Joe Pacher
Manager, Nuclear Engineering Services

R.E. Ginna Nuclear Power Plant, LLC
1503 Lake Road
Ontario, New York 14519-9364

585.771.5208
585.771.3392 Fax

joseph.pacher@constellation.com

Constellation Energy
Nuclear Generation Group

March 5, 2009

U. S. Nuclear Regulatory Commission
Washington, DC 20555

ATTENTION: Document Control Desk

SUBJECT: **R.E. Ginna Nuclear Power Plant**
Docket No. 50-244

Response to Request for Additional Information Associated With the 2008 Steam Generator Examination Report

References:
(1) Letter from J. Pacher, Ginna LLC, to NRC Document Control Desk, Subject: Transmittal of Steam Generator Examination Report for the R.E. Ginna Nuclear Power Plant, dated September 23, 2008.

(2) Letter from D. Pickett, NRC, to J. Carlin, Ginna LLC, Subject: Request for Additional Information Re: 2008 Steam Generator Tube Inspections – R.E. Ginna Nuclear Power Plant (TAC No. MD9727), dated January 7, 2009.

In Reference 1, R.E. Ginna Nuclear Power Plant, LLC (Ginna LLC) submitted the 180 day Steam Generator Examination Report for the refueling outage conducted in 2008. On January 7, 2009 the NRC responded to that submittal with a request for additional information (Reference 2). Enclosed please find the responses to the staff's questions.

No new commitments are being made in this letter.

If you should have any questions regarding this submittal, please contact David Wilson at (585) 771-5219.

Very truly yours,

Joseph E. Pacher

Attachment: Response to Request for Additional Information Associated With the 2008 Steam Generator Examination Report

A047
A001
NRR

1002102

cc: S. J. Collins, NRC
D. V. Pickett, NRC
Resident Inspector, NRC

ATTACHMENT

Response to Request for Additional Information Associated With the 2008 Steam Generator Examination Report

R.E. Ginna Nuclear Power Plant, LLC
March 5, 2009

Question 1

On page 6 of the September 23, 2008 letter, it states, in part, that all tubes were examined full length; however, other parts of the report indicate that approximately 60 percent of the tubes were inspected. Please clarify this apparent discrepancy.

Response:

To clarify the page 6 reference of "all tubes", this was referring to the scheduled and completed examinations table on the same page under section 2.2. The actual scope of tubes inspected full length per steam generator (SG) with the bobbin coil was approximately 60%. All of the tubes in that approximate 60% population received a full length examination except for one, R9 C121, which is addressed below.

Question 2

R9C121 did not receive a bobbin examination on the cold-leg, but the tube was ultimately tested full length with a combination of a bobbin coil and plus-point coil. Please confirm that the cold-leg was examined full length with a plus-point coil. Please clarify the discussion that this tube was inspected full length in 2005 with a different robot and the use of a lighter robot has proven difficult (i.e., why does the robot affect the ability of the probe to pass through the tube), in addition, please clarify whether the dent/ding in this tube is becoming more severe since, in 2008, a 0.610-inch diameter probe could not pass through this tube (unlike prior inspections in which a 0.610-inch probe did pass through the tube).

Response:

Section 2.2 discusses SG tube R9 C121 and the probe obstruction during the 2008 RFO. A clarification for the 2008 RFO inspection is required, in that tube R9 C121 was not tested full length with a combination of bobbin probe and plus point probe inspections. Specifically, R9 C121 was inspected with a bobbin coil from the hot leg tube end to the point of obstruction dent located in the U-bend. The plus point coil inspection of R9 C121 was through the dent location to the next U-bend support beyond the dent. The portion of uninspected tube was from this cold leg U-bend support to the cold leg tube end.

Tube R9 C121 was tested full length during inservice examinations during refueling outages in 1997, 1999, 2002, and 2005 with a .610 bobbin coil. There is no growth in dent voltage from these repeated examinations, so the dent is not experiencing any growth. Tube R9 C121 was also tested through the dent location during inservice examinations during refueling outages in 1997, 1999, 2002, and 2005 with a MRPC surface riding (plus point) rotating coil. To date, no indications of degradation have been detected.

The ability to inspect this tube during previous examinations was aided with the previous manipulator in the following manner. The probe was positioned at the dent location with the probe pusher, and the manipulator elevator was then used to assist the probe through the dent location. The recent manipulator is a lighter version and does not have an elevator assist.

