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Subject: **Response to Portion of NRC Request for Additional Information Letter No. 355 Related to ESBWR Design Certification Application – Auxiliary Systems – RAI Number 9.4-53 S01**

The purpose of this letter is to submit the GE Hitachi Nuclear Energy (GEH) response to the U.S. Nuclear Regulatory Commission (NRC) Request for Additional Information (RAI) 9.4-53 S01 sent by NRC Letter No. 355, Reference 1. The response to RAI Number 9.4-53 was previously submitted to the NRC via Reference 2 in response to Reference 3.

GEH response to RAI Number 9.4-53 S01 is addressed in Enclosure 1. Enclosure 2 contains the DCD markups associated with this response.

If you have any questions or require additional information, please contact me.

Sincerely,

Richard E. Kingston

Richard E. Kingston
Vice President, ESBWR Licensing

References:

1. MFN 09-600, Letter from U.S. Nuclear Regulatory Commission to Jerald G. Head, *Request for Additional Information Letter No. 355 Related to ESBWR Design Certification Application*, September 16, 2009
2. MFN 08-791, Response to Portion of NRC Request for Additional Information Letter Number No. 215, Related to ESBWR Design Certification Application – Auxiliary Systems – RAI Number 9.4-53, October 20, 2008
3. MFN 08-550, Letter from U.S. Nuclear Regulatory Commission to Robert E. Brown, *Request for Additional Information Letter No. 215 Related to ESBWR Design Certification Application*, June 23, 2008

Enclosures:

1. Response to Portion of NRC Request for Additional Information Letter No. 355 Related to ESBWR Design Certification Application - Auxiliary Systems - RAI Number 9.4-53 S01
2. Response to Portion of NRC Request for Additional Information Letter No. 355 Related to ESBWR Design Certification Application - Auxiliary Systems - RAI Number 9.4-53 S01 – DCD Markups

cc: AE Cubbage USNRC (with enclosures)
JG Head GEH/Wilmington (with enclosures)
DH Hinds GEH/Wilmington (with enclosures)
TL Enfinger GEH/Wilmington (with enclosures)
eDRF Section 0000-0089-7042, Revision 1

Enclosure 1

MFN 09-627

Response to Portion of NRC Request for Additional Information Letter No. 355 Related to ESBWR Design Certification Application

Auxiliary Systems

RAI Number 9.4-53 S01

NRC RAI 9.4-53 S01

1. In the response to RAI 9.4-53, it was stated that the Reactor Building (RB) accident clean up system draws the contaminated portion (CONAVS area) down to a negative pressure of ¼ in. w.g. Is any credit taken for this negative pressure in terms of a reduction of exfiltration flow in the RADTRAD dose evaluations which were performed for the 72 hour case and the 168 hour case?

2. Operating the RB accident dose clean up system provides a direct release to the environment through the stack. With a 95% efficient filter, 5% of the release would be considered unfiltered and impact the dose consequence analysis results. The staff is concerned that the testing program for filter efficiency base on RG 1.140 does not provide the level of confidence in filter efficiency to justify its use in the dose consequence analysis for the operation of the RB accident clean up system prior to the end of the 30 day accident evaluation period. Maintaining filter efficiency is an important protection to the public and operators during accident scenarios. Change the test program for filter efficiency to be based on RG 1.52, including test frequency in order to provide additional assurance that the filters have not degraded.

3. In ITAAC Table 2.16-2-2 item 12b, change the RG 1.140 to RG 1.52. Clarify that the RB accident clean up system must meet the requirements for filter efficiency as tested in the laboratory and meet the in place by pass leakage test which is done in the field. These are two separate tests.

GEH Response

1. In the response to RAI 9.4-53, it was stated that the Reactor Building (RB) accident clean up system draws the contaminated portion (CONAVS area) down to a negative pressure of ¼ in. w.g. Is any credit taken for this negative pressure in terms of a reduction of exfiltration flow in the RADTRAD dose evaluations which were performed for the 72 hour case and the 168 hour case?

No credit has been taken for the negative pressure that would result in a reduction of exfiltration flow in any of the DCD Chapter 15 DBA dose evaluations which model releases from the Reactor Building. Further, none of the post accident dose evaluations credit use of the Reactor Building HVAC Accident Exhaust Filter Units for mitigating dose consequences. The Reactor Building Accident Exhaust Filter Units are defense-in-depth units only, with no requirements to run them post-accident.

