ITS NRC Questions

Id	**1591**
NRC Question Number	**KAB-069**
Category	**Technical**
ITS Section	**3.3**
ITS Number	**5.5.16**
DOC Number	
JFD Number	
JFD Bases Number	
Page Number (s)	**102**
NRC Reviewer Supervisor	**Rob Elliott**
Technical Branch POC	**Add Name**
Conf Call Requested	**N**
NRC Question	**On page 102 of Attachment 1, volume 16, insert 8 is not consistent with TSTF-493, Revision 4, including applicable errata. Please correct the TS 5.5.16, "Setpoint Control Program" or provide an explanation of the changes.**
Attach File 1	
Attach File 2	
Issue Date	**1/26/2010**
Added By	**Kristy Bucholtz**
Date Modified	
Modified By	
Date Added	**1/26/2010 10:36 AM**
Notification	**NRC/LICENSEE Supervision**

Licensee Response/NRC Response/NRC Question Closure

Id	**2101**
NRC Question Number	**KAB-069**
Select Application	**Licensee Response**
Response Date/Time	**2/9/2010 7:20 AM**
Closure Statement	
Response Statement	**The Kewaunee Power Station (KPS) ITS Amendment was based upon the most current revision of TSTF-493 at the time of submittal. Since the date of the submittal, a newer revision (Rev. 4) of the TSTF has been sent to the NRC for review. KPS has reviewed this revision and appropriate changes will be made. A draft markup regarding this change is attached. This change will be reflected in the supplement to this section of the ITS conversion amendment.**
Question Closure Date	
Attachment 1	**KAB-069 Markup.pdf** (754KB)
Attachment 2	
Notification	**NRC/LICENSEE Supervision** **Kristy Bucholtz** **Jerry Jones** **Bryan Kays** **Ray Schiele**
Added By	**Robert Hanley**
Date Added	**2/9/2010 7:20 AM**
Modified By	
Date Modified	

CTS

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INSERT 8

DOC M11 5.5.~~18~~ 16 Setpoint Control Program 25

This program shall establish the requirements for ensuring that setpoints for automatic protective devices are initially within and remain within the ~~technical specification requirements. This program~~ assumptions of the applicable safety analyses, provides a means for processing changes to instrumentation setpoints and identifies setpoint methodologies to ensure instrumentation will function as required. The program ~~also~~ shall ensures that testing of automatic protective devices related to variables having significant safety functions as delineated by 10 CFR 50.36(c)(1)(ii)(A) verify that instrumentation will function as required.

a. The program shall list the Functions in the following specifications to which it applies:

1. LCO 3.3.1, "Reactor ~~Trip~~ Protection System (R~~T~~PS) Instrumentation";
2. LCO 3.3.2, "Engineered Safety Feature Actuation System (ESFAS) Instrumentation Functions";
3. LCO 3.3.5, "Loss of Offsite Power (LOOP) Diesel Generator (DG) Start Instrumentation";
4. LCO 3.3.6, "Containment Purge and ~~Exhaust~~ Vent Isolation Instrumentation"; and
5. LCO 3.3.7, "Control Room ~~Emergency Filtration System (CREFS)~~ Post Accident Recirculation (CRPAR) Actuation Instrumentation~~"~~."
6. ~~LCO 3.3.8, "Fuel Building Air Cleanup System (FBACS) Actuation Instrumentation;"~~
7. ~~LCO 3.3.9, "Boron Dilution Protection System (BDPS)."~~

26

b. The program shall require the Nominal Trip Setpoint (NTSP), Allowable Value (AV), As-Found Tolerance (AFT), and As-Left Tolerance (ALT) (as applicable) of the Functions described in Paragraph a. are calculated using the NRC approved setpoint methodology, as listed below. In addition, the program shall contain the value of the NTSP, AV, AFT, or ALT (as applicable) for each Function described in paragraph a. and shall identify the setpoint methodology used to calculate these values.

Enclosure, Q&A to Attachment 1, Volume 16 (Chapter 5.0) 3 of 169

CTS

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INSERT 8 (continued)

DOC M11

Technical Report EE-0116, Revision 6, "Allowable Values for North Anna Improved Technical Specifications (ITS) Table 3.3.1-1 and 3.3.2-1, Setting Limits for Surry Custom Technical Specifications (CTS), Sections 2.3 and 3.7, and Allowable Values for Kewaunee Power Station Improved Technical Specifications (ITS) Functions listed in Specification 5.5.16."

6

---------------------------------- Reviewer's Note --
List the NRC safety evaluation report by letter, date, and ADAMS accession number that approved the setpoint methodologies. 13
--------------------- (if available) ---

1. [Insert reference to NRC safety evaluation that approved the setpoint methodology.] 1

c. The program shall establish methods to ensure that Functions described in Paragraph a. will function as required by verifying the as-left and as-found settings are consistent with those established by the setpoint methodology.

d.

