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NSD-NRC-96-4800  
DCP/NRC0580  
Docket No.: STN-52-003

August 13, 1996

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

ATTENTION: T. R. QUAY

SUBJECT: SSAR CHAPTER 14 - INITIAL TEST PROGRAM, RESPONSES TO RAIS  
AND OPEN ITEMS

Dear Mr. Quay:

The enclosure to this letter provides responses to requests for additional information and open items contained in the November 1994 Draft Safety Evaluation Report on the AP600. These responses reflect the recent revision to Chapter 14 of the AP600 SSAR (Revision 9). Attachment 1 identifies the open items and RAIs addressed by this transmittal. We request that these responses be included in the ongoing review of the Chapter 14 revision.

Please contact John C. Butler on (412) 374-5268 if you have any questions concerning this transmittal.

Brian A. McIntyre, Manager  
Advanced Plant Safety and Licensing

/nja

Enclosures  
Attachment

cc: T. Kenyon, NRC (w/o Enclosures/Attachments)  
J. Sebrosky, NRC (1A, 1E)  
J. Peralta, NRC (1A, 1E)  
R. Gruel, PNL (1A, 1E)  
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**Attachment 1**  
**AP600 Initial Test Program Open Items and RAIs**  
**Addressed via Enclosure to Westinghouse Letter NSD-NRC-96-4800**

OITS Number	Open Item
780	DSER 3.9.2.1-1
1124	DSER 9.5.1.4-7
1162	DSER 10.4.7-1
1234	DSER 14.2.1-1
1235	DSER 14.2.2-1
1236	DSER 14.2.2-2
1237	DSER 14.2.2.1-1
1238	DSER 14.2.2.2-1
1239	DSER 14.2.8-1
1240	DSER 14.2.8-2
1241	DSER 14.2.8-3
1242	DSER 14.2.8-4
1243	DSER 14.2.8-5
1244	DSER 14.2.8-6
1245	DSER 14.2.8-7
1246	DSER 14.2.8-8
1247	DSER 14.2.8-9
1248	DSER 14.2.8-10
1249	DSER 14.2.8-11
1250	DSER 14.2.8-12
1251	DSER 14.2.8-13
1252	DSER 14.2.8-14
1253	DSER 14.2.8-15
1254	DSER 14.2.8-16
1255	DSER 14.2.8.3-1
1256	DSER 14.2.8.4-1
1257	DSER 14.2.9-1
1258	DSER 14.2.9-2

OITS Number	Open Item
1792	DSER 3.9.2.1-4
1828	DSER 14.2.7-1
1829	DSER 14.2.8-1
1963	DSER 14.2.2-1
1964	DSER 14.2.2-2
1965	DSER 14.2.2-3
1966	DSER 14.2.2-4
1967	DSER 14.2.2.2-1
1968	DSER 14.2.8-1
2035	DSER "top 50" item
2271	Meeting Open Item
2543	RAI 260.35
2544	RAI 260.36
2545	RAI 260.37
2546	RAI 260.38
2547	RAI 260.39
2548	RAI 260.40
2549	RAI 260.41
2550	RAI 260.42
2551	RAI 260.43
2552	RAI 260.44
2553	RAI 260.45
2554	RAI 260.46
2555	RAI 260.47
2556	RAI 260.48
2557	RAI 260.49
2558	RAI 260.50
2559	RAI 260.51
2560	RAI 260.52
2561	RAI 260.53
2562	RAI 260.54

OITS Number	Open Item
2563	RAI 260.55
2564	RAI 260.56
2565	RAI 260.57
2566	RAI 260.58
2567	RAI 260.59
2568	RAI 260.60
2569	RAI 260.61
2570	RAI 260.62
2571	RAI 260.63
2572	RAI 260.64
2639	RAI 260.65
2640	RAI 260.66
2641	RAI 260.67
2642	RAI 260.68
2643	RAI 260.69
2644	RAI 260.70
2645	RAI 260.71
2646	RAI 260.72
2647	RAI 260.73
2648	RAI 260.74
2931	RAI 260.75
2932	RAI 260.76
2933	RAI 260.77
2934	RAI 260.78
2935	RAI 260.79
2936	RAI 260.80
2937	RAI 260.81
2938	RAI 260.82



## RESPONSE TO DSER OPEN ITEMS



OITS 780

DSER 3.9.2.1-1

Re: SSAR Chapter 14, Section 14.2.9.1.7

Westinghouse should revise the SSAR to state that the identified piping systems will be included in the AP600 preoperational piping vibration, thermal expansion, and dynamic test programs.

### Response:

Subsection 14.2.9.1.7, has been revised to state that the AP600 preoperational piping vibration, thermal expansion, and dynamic testing will include ASME Code Class 1, 2, and 3; i.e., safety related high energy piping system components, piping, and piping support and restraint devices.

Westinghouse Status: Closed



Westinghouse

## RESPONSE TO DSER OPEN ITEMS



OITS 1124

DSER 9.5.1.4-7

Re: SSAR Chapter 14, Section 14.2.9.2.8

The staff has not yet determined the acceptability of the preoperational acceptance test for all active components of the entire fire-protection system(s).

### Response:

Subsection 14.2.9.2.8, fire protection system testing, has been revised to state that the system operates as specified in subsection 9.5.1 and in appropriate design specifications. These documents identify the applicable NFPA standards for the testing of individual components in the fire protection system. Subsections 14.2.9.2.19 and 14.2.9.4.13 describe testing of the plant lighting and communication systems, respectively. The breathing apparatus provided at the plant and the use of this equipment will be identified by the COL applicant, as part of the fire protection personnel training.

Westinghouse Status: Closed

## RESPONSE TO DSER OPEN ITEMS



OITS 1162

DSER 10.4.7-1

Re: SSAR Chapter 14, Section 14.2.9.1.7      Question 410.263

Westinghouse should provide procedures for testing feedwater hammer occurrence.

### Response:

Subsection 14.2.9.1.7 on dynamic effects on piping, has been revised to include testing to start/stop startup feedwater to the steam generators to verify that unacceptable feedwater hammer does not occur. Additional testing is also performed during the plant startup testing which includes both startup and main feedwater to the steam generators, as described in subsections 14.2.10.4.13, 14.2.10.4.18, and 14.2.10.1.20.

Westinghouse Status: Closed



Westinghouse

## RESPONSE TO DSER OPEN ITEMS



OITS 1234

DSER 14.2.1-1

Re: SSAR Chapter 14, Section 14.2.1

Question 260.23

Westinghouse should acceptably address the issues identified in Q260.23, and identify items (discussed in Section 14.2.1 of this report) that are not addressed by the initial test program, and justify their exclusions.

### Response:

Subsection 14.2.1, has been revised to include the test objectives identified in the August 8, 1994 response to RAI 260.23. In addition, test abstracts for applicable systems identified in Regulatory Guide 1.68, Revision 2, Appendix A have been included.

Westinghouse Status: Closed

## RESPONSE TO DSER OPEN ITEMS



OITS 1235

DSER 14.2.2-1

Re: SSAR Chapter 14, Section 14.2.2

In Section 14.2.2 of the SSAR, Westinghouse should replace the phrase "NRC staff personnel from the Office of Inspection and Enforcement" with "NRC inspection personnel."

Response:

Subsection 14.2.2, has been revised deleting the phrase "NRC staff personnel from the Office of Inspection and Enforcement."

Westinghouse Status: Closed



Westinghouse

## RESPONSE TO DSER OPEN ITEMS



OITS 1236

DSER 14.2.2-2

Re: SSAR Chapter 14

Westinghouse should add to the SSAR the identified COL Action Items.

Response:

Information to be provided by the COL, related to the plant initial testing program, has been added to the SSAR in Section 14.4.

Westinghouse Status: Closed



Westinghouse



## RESPONSE TO DSER OPEN ITEMS



OITS 1237

DSER 14.2.2.1-1

Re: SSAR Chapter 14, Section 14.4

Westinghouse should include in the SSAR a description of the organizational units and any augmented organizations or other personnel that will manage, supervise, or execute any phase of the ITP in a manner consistent with the guidance in Section 14.2.2 of RG 1.70.

### Response:

A description of the organizational units and any augmented organizations or other personnel that will manage, supervise, or execute any phase of the initial test program is the responsibility of the combined license applicant. Section 14.4, states that the COL is to provide this information.

Westinghouse Status: Closed



Westinghouse

## RESPONSE TO DSER OPEN ITEMS



OITS 1238

DSER 14.2.2.2-1

Re: SSAR Chapter 14, Section 14.4

Westinghouse should add COL Action Item 14.2.2.2-1 to the SSAR.

Response:

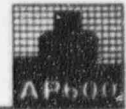
COL Action Items related to the plant initial testing program have been added to the SSAR in Section 14.4.

Westinghouse Status: Closed



Westinghouse

## RESPONSE TO DSER OPEN ITEMS



OITS 1239

DSER 14.2.8-1

Re: SSAR Chapter 14, Section 14.2.9.3

Westinghouse should modify preoperational test abstract 14.2.8.1.80 in Appendix 1A of the SSAR to include the applicability of this testing to subsequent AP600 plants, or to provide appropriate justification for this exception to RG 1.68, Appendix A, Items 1.a.(2)(d) and 1.h.(2).

