STEAM GENERATOR TUBE INSPECTION DISCUSSION POINTS
Palisades 2020 Inspection (1R27)

Currently Palisades is ~ 90% through the base scope eddy current inspection and starting the special interest inspection scope as of 09/10/2020 at ~ 0900 hours

The following discussion points have been prepared to facilitate the conference call arranged with the licensee to discuss the results of the steam generator (SG) tube inspections to be conducted during the upcoming fall 2020, Palisades Nuclear Plant, refueling outage. This conference call is scheduled to occur towards the end of the planned SG tube inspections, but before the inspections and repairs are completed.

The Nuclear Regulatory Commission (NRC) staff plans to document a summary of the conference call, as well as any material that is provided in support of the call.

1. **Discuss any trends in the amount of primary-to-secondary leakage observed during the recently completed cycle.**

   Refer to attached Primary to Secondary Leak Rate for Operational Cycle 27 Primary to Secondary Leak Rate graph. Leakage has been minimal all cycle.

2. **Discuss whether any secondary side pressure tests were performed during the outage and the associated results.**

   No secondary side pressure tests are planned for the 2020 refueling outage (1R27).

3. **Discuss any exceptions taken to the industry guidelines.**

   In cycle 22, Palisades submitted a deviation to the NRC: Technical Justification Supporting Deviation from the EPRI Appendix I ETSS for ODSCC Sizing

   Revision 8 of the "EPRI PWR Steam Generator Examination Guideline" was incorporated in June 2016. Under this revision, Appendix I now is a more generic approach to how a utility is to develop a data set that can be used for probability of detection (POD) and sizing methodologies.

   Palisades uses a modified ETSS for ODSCC. The modified ETSS will be identical to the ETSS approved per Appendix I of the examination guidelines with the exception that only the sub-set of data from CE plants will be used instead of the combined fleet data set used in the approved ETSS.

   A comprehensive review of axial ODSCC in Palisades steam generators shows that Appendix I28432 over sizes maximum depth values for axial ODSCC at Palisades. There is a reasonable basis to submit a deviation request for maximum depth sizing of axial ODSCC indications at Palisades. The request is relatively modest since it uses the Combustion Engineering (CE) subset of the

well vetted data of Appendix I28432. The regression slope and standard error of regression are retained. Only the intercept parameter is changed. This provides an across the board reduction of NDE maximum depth sizing of 11.23 %TW. This will lead to about a 1000 psi increase in calculated condition monitoring burst pressures and much better matching of projected and measured NDE maximum depths.

The deviation was implemented in the 2012 (1R22) refueling outage steam generator inspection for the remaining life of the existing Palisade steam generators.

4. For each SG, provide a description of the inspections performed including the areas examined and the probes used (e.g., dents/dings, sleeves, expansion-transition, U-bends with a rotating probe), the scope of the inspection (e.g., 100 percent of dents/dings greater than 5 volts and a 20 percent sample between 2 and 5 volts), and the expansion criteria.

Full length ECT bobbin coil examination of all in-service tubes (except row 1, 2, and 3 U-bends) in both SGs.

ECT +Point™ coil examinations (both SGs):

- *100% of rows 1, 2, and 3 U-bends.*
- *100% of hot leg from TTS + 4" to a minimum of 13.5" below the bottom of the expansion transition.*
- *100% of free span dings >5V between TSH and TSC.*
- *100% of >2V dents at eggcrate, diagonal bar, and vertical strap intersections between TSH and TSC.*
- *25% of historical %TW calls at diagonal bars and vertical straps*
- *100% of historical trackable (TRA) indications*
- *The outer 3 peripheral tubes at the cold leg from TTS+4" to TTS-2" for detection of possible loose parts or wear signals. The periphery region is defined to be the outer three (3) tubes exposed to the annulus, all tubes in rows 1 through 4, and the inner three (3) tubes around the stay cylinder region.*

Special interest examinations which include but are not limited to:

- *All current outage bobbin I-code signals*
- *All eggcrate bobbin %TWs called during the current outage*
- *All wear scars ≥ 40%TW by bobbin*
- *All new %TWs indications regardless of location*
- *The hot leg square bend region of tubes surrounding SGB tube R99-C140*
- *All bobbin foreign object and foreign object wear indications*
- *Bounding of foreign object signals (new in 1R27 and RPC-confirmed PLPs from 1R26) and foreign object wear at all elevations. These bounding exams will continue until a one tube deep perimeter has been examined in which no PLP or foreign object wear indication is identified.*

- *Bounding of locations in tubes recently plugged that had PLP indication or foreign object wear near the TTS. See Table 5-2 for list of plugged tubes that meet this requirement.*
- *Mag-biased +Point™ coil examination of all bobbin PVN indications that cannot be eliminated using non-mag-biased +Point™ coil.*
- *All tube regions which cannot be examined effectively with bobbin probe due to data quality concerns.*
- *Any other location specified by TIE as required to support CMOA.*

