



Tennessee Valley Authority, 1101 Market Street, LP 5A, Chattanooga, Tennessee 37402-2801

May 23, 2008

10 CFR 52.79

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555

In the Matter of)
Tennessee Valley Authority)

Docket No. 52-014 and 52-015

**BELLEFONTE COMBINED LICENSE APPLICATION – RESPONSE TO REQUEST FOR
ADDITIONAL INFORMATION – LEAK BEFORE BREAK EVALUATIONS, REACTOR COOLANT
PRESSURE BOUNDARY MATERIALS, AND ORGANIC MATERIALS**

Reference Letter: Letter from Ravindra G. Joshi (NRC) to Andrea L. Sterdis (TVA), Request for
Additional Information Letter No. 001 Related to SRP Sections 03.06.03, 05.02.03 and
06.01.02 for the Bellefonte Units 3 and 4 Combined License Application, dated April
10, 2008.

This letter provides the Tennessee Valley Authority's (TVA) response to the Nuclear Regulatory
Commission (NRC) request for additional information (RAI) items included in the referenced letter. The
items address the subjects of leak before break evaluations, reactor coolant pressure boundary materials,
and organic materials.

The enclosures provide responses to the RAI and identify changes that will be made in a future revision of
the BLN application.

If you should have any questions, please contact Phillip Ray at 1101 Market Street, LP 5A, Chattanooga,
Tennessee 37402-2801, by telephone at (423)751-7030, or via email at pmray@tva.gov.

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

Executed on this 23rd day of May, 2008.

Andrea L. Sterdis
Manager, New Nuclear Licensing and Industry Affairs
Nuclear Generation Development & Construction

Enclosure

DOB5
NRO

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cc: (w/enclosure)

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Ravindra G. Joshi/NRC

Cc: (w/o enclosure)

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M. C. Kray, NuStart
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A. M. Monroe, SCE&G
C. R. Pierce, SNC
L. R. Plisco, NRC
R. Reister, DOE/PM
L. Reyes, NRC/ RII
M. E. Shields, DOE/HQ
R. F. Smith-Kevern, DOE/HQ
D. Spurgeon, DOE
G. A. Zinke, NuStart

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Responses to NRC Request for Additional Information letter No. 001 dated April 10, 2008
(11 Pages, including this list)

Subject: Leak before break evaluations, reactor coolant pressure boundary materials, and organic materials in the Final Safety Analysis Report

<u>RAI Number</u>	<u>Date of TVA Response</u>
03.06.03-01	This letter – see following pages
03.06.03-02	This letter – see following pages
03.06.03-03	This letter – see following pages
05.02.03-01	This letter – see following pages
06.01.02-01	This letter – see following pages

Attachments / Enclosures

None

Pages Included

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NRC Letter Dated: April 10, 2008
NRC Review of Final Safety Analysis Report
NRC RAI NUMBER: 03.06.03-01

It is not clear why Alloy 690 is not used in leak-before-break piping applications. If Alloy 690 base material and alloy 52/152 weld material is not being used, please identify what material is being used for the leak-before-break piping.

BLN RAI ID: 0018

BLN RESPONSE:

The material for the AP1000 leak-before-break piping was addressed in the AP1000 certified design. See DCD Appendix 3B and Table 3B-1 for the specific materials. As identified in the FSAR, Alloy 690 is not used for leak-before-break piping.

This response is expected to be STANDARD for the S-COLAs.

ASSOCIATED BLN COL APPLICATION REVISIONS:

No COLA Part 2, FSAR, revisions have been identified associated with this response.

ATTACHMENTS/ENCLOSURES:

None

Enclosure
TVA letter dated May 23, 2008
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NRC Letter Dated: April 10, 2008

NRC Review of Final Safety Analysis Report

NRC RAI NUMBER: 03.06.03-02

If a different base material is planned to be used (other than Alloy 690/52/152), please state the justification for using this material in leak-before-break piping applications based upon operating experience, and provide justification why no augmented inspection plans and evaluation criteria is considered necessary. Additionally, please provide a discussion that supports the use of an alternative material and explains why concerns for potential PWSCC should not be considered a factor.

BLN RAI ID: 0033

BLN RESPONSE:

The material for the AP1000 leak-before-break piping was addressed in the AP1000 certified design. See DCD Appendix 3B and Table 3B-1 for the specific materials. As identified in the FSAR, Alloy 690 is not used for leak-before-break piping.

