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Your ref: Docket No. 52-006
Our ref: DCP/NRC2412

April 1, 2009

Subject: AP1000 Responses to Requests for Additional Information (SRP 5)

Westinghouse is submitting responses to the NRC request for additional information (RAI) on SRP Section 5. These RAI responses are submitted in support of the AP1000 Design Certification Amendment Application (Docket No: 52-006). The information included in the responses is generic and is expected to apply to all COL applications referencing the AP1000 Design Certification and the AP1000 Design Certification Amendment Application.

Enclosure 1 provides the response for the following RAI(s):

RAI-SRP5.2.1-EMB-03
RAI-SRP5.2.1-EMB-04
RAI-SRP5.2.1-EMB-05

Note that these RAI responses include alternative requirements to 10 CFR 50.55a which require NRC approval.

Questions or requests for additional information related to the content and preparation of this response should be directed to Westinghouse. Please send copies of such questions or requests to the prospective applicants for combined licenses referencing the AP1000 Design Certification. A representative for each applicant is included on the cc: list of this letter.

Very truly yours,

A handwritten signature in black ink, appearing to read 'Robert Sisk'.

Robert Sisk, Manager
Licensing and Customer Interface
Regulatory Affairs and Standardization

/Enclosure

1. Response to Request for Additional Information on SRP Section 5

cc:	D. Jaffe	- U.S. NRC	1E
	E. McKenna	- U.S. NRC	1E
	P. Buckberg	- U.S. NRC	1E
	C. Proctor	- U.S. NRC	1E
	T. Spink	- TVA	1E
	P. Hastings	- Duke Power	1E
	R. Kitchen	- Progress Energy	1E
	A. Monroe	- SCANA	1E
	P. Jacobs	- Florida Power & Light	1E
	C. Pierce	- Southern Company	1E
	E. Schmiech	- Westinghouse	1E
	G. Zinke	- NuStart/Entergy	1E
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ENCLOSURE 1

Response to Request for Additional Information on SRP Section 5

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Response to Request For Additional Information (RAI)

RAI Response Number: RAI-SRP5.2.1-EMB-03

Revision: 0

Question:

AP1000 Tier 2* DCD Section 5.2.1.1, "Code Compliance with 10 CFR 50.55a," uses the baseline code of the 1998 Edition throughout and including the 2000 Addenda for evaluations of the safety analysis and the Design Certification, except uses 1989 Edition, 1989 Addenda for Articles NB-3200, NB-3600, NC-3600, and ND-3600 for piping design.

By letter dated January 28, 2009, Westinghouse proposed changes to AP1000 Tier 2* DCD Section 5.2.1.1 to use 1989 Edition, 1989 Addenda for Articles NB-3210, NB-3620, NB-3650, NC-3620, NC-3650, ND-3620 and ND-3650. These proposed limitations represent only portions of Articles NB-3200, NB-3600, NC-3600, and ND-3600 disallowed by 10 CFR 50.55a(b)(1)(iii) for seismic design of piping. Therefore,

- a) Westinghouse is requested to confirm whether AP1000 piping design utilized the 1998 Edition, 2000 Addenda Article NB-3220 for the piping design.
- b) Also, discuss how the proposed changes will meet the requirements of 10 CFR 50.55a(b)(1)(iii). Specifically, how the proposed changes will meet the new code requirements relevant to "Reversing Dynamic Loading in Piping," first introduced in ASME 1994 Addenda.
- c) Please also discuss how the use of 1989 Addenda will satisfy the requirements of 10 CFR 50.55a(b)(1)(ii).

Westinghouse Response:

- a) AP1000 piping design will not utilize the alternative provisions for seismic design introduced in NB-3200 in the 1994 Addenda. The 1989 Edition 1989 Addenda of Subarticle NB-3220 is to be included in the additional restrictions in DCD Subsection 5.2.1.1. NB-3220 will be included in the suggested DCD mark-up as shown below.

