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UniStar
NUCLEAR ENERGY

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April 9, 2009

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

Subject: UniStar Nuclear Energy, NRC Docket No. 52-016
Response to Request for Additional Information for the
Calvert Cliffs Nuclear Power Plant, Unit 3,
RAI No. 74 and 76, Steam and Feedwater System Materials

References:
1) John Rycyna (NRC) to Robert Poche (UniStar), "RAI No 74 CIB1 1565.doc (PUBLIC)", March 11, 2009
2) John Rycyna (NRC) to Robert Poche (UniStar), "RAI No 76 CIB1 1942.doc (PUBLIC)", March 12, 2009

The purpose of this letter is to respond to the requests for additional information (RAIs) identified in the NRC e-mail correspondence to UniStar Nuclear, dated March 11, 2009 (Reference 1) and March 12, 2009 (Reference 2). The responses to these RAIs address Steam and Feedwater System Materials, as discussed in Section 10.3.6 of the Final Safety Analysis Report (FSAR), as submitted in Part 2 of the Calvert Cliffs Nuclear Power Plant (CCNPP) Unit 3 Combined License Application (COLA), Revision 4.

The enclosure provides our response to RAI No. 74, Questions 10.03.06-1, 10.03.06-2, and 10.03.06-3 and RAI No. 76 Question 10.03.06-4.

Our responses to Questions 10.03.06-1, 10.03.06-2, 10.03.06-3 and 10.03.06-4 do not include any new regulatory commitments.

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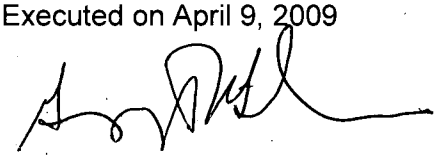
NRO

Our response includes revised COLA content. A Licensing Basis Document Change Request has been initiated to incorporate this change in a future revision of the COLA.

If there are any questions regarding this transmittal, please contact me at 410-470-4205, or Mr. Michael J. Yox at (410) 495-2436.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on April 9, 2009



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Enclosure: Responses to NRC Request for Additional Information, RAI Nos. 74 and 76, Steam and Feedwater System Materials, Calvert Cliffs Nuclear Power Plant Unit 3

Attachment: Revision to COL Application Part 2 (FSAR) Section 10.3.6.3

cc: John Rycyna, NRC Project Manager, U.S. EPR COL Application
Laura Quinn, NRC Environmental Project Manager, U.S. EPR COL Application
Getachew Tesfaye, NRC Project Manager, U.S. EPR DC Application (w/o enclosure)
Loren Plisco, Deputy Regional Administrator, NRC Region II (w/o enclosure)
Silas Kennedy, U.S. NRC Resident Inspector, CCNPP, Units 1 and 2
U.S. NRC Region I Office

Enclosure

**Responses to NRC Request for Additional Information,
RAI Nos. 74 and 76, Steam and Feedwater System Materials,
Calvert Cliffs Nuclear Power Plant Unit 3**

RAI No. 74

Question 10.03.06-1

In FSAR Section 10.3.6.3, the applicant indicates that it will follow the guidance in NSAC-202L-R3 related to water chemistry. It is not clear to the staff if the applicant intends to follow the guidance provided in NSAC-202L-R3 for the entire Flow Accelerated Corrosion (FAC) program. In addition, the applicant's description of its intentions to address COL information item 10.3-2 does not reference Generic Letter 89-08. The staff requests that the applicant modify FSAR section 10.3.6.3 to state that its FAC program will be consistent with the recommendations of NRC Generic Letter 89-08 and NSAC-202L-R3, or justify an alternative.

Response

The Flow Acceleration Corrosion (FAC) Program will be consistent with the requirements and recommendations identified in NSAC-202L-R3 and Generic Letter 89-08.

COLA Impact

As shown in Attachment 1, the response to COL Item 10.3-2 has been deleted in its entirety and rewritten as indicated.

Question 10.03.06-2

To ensure that an effective, long-term FAC monitoring program is in place to address the concerns discussed in NRC Generic Letter 89-08, the the applicant should confirm: (1) that the program for erosion/corrosion and flow accelerated corrosion (FAC) monitoring will include preservice thickness measurements of as-built components considered susceptible to FAC, and (2) that these measurements will use grid locations and measurement methods most likely to be used for inservice inspection according to industry guidelines; or justify an alternative. In addition, describe in the COL application how these concerns are documented, or justify why that is unnecessary. Due to factors such as the wall thickness tolerance in pipe fabrication and wall thinning due to bending, preservice measurements of the components are needed to accurately detect and assess inservice degradation. Some of the complications resulting from a lack of baseline thickness information are discussed in EPRI NSAC-202L-R3, the industry guideline document referenced in SRP Section 10.3.6.

