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Constellation Energy
Generation Group

September 19, 2006

U. S. Nuclear Regulatory Commission
Washington, DC 20555

ATTENTION: Document Control Desk

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

Modification of Commitment to Perform Bare Metal Inspection of the Reactor Lower Head Bottom Mounted Instrumentation Nozzles in Accordance with NRC Bulletin 2003-02

In reference (1), the NRC notified R.E. Ginna Nuclear Power Plant, LLC (Ginna LLC) of a Finding by NRC inspectors of a failure to perform bare metal inspections as committed to in Reference (2). Specifically, Ginna LLC had not removed paint that exists in the annulus between the reactor pressure vessel lower head instrument penetration bore, and the instrument tube for the bottom mounted instrumentation. The presence of this paint could potentially delay identification of through wall cracks in the J-groove weld, caused by Primary Water Stress Corrosion Cracking (PWSCC).

On June 27, 2006, members of our staff met with members of the NRC staff and discussed our progress toward resolution of this issue. Attachment 1 of this letter documents the technical arguments provided in that meeting that have lead Ginna LLC to conclude that further attempts to remove the paint from the annulus may cause more harm than good. We note that during the meeting, the members of the NRC staff present indicated general agreement with our conclusions.

In addition, Attachment 1 serves to revise our response to Bulletin 2003-02 including requested information 1(d) "*the basis for concluding that the inspections performed will assure applicable regulatory requirements are and will continue to be met*". Attachment 2 contains our revised commitment.

Should you have questions regarding this matter, please contact Mr. Robert Randall at (585) 771-3734, or robert.randall@constellation.com.

Very truly yours,

Mary G. Korsnick

Mary G. Korsnick

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STATE OF NEW YORK :
: **TO WIT:**
COUNTY OF WAYNE :

I, Mary G. Korsnick, being duly sworn, state that I am Vice President – R.E. Ginna Nuclear Power Plant, LLC (Ginna LLC), and that I am duly authorized to execute and file this request on behalf of Ginna LLC. To the best of my knowledge and belief, the statements contained in this document are true and correct. To the extent that these statements are not based on my personal knowledge, they are based upon information provided by other Ginna LLC employees and/or consultants. Such information has been reviewed in accordance with company practice and I believe it to be reliable.

Mary G. Korsnick

Subscribed and sworn before me, a Notary Public in and for the State of New York and County of Monroe, this 19 day of September, 2006.

WITNESS my Hand and Notarial Seal:

Sharon L Miller
Notary Public

My Commission Expires: 12-21-06

SHARON L. MILLER
Notary Public, State of New York
Registration No. 01MI6017755
Monroe County
Commission Expires December 21, 20 06

REFERENCES:

(1) Letter from James M. Trapp (NRC) to Mrs. Mary G. Korsnick (Ginna LLC), Subject: R. E. Ginna Nuclear Power Plant – NRC Integrated Inspection Report 05000244/2005003, July 21, 2005

(2) Letter from Joseph A. Widay (Ginna LLC) to Mr. Robert L. Clark (NRC), Subject: Response to Bulletin 2003-02, Leakage from Reactor Pressure Vessel Lower Head Penetrations and Reactor Coolant Pressure Boundary Integrity, September 19, 2003

cc: S. J. Collins, NRC
P. D. Milano, NRC
Resident Inspector, NRC

ATTACHMENT (1)

MODIFICATION OF COMMITMENT TO PERFORM BARE METAL INSPECTION OF THE REACTOR LOWER HEAD BOTTOM MOUNTED INSTRUMENTATION NOZZLES

Background

NRC Bulletin 2003-02 described a domestic pressurized water reactor (PWR) that suffered a through wall flaw of the J-groove weld in two of their bottom mounted nozzle (BMN) instrumentation penetrations. The flaws were discovered by the presence of crystallized boric acid deposits on the reactor vessel lower head. The bulletin required all domestic PWRs to inspect for similar conditions.

In response to the NRC Bulletin 2003-02, Ginna LLC performed a visual inspection of the lower Reactor head and BMN Nozzle areas during the 2003 refueling outage by devising a way to lower the original existing contour fitting insulation. The 2003 examination results were documented in a Ginna LLC letter to the NRC on Dec. 9, 2003 along with the Ginna LLC 60 day response to Bulletin 2003-02. The NRC SER response was provided on November 8, 2004.

During the 2005 RFO, Ginna LLC modified the reactor lower head contour fitting insulation design to facilitate future lower head examinations by installing Transco removable reflective insulation. This insulation package includes four (4) removable doors to allow easier access to the BMNs for future visual inspections.

2005 examination results noted that no changes in lower head conditions from 2003 were observed.

