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Your ref: Docket No. 52-006
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Subject: AP1000 Response to Request for Additional Information (SRP 6)

Westinghouse is submitting a response to the NRC request for additional information (RAI) on SRP Section 6. This RAI response is submitted in support of the AP1000 Design Certification Amendment Application (Docket No. 52-006). The information included in this response is generic and is expected to apply to all COL applications referencing the AP1000 Design Certification and the AP1000 Design Certification Amendment Application.

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

RAI-SRP 6.4-SPCV-11 R2

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

Very truly yours,

D. A. Lindgren /FOR

Robert Sisk, Manager
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/Enclosure

1. Response to Request for Additional Information on SRP Section 6

D063
NRO

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ENCLOSURE 1

Response to Request for Additional Information on SRP Section 6

RAI Response Number: RAI-SRP 6.4-SPCV-11
Revision: 2

Question: (Revision 2)

Regulatory Guide (RG) 1.52 Rev 3 Table 1 includes maximum credited efficiencies and associated testing penetration limits. You have chosen to use values that differ from those in Table 1. Although this can be acceptable, it requires justification as an exception to the RG.

A) As described in Note 1 of the RG the values in Table 1 assume a residence time of 0.25 inches/second or greater and a 1% bypass is assumed. As a result:

1) Please verify that the residence time across the carbon filter in the housing will be greater than or equal to 0.25 inches/second and ensure that an accompanying description is included in the DCD/FSAR.

2) Please account for a 1% bypass in the calculation of the acceptance criteria for the penetration limit.

B) Table 1 of the RG uses the same value for elemental and organic iodine efficiencies. Your proposal uses different efficiencies. Please explain and justify, with data, why testing organic iodine to an efficiency of 30% demonstrates that the elemental iodine efficiency is 90% or greater?

Westinghouse Response (Revision 2):

The absorbers used in the AP1000 passive filtration line are designed for a minimum average atmosphere residence time of 0.25 seconds per 2 inches of absorbent bed. This information has been added to Appendix 1A of the AP1000 DCD as shown below.

The design basis main control room habitability dose calculations assume an elemental iodine removal efficiency of 90% and an organic iodine removal efficiency of 30%. The previously submitted markup of the AP1000 technical specifications proposed demonstrating adsorber efficiency by showing methyl iodide penetration is less than 35%, which would correspond to a 30% organic iodine removal efficiency. The DCD markup below changes the allowable penetration depth from 35% to 5%. Testing conducted to this penetration depth demonstrates that the adsorbers remove at 90% of both elemental and organic iodine based on the methodology provided in Regulatory Guide 1.52 Revision 3. Testing to 90% removal efficiency provides a significant amount of margin in comparison to the assumed 30% organic iodine removal efficiency used in the design basis calculations. Testing in accordance with these constraints provides ample margin relative to the dose calculations to account for a 1% bypass during testing. This information has been added to Appendix 1A of the DCD as shown below.

This revised response also addresses the Staff's concerns with regards to response part 3 provided in the previous revision of this response as discussed at a public meeting on December 15, 2009. Westinghouse is proposing to modify the AP1000 Technical Specifications to incorporate dP testing across the main control room emergency habitability system (VES) passive filtration unit. Item (c) has been added to TS 5.5.13 as shown in the DCD markup section below to require dP testing across the VES passive filtration unit. The technical

specification is in accordance with the Westinghouse Standard Technical Specifications, NUREG 1431. The testing flow rate is based on the minimum required flow at the discharge of the eductor in the VES passive filtration flow path. The maximum allowable dP across the filtration unit is based on the testing conducted for the AP10000 passive filtration line. Adequate filtration flow is induced when the delta P across the filtration unit is maintained below this value.

