

1101 Market Street, Chattanooga, Tennessee 37402

CNL-23-011

January 18, 2023

10 CFR 50.90

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

> Sequoyah Nuclear Plant, Units 1 and 2 Renewed Facility Operating License Nos. DPR-77 and DPR-79 NRC Docket Nos. 50-327 and 50-328

#### Subject: Sequoyah Nuclear Plant, Units 1 and 2, Steam Generator Tube Inspection Report to Reflect TSTF-577 Reporting Requirements

- References: 1. TVA letter to NRC, CNL-22-001, "Application to Revise Technical Specifications to Adopt TSTF-577, 'Revised Frequencies for Steam Generator Tube Inspections' (SQN-TS-21-03 and WBN-TS-21-08)," dated April 4, 2022 (ML22095A023)
  - NRC letter to TVA, "Sequoyah Nuclear Plant, Units 1 and 2; and Watts Bar Nuclear Plant, Units 1 and 2 – Issuance of Amendment Nos. 359, 353, 155, and 63 Regarding Adoption of Technical Specification Task Force Traveler TSTF-577, 'Revised Frequencies for Steam Generator Tube Inspections' (EPID L-2022-LLA-0051)," dated October 24, 2022 (ML22276A161)
  - 3. TVA letter to NRC, "Unit 1 Cycle 21 180-Day Steam Generator Tube Inspection Report," dated February 13, 2017 (ML17045A145)
  - 4. TVA letter to NRC, "Unit 2 Cycle 22 180-Day Steam Generator Tube Inspection Report," dated April 25, 2019 (ML19126A274)

In Reference 1, Tennessee Valley Authority (TVA) submitted a request for an amendment to Renewed Facility Operating License Nos. DPR-77 and DPR-79 for the Sequoyah Nuclear Plant (SQN), Units 1 and 2 and Facility Operating License Nos. NPF-90 and NPF-96 for the Watts Bar Nuclear Plant (WBN), Units 1 and 2, respectively, to adopt Technical Specifications Task Force (TSTF)-577, "Revised Frequencies for Steam Generator Tube Inspections." Reference 1 was approved by the Nuclear Regulatory Commission (NRC) in Reference 2. As noted in Reference 1, "TVA will submit a SG Tube Inspection Report for SQN Units 1 and 2 meeting the revised TS 5.6.6 requirements within 30 days after implementation of the license amendment." Reference 2 was implemented for SQN on December 19, 2022; therefore, the required SQN Units 1 and 2 steam generator (SG) tube inspection report to reflect the TSTF-577 reporting requirements is required to be submitted to NRC by January 18, 2023.

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Enclosure 1 provides the revised SQN Unit 1 180-day report in accordance with the revised SQN Unit 1 TS 5.6.6 reporting requirements in References 1 and 2. Each SQN Unit 1 TS 5.6.6 reporting requirement is listed along with the associated information based on the inspection performed during the SQN Unit 1 Cycle 21 fall 2016 refueling outage (U1R21), which was the last inspection of the SQN Unit 1 replacement steam generators (RSG) (Reference 3).

Enclosure 2 provides the revised SQN Unit 2 180-day report in accordance with the revised SQN Unit 2 TS 5.6.6 reporting requirements in References 1 and 2. Each SQN Unit 2 TS 5.6.6 reporting requirement is listed along with the associated information based on the inspection performed during the SQN Unit 2 Cycle 22 fall 2018 refueling outage (U2R22), which was the last inspection of the SQN Unit 2 RSGs (Reference 4).

There are no new regulatory commitments associated with this submittal. Please address any questions regarding this request to slrymer@tva.gov.

Respectfully,

Start 1 Rymer Digitally signed by Rymer, Stuart Loveridge Date: 2023.01.18 12:25:06 -05'00'

Stuart L. Rymer Director (Acting), Nuclear Regulatory Affairs

Enclosures:

- 1. Sequovah Nuclear Plant, Unit 1 Steam Generator Tube Inspection Report
- 2. Sequoyah Nuclear Plant, Unit 2 Steam Generator Tube Inspection Report

cc (Enclosure):

NRC Regional Administrator – Region II NRC Senior Resident Inspector – Sequoyah Nuclear Plant NRC Project Manager – Seguoyah Nuclear Plant

#### Enclosure 1

Sequoyah Nuclear Plant, Unit 1 Steam Generator Tube Inspection Report

Sequoyah Nuclear Plant, Unit 1 Steam Generator Tube Inspection Report

#### Introduction

In Reference 1, Tennessee Valley Authority (TVA) submitted a request for an amendment to Renewed Facility Operating License No. DPR-77 for the Sequoyah Nuclear Plant (SQN), Unit 1 to adopt Technical Specifications Task Force (TSTF)-577, "Revised Frequencies for Steam Generator Tube Inspections." Reference 1 was approved by the Nuclear Regulatory Commission (NRC) in Reference 2. As noted in Reference 1, "TVA will submit a SG Tube Inspection Report for SQN Units 1 and 2 meeting the revised TS 5.6.6 requirements within 30 days after implementation of the license amendment." Reference 2 was implemented for SQN on December 19, 2022.

SQN Unit 1 Technical Specification (TS) 5.6.6, "Steam Generator Tube Inspection Report," states "A report shall be submitted within 180 days after the initial entry into MODE 4 following completion of an inspection performed in accordance with the Specification 5.5.7, 'Steam Generator (SG) Program'." This enclosure provides the revised 180-day report with the revised SQN Unit 1 TS 5.6.6 reporting requirements in accordance with References 1 and 2. Each SQN Unit 1 TS 5.6.6 reporting requirement is listed below along with the associated information based on the inspection performed during the SQN Unit 1 Cycle 21 fall 2016 refueling outage (U1R21), which was the last inspection of the SQN Unit 1 replacement steam generators (RSG) (Reference 3). This report follows the template provided in Appendix G to the Electric Power Research Institute (EPRI) *Steam Generator Management Program: Steam Generator Integrity Assessment Guidelines, Revision 5* (Reference 4), which provides additional information beyond the SQN Unit 1 TS 5.6.6 reporting requirements.

#### 1. Design and operating parameters

The original SGs at SQN Unit 1 were replaced in 2003 with Westinghouse Model 57AG SGs, which have thermally treated Alloy 690 tubing. The U1R21 inspection was the fourth in-service inspection of the RSGs. Prior to the U1R21 inspection, the RSGs had operated for nine fuel cycles since replacement. The RSGs had operated for three fuel cycles since the previous inspection at U1R18. Table 1 provides the SQN Unit 1 SG design and operating parameter information.

Table 1									
Steam Generato	or Design and Operating Parameters								
SG Model / Tube Material /	Westinghouse Model 57AG / Alloy 690TT / 4								
Number of SGs per Unit									
Number of tubes per SG /	4,983 / 0.75 in. / 0.043 in								
Nominal Tube Diameter / tube									
thickness									
Support Plate Style / Material	Advanced Tube Support Grid (ATSG) and vertical								
	straps/stainless steel								
Last Inspection Date	Spring 2012								
Effective full power months	48.96 EFPM [4.08 effective full power years (EFPY)]								
(EFPM) Since Last Inspection	(from U1R18 to U1R21)								
Total Cumulative SG EFPY	12.4 EFPY (as of U1R21)								
Mode 4 Initial Entry	12/25/2016 from U1R21								
Observed Primary-to-Secondary	No observed leakage								
Leak Rate									
Nominal Thot at Full Power	611°F								
Operation									
Loose Parts Strainer	The Model 57AG design has spray can nozzles on the								
	main feedwater distribution ring. Each nozzle has								
	small diameter holes acting as strainers to prevent the								
	introduction of foreign material into the SGs.								
Degradation Mechanism	There are no sets of tubing currently designated as								
Sub-Population	degradation mechanism sub populations in the U1R21								
	operational assessment (OA).								
SG program guideline deviations	None								
since last Inspection									
SG Schematic	See Figure 1								

Enclosure 1



#### Tube Support Arrangement for Sequoyah Unit 1 Model 57AG Replacement SGs

Notes: VS - Vertical Strap DS - Diagonal Strap HTS/CTS -Hot/Cold Tubesheet (designates top of tubesheet) HTE/CTE - Hot/Cold Tube End Horizontal supports are a lattice grid design

### 2. The scope of the inspections performed on each SG (TS 5.6.6.a) and if applicable, a discussion of the reason for scope expansion

The U1R21 outage included a combination of bobbin and array coil inspections of 100 percent (%) of the full length in all in-service tubes except for tubes in rows 1 through 4. Tube rows 1 through 4 were inspected to the first support with the combination bobbin and array coil from both the HTE and the CTE. The remainder of the tube length in rows 1 through 4 were inspected with a singular bobbin probe due to dimensional clearance restrictions in the U-bend region. As a result, the inspection included all tubes with prior indications of degradation and all tubes not inspected during the previous SG in-service inspection. Table 2 summarizes the number and type of eddy current examinations performed during U1R21. There was no scope expansion required or performed during the U1R21 eddy current inspections.

Eddy Current Exam Type	SG 1	SG 2	SG 3	SG 4	Total
0.610 HL Bobbin & Array VS3-HTE	4,720	4,539	4,636	4,730	18,625
0.610 HL Bobbin & Array H01-HTE	248	247	248	248	991
0.610 CL Bobbin & Array VS3-CTE	4,720	4,539	4,636	4,730	18,625
0.610 CL Bobbin & Array C01-CTE	248	247	248	248	991
0.610 HL/CL Bobbin (VS3-HTE/CTE)	496	494	496	496	1,982
0.610 Full Length Array (Note 1)	0	191	92	0	283

Table 2U1R21 Steam Generator Eddy Current Inspection Scope

Note 1: These tube inspections were performed with the array coil only in order to capture both bobbin and array data full length in the tubes above Row 4.

In addition to the eddy current inspections, visual inspections were also performed on both the primary and secondary sides. Primary side visual inspections included the previously installed tube plugs, the channel head bowl cladding, and the divider plate. Secondary side visual inspections were performed at the top of the tubesheet for the detection of foreign objects, assessment of hard deposit buildup in the tube bundle interior kidney region, and for determining the effectiveness of the tubesheet cleaning performed in the four SGs.

## 3. The nondestructive examination techniques utilized for tubes with increased degradation susceptibility (TS 5.6.6.b)

No tubes were designated as having increased degradation susceptibility during the U1R21 inspection.

## 4. The nondestructive examination technique utilized for each degradation mechanism found (TS 5.6.6.c.1)

Table 3 provides the nondestructive examination (NDE) techniques that were used for the detection of each degradation mechanism that was considered as existing or potential for the U1R21 inspection.

Table 3
NDE Techniques for Each Existing or Potential Degradation Mechanism

Degradation Mechanism	Detection Technique	EPRI Examination Technique Specification Sheets (ETSS)
II Bend Support Structure	Bobbin	96004.1, Revision 13
Wear	Array	11956.1, Revision 2
vveai	Array	11956.2, Revision 2
Harizantal Tuba Support	Bobbin	96004.1, Revision 13
	Array	11956.1, Revision 2
Gild Wear	Array	11956.2, Revision 2
	Bobbin	27091.2, Revision 2
Foreign Object Wear	Array	11956.1, Revision 2
	Array	11956.2, Revision 2
Tube-to-Tube Wear	Bobbin	96010.1, Revision 7

## The location, orientation (if linear), measured size (if available), and voltage response for each indication. For tube wear at support structures less than 20 percent through-wall, only the total number of indications needs to be reported (TS 5.6.6.c.2)

Volumetric wear at support structures was the only degradation mechanism detected during the U1R21 inspection. The wear indications detected were located at either U-bend or horizontal tube support structures. Table 4 provides the number of indications reported during the U1R21 inspection.