Response

Preservice thickness measurements and grid locations are conducted in accordance with Generic Letter 89-08, and industry guideline document, EPRI NSAC-202L-R3. Measurement methods for inservice inspections and method of documentation are followed according to the UniStar inservice FAC Program, and adhere to all aspects of NSAC-202L and Generic Letter 89-08.

COLA Impact

As shown in Attachment 1, the response to COL Item 10.3-2 has been deleted in its entirety and rewritten as indicated.

Question 10.03.06-3

The applicant should discuss its implementation schedule for the detailed flow-accelerated corrosion (FAC) program described under "Flow Accelerated Corrosion" in Section 10.3.6.3. To ensure that the FAC concerns addressed in NRC Generic Letter 89-08 are addressed in the application, the applicant should include a discussion of the activities of the FAC program that will be conducted during the construction phase and the schedule for those activities, or justify why it is not necessary.

Response

The Flow Accelerated Corrosion (FAC) Program will be established during construction and will adhere to the guidelines set forth in Generic Letter 89-08 and NSAC-202L, "Recommendations for an Effective Flow Accelerated Corrosion Program." The FAC Program will include preservice thickness measurements to establish baseline data and utilize the same grid locations and measurement methods planned for inservice FAC inspections. Preservice inspections are to be performed following system construction completion (usually denoted by performance of the system hydrostatic test) and prior to plant operation.

COLA Impact

As shown in Attachment 1, the response to COL Item 10.3-2 has been deleted in its entirety and rewritten as indicated.

RAI No. 76

Question 10.03.06-4

The U.S. EPR design utilizes carbon steel components containing a minimum chromium content of 0.10% for components of the main steam supply system (MSSS) and feedwater system that are susceptible to Flow-Accelerated Corrosion (FAC). NSAC-202L-R3 considers this material resistant to FAC but also notes that components containing a minimum chromium content of 0.10% should be inspected at least one time to verify that degradation is not occurring before components are excluded from further inspections. Therefore, modify the COLA FSAR to provide a description of the inspections that includes types and timing of the inspections, or justify an alternative. Also verify that the baseline inspections on components containing 0.10% chromium will be performed before the plant goes into commercial operation, or justify an alternative.

Response

Preservice inspections, to include thickness measurements, are to be conducted prior to operation of main steam supply system (MSSS) and feedwater system components containing a minimum 0.10% chromium content in accordance with the Flow Accelerated Corrosion (FAC) Program. The inspection and measurement methods will be in accordance with the FAC program, including use of grid locations, according to Generic Letter 89-08 and NSAC-202L, "Recommendations for an Effective Flow Accelerated Corrosion Program." Inservice inspections of the identified components will be based on the UniStar inservice FAC Program. The process for exclusion of components from further inspections will be based on guidance of NSAC-202L, such that these components will be subject to a minimum of one inspection to verify degradation is not occurring.

COLA Impact

As shown in Attachment 1, the response to COL Item 10.3-2 has been deleted in its entirety and rewritten as indicated.

Attachment 1

Revision to COL Application Part 2 (FSAR)
Section 10.3.6.3

COL Item 10.3-2 in FSAR Section 10.3.6.3 will be revised as follows:

This COL Item is addressed as follows:

~~{Constellation Generation Group and UniStar Nuclear Operating Services} shall implement a flow-accelerated corrosion (FAC) program that provides a structured, logical approach to identifying locations in the steam and power conversion system that could be susceptible to degradation of pressure boundary thickness due to erosion/corrosion (EC) and flow conditions.~~

~~Multiple criteria are identified, which alone or in combination can create conditions where erosion/corrosion will result from process flow conditions. These criteria include process fluid characteristics (water, steam, two-phase, chemical characteristics), process flow rate, flow path configuration (straight pipe, elbow, valve body, elevation change, etc.), temperature, pressure, duty cycles or cycling of conditions (variations in temperature, pressure, steam quality or wetness, etc.), pressure boundary mechanical stresses (e.g., temperature-induced pipe growth), and materials of construction.~~

~~These criteria are evaluated using industry operating experience and applied initially in the design of the main steam and power conversion system to identify locations that are susceptible to FAC. Adjustments are made to pipe routing and component locations, as possible, to minimize flow velocities and turbulence. In addition, water chemistry requirements are established and materials of construction are selected to further limit contributing factors.~~

~~The criteria are then applied to the final as-built arrangement to identify locations that may be susceptible and determine a relative level of susceptibility. Once the plant is in operation, each of those locations is inspected by visual or volumetric methods on a frequency proportional to the presumed level of susceptibility.~~

~~The water chemistry program for the steam and power conversion system is focused on prevention of corrosion, and is thus integral to the control of FAC. The site specific FAC Program utilizes the guidance of NSAC-202L-R3, "Recommendations for an Effective Flow Accelerated Corrosion Program" (EPRI, 2006). Emphasis is placed on control of dissolved impurities that contribute to corrosion and removal of corrosion products. Water chemistry is discussed in Section 10.3.5.~~