Question (Revision 1): Adsorber in the Passive Filtration Line

1) In USNRC, "Design, Inspection, and Testing Criteria or Air Filtration and Adsorption Units of Post-Accident Engineered-Safety-Feature Atmosphere Cleanup Systems in Light-Water-Cooled Nuclear Power Plants," Regulatory Guide 1.52, Revision 3, June 2001 (RG 1.52), Section 6.4 for adsorbers in-place leak testing, the acceptable combined penetration and leakage (or bypass) is shown to be less than 0.05% of the challenge gas. The applicant proposed TS 5.5.13 shows this value to be 0.5%. In a letter dated May 4, 2009, the applicant states that the charcoal adsorber is designed, constructed, qualified, and tested in accordance with ASME AG-1 and RG 1.140 (RAI-SRP6.4-SPCV-06, page 28). Both RG 1.52 and RG 1.140 specify a combined penetration and leakage (or bypass) in-place leak test criteria of adsorber of 0.05% or less of the challenge gas. The applicant needs to provide technical basis the exception taken to relax the adsorber penetration and system bypass criteria from 0.05% to 0.5%.

2) In RG 1.52 Revision 3 Section 7 for laboratory testing of charcoal samples, for maximum assigned credit for active carbon decontamination efficiencies 95% (elemental iodine and organic iodide), the acceptable penetration is shown less than 2.5% for 2-inches deep charcoal bed, and for maximum assigned credit for active carbon decontamination efficiencies 99% (elemental iodine and organic iodide), the acceptable penetration is shown less than 0.5% for a 4-inches bed. In a letter dated May 4, 2009, the applicant states that the charcoal filters would remove 90% of the elemental iodine and 30% of the organic iodine claiming to be consistent with Regulatory Guide 1.52 Revision 2 (RAI-SRP6.4-SPCV-06, page 3). In RG 1.52, Revision 2, Section 6 for laboratory testing criteria for activated carbon, the assigned activated carbon decontamination efficiencies 90% (elemental iodine) and 30% (organic iodide), the acceptable laboratory testing criteria is shown for a methyl iodide penetration of less than 10% for 2-inches deep charcoal bed. The applicant proposed TS 5.5.13 shows a value of 35%. The 35% allowable penetration must be calculated from a safety factor of two recommended by NRC Generic Letter 99-02: (100% - Organic Iodide Efficiency)/Safety Factor = (100% - 30%)/2 = 35%. The applicant needs to provide technical basis to assign a credit for active carbon decontamination efficiencies of 90% (elemental iodine) and 30% (organic iodide) charcoal carbon efficiency at 35% penetration conditions.

3) Regulatory Guide 1.52, Revision 3, Section 6, ASME N510-2007 Section 10.5 and ASME N511-2007 Section 5.8 specify differential pressure (dP) test across adsorber banks. The dP test across adsorber bank was not specified in the proposed TS 5.5.13. The applicant needs to provide the rationale the dP test across Charcoal filter bank was not specified in the TS.

Westinghouse Response (Revision 1):

1. Westinghouse intends to comply with Section 6.3 of Regulatory Guide 1.52, Revision 3 (Reference 1) as indicated in the markup of Appendix 1A in RAI-SRP 6.4-SPCV-06 (Reference 2). The markup of the Technical Specifications that indicates combined penetration and leakage of less than 0.5% is an editorial error. Technical Specification 5.5.13 will be corrected as indicated below to indicate a leakage value of less than 0.05%.
2. The technical basis for assigning activated carbon decontamination efficiencies of 90% (elemental iodine) and 30% (organic iodine) for charcoal carbon efficiency at 35% penetration conditions should have been identified as Reference 1. Reference 1 identifies methodology developed in NRC Generic Letter 99-02 (Reference 3) to calculate the allowable penetration percentage based on assumed organic iodine efficiency and a defined safety factor. Using the provided methodology, a 35% penetration condition is calculated assuming a 30% organic iodine efficiency and a safety factor of 2.
3. Differential pressure testing across the adsorber banks is not necessary for the AP1000 passive filtration line. The filtration lines are not used during normal plant operation; therefore, it is unlikely that there will be any degradation of the adsorbers that will cause an unpredicted differential pressure. Additionally, TS 5.5.13 requires the passive filtration line be tested to verify that filtration flow path produce a flow rate of atleast 600 cfm greater than the flow measured by VES-FT003A/B. The induced filtration flow rate of atleast 600 cfm requires that differential pressure through the filtration line be minimized. If the backpressure in the line at the discharge of the eductor is excessive, an induced filtration flow of 600 cfm is unlikely to be achieved. The existing technical specifications that measure VES flow through the passive filtration line are adequate to demonstrate adsorber performance. Addition testing would be redundant and is unnecessary. If 600 cfm of filtration flow rate is not generated using a motive flow of 65 +/- 5 cfm from the VES air storage tanks, the operator will be required to take the necessary actions to reduce differential pressure through the filtration line to ensure adequate filtration flow. As part of these actions, an operator would examine the adsorbers for possible causes on increased differential pressure.