The subarticles identified as additional restrictions, including NB-3220, are based on discussions with NRC personnel working with ASME Code committees about the specific objections to information in the ASME Code, Section III introduced in the 1994 Addenda

- b) The provisions of 10 CFR 50.55a(b)(1)(iii) relate to the seismic design of piping. The 1989 Edition, 1989 Addenda subarticles identified in the proposed restrictions include the criteria for the seismic design of piping. The restrictions included in the proposed DCD mark-up shown below are consistent with the provisions of 10 CFR 50.55a(b)(1)(iii). The AP1000 piping analyses do not use the provisions in NB-3220 first introduced in the ASME 1994 Addenda on reversing dynamic loading in piping. Also, the AP1000 piping design will not

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utilize the alternative provisions for seismic design introduced in NB-3600 in the 1994 Addenda.

- c) The requirements in 10 CFR 50.55a(b)(1)(ii) relate to weld leg dimensions for socket welds. AP1000 piping design will comply with the requirements of 10 CFR 50.55a(b)(1)(ii) for socket weld dimensions. DCD Subsection 5.2.1.1 includes specific requirements including primary stress indices and stress intensification factor consistent with the requirements of 10CFR50.55a(b)(1)(ii). The DCD will be revised as shown below to clarify that the requirements on weld leg dimensions apply as additional restrictions to piping design.

Design Control Document (DCD) Revision:

Revise the first three paragraphs of subsection 5.2.1.1 as follows: (Note: This mark-up is based on the text included DCD Revision 17.)

5.2.1.1 Compliance with 10 CFR 50.55a

Reactor coolant pressure boundary components are designed and fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section III. A portion of the chemical and volume control system inside containment that is defined as reactor coolant pressure boundary uses an alternate classification in conformance with the requirements of 10 CFR 50.55a(a)(3). Systems other than the reactor coolant system connecting to the chemical and volume control system have required isolation and are not classified as reactor coolant pressure boundary. The alternate classification is discussed in Section 5.2.1.3. The quality group classification for the reactor coolant pressure boundary components is identified in subsection 3.2.2. The quality group classification is used to determine the appropriate sections of the ASME Code or other standards to be applied to the components.

The edition and addenda of the ASME Code applied in the design and manufacture of each component are the edition and addenda established by the requirements of the Design Certification. The use of editions and addenda issued subsequent to the Design Certification is permitted or required based on the provisions in the Design Certification. *[The baseline used for the evaluations done to support this safety analysis report and the Design Certification is the 1998 Edition, 2000 Addenda, ~~except with an additional restriction for piping design,~~ as follows:*

The restriction on piping design is that the treatment of dynamic loads, including seismic loads, in pipe stress analysis will satisfy the requirements of the ASME Code, Section III, Subarticles NB-3210, NB-3220, NB-3620, NB-3650, NC-3620, NC-3650, ND-3620, and ND-3650 1989 Edition, 1989 Addenda, is used for Articles NB 3200, NB 3600, NC 3600, and ND 3600 in lieu of later editions and addenda for piping design. The requirements shown below for fillet welds are also applicable.

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PRA Revision:

None

Technical Report (TR) Revision:

None

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Response to Request For Additional Information (RAI)

RAI Response Number: RAI-SRP5.2.1-EMB-04

Revision: 0

Question:

Revision 17 of the AP1000 DCD indicated that three new Code Cases were added to Table 5.2-3 as Code Cases used in AP1000 design. These code cases are N-655, "Use of SA-738, Grade B, for Metal Containment Vessels, Class MC, Section 11, Division 1", N-757, "Alternative Rules for Acceptability for Class 2 and 3 Valves, NPS 1 (DN25) and Smaller with Welded and Non-welded End Connections other than Flanges, Section III, Division 1", and N-759-1, "Alternative Rules for Determining Allowable External Pressure and Compressive Stresses for Cylinders, Cones, Spheres, and Formed Heads, Section III, Division 1". The staff requests that Westinghouse confirm whether these code cases are approved by the NRC in Regulatory Guide 1.84. If not, provide justification and reconciliation for using these code cases in the AP1000 design in accordance with the requirements of ASME Section III, NCA-1140.

