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From: Joelle Starefos
To: Corletti, Mike
Date: 08/12/2003 4:29PM
Subject: AP1000 OI 14.2-1 Followup Questions

Mike,
Please see the attached list of followup questions that were identified during our review associated with open item 14.2-1. I'd like to schedule a call to address any of the items which require further discussion following your review. Please contact me at your convenience to schedule the call.
Thanks, Joelle

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Background Information for OI 14.2-1.a-e
Passive Containment Cooling System

Parameter		DCD Sec. 6 (Rev 6)	ITAAC 2.2.2	ITP 14.2.9.1.4 (Table 14.3-2)	
Minimum Level (ft)	—	27.4	27.4 +0.02 / -0.0		T 6.6.2-2
Standpipe (ft)	1	24.3	24.3 ± 0.2	24.3	24.1
	2	20.5	20.5 ± 0.2	20.5	20.3
	3	17.0	17.0 ± 0.2	17.0 (RAI 1)	16.8
Flow rate (gpm) (minimum value)	—	471.1	471.1 @ 27.4 ±		
	1	238.4	238.4 @ 24.3 ±	226.2	
	2	184.0	184.0 @ 20.5 ±	176.3	
	3	151.4	151.4 @ 17.0 ±	144.2	
	72 hr	109.6	100.7 at 72 hr (RAI 5)	Not specified (RAI 2)	
Time (hr)		72	72	72	
Drain flow (gpm)		525	525	525	
Makeup (gpm)		100	100	100	
Spent fuel pit (gpm)		118	118	118	
Volume (gal)		756,700	756,700	756,700	
Long term makeup (days)		4	4	3 (RAI 3)	
Spent fuel long term (gpm)		35	35	Not specified (RAI 4)	
Note: Technical specification 3.6.6 (Rev 6) captures the 756,700 gal minimum PCS tank volume.					

OI 14.2-1.a
Ref design control document (DCD) Tier 2 Section 14.3 Table 14.3-2

The three elevations which reference DCD Tier 2 Section 6.2 Table 6.2.2-2 (see page 14.3-20) are not consistent with that table. In addition, the values listed in DCD Tier 2 Section 6.2 Table 6.2.2-2 are not "Nominal" but minimum allowable based on DCD Tier 1 Section 2.2 inspections, tests, analyses, and acceptance criteria (ITAAC) 2.2.2 Table 2.2.2-3, item 7.b) i. The "as listed" values are, however, consistent with DCD Tier 2 Section 6.2 Table 6.2.2-1 and would be considered "Nominal" based on the ITAAC. Please address these inconsistencies.

OI 14.2-1.b
Ref DCD Tier 2 Section 14.3 Table 14.3-2
There is no DCD Tier 2 Section 6.2 Figure 6.2.2-3 (see page 14.3-20). The correct location for the flow rates is found in DCD Tier 2 Section 6.2 Table 6.2.2-1. The values as listed in DCD Tier 2 Section 14.3 Table 14.3-2 are not consistent with DCD Tier 2 Section 6.2 Table 6.6.2-1 or DCD Tier 1 Section 2.2 ITAAC 2.2.2 Table 2.2.2-3 item 7.a) i. In addition, DCD Tier 2 Section 14.3 Table 14.3-2 should include an entry following the third flow rate to be consistent with DCD Tier 2 Section 6.2 Table 6.2.2-1 and DCD Tier 1 Section 2.2 ITAAC 2.2.2 Table 2.2.2-3 item 7.a) i, similar to:

Reference		Design Feature	Value
Table	6.2.2-1	The minimum passive containment cooling water flow rate with water inventory at a minimum level of 24.7 ft (gpm)	≥ 471.1

Please address these inconsistencies.

OI 14.2-1.c
Ref DCD Tier 2 Section 14.3 Table 14.3-2

The long term makeup duration is not consistent with DCD Tier 2 Section 6.2 Table 6.2.2-1 or DCD Tier 1 Section 2.2 ITAAC 2.2.2 Table 2.2.2-3 item 8.a). Please address these inconsistencies.

