ATTACHMENT (1)

RESPONSES TO QUESTIONS 1 AND 2 OF

REQUEST FOR ADDITIONAL INFORMATION

(NON-PROPRIETARY VERSION)

Constellation Energy Nuclear Group, LLC
November 11, 2013

Suggested Responses to NRC RAIs Regarding the R.E. Ginna BE LBLOCA Evaluation of Elevated Initial Containment and Accumulator Temperature, NP-Attachment

(11 pages including this cover page)

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Background

This letter provides suggested responses to the Nuclear Regulatory Commission (NRC) Requests for Additional Information (RAIs) related to the R.E. Ginna Best Estimate Large Break Loss-of-Coolant Accident (BE LBLOCA) evaluation of elevated initial containment and accumulator temperature (see RAIs #1 and 2 of Reference 1). Note that RAIs #3 and 4 of Reference 1 are outside of BE LBLOCA scope. RAIs #1 and 2 of Reference 1 are provided below.

1. *To ensure that the most severe postulated loss-of-coolant accidents are calculated:*

    a. *Provide a table that includes the following ASTRUM run attributes for the Analysis of Record (AOR) and integrated analyses: (1) AOR Run#, (2) PCT, (3) Time of PCT, (4) Reactor Coolant System Tavg, (5) Accumulator Water Temperature, (6) Accumulator Pressure, (7) Safety Injection Temperature, (8) Safety Injection Time, (9) Containment Pressure, (10) Break Size.*

    b. *Explain how containment air temperature is input into the Large Break LOCA analyses and what assumptions are used.*

    c. *Highlight the cases in ASTRUM run matrices provided in RAI #1a that were chosen to be re-executed as a result of this LAR and explain how these cases were chosen.*

    d. *Justify the selection of the number of cases that were re-executed, as opposed to a larger number of cases.*

2. *Based on the cases that were chosen to be re-executed and the selection of the number of cases to be re-executed, explain how ECCS cooling performance has been calculated in accordance with an acceptable evaluation model.*

Reference

1. Letter from Mohan C. Thadani (NRC) to Joseph E. Pacher (R.E. Ginna Nuclear Power Plant), "R.E. GINNA NUCLEAR POWER PLANT - REQUEST FOR ADDITIONAL INFORMATION REGARDING AMENDMENT TO REVISE TECHNICAL SPECIFICATION 3.6.5, 'CONTAINMENT AIR TEMPERATURE' (TAC NO. MF0900)," September 24, 2013. (available in NRC ADAMS database – Accession Number: ML13261A061)

Response to RAI #1a:

The requested Automated Statistical Treatment of Uncertainty Method (ASTRUM) run attributes and results are provided in Tables 1 through 3 for the R.E. Ginna analysis-of-record (AOR) runs (Reference 1), the [ ]^{a,c} that explicitly accounted for fuel pellet thermal conductivity degradation (TCD) (Reference 2), and the run set used to evaluate the elevated accumulator temperature (Reference 3). The information is sorted by run number.

The [ ]^{a,c} that explicitly accounted for fuel pellet TCD is included because the explicit modeling of fuel pellet TCD resulted in a significant Peak Cladding Temperature (PCT) impact on the R.E. Ginna AOR. Therefore, this run set was used as the starting point for the evaluation of the elevated accumulator temperature.

Figure 1 shows the containment pressure input used for the R.E. Ginna AOR runs, the [ ]^{a,c} that explicitly accounted for fuel pellet TCD, and the run set used to evaluate the elevated accumulator temperature. In accordance with the ASTRUM evaluation model (EM) (Reference 4), the conservatively low pressure transient in Figure 1 is based on the pressure response calculated with the approved containment model, COCO (References 5 and 6).

Note that the elevated initial containment temperature does not impact the R.E. Ginna AOR as described in the responses to RAI #1b.