### Response:

Subsection 14.2.9.3, specifies that testing to demonstrate the flowpath resistances of each automatic depressurization system flowpath is to be performed for each AP600 plant. A blowdown test of the heated and pressurized reactor coolant system through the stage 1, 2, and 3 depressurization flowpaths into the in-containment refueling water storage tank is performed on only the first AP600 plant. This first-plant-only blowdown test is performed to verify that the response of in-containment refueling water storage tank and plant structures to the hydrodynamic loads resulting from the blowdown are consistent with design basis loading developed from the extensive blowdown testing done as part of the certification test program. Once this blowdown test is performed and proper structural response is verified, this test need not be repeated on subsequent plants since the IRWST and spargers are identical and the flowpath resistance will be verified. Therefore, the blowdown flowrates and hydrodynamic loads will be the same.

The above first-plant-only blowdown test meets the following criteria used to establish which testing is to be performed only on the first AP600 plant:

- The performance parameter(s) to be measured is not provided by previous certification, qualification, or prototype testing.

and

- Construction/installation inspections and other preoperational tests, performed on every plant, demonstrate that the performance parameter(s) does not change from plant to plant.

Examples of previous tests which are done only for the first plant, with NRC concurrence, have been reactor internals vibration and reactor coolant system natural circulation testing.

Westinghouse Status: Closed

## RESPONSE TO DSER OPEN ITEMS



OITS 1240

DSER 14.2.8-2

Re: SSAR Chapter 14, Section 14.2.9.1.3

Westinghouse should modify preoperational test abstract 14.2.8.1.85 in Appendix 1A of the SSAR to include the applicability of this testing to subsequent AP600 plants, or to provide appropriate justification for this exception to RG 1.79 and RG 1.68, Appendix A, Item 1.h.(1).

### Response:

Subsection 14.2.9.1.3 on passive core cooling system testing, has been revised to specify verification of core makeup tank and accumulator performance for each AP600 plant.

Westinghouse Status: Closed



Westinghouse

## RESPONSE TO DSER OPEN ITEMS



OITS 1241

DSER 14.2.8-3

Re: SSAR Chapter 14, Section 14.2.9.1.3

Westinghouse should modify preoperational test abstract 14.2.8.1.87 in Appendix 1A of the SSAR to include the applicability of this testing to subsequent AP600 plants, or to provide appropriate justification for this exception to RG 1.139 and RG 1.68, Appendix A, Items 1.d.(5), 1.d.(8), and 1.h.

### Response:

Subsection 14.2.9.1.3 on passive core cooling system testing, has been revised to specify verification of passive residual heat removal heat exchanger performance for each AP600. Observation of the accompanying heatup characteristics of the in-containment refueling water storage tank water is specified only for the first AP600 plant.

Westinghouse Status: Closed



Westinghouse

## RESPONSE TO DSER OPEN ITEMS



OITS 1242

DSER 14.2.8-4

Re: SSAR Chapter 14, Section 14.2.9.1.12

Westinghouse should modify preoperational test abstract 14.2.8.1.94 in Appendix 1A of the SSAR to include the applicability of this testing to subsequent AP600 plants, or to provide appropriate justification for this exception to RG 1.68.2, as well as RP C.3 and C.4.

### Response:

Subsection 14.2.9.1.12, has been revised to include verification of the ability to initiate actuation signals to the systems/components required for safe-shutdown from the remote shutdown workstation for each AP600 plant.

Westinghouse Status: Closed



## RESPONSE TO DSER OPEN ITEMS



OITS 1243

DSER 14.2.8-5

Re: SSAR Chapter 14, Section 14.2.9.1.4

Westinghouse should modify preoperational test abstract 14.2.8.1.97 in Appendix 1A of the SSAR to include the applicability of this testing to subsequent AP600 plants, or to provide appropriate justification for this exception to RG 1.68, Appendix A, Item 1.h.(3).

Response:

Subsection 14.2.9.1.4, has been revised to include verification of the proper operation of the functions required for passive containment cooling for each AP600 plant.

Westinghouse Status: Closed



Westinghouse

## RESPONSE TO DSER OPEN ITEMS



OITS 1244

DSER 14.2.8-6

Re: SSAR Chapter 14, Section 14.2.9.1.6

Westinghouse should modify preoperational test abstract 14.2.8.1.100 in Appendix 1A of the SSAR to include the applicability of this testing to subsequent AP600 plants, or provide appropriate justification for this exception to RG 1.68, Appendix A, Item 1.n.(14)(f).

### Response:

Subsection 14.2.9.1.6, has been revised to include verification of the proper operation of the main control room habitability system and components for each AP600 plant. A long-term demonstration test of this system is specified only for the first plant in order to demonstrate the ability of the structural heat sinks to maintain proper component temperatures and demonstrate the proper sizing of the stored air supply.

The above first-plant-only test meets the following criteria used to establish which testing is to be performed only on the first AP600 plant:

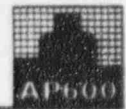
- The performance parameter(s) to be measured is not provided by previous certification, qualification, or prototype testing.

and

- Construction/installation inspections and other preoperational tests, performed on every plant, demonstrate that the performance parameter does not change from plant to plant.

Westinghouse Status: Closed

## RESPONSE TO DSER OPEN ITEMS



OITS 1245

DSER 14.2.8-7

Re: SSAR Chapter 14, Section 14.4

COL Action Item 14.2.8-7

Westinghouse should add additional criteria to startup test abstract 14.2.8.2.34 in Appendix 1.A of the SSAR.

### Response:

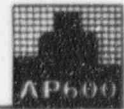
Section 14.3, provides reference to Certified Design Material which commits the COL to conduct the Initial Test Program. As part of that Initial Test Program, the COL will verify the physical layout and configuration of the components, and component parameters important to the natural circulation of fluid in the reactor coolant system. These verifications will establish that AP600 plants subsequent to the first plant, will achieve natural circulation flow similar to the flow demonstrated by testing in the first plant.

Westinghouse Status: Closed



Westinghouse

## RESPONSE TO DSER OPEN ITEMS



OITS 1246

DSER 14.2.8-8

Re: SSAR Chapter 14, Section 14.2.10.4.9

Westinghouse should modify startup test abstract 14.2.8.2.38 in Appendix 1A of the SSAR to include the applicability of this testing to subsequent AP600 plants, or to provide appropriate justification for this exception to RG 1.68, Appendix A, Items 5.b and 5.y.

### Response:

Subsection 14.2.10.4.9, has been revised to include verification of the proper operation of the reactor external core flux meters for each AP600 plant.

Westinghouse Status: Closed

## RESPONSE TO DSER OPEN ITEMS



OITS 1247

DSER 14.2.8-9

Re: SSAR Chapter 14, Section 14.2.9.2.17

Westinghouse should modify startup test abstract 14.2.8.2.41 in Appendix 1A of the SSAR to include the applicability of this testing to subsequent AP600 plants, or to provide appropriate justification for this exception to RG 1.68, Appendix A, Item 5.j.j.

### Response:

Chapter 14 has been revised to delete testing which simulates a loss of off-site electrical power with the reactor core at power; however, each aspect of a loss of offsite power transient is tested separately. These tests include the RCP flow coastdown test (14.2.10.1.18), the diesel generator start, and load testing (14.2.9.2.17), the rod control system test (14.2.10.1.11), and the rod drop time measurement test (14.2.10.1.14).

Westinghouse Status: Closed



Westinghouse

## RESPONSE TO DSER OPEN ITEMS



OITS 1248

DSER 14.2.8-10

Re: SSAR Chapter 14, Section 14.2.10.4.6

Westinghouse should modify startup test abstract 14.2.8.2.47 to include the applicability of this testing to subsequent AP600 plants, or to provide appropriate justification for this exception to RG 1.68, Appendix A, Item 5.i.

### Response:

Subsection 14.2.10.4.6, which describes rod cluster control assembly out of bank measurements, has been revised to be performed for each AP600 plant.

Westinghouse Status: Closed



Westinghouse



## RESPONSE TO DSER OPEN ITEMS



OITS 1249

DSER 14.2.8-11

Re: SSAR Chapter 14, Section 14.2.10.4.21

Westinghouse should modify startup test abstract 14.2.8.2.51 in Appendix 1A of the SSAR to include the applicability of this testing to subsequent AP600 plants, or to provide appropriate justification for this exception to RG 1.68, Appendix A, Item 5.n.n.

### Response:

Subsection 14.2.10.4.21 specifies that the 100% load rejection test is to be performed only on the first AP600 plant. This testing provides measurements of the plant parameters including reactor power and primary and secondary pressures and temperatures that occur following this transient. Subsequent plants have similar equipment, control systems, and setpoints. The above first-plant-only test meets the following criteria used to establish which testing is to be performed only on the first AP600 plant:

- The performance parameter(s) to be measured is not provided by previous certification, qualification, or prototype testing.

and

- Construction/installation inspections and other preoperational tests, performed on every plant, demonstrate that the performance parameter(s) does not change from plant to plant.

Westinghouse Status: Closed



Westinghouse

## RESPONSE TO DSER OPEN ITEMS



OITS 1250

DSER 14.2.8-12

Re: SSAR Chapter 14, Section 14.2.10.4.22

Westinghouse should modify startup test abstract 14.2.8.2.52 in Appendix 1A of the SSAR to include the applicability of this testing to subsequent AP600 plants, or to provide appropriate justification for this exception to RG 1.68, Appendix A, Item 5.h.h.