2. Operating the RB accident dose clean up system provides a direct release to the environment through the stack. With a 95% efficient filter, 5% of the release

would be considered unfiltered and impact the dose consequence analysis results. The staff is concerned that the testing program for filter efficiency base on RG 1.140 does not provide the level of confidence in filter efficiency to justify its use in the dose consequence analysis for the operation of the RB accident clean up system prior to the end of the 30 day accident evaluation period. Maintaining filter efficiency is an important protection to the public and operators during accident scenarios. Change the test program for filter efficiency to be based on RG 1.52, including test frequency in order to provide additional assurance that the filters have not degraded.

Operating the Reactor Building Accident Exhaust Filter Unit as a defense-in-depth function during a LOCA:

1. Is not credited in the dose consequence analysis; and
2. Would not cause an increase in dose above that assumed in the analysis.

Operating the filter unit would draw the RB down to at least -0.25" w.g. This negative pressure would reduce the assumed unfiltered RB leakage compared to that resulting from the positive RB (CONAVS area) pressure developed under accident conditions. The amount of equivalent unfiltered exfiltration would therefore be less than the assumed 300 cfm. The site-specific dose consequence analysis of operating the Reactor Building Accident Exhaust Filter Unit at any time following an accident would be documented as part of the Emergency Operating Procedure Development Plan. The testing for filter efficiency based upon RG 1.140 or per RG 1.52 both provide a level of confidence against filter degradation. As shown in Table 1 of this response, Comparison of RG 1.140 and RG 1.52 Requirements, the methodology, testing, and filter efficiencies tested to, are prescriptive in both Regulatory Guides. Both Regulatory Guides ensure required laboratory test efficiency to 99% HEPA and 95% charcoal. Both Regulatory Guides specify the identical standards acceptable to the NRC staff for design and testing of atmospheric cleanup systems (filter units). Testing to RG 1.140 ensures protection to the public and operators during system operation.

The testing frequency for the Accident Exhaust Filter Units is revised from 1440 hours of operation to 720 hours of operation to align the RB Accident Exhaust Filter Unit testing frequency requirements to conform with testing requirements of RG 1.52.

3. In ITAAC Table 2.16-2-2 item 12b, change the RG 1.140 to RG 1.52. Clarify that the RB accident clean up system must meet the requirements for filter efficiency as tested in the laboratory and meet the in place by pass leakage test which is done in the field. These are two separate tests.

DCD Tier 1, Section 2.16.2.1 Reactor Building HVAC and ITAAC Table 2.16.2-2 correctly specify the Reactor Building HVAC Accident Exhaust Filters meet RG 1.140 and ASME AG-1 requirements for HEPA and carbon filter efficiency. These filter units are not assumed to operate post-accident in the licensing bases and are not credited in

the design basis accident analysis. As such, they are not safety-related RG 1.52 ESF Credited Filter Units. They are “atmospheric cleanup systems designed to collect airborne radioactive materials during normal plant operation, including anticipated operational occurrences” which fall under RG 1.140 scope, as specified in RG 1.52.

The filter efficiency requirements for both RGs are specifically delineated in the RGs as stated above and in previously issued RAI 9.4-53 response. Testing will ensure the filtration requirements are met. Stating that the Reactor Building HVAC Accident Exhaust Filters meet RG 1.140, with additional guidance in DCD Section 9.4.6.4, ensures that the filter efficiency meets the laboratory and in place testing per the Regulatory Guide. Committing to RG 1.52 in lieu of RG 1.140 for the Reactor Building Accident Exhaust Filter Units places additional unnecessary safety related requirements on these RTNSS components (i.e. Seismic Cat I, 1E electrical power supply). Table 1 of this response is provided to illustrate the filter testing similarities between RG 1.52 and RG 1.140. DCD clarification/change is needed to DCD Section 9.4.6.4 to ensure testing is performed on the Accident Exhaust Filter Units after each 720 hours of operation versus the 1440 hours currently specified. This will align the RB Accident Exhaust Filter Unit testing frequency requirements in DCD Section 9.4.6.4 with identical testing requirements of RG 1.52.

GEH agrees that both in-place filter bypass leakage testing and laboratory filter efficiency testing is required for the RB Accident Exhaust Filter Units. DCD Tier 1, Table 2.16.2-2, ITAAC for the Reactor Building HVAC will be revised to clarify that these separate tests will be performed.

DCD Impact

DCD Tier 1, Table 2.16.2-2, ITAAC for the Reactor Building HVAC will be changed to clarify that in place by-pass leakage testing and requirements for filter efficiency as tested in the laboratory are performed to ensure RB Accident Exhaust Filter Units performance.

DCD Tier 2, Section 9.4.6.4 will be changed to ensure testing is performed on the Accident Exhaust Filter Units after each 720 hours of operation versus the 1440 hours currently specified.

