Exelon Generation.

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June 30, 2015

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

R.E. Ginna Nuclear Power Plant
Facility Operating License No. DPR-18
NRC Docket No. 50-244

SUBJECT: Steam Generator Tube Inspection Report Response to Request for Additional Information

REFERENCES:
(A) Letter from Mr. Thomas Mogren (Ginna LLC) to Document Control Desk (NRC) dated November 13, 2014, Subject: 2014 Steam Generator Tube Inspection Report (ML14322A149)
(B) Email from Mr. Bhalchandra Vaidya (NRC) to Tom Harding (Exelon) dated April 9, 2015, Subject: RE: Ginna, MF5424, Request for Additional Information (RAI) - SG Tube Inspection Report

Enclosed are the responses to Requests for Additional Information (RAI) to the 2014 Steam Generator Tube Inspection Report (Reference A). These responses are for the RAIs received via email on April 9, 2015 (Reference B).

There are no regulatory commitments contained in this letter.

Should you have any questions regarding this submittal, please contact Thomas Harding at 315-791-5219.

Respectfully,

Thomas Mogren
Director, Site Engineering
R.E. Ginna Nuclear Power Plant, LLC

TM/kc

Attachment: Response to Request for Additional Information

cc: NRC Regional Administrator, Region I
NRC Project Manager, Ginna
NRC Resident Inspector, Ginna

A001
NRR

Attachment

Response to Request for Additional Information

ESGB RAI-1. The reported effective full power months (EFPM) of operation for the SGs at the beginning of RFO 33, RFO 35, and RFO 37 were reported as 132, 165.36, and 186.48 EFPM, respectively. Please clarify whether the reported EFPM is the total operating time of the SGs (i.e., whether it includes the 15.6 EFPM prior to the first inservice inspection). The NRC staff notes that the first inspection period of 144 months begins after the first inservice inspection.

Due to inconsistencies in the historical determination of EFPM and EFPY Ginna has formalized a calculation documenting these values. The following table provides the EFPM and EFPY since the steam generators were installed. In addition, a revised 2014 inspection report is attached.

Cycle	Cycle EFPY	Cumulative EFPY	Cumulative EFPM	Inspection Interval EFPM
26	1.24	1.24	14.88	0.00
27	1.25	2.49	29.91	15.02
28	1.36	3.85	46.24	31.36
29	1.38	5.23	62.79	47.90
30	1.38	6.61	79.36	64.48
31	1.41	8.02	96.24	81.35
32	1.48	9.50	114.00	99.12
33	1.44	10.94	131.28	116.40
34	1.32	12.26	147.09	132.21
35	1.52	13.78	165.37	6.48
36	1.35	15.13	181.57	22.68
37	1.41	16.54	198.49	39.61

ESGB RAI-2. Please provide the discussion of the results of your visual plug inspection and divider plate inspections (and any other primary channel head inspections). Was any degradation observed?

Ginna performs visual inspections of the entire primary side of the Steam Generator. Since the Steam Generators were replaced in 1996, site procedure GMS-43-08-TUBESHEET has been used for inspection of the tubesheet, tube plugs, divider plate, and the channel head. The procedure includes specific requirements for the divider plate seat bar and divider plate triple point where the divider plate meets the channel head. These visual inspections have resolution requirements and look for any in-service degradation such as cladding discoloration, cracking or pressure boundary leakage. These inspections have not identified any degradation to date.

Exelon

R. E. Ginna Nuclear Power Plant, LLC

STEAM GENERATOR TUBE INSPECTION REPORT

END OF CYCLE 37 REFUELING OUTAGE

MAY 2014

1503 Lake Road
Ontario, N.Y. 14519

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1.0 INTRODUCTION

The R.E. Ginna Nuclear Power Plant (Ginna) design has two (2) re-circulating design steam generators (SG) designed and fabricated by Babcock and Wilcox (BWI) of Cambridge, Ontario, Canada. The nomenclature used for fabrication and subsequent in-service inspections is BWI #34 (SG-A) and BWI #35 (SG-B). Each BWI steam generator was designed to contain 4765 tubes. One tube in each steam generator was removed from service during fabrication by means of a shop welded Inconel 690 plug. SG-A contains 4764 open tubes, and SG-B had four (4) tubes plugged at End of Cycle (EOC 32) due to a loose part that brings the total to 4760 open tubes. The tubing material is thermally treated Inconel 690 having a nominal outer diameter (OD) of 0.750 inch and a nominal wall thickness of 0.043 inch. The nominal thickness of the tube sheet is 25.25 inches, with a full depth hydraulic expansion of all the tubes into the tube sheet material.

