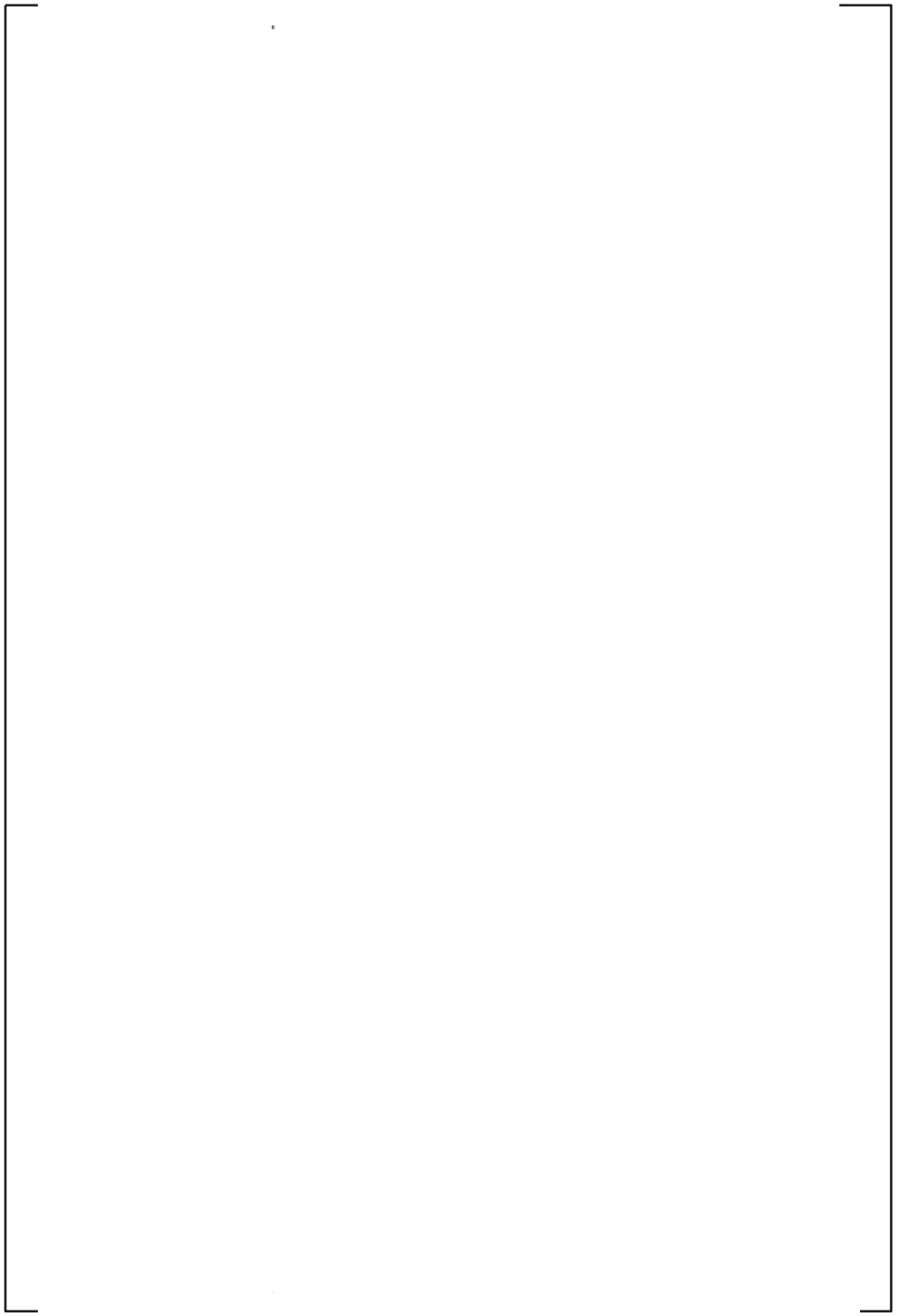

Figure 3 - Tube Bundle Supports

a,c,e

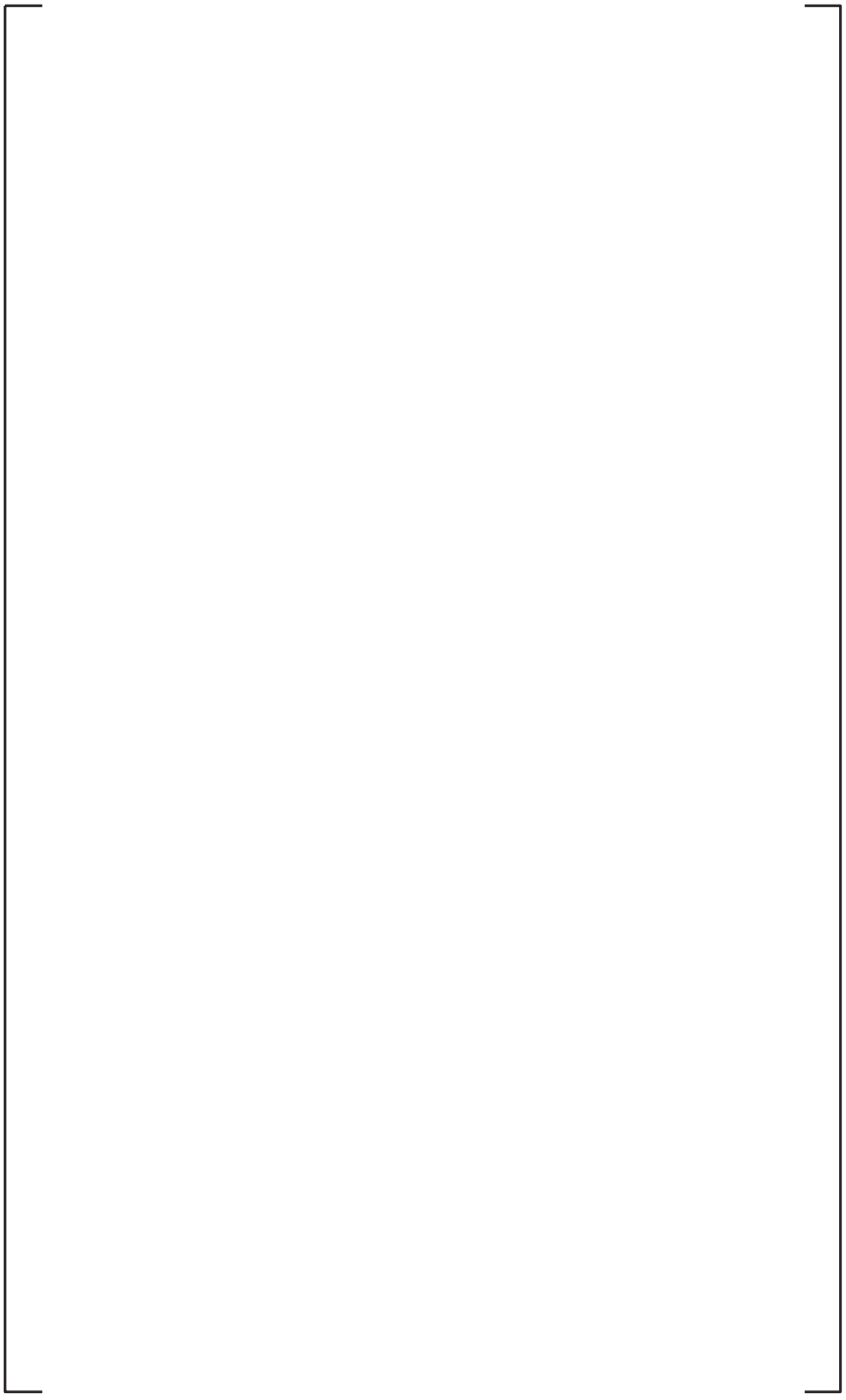

Figure 4 - Typical Upper Bundle Support Element

a.c,e

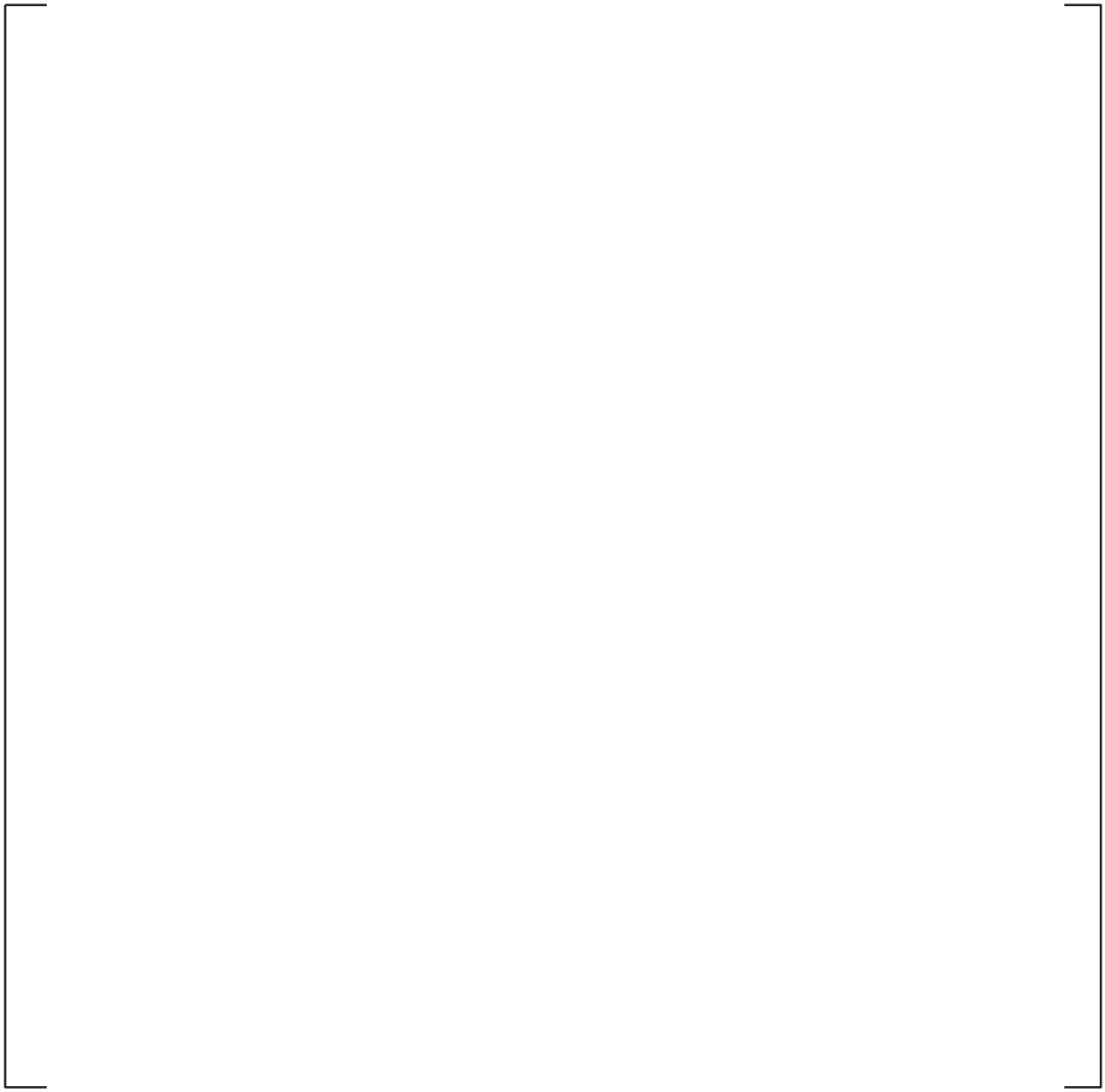

Figure 5 - SG-1 Tube Map (Typical) (As Viewed from the Primary Side)

References

1. WCAP-18167-P Rev. 0, Watts Bar Unit 2 Replacement Steam Generator Program NSSS Engineering Report, October 30, 2018
2. Westinghouse Drawing 20010E06 Rev. 0, Tubesheet TVA – Watts Bar 2 RSG, Westinghouse Internal Approval Date = June 4, 2014, Released for Use on March 16, 2015, per WB2DS-15-009