Table 4Number of Indications Detected for Each Degradation Mechanism

Degradation Mechanism	SG 1	SG 2	SG 3	SG 4	Total
U-bend Support Structure Wear	75	29	46	27	177
Horizontal Tube Support Grid Wear	4	3	1	1	9

Tables 5 through 9 provide a listing of the service-induced indications reported during the U1R21 inspection including the measured depths from the bobbin coil. Indications of tube wear at support structures are provided regardless of percent through-wall depth and the voltages provided correspond to the bobbin coil.

	Table 5 U1R21 U-bend Support Structure Wear Indications – SG1													
SG	Row	Col	Locn	Inch	Ind	Volts	%Through wall (TW)	Characteriz ation	Resolution					
1	74	48	VS3	-0.82	PCT	0.13	9	Vertical Strep Weer	Remain In-					
								Vertical	Remain In-					
1	83	49	VS2	1.02	PCT	0.47	18	Strap Wear	Service					
1	88	52	VS3	0.94	PCT	0.68	21	Vertical Strap Wear	Remain In- Service					
1	88	52	VS4	-0.97	PCT	0.3	16	Vertical Strap Wear	Remain In- Service					
1	65	53	VS2	0.44	PCT	0.57	20	Vertical Strap Wear	Remain In- Service					
1	30	54	VS3	-0.2	РСТ	0.91	24	Vertical Strap Wear	Remain In- Service					
1	75	55	VS2	-0.72	PCT	0.27	15	Vertical Strap Wear	Remain In- Service					
1	69	59	VS3	1.15	PCT	0.06	4	Vertical Strap Wear	Remain In- Service					
1	87	59	VS4	-0.95	PCT	0.31	16	Vertical Strap Wear	Remain In- Service					
1	95	61	VS4	0.8	PCT	0.52	19	Vertical Strap Wear	Remain In- Service					
1	97	61	VS4	0.63	PCT	0.45	18	Vertical Strap Wear	Remain In-					
1	95	63	VS3	-0.35	PCT	0.81	23	Vertical Strap Wear	Remain In- Service					
1	95	63	VS4	-1.07	РСТ	0.58	20	Vertical Strap Wear	Remain In-					
1	97	63	VS2	0.94	PCT	0.53	19	Vertical Strap Wear	Remain In-					
1	84	64	VS4	1.13	PCT	0.72	22	Vertical Strap Wear	Remain In-					
1	98	64	VS5	1.29	PCT	0.29	21	Vertical Strap Wear	Remain In-					
1	98	64	VS5	0.62	PCT	0.49	18	Vertical Strap Wear	Remain In-					
1	98	64	VS5	-0.09	РСТ	0.71	16	Vertical Strap Wear	Remain In-					
1	85	65	VS4	0.72	PCT	0.71	21	Vertical Strap Wear	Remain In-					
1	93	65	VS2	0.51	PCT	0.64	20	Vertical Strap Wear	Remain In-					
1	70	66	VS4	-1.31	PCT	0.75	22	Vertical Strap Wear	Remain In-					
1	98	66	VS4	-0.68	PCT	0.26	15	Vertical Strap Wear	Remain In-					
1	98	66	VS5	1.01	PCT	0.65	21	Vertical Strap Wear	Remain In-					
1	85	67	VS4	0.61	PCT	0.74	22	Vertical Strap Wear	Remain In-					
1	92	68	VS2	1.25	РСТ	0.48	18	Vertical Strap Wear	Remain In- Service					

	Table 5 U1R21 U-bend Support Structure Wear Indications – SG1													
SG	Row	Col	Locn	Inch	Ind	Volts	%Through wall (TW)	Characteriz ation	Resolution					
1	92	68	VS4	0.54	PCT	0.59	26	Vertical	Remain In-					
	_				_		_	Strap Wear	Service					
1	92	68	VS4	0	PCT	1.06	20	Vertical Strap Wear	Remain in- Service					
1	99	69	VS3	0.89	PCT	0.64	20	Vertical	Remain In-					
	00	00	100	0.00	101	0.04	20	Strap Wear	Service					
1	88	70	VS4	-1.4	PCT	0.78	22	Vertical Strap Wear	Remain In- Service					
1	90	70	VS4	0.68	PCT	0.73	36	Vertical Strap Wear						
1	90	70	1/5/	0.03	РСТ	1	25	Vertical	Preventively					
1	30	10	V04	-0.05	101	I	25	Strap Wear	Plugged					
1	90	70	VS4	-1.28	PCT	2.39	22	Vertical Strap Wear						
1	92	70	VS2	-0.98	PCT	0.78	21	Vertical	Remain In-					
	-				_			Strap Wear	Service Domain In					
1	92	70	VS4	0.95	PCT	0.67	22	Strap Wear	Service					
1	94	70	VS1	-0.53	PCT	0.4	20	Vertical Strap Wear	Remain In- Service					
4	0.4	70	<b>N/00</b>	0.00	DOT	0.00	47	Vertical	Remain In-					
1	94	70	VS3	-0.22	PCT	0.63	17	Strap Wear	Service					
1	97	71	VS1	-1.22	PCT	0.37	17	Vertical	Remain In-					
	_				_			Strap Wear	Service Domain In					
1	92	72	VS2	1.16	PCT	0.52	19	Strap Wear	Service					
4	07	70	N/00	0.00	DOT	0.00	4.5	Vertical	Remain In-					
1	67	73	VS3	0.06	PCT	0.26	15	Strap Wear	Service					
1	75	73	VS2	0.87	PCT	0.44	18	Vertical Strap Wear	Remain In- Service					
		===		4.0.4	DOT			Vertical	Remain In-					
1	75	73	VS3	1.01	PCT	1.17	28	Strap Wear	Service					
1	87	73	VS2	1.11	PCT	0.83	23	Vertical	Remain In-					
	-				_		_	Strap Wear	Service Domain In					
1	87	73	VS3	1.09	PCT	1.18	28	Strap Wear	Service					
1	88	74	VS2	0.83	PCT	0.56	19	Vertical Strap Wear	Remain In- Service					
				0.70	DOT	0.07	4 -	Vertical	Remain In-					
1	92	74	VS4	0.78	PCT	0.37	17	Strap Wear	Service					
1	68	76	VS2	-0.23	РСТ	0.26	15	Vertical	Remain In-					
-								Strap Wear	Service Domain In					
1	96	76	VS3	1.16	PCT	0.59	20	Strap Wear	Service					
1	83	77	VS2	0.88	PCT	0.4	17	Vertical Strap Wear	Remain In- Service					
1	05	77	1/01	_1 16	рст	0.4	17	Vertical	Remain In-					
	35		v 04	-1.10	101	0.4	17	Strap Wear	Service					
1	78	78	VS2	1.11	PCT	0.68	21	vertical Strap Wear	Remain In- Service					