TABLE 1 - COMPARISION OF RG 1.140 and RG 1.52 REQUIREMENTS

Subject / Criterion	Reg Guide 1.140, Rev. 2	Reg Guide 1.52, Rev. 3	Notes
Title	Design, Inspection, and Testing Criteria for Air Filtration and Adsorption Units of **Normal Atmosphere Cleanup Systems** in Light-Water-Cooled Nuclear Power Plants	Design, Inspection, and Testing Criteria for Air Filtration and Adsorption Units of **Post-Accident Engineered-Safety-Feature Atmosphere Cleanup Systems** in Light-Water-Cooled Nuclear Power Plants	RG 1.140 is for nonsafety-related. RG 1.52 is for safety-related.
Discussion Standards acceptable to NRC for Design and Testing	Standards acceptable to the NRC staff for the design and testing of normal atmosphere cleanup systems include those portions of ASME N509-1989, "Nuclear Power Plant Air-Cleaning Units and Components" (Ref. 1), ASME N510-1989, "Testing of Nuclear Air-Treatment Systems" (Ref. 2), and ASME AG-1-1997, "Code on Nuclear Air and Gas Treatment" (Ref. 3) that are referenced in this guide and ASTM D3803-1989, "Standard Test Methods for Nuclear-Grade Activated Carbon" (Ref. 4).	Standards acceptable to the NRC staff for the design and testing of ESF atmosphere cleanup systems include those portions of ASME N509-1989, "Nuclear Power Plant Air-Cleaning Units and Components" (Ref. 7); ASME N510-1989, "Testing of Nuclear Air-Treatment Systems" (Ref. 8); and ASME AG-1-1997, "Code on Nuclear Air and Gas Treatment" (Ref. 9) that are referenced in this guide, and ASTM D3803-1989, "Standard Test Methods for Nuclear-Grade Activated Carbon" (Ref. 10).	Both RGs call out identical Standards.
General Design and Testing Criteria	C. Regulatory Position; 1. General Design and Testing Criteria Invokes ASME AG-1-1997 and ASME N509-1989 as guidance.	C. Regulatory Position; 1. General Design and Testing Criteria Invokes ASME AG-1-1997 and ASME N509-1989 as **criteria**.	Both RGs call out ASME N510-1989 for testing.

Subject / Criterion	Reg Guide 1.140, Rev. 2	Reg Guide 1.52, Rev. 3	Notes
HEPA Filters	C. Regulatory Position; 4. Component Design Criteria and Qualification Testing; 4.3 The HEPA filters should be designed, constructed, and tested in accordance with Section FC of ASME AG-1-1997. Each HEPA filter should be tested for penetration of a challenge aerosol such as dioctyl phthalate (DOP) in accordance with Section TA of ASME AG-1-1997.	C. Regulatory Position; 4. Component Design Criteria and Qualification Testing; 4.4 HEPA filters used in ESF atmosphere cleanup systems should be designed, constructed, and tested in accordance with Section FC of ASME AG-1-1997. HEPA filters should be compatible with the chemical composition and physical conditions of the air stream. Each HEPA filter should be tested by the manufacturer (or by a qualified filter test facility) for penetration of a challenge aerosol such as dioctyl phthalate (DOP) in accordance with the procedures of Section TA of ASME AG-1-1997. Testing and documentation should be in accordance with a quality assurance program consistent with Appendix B to 10 CFR Part 50.	RG 1.140 is for nonsafety-related. RG 1.52 is for safety-related (10 CFR 50 , Appendix B).
In-Place Testing Codes	C. Regulatory Position; 6. In-place Testing Criteria; Introduction Initial in-place testing of normal atmosphere cleanup systems should be performed in accordance with Section TA of ASME AG-1-1997. Periodic, in-place testing of normal atmosphere cleanup systems and components should be performed in accordance with ASME N510-1989 as modified and supplemented by the following:	C. Regulatory Position; 6. In-place Testing Criteria; Introduction Initial in-place acceptance testing of ESF atmosphere cleanup systems and components should be performed in accordance with Section TA of ASME AG-1-1997. Periodic, in-place testing of ESF atmosphere cleanup systems and components should be performed in accordance with ASME N510-1989 as modified and supplemented by the following:	Same.