The tubes are supported in the straight section by eight 410 stainless steel lattice grid supports which are comprised of high, medium, and low bars. The tubes are supported in the U-bend by ten 410 stainless steel fan bar / collector bar assemblies.

Ginna Technical Specifications (TS) 5.5.8.d provides the requirements for SG inspection frequencies. The TS requires that 100% of the tubes are to be inspected at sequential periods of 144, 108, 72, and, thereafter, 60 effective full power months (EFPM). Additionally, inspect 50% of the tubes by the refueling outage nearest the midpoint of the period and the remaining 50% by the refueling outage nearest the end of the period. At the beginning of the Ginna EOC 37 refueling outage, Ginna was at 16.54 EFPY (198.49 EFPM). Therefore, Ginna was at 39.61 EFPM within the second 108 EFPM inspection period.

In accordance with the Ginna TS 3.4.17, "Steam Generator (SG) Tube Integrity," Ginna TS 5.5.8, "Steam Generator (SG) Program," and American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel (B&PV) Code Section XI, 2004 Edition, IWB 2500-1, Examination category B-Q, item B16.20, SG eddy current examinations were performed during the Ginna EOC 35 refueling outage. All inspections were completed in accordance with Ginna TS 5.5.8.

2.0 SUMMARY

The EOC 37 2014 refueling outage (RFO) was the eighth in-service inspection of the Ginna SGs and entered Mode 4 on May 18, 2014. A degradation assessment was performed prior to the EOC 37 inspection to assure qualified inspection

techniques would be used to detect any existing and potential damage mechanisms.

The modes of tube degradation detected during the EOC 37 RFO were secondary side foreign object wear, and minor tube to lattice grid wear.

Foreign objects were also detected on the tubesheet secondary face of both "A" and "B" steam generators (SG). A process was established to prioritize the removal of foreign objects, with the highest priority given to the foreign objects that posed a higher risk to tube integrity. Each foreign object that was detected and left in-service was evaluated in accordance with EPRI Steam Generator Integrity Assessment Guidelines, Revision 3, with Ginna SG plant-specific thermal performance inputs. The basis for leaving each foreign object in-service is the disposition of each foreign object evaluation.

Tube manufacturing anomalies were sampled with no detectable degradation and no detectable changes since the original SG manufacturing baseline.

In-service denting at the cold leg tubesheet secondary face was initially detected during the 2008 RFO and was again detected during the EOC 37 2014 examination. While denting is not considered degradation as defined in the EPRI Steam Generator Examination Guidelines, it is considered worthy of discussion. During the 2008 RFO eighty (80) tubes were identified with dents in the cold leg of SG-B and two (2) dented tubes in the cold leg of SG-A. The detected dent populations were based upon an approximately 58% bobbin-coil examination plan. The 2014 RFO detected dent populations were based upon a 100% bobbin coil examination.

The 100% full length 2014 RFO eddy-current bobbin-coil examination plan incorporated potential extent of condition for denting at the tubesheet secondary face. This scope was the same for both the "A" and "B" SG.

The 2014 bobbin examination detected no additional cold leg top of tubesheet dents in SG-A. A total of four (4) dents have been detected in SG-A.

The 2014 bobbin examination identified ten new cold leg top of tubesheet dents in SG-B. A total of two hundred forty seven (247) cold leg top of tubesheet dents and one (1) hot leg top of tubesheet dent have been detected in SG-B. The 10 newly reported dents had voltages that were near the limit of detectability. The denting proved to be arrested when comparing the historical indication voltages.

All dents identified by the bobbin coil at the hot leg and cold leg top of tubesheet were inspected using a “D” probe. The “D” probe is a three coil probe containing a +Point coil, 0.115” pancake coil, and a non-surface riding 0.080” pancake coil. The data collected with the “D” probe was analyzed for defects using the +Point and 0.115 pancake coil, no degradation was detected. A comparison of the 2011 RFO to 2014 RFO inspection results indicates that no active continued progression of denting is occurring.