This response is expected to be STANDARD for the S-COLAs.

ASSOCIATED BLN COL APPLICATION REVISIONS:

No COLA Part 2, FSAR, revisions have been identified associated with this response.

ATTACHMENTS/ENCLOSURES:

None

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NRC Letter Dated: April 10, 2008

NRC Review of Final Safety Analysis Report

NRC RAI NUMBER: 03.06.03-03

For leak-before-break piping requiring dissimilar-metal welds, if Alloy 52/152 is not being used for the weld material, please identify the weld material and provide justification for its use. Provide a discussion that supports the use of an alternative weld material and explains why concerns regarding the potential for PWSCC should not be considered a factor. Please note that there are currently ASME Code cases being developed for dissimilar-metal welds due to PWSCC concerns.

BLN RAI ID: 0034

BLN RESPONSE:

The weld materials and processes for the AP1000 leak-before-break piping, including information on dissimilar metal welds, were addressed in the AP1000 certified design. See DCD Appendix 3B.

This response is expected to be STANDARD for the S-COLAs.

ASSOCIATED BLN COL APPLICATION REVISIONS:

No COLA Part 2, FSAR, revisions have been identified associated with this response.

ATTACHMENTS/ENCLOSURES:

None

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NRC Letter Dated: April 10, 2008
NRC Review of Final Safety Analysis Report
NRC RAI NUMBER: 05.02.03-01

The applicant included the following supplemental information in Section 5.2.3:

“Monitoring of water chemistry is implemented using the guidance of EPRI TR-1002884 “Pressurized Water Reactor Primary Water Chemistry Guidelines: Volume 1”, Appendix F.” (Rev. 5 dated October 2003).

The cited appendix pertains specifically to sampling of soluble and insoluble corrosion products from the reactor coolant system. The Standard Review Plan, NUREG-0800, Section 5.2.3 does not provide guidance for details of PWR reactor coolant chemistry, but refers the reviewer to SRP Section 9.3.4, “Chemical and Volume Control System (PWR) Including Boron Recovery”. SRP Section 9.3.4 recommends the Chemical and Volume Control System (CVCS) ensure that reactor coolant system chemistry meets General Design Criteria 14, by maintaining acceptable purity levels in the reactor coolant through the removal of insoluble corrosion products and dissolved ionic material by filtration and ion exchange. In addition, per SRP Section 9.3.4, the CVCS maintains proper RCS chemistry by controlling total dissolved solids, pH, oxygen concentration, and halide concentrations within the acceptable ranges. Further, RG 1.206, Section C.I.5.2.3.2, recommends that the applicant describe the reactor coolant water chemistry program, including maximum halogen, sulfate and oxygen content, permissible content of hydrogen and soluble poisons. Additionally, RG 1.206, section C.I.5.2.3.2, states that (COL Section 5.2.3) may reference the EPRI water chemistry guidelines to support the plant-specific program, and should fully describe and discuss the plant-specific water coolant chemistry control program and its compatibility with the RCPB materials.

Appendix F of the Primary Water Chemistry Guidelines only provides a recommended methodology for sampling RCS corrosion products, and does not provide acceptance criteria or methods for reducing/controlling RCS corrosion products. Further, other primary water chemistry parameters that the SRP and RG 1.206 recommend be addressed in the FSAR are not addressed by Appendix F, such as pH, oxygen, and halide concentrations. These parameters are addressed in DCD Section 5.2.3 and DCD Table 5.2.2, which provides maximum values of primary water chemistry parameters including oxygen, pH and halide concentration for the various plant operating modes..

Referencing Appendix F only of the Primary Water Chemistry Guidelines does not add any more detail or specificity for these other parameters.

Please explain the rationale for referencing only Appendix F to the “Pressurized Water Reactor Primary Water Chemistry Guidelines” rather than referencing the entire guidelines document.

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BLN RAI ID: 0016

BLN RESPONSE:

The AP1000 Design Control Document (DCD) describes, in Subsection 5.2.3.2.1, the reactor coolant system chemistry specifications and the methods to control water chemistry. In addition, DCD Table 5.2-2 summarizes these specifications for conductivity, pH, oxygen, chloride, hydrogen, suspended solids (corrosion product particulates), pH control agent, boric acid, silica, aluminum, calcium, magnesium, and zinc.