Response to RAI #1b:

Large Break Loss-of-Coolant Accident (LBLOCA) analyses apply a conservatively low containment pressure transient that is lower than the pressure response calculated with the approved containment model, COCO, as shown in Figure 1. The containment air temperature is an input to the approved containment model, COCO. For dry containments, [

]^{a,c}

Response to RAI #1c:

The explicit modeling of fuel pellet TCD resulted in a significant PCT impact on the R.E. Ginna AOR. Therefore, the [ ]^{a,c} that explicitly accounted for fuel pellet TCD was used as the starting point for the evaluation of the elevated accumulator temperature.

The top 10 cases, as ranked by maximum PCT, from the [ ]^{a,c} that explicitly accounted for fuel pellet TCD were chosen for re-execution to evaluate the elevated accumulator temperature. These cases are highlighted in Table 2 and shown in Table 3.

Response to RAI #1d:

The evaluation of the elevated accumulator temperature included re-execution of five [ ]^{a,c} runs and five [ ]^{a,c} runs from the [ ]^{a,c} that explicitly accounted for fuel pellet TCD. This subset also included the top 10 Maximum Local Oxidation (MLO) results and the top 6 Core-Wide Oxidation (CWO) results from the TCD evaluation. This subset included all cases with a PCT within 250°F or a MLO result within 4.9% or a CWO result within 0.7% of the limiting results from the TCD evaluation. The impact of the elevated accumulator temperature was much less than 250°F in PCT, 4.9% in MLO and 0.7% in CWO. This provides a high level of confidence that all potentially limiting cases were re-executed.

Response to RAI #2:

The Emergency Core Cooling System (ECCS) cooling performance was calculated based on the ASTRUM EM. In the ASTRUM EM, the 95/95 PCT, MLO and CWO results are determined as the maximum result from 124 uncertainty cases. The effect of the elevated accumulator temperature was explicitly calculated for the 10 maximum PCT and MLO cases, which was judged to capture all potentially limiting cases when considering the effects of fuel TCD and elevated initial temperature conditions. Note that the random sampling of the uncertainty attributes was maintained for these cases, which were executed in the same manner as a full ASTRUM uncertainty analysis using the WCOBRA/TRAC code to predict the thermal-hydraulic response and the HOTSPOT code to predict the effect of local uncertainties on the PCT and MLO results. The remaining cases were significantly non-limiting compared to the impact of the elevated accumulator temperature. Therefore, there is a high level of confidence that the maximum PCT, MLO and CWO results from all 124 uncertainty cases have been captured , and the effect of the elevated accumulator temperature was estimated pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.46(a)(3)(i).

References

1. Letter from Mary G. Korsnick (R.E. Ginna Nuclear Power Plant) to Donna M. Skay (NRC), "License Amendment Request Regarding Revised Loss of Coolant Accident (LOCA) Analyses-Changes to Accumulator, Refueling Water Storage (RWST), and Administrative Control Technical Specifications, R.E. Ginna Nuclear Power Plant, Docket No. 50-244," April 29, 2005. (available in NRC ADAMS database – Accession Number: ML051260239)
2. Letter from Thomas Mogren (R.E. Ginna Nuclear Power Plant) to Document Control Desk (NRC), "ECCS 30-Day Report for the Thermal Conductivity Degradation Impact on R.E. Ginna Large Break Loss of Coolant Accident Analaysis with ASTRUM," August 16, 2012. (available in NRC ADAMS database – Accession Number: ML12233A621)
3. Letter from Joseph E. Pacher (R.E. Ginna Nuclear Power Plant) to Document Control Desk (NRC), "License Amendment Request, Revise Section 3.6.5 of the Technical Specifications, 'Containment Air Temperature'," February 28, 2013. (available in NRC ADAMS database – Accession Number: ML13067A328)
4. WCAP-16009-P-A, "Realistic Large-Break LOCA Evaluation Methodology Using the Automated Statistical Treatment Of Uncertainty Method (ASTRUM)," January 2005.
5. WCAP-8327 (Proprietary Version), WCAP-8326 (Non-Proprietary Version), "Containment Pressure Analysis Code (COCO)," 1974.
6. WCAP-8339, "Westinghouse Emergency Core Cooling System Evaluation Model - Summary," 1974.