SG         Row         Col         Locn         Inch         Ind         Voits         %Through wall (TW)         Characteriz ation         Resolution           1         88         78         VS5         1.9         PCT         0.66         21         Strap Wear         Service           1         96         80         VS2         1.05         PCT         0.74         19         Vertical         Remain In-Service           1         96         80         VS3         -0.95         PCT         0.5         16         Vertical         Remain In-Service           1         96         80         VS4         -1.2         PCT         0.5         16         Vertical         Remain In-Service           1         85         81         VS2         0.96         PCT         0.71         21         Vertical         Strap Wear         Service           1         87         81         VS4         -1.19         PCT         0.67         21         Vertical         Remain In-Service           1         93         81         VS2         0.99         PCT         0.65         21         Vertical         Remain In-Service         Service           1		Table 5         U1R21 U-bend Support Structure Wear Indications – SG1													
1         88         78         VS5         1.9         PCT         0.66         21         Vertical Strap Wear         Remain In- Service           1         96         80         VS2         1.05         PCT         0.74         19         Vertical Strap Wear         Remain In- Service           1         96         80         VS3         -0.95         PCT         0.34         22         Vertical Strap Wear         Remain In- Service           1         96         80         VS4         -1.2         PCT         0.5         19         Vertical Vertical Strap Wear         Remain In- Service           1         87         81         VS4         -1.19         PCT         0.67         21         Vertical Vertical Strap Wear         Remain In- Service           1         87         81         VS4         0.6         PCT         0.65         21         Vertical Vertical Strap Wear         Remain In- Service           1         93         81         VS2         0.99         PCT         0.65         21         Vertical Vertical Strap Wear         Remain In- Service           1         98         82         VS5         -1.41         PCT         0.61         20         Vertical Vertical Remai	SG	Row	Col	Locn	Inch	Ind	Volts	%Through wall (TW)	Characteriz ation	Resolution					
1         36         16         16         16         16         16         16         16         16         16         16         16         16         16         16         16         17         19         Strap Wear         Service         Service           1         96         80         VS3         -0.95         PCT         0.34         22         Vertical         Remain In-Service           1         96         80         VS4         -1.2         PCT         0.5         16         Vertical         Remain In-Service           1         85         81         VS2         0.96         PCT         0.71         21         Vertical         Remain In-Service           1         87         81         VS4         -1.19         PCT         0.67         21         Vertical         Remain In-Service           1         93         81         VS2         0.99         PCT         0.43         18         Vertical         Remain In-Service           1         93         81         VS2         1.13         PCT         0.65         21         Vertical         Remain In-Service           1         94         84         VS4	1	88	78	VS5	19	PCT	0.66	21	Vertical	Remain In-					
1         96         80         VS2         1.05         PCT         0.74         19         Vertical Strap Wear         Remain In- Service           1         96         80         VS3         -0.95         PCT         0.34         22         Vertical Strap Wear         Remain In- Service           1         96         80         VS4         -1.2         PCT         0.5         16         Vertical Vertical Strap Wear         Remain In- Service           1         85         81         VS2         0.96         PCT         0.5         19         Vertical Vertical Strap Wear         Remain In- Service           1         87         81         VS4         -1.19         PCT         0.67         21         Vertical Vertical Strap Wear         Remain In- Service           1         93         81         VS2         0.99         PCT         0.43         18         Vertical Vertical Strap Wear         Remain In- Service           1         93         81         VS2         0.99         PCT         0.65         21         Vertical Vertical Strap Wear         Remain In- Service           1         98         82         VS5         -1.41         PCT         0.51         19         Vertical Vert	-	00	10	100	1.0		0.00	21	Strap Wear	Service					
1         96         80         VS3         -0.95         PCT         0.34         22         Vertical Strap Wear         Service Remain In- Service           1         96         80         VS3         -1.2         PCT         0.5         16         Strap Wear         Service           1         85         81         VS2         0.96         PCT         0.5         19         Strap Wear         Service           1         87         81         VS4         -1.19         PCT         0.71         21         Vertical Strap Wear         Remain In- Service           1         89         81         VS4         0.6         PCT         0.67         21         Vertical Strap Wear         Remain In- Service           1         93         81         VS2         0.99         PCT         0.67         21         Vertical Strap Wear         Remain In- Service           1         98         82         VS5         -1.41         PCT         0.65         21         Strap Wear         Service           1         98         82         VS2         1.13         PCT         0.63         20         Vertical Strap Wear         Remain In- Service         Service	1	96	80	VS2	1.05	PCT	0.74	19	Vertical	Remain In-					
1         96         80         VS3         -0.95         PCT         0.34         22         Strap Wear         Remain In-Service           1         96         80         VS4         -1.2         PCT         0.5         16         Vertical Strap Wear         Remain In-Service           1         85         81         VS2         0.96         PCT         0.5         19         Vertical Strap Wear         Remain In-Service           1         87         81         VS4         -1.19         PCT         0.71         21         Vertical Strap Wear         Remain In-Service           1         89         81         VS4         0.6         PCT         0.67         21         Vertical Strap Wear         Service           1         93         81         VS2         0.99         PCT         0.43         18         Vertical Strap Wear         Remain In-Service           1         93         81         VS2         1.14         PCT         0.65         21         Vertical Strap Wear         Remain In-Service           1         98         82         VS5         1.14         PCT         0.63         20         Strap Wear         Service           1							••••		Strap Wear	Service					
1         96         80         VS4         -1.2         PCT         0.5         16         Vertical Strap Wear         Remain In- Service           1         85         81         VS2         0.96         PCT         0.5         19         Vertical Strap Wear         Remain In- Service           1         87         81         VS4         -1.19         PCT         0.71         21         Vertical Strap Wear         Remain In- Service           1         89         81         VS4         0.6         PCT         0.67         21         Vertical Strap Wear         Remain In- Service           1         93         81         VS2         0.99         PCT         0.43         18         Vertical Strap Wear         Remain In- Service           1         93         81         VS2         1.11         PCT         0.65         21         Vertical Strap Wear         Remain In- Service           1         98         82         VS5         -1.41         PCT         0.63         20         Strap Wear         Service           1         90         84         VS4         -1.43         PCT         0.31         16         Vertical Strap Wear         Remain In- Service	1	96	80	VS3	-0.95	PCT	0.34	22	Vertical Strap Wear	Remain In- Service					
1         30         00         V34         1.12         FOT         0.3         10         Strap Wear         Service           1         85         81         VS2         0.96         PCT         0.5         19         Vertical Strap Wear         Remain In- Service           1         87         81         VS4         -1.19         PCT         0.71         21         Vertical Strap Wear         Remain In- Service           1         93         81         VS2         0.99         PCT         0.67         21         Vertical Strap Wear         Remain In- Service           1         93         81         VS2         0.99         PCT         0.65         21         Vertical Strap Wear         Remain In- Service           1         98         82         VS5         -1.41         PCT         0.63         20         Vertical Strap Wear         Remain In- Service           1         90         84         VS4         -1.43         PCT         0.63         20         Vertical Strap Wear         Remain In- Service           1         90         84         VS4         -1.13         PCT         0.31         16         Vertical Strap Wear         Remain In- Strap Wear         S	1	96	80	1/54	1.2	PCT	0.5	16	Vertical	Remain In-					
1         85         81         VS2         0.96         PCT         0.5         19         Vertical Strap Wear         Remain In- Service           1         87         81         VS4         -1.19         PCT         0.71         21         Vertical Strap Wear         Remain In- Service           1         89         81         VS4         0.6         PCT         0.67         21         Vertical Strap Wear         Remain In- Service           1         93         81         VS2         0.99         PCT         0.43         18         Vertical Strap Wear         Remain In- Service           1         93         81         VS2         0.99         PCT         0.65         21         Vertical Strap Wear         Remain In- Service           1         98         82         VS5         -1.41         PCT         0.63         20         Vertical Strap Wear         Remain In- Service           1         90         84         VS4         -1.43         PCT         0.41         17         Vertical Strap Wear         Remain In- Service           1         90         84         VS4         -1.43         PCT         0.51         19         Vertical Strap Wear         Remain In- Service </td <td>-</td> <td>90</td> <td>00</td> <td>V 34</td> <td>-1.2</td> <td>FUI</td> <td>0.5</td> <td>10</td> <td>Strap Wear</td> <td>Service</td>	-	90	00	V 34	-1.2	FUI	0.5	10	Strap Wear	Service					
1         0.0         0.0         1.0         0.0         1.0         Strap Wear Vertical Strap Wear         Service Remain In- Service           1         87         81         VS4         0.6         PCT         0.71         21         Vertical Strap Wear         Remain In- Service           1         89         81         VS4         0.6         PCT         0.67         21         Vertical Strap Wear         Remain In- Service           1         93         81         VS2         0.99         PCT         0.65         21         Vertical Strap Wear         Remain In- Service           1         98         82         VS5         -1.41         PCT         0.61         19         Vertical Strap Wear         Remain In- Service           1         95         83         VS2         1.13         PCT         0.63         20         Vertical Strap Wear         Remain In- Service           1         90         84         VS4         -1.43         PCT         0.41         17         Vertical Strap Wear         Remain In- Service           1         92         86         VS4         0.23         PCT         0.51         19         Vertical Strap Wear         Remain In- Service	1	85	81	V/S2	0.96	PCT	05	10	Vertical	Remain In-					
1         87         81         VS4         -1.19         PCT         0.71         21         Vertical Strap Wear         Remain In- Service           1         89         81         VS4         0.6         PCT         0.67         21         Vertical Strap Wear         Remain In- Service           1         93         81         VS2         0.99         PCT         0.43         18         Vertical Strap Wear         Remain In- Service           1         76         82         VS3         -0.8         PCT         0.65         21         Vertical Strap Wear         Remain In- Service           1         98         82         VS5         -1.41         PCT         0.51         19         Vertical Vertical Strap Wear         Remain In- Service           1         90         84         VS4         -1.43         PCT         0.63         20         Vertical Vertical Strap Wear         Remain In- Strap Wear         Service           1         90         84         VS4         -1.43         PCT         0.31         16         Vertical Strap Wear         Remain In- Strap Wear         Service           1         92         86         VS5         1.18         PCT         0.51         19		00	01	V02	0.00	101	0.0	10	Strap Wear	Service					
1         01         03         101         101         0.11         211         Strap Wear Vertical Strap Wear         Service Remain In- Strap Wear           1         93         81         VS2         0.99         PCT         0.43         18         Vertical Strap Wear         Remain In- Service           1         93         81         VS2         0.99         PCT         0.43         18         Vertical Strap Wear         Remain In- Service           1         98         82         VS5         -1.41         PCT         0.65         21         Vertical Strap Wear         Remain In- Service           1         95         83         VS2         1.13         PCT         0.63         20         Vertical Strap Wear         Remain In- Service           1         90         84         VS4         -1.43         PCT         0.41         17         Vertical Strap Wear         Remain In- Service           1         90         84         VS4         -0.23         PCT         0.51         19         Vertical Strap Wear         Remain In- Service           1         92         86         VS5         1.18         PCT         0.51         19         Vertical Strap Wear         Remain In- Service	1	87	81	V/S4	_1 10	PCT	0.71	21	Vertical	Remain In-					
1         89         81         VS4         0.6         PCT         0.67         21         Vertical Strap Wear         Remain In- Service           1         93         81         VS2         0.99         PCT         0.43         18         Vertical Strap Wear         Remain In- Strap Wear           1         76         82         VS3         -0.8         PCT         0.65         21         Vertical Vertical         Remain In- Strap Wear         Service           1         98         82         VS5         -1.41         PCT         0.51         19         Vertical Strap Wear         Remain In- Service           1         90         84         VS4         -1.43         PCT         0.41         17         Vertical Strap Wear         Remain In- Service           1         90         84         VS4         -1.43         PCT         0.31         16         Vertical Strap Wear         Remain In- Service           1         92         86         VS4         0.23         PCT         0.51         19         Vertical Strap Wear         Remain In- Service           1         92         86         VS5         1.18         PCT         0.51         19         Vertical Strap Wear	-	07	01	101	-1.10	101	0.71	21	Strap Wear	Service					
1         0.5         0.6         1.6         0.67         2.1         Strap Wear         Service           1         93         81         VS2         0.99         PCT         0.43         18         Vertical         Remain In-Strap Wear         Service           1         76         82         VS3         -0.8         PCT         0.65         21         Vertical         Remain In-Service           1         98         82         VS5         -1.41         PCT         0.51         19         Vertical         Remain In-Service           1         95         83         VS2         1.13         PCT         0.63         20         Vertical         Remain In-Service           1         90         84         VS4         -1.43         PCT         0.41         17         Vertical         Remain In-Service           1         61         85         VS2         -1.13         PCT         0.31         16         Vertical         Remain In-Service           1         92         86         VS4         0.23         PCT         0.51         19         Vertical         Remain In-Service           1         92         88         VS3	1	80	81	1/5/	0.6	PCT	0.67	21	Vertical	Remain In-					
1         93         81         VS2         0.99         PCT         0.43         18         Vertical Strap Wear         Remain In- Service           1         76         82         VS3         -0.8         PCT         0.65         21         Vertical Strap Wear         Remain In- Service           1         98         82         VS5         -1.41         PCT         0.51         19         Vertical Strap Wear         Remain In- Service           1         95         83         VS2         1.13         PCT         0.63         20         Vertical Vertical Strap Wear         Remain In- Service           1         90         84         VS4         -1.43         PCT         0.41         17         Vertical Strap Wear         Remain In- Service           1         61         85         VS2         -1.13         PCT         0.31         16         Vertical Vertical Strap Wear         Remain In- Service           1         92         86         VS4         0.23         PCT         0.51         19         Vertical Vertical Strap Wear         Remain In- Service           1         92         88         VS3         0.72         PCT         0.51         19         Vertical Vertical Strap Wear<	-	09	01	V04	0.0	FOI	0.07	21	Strap Wear	Service					
1         0.0         0.0         0.0         0.00         0.00         0.00         0.00         Strap Wear         Service           1         76         82         VS3         -0.8         PCT         0.65         21         Vertical         Remain In-Service           1         98         82         VS5         -1.41         PCT         0.51         19         Vertical         Remain In-Service           1         95         83         VS2         1.13         PCT         0.63         20         Vertical         Remain In-Service           1         90         84         VS4         -1.43         PCT         0.41         17         Vertical         Remain In-Service           1         61         85         VS2         -1.13         PCT         0.31         16         Vertical         Remain In-Service           1         92         86         VS4         0.23         PCT         0.51         19         Vertical         Remain In-Service           1         92         86         VS3         -0.74         PCT         0.51         19         Vertical         Remain In-Service           1         92         88         VS3	1	03	81	1/52	0 00	PCT	0 / 3	18	Vertical	Remain In-					
1         76         82         VS3         -0.8         PCT         0.65         21         Vertical Strap Wear         Remain In-Service           1         98         82         VS5         -1.41         PCT         0.51         19         Vertical Strap Wear         Remain In-Service           1         95         83         VS2         1.13         PCT         0.63         20         Vertical Strap Wear         Remain In-Service           1         90         84         VS4         -1.43         PCT         0.61         17         Vertical Strap Wear         Remain In-Service           1         61         85         VS2         -1.13         PCT         0.31         16         Vertical Strap Wear         Remain In-Service           1         92         86         VS4         0.23         PCT         0.51         19         Vertical Strap Wear         Remain In-Service           1         92         86         VS5         1.18         PCT         0.51         19         Vertical Strap Wear         Remain In-Service           1         92         88         VS3         0.72         PCT         0.51         19         Vertical Strap Wear         Remain In-Service	-	30	01	V02	0.33	101	0.40	10	Strap Wear	Service					
1         10         02         103         103         103         21         Strap Wear Strap Wear         Service Remain In- Strap Wear           1         98         82         VS5         -1.41         PCT         0.51         19         Vertical Strap Wear         Remain In- Service           1         95         83         VS2         1.13         PCT         0.63         20         Vertical Strap Wear         Remain In- Service           1         90         84         VS4         -1.43         PCT         0.41         17         Vertical Strap Wear         Remain In- Service           1         61         85         VS2         -1.13         PCT         0.31         16         Vertical Strap Wear         Remain In- Service           1         92         86         VS4         0.23         PCT         0.51         19         Vertical Strap Wear         Remain In- Service           1         92         86         VS5         1.18         PCT         0.93         25         Vertical Strap Wear         Remain In- Service           1         92         88         VS3         0.72         PCT         0.44         18         Vertical Strap Wear         Remain In- Service     <	1	76	82	1/53	0.8	DOT	0.65	21	Vertical	Remain In-					
1         98         82         VS5         -1.41         PCT         0.51         19         Vertical Strap Wear         Remain In- Service           1         95         83         VS2         1.13         PCT         0.63         20         Vertical Strap Wear         Remain In- Service           1         90         84         VS4         -1.43         PCT         0.41         17         Vertical Strap Wear         Remain In- Service           1         61         85         VS2         -1.13         PCT         0.31         16         Vertical Vertical         Remain In- Strap Wear         Service           1         92         86         VS4         0.23         PCT         0.51         19         Vertical Vertical         Remain In- Strap Wear         Service           1         92         86         VS5         1.18         PCT         0.51         19         Vertical Vertical         Remain In- Strap Wear         Service           1         93         87         VS3         -0.74         PCT         0.51         19         Vertical Strap Wear         Remain In- Strap Wear         Service           1         92         88         VS4         -1.04         PCT	I	70	02	V33	-0.0	FUI	0.05	21	Strap Wear	Service					
1         96         32         V33         -1.41         PCI         0.31         19         Strap Wear         Service           1         95         83         VS2         1.13         PCT         0.63         20         Vertical Strap Wear         Remain In- Strap Wear           1         90         84         VS4         -1.43         PCT         0.41         17         Vertical Strap Wear         Remain In- Strap Wear           1         61         85         VS2         -1.13         PCT         0.31         16         Vertical Strap Wear         Remain In- Strap Wear           1         92         86         VS4         0.23         PCT         0.51         19         Vertical Vertical         Remain In- Strap Wear         Service           1         92         86         VS5         1.18         PCT         0.51         19         Vertical Remain In- Strap Wear         Remain In- Strap Wear           1         92         88         VS3         0.72         PCT         0.51         19         Vertical Vertical         Remain In- Strap Wear           1         92         88         VS3         0.72         PCT         0.41         18         Vertical Strap Wear	1	00	စၥ		1 1 1	рст	0 51	10	Vertical	Remain In-					
1         95         83         VS2         1.13         PCT         0.63         20         Vertical Strap Wear         Remain In- Service           1         90         84         VS4         -1.43         PCT         0.41         17         Vertical Strap Wear         Remain In- Service           1         61         85         VS2         -1.13         PCT         0.31         16         Vertical Strap Wear         Remain In- Service           1         92         86         VS4         0.23         PCT         0.51         19         Vertical Strap Wear         Remain In- Service           1         92         86         VS5         1.18         PCT         0.93         25         Vertical Strap Wear         Remain In- Service           1         93         87         VS3         -0.74         PCT         0.51         19         Vertical Strap Wear         Remain In- Service           1         92         88         VS3         0.72         PCT         0.44         18         Vertical Strap Wear         Remain In- Service           1         92         88         VS4         -1.04         PCT         0.47         18         Vertical Strap Wear         Remain In- Strap W	1	90	02	V 30	-1.41	PCI	0.51	19	Strap Wear	Service					
1         93         63         V32         1.13         PC1         0.03         20         Strap Wear         Service           1         90         84         VS4         -1.43         PCT         0.41         17         Vertical Strap Wear         Remain In- Strap Wear           1         61         85         VS2         -1.13         PCT         0.31         16         Vertical Strap Wear         Remain In- Service           1         92         86         VS4         0.23         PCT         0.51         19         Vertical Strap Wear         Remain In- Service           1         92         86         VS5         1.18         PCT         0.93         25         Vertical Vertical Strap Wear         Remain In- Service           1         93         87         VS3         -0.74         PCT         0.51         19         Vertical Strap Wear         Remain In- Service           1         92         88         VS3         0.72         PCT         0.44         18         Vertical Strap Wear         Remain In- Service           1         92         88         VS4         -1.04         PCT         0.47         18         Vertical Strap Wear         Remain In- Service	1	05	02	1/60	1 1 2	рст	0.62	20	Vertical	Remain In-					
1         90         84         VS4         -1.43         PCT         0.41         17         Vertical Strap Wear         Remain In- Service           1         61         85         VS2         -1.13         PCT         0.31         16         Vertical Strap Wear         Remain In- Service           1         92         86         VS4         0.23         PCT         0.51         19         Vertical Strap Wear         Remain In- Service           1         92         86         VS5         1.18         PCT         0.93         25         Vertical Strap Wear         Remain In- Service           1         93         87         VS3         -0.74         PCT         0.51         19         Vertical Strap Wear         Remain In- Service           1         92         88         VS3         0.72         PCT         0.44         18         Vertical Strap Wear         Remain In- Service           1         92         88         VS4         -1.04         PCT         0.47         18         Vertical Strap Wear         Remain In- Service           1         70         98         VS2         0.97         PCT         0.31         16         Vertical Strap Wear         Remain In- Service	I	95	03	V 3Z	1.15	FCI	0.03	20	Strap Wear	Service					
1         30         04         VS4         1.43         1 C1         0.41         11         Strap Wear         Service           1         61         85         VS2         -1.13         PCT         0.31         16         Vertical Strap Wear         Remain In- Service           1         92         86         VS4         0.23         PCT         0.51         19         Vertical Strap Wear         Remain In- Service           1         92         86         VS5         1.18         PCT         0.93         25         Vertical Strap Wear         Remain In- Service           1         93         87         VS3         -0.74         PCT         0.51         19         Vertical Strap Wear         Remain In- Service           1         92         88         VS3         0.72         PCT         0.44         18         Vertical Strap Wear         Remain In- Service           1         92         88         VS4         -1.04         PCT         0.47         18         Vertical Strap Wear         Remain In- Service           1         70         98         VS2         0.97         PCT         0.31         16         Vertical Strap Wear         Service	1	00	84	1/5/	1/3	DOT	0.41	17	Vertical	Remain In-					
1         61         85         VS2         -1.13         PCT         0.31         16         Vertical Strap Wear         Remain In- Service           1         92         86         VS4         0.23         PCT         0.51         19         Vertical Strap Wear         Remain In- Service           1         92         86         VS5         1.18         PCT         0.93         25         Vertical Strap Wear         Remain In- Service           1         93         87         VS3         -0.74         PCT         0.51         19         Vertical Strap Wear         Remain In- Service           1         92         88         VS3         0.72         PCT         0.51         19         Vertical Strap Wear         Remain In- Service           1         92         88         VS4         -1.04         PCT         0.47         18         Vertical Strap Wear         Remain In- Service           1         70         98         VS2         0.97         PCT         0.31         16         Vertical Strap Wear         Remain In- Strap Wear           1         76         100         VS2         -1.03         PCT         0.82         23         Vertical Strap Wear         Remain In- Str	I	90	04	V 34	-1.45	FUI	0.41	17	Strap Wear	Service					
1         01         03         V32         11.13         PCT         0.31         10         Strap Wear         Service           1         92         86         VS4         0.23         PCT         0.51         19         Vertical Strap Wear         Remain In- Strap Wear           1         92         86         VS5         1.18         PCT         0.93         25         Vertical Strap Wear         Remain In- Strap Wear           1         93         87         VS3         -0.74         PCT         0.51         19         Vertical Strap Wear         Remain In- Strap Wear           1         92         88         VS3         0.72         PCT         0.44         18         Vertical Strap Wear         Remain In- Strap Wear         Service           1         92         88         VS4         -1.04         PCT         0.47         18         Vertical Strap Wear         Remain In- Strap Wear         Service           1         70         98         VS2         0.97         PCT         0.31         16         Vertical Strap Wear         Remain In- Strap Wear         Service           1         76         100         VS2         -1.03         PCT         0.82         2	1	61	85	1/52	1 1 2	DOT	0.31	16	Vertical	Remain In-					
1         92         86         VS4         0.23         PCT         0.51         19         Vertical Strap Wear         Remain In- Service           1         92         86         VS5         1.18         PCT         0.93         25         Vertical Strap Wear         Remain In- Strap Wear           1         93         87         VS3         -0.74         PCT         0.51         19         Vertical Strap Wear         Remain In- Strap Wear           1         92         88         VS3         0.72         PCT         0.44         18         Vertical Strap Wear         Remain In- Strap Wear           1         92         88         VS4         -1.04         PCT         0.47         18         Vertical Strap Wear         Remain In- Strap Wear           1         70         98         VS2         0.97         PCT         0.31         16         Vertical Strap Wear         Remain In- Strap Wear         Service           1         76         100         VS2         -1.03         PCT         0.82         23         Vertical Strap Wear         Remain In- Strap Wear         Service           1         76         102         VS2         -0.65         PCT         1.01         25 <td>-</td> <td>01</td> <td>00</td> <td>V 3Z</td> <td>-1.15</td> <td>FUI</td> <td>0.51</td> <td>10</td> <td>Strap Wear</td> <td>Service</td>	-	01	00	V 3Z	-1.15	FUI	0.51	10	Strap Wear	Service					
1         52         60         VS4         6.23         FOT         6.31         13         Strap Wear         Service           1         92         86         VS5         1.18         PCT         0.93         25         Vertical Strap Wear         Remain In- Strap Wear         Service           1         93         87         VS3         -0.74         PCT         0.51         19         Vertical Strap Wear         Remain In- Strap Wear           1         92         88         VS3         0.72         PCT         0.44         18         Vertical Strap Wear         Remain In- Strap Wear           1         92         88         VS4         -1.04         PCT         0.47         18         Vertical Strap Wear         Remain In- Strap Wear           1         70         98         VS2         0.97         PCT         0.31         16         Vertical Strap Wear         Remain In- Strap Wear           1         76         100         VS2         -1.03         PCT         0.82         23         Vertical Strap Wear         Remain In- Strap Wear           1         76         102         VS2         -0.65         PCT         1.01         25         Vertical Strap Wear	1	02	86	1/5/	0.23	PCT	0.51	10	Vertical	Remain In-					
1         92         86         VS5         1.18         PCT         0.93         25         Vertical Strap Wear         Remain In- Strap Wear           1         93         87         VS3         -0.74         PCT         0.51         19         Vertical Strap Wear         Remain In- Strap Wear           1         92         88         VS3         0.72         PCT         0.44         18         Vertical Strap Wear         Remain In- Strap Wear           1         92         88         VS4         -1.04         PCT         0.47         18         Vertical Strap Wear         Remain In- Strap Wear           1         92         88         VS4         -1.04         PCT         0.47         18         Vertical Strap Wear         Remain In- Strap Wear           1         70         98         VS2         0.97         PCT         0.31         16         Vertical Strap Wear         Remain In- Strap Wear           1         76         100         VS2         -1.03         PCT         0.82         23         Vertical Strap Wear         Remain In- Strap Wear           1         76         102         VS2         -0.65         PCT         1.01         25         Vertical Strap Wear		52	00	101	0.20	101	0.01	10	Strap Wear	Service					
1020000000011001010.00200Strap WearService19387VS3-0.74PCT0.5119Vertical Strap WearRemain In- Strap Wear19288VS30.72PCT0.4418Vertical Strap WearRemain In- Strap Wear19288VS4-1.04PCT0.4718Vertical Strap WearRemain In- Strap Wear19288VS20.97PCT0.4718Vertical Strap WearRemain In- Strap Wear17098VS20.97PCT0.3116Vertical Strap WearRemain In- Strap Wear176100VS2-1.03PCT0.8223Vertical Strap WearRemain In- Strap Wear176102VS2-0.65PCT1.0125Vertical Strap WearRemain In- Strap Wear171107VS3-0.94PCT0.4818Vertical Strap WearRemain In- Strap Wear166110VS30.51PCT0.2816Vertical Strap WearRemain In- Strap Wear162112VS30.87PCT0.3416Vertical Strap WearRemain In- Strap Wear155115VS3-1.4PCT0.4117Vertical Strap WearRemain In- Strap Wear	1	92	86	V/S5	1 18	PCT	0 93	25	Vertical	Remain In-					
19387VS3-0.74PCT0.5119Vertical Strap WearRemain In- Service19288VS30.72PCT0.4418Vertical Strap WearRemain In- Service19288VS4-1.04PCT0.4718Vertical Strap WearRemain In- Service19288VS4-1.04PCT0.4718Vertical Strap WearRemain In- Service17098VS20.97PCT0.3116Vertical Strap WearRemain In- Service176100VS2-1.03PCT0.8223Vertical Strap WearRemain In- Service176102VS2-0.65PCT1.0125Vertical Strap WearRemain In- Service171107VS3-0.94PCT0.4818Vertical Strap WearRemain In- Service166110VS30.51PCT0.2816Vertical Strap WearRemain In- Strap Wear162112VS30.87PCT0.3416Vertical Strap WearRemain In- Strap Wear155115VS3-1.4PCT0.4117Vertical Strap WearRemain In- Strap Wear		52	00	100	1.10	101	0.00	20	Strap Wear	Service					
13567V660.74PCT0.6110Strap WearStrap WearService19288VS30.72PCT0.4418Vertical Strap WearRemain In- Strap WearRemain In- Strap Wear19288VS4-1.04PCT0.4718Vertical Strap WearRemain In- Strap Wear17098VS20.97PCT0.3116Vertical Strap WearRemain In- Strap Wear176100VS2-1.03PCT0.8223Vertical Strap WearRemain In- Strap Wear176102VS2-0.65PCT1.0125Vertical Strap WearRemain In- Strap Wear171107VS3-0.94PCT0.4818Vertical Strap WearRemain In- Strap Wear166110VS30.51PCT0.2816Vertical Strap WearRemain In- Strap Wear162112VS30.87PCT0.3416Vertical Strap WearRemain In- Strap Wear155115VS3-1.4PCT0.4117Vertical Strap WearRemain In- Strap Wear	1	93	87	V/S3	-0 74	PCT	0 51	10	Vertical	Remain In-					
19288VS30.72PCT0.4418Vertical Strap WearRemain In- Service19288VS4-1.04PCT0.4718Vertical Strap WearRemain In- Strap Wear17098VS20.97PCT0.3116Vertical Strap WearRemain In- Strap Wear176100VS2-1.03PCT0.8223Vertical Strap WearRemain In- Strap Wear176102VS2-0.65PCT1.0125Vertical Strap WearRemain In- Strap Wear171107VS3-0.94PCT0.4818Vertical Strap WearRemain In- Strap Wear166110VS30.51PCT0.2816Vertical Strap WearRemain In- Strap Wear162112VS30.87PCT0.3416Vertical Strap WearRemain In- Strap Wear155115VS3-1.4PCT0.4117Vertical Strap WearRemain In- Strap Wear	-	00	07	100	0.14	101	0.01	10	Strap Wear	Service					
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176100VS2-1.03PCT0.8223Vertical Strap WearRemain In- Service176102VS2-0.65PCT1.0125Vertical Strap WearRemain In- Service171107VS3-0.94PCT0.4818Vertical Strap WearRemain In- Service166110VS30.51PCT0.2816Vertical Strap WearRemain In- Service162112VS30.87PCT0.3416Vertical Strap WearRemain In- Service155115VS3-1.4PCT0.4117Vertical Strap WearRemain In- Service	-								Strap Wear	Service					
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171107VS3-0.94PCT0.4818Vertical Strap WearRemain In- Service166110VS30.51PCT0.2816Vertical Strap WearRemain In- Service162112VS30.87PCT0.3416Vertical Strap WearRemain In- Service155115VS3-1.4PCT0.4117Vertical Strap WearRemain In- Service									Strap Wear	Service					
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1     62     112     VS3     0.87     PCT     0.34     16     Strap Wear     Service       1     55     115     VS3     -1.4     PCT     0.41     17     Vertical Strap Wear     Remain In- Strap Wear	1	66	110	VS3	0.51	PCT	0.28	16		Remain In-					
162112VS30.87PCT0.3416Vertical Strap WearRemain In- Service155115VS3-1.4PCT0.4117Vertical Strap WearRemain In- Service									Strap wear	Service					
1     55     115     VS3     -1.4     PCT     0.41     17     Strap Wear     Service	1	62	112	VS3	0.87	PCT	0.34	16		Remain in-					
1 55 115 VS3 -1.4 PCT 0.41 17 Vertical Remain In-	<u> </u>								Suap wear	Bomoin In					
	1	55	115	VS3	-1.4	PCT	0.41	17	Strap Woor	Service					