OI 14.2-1.d
Ref DCD Tier 2 Section 14.3 Table 14.3-2

The long-term makeup to the spent fuel pool (35 gpm) is not addressed in the Initial Test Program to confirm the value in DCD Tier 2 Section 6.2 Table 6.2.2-1 and DCD Tier 1 Section 2.2 ITAAC 2.2.2 Table 2.2.2-3 item 8.b). Please address this inconsistency, for example following the PCCAWST to PCCWST [passive containment cooling water storage tank] flow rate:

Reference		Design Feature	Value
Table	6.2.2-1	The minimum long term makeup flow capacity from the PCCAWST to the spent fuel pool (gpm)	≥ 35

OI 14.2-1.e
Ref DCD Tier 2 Section 14.3 Table 14.3-2
Ref DCD Tier 1 Section 2.2 ITAAC 2.2.2 Table 2.2.2-3, Item 7.a) ii.

DCD Tier 2 Section 6.2 Table 6.2.2-1 indicates the minimum flow at 72 hours is 109.6 gpm. DCD Tier 1 Section 2.2 ITAAC 2.2.2 Table 2.2.2-3, Item 7.a) ii allows for a minimum value of 100.7 gpm. In addition, DCD Tier 2 Section 14.3 Table 14.3-2 should include an entry before the first flow rate to be consistent with DCD Tier 2 Section 6.2 Table 6.2.2-1 and DCD Tier 1 Section 2.2 ITAAC 2.2.2 Table 2.2.2-3 item 7.a) ii, similar to,:

Reference		Design Feature	Value
Table	6.2.2-1	The minimum passive containment cooling water flow rate at 72 hours (gpm)	≥ 109.6

Please address these inconsistencies.

OI 14.2-1.f
14.2.9.1.2 - Steam Generator System Testing

The staff requests that Westinghouse identify whether, during the initial test program, the combined license (COL) applicant will monitor (e.g., acoustic monitoring) the primary and secondary sides of the steam generator for indications of loose parts or anomalous internals vibration that can lead to tube degradation. If this type of monitoring will be performed, Westinghouse should make appropriate additions to the DCD. If this type of monitoring will not be performed, Westinghouse should identify the reasons such monitoring is not believed necessary.

OI 14.2-1.g
Protection and Safety Monitoring System (PMS) testing

For the PMS testing, equipment or components which can not be actuated without damage or upsetting the plant are isolated using the test switches provided by the PMS to block device actuation. However, for the Plant Control System testing (14.2.9.2.12) and the Diverse Actuation System testing (14.2.9.2.14), there is no mention of the "test switches" being provided to block the unwanted device actuation. Please clarify the testing design provisions of the Plant Control System and the Diverse Actuation System.

OI 14.2-1.h
14.2.9.4.13 Plant Communication System testing

For Plant Communication System testing (14.2.9.4.13) acceptance criteria verification should also include "maximum potential noise levels" to be consistent with DCD 9.5.2.

OI 14.2-1.i
In the request for additional information (RAI) 410.021, the NRC staff requested a summary of ventilation flows and corresponding ambient pressure data similar to AP600 design for the radiologically controlled area ventilation system (VAS), non-radioactive ventilation system (VBS), health physics and hot machine shop HVAC system (VHS), and radwaste building HVAC system (VRS). Westinghouse provided a response to RAI 410.021 (10/30/2002) as follows:

System	Nominal Outside Supply Airflow (cfm)	Nominal Exhaust Airflow (cfm)	Ambient Pressure
Fuel Handling Area - VAS	17,300	19,000	Negative
Auxiliary/Annex Buildings -VAS	33,000	36,000	Negative
MCR/TSC - VBS	1,350	650	Positive
Health Physics and Hot Machine Shop - VHS	12,750	14,000	Negative
Radwaste Building - VRS	16,200	18,000	Negative

However, Tier 2 Sections 9.4.3 (VAS), 9.4.8 (VRS), and 9.4.11 (VHS) and ITAAC Tables 2.7.5-2 provide the system flow information as follows:

- Tier 2 Section 9.4.3 states that the fuel handling area ventilation subsystem of VAS consists of two 50% capacity supply air handling units of about 9,500 scfm each, and two 50% capacity exhaust air fans sized to allow the system to maintain a negative pressure.

- Tier 2 Section 9.4.8 states that the VRS supply air system consists of two 50% capacity supply air handling units of about 9,000 scfm each, and exhaust air system consists of two 50% capacity fans sized to allow the system to maintain a negative pressure.