5. For each area examined (e.g., tube supports, dent/dings, sleeves, etc.), provide a summary of the number of indications identified to date for each degradation mode (e.g., number of circumferential primary water stress-corrosion cracking (PWSCC) indications at the expansion transition). For the most significant indications in each area, provide an estimate of the severity of the indication (e.g., provide the voltage, depth, and length of the indication). In particular, address whether tube integrity (structural and accident induced leakage integrity) was maintained during the previous operating cycle. In addition, discuss whether any location exhibited a degradation mode that had not previously been observed at this location at this unit (e.g., observed circumferential PWSCC at the expansion transition for the first time at this unit).

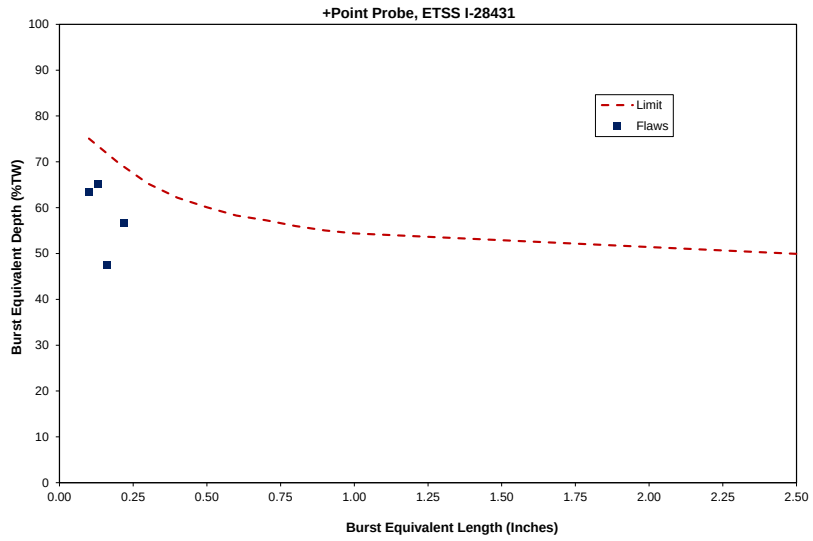
As of 9/10/2020 @ 0900 hours

SG	Location	Type	Number Indications	Number Tubes	Integrity Acceptable
A	TSH	Axial ODSCC	4	4	YES
A	TSH	Axial PWSCC	0	0	N/A
A	TSH	Circ PWSCC	0	0	N/A
A	TSH	Circ ODSCC	13	13	YES
A	TSH	Volumetric	1*	1*	YES
A	TEC to TEH	Wear > 40	1	1	YES
B	TSH	Axial ODSCC	4	4	YES
B	TSH	Axial PWSCC	1	1	YES
B	TSH	Circ PWSCC	0	0	N/A
B	TSH	Circ ODSCC	4	3	YES
B	TSH	Volumetric	2	1	N/A
B	TEH to TEC	Wear > 40	0	0	YES
A	Tube Supports	Axial ODSCC	6*	5*	YES
A	Freespan	Axial ODSCC	0	0	N/A
B	Tube Supports	Axial ODSCC	0*	0*	YES
B	Freespan	Axial ODSCC	0	0	N/A
	Total		36	33	

*Some indications have been identified but are not completely through the data resolution process as of this snapshot. Updated quantities may be presented verbally during the phone call.

SGA

- Axial ODSCC at TSH

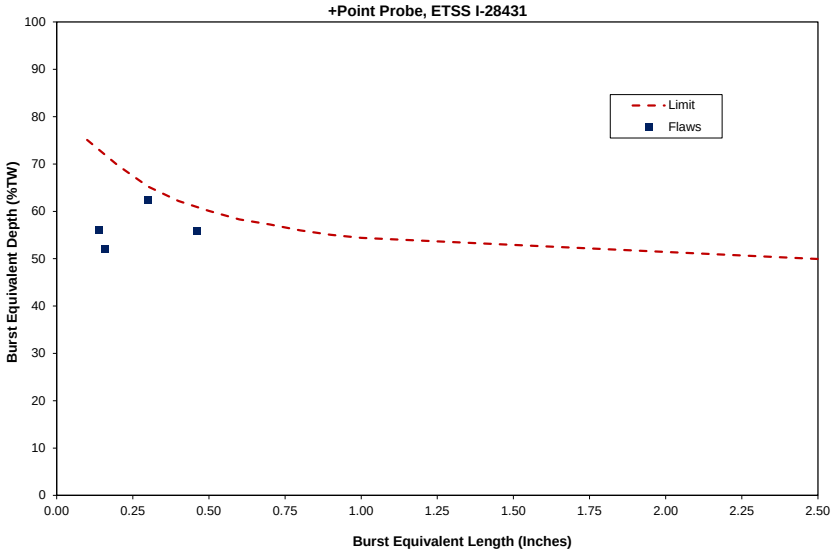


- Circ ODSCC at TSH. Max indication parameters (not the same indication):
  - Voltage: 0.81 V
  - Circumferential extent: 0.71" (109 degrees)
  - Depth: 78 %TW
  - PDA: 7.44
  - SIPC and AILPC criteria satisfied