Table 6 U1R21 U-bend Support Structure Wear Indications – SG2												
SG	Row	Col	Locn	Inch	Ind	Volts	%TW	Characterization	Resolution			
2	63	15	VS4	1.03	PCT	0.49	18	Vertical Strap Wear	Remain In- Service			
2	68	18	VS4	0.71	PCT	0.4	17	Vertical Strap Wear	Remain In- Service			
2	70	18	VS4	1.05	PCT	0.4	17	Vertical Strap Wear	Remain In- Service			
2	71	19	VS4	1.05	PCT	0.46	18	Vertical Strap Wear	Remain In- Service			
2	73	21	VS4	0.98	PCT	0.35	17	Vertical Strap Wear	Remain In- Service			
2	75	21	VS4	0.95	PCT	0.61	20	Vertical Strap Wear	Remain In- Service			
2	76	22	VS2	1.03	PCT	0.57	20	Vertical Strap Wear	Remain In- Service			
2	77	23	VS4	0.89	PCT	0.51	19	Vertical Strap Wear	Remain In- Service			
2	78	24	VS2	1.08	PCT	0.65	21	Vertical Strap Wear	Remain In- Service			
2	81	25	VS4	1.18	PCT	0.34	16	Vertical Strap Wear	Remain In- Service			
2	81	27	VS4	0.85	PCT	0.22	15	Vertical Strap Wear	Remain In- Service			
2	83	27	VS4	0.9	PCT	0.61	20	Vertical Strap Wear	Remain In- Service			
2	74	28	VS2	0.88	PCT	0.45	18	Vertical Strap Wear	Remain In- Service			
2	91	37	VS4	0.67	PCT	0.52	19	Vertical Strap Wear	Remain In- Service			
2	89	39	VS4	0.66	PCT	0.27	15	Vertical Strap Wear	Remain In- Service			
2	92	42	VS2	-0.83	PCT	0.64	21	Vertical Strap Wear	Remain In- Service			
2	77	49	VS2	0.92	PCT	0.51	19	Vertical Strap Wear	Remain In- Service			
2	77	49	VS3	-0.69	PCT	0.42	17	Vertical Strap Wear	Remain In- Service			
2	89	51	VS4	0.68	PCT	0.28	16	Vertical Strap Wear	Remain In- Service			
2	94	52	VS1	-0.76	PCT	0.43	18	Vertical Strap Wear	Remain In- Service			
2	94	52	VS2	1.27	PCT	0.67	21	Vertical Strap Wear	Remain In- Service			
2	93	59	VS4	-1.05	PCT	0.43	18	Vertical Strap Wear	Remain In- Service			
2	86	64	VS2	1.2	PCT	0.27	16	Vertical Strap Wear	Remain In- Service			
2	68	68	VS4	0.8	PCT	0.33	16	Vertical Strap Wear	Remain In- Service			