Table 1 – R.E. Ginna Analysis-of-Record Key Results and Run Attributes

a,c

a,c

a,c

Table 2 – R.E. Ginna TCD Evaluation Key Results and Run Attributes

a,c

Table 3 – R.E. Ginna Evaluation of Elevated Accumulator Temperature Key Results and Run Attributes

a,c

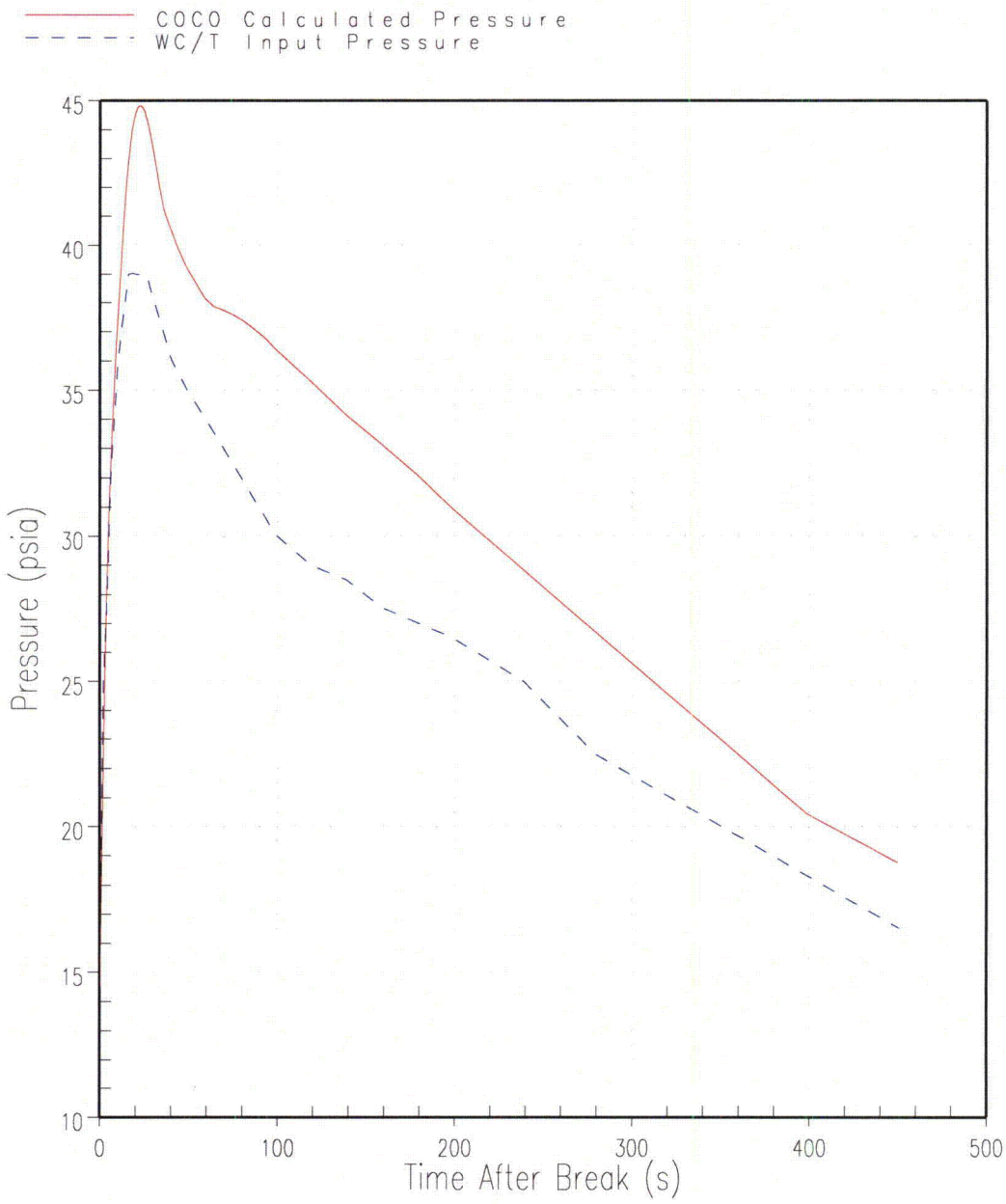

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Figure 1 – Containment Pressure for R.E. Ginna Analysis-of-Record, TCD Evaluation and Evaluation of Elevated Accumulator Temperature

ATTACHMENT (2)

RESPONSES TO QUESTIONS 3 AND 4 OF

REQUEST FOR ADDITIONAL INFORMATION

RESPONSES TO QUESTIONS 3 AND 4 OF REQUEST FOR ADDITIONAL INFORMATION

Question #3

1. Generic Letter (GL) 96-06, "Assurance of Equipment Operability and Containment Integrity during Design-Basis Accident Conditions," requested licensees to determine:

    a. If containment air cooler cooling water systems are susceptible to either waterhammer or two-phase flow conditions during postulated accident conditions;

    b. If piping system that penetrate the containment are susceptible to thermal expansion of fluid so that over pressurization of piping could occur.

    In addition to the individual addressee's postulated accident conditions, these items should be reviewed with respect to the scenarios referenced in the GL.

    Issue

    The licensee is proposing to revise TS 3.6.5, "Containment Air Temperature," to change the allowable containment average air temperature from 120°F to 125°F.

    Higher initial containment temperature and corresponding higher containment heat sinks could affect GL 96-06 analysis.

    Please discuss and justify your proposed LAR to revise Section 3.6.5 of the TSs, "Containment Air Temperature," considering GL 96-06 and current license thermal power for Extended Power Uprate (EPU).

Response #3