----------------------------------- REVIEWER'S NOTE -------------------------------------
A license amendment request to implement a Setpoint Control Program must list the instrument functions to which the program requirements of paragraph d. will be applied. Paragraph d shall apply to all Functions in the Reactor Trip System and Engineered Safety Feature Actuation System specifications unless one or more of the following exclusions apply:

1. Manual actuation circuits, automatic actuation logic circuits or to instrument functions that derive input from contacts which have no associated sensor or adjustable device, e.g., limit switches, breaker position switches, manual actuation switches, float switches, proximity detectors, etc. are excluded. In addition, those permissives and interlocks that derive input from a sensor or adjustable device that is tested as part of another TS function are excluded.

2. Settings associated with safety relief valves are excluded. The performance of these components is already controlled (i.e., trended with as-left and as-found limits) under the ASME Code for Operation and Maintenance of Nuclear Power Plants testing program. 15

3. Functions and Surveillance Requirements which test only digital components are excluded. There is no expected change in result between SR performances for these components. Where separate as-left and as-found tolerance is established for digital component SRs, the requirements would apply.

Enclosure, Q&A to Attachment 1, Volume 16 (Chapter 5.0) 4 of 169

CTS

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INSERT 8 (continued)

DOC M11

~~d.~~ The program shall identify the Functions described in Paragraph a. that are automatic protective devices related to variables having significant safety functions as delineated by 10 CFR 50.36(c)(1)(ii)(A). The NTSP of these Functions are Limiting Safety System Settings. These Functions shall be demonstrated to be functioning as required by applying the following requirements during CHANNEL CALIBRATIONS, CHANNEL OPERATIONAL TESTS, and TRIP ACTUATING DEVICE OPERATIONAL TESTS that verify the NTSP.

1. The as-found value of the instrument channel trip setting shall be compared with the previous as-left value or the specified NTSP.

2. If the as-found value of the instrument channel trip setting differs from the previous as-left value or the specified NTSP by more than the pre-defined test acceptance criteria band (i.e., the specified AFT), then the instrument channel shall be evaluated before declaring the SR met and returning the instrument channel to service. This condition shall be entered in the plant corrective action program.

3. If the as-found value of the instrument channel trip setting is less conservative than the specified AV, then the SR is not met and the instrument channel shall be immediately declared inoperable.

4. The instrument channel setpoint shall be reset to a value that is within the as-left tolerance around the NTSP at the completion of the surveillance test; otherwise, the channel is inoperable~~. Setpoints~~ (setpoints may be more conservative than the NTSP provided that the as-found and as-left tolerances apply to the actual setpoint used to confirm channel performance).

e. Changes to the program shall be made in accordance with the requirements of 10 CFR 50.59. ~~1.~~ Revisions or supplements to the program shall be provided upon issuance to the NRC.

Enclosure, Q&A to Attachment 1, Volume 16 (Chapter 5.0) 5 of 169

Licensee Response/NRC Response/NRC Question Closure

Id	**2231**
NRC Question Number	**KAB-069**
Select Application	**NRC Response**
Response Date/Time	**2/18/2010 6:00 PM**
Closure Statement	
Response Statement	**Kewaunee's markup is consistent with TSTF 493 revision 4 and errata, with a few exceptions. Please change TS 5.5.16.b.1 to the following phrase, "NRC safety evaluation dated " and move the proposed insert to 5.5.16.b.1 into paragraph 5.5.16.e. Please change TS 5.5.16.e to the following phrase, "The program shall be specified in [insert technical report insert from TS 5.5.16.b.1]" from Attachment 1, Volume 8, Pages 103 and 104 of 517 to be consistent with TSTF 493 errata.**
Question Closure Date	
Attachment 1	
Attachment 2	
Notification	**NRC/LICENSEE Supervision**
Added By	**Kristy Bucholtz**
Date Added	**2/18/2010 7:57 AM**
Modified By	
Date Modified	

Licensee Response/NRC Response/NRC Question Closure

Id	**2361**
NRC Question Number	**KAB-069**
Select Application	**Licensee Response**
Response Date/Time	**3/1/2010 3:30 PM**
Closure Statement	
Response Statement	**KPS has reviewed the errata to TSTF-493, Rev. 4 and determined that the draft markup attached to the previous KPS response to KAB-069 did not include the NRC reviewer's requested change. In lieu of the NRC reviewer recommended wording for ITS 5.5.16.e to include the program name from what is specified in the originally submitted ITS 5.5.16.b.1 (i.e., Technical Report EE-0116), the TSTF errata allows the name of a document incorporated by reference into the facility FSAR. KPS will specify the Technical Requirements Manual (TRM) as the document. The TRM is currently referenced in the KPS USAR. Using the TRM as the reference document is also consistent with many other CTS requirements that are being relocated to the TRM as part of the ITS conversion. A draft markup regarding these changes is attached, and supersedes the previous draft markup. Changes from the previous markup are identified in green (see pages 2 and 3 of the attachment). These changes will be reflected in the supplement to this section of the ITS conversion amendment.**
Question Closure Date	
Attachment 1	**KAB-069 Rev 1 Markup (7).pdf** (2MB)
Attachment 2	
Notification	**NRC/LICENSEE Supervision** **Kristy Bucholtz** **Robert Hanley** **Jerry Jones** **Bryan Kays**
Added By	**David Mielke**
Date Added	**3/1/2010 3:33 PM**
Modified By	
Date Modified	