It appears that the most recent versions of these code cases are identified as N-655-1, N-757-1 and N-759-2. A resolution would be for Westinghouse to apply the most recent code cases in Table 5.2-3 in compliance with 10CFR50.55a (b)(4).

Westinghouse Response:

These ASME Section III Code Cases are not included in the most recent publication of Regulatory Guide 1.84. The justification required by 10CFR50.55a (b)(4) for the use of the subject code cases is provided below. This RAI response should be considered a request for the use of these code cases. As suggested in the request above, Westinghouse is applying the most recent versions of the subject Code Cases. Westinghouse has determined that using the most recent revisions of the Code Cases will have no adverse impact on the design and licensing basis of the AP1000.

ASME Code Case N-655 was originally written to permit the use of SA-738 material. The version of the ASME Code used for the construction of the containment, 2001 Edition, 2002 Addenda, includes the use of SA-738 so a Code case is not needed for this material. Code Case N-655-1 replaced Supplementary Requirement S-17 by Supplementary Requirement S-1. Supplementary Requirement S-1 is considered to be equivalent to Supplementary Requirement S-17 for controlling the quality of the SA-738 material. Table 5.2-3 will be changed from N-655 to N-655-1 as shown in the DCD markup below.

The change from S17 to S1 was communicated to the NRC in APP-GW-GLN-113, (TR-113) "AP1000 Containment Vessel Shell: Material Specification" (ML071340345) which was submitted in May 2007. Westinghouse has not received any feedback on this document. As noted in APP-GW-GLN-113, SA-738 Grade B material with imposed Supplementary Requirement S-17 is generally not available. It has been determined that the steel producing mills do not use S17 process ("Vacuum Carbon-Deoxidized Steel"); but use supplementary

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requirement S1 to get similar high quality steel. Supplementary Requirement S1 requires the steel to be made by a process which includes vacuum degassing while molten by a suitable practice selected by the steel manufacturer or purchaser.

In letter DCP/NRC2402 Westinghouse requested NRC approval of the use of Code Cases N-757 and N-759-1. This letter included justification of the use of two Code Cases added in DCD Revision 17 as shown below.

Code Case N-757-1 specifies the use of the alternate rules for the acceptability of Class 2 and 3 valves, NPS 1 (DN25) and smaller with welded and nonwelded end connections other than flanges in the design of small valves. The ASME Code requirements for the design of valves are contained in Articles NC-3500 and ND-3500 for ASME Code Class 2 and 3 valves. The standard design rules in Paragraphs NC-3512 and ND-3512 require that the minimum wall thickness satisfies the thickness requirements specified in the valve standard ASME B16.34, Valves - Flanged, Threaded, and Welding End. Paragraphs NC-3513 and ND-3513 provide alternate design rules that may be used in place of NC-3512 and NC-3512 when permitted by the Design Specification. However, these alternate rules only apply to valves with butt welding end connections and socket welding end connections. Code Case N-757-1 specifies the use of the alternate design rules for welded and non-welded end connections other than flanges, in the design of small valves. The Code Case N-757-1 provides additional requirements that the valves must meet in order that they meet the design requirements of Section III, Division 1, Class 2 and 3 rules of Paragraphs NC-3512 and ND-3512. These include wall thickness requirements, end connection requirements, such as compression fittings, loadings requirements, and design requirements.

The entry for Code Case N-757-1 in DCD Table 5.2-3 includes a footnote that is consistent with the restrictions included by the NRC on the approval of the use of Code Case N-757 for another nuclear power plant.

Code Case N-759-2 is used in the design of the AP1000 to address an issue with the primary side depressurization transients. The revised transient requires a different set of criteria for steam generator tube collapse analysis. Code Case N-759-2, provides an alternative methodology for tube collapse analysis based on theoretical buckling equations and buckling tests on fabricated cylindrical tubes.

Design Control Document (DCD) Revision:

Revise the entries for Code Cases N-655, N-757, and N-759 in Table 5.2-3 as shown below.