### Response:

Subsection 14.2.10.4.22 specifies that the capability of the plant to properly perform load follow maneuvers is demonstrated only on the first AP600 plant. This testing provides measurements of the core power distributions that occur during load follow maneuvers. Subsequent plants have similar equipment, control systems, and setpoints. The above first-plant-only test meets the following criteria used to establish which testing is to be performed only on the first AP600 plant:

- The performance parameter(s) to be measured is not provided by previous certification, qualification, or prototype testing.

and

- Construction/installation inspections and other preoperational tests, performed on every plant, demonstrate that the performance parameter(s) does not change from plant to plant.

Westinghouse Status: Closed



Westinghouse

## RESPONSE TO DSER OPEN ITEMS



OITS 1251

DSER 14.2.8-13

Re: SSAR Chapter 14, Section 14.2.10.4.24

Westinghouse should modify startup test abstract 14.2.8.2.55 in Appendix 1A of the SSAR to include the applicability of this testing to subsequent AP600 plants, or to provide appropriate justification for this exception to RG 1.68, Appendix A, Item 5.1.1.

### Response:

Subsection 14.2.10.4.24, has been revised to specify that a plant trip test is to be performed on each AP600 plant.

Westinghouse Status: Closed



Westinghouse

## RESPONSE TO DSER OPEN ITEMS



OITS 1252

DSER 14.2.8-14

Re: SSAR Chapter 14, Section 14.4

Questions 260.24 & 260.28

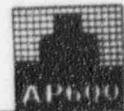
Westinghouse should revise Section 14.2.8 of the SSAR to reconcile its contents with that of Section 14.2.2 of the SSAR, as discussed above in relation to Q260.24.

### Response:

Responses to RAIs 260.24 and 260.28 have been provided. Section 14.4, has been revised to specify the COL provide appropriate initial test program documents for review by the staff.

Westinghouse Status: Closed

## RESPONSE TO DSER OPEN ITEMS



OITS 1253

DSER 14.2.8-15

Re: SSAR Chapter 14, Section 14.2.9

Westinghouse should revise Section 14.2.8 of the SSAR, as well as the individual test methods or performance criteria, to provide specific references to the basis for determining acceptable system and component performance.

### Response:

Subsection 14.2.9, has been revised to specify specific references that should be used to determine acceptable system and component performance.

Westinghouse Status: Closed



Westinghouse

## RESPONSE TO DSER OPEN ITEMS



OITS 1254

DSER 14.2.8-16

Re: SSAR Chapter 14, Section 14.2.9

Westinghouse should either expand the test abstracts of Section 14.2.8 of the SSAR to address the issued identified in Appendix A to RG 1.68, or revise Appendix 1A of the SSAR to provide technical justification for any exceptions taken.

### Response:

Subsection 14.2.9, has been revised to include test abstracts for all applicable AP600 systems and components as specified in Regulatory Guide 1.68, Revision 2, Appendix A.

Westinghouse Status: Closed



Westinghouse



## RESPONSE TO DSER OPEN ITEMS



OITS 1255

DSER 14.2.8.3-1

Re: SSAR Chapter 14, Section 14.2.9

Westinghouse should acceptably address the issues identified in Q260.30.

### Response:

Subsection 14.2.9, has been revised to include test abstracts for appropriate AP600 systems and components as specified in Regulatory Guide 1.68, Revision 2, Appendix A.

Westinghouse Status: Closed



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## RESPONSE TO DSER OPEN ITEMS



OITS 1256

DSER 14.2.8.4-1

Re: SSAR Chapter 14, Section 14.2.9.1.12      Question 260.31

Westinghouse should acceptably address the issues identified in Q260.31.

### Response:

Subsection 14.2.9.1.12, has been revised to include testing to verify the ability to initiate actuation signals to the systems/components required for reactor shutdown from the remote shutdown workstation. Note that the AP600 remote shutdown workstation provides the operator with the same capability to maintain the plant at hot shutdown conditions, or to cool the plant down; as is provided from the main control room. Therefore, the operator does not need to perform manual actions or operate equipment from local control panels. In addition, test abstracts for the instrument and compressed air system and appropriate HVAC systems have been revised.

Westinghouse Status: Closed



Westinghouse

## RESPONSE TO DSER OPEN ITEMS



OITS 1257

DSER 14.2.9-1

Re: SSAR Chapter 14, Section 14.4

Question 260.32

Westinghouse should acceptably address the issues identified in Q260.32.

### Response:

Section 14.3, provides reference to COL information items to verify site specific aspects of the plant that may require testing are within the certification envelope.

Westinghouse Status: Closed



Westinghouse

## RESPONSE TO DSER OPEN ITEMS



OITS 1258

DSER 14.2.9-2

Re: SSAR Chapter 14, Section 14.4

Question Q260.25 & 260.27

Westinghouse should acceptably address the issues identified in Q260.25.

### Response:

Section 14.4, has been revised to include a COL information item to provide a startup administrative manual that will delineate specific permissions required for the approval of test results and the permission to proceed to the next testing phase.

Westinghouse Status: Closed



Westinghouse

## RESPONSE TO DSER OPEN ITEMS



OITS 1792

DSER 3.9.2.1-4

Re: SSAR Chapter 14, Section 14.2.9.1.7

Question 210.57

3.9.2.1-4 Westinghouse should revise the SSAR as noted in Section 3.9.2.1 of this report. (Incorporate SSAR revision from RAI 210.57, acceptance standard for alternating stress intensity.)

### Response:

Subsection 14.2.9.1.7 on expansion, vibration, and dynamic effects testing, has been revised to include reference to SSAR subsection 3.9.2, which delineates the acceptance criteria for alternating stress intensity due to vibration.

Westinghouse Status: Closed



Westinghouse

## RESPONSE TO DSER OPEN ITEMS



OITS 1828

DSER 14.2.7-1

Re: SSAR Chapter 14, Section 14.4

Question 260.27

Westinghouse will revise the SSAR to state that the startup administrative manual (procedures) will be the responsibility of the COL applicant, as will other documents that delineate the test program schedule for the initial fuel load and for each major test program.

### Response:

Section 14.4, has been revised to include a COL information item to provide a startup administrative manual that will delineate the test program schedule for staff review.

Westinghouse Status: Closed

## RESPONSE TO DSER OPEN ITEMS



OITS 1329

DSER 14.2.8-1

Re: SSAR Chapter 14

Question 210.58 & 210.53

Westinghouse will make the appropriate changes to the preoperational and startup test abstracts, pending satisfactory resolution of Q210.53 and Q210.58.

### Response:

Chapter 14 has been revised to require steady-state and dynamic vibration measurements of safety related, high energy piping during hot functional testing and during startup testing; for all AP600 plants. Reactor internals vibration testing is specified for the first AP600 plant only. This first-plant-only internals vibration test meets the following criteria used to establish which testing is to be performed only on the first AP600 plant:

- The performance parameter(s) to be measured is not provided by previous certification, qualification, or prototype testing.

and

- Construction/installation inspections and other preoperational tests, performed on every plant, demonstrate that the performance parameter(s) does not change from plant to plant.

This first-plant-only reactor internals vibration test is consistent with internals testing done on previous plants for the first plant, with NRC concurrence.

Westinghouse Status: Closed



Westinghouse

## RESPONSE TO DSER OPEN ITEMS



OITS 1963

DSER 14.2.2-1

Re: SSAR Chapter 14, Section 14.4

The COL applicant should provide for staff review, the scoping document (i.e., preoperational and startup test specifications) containing testing objectives and acceptance criteria applicable to Westinghouse's scope of design responsibility.

### Response:

Section 14.4, has been revised to include a COL information item to provide preoperational and startup test procedures containing test objectives and acceptance criteria for Westinghouse scope systems/equipment.

Westinghouse Status: Closed



Westinghouse



## RESPONSE TO DSER OPEN ITEMS



OITS 1964

DSER 14.2.2-2

Re: SSAR Chapter 14, Section 14.4

The COL applicant should provide for staff review, the scoping document, and any related documents, which delineate plant operational conditions at which tests are to be conducted, testing methodologies to be utilized, specific data to be collected, and acceptable data reduction techniques to be utilized.

### Response:

Section 14.4, has been revised to include a COL information item to provide preoperational and startup test procedures to delineate test conditions, testing method, data to be collected, and data reduction techniques.

Westinghouse Status: Closed



Westinghouse

## RESPONSE TO DSER OPEN ITEMS



OITS 1965

DSER 14.2.2-3

Re: SSAR Chapter 14, Section 14.4

The COL applicant should provide for staff review, the scoping document that delineates any reconciliation methods needed to account for test conditions, methods, or results if testing is performed at conditions other than representative of design operating conditions.

### Response:

Section 14.4, has been revised to include a COL information item to provide preoperational and startup test procedures to delineate any reconciliation methods needed to account for test conditions, methods, or results if testing is performed at conditions not representative of design conditions.

Westinghouse Status: Closed



Westinghouse

## RESPONSE TO DSER OPEN ITEMS



OITS 1966

DSER 14.2.2-4

Re: SSAR Chapter 14, Section 14.4

The COL applicant should provide for staff review, the approved preoperational test procedures (to be provided approximately 60 days before their intended use, and startup test procedures (to be provided approximately 60 days before fuel loading).