References:

1. Regulatory Guide 1.52, "Design, Inspection, and Testing Criteria for Airfiltration and Adsorption Units of Post-Accident Engineered-Safety- Feature Atmosphere Cleanup Systems in Light-Water-Cooled Nuclear Power Plants," Revision 3

2. RAI-SRP 6.4-SPCV-06 Revision 0

3. NRC Generic Letter 99-02

Design Control Document (DCD) Revision: (all revisions)

Modify Appendix 1A as follows:

Reg. Guide 1.52, **Rev. 3, 6/01** ~~Rev. 2, 3/78~~ Design, Testing, and Maintenance Criteria for Post Accident Engineered Safety Feature Atmosphere Cleanup System Air Filtration and Absorption Units of Light Water Cooled Nuclear Power Plants

~~General~~	~~N/A~~	~~There are no ESF atmosphere cleanup systems for the AP1000. The AP1000 does not require engineered safety feature atmosphere cleanup systems to meet limits on doses offsite or onsite.~~
General	Conforms	The AP1000 main control room emergency habitability system (VES) includes a passive filtration system that is contained entirely within the main control room envelope. The passive filtration portion of the AP1000 VES contains no active equipment. This regulatory guide is followed where appropriate for the AP1000 MCR passive filtration system.
C.1	Conforms	The performance, design, construction, acceptance testing, and QA of the AP1000 MCR passive filtration system will be in accordance with ASME AG-1-1997 where appropriate. Also, it will be designed to ASME N509-1989 and tested to ASME N510-1989.
C.2	Conforms	The AP1000 MCR passive filtration is designed to operate under the environmental conditions specified by the guidelines in this regulatory position.
C.3.1 - 3.2	Exception	Redundant filtration trains are not needed in AP1000 passive filtration system. There passive filtration system contains no active components or moving parts. Adequate margin is provided in the design to prevent the likelihood of a passive failure.
C.3.3	Conforms	The maximum pressure surge is experienced during the highly unlikely failure of the upstream pressure regulator valve in the VES. The passive filtration system is designed to operate under this pressure surge.
C.3.4	Conforms	All components in the MCR passive filtration system are designed to be Seismic Category I.
C.3.5	Conforms	The mechanical design of the MCR passive filtration system is such that it can withstand the buildup of