3. Westinghouse Drawing 20006D02 Rev. 0, Tube Bundle Details TVA – Watts Bar 2 RSG, Westinghouse Internal Approval Date = May 15, 2014, Released for Use on March 16, 2015, per WB2DS-15-009
4. Westinghouse Drawing 20006D03 Rev. 0, Flow Distribution Plate TVA – Watts Bar 2 RSG, Westinghouse Internal Approval Date = July 22, 2015, Released for Use on March 24, 2016, per WB2DS-16-016
5. TR-NCE-14-2 Rev. 0, TVA Watts Bar Two Replacement Steam Generator Contract Attachment A – Westinghouse RSG Project Technical Description, February 13, 2014
6. CP 9536 Rev. 2, Long Time Thermal Treatment, Sandvik, Dated March 18, 2016, Released for Use on April 8, 2016, per LAD 95 Rev. 52
7. CP 9542 Rev. 0, Stress Relieving, Sandvik, Dated August 26, 2015, Released for Use on December 23, 2015, per LAD 95 Rev. 52
8. Westinghouse Drawing 20010E08 Rev. 0, Tubesheet Marking TVA – Watts Bar 2 RSG, Westinghouse Internal Approval Date = February 20, 2015, Released for Use on June 15, 2015, per WB2DS-15-036