### Response:

Section 14.4, has been revised to include a COL information item to provide approved preoperational test procedures for all safety-related systems, and systems that perform defense-in-depth functions approximately 60 days before their intended use; and to provide approved startup test procedures 60 days before fuel loading.

Westinghouse Status: Closed



Westinghouse

## RESPONSE TO DSER OPEN ITEMS



OITS 1967

DSER 14.2.2.2-1

Re: SSAR Chapter 14, Section 14.4

The COL applicant should provide the startup administrative manual, which will delineate the review, evaluation, and approval of test results, for staff review.

### Response:

Section 14.4, has been revised to include a COL information item to provide the startup administration manual which delineates the review, evaluation, and approval of test results.

Westinghouse Status: Closed



Westinghouse

## RESPONSE TO DSER OPEN ITEMS



OITS 1968

DSER 14.2.8 - 1

Re: SSAR Chapter 14, Section 14.4

The COL applicant will provide the identified information associated with startup test abstract 14.2.8.2.34.

### Response:

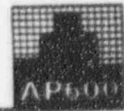
Section 14.3 references Certified Design Material which commits the COL to conduct an Initial Test Program. As part of that Initial Test Program, the COL will verify that reactor coolant system parameters are comparable to the first AP600 plant in order to obtain similar natural circulation flows.

Westinghouse Status: Closed



Westinghouse

## RESPONSE TO DSER OPEN ITEMS



OITS 2035

DSER OI50

Re: SSAR Chapter 14

The NRC is not satisfied with the detail and scope of Chapter 14 (Initial Test Program). The most significant issues fall into four categories.

### Response:

Chapter 14 has been revised to include test abstracts in accordance with Regulatory Guide 1.68, Rev. 2, Appendix A, and to include the basis for tests acceptance criteria. Justification for tests only performed for the first AP600 plant has been provided in Westinghouse letter NSD-NRC-96-4772, 7/16/96.

Westinghouse Status: Closed



Westinghouse

## RESPONSE TO DSER OPEN ITEMS



OITS 2271

Re: SSAR Chapter 14, Sections 14.2.10.3.6 & 14.2.10.4.12

### APRIL 19, 1995 (HSII) DISCUSSION ITEMS

#### 14. Reactor Vessel Head Vent SSAR Chapter 15):

- d. Branch Technical Position RSB 5-1 in SRP Section 5.4.7 states that the initial test program should include tests with supporting analysis to confirm that (1) adequate mixing of borated water added prior to or during cooldown can be achieved under natural circulation conditions, and (2) the cooldown under NC conditions can be achieved within the limits specified in the emergency operating procedures. Discuss how the AP600 satisfies this position.

#### Response:

Subsection 14.2.10.3.6 describes natural circulation testing, which includes simulation of reactor decay heat and specifies that data characterizing the plant under natural circulating conditions be obtained. This data is sufficient to support analysis to confirm that adequate mixing of borated water can be achieved under natural circulation conditions.

The capability to cooldown the reactor using active systems is demonstrated during the hot functional portion of preoperational testing of the reactor coolant system, steam generator system, startup feedwater system, normal residual heat removal system, and plant cooling water systems; prior to fuel loading. This testing verifies that each component performs in accordance with its design requirements. Additional testing of the capability to remove heat via the steam generators in a controlled manner is described in subsection 14.2.10.4.12, steam dump control system testing. These component performance capabilities are part of the calculational basis for the cooldown limits which are specified in the operating procedures.

Westinghouse Status: Closed

## RESPONSE TO DSER OPEN ITEMS



OITS 2543

Re: SSAR Chapter 14, Section 14.2.9.1.1      Question 260.35

Initial Test Program (ITP) Test Abstract 14.2.8.1.25, Reactor Coolant System (RCS) Hydrostatic Test: The Acceptance Criterion should be revised to clearly indicate that if there is any evidence of leak within the hydrostatic test boundaries, the leak should be repaired and retested prior to final inspection.

### Response:

Subsection 14.2.9.1.1, which includes the hydrostatic test of the reactor coolant system, has been revised to indicate that if there is evidence of leakage, the leak is to be repaired and retested prior to final inspection.

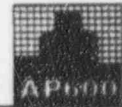
Westinghouse Status: Closed



Westinghouse



## RESPONSE TO DSER OPEN ITEMS



OITS 2544

Re: SSAR Chapter 14, Section 14.2.9.2.9

Question 260.36

ITP Test Abstract 14.2.8.1.26, Chilled Water System: (1) Use of system nomenclature should be consistent. This abstract and/or SSAR Section 9.2.7, Central Chilled Water System of the Standard Safety Analysis Report (SSAR) should be re-labeled accordingly; (2) The Objective subsection should be revised to include verification of proper performance of the system components.

### Response:

The test abstract for the central chilled water system in subsection 14.2.9.2.9, has been revised to reflect the correct nomenclature and to require verification of the proper operation of the system components.

Westinghouse Status: Closed



Westinghouse

## RESPONSE TO DSER OPEN ITEMS



OITS 2545

Re: SSAR Chapter 14, Sections 14.2.9.2.9 & 14.2.9.4.6

Question 260.37

ITP Test Abstracts 14.2.8.1.26, Chilled Water System and 14.2.8.1.61, Circulating Water System: The Test Method and Acceptance Criterion subsections of these abstracts should be revised to incorporate verification of integrated system testing requirements at rated volumetric flow conditions, pressure, and temperature as specified in the applicable SSAR sections. These abstracts should demonstrate, as a minimum, (1) proper operation of instrumentation and system controls in all logic combinations, (2) proper operation of all motor-operated and air-operated control valves, including open/closure cycling and timing, and position indicator verification and isolation functions (when applicable), (3) proper operating conditions (flow, vibration, bearing temperature) of system pumps in design mode of operations, including verification of acceptable net positive suction head (NPSH) under the most limiting design flow conditions, and (4) proper operating conditions and system performance capability (design bases) during all operational (normal and abnormal) modes.

### Response:

Test abstracts for the central chilled water system in subsection 14.2.9.2.9, and for the circulating water system in subsection 14.2.9.4.6 have been revised to provide verifications to assure proper operation of the system components.

Westinghouse Status: Closed



Westinghouse

## RESPONSE TO DSER OPEN ITEMS



OITS 2546

Re: SSAR Chapter 14, Section 14.2.9.4.11      Question 260.38

ITP Test Abstract 14.2.8.1.27, Containment Recirculation Cooling System: The Objective subsection should be revised to incorporate verification of integrated system testing requirements at rated volumetric flow conditions, pressure, and temperature as specified in SSAR Section 9.4.6.

### Response:

The test abstract for the containment recirculation cooling system in subsection 14.2.9.4.11, has been revised to incorporate verification of the integrated system performance.

Westinghouse Status: Closed

## RESPONSE TO DSEH OPEN ITEMS



OJTS 2547

Re: SSAR Chapter 14, Sections 14.2.9.1.2 & 14.2.10.1.22

Question 260.39

ITP Test Abstract 14.2.8.1.30, Feedwater Control System: The Test Method subsection should be revised to incorporate verification that automatically initiated valve open/closure cycling and timing meets the system design basis requirements.

### Response:

The test abstract for the steam generator system in subsection 14.2.9.1.2, specifies that the proper operation of the main and startup feedwater valves is verified, including automatic open/close valve operation and timing. Additional testing of the main feedwater valves is specified with the reactor at power during the startup testing described in subsection 14.2.10.1.22.

Westinghouse Status: Closed



Westinghouse

## RESPONSE TO DSER OPEN ITEMS



OITS 2548

Re: SSAR Chapter 14, Sections 14.2.9.1.1, 14.2.10.1.18, & 14.2.10.4.12      Question 260.40

ITP Test Abstract 14.2.8.1.40, Reactor Coolant Pump Initial Operation: The Test Method subsection should specify the system and pump operating parameters to be tested or measured.

### Response:

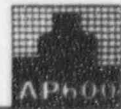
The test abstract for the reactor coolant system in subsection 14.2.9.1.1, has been revised to include verification of proper reactor coolant pump operation. Additional testing of the reactor coolant pumps is specified during the startup testing described in subsections 14.2.10.1.18 and 14.2.10.4.12 following the initial fuel loading.

Westinghouse Status: Closed



Westinghouse

## RESPONSE TO DSER OPEN ITEMS



OITS 2549

Re: SSAR Chapter 14, Section 14.2.9.1.1

Question 260.41

ITP Test Abstract 14.2.8.1.41, Reactor Coolant System: (1) The Test Method subsection should specify the data and parameters to be verified during control systems circuitry and system valves operation; (2) The Performance Criteria subsection should specify (i) acceptance criteria for the measured parameters, including response times, for the control systems and valves, and (ii) acceptance criteria for the head vent system operation.

### Response:

The test abstract for the reactor coolant system in subsection 14.2.9.1.1, has been revised to include verification of proper valve and control system operation and to include reference to design specifications which specify the functional requirements and operating parameters.