The Ginna Technical Specification requirement 5.5.8.d.2 requiring a full length examination during the 144 effective full power months (EFPM) interval was met for this tube with the described repeated full length examinations. The dent is not active and is not growing as evident from no bobbin coil voltage response with the repeated examinations.

Question 3

Approximately 25 tubes have been historically identified as being in close proximity. Please discuss whether any additional tubes were identified as being in close proximity (since other plants have found additional tubes in close proximity during subsequent inservice inspections).

Response:

The "close proximity" or tube to tube out of design tolerance is a manufacturing issue that Ginna became aware of prior to the first inservice inspection. A calibration standard was fabricated for both tube to tube proximity and tube to tube wear detection. This susceptible region has been inspected with the bobbin coil during each subsequent SG examination with no additional tubes detected with close proximity. The tube locations that have been detected with tube to tube proximity out of design tolerances have been examined with an MRPC surface riding rotating coil during each inspection through the area of close proximity. Based upon these examinations, the tubes that are affected with the out of design tolerance appear to have not changed, and the area of tube proximity for each tube has not changed.

Question 4

For each refueling outage and steam generator (SG) tube inspection since installation of the SGs, please provide the cumulative effective full-power months that the SGs have operated.

Response:

Refueling outage	Cycle	EFPM	EFPY
1996 SG replacement RFO	EOC 25	0	0
1997 RFO (1st ISI)	EOC 26	15.6	1.2
1999 RFO (2nd ISI)	EOC 27	31.2	2.5
2000 RFO	EOC 28	46.8	3.9
2002 RFO (3rd ISI)	EOC 29	63.6	5.2
2003 RFO	EOC 30	81.6	6.7
2005 RFO (4th ISI)	EOC 31	96	8.1
2006 RFO	EOC 32	114	9.5
2008 RFO (5th ISI)	EOC 33	132	11.0

ISI = In-service Inspection
EOC = End of cycle
EFPM = Effective full power months
EFPY = Effective full power years

Question 5

Denting was observed in the cold-leg of SG B. Please discuss your insights into the cause of this degradation mechanism (since it does not appear to be widespread in plants with Alloy 690 tubing). Include in your response, why it is only occurring on the cold-leg of one SG, and how you assessed this condition in your condition monitoring/operational assessment.

Response:

Denting is not considered to be a degradation mechanism by Ginna or the industry. However, Ginna does consider a dent location to be a long term potential location for degradation to develop. Ginna is aware of some international experience with denting in replacement steam generators, as well as US experience with denting at tube supports in steam generators with Inconel 690 tubing, most of which are related to manufacturing issues with one international plant exception. There has not been any reported Inconel 690 tube degradation as a result of any type of denting.

Ginna has confirmed through a review of historical eddy current data that the dents were not present in previous inspections. The denting would be categorized as minor to date, based upon a qualitative evaluation of eddy current dent voltages and the ability to pass through the nominal bobbin probe diameter, i.e., there was no need to down size bobbin probe diameter due to dent restriction or any significant liftoff signal associated with the dents.

A historical review of the Ginna secondary side chemistry parameters, most notably copper, oxygen, and chloride do not indicate any obvious environments to promote denting. While impurities known to promote denting were detected, concentrations were not unique when compared to the industry.

In addition, sludge samples from each steam generator were obtained from the 2008 RFO and analyses on bulk sludge and two collar samples was performed in December 2008. The analysis performed included elemental analysis by Inductively Coupled Plasma Mass Spectrometry (ICP-MS), compound identification by X-ray Diffraction, Atomic Absorption Spectroscopy, and Scanning electron Microscopy Energy Dispersive X ray analyses (SEM/EDS) Examination (ID/OD/XS). None of the analyses provided Ginna with an obvious indicator of why the denting has occurred.

The denting does not appear to be the classic acidic denting process based upon the lack of any conclusive indicators for a sustained acidic crevice environment. However, because this condition is relatively localized, species from the affected crevices may not be detectable in the bulk fluid sampled for hideout return testing. Finally, the denting does not appear to be temperature driven due to its occurrence in the cold leg rather than the hot leg.

The condition monitoring assessment referenced the inspections that were performed in the B SG. The dent voltages of the B SG tubes bounded the two dented tubes located in the A SG. All dents detected with the bobbin coil in the B SG were inspected with an MRPC surface riding rotating coil with no detectable degradation.