	Table 6         U1R21 U-bend Support Structure Wear Indications – SG2												
SG	Row	Col	Locn	Inch	Ind	Volts	%TW	Characterization	Resolution				
2	97	69	VS3	0.88	PCT	0.34	16	Vertical Strap Wear	Remain In- Service				
2	100	70	VS3	-0.58	PCT	0.46	18	Vertical Strap Wear	Remain In- Service				
2	20	80	VS3	0	PCT	0.62	20	Vertical Strap Wear	Remain In- Service				
2	24	84	VS3	-1	PCT	0.55	19	Vertical Strap Wear	Remain In- Service				
2	78	84	VS3	1.28	PCT	0.36	17	Vertical Strap Wear	Remain In- Service				

	Table 7 U1R21 U-bend Support Structure Wear Indications – SG3												
SG	Row	Col	Locn	Inch	Ind	Volts	%TW	Characterization	Resolution				
3	36	50	VS3	-0.15	PCT	0.49	18	Vertical Strap Wear	Remain In- Service				
3	96	52	VS3	-0.12	PCT	0.37	17	Vertical Strap Wear	Remain In- Service				
3	96	52	VS4	1.06	PCT	0.26	15	Vertical Strap Wear	Remain In- Service				
3	47	53	VS2	1.03	PCT	0.29	16	Vertical Strap Wear	Remain In- Service				
3	64	54	VS2	-1.22	PCT	0.26	15	Vertical Strap Wear	Remain In- Service				
3	96	56	VS3	0.95	PCT	0.56	19	Vertical Strap Wear	Remain In- Service				
3	98	56	VS4	-1.04	PCT	0.87	24	Vertical Strap Wear	Remain In- Service				
3	100	56	VS3	1.04	PCT	0.33	16	Vertical Strap Wear	Remain In- Service				
3	101	57	VS3	0.77	PCT	0.4	17	Vertical Strap Wear	Remain In- Service				
3	101	57	VS4	0.77	PCT	0.29	16	Vertical Strap Wear	Remain In- Service				
3	91	61	VS4	-0.95	PCT	0.27	15	Vertical Strap Wear	Remain In- Service				
3	94	62	VS3	1.48	PCT	0.39	17	Vertical Strap Wear	Remain In- Service				
3	87	63	VS2	1.39	PCT	0.69	21	Vertical Strap Wear	Remain In- Service				
3	87	65	VS3	0.89	PCT	0.82	23	Vertical Strap Wear	Remain In- Service				
3	75	69	VS4	0.63	PCT	0.65	21	Vertical Strap Wear	Remain In- Service				
3	77	69	VS4	0.84	PCT	0.41	17	Vertical Strap Wear	Remain In- Service				
3	85	69	VS4	0.82	PCT	0.77	22	Vertical Strap Wear	Remain In- Service				
3	89	69	VS4	-0.88	PCT	0.64	20	Vertical Strap Wear	Remain In- Service				

	Table 7         U1R21 U-bend Support Structure Wear Indications – SG3												
SG	Row	Col	Locn	Inch	Ind	Volts	%TW	Characterization	Resolution				
3	91	69	VS2	0.73	PCT	0.5	19	Vertical Strap Wear	Remain In- Service				
3	89	71	VS4	1.04	PCT	0.36	17	Vertical Strap Wear	Remain In- Service				
3	97	71	VS3	0.76	PCT	0.27	16	Vertical Strap Wear	Remain In- Service				
3	80	72	VS4	-0.86	PCT	0.51	19	Vertical Strap Wear	Remain In- Service				
3	91	73	VS4	0.71	PCT	0.43	18	Vertical Strap Wear	Remain In- Service				
3	67	75	VS2	1.24	PCT	0.48	18	Vertical Strap Wear	Remain In- Service				
3	73	75	VS3	0.84	PCT	0.38	17	Vertical Strap Wear	Remain In- Service				
3	66	76	VS2	1	PCT	0.33	16	Vertical Strap Wear	Remain In- Service				
3	77	77	VS2	0.97	PCT	0.58	20	Vertical Strap Wear	Remain In- Service				
3	79	79	VS2	-0.71	PCT	0.57	17	Vertical Strap Wear	Remain In- Service				
3	79	79	VS3	0.88	PCT	0.39	20	Vertical Strap Wear	Remain In- Service				
3	34	80	VS3	-0.37	PCT	0.56	19	Vertical Strap Wear	Remain In- Service				
3	67	81	VS2	0.85	PCT	0.37	19	Vertical Strap Wear	Remain In- Service				
3	67	81	VS3	-0.75	PCT	0.5	17	Vertical Strap Wear	Remain In- Service				
3	77	81	VS2	0.81	PCT	0.52	19	Vertical Strap Wear	Remain In- Service				
3	76	82	VS2	1.03	PCT	0.44	18	Vertical Strap Wear	Remain In- Service				
3	67	87	VS3	-0.71	PCT	0.35	17	Vertical Strap Wear	Remain In- Service				
3	73	87	VS3	-0.49	PCT	0.61	20	Vertical Strap Wear	Remain In- Service				
3	76	90	VS2	0.79	PCT	0.56	19	Vertical Strap Wear	Remain In- Service				
3	71	91	VS2	1.13	PCT	0.3	16	Vertical Strap Wear	Remain In- Service				
3	70	92	VS3	-0.74	PCT	0.51	19	Vertical Strap Wear	Remain In- Service				
3	76	92	VS3	-0.83	PCT	0.51	19	Vertical Strap Wear	Remain In- Service				
3	78	92	VS3	-0.87	PCT	0.44	18	Vertical Strap Wear	Remain In- Service				
3	68	96	VS3	-0.81	PCT	0.54	19	Vertical Strap Wear	Remain In- Service				
3	73	103	VS2	0.88	PCT	0.43	18	Vertical Strap Wear	Remain In- Service				