Subject / Criterion	Reg Guide 1.140, Rev. 2	Reg Guide 1.52, Rev. 3	Notes
Required Intermittent Operation	N/A.	C. Regulatory Position; 6. In-place Testing Criteria; 6.1 Each ESF atmosphere cleanup train should be operated continuously for at least 15 minutes each month, with the heaters on (if so equipped), to justify the operability of the system and all its components.	ESBWR DCD Tier 2 Section 9.4.6.4 Testing and Inspection Requirements states: The RTNSS RB HVAC Accident Exhaust Filter Units will additionally be operationally tested each month by running each filter unit for 15 minutes as is recommended in RG 1.52 Rev. 3.
Leak Tests for HEPA Filters	C. Regulatory Position; 6. In-place Testing Criteria; 6.2 In-place aerosol leak tests for HEPA filters upstream from the carbon adsorbers in normal atmosphere cleanup systems should be performed (1) initially, (2) at least once each 24 months, (3) after each partial or complete replacement of a HEPA filter bank, (4) following detection of, or evidence of, penetration or intrusion of water or other material into any portion of a normal atmosphere cleanup system that may have an adverse effect on the functional capability of the filters, and (5) following painting, fire, or chemical release in any ventilation zone communicating with the system that may have an adverse effect on the functional capability of the system. The test should be	C. Regulatory Position; 6. In-place Testing Criteria; 6.3 In-place aerosol leak tests for HEPA filters upstream from the carbon adsorbers in ESF atmosphere cleanup systems should be performed (1) initially, (2) at least once each 24 months, (3) after each partial or complete replacement of a HEPA filter bank, (4) following detection of, or evidence of, penetration or intrusion of water or other material into any portion of an ESF atmosphere cleanup system that may have an adverse effect on the functional capability of the filters, and (5) following painting, fire, or chemical release in any ventilation zone communicating with the system that may have an adverse effect on the functional capability of the system. The test should be performed in accordance with Section 10 of ASME N510-1989.	Criterion 6.2 of RG 1.140 corresponds to Criterion 6.3 of RG 1.52.

Subject / Criterion	Reg Guide 1.140, Rev. 2	Reg Guide 1.52, Rev. 3	Notes
	performed in accordance with Section 10 of ASME N510-1989. The leak test should confirm a combined penetration and leakage (or bypass) of the normal atmosphere cleanup system of less than 0.05% of the challenge aerosol at rated flow ±10%. A filtration system satisfying this condition can be considered to warrant a 99% removal efficiency for particulates. HEPA filter sections in normal atmosphere cleanup systems that fail to satisfy the appropriate leak-test conditions should be examined to determine the location and cause of leaks. Repairs, such as alignment of filter frames and tightening of filter hold-down bolts, may be made; however, repair of defective, damaged, or torn filter media by patching or using caulking materials is not recommended in normal atmosphere cleanup systems, and such filters should be replaced and not repaired. HEPA filters that fail to satisfy test conditions should be replaced with filters qualified pursuant to Regulatory Position 4.3 of this guide. After repairs or filter replacement, the normal atmosphere cleanup system should be retested as described above in this Regulatory Position.	The leak test should confirm a combined penetration and leakage (or bypass) of the ESF atmosphere cleanup system of less than 0.05% of the challenge aerosol at rated flow ±10%. To be credited with a 99% removal efficiency for particulate matter in accident dose evaluations, a HEPA filter bank in an ESF atmosphere cleanup system should demonstrate an aerosol leak test result of less than 0.05% of the challenge aerosol at rated flow ±10%. HEPA filter sections in ESF atmosphere cleanup systems that fail to satisfy the appropriate leak-test conditions should be examined to determine the location and cause of leaks. Repairs, such as alignment of filter frames and tightening of filter hold-down bolts, may be made; however, patching or caulking materials should not be used in the repair of defective, damaged, or torn filter media in ESF atmosphere cleanup systems; such filters should be replaced and not repaired. HEPA filters that fail to satisfy test conditions should be replaced with filters qualified pursuant to Regulatory Position 4.4 of this guide. After repairs or filter replacement, the ESF atmosphere cleanup system should be retested as described above in this Regulatory Position. The above process should be repeated as	