FSAR Section 5.2 incorporates the aforementioned DCD subsection by reference and refers to Appendix F of the EPRI "Pressurized Water Reactor Water Chemistry Guidelines" as the industry-recommended methodology to be used to monitor water chemistry. As noted by the question, Appendix F of the EPRI document is limited to corrosion products and as such, is insufficient to address the remaining details of the program. As such, the text of FSAR Subsection 5.2.3.2.1 will be revised to reference the complete EPRI document which does address the requested program attributes not covered by the DCD.

This response is expected to be STANDARD for the S-COLAs.

ASSOCIATED BLN COL APPLICATION REVISIONS:

COLA Part 2, FSAR Chapter 5, Subsection 5.2.3.2.1 will be revised from:

"Add the following text to the end of DCD Subsection 5.2.3.2.1.

Monitoring of water chemistry is implemented using the guidance of EPRI TR-1002884 "Pressurized Water Reactor Primary Water Chemistry Guidelines: Volume 1" (Reference 201), Appendix F."

To read:

"Add the following text to the end of DCD Subsection 5.2.3.2.1.

The water chemistry program is based on industry guidelines as described in EPRI TR-1002884, "Pressurized Water Reactor Primary Water Chemistry" (Reference 201). The program includes periodic monitoring and control of chemical additives and reactor coolant impurities listed in DCD Table 5.2-2. Detailed procedures implement the program requirements for sampling and analysis frequencies, and corrective actions for control of reactor water chemistry.

The frequency of sampling water chemistry varies (e.g. continuous, daily, weekly, or as needed) based on plant operating conditions and the EPRI water chemistry guidelines. Whenever corrective actions are taken to address an abnormal chemistry condition, increased sampling is utilized to verify the effectiveness of these actions. When measured water chemistry parameters are outside the specified range, corrective actions are taken to bring the parameter back within the acceptable range and within the time period specified in the EPRI water chemistry guidelines. Following corrective actions, additional samples are taken and analyzed to verify that the corrective actions were effective in returning the concentrations of contaminants.

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Chemistry procedures will provide guidance for the sampling and monitoring of primary coolant properties.”

COLA Part 2, FSAR Chapter 5, Subsection 5.2.7, will be revised from:

“201. EPRI, "Pressurized Water Reactor Primary Water Chemistry Guidelines: Volume 1, EPRI TR-1002884, Revision 5, October 2003.”

To read:

“201. EPRI, "Pressurized Water Reactor Primary Water Chemistry Guidelines, EPRI TR-1002884, Revision 5, October 2003.”

ATTACHMENTS/ENCLOSURES:

None

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TVA letter dated May 23, 2008
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NRC Letter Dated: April 10, 2008

NRC Review of Final Safety Analysis Report

NRC RAI NUMBER: 06.01.02-01

In FSAR Section 6.1.2.1.6, the applicant provided the following information as STD COL 6.1-2 in order to resolve COL Information Item 6.1.3.2:

“The protective coatings program controls the procurement, application, inspection, and monitoring of Service Level I and Service Level III coatings with the quality assurance features discussed above.

The protective coatings program complies with Regulatory Guide 1.54, and is controlled and implemented by administrative procedures.”

The DCD text to be replaced was the third paragraph under the subsection titled “Service Level I and Service Level III Coatings” within DCD subsection 6.1.2.1.6, which stated “The procurement, application, and monitoring of Service Level I and Service Level III coatings are controlled by a program described in subsection 6.1.3.2. DCD Section 6.1.3.2 stated “The Combined License applicants referencing the AP1000 will provide a program to control procurement, application, and monitoring of Service Level I and Service Level III coatings. The program for the control of the use of these coatings will be consistent with subsection 6.1.2.1.6.”

The information provided for resolution of the COL information item indicates that the protective coatings program complies with Regulatory Guide 1.54, which provides an acceptable method to comply with the recommendation of Standard Review Plan Section 6.1.2, “Protective Coating Systems (Paints) - Organic Materials.” However, to complete its review, the staff requests the following information:

- A description of the coating program in sufficient detail to enable the staff to reach a conclusion that the coatings program will meet RG 1.54, addressing the following items:

- The program description should address the standards to be applied for the procurement, application, and monitoring of Service Level I and III protective coatings.