Westinghouse Status: Closed



Westinghouse

## RESPONSE TO DSER OPEN ITEMS



OITS 2550

Re: SSAR Chapter 14, Section 14.2.9.2.4

Question 260.42

ITP Test Abstract 14.2.8.1.42, Normal Residual Heat Removal System: The Test Method subsection should specify the functional requirements, parameters to be measured, and data to be recorded for each test objective and each mode of operation.

### Response:

The test abstract for the normal residual heat removal system in subsection 14.2.9.2.4, has been revised to include reference to design specifications which specify the functional requirements and operating parameters for each mode of operation.

Westinghouse Status: Closed



Westinghouse

## RESPONSE TO DSER OPEN ITEMS



OITS 2551

Re: SSAR Chapter 14, Section 14.2.9.1.7      Question 260.43

ITP Test Abstract 14.2.8.1.49, Thermal Expansion: Westinghouse should revise this abstract to provide a commitment that this test will be conducted in accordance with the American Society of Mechanical Engineers (ASME) OM Standard, Part 7 (Ref.: Draft Safety Evaluation Report (DSER) Confirmatory Item 3.9.2.1-3).

### Response:

The test abstract for thermal expansion testing in subsection 14.2.9.1.7, has been revised to include reference to the ASME OM Standard, Part 7.

Westinghouse Status: Closed



Westinghouse



## RESPONSE TO DSER OPEN ITEMS



OITS 2552

Re: SSAR Chapter 14, Section 14.2.9.1.1

Question 260.44

ITP Test Abstract 14.2.8.1.64, Reactor Coolant System Flow Measurement: (1) The Objective subsection should be modified to include verification of proper operation of the RCS at conditions approaching rated operating temperature and pressure. Baseline RCS pressure drops will also need to be established; (2) The Test Method subsection needs to be modified to include closer coordination of the performance of this test with that of 14.2.8.1.41, Reactor Coolant System, in order to adequately demonstrate proper integrated system response and operation; (3) The Performance Criteria subsection needs to be revised to include acceptance criteria for the RCS pressure drop, flow rate (accounting for measurement uncertainty allowances), or provide reference to the appropriate SSAR sections delineating such acceptance criteria.

### Response:

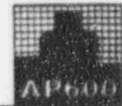
The test abstract for the reactor coolant system in subsection 14.2.9.1.1, has been revised to include flow measurement testing at elevated pressure and temperature and references the appropriate SSAR sections and design specifications for acceptance criteria.

Westinghouse Status: Closed



Westinghouse

## RESPONSE TO DSER OPEN ITEMS



OITS 2553

Re: SSAR Chapter 14, Sections 14.2.9.1.1 & 14.2.9.1.7

Question 260.45

ITP Test Abstract 14.2.8.1.67, Reactor Coolant System Hot Functional Test: (1) The Objective subsection should outline all preoperational tests that will be performed (or encompassed) as part of this test, and (2) In response to request for additional information (RAI) 210.59, Westinghouse agreed to implement a monitoring program at the first AP600 plant to record temperature distributions, thermal displacements and other pertinent parameters of the pressurizer surge line for verifying assumptions used in the surge line thermal stratification analysis. Therefore, the implementation of this monitoring program should be reflected in this abstract and/or in another section of the ITP, accordingly.

In addition, DSER Open Item 3.12.5.10-1 requests identification of other piping systems susceptible to thermal stratification, and a description of the methods used to assure their structural integrity. If a monitoring program is intended to be implemented by Westinghouse during the hot functional test for resolving this open item, the program should also be included in the ITP.

### Response:

The test abstract for the reactor coolant system in subsection 14.2.9.1.1, has been revised to include the testing performed at elevated pressure and temperature. The expansion/vibration test abstract, subsection 14.2.9.1.7, has been revised to include testing on surge line temperature distributions, thermal displacements, etc. for surge line thermal stratification analysis, as previously committed in RAI response to Q210.59. Also in response to DSER item 3.12.5.10-1, additional temperature measurements on the pressurizer spray piping are specified.

Westinghouse Status: Closed



Westinghouse

## RESPONSE TO DSER OPEN ITEMS



OITS 2554

Re: SSAR Chapter 14, Section 14.2.9.2.3

Question: 260.46

ITP Test Abstract 14.2.8.1.75, Boric Acid Batching Operation: Westinghouse should clarify whether the test is to be performed with or without boric acid.

### Response:

Chapter 14 has been revised and a specific test abstract for boric acid batching is not included. Test abstracts for the chemical and volume control system which performs this function, subsections 14.2.9.1.5 and 14.2.9.2.3, specify testing of valves that control boric acid use.

Westinghouse Status: Closed



Westinghouse

## RESPONSE TO DSER OPEN ITEMS



OITS 2555

Re: SSAR Chapter 14, Section 14.2.9.2.2

Question 260.47

ITP Test Abstract 14.2.8.1.91, Startup Feedwater Control System: (1) The Objective subsection should be revised to incorporate verification of the startup feedwater control system automatic initiation capability, and (2) The Test Method subsection should be revised to require verification of the automatic initiation of the startup feedwater control system upon receipt of a loss of main feedwater supply signal.

### Response:

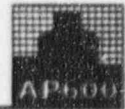
The test abstract for the main and startup feedwater system in subsection 14.2.9.2.2, has been revised to specify that the proper actuation/start of the startup feedwater pumps is to be demonstrated.

Westinghouse Status: Closed



Westinghouse

## RESPONSE TO DSER OPEN ITEMS



OITS 2556

Re: SSAR Chapter 14, Section 14.2.1.10

Question 260.48

ITP Test Abstract 14.2.8.1.93, Reactor Containment Structural Integrity Test: In the Objective subsection, the reactor containment building should be changed to reactor containment vessel.

### Response:

The test abstract for the containment isolation and leak rate testing in subsection 14.2.9.1.10, has been revised to specify that the containment vessel is pressure and leak tested.

Westinghouse Status: Closed



Westinghouse

## RESPONSE TO DSER OPEN ITEMS



OITS 2557

Re: SSAR Chapter 14, Section 14.2.9.1.4

Question 260.49

ITP Test Abstracts 14.2.8.1.96, Passive Containment Cooling System and 14.2.8.1.97, Passive Containment Cooling System (First Plant Only): These test abstracts should be modified to encompass the Objective of 14.2.8.1.97 into a single comprehensive test abstract based upon 14.2.8.1.96. Such abstract would then be applicable to all plants, not just the prototype.

### Response:

The test abstract for the passive containment cooling system in subsection 14.2.9.1.4, has been revised to include system testing for each AP600 plant.

Westinghouse Status: Closed



Westinghouse

## RESPONSE TO DSER OPEN ITEMS



OITS 2558

Re: SSAR Chapter 14, Section 14.2.10.1.1      Question 260.50

ITP Test Abstract 14.2.8.2.1, Initial Fuel Loading Test Sequence: (1) The Prerequisites subsection of this abstract should: (i) include the Objectives in 14.2.8.2.2, Initial Fuel Loading, and in 14.2.8.2.3, Fuel Loading Prerequisites and Periodic Checkoff, and (ii) outline all systems required for the initial fuel loading; (2) The performance criteria for 14.2.8.2.2 and 14.2.8.2.3 should be included in the Performance Criteria subsection of this abstract.

### Response:

The test abstract for the initial fuel loading in subsection 14.2.10.1.1, has been revised to include fuel loading prerequisites and periodic checkoff. A checklist for the initial fuel loading abstract in subsection 14.2.10.1.5 is provided.

Westinghouse Status: Closed



Westinghouse

## RESPONSE TO DSER OPEN ITEMS



OITS 2559

Re: SSAR Chapter 14

Question 260.51

Westinghouse should revise the following AP600 SSAR Chapter 14 test abstracts in order to provide specific acceptance criteria or design basis functional requirements traceable to the appropriate SSAR sections:

- a. 14.2.8.1.40, Reactor Coolant Pump Initial Operation
- b. 14.2.8.1.42, Normal Residual Heat Removal System
- c. 14.2.8.2.11, Rod Drop Time Measurement
- d. 14.2.8.2.32, Bank Worth Measurement
- e. 14.2.8.2.55, Plant Trip from 100 Percent Power

### Response:

The test abstracts for the tests listed below have been revised to include acceptance criteria or reference to design specifications and the appropriate sections of the SSAR:

- a. 14.2.9.1.1 Reactor Coolant System Testing which includes reactor coolant pump initial operation
- b. 14.2.9.2.4 Normal Residual Heat Removal System
- c. 14.2.10.1.14 Rod Drop Time Measurement
- d. 14.2.10.3.5 Bank Worth Measurement
- e. 14.2.10.4.24 Plant Trip from 100 Percent Power

Westinghouse Status: Closed



Westinghouse



## RESPONSE TO DSER OPEN ITEMS



OITS 2560

Re: SSAR Chapter 14, Sections 14.2.10.1.5 & 14.2.10.1.1

Question 260.52

ITP Test Abstracts 14.2.8.2.2, Initial Fuel Loading, and 14.2.8.2.3, Fuel Loading Prerequisites and Periodic Checkoff: The objectives of these two tests appears to be redundant. Westinghouse should amalgamate them with 14.2.8.2.1.

### Response:

The test abstract for the initial fuel loading in subsection 14.2.10.1.5, has been revised to include both initial fuel loading and initial fuel loading sequence tests. Subsection 14.2.10.1.1 contains the test abstract for fuel loading and prerequisites and periodic checkoff.