	Table 7         U1R21 U-bend Support Structure Wear Indications – SG3										
SG	Row	Col	Locn	Inch	Ind	Volts	%TW	Characterization	Resolution		
3	66	106	VS2	-0.66	PCT	0.51	19	Vertical Strap Wear	Remain In- Service		
3	66	106	VS3	0.73	PCT	0.51	19	Vertical Strap Wear	Remain In- Service		
3	59	113	VS4	1.15	PCT	0.54	19	Vertical Strap Wear	Remain In- Service		

			U1R21 L	J-bend S	upport S	Table 8 Structure	e Wear I	ndications – SG4	
SG	Row	Col	Locn	Inch	Ind	Volts	%TW	Characterization	Resolution
4	92	38	VS2	0.8	PCT	0.3	16	Vertical Strap Wear	Remain In- Service
4	27	45	VS3	0.07	PCT	0.45	18	Vertical Strap Wear	Remain In- Service
4	95	47	VS3	1.2	РСТ	0.42	16	Vertical Strap Wear	Remain In- Service
4	95	47	VS3	-0.72	PCT	0.33	17	Vertical Strap Wear	Remain In- Service
4	96	48	VS3	-0.8	PCT	0.75	22	Vertical Strap Wear	Remain In- Service
4	97	49	VS3	-0.72	PCT	0.27	15	Vertical Strap Wear	Remain In- Service
4	56	50	VS3	0.14	PCT	0.52	19	Vertical Strap Wear	Remain In- Service
4	98	52	VS3	-0.55	PCT	0.42	17	Vertical Strap Wear	Remain In- Service
4	30	54	VS3	-0.2	PCT	0.68	21	Vertical Strap Wear	Remain In- Service
4	55	55	VS3	0.11	РСТ	0.41	17	Vertical Strap Wear	Remain In- Service
4	97	55	VS2	-0.72	PCT	0.37	16	Vertical Strap Wear	Remain In- Service
4	97	55	VS4	-0.45	PCT	0.24	15	Vertical Strap Wear	Remain In- Service
4	97	55	VS4	-1.01	РСТ	0.34	17	Vertical Strap Wear	Remain In- Service
4	99	55	VS2	-0.79	PCT	0.4	23	Vertical Strap Wear	Remain In- Service
4	99	55	VS3	-0.24	PCT	0.83	17	Vertical Strap Wear	Remain In- Service
4	58	56	VS3	-0.47	PCT	0.78	22	Vertical Strap Wear	Remain In- Service
4	50	60	VS3	-0.21	PCT	0.42	17	Vertical Strap Wear	Remain In- Service
4	28	62	VS3	-1.07	PCT	0.56	19	Vertical Strap Wear	Remain In- Service
4	99	63	VS5	0.96	РСТ	0.32	16	Vertical Strap Wear	Remain In- Service

	Table 8         U1R21 U-bend Support Structure Wear Indications – SG4										
SG	G Row Col Locn Inch Ind Volts %TW Characterization						Resolution				
4	68	64	VS3	-0.76	PCT	0.43	18	Vertical Strap Wear	Remain In- Service		
4	70	64	VS2	0.64	PCT	0.31	16	Vertical Strap Wear	Remain In- Service		
4	70	64	VS4	0.73	PCT	0.29	16	Vertical Strap Wear	Remain In- Service		
4	70	66	VS2	0.94	PCT	0.23	15	Vertical Strap Wear	Remain In- Service		
4	62	74	VS2	-0.74	PCT	0.27	15	Vertical Strap Wear	Remain In- Service		
4	45	75	VS3	0.03	PCT	0.68	21	Vertical Strap Wear	Remain In- Service		
4	45	79	VS3	-0.69	PCT	0.66	21	Vertical Strap Wear	Remain In- Service		
4	51	85	VS3	0.06	PCT	0.71	21	Vertical Strap Wear	Remain In- Service		

	Table 9         U1R21 Horizontal Tube Support Grid Wear Indications - All SGs										
SG	Row	Col	Locn	Locn Inch Ind Volts %TW Characterization					Resolution		
1	4	36	C06	-0.99	PCT	0.26	15	Horizontal Grid Wear	Remain In- Service		
1	98	70	C07	0.69	PCT	0.64	20	Horizontal Grid Wear	Remain In- Service		
1	98	72	C07	0.57	PCT	0.53	19	Horizontal Grid Wear	Remain In- Service		
1	98	82	C07	0.67	PCT	0.35	17	Horizontal Grid Wear	Remain In- Service		
2	5	37	H02	0.57	PCT	0.35	22	Horizontal Grid Wear	Remain In- Service		
2	5	37	H02	-0.94	PCT	0.74	17	Horizontal Grid Wear	Remain In- Service		
2	10	102	C05	-0.86	PCT	0.37	17	Horizontal Grid Wear	Remain In- Service		
3	5	33	H06	-0.95	PCT	0.41	17	Horizontal Grid Wear	Remain In- Service		
4	11	33	H03	-1.13	PCT	0.36	17	Horizontal Grid Wear	Remain In- Service		

6. A description of the condition monitoring assessment and results, including the margin to the tube integrity performance criteria and comparison with the margin predicted to exist at the inspection by the previous forward-looking tube integrity assessment (TS 5.6.6.c.3). Discuss any degradation that was not bounded by the prior operational assessment in terms of projected maximum flaw dimensions, minimum burst strength, and/or accident induced leak rate. Provide details of any in situ pressure test.

A condition monitoring (CM) assessment was performed as required by the SQN Unit 1 SG program. The only tube degradation detected during the U1R21 inspection was wear at tube support structures. The limiting indication had an estimated depth of 36%TW from the bobbin coil exam and was located at a vertical strap. This indication was less than the worst-case projected U-bend support structure wear indication of 50.7%TW from the previous forward-looking tube integrity assessment.

Conservatively assuming an enveloping flaw length slightly greater than the width of the support (2.5 inches), the CM limit for U-bend support structure wear is 47%TW. Therefore, the margin between the worst-case as found degradation and the CM limit was 11%TW. The CM limit includes uncertainties for material properties, NDE depth sizing, and the burst pressure relationship. Because the deepest flaw has an estimated depth less than the conservatively determined CM limit, the structural integrity performance criterion was met for the operating interval prior to U1R21.

Because volumetric wear indications will leak and burst at essentially the same pressure, accident-induced leakage integrity is also demonstrated. Operational leakage integrity was demonstrated by the absence of any detectable primary-to-secondary leakage during the operating interval prior to U1R21. Because tube integrity was demonstrated analytically, in-situ pressure testing was not required nor performed during U1R21. There were no tube pulls planned or performed during U1R21.

## 7. The number of tubes plugged during the inspection outage (TS 5.6.6.c.4). Also, provide the tube location and reason for plugging.

Table 10 provides the numbers of tubes plugged for each degradation mechanism detected. One tube was plugged during U1R21 for wear at the U-bend support structure. Table 10 also shows the numbers of tubes plugged before and after the U1R21 outage and the percentage of tubes currently plugged. The one plugged tube location was in SG1 at row 90 column 70, which was preventively plugged for wear at a U-bend support structure location.

#### Enclosure 1

Tubes plugged	SG 1	SG 2	SG 3	SG 4	Total
Plugged tubes prior to U1R21	15	6	7	5	33
Plugged tubes during U1R21 for U-bend Support Structure Wear	1	0	0	0	1
Plugged tubes during U1R21 for Horizontal Grid Wear	0	0	0	0	0
Total plugged tubes to Date	16	6	7	5	34
Effective Percentage Plugged to Date	0.32%	0.12%	0.14%	0.10%	0.17%

Table 10Number of Tubes Plugged for Each Degradation Mechanism

# 8. An analysis summary of the tube integrity conditions predicted to exist at the next scheduled inspection (the forward-looking tube integrity assessment) relative to the applicable performance criteria, including the analysis methodology, inputs, and results (TS 5.6.6.d). The effective full power months of operation permitted for the current operational assessment.

For consistency with the other sections in this enclosure and Reference 3, the information in this section is provided in EFPY rather than EFPM. Based on application of conservative U-bend support structure and horizontal ATSG wear growth rates, the condition of the SQN Unit 1 RSG tubes has been analyzed with respect to continued operability of the SGs without exceeding the SG tube integrity performance criteria. The growth rates were determined by comparative analysis of U-bend support structure and horizontal ATSG wear sites for the SGs. The OA was performed using a %TW volume-based computer program, which demonstrated tube integrity is maintained for at least the next 7.5 EFPY of operation. The associated inputs and results are provided in Tables 11 and Table 12. The flaw population in the SGs meets the structural integrity performance criteria of 4,200 pounds per square inch (psi) at 95% probability and 50% confidence levels for at least 7.5 EFPY of operation. For pressure-only loading of volumetric flaws, satisfaction of the structural integrity implies satisfaction of leakage integrity at accident conditions because steam line break accident condition pressure differential for pop-through is much smaller than  $3\Delta P_{NO}$ .

SG	Beginning of Growth Period	End of Growth Period	Growth Period (EFPY)	Max R21 Indication Remaining In-Service (%TW)	Projection EFPY	Largest Projected Flaw (including NDE Uncertainty)	95/50 Burst Pressure (psi)
	5.40	5.01				(% I VV)	
1	R18	R21	4.08	28	1.5	54.4	4,314
2	R18	R21	4.08	21	7.5	47.6	4,907
3	R18	R21	4.08	24	7.5	46.4	4,901
4	R18	R21	4.08	23	7.5	54.4	4,376

Table 11 Projected 95/50 Burst Pressures for U-bend Structural Support Wear

Table 12:Projected 95/50 Burst Pressures for ATSG Tube

SG	Beginning of Growth Period	End of Growth Period	Growth Period (EFPY)	Maximum R21 Indication Remaining In-Service (%TW)	Projection EFPY	Largest Projected Flaw (including NDE Uncertainty) (%TW)	95/50 Burst Pressure (psi)
1-4 (Note 1)	U1R18	U1R21	4.08	22	9.0	53.9	4,519

Note 1: Flaws from all SGs included with maximum flaw referenced in table above.

## 9. The number and percentage of tubes plugged to date, and the effective plugging percentage in each SG (TS 5.6.6.e).

Table 10 provides the number and percentage of tubes plugged to date and the effective tube plugging percentage in each SG.

## 10. The results of any SG secondary-side inspection (TS 5.6.6.f). The number, type, and location (if available) of loose parts that could damage tubes removed or left in service in each SG.

The secondary side foreign object search and retrieval (FOSAR) inspections performed in the four SGs included visual examination of tube bundle periphery tubes from the hot leg and cold leg annulus and center no tube lane. A total of 15 foreign objects were removed from the top of the tubesheet region and 23 objects remain on the secondary side among the four SGs. The foreign objects remaining are small pieces of gasket, wires, bristles, and graphite, which are located at the top of the tubesheet on either the hot leg or cold leg side. The limiting foreign object in terms of dimensions was a wire measuring 1.5 inches long and 0.025 inch in diameter located at the hot leg tubesheet in SG4 at tube row 32, column 60.

Any foreign objects not able to be retrieved were characterized and an analysis performed to demonstrate acceptability of continued operation without exceeding the performance criteria. A limited top of tubesheet in-bundle visual inspection was also performed in each SG for the purpose of assessing and trending the level of hardened deposit buildup in the

kidney region. The tube integrity assessment of the foreign objects remaining in the SGs also supports the conclusion as no adverse effects on tube integrity are projected within 7.5 EFPY of operation.