Prior evaluations performed for GL 96-06 used a containment LOCA peak temperature of 286°F when predicting (1) the potential for reduced heat transfer due to two phase conditions at the CRFC's, (2) the potential effects of water hammer loads, and (3) the potential for thermal over pressurization. For EPU, the peak containment temperature for a LOCA was predicted to be less than 286°F such that the previous GL 96-06 evaluations remained bounding. The prior GL 96-06 evaluations were not dependent on the initial average containment temperature except for its effect on the peak containment temperature. Thermal over pressurization potential was predicted during Ginna's response to GL 96-06 for some lines and the corrective action was installation of relief valves in these cases. The peak containment LOCA temperature is predicted to remain below 286°F for the proposed increase in allowable containment average air temperature. Consequently, prior evaluations bound the proposed increase in allowable average containment air temperature. Letters to the NRC relative to GL 96-06 with corresponding evaluations were dated January 30, 1997, July 21, 1998, and November 26, 2002.

Question 4

2. In the licensee's discussion of Main Steamline Break (MSLB) mass and energy release and containment response on page 6 of Attachment (1) of the submittal, the licensee stated:

Therefore, additional margin was gained in the limiting case by delaying the Turbine-Driven Auxiliary Feedwater (TDAFW) pump start to coincide with the faulted SG reaching the low-low level setpoint. This reduces the mass available for release from the faulted SG. This change is in agreement with the assumptions in the analysis previously presented in Reference 2 and approved in Reference 1.

Please clarify:

a. Does delay start of the TDAFW pump to coincide with the low-low level setpoint occur in the new analysis that supports the LAR or in the existing analysis that supports the EPU submittal?

b. Is additional margin gained in the existing EPU analysis or in the new analysis used for their LAR?