Westinghouse Status: Closed



Westinghouse

## RESPONSE TO DSER OPEN ITEMS



OITS 2561

Re: SSAR Chapter 14, Section 14.2.10.1.2      Question 260.53

ITP Test Abstract 14.2.8.2.4, Reactor System Sampling for Fuel Loading: Verification of the requirements in the Objective of this abstract should be included in its prerequisites.

### Response:

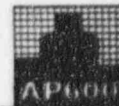
The test abstract for reactor systems sampling for fuel loading, subsection 14.2.10.1.2, specifies the boron concentration requirements that are to be verified prior to initiating fuel loading in the performance criteria section.

Westinghouse Status: Closed



Westinghouse

## RESPONSE TO DSER OPEN ITEMS



OITS 2562

Re: SSAR Chapter 14, 14.2.10.1.4

Question 260.54

ITP Test Abstract 14.2.8.2.6, Inverse Count Rate Ratio Monitoring for Fuel Loading: The requirements in the Prerequisites, Test Method and Performance Criteria subsections do not appear to be consistent with the Objective of the test abstract.

**Response:**

The test objectives of the abstract for inverse count rate ratio monitoring, subsection 14.2.10.1.4, have been revised to more clearly denote the test purpose.

Westinghouse Status: Closed



Westinghouse

## RESPONSE TO DSER OPEN ITEMS



OI 'S 2563

Re: SSAR Chapter 14, Section 14.2.10.1.6      Question 260.55

ITP Test Abstract 14.2.8.2.7, Post-Fuel Loading Precritical Test Sequence: (1) The Prerequisite subsection should be revised to include specific plant system conditions; and (2) The information in the Test Method and Acceptance Criteria subsections is inadequate.

### Response:

Subsection 14.2.10.1.6 on post-fuel loading precritical test sequence, has been revised to specify plant system conditions and acceptance criteria as contained in subsequent precritical testing.

Westinghouse Status: Closed



Westinghouse

## RESPONSE TO DSER OPEN ITEMS



OITS 2564

Re: SSAR Chapter 14, Section 14.2.10.1.18      Question 260.56

### Response:

Subsection 14.2.10.1.18 on reactor coolant system flow coastdown, has been revised to include flow coastdown testing with two and four reactor coolant pumps tripped, and reference to the appropriate SSAR analyses in Chapter 15 are provided. This testing is consistent with the events analyzed in the SSAR where the trip of two of four pumps is the limiting condition II loss of flow event, while the trip of all four pumps is the limiting condition III loss of flow event. Analyses of the trip of one pump and of three of four pumps are not performed since the one pump case is not limiting, and the loss of three pumps would require two simultaneous, independent failures.

Westinghouse Status: Closed



Westinghouse

## RESPONSE TO DSER OPEN ITEMS



OITS 2565

Re: SSAR Chapter 14, Section 14.2.10.3.4      Question 260.57

ITP Test Abstract 14.2.8.2.31, Isothermal Temperature Coefficient Measurement: It appears that the isothermal temperature coefficient (ITC) measurement will be limited to just two end-point rod configurations (near fully withdrawn or near fully inserted) while the reactor coolant system boron concentration remains constant. Westinghouse should revise the Prerequisite and/or Test Method subsections of this abstract to perform ITC measurements at various rod configurations and boron concentrations which would more conservatively reflect actual reactor coolant system behavior or should provide justification to establish that the proposed measurement in the current abstract would yield similarly conservative values.

### Response:

The isothermal temperature coefficient measurement testing specified in Subsection 14.2.10.3.4 need only be performed at the near fully withdrawn and near fully inserted rod positions since this provides the most positive value, and a design verification point, of the moderator temperature coefficient, respectively; over a large range of the isothermal temperature coefficient.

Westinghouse Status: Closed



Westinghouse

## RESPONSE TO DSER OPEN ITEMS



OITS 2566

Re: SSAR Chapter 14, Section 14.2.10.4.6

Question 260.58

ITP Test Abstract 14.2.8.2.47, Rod Cluster Control Assembly Out of Bank Measurement (First Plant Only): (1) The Test Method subsection requires that a group of selected rod cluster control assemblies (RCCA) be inserted "first to the technical specification limit of misalignment." However, SSAR Chapter 15 currently specifies RCCA alignment limits. Westinghouse should revise the text in the abstract accordingly; (2) The test Method subsection should specify parameters to be measured and describe expected power distributions; and (3) The Performance Criteria subsection should specify the acceptance criteria for the sensitivity of the incore and excore instrumentation to RCCA misalignment.

### Response:

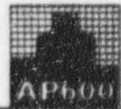
Subsection 14.2.10.4.6 on rod cluster control assembly out of bank measurements, has been revised to reference SSAR subsection 15.0.5 for the rod misalignment limit, and to provide additional information on parameters to be measured and acceptance criteria.

Westinghouse Status: Closed



Westinghouse

## RESPONSE TO DSER OPEN ITEMS



OITS 2567

Re: SSAR Chapter 14, Section 14.2.10.4.20      Question 260.59

ITP Test Abstract 14.2.8.2.49, Load Swing Test: (1) The Test Method subsection should identify the plant parameters to be monitored and recorded; and (2) The Performance Criterion subsection should specify the acceptable ranges of the primary and secondary pressure, level, temperature, etc. at various power levels, or provide specific acceptance criteria or design basis functional requirements traceable to the appropriate SSAR sections.

### Response:

The test abstract for the load swing test, subsection 14.2.10.4.20, has been revised to identify key plant parameters to be monitored, and the acceptance criteria has been expanded to include a review of plant response and adjustment of control systems, if necessary.

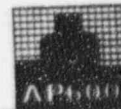
Westinghouse Status: Closed



Westinghouse



## RESPONSE TO DSER OPEN ITEMS



OITS 2568

Re: SSAR Chapter 14

Question 260.60

ITP Test Abstract 14.2.8.2.50, 50 Percent Load Rejection: The Performance Criterion subsection should specify the acceptable ranges of the primary and secondary pressure, level, temperature, etc. or provide specific acceptance criteria or design basis functional requirements traceable to the appropriate SSAR sections.

**Response:**

The test abstract for the 50% load rejection test has been deleted. The AP600 is designed to accept a 100% load rejection which is included in the startup testing program in subsection 14.2.10.4.21.

Westinghouse Status: Closed



Westinghouse

## RESPONSE TO DSEI OPEN ITEMS



OITS 2569

Re: SSAR Chapter 14, Section 14.2.10.4.21      Question 260.61

ITP Test Abstract 14.2.8.2.51, 100 Percent Load Rejection (First Plant Only): The Test Method subsection should identify the plant parameters to be monitored and recorded.

### Response:

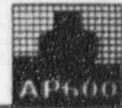
The test method section of the 100% load rejection test, subsection 14.2.10.4.21, has been revised to include the key plant parameters to be measured.

Westinghouse Status: Closed



Westinghouse

## RESPONSE TO DSER OPEN ITEMS



OITS 2570

Re: SSAR Chapter 14

Question 260.62

The staff has identified the following systems, components, and/or features that do not appear to have been incorporated within the AP600 ITP:

- a. Ventilation System through Fire Walls and Smoke Removal
- b. Fire Dampers and Doors
- c. Onsite Standby Power System (Onsite Standby Diesel Generator Support System)
- d. Containment Igniters
- e. Annex/Auxiliary building Non-Radioactive HVAC System
- f. Health Physics and Hot Machine Shop HVAC System
- g. Turbine Building Ventilation System
- h. Reactor Vessel Flooding System/Vessel Insulation Arrangement (testing should not involve flooding the cavity, but would encompass confirming: (1) flow paths/areas between the IRWST and the cavity, (2) drainage paths into the cavity, (3) flood valve operability, (4) gaps/openings in the insulation system for water ingress and egression, (5) integrity of insulation support system and outer surface of vessel lower head)

For the items listed above, Westinghouse should identify and revise the pertinent test abstracts or summaries to encompass them, or create additional abstracts accordingly.

### Response:

Chapter 14 has been revised to include test abstracts as specified in Regulatory Guide 1.68, Revision 2, Appendix A which includes testing for the listed systems/components:

- Ventilation through fire walls and smoke removal
- Fire dampers and doors
- Diesel generator support systems (cooling, ventilation, oil, etc)
- Containment igniters
- Nuclear Island non-radioactive and radiologically controlled area HVAC
- Drain paths to the containment sump

Confirmation of the reactor vessel flood flow areas and insulation arrangement are inspections performed during/after construction.

Westinghouse Status: Closed



Westinghouse

## RESPONSE TO DSER OPEN ITEMS



OITS 2571

Re: SSAR Chapter 14, Sections 14.2.9.1.16 & 14.2.9.4.16

Question 260.63

Westinghouse should include a pre-operational test abstract for (a) the 480V non-Class 1E transportable ac generator and its distribution panel, including the incoming and outgoing feeder circuit breakers and plug-in type twist lock connectors pre-wired to outgoing feeder circuit breakers; and (b) the Digital Metal Impact Monitoring System.

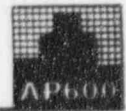
### Response:

The test abstract for long-term safety-related system testing in subsection 14.2.9.1.16, has been revised to include verification of the proper operation of the 480V non-Class 1E transportable ac generator.