Subject / Criterion	Reg Guide 1.140, Rev. 2	Reg Guide 1.52, Rev. 3	Notes
	In accordance with ASME N510-1989 and Article TA-1000 of ASME AG-1-1997, the standard challenge aerosol used in the in-place leak testing of HEPA filters is polydisperse droplets of dioctyl phthalate (DOP), also known as di-2-ethylhexyl-phthalate (DEHP). The 0.3 micrometer monodisperse DOP aerosol is used for efficiency testing of individual HEPA filters by manufacturers. Alternative challenge agents7 may be used to perform in-place leak testing of HEPA filters when their selection is based on the following: 1. The challenge aerosol has the approximate light scattering droplet size specified in Article TA-1130 of ASME AG-1-1997 2. The challenge aerosol has the same in-place leak test results as DOP. 3. The challenge aerosol has similar lower detection limit, sensitivity, and precision as DOP. 4. The challenge aerosol causes no degradation of the HEPA filter or the other normal air cleaning system components under test conditions. 5. The challenge aerosol is listed in the Environmental Protection Agency's "Toxic Substance Control Act" (TSCA) inventory for commercial	necessary until combined penetration and leakage (bypass) of the system is less than the acceptance criteria described above in this Regulatory Position. In accordance with ASME N510-1989 and Article TA-1000 of ASME AG-1-1997, the standard challenge aerosol used in the in-place leak testing of HEPA filters is polydisperse droplets of dioctyl phthalate (DOP), also known as di-2-ethylhexyl-phthalate (DEHP). The 0.3 micrometer monodisperse DOP aerosol is used for efficiency testing of individual HEPA filters by manufacturers and Filter Test stations. Alternative challenge agents may be used to perform in-place leak-testing of HEPA filters when their selection is based on the following. 1. The challenge aerosol has the approximate light scattering droplet size specified in Article TA-1130 of ASME AG-1-1997. 2. The challenge aerosol has the same in-place leak test results as DOP. 3. The challenge aerosol has a similar lower detection limit, sensitivity, and precision as DOP. 4. The challenge aerosol causes no degradation of the HEPA filter or the other ESF air cleaning system components under test conditions. 5. The challenge aerosol is listed in the	

Subject / Criterion	Reg Guide 1.140, Rev. 2	Reg Guide 1.52, Rev. 3	Notes
	use.	Environmental Protection Agency's "Toxic Substance Control Act" (TSCA) inventory for commercial use.	
Leak Tests for Adsorbers	C. Regulatory Position; 6. In-place Testing Criteria; 6.3 In-place leak testing for adsorbers should be performed (1) initially, (2) at least once each 24 months, (3) following removal of an adsorber sample for laboratory testing if the integrity of the adsorber section is affected, (4) after each partial or complete replacement of carbon adsorber in an adsorber section, (5) following detection of, or evidence of, penetration or intrusion of water or other material into any portion of a normal atmosphere cleanup system that may have an adverse effect on the functional capability of the adsorbers, and (6) following painting, fire, or chemical release in any ventilation zone communicating with the system that may have an adverse effect on the functional capability of the system. The test should be performed in accordance with Section 11 of ASME N510-1989. The leak test should confirm a combined penetration and leakage (or bypass) of the adsorber section of 0.05% or less of the challenge gas at rated flow±10%.	C. Regulatory Position; 6. In-place Testing Criteria; 6.4 In-place leak testing for adsorbers should be performed (1) initially, (2) at least once each 24 months, (3) following removal of an adsorber sample for laboratory testing if the integrity of the adsorber section is affected, (4) after each partial or complete replacement of carbon adsorber in an adsorber section, (5) following detection of, or evidence of, penetration or intrusion of water or other material into any portion of an ESF atmosphere cleanup system that may have an adverse effect on the functional capability of the adsorber, and (6) following painting, fire, or chemical release in any ventilation zone communicating with the system that may have an adverse effect on the functional capability of the system. The test should be performed in accordance with Section 11 of ASME N510-1989. The leak test should confirm a combined penetration and leakage (or bypass) of the adsorber section of 0.05% or less of the challenge gas at rated flow ±10%. Adsorber sections that fail to satisfy the	Criterion 6.3 of RG 1.140 corresponds to Criterion 6.4 of RG 1.52.

Subject / Criterion	Reg Guide 1.140, Rev. 2	Reg Guide 1.52, Rev. 3	Notes
	Adsorber sections that fail to satisfy the appropriate leak-test conditions should be examined to determine the location and cause of leaks. Repairs, such as alignment of adsorber cells, tightening of adsorber cell hold-down bolts, or tightening of test canister fixtures, may be made; however, the use of temporary patching material on adsorbers, filters, housings, mounting frames, or ducts should not be allowed. After repairs or adjustments have been made, the adsorber sections should be retested as described above in this Regulatory Position. In accordance with ASME N510-1989 and Section TA of ASME AG-1-1997, the standard challenge gas used in the in-place leak testing of adsorbers is Refrigerant-11 (trichloromonofluoro-methane). Alternative challenge gases may be used to perform in-place leak testing of adsorbers when their selection is based on meeting the characteristics specified in Appendix TA-C of ASME AG-1-1997.	appropriate leak-test conditions should be examined to determine the location and cause of leaks. Repairs, such as alignment of adsorber cells, tightening of adsorber cell holddown bolts, or tightening of test canister fixtures, may be made; however, the use of temporary patching material on adsorbers, filters, housings, mounting frames, or ducts should not be allowed. After repairs or adjustments have been made, the adsorber sections should be retested as described above in this Regulatory Position. The above process should be repeated as necessary until the combined penetration and leakage (bypass) of the adsorber section is less than the acceptance criteria described above in this Regulatory Position. In accordance with ASME N510-1989 and Section TA of ASME AG-1-1997, the standard challenge gas used in the in-place leak testing of adsorbers is Refrigerant-11 (trichloromonofluoromethane). Alternative challenge gases may be used to perform in-place leak testing of adsorbers, when their selection is based on meeting the characteristics specified in Appendix TA-C of ASME AG-1-1997.	