During original fabrication of the Ginna LLC Reactor vessel, some of the BMNs had tenacious, high temperature paint liberally applied at the junction of the penetration nozzle and the lower head outer surface. Review of 2003 and 2005 examination results indicate that 14 out of 36 penetrations are completely covered with paint. The NRC has raised a concern that the paint could potentially delay or prevent reactor coolant system fluid presenting itself in the form of boric acid crystals at the annulus to head interface thus delaying the identification of through wall cracks in the BMN or J groove weld.

Paint removal

Ginna LLC has explored a number of methods of removing the paint. Several mockups were built and coated with a paint that was as close as currently available to the original. Paint removal methods were tested on these mockups, but none were determined to be successful

Carbon dioxide pellet blasting, although successful at removing surface paint, was ineffective in removing paint from the annulus, as revealed by dissection of the mockup.

Mechanical removal was also attempted, but the gap was too narrow to allow entry of a tool into the annulus space.

Chemical means of removal was considered, but it was deleted from consideration due to the potential deleterious effects on the vessel annulus space and Alloy 600 nozzle material. In addition, most chemical paint removers require some mechanical means to remove the residue which again posed the limited annulus space constraint. Chemical removal options would also present a challenge to personnel in a confined space application such as the under vessel area.

A high pressure water jet application was also considered, however, it was concluded that while it would likely be successful at breaking the paint free, it could have the potential to jam paint particles into the annulus. Further, due to surface tension effects, there is concern that the water would not drain out of the annulus, potentially causing additional corrosion of the unprotected carbon steel in the annulus region. This corrosion product would likely fill the inside of the annulus, creating a potential flow blockage, thus the water jet option was not considered feasible. Furthermore, all options increased the radiation dose to personnel involved in the paint removal process.

Thus we concluded that there is no practical method for removing the paint from the annulus. Therefore we need to remove the words "bare metal" from our previous Bulletin 2003-002 commitment.

Additional Paint Considerations

Removal of the paint could also introduce a potential to create a change to the existing base line conditions already documented in previous 2003 and 2005 results.

As noted in the letter to the NRC on June 10, 2006, a comparison of the 2005 results to the 2003 results for both the annulus region and the lower head surface condition was made and documented in that the paint in the area of the annulus and general head area had not changed form one RFO to the next.

Ginna LLC's position is that the annulus area comparison is a critical comparison for the Ginna LLC head inspections in that if corrosion were occurring in the annulus region, the expansion of corrosion product volume would be expected to cause the paint to distort at those penetrations that are covered by the paint.

Removal of protective paint from the Ginna LLC vessel may create conditions necessitating the comparison of rust rings from year to year. Ginna LLC believes this comparison to be a less reliable means of detecting leakage then comparing clean, painted surfaces from year to year.

Ginna LLC proposes to continue RFO examinations of the lower head surface until such time that Industry guidelines provide additional guidance on BMN inspection options.

Analysis

Operating experience:

As of June 2006, approximately 3009 of 3095 (97.2%) BMN penetrations in the US have had bare metal visual inspections performed. In addition, 659 of 3095 (21.3%) have been volumetrically examined with ultrasonic testing techniques (UT). The results are that no other leaks or cracks have been found beyond the 2 penetrations discussed in Bulletin 2003-02.

Material condition:

Although the materials of construction are similar to the Bulletin 2003-02 plant (alloy 600), the Ginna LLC BMN penetrations received post weld heat treatment (PWHT) as part of the final lower assembly stress relief during construction. The PWHT conditions were:

- 1100-1150°F, one hour per inch vessel thickness
- 4.5 to 5 hour time at temperature (minimum)

While no PWHT testing was performed to verify effectiveness of this treatment, testing of in-situ stress relief of steam generator tube U-bends at similar temperatures showed a factor of four increase in time to crack initiation due to PWSCC. Therefore we conclude that the PWHT of Ginna LLC has yielded a superior material condition as compared to the power plant discussed in Bulletin 2003-02.

Comparison of susceptibility:

Bulletin 2003-02 plant conditions

- bottom head temperature = 561°F
- cracking occurred after 11 EFPY

Ginna LLC conditions

- current bottom head temperature = 533°F (post-steam generator replacement (SGR), ~9 EFPY)
- historical bottom head temperature = 545°F (pre-SGR, ~20 EFPY)
- future bottom head temperature = 541°F (after extended power up-rate)

Equivalent Degradation Years (EDY) calculated using simplified time-temperature model

- Bulletin 2003-02 plant EDY at time of cracking = 2.17
- Ginna LLC equivalent EDY is 2.4 Conservatively using a factor of 2 improvement, which is half the improvement factor determined in the steam generator U-bend stress relief study, the 2.4 EDY can be divided by two, yielding 1.2 EDY, which is less than 60% of Bulletin 2003-02 plant at the time cracking was discovered.