Enclosure 3

Westinghouse Electric Company LLC Application for Withholding Proprietary Information From Public Disclosure (Affidavit CAW-21-5249)

COMMONWEALTH OF PENNSYLVANIA:
COUNTY OF BUTLER:

(1) I, Zachary S. Harper, have been specifically delegated and authorized to apply for withholding and execute this Affidavit on behalf of Westinghouse Electric Company LLC (Westinghouse).

(2) I am requesting the proprietary portions of LTR-CDMP-21-44 P-Attachment, Revision 1, "Response to NRC Request for Additional Information from the Application to Modify Watts Bar Nuclear Plant, Unit 2 Technical Specifications Steam Generator Inspection/Repair Program Provisions and Unit 2 Facility Operating License Condition 2.C.(4) (WBN-TS-20-06)," be withheld from public disclosure under 10 CFR 2.390.

(3) I have personal knowledge of the criteria and procedures utilized by Westinghouse in designating information as a trade secret, privileged, or as confidential commercial or financial information.

(4) Pursuant to 10 CFR 2.390, the following is furnished for consideration by the Commission in determining whether the information sought to be withheld from public disclosure should be withheld.

(i) The information sought to be withheld from public disclosure is owned and has been held in confidence by Westinghouse and is not customarily disclosed to the public.

(ii) The information sought to be withheld is being transmitted to the Commission in confidence and, to Westinghouse's knowledge, is not available in public sources.

(iii) Westinghouse notes that a showing of substantial harm is no longer an applicable criterion for analyzing whether a document should be withheld from public disclosure. Nevertheless, public disclosure of this proprietary information is likely to cause substantial harm to the competitive position of Westinghouse because it would

enhance the ability of competitors to provide similar technical evaluation justifications and licensing defense services for commercial power reactors without commensurate expenses. Also, public disclosure of the information would enable others to use the information to meet NRC requirements for licensing documentation without purchasing the right to use the information.

(5) Westinghouse has policies in place to identify proprietary information. Under that system, information is held in confidence if it falls in one or more of several types, the release of which might result in the loss of an existing or potential competitive advantage, as follows:

(a) The information reveals the distinguishing aspects of a process (or component, structure, tool, method, etc.) where prevention of its use by any of Westinghouse's competitors without license from Westinghouse constitutes a competitive economic advantage over other companies.

(b) It consists of supporting data, including test data, relative to a process (or component, structure, tool, method, etc.), the application of which data secures a competitive economic advantage (e.g., by optimization or improved marketability).

(c) Its use by a competitor would reduce his expenditure of resources or improve his competitive position in the design, manufacture, shipment, installation, assurance of quality, or licensing a similar product.

(d) It reveals cost or price information, production capacities, budget levels, or commercial strategies of Westinghouse, its customers or suppliers.

(e) It reveals aspects of past, present, or future Westinghouse or customer funded development plans and programs of potential commercial value to Westinghouse.

(f) It contains patentable ideas, for which patent protection may be desirable.

(6) The attached documents are bracketed and marked to indicate the bases for withholding. The justification for withholding is indicated in both versions by means of lower-case letters (a) through (f) located as a superscript immediately following the brackets enclosing each item of information being identified as proprietary or in the margin opposite such information. These lower-case letters refer to the types of information Westinghouse customarily holds in confidence identified in Sections (5)(a) through (f) of this Affidavit.

I declare that the averments of fact set forth in this Affidavit are true and correct to the best of my knowledge, information, and belief.

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

Executed on: 12/15/2021

Zachary S. Harper, Manager
Licensing Engineering