Subject / Criterion	Reg Guide 1.140, Rev. 2	Reg Guide 1.52, Rev. 3	Notes
Laboratory Testing Standard	N/A.	C. Regulatory Position; 7. Laboratory Testing Criteria for Activated Carbon; Intro. Laboratory testing of samples of activated carbon adsorber material from ESF atmosphere cleanup systems should be performed in accordance with ASTM D3803-1989 and Table 1 of this guide as supplemented by the following:	
Decontamination Efficiencies	C. Regulatory Position; 7. Laboratory Testing Criteria for Activated Carbon; 7.1 The activated carbon adsorber section of the normal atmosphere cleanup system should be assigned the decontamination efficiencies given in Table 1 for radioiodine if the following conditions are met: 1. The adsorber section meets the conditions given in Regulatory Position 6.3 of this guide, 2. New activated carbon meets the physical property specifications given in Regulatory Position 4.9 of this guide, and 3. Representative samples of used activated carbon pass the laboratory tests given in Table 1 of this guide. If the activated carbon fails to meet any of the above conditions, it should not be used in adsorption units.	C. Regulatory Position; 7. Laboratory Testing Criteria for Activated Carbon; 7.3 For accident dose evaluation purposes, the activated carbon adsorber section of an ESF atmosphere cleanup system should be assigned the appropriate decontamination efficiency given in Table 1 for elemental iodine and organic iodides if the following conditions are met: 1. The adsorber section meets the leak-test conditions given in Regulatory Position 6.4 of this guide. 2. New activated carbon meets the performance and physical property specifications given in Regulatory Position 4.11 of this guide, and 3. Representative samples of new or used activated carbon pass the applicable laboratory tests specified in Table 1 of this guide.	Criterion 7.1 of RG 1.140 corresponds to Criterion 7.3 of RG 1.52.

Subject / Criterion	Reg Guide 1.140, Rev. 2	Reg Guide 1.52, Rev. 3	Notes
		If the activated carbon fails to meet any of the above conditions, it should not be used in adsorbers in ESF atmosphere cleanup systems.	
Analysis of Unused Activated Carbon	N/A	C. Regulatory Position; 7. Laboratory Testing Criteria for Activated Carbon; 7.1 If an analysis of unused activated carbon has not been conducted within the past 5 years, representative samples of the unused activated carbon should be collected at the time of installation or replacement of adsorber material and submitted for analysis. The analysis should be performed in accordance with Regulatory Position 4.11 or Table 1 of this guide, whichever is more restrictive. Carbon that is stored for future use should be stored in its original unopened and undamaged container and stored in a storage area that meets the specifications provided in Subpart 2.2 of ASME NQA-1-1997. Carbon that does not meet these specifications should not be used without performing an analysis demonstrating its current capability.	
Determination of Efficiency of Activated Carbon Adsorber	C. Regulatory Position; 7. Laboratory Testing Criteria for Activated Carbon; 7.2 The efficiency of the activated carbon adsorber section should be	N/A	

Subject / Criterion	Reg Guide 1.140, Rev. 2	Reg Guide 1.52, Rev. 3	Notes
	determined by laboratory testing of representative samples of the activated carbon exposed simultaneously to the same service conditions as the adsorber section. Each representative sample should be not less than 2 inches in both length and diameter, and each sample should have the same qualification and batch test characteristics as the system adsorbent. There should be a sufficient number of representative samples located in parallel with the adsorber section to estimate the amount of penetration of the system adsorbent throughout its service life. The design of the samples should be in accordance with Appendix A to ASME N509-1989. Where system activated carbon is greater than 2 inches deep, each representative sampling station should consist of enough 2-inch samples in series to equal the thickness of the system adsorbent. Once representative samples are removed for laboratory testing, their positions in the sampling array should be blocked off. Sampling and analysis should be performed (1) initially, (2) at intervals of approximately 24 months, (3) following painting, fire, or chemical release in any ventilation zone		

