## AP1000DCDFileNPEm Resource

**From:** Adams II, Samuel L. [adamssl@westinghouse.com]
**Sent:** Tuesday, April 29, 2008 10:22 AM
**To:** Michael Miernicki
**Cc:** Perry Buckberg; Rhonda Carmon
**Subject:** FW: RAIs SRP-3.9.2-EMB1-01-11
**Attachments:** RAI-SRP-3.9.2-EMB1-01-11.doc

Hi Mike,

I acknowledge receipt of the attached RAIs on SRP Section 3.9.2.

I will let you know as soon as possible if a clarification call is necessary.

Thanks.

Sam

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**From:** Michael Miernicki [mailto:Michael.Miernicki@nrc.gov]
**Sent:** Tuesday, April 29, 2008 9:34 AM
**To:** Adams II, Samuel L.
**Cc:** Perry Buckberg; Rhonda Carmon
**Subject:** RAIs SRP-3.9.2-EMB1-01-11

Sam, please see attached RAIs and let me know as soon as possible whether Westinghouse understands these questions or whether a conference call is necessary for any clarifications. Thanks.

Mike

Michael J. Miernicki
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301-415-2304

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**Received Date:** 4/29/2008 10:24:20 AM
**From:** Adams II, Samuel L.

**Created By:** adamssl@westinghouse.com

**Recipients:**
"Perry Buckberg" <Perry.Buckberg@nrc.gov>
Tracking Status: None
"Rhonda Carmon" <Rhonda.Carmon@nrc.gov>
Tracking Status: None
"Michael Miernicki" <Michael.Miernicki@nrc.gov>
Tracking Status: None

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**AP 1000 DCD Rev 16 –Section 3.9.2**

**Request for Addition Information (RAIs)**

**RAI-SRP-3.9.2-EMB1-01** Describe the design and modeling of the core barrel/upper core plate as they relate to flow-induced vibration (FIV) structural dynamic analysis. What is the uncertainty that the model of the interface employed in the modal analysis is representative of the physical support?

**RAI-SRP-3.9.2-EMB1-02** Discuss the potential fluid forces created by the redesigned neutron panels and their potential effects on the FIV excitation of the core barrel/core shroud.

**RAI-SRP-3.9.2-EMB1-03** Discuss the rationale for and the location of instrumentation to provide predicted stresses. There is no instrumentation between the upper end of the core shroud and the lower core support plate. If these are not the maximum stresses, provide the value and location of the maximum stresses for the core barrel/core shroud assembly.

**RAI-SRP-3.9.2-EMB1-04** Discuss how the vibration content affects the strain gage data, how associated conversion factors from 3XL to AP1000 are affected, and the uncertainties in the conversion factors. Table 5.3, "Comparison of calculated and measured 3XL responses," in WCAP 15949 states that the accelerations are considered to be influenced by accelerometer pressure sensitivity and that vertical vibration content in the core barrel strain gages is difficult to ascertain because of masking by other contributors.

**RAI-SRP-3.9.2-EMB1-05** Describe the methodology for determining bias errors and uncertainties associated with data obtained from various sources for evaluating AP 1000 reactor internals responses. The overall methodology for estimating the vibrational forces and using these forces to predict the response of the reactor internals is outlined in Figure 5-1 of WCAP-15949.

**RAI-SRP-3.9.2-EMB1-06** Discuss and summarize the significant additional information/items provided in WCAP 15949- Rev. 2; dated June 2007. WCAP 15949-P Rev 1 "AP 1000 Reactor Internals Flow Induced Vibration Assessment Program" was reviewed previously by the staff during the review of the AP 1000 standard design in September 2004 (Ref. NUREG -1793 Vol. 1).

**RAI-SRP-3.9.2-EMB1-07** Discuss the potential for generation of vortices in the region of the flow skirt due to the presence of these welded joints as well as the flow skirt itself and the potential adverse effects on the response of other internals components. Also discuss any tests related to the evaluation of the flow skirt performance.

**RAI-SRP-3.9.2-EMB1-08** Discuss the redundancy in the instrumentation proposed for the AP 1000 reactor internals preoperational test program. Based on past experience

related to testing of reactor internals, instrument failures do occur during testing. Therefore, it is prudent to provide redundancy in the data acquisition process.

**RAI-SRP-3.9.2-EMB1-09** Provide the following topical reports which relate to preoperational test programs for the Trojan 1 and Doel 4 plants that are referenced in the AP 1000 DCD Revision 16:

> WCAP-8766, Verification of Neutron Pads and 17x17 Guide Tube Designs by Preoperational Tests on the Trojan 1 Power Plant
>
> WCAP-10846, Doel 4 Reactor Internals Flow-induced Vibration Measurement Program

Also, provide test data from the core shroud at the Yonggwang 4 plant, which is relevant to the evaluation of the AP 1000 reactor internals.

**RAI-SRP-3.9.2-EMB1-10** Provide analytical or test data to quantitatively validate the following conclusion in Section 5.1.3.1 of WCAP-15949:

**"**The flow area including the addition of the neutron panels, increased vessel diameter, and different specimen basket design is increased by approximately 4 percent. This tends to offsets the turbulence and increase in local velocities generated by the presence of the neutron panels. Due to the addition of a flow skirt to the lower head of the reactor vessel, the excitations of the structures in the lower vessel head plenum are likely to be lower, also contributing to a lower core barrel vibration."

**RAI-SRP-3.9.2-EMB1-11** Discuss how the uncertainties associated with acoustic analysis have been factored in the results of the updated calculations. Section 5.1.3.1 of WCAP 15949 states:

"The impact of the results of the updated calculations has been addressed in the individual component analyses for the guide tube, upper support column, core barrel, and core shroud. The reactor internals were evaluated for the RCP startup conditions shown in Table 5-9a. The updated reactor conditions are shown in Table 5-9b. Note that the updated conditions are less severe since the time to reach hot standby is the same for the new and old conditions but the flow rates during heat-up are lower for the new conditions. Therefore, fluid velocities are lower for the updated startup conditions than for the evaluated startup conditions. Lower flow rates would result in lower flow turbulence loads."

In order to evaluate the impact on predicted pressure differences due to the design changes, an updated ACSTIC calculation was performed. However, simplifying assumptions were made in the acoustic modeling. Therefore the above conclusions are not necessarily valid unless adequate justification is provided that the uncertainties associated with the ACSTIC calculation have been taken into consideration.