In addition, the test abstract for the digital metal impact monitoring system is included in subsection 14.2.9.4.16.

Westinghouse Status: Closed

## RESPONSE TO DSER OPEN ITEMS



OITS 2572

Re: SSAR Chapter 14, Section 14.2.10.4.23      Question 260.64

ITP Test Abstract 14.2.8.2.53, Hot Full Power Boron Endpoint: (1) The Test Method subsection specifies that measurement of the RCS critical boron concentration be only performed for a single RCCA configuration (all rods out, hot full power, and equilibrium xenon). Westinghouse should revise the Prerequisite and/or Test Method subsection of this abstract to perform critical boron concentration measurements at various RCCA configurations which would more conservatively reflect actual reactor coolant system behavior, or should provide adequate justification to establish that the proposed measurement in the current abstract would yield similarly conservative values; and (2) The Test Method requires the renormalization of the predicted boron concentration as a function of core burnup using the corrected (or resultant) measured boron concentration. The Acceptance Criterion should specify the difference between the measured and predicted boron concentrations expected after renormalization or provide specific acceptance criteria traceable to the appropriate SSAR sections.

### Response:

The test abstract for the hot full power boron endpoint, subsection 14.2.10.4.23 has been revised to include reference to SSAR subsection 4.3.3.3 which specifies the acceptance criteria. This abstract correctly specifies that the rods be at a nearly withdrawn position for boron endpoint determination. The boron endpoint determination at zero power, subsection 10.2.10.3.3, and the bank worth measurement test, subsection 10.2.10.3.5, provide data for establishing the boron concentrations for other rod positions.

Westinghouse Status: Closed



Westinghouse

## RESPONSE TO DSER OPEN ITEMS



OITS 2639

Re: SSAR Chapter 14, Section 14.2.9.1.14

Question 260.65

Chapter 14 - Initial Test Program: 14.2.8.1.2, Class 1E Uninterruptible Power Supplies: This test abstract does not reflect the design and configuration of the AP600 Class 1E DC distribution system. Specifically, SSAR Section 8.3.2.1.1.1, Class 1E DC distribution, states that there are four independent, Class 1E 125Vdc divisions (A, B, C, and D) each comprised of one battery bank (designated as 24hr battery bank) that provides power sources to the loads required for the first 24 hours following a loss of all ac power concurrent with a design basis accident (DBA). The second battery bank in divisions B and D (designated as 72hr battery bank) is used to supply those loads requiring power for 72 hours following a DBA. No load shedding or load management program is needed to feed the essential loads during the required safety actuation periods.

All subsections of this test abstract need to be revised to reflect the unique design features of the AP600 dc power systems as described in the SSAR.

### Response:

The test abstract for the Class 1E DC and UPS system in subsection 14.2.9.1.14 has been revised to properly reflect the AP600 design.

Westinghouse Status: Closed



Westinghouse

## RESPONSE TO DSER OPEN ITEMS



OITS 2640

Re: SSAR Chapter 14, Section 14.2.9.2.12      Question 260.66

Chapter 14 - Initial Test Program: 14.2.8.1.17, Process Computer: The Performance Criteria subsection of this test abstract should be revised to provide specific acceptance criteria or design basis functional requirements traceable to the appropriate SSAR section(s).

### Response:

The test abstract for the plant control system in subsection 14.2.9.2.12 has been revised to include reference to the appropriate SSAR section for the performance criteria.

Westinghouse Status: Closed



Westinghouse

## RESPONSE TO DSER OPEN ITEMS



OITS 2641

Re: SSAR Chapter 14, Section 14.2.9.4.13      Question 260.67

Chapter 14 - Initial Test Program. 14.2.8.1.18, In-Plant Communication System: The Test Methods and Performance Criterion subsections of this abstract need to be revised to demonstrate acceptable performance of all subsystems encompassed by the In-Plant Communication System as described in SSAR Section 9.5.2.

### Response:

The test abstract for the plant communication system in subsection 14.2.9.4.13 has been revised to include verification of the proper performance of the system subsystems.

Westinghouse Status: Closed



Westinghouse



## RESPONSE TO DSER OPEN ITEMS



OITS 2642

Re: SSAR Chapter 14, Section 14.2.9.2.12      Question 260.68

Chapter 14 - Initial Test Program. 14.2.8.1.51, Operations and Control Center System: This test abstract does not reflect the design and configuration of the AP600 Operations and Control Center System. Specifically, the primary plant control system operator interface is a set of "soft" control units that replace conventional switch/light or potentiometer/meter assemblies used for operator interface with control systems. The function-based test analysis serves as the basis for determining the alarms, displays, controls, and procedures in the main control area.

The Test Methods and Performance Criterion subsections of this abstract need to be revised to demonstrate acceptable performance of, and to encompass, these unique AP600 design features.

### Response:

The test abstract for the plant control system in subsection 14.2.9.2.12 has been revised to reflect the use of "soft" controls and function-based analysis for alarms, displays, controls, and procedures used in the AP600.

Westinghouse Status: Closed



Westinghouse

## RESPONSE TO DSER OPEN ITEMS



OITS 2643

Re: SSAR Chapter 14, Section 14.2.9.1.12      Question 260.69

Chapter 14 - Initial Test Program. 14.2.8.1.59, Engineered Safety Features Actuation Cabinets Test Capability: This test abstract does not reflect the configuration of the AP600 computer based protection system design. This section is a subset of Section 14.2.8.1.72, "Protection and Safety Monitoring." The primary purpose of Section 14.2.8.1.72 is to demonstrate the acceptability of reactor trip logic functions while the primary purpose of this section is to demonstrate acceptable performance of the Engineered Safety Features Actuation System (ESFAS). This test needs to be revised to encompass and properly verify acceptable performance of the isolated fiber-optic data/communication links, including associated protocols, of (a) the Integrated Protection Cabinets to/from Engineered Safety Features Actuation Cabinets, (b) the Engineered Safety Features Actuation Cabinets to/from the Protection Logic Cabinets, and (c) the Protection Logic Cabinets to/from the Protection Multiplexer Cabinets.

### Response:

The test abstract for the protection and safety monitoring system in subsection 14.2.9.1.12 has been revised to reflect the AP600 computer based protection system design.

Westinghouse Status: Closed



Westinghouse

## RESPONSE TO DSER OPEN ITEMS



OITS 2644

Re: SSAR Chapter 14, Section 14.2.9.1.1

Question 260.70

Chapter 14 - Initial Test Program. 14.2.8.1.68, Resistance Temperature Detector Cross Calibration: Westinghouse should revise the subsections of this test abstract as follows: (a) the Objective subsection should include verification of response times, and accuracy requirements consistent with the safety analysis included in Chapter 15 of the SSAR; (b) the Prerequisites subsection should be revised to describe the in-situ or laboratory calibration testing that will be performed to verify the manufacturer's calibration data (including range, accuracy, repeatability, dynamic response, environmental qualification, calibration reference, and calibration intervals); (c) the Test Method subsection should be revised to clearly establish bounds for RTD calibration. Particularly, the dependency of the data on uniform coolant temperature and flow should be emphasized; and (d) the Performance Criteria subsection should be revised to include the basis for the acceptance criteria and values of cross-calibration points monitored in-situ throughout the RTD range, to assure that the data is adequate for detecting degradation or systematic drift.

### Response:

The test abstract for the reactor coolant system in subsection 14.2.9.1.1 specifies that the proper operation of the resistance temperature detectors is verified, and additional testing is described in subsection 14.2.10.1.8.

Westinghouse Status: Closed

## RESPONSE TO DSER OPEN ITEMS



OITS 2645

Re: SSAR Chapter 14, Section 14.2.9.1.12      Question 260.71

Chapter 14 - Initial Test Program. 14.2.8.1.72, Protection and Safety Monitoring System: This test abstract does not reflect the configuration of the AP600 computer based protection system design. See item 260.69 above.

**Response:**

The test abstract for the protection and safety monitoring system in subsection 14.2.9.1.12 has been revised to reflect the AP600 computer based protection system design.

Westinghouse Status: Closed

## RESPONSE TO DSER OPEN ITEMS



OITS 2646

Re: SSAR Chapter 14, Section 14.2.9.1.1

Question 260.72

Chapter 14 - Initial Test Program. 14.2.8.1.81, Pressurizer Pressure and Level Control: The Test Method subsection does not include testing of signal selector and isolation devices. Westinghouse should revise this subsection to encompass testing of these devices or should identify the test abstract that encompasses such testing.

### Response:

The test abstract for the reactor coolant system in subsection 14.2.9.1.1 specifies that the proper operation of the pressurizer pressure and level control is verified. Additional testing is also performed during the startup testing. Detailed methods for performing this verification, including signal selector and isolation devices, are to be included in the actual test procedures developed by the COL applicant.

Westinghouse Status: Closed



Westinghouse

## RESPONSE TO DSER OPEN ITEMS



OITS 2647

Re: SSAR Chapter 14, Section 14.2.9.1.12

Question 260.73

Chapter 14 - Initial Test Program. 14.2.8.1.95, Reactor Trip System and Engineered Safety Features Actuation Cabinets System Response Time Test: This abstract should be revised as follows: (a) the Objective subsection should incorporate verification of "Real-Time Performance" of the digital system (the architecture of the digital system affects the response time of the RTS and the ESFAS performance); (b) the Prerequisites subsection should incorporate the determination of sensor delays and actuator delays (by setpoint study). Since real-time deadlines for the digital part of the reactor protection system are computed by subtracting sensor delay and actuator delay from the maximum response times established by analysis of Chapter 15 events, software units timing limits should be available to demonstrate that software units adequately meet their timing specifications.