Response #4

The new analysis delays the start of the TDAFW pump to coincide with the SG low-low level setpoint. The existing EPU analysis simulates the TDAFW pump starting coincident with the MDAFW pumps.

The TDAFW pump was started later in the new analysis in order to accommodate the increase in containment average temperature with some additional margin to the maximum allowable containment pressure.

ATTACHMENT (3)

10 CFR 2.390 AFFIDAVIT OF WESTINGHOUSE – CAW-13-3847

CAW-13-3847

AFFIDAVIT

COMMONWEALTH OF PENNSYLVANIA:

ss

COUNTY OF BUTLER:

Before me, the undersigned authority, personally appeared James A. Gresham, who, being by me duly sworn according to law, deposes and says that he is authorized to execute this Affidavit on behalf of Westinghouse Electric Company LLC (Westinghouse), and that the averments of fact set forth in this Affidavit are true and correct to the best of his knowledge, information, and belief:

James A. Gresham, Manager
Regulatory Compliance

Sworn to and subscribed before me
this 4th day of November 2013

Notary Public

COMMONWEALTH OF PENNSYLVANIA
Notarial Seal
Anne M. Stegman, Notary Public
Unity Twp., Westmoreland County
My Commission Expires Aug. 7, 2016
MEMBER, PENNSYLVANIA ASSOCIATION OF NOTARIES

(1) I am Manager, Regulatory Compliance, in Engineering, Equipment and Major Projects, Westinghouse Electric Company LLC (Westinghouse), and as such, I have been specifically delegated the function of reviewing the proprietary information sought to be withheld from public disclosure in connection with nuclear power plant licensing and rule making proceedings, and am authorized to apply for its withholding on behalf of Westinghouse.

(2) I am making this Affidavit in conformance with the provisions of 10 CFR Section 2.390 of the Commission's regulations and in conjunction with the Westinghouse Application for Withholding Proprietary Information from Public Disclosure accompanying this Affidavit.

(3) I have personal knowledge of the criteria and procedures utilized by Westinghouse in designating information as a trade secret, privileged or as confidential commercial or financial information.

(4) Pursuant to the provisions of paragraph (b)(4) of Section 2.390 of the Commission's regulations, the following is furnished for consideration by the Commission in determining whether the information sought to be withheld from public disclosure should be withheld.

(i) The information sought to be withheld from public disclosure is owned and has been held in confidence by Westinghouse.

(ii) The information is of a type customarily held in confidence by Westinghouse and not customarily disclosed to the public. Westinghouse has a rational basis for determining the types of information customarily held in confidence by it and, in that connection, utilizes a system to determine when and whether to hold certain types of information in confidence. The application of that system and the substance of that system constitutes Westinghouse policy and provides the rational basis required.

Under that system, information is held in confidence if it falls in one or more of several types, the release of which might result in the loss of an existing or potential competitive advantage, as follows:

(a) The information reveals the distinguishing aspects of a process (or component, structure, tool, method, etc.) where prevention of its use by any of

Westinghouse's competitors without license from Westinghouse constitutes a competitive economic advantage over other companies.

(b) It consists of supporting data, including test data, relative to a process (or component, structure, tool, method, etc.), the application of which data secures a competitive economic advantage, e.g., by optimization or improved marketability.

(c) Its use by a competitor would reduce his expenditure of resources or improve his competitive position in the design, manufacture, shipment, installation, assurance of quality, or licensing a similar product.

(d) It reveals cost or price information, production capacities, budget levels, or commercial strategies of Westinghouse, its customers or suppliers.

(e) It reveals aspects of past, present, or future Westinghouse or customer funded development plans and programs of potential commercial value to Westinghouse.

(f) It contains patentable ideas, for which patent protection may be desirable.

(iii) There are sound policy reasons behind the Westinghouse system which include the following:

(a) The use of such information by Westinghouse gives Westinghouse a competitive advantage over its competitors. It is, therefore, withheld from disclosure to protect the Westinghouse competitive position.