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Table 5.2-3	
ASME CODE CASES	
Code Case Number	Title
N-655-1	Use of SA-738, Grade B, for Metal Containment Vessels, Class MC, Section III III, Division 1
N-757-1	Alternative Rules for Acceptability for Class 2 and 3 Valves, NPS 1 (DN25) and Smaller with Welded and Nonwelded End Connections other than Flanges, Section III, Division 1 ^(d)
N-759-1 2	Alternative Rules for Determining Allowable External Pressure and Compressive Stresses for Cylinders, Cones, Spheres, and Formed Heads, Section III, Division 1

PRA Revision:

None

Technical Report (TR) Revision:

None

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Response to Request For Additional Information (RAI)

RAI Response Number: RAI-SRP5.2.1-EMB-05

Revision: 0

Question:

Revision 17 of the AP1000 DCD, Table 1-1 contains Tier 2* information requiring NRC approval for change. It appears that Table 5.2-3, "ASME Code Cases" also contains Tier 2* information as specified in the foot notes of the table. Westinghouse is requested to include Table 5.2-3, "ASME Code Cases" in Table 1-1 Tier 2* information.

The information: "2001 Edition of ASME Code, Section III, including 2002 Addenda" listed in Table 1-1 Tier 2* information requiring NRC approval for change, is incorrect and should be change to read: "1998 Edition of ASME Code, Section III, including 2000 Addenda." The change is necessary for consistency with the AP1000 baseline code of record that is 1998 Edition of ASME Section III, throughout and including 2000 Addenda as specified in Section 5.2.1.1, "Code compliance with 10CFR50.55a".

Westinghouse Response:

In preparing the response for this RAI, Westinghouse identified inconsistencies and an omission in Table 1-1 of the AP1000 Design Control Document (DCD) Introduction. The changes to the Table are discussed below.

In Table 1-1 of the AP1000 DCD Introduction, Table 5.2-3 is included as a reference in the row (fifth row of Page Intro-10) for the Item titled "N-284-1 Metal Containment Shell Buckling Design Methods, Section III, Division I Class MC." This Item should be labeled ASME Code Cases. The DCD will be revised as shown below to change the title of the item.

Also in Table 1-1 of the AP1000 DCD Introduction, the item labeled "2001 Edition of ASME Code, Section III, including 2002 Addenda" (fifth row of Page Intro-7) makes reference to DCD Tier 2 Section 3.8.2.2. The entry "ASME Code, Section III, 2001 Edition, 2002 Addenda" is the correct reference in Subsection 3.8.2.2 for the containment design. A phrase will be added to the entry to note that it applies to containment design. The references to Section 3.8.2.5 and 5.2.1.1 in this row are incorrect. The DCD will be revised as shown below to remove the incorrect references. The information in the following row for ASME Code Case N-284-1 Tier 2* information in DCD Section 3.8.2.2 and 3.8.2.5 is correct and will remain.

In DCD Tier 2 Section 5.2.1.1, the baseline ASME code is shown as Tier 2* information. The base line Code is "1998 Edition, 2000 Addenda plus additional restrictions." An item should be added to Table 1-1 of the AP1000 DCD Introduction to include the Tier 2* information in 5.2.1.1. The DCD will be revised as shown below.

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Design Control Document (DCD) Revision:

Revise Table 1-1 of the DCD Introduction as follows:

Item	Expiration at First Full Power	Tier 2 Reference
2001 Edition of ASME Code, Section III, including 2002 Addenda for containment design	Yes	3.8.2.2 3.8.2.5 5.2.1.1
ASME Code Case N-284-1	Yes	3.8.2.2 3.8.2.5
<u>Baseline ASME Code Edition and Addenda</u>	<u>Yes</u>	<u>5.2.1.1</u>
<u>ASME Code Cases N-284-1 Metal Containment Shell Buckling Design Methods, Section III, Division I Class MC</u>	Yes	Table 5.2-3

PRA Revision:

None

Technical Report (TR) Revision:

None