- Tier 2 Section 9.4.11 states that the VHS supply air system consists of two 100% capacity supply air handling units of about 14,000 scfm each, and exhaust air system consists of two 100% capacity fans sized to allow the system to maintain a negative pressure.

Also, ITAAC Tables 2.7.5-2 provide the testing and Acceptance Criteria information on VAS as follows

- Tables 2.7.5-2, Item 2 states that the VAS maintains each building area at a slightly negative pressure relative to the atmosphere or adjacent clean plant areas.

    i. The Testing will be performed to confirm the ventilation flow rate through the auxiliary building fuel handling area when operating all VAS supply AHUs [air handling units] and all VAS exhaust fans to meet Acceptance Criteria. The Acceptance Criteria states that a report exists and concludes that the calculated exhaust flow rate based on the measured flow rates is greater than or equal to 15,300 cfm.

    ii. The testing will be performed to confirm the auxiliary building radiologically controlled area ventilation flow rate when operating all VAS supply AHUs and all VAS exhaust fans to meet Acceptance Criteria. The Acceptance Criteria states that a report exists and concludes that the calculated exhaust flow rate based on the measured flow rates is greater than or equal to 22,500 cfm.

Clarify the VAS flow discrepancies in the RAI 410.021, and Tier 1 and Tier 2 materials, as discussed above, and revise as necessary in order to maintain a negative pressure with respect to the adjacent areas inside the fuel handling area and radiologically controlled area served by VAS, health physics and hot machine shop served by VHS, and radwaste building served by VRS.

OI 14.2-1.j
14.2.9.1.1 Reactor Coolant System Testing

The list in the "Purpose" section of reactor coolant system (RCS) safety-related and defense-in-depth functions to be verified during the RCS preoperational test is not complete. For example, it does not include Integrated System Test stated in Regulatory Guide 1.68, Appendix A, Item 1.a, Reactor Coolant System. It also does not include many safety functions of the RCS described in DCD Tier 1, Section 2.1.2, Item 8 of Design Description of the Reactor Coolant system, such as pressurizer safety valves for overpressure protection; the reactor

coolant pumps rotating inertia providing RCS flow coastdown on loss of power; the RCP flywheel assembly being able to withstand a design overspeed condition; the automatic depressurization system providing automatic depressurization during design basis events; and the RCS providing emergency letdown during design basis event.

In addition, there is a mismatch between the RCS functions described in the "Purpose" section and the scope of tests described in the "General Test Method and Acceptance Criteria" section for verification of these functions. Many RCS functions to be verified are not covered by the RCS preoperational tests abstract.

Please provide a complete list of important RCS functions to be verified during the preoperational tests, and a corresponding test abstract, including acceptance criteria, for verification of each of these functions.

OI 14.2-1.k
14.2.9.1.3 Passive Core Cooling System Testing

The "General Test Method and Acceptance Criteria" section described various testings to be performed to verify the passive core cooling system's emergency core decay heat removal function, emergency makeup and boration function, and safety injection function. However, it does not specify the acceptance criteria regarding the passive residual heat removal heat exchanger (PRHRHX) heat transfer capability, in-containment refueling water storage tank (IRWST) heatup characteristics, flow resistances of the core makeup tank (CMT) pressure balance and injection lines, accumulator injection line, IRWST injection line, sump recirculation line, and the flow paths of various stages of automatic depressurization system (ADS).

Provide the acceptance criteria, either the values or reference, for the tests of the above listed systems and components.

OI 14.2-1.l
14.2.9.2.4 Normal Residual Heat Removal System Testing

Provide the acceptance criteria, either the values or reference, for the normal residual heat removal system (RNS) tests which verify the following RNS functions: core and spent fuel pool decay heat removal capability; RCS makeup at low pressure; and low-temperature overpressure protection.

OI 14.2-1.m
14.2.10.1.2 Reactor Systems Sampling for Fuel Loading

Please specify the required operator actions if boron concentration is outside the predetermined range or if the boron readings are not uniform.

OI 14.2-1.n
14.2.10.1.3 Fuel Loading Instrumentation and Neutron Source Requirements

The operability of the core loading instrumentation and neutron source has been established, but the expected "correct" response has not been defined.

Please specify the expected "correct" response of neutron monitoring instrumentation.