Subject / Criterion	Reg Guide 1.140, Rev. 2	Reg Guide 1.52, Rev. 3	Notes
	communicating with the system that may have an adverse effect on the functional capability of the carbon media, and (4) following detection of, or evidence of, penetration of water or other material into any portion of the filter system that may have an adverse effect on the functional capability of the carbon media. Laboratory tests of representative samples should be conducted, as indicated in Table 1 of this guide, with the test gas flow in the same direction as the flow during service conditions. Similar laboratory tests should be performed on an adsorbent sample before loading into the adsorbers to establish an initial point for comparison of future test results. The activated carbon adsorber section should be replaced with new unused activated carbon meeting the physical property specifications given in Regulatory Position 4.9 of this guide if (1) testing in accordance with Table 1 results in a representative sample that fails to pass the acceptance criterion or (2) no representative sample is available for testing.		

Subject / Criterion	Reg Guide 1.140, Rev. 2	Reg Guide 1.52, Rev. 3	Notes
Sampling and Analysis Schedule	N/A	C. Regulatory Position; 7. Laboratory Testing Criteria for Activated Carbon; 7.2 Sampling and analysis should be performed (1) after each 720 hours of system operation, or at least once each 24 months, whichever comes first, (2) following painting, fire, or chemical release in any ventilation zone communicating with the system that may have an adverse effect on the functional capability of the carbon media, and (3) following detection of, or evidence of, penetration or intrusion of water or other material into any portion of an ESF atmosphere cleanup system that may have an adverse effect on the functional capability of the carbon media.	Sampling and Analysis Schedule Criterion 7.2 of RG 1.140 corresponds to Criterion 7.2 of RG 1.52 with the following ESBWR added requirement: ESBWR DCD Tier 2 Section 9.4.6.4 Testing and Inspection Requirements states: There is an additional requirement that charcoal laboratory testing will be performed on the RB HVAC Accident Exhaust Filter Unit after each 720 hours of operation as recommended by RG 1.52 Rev. 3 for the time based charcoal testing frequency.

Subject / Criterion	Reg Guide 1.140, Rev. 2	Reg Guide 1.52, Rev. 3	Notes
Replacement of Activated Carbon Adsorber	N/A	C. Regulatory Position; 7. Laboratory Testing Criteria for Activated Carbon; 7.4 The activated carbon adsorber section should be replaced with new unused activated carbon that meets the performance and physical property specifications of Regulatory Position 4.11 of this guide if (1) testing in accordance with Regulatory Positions 7.1 and 7.2 results in a representative sample that fails to pass the applicable test in Table 1 of this guide or if (2) no representative sample is available for testing.	
Table 1: Laboratory Tests for Activated Carbon	See Notes	See Notes	The Methyl Iodide Penetration Acceptance Criterion is more strict for RG 1.52 than 1.140. Otherwise, same.

Enclosure 2

MFN 09-627

Response to Portion of NRC Request for Additional Information Letter No. 355 Related to ESBWR Design Certification Application

Auxiliary Systems

RAI Number 9.4-53 S01

DCD Markups

Table 2.16.2-2

ITAAC For The Reactor Building HVAC

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
7. The RBVS provides post 72-hour cooling for DCIS , CRD and RWCU pump rooms, electrical cabinet cooling and CRD / RWCU motor cooling.	Testing of the integrated system will be performed to demonstrate the air flow capability of the RBVS to support post-72 hour cooling for DCIS, CRD and RWCU pump rooms, electrical cabinet cooling and CRD / RWCU motor cooling.	The integrated system test demonstrates the air flow capability to support post-72 hour cooling for DCIS, CRD and RWCU pump rooms, electrical cabinet cooling and CRD / RWCU motor cooling.
8. Indications and controls for safety-related components of the RBVS as indicated in Table 2.16.2-1 are available in the MCR.	Inspection of the MCR will be performed to verify that the safety-related system functions of the RBVS are available.	Indications and controls for the safety-related components of the RBVS as indicated in Table 2.16.2-1 are available in the MCR.
9. Independence is provided between safety-related divisions, and between safety-related divisions and nonsafety-related equipment.	i. Tests will be performed on the RBVS dampers by providing a test signal in only one safety-related division at a time. ii. Inspection of the as-built safety-related divisions in the system will be performed.	i. The test signal exists only in the safety-related division under test in the as-built RBVS damper. ii. Physical separation and electrical isolation exists between as-built RBVS dampers. Physical separation or electrical isolation exists between safety-related divisions and nonsafety-related equipment.
10. (Deleted)		
11. The Reactor Building HVAC Online Purge Exhaust Filters meet RG 1.140 and ASME AG-1 requirements for HEPA and carbon filter efficiency	Each charcoal adsorber will be tested in accordance with RG 1.140. HEPA filters will be tested in accordance with ASME AG-1, Section FC.	The as-built Reactor Building HVAC Online Purge Exhaust filter efficiency meet the acceptance criteria for laboratory and in place testing in accordance with RG 1.140 and ASME AG-1.