3.0 REPORT

3.1 Scope of Inspections Performed on each Steam Generator (TS 5.6.7.a.)

3.1.1 Primary Side Base Scope

Scope	SG- A	SG-B
Bobbin Probe: 100% Full Length of open tubes	4188* 575 low rows tested H/L and C/L and 1 tube downsized for restriction Total tests: 4764	4154 606 low rows tested H/L and C/L Total tests: 4760
Rotating Probe: Periphery and no tube lane Hot Leg expansion transition (TSH ± 3”)	616	619
Rotating Probe: Bounding of previous foreign objects evaluated but not removed, and manufacturing anomalies. Hot Leg expansion transition combination of extents (TSH ± 3”), (TSH +5”-3”)	194	168
Rotating Probe: Bounding of previous foreign objects evaluated but not removed, and manufacturing anomalies. Cold Leg expansion transition combination of extents (TSC ± 3”), (TSC +5”-3”)	7	38
Rotating Probe: Periphery and no tube lane Cold Leg expansion transition (TSC ± 3”)	647	632
Rotating Probe: Top of tubesheet dents detected in 2011 Cold Leg expansion transition (TSC +5”-3”)	4	237
Divider plate / divider-plate weld visual inspection	1	1
100% Plug visual inspection	1 tube (2 plugs)	5 tubes (10 plugs)

*One tube in SG-A (not included in 3241) was restricted with a 0.610" diameter bobbin probe in the U-bend. This tube was tested along its full length with a combination bobbin coil and rotating coil examinations.

3.1.2 Primary Side Special Interest Scope (Scope Expansion)

Scope	SG-A	SG-B
Rotating Probe: Special interest - MBMs, DNTs, Bobbin special interest, tube-to-tube proximity	38	281
Ghent probe: Special interest top of tubesheet	0	1
Expansion for Bounding of new foreign objects and PLPs identified by FOSAR or Eddy-Current Hot-Leg expansion transition extents (TSH +5"-3")	12	75
Expansion for Bounding of new foreign objects and PLPs identified by FOSAR or Eddy-Current Cold-Leg expansion transition extents (TSC +5"-3")	0	25
Newly identified top-of-tubesheet denting Cold-Leg expansion transition (TSC +5"-3")	0	10
Newly identified top of tubesheet denting Hot-Leg expansion transition (TSC +5"-3")	0	0

3.1.3 Secondary Side Inspection Scope

SG-A:

- FOSAR Inspection (top of tubesheet) prior to Sludge Lance
- TTS In-Bundle inspection prior to Sludge Lance
- FOSAR Inspection (top of tubesheet) Post-Sludge Lance
  - 100% of Annulus
  - 100% of No tube lane
  - Blowdown & drain holes
  - Shroud supports

  - Inspection of tube support structures

- TTS In-Bundle Inspection Post-Sludge Lance
  - Previously identified foreign objects
  - Eddy-current-detected potential loose parts (PLP)

SG-B:

- FOSAR Internals Inspection (top of tubesheet) prior to Sludge Lance

- TTS In-Bundle Inspection prior to Sludge Lance

- FOSAR Inspection (top of tubesheet) Post-Sludge Lance
  - 100% of Annulus
  - 100% of No tube lane
  - Blowdown & drain holes
  - Shroud Supports
  - Inspection of tube support structures

- TTS In-Bundle Inspection post-Sludge Lance
  - Previously identified foreign objects
  - Eddy-current-detected potential loose parts (PLP)

- Upper Internals Inspection
  - Primary and Secondary Moisture Separators, structural welds, etc.

- Upper Bundle Inspection
  - Tube bundle, tube support structures, structural components, etc.

3.2 Active Degradation Mechanisms Found (TS 5.6.7.b.)

The only detected tube degradation was volumetric resulting from foreign object wear and tube to lattice grid support wear. There were a total of 7 wear locations in 6 tubes (3 new tube locations detected in 2014). These were sized with the techniques in Table 1.

In addition, during the comprehensive secondary side upper internals examinations in SG-B, very minor flow accelerated corrosion to moderate flow accelerated corrosion was visually detected in approximately 65 of 85 secondary steam separator base plates. The results of these exams were acceptable for the

next operating interval, examinations that include improved quantitative results are planned.

3.3 Nondestructive Examination Techniques Utilized for each Degradation Mechanism (TS 5.6.7.c.)

See Table 1.

3.4 Location, Orientation (if Linear), and Measured Sizes (if Available) of Service-Induced Indications (TS 5.6.7.d.)

See Table 1.