		postulated radioactivity levels and maintain functionality.
C.3.6	Conforms	The AP1000 passive filtration system volumetric air-flow rate is below 30,000 CFM.
C.3.7	Conforms	The flow instrumentation is not required to be safety related. The instrumentation does not perform a safety function. The instrumentation monitoring flow from the VES emergency air storage tanks indicates whether there is sufficient flow coming from the compressed air tanks to induce the passive filtration.
C.3.8	Exception	The AP1000 passive filtration system does not rely upon, use, or need a power supply and/or electrical distribution.
C.3.9	Conforms	The AP1000 passive filtration system is designed to operate for 72 hours following a DBA.
C.3.10	Conforms	
C.3.11	Exception	There are no outdoor air intakes for the AP1000 passive filtration system. The system uses breathable compressed air that is stored in compressed air tanks during the post-72 hour operation time.
C.3.12	Exception	The AP1000 passive filtration system is located completely within the CRE. Leakages as explained in this regulatory position are not applicable to this system.
C.4.1 – 4.2	Exception	There are no moisture separators and/or heaters in the AP1000 passive filtration line.
C.4.3 – 4.7	Conforms	
C.4.8	Exception	There are no water drains in the AP1000 passive filtration line.
C.4.9	Exception	The credited adsorber efficiencies are 90% for elemental iodine and 30% for organic iodine. These efficiencies assume no humidity control.
C.4.10	Conforms	Type II adsorbers are used in this application
C.4.11	Conforms	The AP1000 passive filtration line uses impregnated activated carbon as the absorbent. The absorber is designed for a minimum average atmosphere residence time of 0.25 seconds per 2 inches of absorbent bed.

C.4.12	Conforms	
C.4.13	Conforms	
C.4.14	Exception	The passive filtration line requires no fans.
C.5.1	N/A	Only one bank of filters is used.
C5.2	Exception	This system is not used for normal HVAC and the filters should not buildup unusually levels of particulate once installed.
C.6.1	Exception	Testing will be conducted in accordance with system operability testing.
C.6.2 – 6.6	Conforms	
C.7	Conforms	
Table 1	Exception	The Technical Specification methyl iodide penetration acceptance limit for the AP1000 activated carbon adsorber is 5%, which correlates to 90% removal efficiency of both organic and elemental iodine. The calculated design basis for the AP1000 passive filtration adsorbers assumes a 30% organic iodine removal efficiency and a 90% elemental iodine efficiency. 1% bypass leakage is accounted for by testing to increased organic iodine removal efficiency.

5.5.13 Ventilation Filter Testing Program (VFTP)

A program shall be established to implement the following required testing of Engineered Safety Feature (ESF) filter ventilation systems at the frequencies specified in accordance with Regulatory Guide 1.52, Revision 3, ASME N510-1989, and AG-1.

a. Demonstrate for the ESF system that an inplace test of the high efficiency particulate air (HEPA) filters shows a penetration and system bypass ≤0.05% when tested in accordance with Regulatory Guide 1.52, Revision 3, and ASME N510-1989 at a flow rate at least 600 cfm greater than the flow measured by VES-003A/B. The flow rate being measured is a combination of the VES supply flow and the recirculation flow drawn through the eductor.

Demonstrate for the ESF system that an inplace test of the charcoal adsorber shows a penetration and system bypass ≤0.05% when tested in accordance with Regulatory Guide 1.52, Revision 3, and ASME N510-1989 at a flow rate at least 600 cfm greater than the flow measured by VES-003A/B.

b. Demonstrate for the ESF system that a laboratory test of a sample of the charcoal adsorber, when obtained as described in Regulatory Guide 1.52, Revision 3, shows the methyl iodide penetration less than the value specified below when tested in accordance with ASTM D3803-1989 at a temperature of 30°C (86°F) and the relative humidity specified below.

ESF Ventilation System	Penetration	RH
VES	~~35~~ 5%	95%

c. Demonstrate for the ESF system that the pressure drop across the combined HEPA filter, the charcoal adsorber, and the post filter is less than the value specified below when tested in accordance with Regulatory Guide 1.52 Revision 3, and ASME N510-1989 at the system flow rate specified below +/- 10%.

ESF Ventilation System	Delta P	Flow rate
VES	5 in. water gauge	660 cfm

The provisions of SR 3.0.2 and SR 3.0.3 are applicable to the VFTP test frequencies.

PRA Revision: None

Technical Report (TR) Revision: None