Table 2.16.2-2

ITAAC For The Reactor Building HVAC

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
12a. The Reactor Building HVAC Accident Exhaust Filters maintains the CONAVS served areas of the reactor building at a minimum negative pressure of 62 Pa (-1/4 inch W.G.) relative to surrounding clean areas when operating.	Testing will be performed to confirm that the Reactor Building HVAC Accident Exhaust Filters maintain the CONAVS area at a minimum negative pressure of 62 Pa (-1/4 inch W.G.) relative to surrounding clean areas when operating each filter train.	The time average pressure differential in the as-built CONAVS served areas of the reactor building as measured by pressure differential indicators is minimum negative pressure of 62 Pa (-1/4 inch W.G.).
12b. The Reactor Building HVAC Accident Exhaust Filters meet RG 1.140 and ASME AG-1 requirements for HEPA and carbon filter efficiency.	The Reactor Building HVAC Accident Exhaust Filters meet RG 1.140 and ASME AG-1 requirements for HEPA and carbon filter efficiency.	The as-built RB HVAC Accident Exhaust filter efficiencies meet the acceptance criteria for laboratory and in place testing in accordance with RG 1.140 and ASME AG-1.

The Non-safety Related, RB HVAC Online Purge Exhaust Filter Units provide online cleanup of contaminated areas within the CONAVS or REPAVS subsystems. These online units are not RTNSS components.

9.4.6.4 Testing and Inspection Requirements

Routine testing of the RBVS is conducted in accordance with normal power plant requirements for demonstrating system and component operability. Periodic surveillance testing of safety-related building isolation dampers is carried out per IEEE-338.

The RB HVAC ("Accident" and "Online" Purge) Exhaust Filter components are periodically tested in accordance with RG 1.140, Design, Inspection, and Testing Criteria for Air Filtration and Adsorption Units of Normal Atmosphere Cleanup Systems in Light-Water-Cooled Nuclear Power Plants. There is an additional requirement that charcoal laboratory testing will be performed on the RB HVAC Accident Exhaust Filter Unit after each ~~1440~~720 hours of operation as recommended by RG 1.52 Rev. 3 for the~~, because RG 1.140 does not specify a~~ time based charcoal testing frequency. The RB HVAC Online Purge Exhaust Filter Units will be tested on a 4-year frequency. The RTNSS RB HVAC Accident Exhaust Filter Units will additionally be operationally tested each month by running each filter unit for 15 minutes as is recommended in RG 1.52 Rev. 3.

9.4.6.5 Instrumentation Requirements

The RBVS is operated from the MCR. A local run/stop control switch is provided for each fan for maintenance and testing purposes. The RBVS is manually controlled, except for certain automatic operations described below:

- Reactor Building boundary isolation dampers for the CONAVS and REPAVS subsystems close on receipt a high radiation signal or on a loss of AC power. There is no automatic high radiation isolation signal for the CLAVS subsystem. As stated in Section 11.5, radiation monitors of the PRMS which initiate automatic building isolation are:
  - Reactor Building HVAC Exhaust (CONAVS)
  - Refuel Handling Area HVAC Exhaust (REPAVS)
- For systems with redundant fans, the lead fan is selected manually. The standby fan automatically starts upon indication of low flow in the associated discharge duct.
- Fan operation is allowed only when the corresponding fan shutoff dampers are open.
- The CLAVS return/exhaust fan auto starts after the supply fan starts and the ventilated spaces are at a positive pressure.
- Differential pressures between the ventilated spaces and the outside are transmitted to a pressure controller. The controller adjusts the CLAVS return/exhaust fan speed that modulates airflow to maintain the ventilated spaces at a positive pressure.
- A temperature controller modulates the CLAVS outside, return and exhaust air dampers when outside air temperatures are below design supply air temperatures. Damper modulation provides a mixture of outside and return air at or below design supply air temperatures to the ventilated spaces.