- Tube support wear:
  - Max depth: 41 %TW
  - SIPC and AILPC criteria satisfied
- Historical (carryover from previous inspection) foreign object wear flaws
  - Max depth: TBD %TW
  - SIPC and AILPC criteria satisfied
- No newly-identified foreign object wear flaws

SG B

- Axial ODSCC at TSH



- Axial PWSCC within tube sheet:
  - Max Voltage: 0.52 V
  - Max Length: 0.14”
  - Max Depth: 42.9 %TW
  - SIPC and AILPC criteria satisfied
- Circ ODSCC at TSH. Max indication parameters (not the same indication):
  - Voltage: 0.84 V
  - Circumferential extent: 0.79” (116 degrees)
  - Depth: 53 %TW
  - PDA: 6.73
  - SIPC and AILPC criteria satisfied
- Tube support wear:
  - Max depth: 40 %TW
  - SIPC and AILPC criteria satisfied
- Historical (carryover from previous inspection) foreign object wear flaws
  - Max depth: 23 %TW
  - SIPC and AILPC criteria satisfied
- No newly identified foreign object wear flaws

Both SGs – Support Structure Wear

- Average growth is essentially zero
- 95/50 growth rate is <2.0 %TW/EFPY

Freespan

There are no free span repairable indications reported as of this date. Some support indications have been identified but are not completely through the data resolution process as of this snapshot. Updated quantities may be presented verbally during the phone call.

U-Bends

There are no U-bend repairable indications reported to date.

6. Describe repair/plugging plans.

Currently there are 26 potential tubes requiring tube plugging in SG E-50A and 7 potential tubes in SG E-50B.

All stress corrosion cracking (SCC) indications will be plugged. Any circumferential SCC indications near the top-of-tube sheet (TTS) will be stabilized and plugged. C depth is applicable to the HL and CL.*

All wear indications (at support structures) greater than or equal to 40%TW will be plugged.

Any indication of foreign objects that present a threat to tube integrity will be plugged and stabilized as necessary. Presently, there are no such indications.

7. Describe in-situ pressure test and tube pull plans and results (as applicable and if available).

Based on the available data to date, no tubes will require in-situ pressure testing and none is planned for any reason.

No tube pulls were planned before the outage and there is presently no plan or reason to conduct a tube pull.

8. Discuss the following regarding loose parts:

- **what inspections are performed to detect loose parts;**

The hot leg top of tube sheet (TTS) region is inspected with +Pt up to a nominal 4 inches, but not less than 3.5 inches and not less than the height of the sludge pile, above TTS. A similar inspection is performed for the cold leg TTS region 3 tubes deep along periphery and tube lane and 3 inches above the TTS. Foreign object search and retrieval (FOSAR) will be performed for the periphery, tube lane annulus, and stay cavity areas. This is similar to last outage.

- **a description of any loose parts detected and their location within the SG (including the source or nature of the loose part, if known);**

Since FOSAR has not yet started, no objects have been removed from the secondary side.

As of 9/10/2020 at 0900 hours, the following are the number of PLP (potential loose part) indications identified with the plus point inspection:

E-50A 150 PLP Calls in 143 Tube Locations
E-50B 99 PLP Calls in 95 Tube Locations

The vast majority (over 85%) of the indications are historical. None have resulted in tube degradation. Anticipate FOSAR start on 9/11/2020

- **if the loose parts were removed from the SG; and**

Anticipate FOSAR to start on 9/11/2020.

- **indications of tube damage associated with the loose parts**

Anticipate FOSAR to start on 9/11/2020.

9. Discuss the scope and results of any secondary side inspection and maintenance activities (e.g., in-bundle visual inspections, feed-ring inspections, sludge lancing, assessing deposit loading).

No secondary side inspection and maintenance activities are scheduled for 1R27.

10. Discuss any unexpected or unusual results.

Currently there are no unexpected or unusual results. There are no tubes that have failed the screening criteria requiring in-situ pressure testing

11. Provide the schedule for SG-related activities during the remainder of the current outage.

The base scope bobbin and top of tube sheet inspections are nearly complete. Special interest examinations are ongoing. U-bend examinations are pending. Nominal SG schedule is as follows:

Scheduled complete ECT 9/12/2020
Scheduled complete repair 9/13/2020
Scheduled SG closeout 9/14/20208

Attachment 1
Primary to Secondary Leakage