OI 14.2-1.o
14.2.10.1.4 Inverse Count Rate Ratio Monitoring for Fuel Loading

No guidance is provided to the operator concerning the count rate and what criteria would warrant a "stop loading" or "unload" action. For example, there is no guidance as to the actions the operators should take if they realize that an assembly is loaded in the wrong direction or the wrong position.

Please provide such guidance and criteria.

OI 14.2-1.p
14.2.10.1.5 Initial Fuel Loading

The order of test abstracts 14.2.10.1.4 and 14.2.10.1.5 should be reversed because one cannot implement a reverse neutron count until after there is fuel in the core.

Please specify the conditions which would warrant a "stop loading" action.

It should be stated that the fuel loading operation must be supervised by a licensed senior operator with no concurrent duties.

OI 14.2-1.q
14.2.10.1.6 Post-Fuel Loading Precritical Test Sequence

In specifying the sequence of the pre-critical test, the evolution should be such that plant safety does not depend entirely upon non-tested systems. It is not clear that this testing principle was taken into account.

Regulatory Guide (RG) 1.68 provides for a final calibration of the source range instrumentation and verification of the alarm and protective functions of the source and the intermediate range monitors.

Please identify the instrumentation to be used, and provide guidance to the operators that prevents their reliance on untested instrumentation. Please describe and specify these tests.

OI 14.2-1.r
14.2.10.1.14 Rod Drop Time Measurement

Initial control rod drive testing seems to be limited to rod drop time measurement. The functional testing of the reactor protection system such as trip setpoints, logic, operability of scram breakers and manual scram functions are not listed. Guidance is not available to the

operators regarding actions if drop tests are outside the expected range.

Please supplement this test to follow the guidance of RG 1.68.

OI 14.2-1.s
14.2.10.1.19 Pressurizer Spray Capability and Continuous Spray Flow Verification

With regard to the pressurizer spray capability tests, one of the performance criteria is that the pressurizer pressure response to the opening of the pressurizer spray valves is within design basis functional limits as specified in subsection 7.7.1.6. Subsection 7.7.1.6 does not specifically define the design basis functional limits for the pressurizer pressure control system, except that the primary system pressure is regulated to prevent the actuation of the engineered safety feature to prevent overstressing the pressure boundary or the possibility of departure from nucleate boiling.

Provide specific acceptance criteria for the pressurizer spray test.

OI 14.2-1.t
14.2.10.2.3 Nuclear Instrumentation System Verification

No action statement is stated if the measured reactivity and the corresponding value indicated by the computer are not within tolerance levels.

Please specify appropriate operator action if the measured reactivity and the corresponding value indicated by the computer are not within tolerance levels. Supplement this test with verification of proper operation of associated alarms and protective functions for source-range and intermediate-range monitors.

OI 14.2-1.u
14.2.10.3.4 Isothermal Temperature Coefficient Measurement

The "prerequisites" do not include Xenon and Samarium equilibration. Also, no required actions is specified if the moderator temperature coefficient (MTC) is equal to or significantly exceeds the technical specification (TS) value.

Please specify the missing prerequisites in this test.

OI 14.2-1.v
14.2.10.3.7 Passive Residual Heat Removal Heat Exchanger (First Plant only)

Section 14.2.10.3.7 indicates that the low-power PRHRHX test is to be performed for the first AP1000 plant only. It also contains a note stating that this test is not required to be performed if a large scale test of the AP600 or AP1000 type PRHRHX has been conducted, and has provided data confirming adequate heat removal capability (underline added).

Clarify the note with an example of existing large scale PRHRHX tests that can fit into the

above underlined category. Justify why this large scale test can substitute for the low power test to be performed for the first AP1000 plant, or delete the note.

OI 14.2-1.w
14.2.10.4.19 Reactor Power Control System

Please explain why Xenon and Samarium equilibration is not part of the prerequisites if it is expected that T_{avg} will return to T_{ref}.

OI 14.2-1.x
14.2.10.4.20 Load Swing Test

The load swing test requires a 10% load change from 100% power.

Please clarify that this is not a 10% load increase from 100% power, or specify the required operator response.

OI 14.2-1.y
14.2.10.4.23 Hot Full Power Boron Endpoint

Please explain the origin of the burn-up data for a startup test of a new plant.