~~Inspection results are recorded and trended throughout the plant's operating life. As data are accumulated for each location, the actual existence of FAC, or lack thereof, can be established as well as the rate of pressure boundary reduction in thickness. With this information, the frequency of inspections can be adjusted as appropriate to assure accurate understanding of the physical condition and maintenance of the required minimum wall thickness, design margins of safety, and piping integrity. In addition, necessary repairs or replacements, including material changes, can be accomplished in a planned and efficient manner.~~

~~Lessons learned through the program are applied to the program itself, and to other systems, programs and/or situations as may be appropriate.~~

~~The FAC Program encompasses the following systems: Main Steam, Condensate, Feedwater, Extraction Steam, Cold and Hot Re-Heat Steam, Heater Drains, MSR Drains, Steam Dump System, and Steam Generator Blowdown.~~

{Calvert Cliffs 3 Nuclear Project and UniStar Nuclear Operating Services} shall implement a flow accelerated corrosion (FAC) program that provides a structured, logical approach to identifying locations in the steam and power conversion system that could be susceptible to degradation of pressure boundary thickness due to erosion/corrosion (EC) and flow conditions. The FAC Program will be consistent with requirements and recommendations of Generic Letter 89-08 "Erosion/Corrosion-Induced Pipe Wall Thinning" (NRC, 1989) and NSAC-202L-R3 "Recommendations for an Effective Flow Accelerated Corrosion Program" (EPRI, 2006).

Multiple criteria are identified, which alone or in combination can create conditions where erosion/corrosion will result from process flow conditions. These criteria include process fluid characteristics (water, steam, two-phase, chemical characteristics), process flow rate, flow path configuration (straight pipe, elbow, valve body, elevation change, etc.), temperature, pressure, duty cycles or cycling of conditions (variations in temperature, pressure, steam quality or wetness, etc.), pressure boundary mechanical stresses (e.g., temperature-induced pipe growth), and materials of construction.

These criteria are evaluated during the design and construction phases using industry operating experience to identify locations that are susceptible to FAC. Adjustments are made to pipe routing and component locations to minimize flow velocities and turbulence. In addition, water chemistry requirements are established and materials of construction are selected to further limit contributing factors.

The water chemistry program for the steam and power conversion system is focused on prevention of corrosion, and is thus integral to the control of FAC. Emphasis is placed on control of dissolved impurities that contribute to corrosion and removal of corrosion products. Water chemistry is discussed in Section 10.3.5.

Prior to operation, preservice examinations (to include thickness measurements) are performed in accordance with the FAC Program procedures. These preservice examinations are performed following system construction completion (usually denoted by performance of the system hydrostatic test), but prior to plant operation. Preservice examinations are conducted using grid locations and measurement methods anticipated for the inservice examination according to industry guidelines and previous industry experience. Grid locations are determined based upon industry operating experience and a FAC modeling software program, in accordance with Generic Letter 89-08 (NRC, 1989) and NSAC-202L-R3 (EPRI 2006).

Examinations are conducted during inservice examinations to determine the extent of any flow accelerated corrosion. The examination schedule and processes are in accordance with the inservice FAC Program requirements. Examination results are then analyzed to provide additional points and the need to replace components, based upon the wear rates and remaining allowable wall thicknesses. This examination is based on the inservice FAC Program, in accordance with Generic Letter 89-08 (NRC, 1989) and NSAC-202L-R3 (EPRI 2006).

Examination results for preservice and inservice examinations are recorded and trended throughout the plant operating life in the FAC database or other appropriate recording means. As data are accumulated for each location, the actual existence of FAC, or lack thereof, can be established as well as the rate of pressure boundary reduction in thickness. With this information, the frequency of examinations can be adjusted as appropriate to assure accurate understanding of the physical condition and maintenance of the required minimum wall thickness, design margins of safety, and piping integrity. In addition, necessary repairs or replacements, including material changes, can be accomplished in a planned and efficient manner.

The FAC program will include preservice and inservice examinations of main steam supply system (MSSS) and feedwater system carbon steel components containing ≥ 0.10% chromium content that are susceptible to flow accelerated corrosion. Consistent with the guidance of NSAC-202L-R3, components with ≥ 0.10% chromium content may be removed from the program if no degradation has occurred.

Lessons learned through the program are applied to the program itself, and to other systems, programs and/or situations as may be appropriate.

The FAC Program encompasses the following systems: Main Steam, Condensate, Feedwater, Extraction Steam, Cold and Hot Re-Heat Steam, Heater Drains, MSR Drains, Steam Dump System, and Steam Generator Blowdown.