### Response:

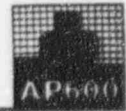
The test abstract for the protection and safety monitoring system in subsection 14.2.9.1.12 includes testing of the reactor trip function, and requires verification that the trip delay time is less than the allowable maximum response time. Additional testing of trip function and rod drop time is also performed during startup testing.

Westinghouse Status: Closed



Westinghouse

## RESPONSE TO DSER OPEN ITEMS



OITS 2648

Re: SSAR Chapter 14, Section 14.2.9.2.12      Question 260.74

Chapter 14 - Initial Test Program. 14.2.8.2.46, Plant Control System: The scope of this test should be expanded to encompass all other Plant Control System subsystems as identified in SSAR Chapter 7.1. Alternatively, Westinghouse should identify the test abstracts that currently encompass such subsystems.

### Response:

The test abstract for the plant control system in Subsection 14.2.9.2.12 has been revised to include the control functions specified in SSAR Section 7.1.

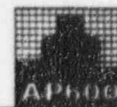
Westinghouse Status: Closed



Westinghouse



## RESPONSE TO DSER OPEN ITEMS



OITS 2931

Re: SSAR Chapter 14, Section 14.2.3

Question 260.75

Westinghouse will develop criteria to be used in its graded approach to testing to determine if identified testing should be included in preoperational testing program or "acceptance testing" program. Westinghouse will provide the criteria for staff review by March 31, 1995.

### Response:

Chapter 14 has been revised to include test abstracts in accordance with the applicable systems specified in Regulatory Guide 1.68, Revision 2, Appendix A. Subsection 14.2.3 and Westinghouse letter NSD-NRC-96-4772 dated 7/16/96, describe distinctions between safety-related and non-safety related system testing quality assurance requirements and procedure review.

Westinghouse Status: Closed



## RESPONSE TO DSER OPEN ITEMS



OITS 2932

Re: SSAR Chapter 14, Section 14.2.9

Question 260.76

Westinghouse will develop criteria for determining if an ITP test should be performed on the first AP600 only or on all AP600 plants. Westinghouse will provide the criteria for staff review by March 31, 1995.

**Response:**

Chapter 14 specifies the criteria used to determine if an ITP test should be performed on only the first AP600 plant or on all plants, in Subsection 14.2.9. Also refer to Westinghouse letter NSD-NRC-96-4772, dated 7/16/96.

Westinghouse Status: Closed



Westinghouse

## NRC REQUEST FOR ADDITIONAL INFORMATION



Question 260.77

Re: Prevention of Passive Safety System Strainer Clogging

Westinghouse will provide the method(s) that will be used to prevent strainer clogging in the passive safety systems.

Response:

The AP600 has two types of sumps, the IRWST sump and the containment recirculation sump. In addition to proper sump design, screen design and layout, several other factors will prevent clogging of these sumps by debris during accident operations. Sump design methods and other factors affecting the plugging potential of the strainers are listed below.

- 1) Sump design and sump locations meet Regulatory Guide 1.82 Revision 2 and include:
  - C.1.1 Two sump locations for each type of sump
  - C.1.2 Separated sump locations
  - C.1.3 Sumps located on lowest floor above reactor cavity. Each sump has two screens, coarse and fine, and debris curb capability
  - C.1.4 Floors slope away from sumps
  - C.1.5 No incoming drains impinge on sumps
  - C.1.6 Sump screens can withstand accident loads and missiles
  - C.1.7 Conservative sized screen area to account for plugging
  - C.1.8 System and Sump performance evaluated
  - C.1.9 Sumps have solid top cover
  - C.1.10 Seismic qualified screens
  - C.1.11 Screen openings sized properly
  - C.1.12 Sumps designed for adequate pump performance (Note that the nonsafety-related normal residual heat removal pumps are designed to take suction from the IRWST and the containment recirculation line.)
  - C.1.13 Corrosion resistant screens
  - C.1.14 Access openings in sump screens
  - C.1.15 Sumps inspected each refueling (COL)
- 2) Large screen flow areas sized for at least 50% plugging.
- 3) Low velocities  $< 0.2$  ft/s in IRWST and flooded containment limiting the transport of heavy debris (Specific Gravity  $> 1.05$ ).
- 4) Use of stainless steel reflective insulation.
- 5) Enclosed IRWST limits debris egress to IRWST sump.
- 6) Containment recirculation screens located above lowest levels of containment.
- 7) Long settling time ( $> 6$  hours) before initiation of containment recirculation.
- 8) Cleanliness program limits debris in containment (COL information item)



### IRWST Sump

The IRWST sump is at the bottom of IRWST tank and isolated from the remainder of containment. The IRWST tank is fully enclosed (except for vents and condensate collection pipes) and is lined with stainless steel. The water has a high cleanliness as it is filtered and demineralized (by the spent fuel pit cooling system) during and after each refueling. Sludge will be minimal and the COL cleanliness program will prevent foreign debris from being introduced into the tank. During a LOCA, vented RCS steam will condense on the containment shell and be directed by gutters to 4 inch pipes which drain into the IRWST. Containment paint or other loose debris will have to be smaller than 4 inches to be drained into the tank. Since the tank is normally full, floating debris will stay on the surface above the sump, and containment paint (which has a high specific gravity) will quickly sink to the bottom of the tank. Curbs in the gutters and inside the IRWST will trap the heavier debris preventing migration to the sump. With the low injection flows and long tank drain down times (>6 hours), no significant transport of heavy debris is expected. When the tank reaches its minimum level during recirculation the water level is above the top of the screens and floating debris can not be trapped on the screens.

### Containment recirculation sump

The intakes for containment recirculation are located on the walls above the floor elevation at 83 feet. This is 11.5 feet above the waste sump below the reactor vessel (at elevation 71.6 feet). The bottom of the inlet screen is one foot off the floor, providing a curb function. During a LOCA, water will flood the vessel cavity and adjacent floors up to the 107 foot elevation. The containment recirculation line is not opened until the water level in the IRWST reaches a low level setpoint. Water level in the flooded containment when IRWST reaches the setpoint is above the top of the recirculation inlet screens. Thus during the long floodup time (>6 hours) there is not a transport of floating debris to the screens and heavy materials will have settled to the waste sump level or the 83 foot floor level. During recirculation the water level in containment will not change significantly nor will it drop below the top of the screens. Thus the recirculation screens will not be clogged by floating debris or by heavy debris.

The methods and factors described above will prevent clogging of the strainers.

SSAR Revision: NONE



## RESPONSE TO DSER OPEN ITEMS



OITS 2934

Re: SSAR Chapter 14, Section 14.2.9.1.4

Question 260.78

Westinghouse will provide additional information on testing of the passive containment cooling, which will include the feasibility of testing with a heated shell and the determination of air velocity as it relates to differences in temperature.

### Response:

The test abstract for the passive containment cooling system in Subsection 14.2.9.1.4 has been revised to include verification of the system parameters that characterize system performance. Heating the inside of containment with steam, to heat the containment shell and demonstrate passive containment cooling system operation is not feasible. Such a test would require a very large amount of steam generation and would have an adverse impact on instrumentation and electrical equipment inside containment.

Westinghouse Status: Closed



Westinghouse

## RESPONSE TO DSER OPEN ITEMS



OITS 2935

Re: SSAR Chapter 14, Section 14.2.9.1.11      Question 260.79

Westinghouse will provide additional information on the testing requirements for the hydrogen igniters.

Response:

The test abstract for the containment hydrogen control system in Subsection 14.2.9.1.11 has been revised to require verification that the hydrogen igniters properly actuate and operate.

Westinghouse Status: Closed



Westinghouse

## RESPONSE TO DSER OPEN ITEMS



OITS 2936

Re: SSAR Chapter 14, Section 14.2.9.1.11      Question 260.80

Westinghouse will provide the testing requirements for the passive autocatalytic recombiners.

**Response:**

The test abstract for the containment hydrogen control system in Subsection 14.2.9.1.11 has been revised to require verification that the passive autocatalytic hydrogen recombiners operate properly when exposed to a hydrogen environment.

Westinghouse Status: Closed



Westinghouse

## RESPONSE TO DSER OPEN ITEMS



OITS 2937

Re: SSAR Chapter 14, Section 14.2.9.2.14      Question 260.81

Westinghouse will provide a test abstract for the diverse actuation system.

Response:

Chapter 14 has been revised to include a test abstract for the diverse actuation system in Subsection 14.2.9.2.14.

Westinghouse Status: Closed



Westinghouse

## RESPONSE TO DSER OPEN ITEMS



OITS 2938

Re: SSAR Chapter 14, Section 14.2.9.4.17      Question 260.82

Westinghouse will provide a test abstract for the loose parts monitoring system.

Response:

Chapter 14 has been revised to include a test abstract for the loose parts monitoring system in Subsection 14.2.9.4.17.

Westinghouse Status: Closed



Westinghouse