#### 11. The scope, method, and results of secondary-side cleaning performed in each SG

Prior to the secondary side FOSAR inspections, sludge, scale, foreign objects, and other deposit accumulations at the top of the tubesheet were removed as part of the top of tubesheet high pressure water lancing process. The weight of deposits removed from each SG by this cleaning process is provided in Table 13.

SG	Weight
SG1	24.0 lbs
SG2	36.5 lbs
SG3	24.5 lbs
SG4	32.5 lbs
All SGs	117.5 lbs

## Table 13U1R21 SG Deposit Removal Weights

#### 12. The results of primary side component visual inspections performed in each SG.

For the primary side tube plug and channel head bowl visual inspections performed during U1R21, there were no indications of tube plug leakage or failure and no indications of channel head bowl cladding or divider plate degradation.

#### 13. Any plant specific reporting requirements, if applicable.

SQN Unit 1 TS 5.6.6 does not have any plant specific reporting requirements.

#### <u>References</u>

- 1. TVA letter to NRC, CNL-22-001, "Application to Revise Technical Specifications to Adopt TSTF-577, 'Revised Frequencies for Steam Generator Tube Inspections' (SQN-TS-21-03 and WBN-TS-21-08)," dated April 4, 2022 (ML22095A023)
- NRC letter to TVA, "Sequoyah Nuclear Plant, Units 1 and 2; and Watts Bar Nuclear Plant, Units 1 and 2 – Issuance of Amendment Nos. 359, 353, 155, and 63 Regarding Adoption of Technical Specification Task Force Traveler TSTF-577, 'Revised Frequencies for Steam Generator Tube Inspections' (EPID L-2022-LLA-0051)," dated October 24, 2022 (ML22276A161)
- 3. TVA letter to NRC, "Unit 1 Cycle 21 180-Day Steam Generator Tube Inspection Report," dated February 13, 2017 (ML17045A145)
- 4. Steam Generator Management Program: Steam Generator Integrity Assessment Guidelines—Revision 5. EPRI, Palo Alto, CA: 2021. 3002020909.

#### Enclosure 2

Sequoyah Nuclear Plant, Unit 2 Steam Generator Tube Inspection Report

Sequoyah Nuclear Plant, Unit 2 Steam Generator Tube Inspection Report

#### Introduction

In Reference 1, Tennessee Valley Authority (TVA) submitted a request for an amendment to Renewed Facility Operating License No. DPR-79 for Sequoyah Nuclear Plant (SQN), Unit 2 to adopt TSTF-577. Reference 1 was approved by the Nuclear Regulatory Commission (NRC) in Reference 2. As noted in Reference 1, "TVA will submit a SG Tube Inspection Report for SQN Units 1 and 2 meeting the revised TS 5.6.6 requirements within 30 days after implementation of the license amendment." Reference 2 was implemented for SQN on December 19, 2022.

SQN Unit 2 TS 5.6.6, "Steam Generator Tube Inspection Report," states "A report shall be submitted within 180 days after the initial entry into MODE 4 following completion of an inspection performed in accordance with the Specification 5.5.7, 'Steam Generator (SG) Program'." This enclosure provides the revised 180-day report with the revised SQN Unit 2 TS 5.6.6 reporting requirements in accordance with References 1 and 2. Each SQN Unit 2 TS 5.6.6 reporting requirement is listed below along with the associated information based on the inspection performed during the SQN Unit 2 Cycle 22 fall 2018 refueling outage (U2R22), which was the last inspection of the SQN Unit 2 replacement steam generators (RSG) (Reference 3). This report follows the template provided in Appendix G to the EPRI *Steam Generator Management Program: Steam Generator Integrity Assessment Guideline, Revision 5* (Reference 4), which provides additional information beyond the SQN Unit 2 TS 5.6.6 reporting requirements.

#### 1. Design and operating parameters

The original SGs at SQN Unit 2 were replaced in 2012 with Westinghouse Model 57AG<sup>+</sup> SGs, which have thermally treated Alloy 690 tubing. Inspections of the RSGs were last performed during U2R22. These inspections included eddy current testing of the SG tubing as well as primary and secondary side cleanings and visual inspections. Table 1 provides the SQN Unit 2 SG design and operating parameter information.

	Table 1
Steam Generato	or Design and Operating Parameters
SG Model / Tube Material /	Westinghouse Model 57AG⁺ / Alloy 690TT / 4
Number of SGs per Unit	
Number of tubes per SG /	4,983 / 0.75 in. / 0.043 in
Nominal Tube Diameter / tube	
thickness	
Support Plate Style / Material	ATSG and vertical straps/stainless steel
Last Inspection Date	Fall 2016 during U2R19
EFPM Since Last Inspection	49.08 EFPM (4.09 EFPY) (from U2R19 to U2R22)
Total Cumulative SG EFPY	5.4 EFPY (as of U2R22)
Mode 4 Initial Entry	12/3/2018 from U2R22
Observed Primary-to-Secondary	No Observed Leakage
Leak Rate	
Nominal Thot at Full Power	611°F
Operation	
Loose Parts Strainer	The Model 57AG⁺ design has spray can nozzles on
	the main feedwater distribution ring. Each nozzle has
	small diameter holes acting as strainers to prevent the
	introduction of foreign material into the SGs.
Degradation Mechanism	There are no sets of tubing currently designated
Sub-Population	as degradation mechanism sub populations in the
	U2R22 operational assessment.
SG program guideline deviations	None
since last Inspection	
SG Schematic	See Figure 1





Figure 1

#### Tube Support Arrangement for Sequoyah Unit 2 Model 57AG<sup>+</sup> Replacement SGs

Notes: VS - Vertical Strap DS - Diagonal Strap HTS/CTS -Hot/Cold Tubesheet (designates top of tubesheet) HTE/CTE - Hot/Cold Tube End Horizontal supports are a lattice grid design

### 2. The scope of the inspections performed on each SG (TS 5.6.6.a) and if applicable, a discussion of the reason for scope expansion

The U2R22 outage included a 100% bobbin inspection of the full length of all in-service tubes. The combination bobbin and array probe was used to inspect the top of tubesheet intersections of tubes along the tube bundle periphery and center tube lane a minimum of three tubes deep on both the hot leg (HL) and cold leg (CL) side. As a result, the inspection included the tubes with prior indications of degradation and all tubes not inspected during the previous SG in-service inspection. Array and rotating pancake coil (RPC) probes were used for special interest testing and resolution of bobbin indications when necessary. Table 2 summarizes the number and type of eddy current examinations performed during U2R22. There was no scope expansion required or performed during the U2R22 eddy current inspections.

Scope#	Eddy Current Exam Type	SG 1	SG 2	SG 3	SG 4	Total
1	0.610 Full Length Bobbin <sup>1</sup>	2,380	4,247	3,685	3,495	13,807
2	0.610 HL Bobbin VS3-HTE <sup>1</sup>	2,115	248	810	1,000	4,173
3	0.610 CL Bobbin VS3-CTE <sup>1</sup>	2,115	248	810	1,000	4,173
4	0.610 HL Array Rows 1-9 H01-HTE	787	787	787	756 <sup>2</sup>	3,117
5	0.610 CL Array Rows 1-9 C01-CTE	787	787	787	787	3,148
6	0.610 Array HL&CL Special Interest	18	16	13	93	125
7	0.610 HL RPC Special Interest	0	0	0	9	9

Table 2U2R22 Steam Generator Eddy Current Inspection Scope

Notes:

- 1. These tube inspections were performed with the array coil only in order to capture both bobbin and array data full length in the tubes above Row 4.
- 2. The remaining array probe tests were captured in scopes 1 through 3 where combination bobbin and array probes were used.

In addition to the eddy current inspections, visual inspections were also performed on both the primary and secondary sides. Primary side visual inspections included the channel head bowl cladding and the divider plate. There were no previously installed tube plugs to inspect from the primary side. Secondary side visual inspections were performed at the top of the tubesheet for the detection of foreign objects, assessment of hard deposit buildup in the tube bundle interior kidney region, and for determining the effectiveness of the tubesheet cleaning performed in the four SGs.

## 3. The nondestructive examination techniques utilized for tubes with increased degradation susceptibility (TS 5.6.6.b).

No tubes were designated as having increased degradation susceptibility during the U2R22 inspection.

## 4. The nondestructive examination technique utilized for each degradation mechanism found (TS 5.6.6.c.1).

Table 3 provides the NDE techniques that were used for the detection of each degradation mechanism that was considered as existing or potential for the U2R22 inspection.

Degradation Mechanism	Detection Technique	EPRI ETSS		
LI Bond Support Structure	Bobbin	96004.1, Revision 13		
Woor	Array	11956.1, Revision 3		
vvear	Array	11956.2, Revision 2		
Harizantal Tuba Support	Bobbin	96004.1, Revision 13		
Grid Woor	Array	11956.1, Revision 3		
Glid Wear	Array	11956.2, Revision 2		
	Bobbin	27091.2, Revision 2		
Foreign Object Weer	Array	1790X.1, Revision 0 <sup>1</sup>		
Foreign Object Wear	Array	1790X.3, Revision 0 <sup>1</sup>		
	RPC	2790X.1 <sup>1</sup>		
Tubo to Tubo	Bobbin	13091.1, Revision 0		
Contact Moor	Array	13902.1, Revision 0		
Contact Wear	RPC	13901.1, Revision 0		

Table 3NDE Techniques for Each Existing or Potential Degradation Mechanism

Note 1: The applicable ETSSs are numbered 2790X.1 where X is variable between 1 and 7. For ETSS 1790X.1 and 1790X.3 techniques, X is a variable between 1 and 6 and all are Revision 0. Techniques and corresponding uncertainty used for sizing of foreign object wear is dependent on foreign object wear indication geometry.

# The location, orientation (if linear), measured size (if available), and voltage response for each indication. For tube wear at support structures less than 20 percent through-wall, only the total number of indications needs to be reported (TS 5.6.6.c.2).

Volumetric wear was the only degradation mechanism detected during the U2R22 inspection. The support structure wear indications detected were located at the U-bend or horizontal tube supports. There were also foreign object wear indications located just below the first support on the hot leg side (H01) in SG 4. Table 4 provides the number of indications reported during the U2R22 inspection.

Table 4Number of Indications Detected for Each Degradation Mechanism

Degradation Mechanism	SG 1	SG 2	SG 3	SG 4	Total
U-bend Support Structure Wear	3	5	1	1	10
Horizontal Tube Support Grid Wear	5	1	3	6	15
Foreign Object Wear	0	0	0	4	4

Tables 5 through 7 provide a listing of the service-induced indications reported during the U2R22 inspection including the measured depths from the bobbin coil. Indications of tube wear at support structures are provided regardless of percent through-wall depth and the voltages provided correspond to the bobbin coil. The voltages provided for foreign object wear correspond to the RPC.