Given the industry operating experience outside the Bulletin 2003-02 plant, superior material condition due to PWHT, and less susceptible operating conditions due to lower temperatures, we conclude that it is unlikely that Ginna LLC would experience through wall cracking of BMN at this stage of plant life, and for some years to come.

Risk Assessment:

Although this commitment change is not based on risk-informed analysis, the industry-generated risk analysis in WCAP-16468 "Risk Assessment of Potential Cracking in Bottom Mounted Instrumentation Nozzles" was reviewed to ensure that there is no potential for significant increase in core damage risk from performing the visual inspections with the paint in place. In this analysis, Westinghouse performed a generic probabilistic risk assessment of core damage frequency resulting from complete break before leak of a BMN (i.e. tube separation and ejection). The analysis conservatively assumed crack growth by PWSCC from an initial fabrication flaw, as opposed to a more realistic onset of crack propagation some years after. Further, the analysis did not take any credit for bare metal inspections of the BMN.

The results for a two-loop plant indicate that the contribution to core damage frequency (CDF) from circumferential cracking and instrument tube separation and ejection is 1.16 E-8/ year. This value is conservative for Ginna LLC given that the WCAP assumed a conditional core damage probability (CCDP) for the generic 2-loop plant, given a tube separation and ejection, of approximately 2E-02, while the Ginna LLC specific PRA indicates a CCDP of approximately 4E-04. As discussed in this submittal, it is not anticipated that performing the inspections with paint on the vessel will increase the likelihood of circumferential cracking and instrument tube separation and ejection. However, based upon the WCAP results, any increase in the risk of core damage from a tube separation and ejection due to the paint preventing detection of a leak would be bounded by the 1.16 E-8/ year value.

As part of the WCAP, the Electric Power Research Institute's (EPRI) Material Reliability Program (MRP) requested a sensitivity study for a higher frequency of fabrication flaws. The sensitivity study used a more conservative value for the probability of the initial circumferential fabrication flaw. Even using this more conservative value for initiating event frequency and the very conservative CCDP from the WCAP, the contribution to CDF remains very low at approximately 2.5E-08/yr.

Other potential deleterious effects:

Should a through wall crack exist in the J-groove weld, but go undetected due to the paint in the annulus, there is a potential for boric acid attack of the carbon steel of the vessel in the annulus region. However, this is extremely unlikely. The paint is unlikely to retain a leak as the pressure at the crack initiation site to leak path interface would be about 2200 psi. If paint did in fact retain the leak, then there would be no flow and no access for oxygen. Recent industry studies have indicated that rapid corrosion of the RPV low–alloy steel will not occur under stagnant or very low flow rates of primary water into an annulus.

MRP research indicates a leak rate of 0.1 gpm or greater is needed for high wastage rates. There has been no significant wastage in over 50 pressurizer heater sleeve leaks with similar geometry to BMNs. Even so, were there to be wastage, a leak rate even at very low flows produces a large volume of corrosion product, the generation of which is capable of producing very high forces. The BMN annulus could not contain the voluminous carbon steel corrosion products that would result, therefore paint rupture or distortion would be expected.

Therefore we conclude that wastage is highly unlikely, and if it did occur, evidence of wastage would be observable during our inspections.

Other Considerations:

The Ginna LLC BMNs are smaller than most PWRs, and to date, UT demonstrations for the smaller ID BMN have shown mixed results. The industry is currently developing BMN inspection guidelines. Ginna LLC personnel are currently engaged in the development of this guideline. This guideline is anticipated to include an UT inspection option that could form the basis for future Ginna LLC inspection activities.

Conclusions:

- Industry experience with BMN inspections indicates an extremely low incidence of degradation
- Ginna LLC BMN nozzles have a lower risk of PWSCC relative to the Bulletin 2003-02 plant based on operating temperature and PWHT
- Wastage is not expected without visual indication
- No proven method exists to remove paint from a BMN annulus
- Removing paint has several disadvantages
- PWSCC of bottom-mounted nozzles has very low risk significance

Consequently, current Ginna LLC visual inspections provide reasonable assurance that leakage will be detected.

Commitments:

Ginna LLC commits to the following actions:

1. Perform a visual examination of the Reactor BMN penetrations and the reactor bottom head surface condition, un-obscured by insulation, during each refueling outage.

2. Engage in industry BMN inspection guideline development and apply the appropriate inspection option for Ginna LLC BMN.

ATTACHMENT 2

REGULATORY COMMITMENT	DUE DATE
Perform a visual examination of the BMN penetrations and the bottom head surface condition, un-obscured by insulation.	During each refueling outage.
Engage in industry BMN Inspection Guideline development and apply the appropriate inspection option for the Ginna LLC BMN.	Prior to startup from the 2011 refueling outage.