Based upon the positive examination results, the time and temperature conditions, and no reason to believe that stress corrosion cracking will develop in these minor dented locations, the condition monitoring operational assessment determined that these dented tubesheet locations were acceptable to meet the next operating interval.

Question 6

A significant number of tubes were tested with a 0.610-inch bobbin probe in SG A. In the text of the document, reference is only made to one tube with a restriction that would not pass a 0.620-inch diameter probe. Please clarify why the 0.610-inch diameter probe was used to inspect so many tubes in SG A.

Response:

The .610" diameter probe was used due to a lack of .620" diameter probe stock available at Ginna. There were no additional .620" probe restrictions. The probe diameters are considered equivalent based upon the following.

The essential variable of interest with probe diameter is the probe fill factor. For Ginna steam generator tubing the .620" bobbin probe diameter provides a fill factor of 87%, and the .610" bobbin probe diameter provides a fill factor of 84%. The industry "Examination Technique Specification Sheet" (ETSS) documents probe diameter in fill factor %. Based upon the review of the applicable ETSS used at Ginna, both bobbin probe diameters are fully qualified for use.

Question 7

A few tubes were identified as having a status of reset incomplete (RIC). Please confirm that these tubes (or portions of tubes) were subsequently inspected satisfactorily (i.e., that RIC is a temporary code that would have required another retest). If a satisfactory inspection was not completed, please discuss how tube integrity was confirmed for these tubes.

Response:

The RIC is a retest code that is used when the planned examination extent is not met. All tubes with a RIC code were retested satisfactorily to the proper extent. The only exception to that is the response to question 2. For tube R9 C121 the hot leg tube end to the point of restriction was tested with the bobbin coil, the area of the restriction was tested with the MRPC surface riding rotating coil. The balance of the tube was not inspected to the cold leg tube end. Based upon 2008 RFO data through the restriction, and previous inspection full length bobbin coil data meeting the Ginna Technical Specification 5.5.8.d.2 requirements, engineering judgment was used to not re-inspect the tube full length.

Question 8

Please discuss the results of your feedring examination in SG A and your upper internals examinations of SG B.

Response:

Ginna has a site specific checklist to perform these examinations. The original equipment manufacturer Babcock & Wilcox International has provided input into these checklists to assure a comprehensive examination. The following is an excerpt from the 2008 refueling outage steam generator secondary side inspection plan.

The Ginna feedring design includes materials that are not susceptible to flow accelerated corrosion. The feedring is fabricated from seamless Ferritic Chrome Moly steel SA-335 GR P22, and the J tubes are fabricated from Inconel 690 SB-167 material. Feedring inspections for foreign material, confirmation of as design conditions, and flow accelerated corrosion were performed with no foreign material or degradation detected.

Upper internals inspection focused on carbon steel components, shell areas susceptible to flow accelerate corrosion, tube bundle supports, welds, structural components, and deposit loading. The examination scope included the following regions and components:

Steam Drum

- General area condition assessment
- Steam nozzle venturis
- Secondary deck skirt welds
- Secondary deck hatch cover and fasteners
- Secondary separator outlet ports, vent holes, skimmer vanes, inlet vanes, drain tubes, and welds
- Primary separator upper can vent holes and rim, flow arms, drain tube attachment points, riser tube to deck joint area
- Primary deck welds, ladder and supports, surfaces, manway cover and gaskets deck to shell attachment point

Feedring Region

- Feedring and some J-nozzles
- Shroud and vessel flow areas

Upper Tube Bundle Region

- General U-bend region
- Support structures
- Tube surfaces
- J-tabs
- Tube to J-tab contact areas
- Flat bar U-bend supports

- Top TSP lattice rim and lattice bar ends
- Riser tube to deck welds
- Primary deck lugs

Tubesheet Region both prior to and post sludge lance

- Annulus and no-tube lane
- 1st lattice support
- Drain holes, blow down flow holes
- Several shroud supports
- Interior bundle passes in both the hot leg and cold leg
- Investigation of foreign objects and in some cases removal of foreign objects.

These examinations revealed no indications of FAC or other internal component degradation, and identified no condition which could conceivably generate foreign objects in the foreseeable future. All steam drum components inspected were structurally sound with no major deposition of corrosion product material or signs of flow erosion.

In general, sludge deposition on the tubes, supports, tubesheet, and steam drum were light to moderate.