- RG 1.54 states that ASTM D 5144-00 and the other ASTM standards (listed in the regulatory guide) provide guidance on practices and programs that are acceptable to the NRC staff for the selection, application, qualification, inspection, and maintenance of protective coatings applied in nuclear power plants.

The COL information item committed the applicant to provide a program for procurement, application, and monitoring of Service Level I and Service Level III coatings, but did not address selection, qualification, or maintenance of coatings.

The following information is requested:

- 1) The applicant should describe the standards to be applied to maintenance of the protective coatings in the program description. The description of the proposed coatings program should also describe the standards to be applied to selection and qualification of coatings, if the applicant intends to use coatings systems different than those described in the DCD, either during construction or after plant operation commences.

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- 2) The program description should describe the administrative controls that will be applied to the coatings program.
- 3) Provide the schedule for full implementation of the coatings program with respect to major milestones in the construction of the plant; for example, prior to application of coatings, prior to preparation of surfaces to be coated, or prior to procurement of coatings materials.

BLN RAI ID: 0017

BLN RESPONSE:

Item 1) The coating program will be based on Revision 1 of Regulatory Guide 1.54 and the referenced ASTM standards in ASTM D5144. Also, the guidance provided in ASTM D5163, "Establishing Procedures to Monitor the Performance of Coating Service Level I Coating Systems in an Operating Nuclear Power Plant," and in ASTM D7167, "Establishing Procedures to Monitor the Performance of Coating Service Level III Coating Systems in an Operating Nuclear Power Plant," will be used to specify monitoring (maintenance) requirements for the safety related coating systems pertaining to containment. While a change in coating systems (from those described in the DCD) is not anticipated, if a different safety related coating system is needed, it will be evaluated in accordance with the appropriate change process, i.e., 10 CFR 50.59 or 10 CFR Part 52, Appendix D, Section VIII.

Item 2) FSAR section 6.1.3.2, Coating Program, will be revised to indicate compliance with 10 CFR Part 50, Appendix B, and 10 CFR Part 52 requirements implemented by the quality assurance program for the plant (see FSAR Chapter 17 and COLA Part 11) for design, construction, and operation of the units.

Item 3) During the design and construction phase, the requirements for the coating program will be contained in certified drawings and/or standards and specifications controlling the coating processes of the designer (Westinghouse); these design documents will be available prior to the procurement and application of the coating material by the constructor of the plant. Prior to initial fuel loading, a consolidated plant coating program will be in place to address procurement, application, and monitoring (maintenance) of those coating system(s) for the life of the plant.

This response is expected to be STANDARD for the S-COLAs.

ASSOCIATED BLN COL APPLICATION REVISIONS:

COLA Part 2, FSAR Chapter 6, Subsection 6.1.2.1.6, will be revised from:

"Replace the third paragraph under the subsection titled "Service Level I and Service Level III Coatings" within DCD Subsection 6.1.2.1.6 with the following information.

The protective coatings program controls the procurement, application, inspection, and monitoring of Service Level I and Service Level III coatings with the quality assurance features discussed above.

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The protective coatings program complies with Regulatory Guide 1.54, and is controlled and implemented by administrative procedures.”

To read:

“Replace the third paragraph under the subsection titled “Service Level I and Service Level III Coatings” within DCD Subsection 6.1.2.1.6 with the following information.

During the design and construction phase the coatings program associated with selection, procurement and application of safety related coatings is performed to applicable quality standards. Regulatory Guide 1.54 and ASTM D5144 form the basis for the coating program. During the operations phase, the coatings program is administratively controlled in accordance with the quality assurance program implemented to satisfy 10 CFR Part 50, Appendix B, and 10 CFR Part 52 requirements. The coatings program provides direction for the procurement, application, and monitoring of safety related coating systems.

Coating system monitoring requirements for the containment coating systems are based on ASTM D5163, “Establishing Procedures to Monitor the Performance of Coating Service Level I Coating Systems in an Operating Nuclear Power Plant,” and ASTM D7167, “Establishing Procedures to Monitor the Performance of Safety-Related Coating Service Level III Lining Systems in an Operating Nuclear Power Plant.” Any anomalies identified during coating monitoring are resolved in accordance with applicable quality assurance requirements.”

ATTACHMENTS/ENCLOSURES:

None