Table 5 U2R22 U-bend Support Structure Wear Indications – All SGs									
SG	Row	Col	Locn	Inch	Ind	Volts	%TW	Characterization	Resolution
1	69	95	DS4	0.93	PCT	0.38	18	U-bend Support Wear	Remain In- Service
1	92	62	VS3	0.79	PCT	0.35	18	U-bend Support Wear	Remain In- Service
1	97	61	VS2	0.89	PCT	0.41	19	U-bend Support Wear	Remain In- Service
2	89	59	VS2	-0.96	PCT	0.20	15	U-bend Support Wear	Remain In- Service
2	93	59	VS2	-1.07	PCT	0.69	23	U-bend Support Wear	Remain In- Service
2	93	59	VS3	0.73	PCT	0.16	13	U-bend Support Wear	Remain In- Service
2	95	63	VS3	0.35	PCT	0.31	17	U-bend Support Wear	Remain In- Service
2	98	64	DS3	-0.77	PCT	0.27	16	U-bend Support Wear	Remain In- Service
3	82	78	VS2	-0.57	PCT	0.77	24	U-bend Support Wear	Remain In- Service
4	67	67	DS4	-0.7	PCT	0.22	15	U-bend Support Wear	Remain In- Service

Table 6 U2R22 Horizontal Tube Support Grid Wear Indications - All SGs										
SG Row Col Locn Inch Ind Volts %TW Characterization Reso							Resolution			
1	3	1	C04	-1	PCT	0.48	20	Horizontal Tube Support Grid Wear	Remain In- Service	
1	3	1	C05	-0.98	PCT	0.30	17	Horizontal Tube Support Grid Wear	Remain In- Service	
1	3	91	C04	-0.92	PCT	0.34	17	Horizontal Tube Support Grid Wear	Remain In- Service	
1	3	91	C05	0.66	PCT	0.65	22	Horizontal Tube Support Grid Wear	Remain In- Service	
1	6	60	H03	0.05	PCT	0.27	16	Horizontal Tube Support Grid Wear		
2	3	85	C05	0.64	PCT	0.50	21	Horizontal Tube Support Grid Wear	Remain In- Service	
3	14	122	C05	-0.99	PCT	0.32	17	Horizontal Tube Support Grid Wear		
3	22	54	H04	-1.11	PCT	0.62	22	Horizontal Tube Support Grid Wear	Remain In- Service	

	Table 6           U2R22 Horizontal Tube Support Grid Wear Indications - All SGs										
SG Row Col Locn Inch Ind Volts %TW Characterization Resolution											
3	43	119	C05	-1.04	PCT	0.57	21	Horizontal Tube Support Grid Wear	Remain In- Service		
4	1	93	C06	-0.95	PCT	0.35	18	Horizontal Tube Support Grid Wear	Remain In- Service		
4	3	39	C04	-0.94	PCT	0.24	15	Horizontal Tube Support Grid Wear	Remain In- Service		
4	3	93	C06	-0.97	PCT	0.21	15	Horizontal Tube Support Grid Wear	Remain In- Service		
4	4	102	C05	0.73	PCT	0.27	16	Horizontal Tube Support Grid Wear	Remain In- Service		
4	5	33	C06	0.71	PCT	0.23	15	Horizontal Tube Support Grid Wear	Remain In- Service		
4	5	33	C07	-0.99	PCT	0.29	17	Horizontal Tube Support Grid Wear	Remain In- Service		

Table 7 U2R22 Foreign Object Wear Indications - All SGs										
SG Row Col Locn Inch Ind Volt %TW Characterization Resolu							Resolution			
4	98	76	H01	-1.08	VOL	0.60	21	Foreign Object Wear	Remain In- Service	
4	99	75	H01	-1.15	VOL	0.16	8	Foreign Object Wear	Remain In- Service	
4	97	75	H01	-1.15	VOL	0.66	23	Foreign Object Wear	Remain In- Service	
4	96	74	H01	-1.32	VOL	0.17	9	Foreign Object Wear	Remain In- Service	

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6. A description of the condition monitoring assessment and results, including the margin to the tube integrity performance criteria and comparison with the margin predicted to exist at the inspection by the previous forward-looking tube integrity assessment (TS 5.6.6.c.3). Discuss any degradation that was not bounded by the prior operational assessment in terms of projected maximum flaw dimensions, minimum burst strength, and/or accident induced leak rate. Provide details of any in situ pressure test.

A CM assessment was performed as required by the SQN Unit 2 SG program. The tube degradation detected during the U2R22 inspection included wear at the U-bend and horizontal grid tube support structures and wear due to foreign objects. The CM results for each of these mechanisms are as follows.

- **U-bend Support Wear:** The deepest U-bend tube support structure wear indication detected during U2R22 had a measured depth of 24%TW from the bobbin coil exam. The U2R22 CM limit for U-bend support structure wear is 45%TW conservatively assuming an enveloping 2.5 inch flaw length. Therefore, the margin between the largest flaw and the CM limit for U-bend tube support wear is 21%TW. The as-found depth is also less than the worst-case projected U-bend support structure wear indication of 46.5%TW from the U2R19 OA.
- Horizontal Grid Wear: The deepest horizontal grid support tube wear indication detected during U2R22 had a measured depth of 22%TW from the bobbin coil exam. Conservatively assuming an enveloping flaw length equal to the full width of the support (2.0 inches), the CM limit for horizontal grid support structure wear is 46%TW. This was a new degradation mechanism for U2R22 and no projection was performed by the U2R19 OA.
- Foreign Object Wear: The deepest foreign object wear indication had a measured depth of 23%TW from the array coil exam and was located just below the bottom edge of tube support H01 near the tube bundle periphery. The array coil ETSS technique 17905.1 corresponding to flat volumetric wear was applied to size the foreign object wear indications. Conservatively assuming an enveloping flaw length of 1.5 inches, the CM limit for U-bend support structure wear is 47%TW. This was a new degradation mechanism for U2R22 and no projection was performed by the U2R19 OA. Because the foreign object was removed, there is no reason to project any growth in %TW degradation.

These CM limits include uncertainties for material properties, NDE depth sizing, and the burst pressure relationship. Because the deepest flaw has an estimated depth less than the corresponding CM limit, the structural integrity performance criterion was met for the operating interval prior to U2R22. Because volumetric wear indications will leak and burst at essentially the same pressure, accident-induced leakage integrity at a much lower accident pressure differential is also satisfied. Operational leakage integrity was demonstrated by the absence of any detectable primary-to-secondary leakage during the inspection interval from U2R19 to U2R22. Because tube integrity was demonstrated analytically, in-situ pressure testing was not required nor performed during the U2R22 outage. No tube pulls were planned or performed during U2R22.

### 7. The number of tubes plugged during the inspection outage (TS 5.6.6.c.4). Also, provide the tube location and reason for plugging.

Table 8 provides the numbers of tubes plugged for each degradation mechanism detected. There were no tubes plugged prior to U2R22 and there were no tubes plugged during U2R22. Therefore, there are currently no tubes plugged in any SG at SQN Unit 2.

Tubes plugged	SG 1	SG 2	SG 3	SG 4	Total
Plugged Tubes prior to U2R22	0	0	0	0	0
Tubes Plugged during U2R22	0	0	0	0	0
Total Plugged to Date	0	0	0	0	0
Effective Percentage Plugged to Date	0.00%	0.00%	0.00%	0.00%	0.00%

Table 8Number of Tubes Plugged for Each Degradation Mechanism

8. An analysis summary of the tube integrity conditions predicted to exist at the next scheduled inspection (the forward-looking tube integrity assessment) relative to the applicable performance criteria, including the analysis methodology, inputs, and results (TS 5.6.6.d). The effective full power months of operation permitted for the current operational assessment.

For consistency with the other sections in this enclosure and Reference 3, the information in this section is provided in EFPY rather than EFPM. Based on application of conservative U-bend support structure and horizontal ATSG wear growth rates, the condition of the SQN Unit 2 RSG tubes has been analyzed with respect to continued operability of the SGs without exceeding the SG tube integrity performance criteria. The growth rates were determined by comparative analysis of U-bend support structure and horizontal ATSG wear sites for the SG. The OA was performed using a %TW volume based computer program which demonstrated tube integrity is maintained for at least the next 10.5 EFPY of operation. The associated inputs and results are provided in Tables 9 and 10. The flaw population in the SGs meets the structural integrity performance criteria of 4200 psi at 95% probability and 50% confidence levels for at least 10.5 EFPY of operation. For pressure-only loading of volumetric flaws, satisfaction of the structural integrity implies satisfaction of leakage integrity at accident conditions because steam line break accident condition pressure differential for pop-through is much smaller than  $3\Delta P_{NO}$ .

SG	Beginning of Growth Period	End of Growth Period	Growth Period (EFPY)	Max Indication Remaining In-Service (%TW)	Projection EFPY	Largest Projected Flaw (including NDE Uncertainty) (%TW)	95/50 Burst Pressure (psi)
1	R19	R22	4.09	19	10.5	39.7	5,481
2	R19	R22	4.09	23	10.5	51.9	4,498
3	R19	R22	4.09	24	10.5	53.2	4,411

Table 9 Projected 95/50 Burst Pressures for U-bend Structural Support Wear

 Table 10:

 Projected 95/50 Burst Pressures for ATSG Tube

SG	Beginning of Growth Period	End of Growth Period	Growth Period (EFPY)	Maximum Indication Remaining In-Service (%TW)	Projection EFPY	Largest Projected Flaw (including NDE Uncertainty) (%TW)	95/50 Burst Pressure (psi)
1	R19	R22	4.09	22	10.5	45.4	5,031
2	R19	R22	4.09	21	10.5	41.8	5,350
3	R19	R22	4.09	22	10.5	44.7	5,092
4	R19	R22	4.09	18	10.5	38.6	5,497

## 9. The number and percentage of tubes plugged to date, and the effective plugging percentage in each SG (TS 5.6.6.e).

There are no tubes plugged to date in the SQN Unit 2 RSGs.

## 10. The results of any SG secondary-side inspection (TS 5.6.6.f). The number, type, and location (if available) of loose parts that could damage tubes removed or left in service in each SG.

The secondary side foreign object search and retrieval (FOSAR) inspections performed in the four SGs included visual examination of tube bundle periphery tubes from the hot leg and cold leg annulus and center no tube lane. A total of 18 foreign objects were removed from the top of the tubesheet region and six objects remain on the secondary side among the four SGs. The foreign objects remaining are small pieces of mesh, bristles, and sludge rocks, which are located at the top of the tubesheet on either the HL or CL side. The limiting foreign object in terms of dimensions was a wire bristle measuring 0.75 inch long and 0.02 inch in diameter located at the hot leg tubesheet in SG4 at tube row 95 column 41.

Any foreign objects not able to be retrieved were characterized and an analysis performed to demonstrate acceptability of continued operation without exceeding the performance criteria. A limited top of tubesheet in-bundle visual inspection was also performed in each SG for the purpose of assessing and trending the level of hardened deposit buildup in the

kidney region. The tube integrity assessment of the foreign objects remaining in the SGs also supports the conclusion as no adverse effects on tube integrity are projected within 7.5 EFPY of operation.

#### 11. The scope, method, and results of secondary-side cleaning performed in each SG

Prior to the secondary side FOSAR inspections, sludge, scale, foreign objects, and other deposit accumulations at the top of the tubesheet were removed as part of the top of tubesheet high pressure water lancing process. The weight of deposits removed from each SG by this cleaning process is provided in Table 11.

SG	Weight
SG1	8.5 lbs
SG2	9.5 lbs
SG3	6.75 lbs
SG4	6.75 lbs
All SGs	31.5 lbs

## Table 11U2R22 SG Deposit Removal Weights

#### 12. The results of primary side component visual inspections performed in each SG

For the primary side channel head bowl visual inspections performed during U2R22, there were no indications of channel head bowl cladding or divider plate degradation.

#### 13. Any plant specific reporting requirements, if applicable.

SQN Unit 2 TS 5.6.6 does not have any plant specific reporting requirements.

#### <u>References</u>

- 1. TVA letter to NRC, CNL-22-001, "Application to Revise Technical Specifications to Adopt TSTF-577, 'Revised Frequencies for Steam Generator Tube Inspections' (SQN-TS-21-03 and WBN-TS-21-08)," dated April 4, 2022 (ML22095A023)
- NRC letter to TVA, "Sequoyah Nuclear Plant, Units 1 and 2; and Watts Bar Nuclear Plant, Units 1 and 2 – Issuance of Amendment Nos. 359, 353, 155, and 63 Regarding Adoption of Technical Specification Task Force Traveler TSTF-577, 'Revised Frequencies for Steam Generator Tube Inspections' (EPID L-2022-LLA-0051)," dated October 24, 2022 (ML22276A161)
- 3. TVA letter to NRC, "Unit 2 Cycle 22 180-Day Steam Generator Tube Inspection Report," dated April 25, 2019 (ML19126A274)
- 4. Steam Generator Management Program: Steam Generator Integrity Assessment Guidelines—Revision 5. EPRI, Palo Alto, CA: 2021. 3002020909.