A general view of the main steam venturi and retainer plate was performed with no detected degradation. The venturi appeared to be intact and effective. The seal skirt to upper secondary head weld was inspected along with the secondary separators and subcomponents, edges appeared to be sharp with no steam erosion (including secondary separator top), welds referred to in the checklist had no detectable degradation and appeared in as manufactured condition. The primary separators and subcomponents were inspected, the welds look in as originally manufactured condition. The CAP 3 separators in general appear to be in as manufactured condition.

The primary deck support lugs had no detectable degradation and appeared in good condition as were the J tubes and accessible exterior of the feed ring.

The tie tubes, tie tube hardware arch bars and J tabs had no detectable degradation. The fan bar, and J tab supports appeared to be maintaining manufacturing tolerances.

<u>Question 9</u>

Please clarify the results of your inspections for loose parts. On page 34, you indicate that two parts were removed and that plus-point examinations revealed no additional objects or evidence of tube degradation. On page 35, however, you indicate that additional potential loose parts were identified by a combination of eddy current and visual examinations. Please confirm that all potential loose part locations were visually inspected, these inspections revealed at least two parts, two parts were removed from the SGs, other loose parts were identified visually, and any loose parts left in the SGs were assessed to confirm that it was acceptable to leave them in the SGs until the next inspection.

Response:

The following should clarify the foreign objects that were detected during the 2008 RFO and how each foreign object was dispositioned or removed. All materials left in the steam generator were evaluated in the following manner:

- A visual inspection was performed on all foreign objects that were detected.
- An estimation of the material and size of the object (diameter, length, and weight) was performed.
- Location of the object, row and column was documented was performed.
- A determination of whether or not the object is firmly lodged or able to move was performed.
- A determination of whether or not tube wear has occurred as a result of the object
- An evaluation was performed of potential wear rate if the object moves and contacts tubes for the planned inspection interval. Conservative assumptions were made on bundle entrance velocity, lowest frequency of tube vibration between the tubesheet and 1st support, maximum amplitude between the top of tubesheet and first support, and fluid density at the top of tubesheet.
- A determination of whether past eddy current data shows the presence of the part was performed.
- In addition, Westinghouse provided experimental data where foreign objects were placed in known fluid velocities to provide bounding results. Industry data was also referenced from foreign material that was left in service without resulting in tube degradation.

The conclusion was that all objects that remain in the Ginna A & B SGs when evaluated are proven to be acceptable to remain in service for the planned three years or two cycles of operation until the next scheduled A & B SG inspection. An analysis of the Ginna specific objects resulted in predicting that the limiting operation time for potential wear to reach the plugging limit is approximately 5 years which is greater than two cycles of operation, which provides a margin in addition to the added conservatism through Ginna specific input parameters that were used to obtain these timeframes.

Steam Generator A Results

Ten small mass foreign objects (loose parts) were identified in the A SG, of which nine small foreign objects remain in the A SG. These parts were detected by a combination of eddy current and secondary side video inspection. All foreign objects include visual confirmation of the foreign object as part of the evaluation.

A piece of flexitallic gasket was removed A SG Row 99 Column 73 hot leg.

The dimensions were 1 1/8" long x 3/16" width x .025" thickness.

The weight was 0.32 grams.

The actual weight of this removed object is about an order of magnitude less than the weight estimated for this object. The conservative weight was used for objects remaining in the S/G, which provided additional conservatism on the nine remaining objects.

Plus Point examination of the top of tubesheet region of all tubes adjacent to the identified objects was performed using an MRPC surface riding rotating coil. No wear or other degradation was found in any of the tubes neighboring the objects. Because no tube degradation was detected the identified loose parts do not challenge the condition monitoring performance criteria.

Steam Generator B Results

Ten small mass foreign objects (loose parts) were identified in the B SG, of which nine small foreign objects remain in the B SG. These parts were detected by a combination of eddy current and secondary side video inspection. All foreign objects include visual confirmation of the foreign object as part of the evaluation.

A piece of wire was removed from B SG Row 52 Column 112 cold leg.

The dimensions were 3 3/8" long x 1/32" diameter.

The weight was 0.23 grams.

The actual weight of this removed object is about an order of magnitude less than the weight estimated for this object. The conservative weight was used for objects remaining in the SG, which provided additional conservatism on the nine remaining objects.

Plus Point examination of the top of the tubesheet region of all tubes adjacent to the identified objects was performed using an MRPC surface riding rotating coil. No wear or other degradation was found in any of the tubes neighboring the objects. Because no tube degradation was detected the identified loose parts do not challenge the condition monitoring performance criteria.