Table 1

SG	Row	Col.	Location	Degradation Type	ETSS	NDE Measurement Parameter(s)
A	1	25	05H -1.54"	Volumetric (New Lattice wear)	96910.1 + Point	10% though wall (TW), .35" length x .39" (60) width using flaw peaks
A	91	51	05H +0.34"	Volumetric (Existing foreign material wear)	21998.1 + Point	32% TW, .35" length x .39" (60°) width using flaw peaks
A	53	85	02H +36.93" (0.5" below 03H)	Volumetric (Existing foreign material wear)	27901.2 + Point	21% TW, .19" length x .39" (60°) width using flaw peaks
B	2	20	06C -1.62"	Volumetric (New Lattice wear)	96910.1 + Point	6% TW, .26" length x .45' (69°) width using flaw peaks
B	78	24	01H +1.20"	Volumetric (Existing foreign material wear)	21998.1 + Point	21% TW, 1.41" length x .68" (104°) width using flaw peaks
B	78	24	01H +0.91"	Volumetric (Existing foreign material wear)	21998.1 + Point	25% TW, .31" length x .40" (61°) width using flaw peaks
B	2	78	02H -1.82"	Volumetric (New foreign material wear)	21998.1 + Point	19% TW, .36" length x .45" (69°) width using flaw peaks

3.5 Number of Tubes Plugged During the Inspection Outage for each Active Degradation Mechanism (TS 5.6.7.e.)

There were no tubes that required removal from service by plugging during the Ginna 2014 RFO examination.

3.6 Total Number and Percentage of Tube Plugs to-Date (TS 5.6.7.f.)

Table 2

	SG-A	SG-B
Tubes plugged to date	1	5
Tubes Installed	4765	4765
% of tubes plugged to date	0.02%	0.10%

The tube plugging performed to-date included 1 tube in each SG during pre-service examinations. The additional 4 tubes plugged in the SG-B were from a foreign object that was not able to be removed during the 2005 RFO in-service examination.

3.7 The Results of Condition Monitoring, including the Results of Tube Pulls and In-Situ Testing (TS 5.6.7.g.)

A condition monitoring assessment was performed for each in-service degradation mechanism detected during the EOC 37 2014 RFO SG examination. The condition monitoring assessment was performed in accordance with Ginna TS 5.5.8.a, NEI-97-06, EPRI Steam Generator Integrity Assessment Guidelines, Revision 3, and the EPRI Steam Generator Degradation Specific Management Flaw Handbook, Revision 1. For each identified degradation mechanism, the as-found condition was compared to the appropriate performance criteria for tube integrity, accident induced leakage and operational leakage as defined in TS 5.5.8.b. For each damage mechanism a tube structural limit was determined to ensure that SG tube integrity would be maintained over the full range of operating conditions and design basis accidents. This included retaining a safety factor of 3.0 against burst under normal steady-state full power operation primary-to-secondary pressure differential and a safety factor of 1.4 against burst under the limiting design basis accident pressure differential.

The as-found condition of each degradation mechanism found during the EOC 37 RFO was shown to meet the appropriate limiting structural integrity performance parameter with a probability of 0.95 at 50% confidence level, including consideration of relevant uncertainties.

The following section provides a summary of the condition monitoring assessment for each damage mechanism.

The largest foreign object wear indication found during EOC 37 2014 RFO examination was 32% TW as measured by the EPRI Appendix H qualified technique 21998.1. The EPRI Steam Generator Degradation Specific Management Flaw Handbook, Revision 1, provides the methodology for the determination of structural limits and condition monitoring limits for various types of tube degradation. Following the flaw handbook methodology that discusses the structural limit for volumetric flaws of a given axial extent and limited circumferential extent (less than 135 degrees), the condition monitoring limit of 46% TW--which includes the total system uncertainty--is well above the 32% TW NDE sizing.

There were no tube pulls or in-situ pressure testing performed during the EOC 37 2014 RFO.

4.0 ACRONYMS

ASME	American Society of Mechanical Engineers
C/L	Cold Leg
TS	Technical Specification
EFPM	Effective Full Power Months
EFPY	Effective Full Power Years
EOC	End of Cycle
EPRI	Electrical Power and Research Institute
ETSS	Examination Technique Specification Sheet
FOSAR	Foreign Object Search and Retrieval
H/L	Hot Leg
NEI	Nuclear Energy Institute
PLP	Potential Loose Part
SG	Steam Generator
TSC	Tubesheet Cold
TSH	Tubesheet Hot
TTS	Top of Tubesheet
TW	Through-Wall

5.0 REFERENCES

5.1 Ginna Technical Specifications

5.2 ASME section XI, 2004 Edition

5.3 Fleet Steam Generator Program, CNG-AM-7.01

5.4 Steam Generator Program Guidelines, Nuclear Energy Institute, NEI 97-06, Revision 2

5.5 EPRI PWR Steam Generator Examination Guidelines, Revision 7

5.6 EPRI Steam Generator Integrity Assessment Guidelines, Revision 3

5.7 EPRI Steam Generator Degradation Specific Management Flaw Handbook, Revision 1