(b) It is information that is marketable in many ways. The extent to which such information is available to competitors diminishes the Westinghouse ability to sell products and services involving the use of the information.

(c) Use by our competitor would put Westinghouse at a competitive disadvantage by reducing his expenditure of resources at our expense.

(d) Each component of proprietary information pertinent to a particular competitive advantage is potentially as valuable as the total competitive advantage. If competitors acquire components of proprietary information, any one component may be the key to the entire puzzle, thereby depriving Westinghouse of a competitive advantage.

(e) Unrestricted disclosure would jeopardize the position of prominence of Westinghouse in the world market, and thereby give a market advantage to the competition of those countries.

(f) The Westinghouse capacity to invest corporate assets in research and development depends upon the success in obtaining and maintaining a competitive advantage.

(iv) The information is being transmitted to the Commission in confidence and, under the provisions of 10 CFR Section 2.390, it is to be received in confidence by the Commission.

(v) The information sought to be protected is not available in public sources or available information has not been previously employed in the same original manner or method to the best of our knowledge and belief.

(vi) The proprietary information sought to be withheld in this submittal is that which is appropriately marked in "Suggested Responses to NRC RAIs Regarding the R.E. Ginna BE LBLOCA Evaluation of Elevated Initial Containment and Accumulator Temperature, P-Attachment" (Proprietary) for submittal to the Commission, being transmitted by Constellation Energy letter and Application for Withholding Proprietary Information from Public Disclosure, to the Document Control Desk. The proprietary information as submitted by Westinghouse is that associated with NRC approval of a revision to Technical Specification 3.6.5, and may be used only for that purpose.

(a) This information is part of that which will enable Westinghouse to:

(i) Provide input to Constellation Energy to provide to the U. S. Nuclear Regulatory Commission in response to NRC Request for Additional Information Regarding Amendment to Revise Technical Specification 3.6.5.

(ii) Provide licensing support for customer submittal.

(b) Further this information has substantial commercial value as follows:

(i) Westinghouse plans to sell the use of the information to its customers for the purpose of obtaining license changes for a Westinghouse pressurized water reactor (PWR).

(ii) Westinghouse can sell support and defense of the technology to its customer in the licensing process.

(iii) The information requested to be withheld reveals the distinguishing aspects of a methodology which was developed by Westinghouse.

Public disclosure of this proprietary information is likely to cause substantial harm to the competitive position of Westinghouse because it would enhance the ability of competitors to provide similar technical evaluation justifications and licensing defense services for commercial power reactors without commensurate expenses. Also, public disclosure of the information would enable others to use the information to meet NRC requirements for licensing documentation without purchasing the right to use the information.

The development of the technology described in part by the information is the result of applying the results of many years of experience in an intensive Westinghouse effort and the expenditure of a considerable sum of money.

In order for competitors of Westinghouse to duplicate this information, similar technical programs would have to be performed and a significant manpower effort, having the requisite talent and experience, would have to be expended.

Further the deponent sayeth not.

PROPRIETARY INFORMATION NOTICE

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In order to conform to the requirements of 10 CFR 2.390 of the Commission's regulations concerning the protection of proprietary information so submitted to the NRC, the information which is proprietary in the proprietary versions is contained within brackets, and where the proprietary information has been deleted in the non-proprietary versions, only the brackets remain (the information that was contained within the brackets in the proprietary versions having been deleted). The justification for claiming the information so designated as proprietary is indicated in both versions by means of lower case letters (a) through (f) located as a superscript immediately following the brackets enclosing each item of information being identified as proprietary or in the margin opposite such information. These lower case letters refer to the types of information Westinghouse customarily holds in confidence identified in Sections (4)(ii)(a) through (4)(ii)(f) of the Affidavit accompanying this transmittal pursuant to 10 CFR 2.390(b)(1).

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