CTS

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INSERT 8

DOC M11 5.5.~~18~~ 16 Setpoint Control Program 25

This program shall establish the requirements for ensuring that setpoints for automatic protective devices are initially within and remain within the ~~technical specification requirements. This program~~ assumptions of the applicable safety analyses, provides a means for processing changes to instrumentation setpoints and identifies setpoint methodologies to ensure instrumentation will function as required. The program ~~also~~ shall ensures that testing of automatic protective devices related to variables having significant safety functions as delineated by 10 CFR 50.36(c)(1)(ii)(A) verify that instrumentation will function as required.

a. The program shall list the Functions in the following specifications to which it applies:

1. LCO 3.3.1, "Reactor ~~Trip~~ Protection System (R~~T~~PS) Instrumentation";
2. LCO 3.3.2, "Engineered Safety Feature Actuation System (ESFAS) Instrumentation Functions";
3. LCO 3.3.5, "Loss of Offsite Power (LOOP) Diesel Generator (DG) Start Instrumentation";
4. LCO 3.3.6, "Containment Purge and ~~Exhaust~~ Vent Isolation Instrumentation"; and
5. LCO 3.3.7, "Control Room ~~Emergency Filtration System (CREFS)~~ Post Accident Recirculation (CRPAR) Actuation Instrumentation~~"~~."
6. ~~LCO 3.3.8, "Fuel Building Air Cleanup System (FBACS) Actuation Instrumentation;"~~
7. ~~LCO 3.3.9, "Boron Dilution Protection System (BDPS)."~~

26

b. The program shall require the Nominal Trip Setpoint (NTSP), Allowable Value (AV), As-Found Tolerance (AFT), and As-Left Tolerance (ALT) (as applicable) of the Functions described in Paragraph a. are calculated using the NRC approved setpoint methodology, as listed below. In addition, the program shall contain the value of the NTSP, AV, AFT, or ALT (as applicable) for each Function described in paragraph a. and shall identify the setpoint methodology used to calculate these values.

CTS

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INSERT 8 (continued)

NRC Safety Evaluation dated [ ].

DOC M11

~~Technical Report EE-0116, Revision 5, "Allowable Values for North Anna Improved Technical Specifications (ITS) Table 3.3.1-1 and 3.3.2-1, Setting Limits for Surry Custom Technical Specifications (CTS), Sections 2.3 and 3.7, and Allowable Values for Kewaunee Power Station Improved Technical Specifications (ITS) Functions listed in Specification 5.5.16."~~

6

~~---------------------------------- Reviewer's Note --~~
~~List the NRC safety evaluation report by letter, date, and ADAMS accession number that approved the setpoint methodologies.~~
~~---~~

(if available)

13

1. ~~[Insert reference to NRC safety evaluation that approved the setpoint methodology.]~~ 1

c. The program shall establish methods to ensure that Functions described in Paragraph a. will function as required by verifying the as-left and as-found settings are consistent with those established by the setpoint methodology.

d.

~~----------------------------------- REVIEWER'S NOTE -----------------------------------~~
~~A license amendment request to implement a Setpoint Control Program must list the instrument functions to which the program requirements of paragraph d. will be applied. Paragraph d shall apply to all Functions in the Reactor Trip System and Engineered Safety Feature Actuation System specifications unless one or more of the following exclusions apply:~~

1. ~~Manual actuation circuits, automatic actuation logic circuits or to instrument functions that derive input from contacts which have no associated sensor or adjustable device, e.g., limit switches, breaker position switches, manual actuation switches, float switches, proximity detectors, etc. are excluded. In addition, those permissives and interlocks that derive input from a sensor or adjustable device that is tested as part of another TS function are excluded.~~

2. ~~Settings associated with safety relief valves are excluded. The performance of these components is already controlled (i.e., trended with as-left and as-found limits) under the ASME Code for Operation and Maintenance of Nuclear Power Plants testing program.~~ 15

3. ~~Functions and Surveillance Requirements which test only digital components are excluded. There is no expected change in result between SR performances for these components. Where separate as-left and as-found tolerance is established for digital component SRs, the requirements would apply.~~

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INSERT 8 (continued)

DOC M11

~~d.~~ The program shall identify the Functions described in Paragraph a. that are automatic protective devices related to variables having significant safety functions as delineated by 10 CFR 50.36(c)(1)(ii)(A). The NTSP of these Functions are Limiting Safety System Settings. These Functions shall be demonstrated to be functioning as required by applying the following requirements during CHANNEL CALIBRATIONS, CHANNEL OPERATIONAL TESTS, and TRIP ACTUATING DEVICE OPERATIONAL TESTS that verify the NTSP.

1. The as-found value of the instrument channel trip setting shall be compared with the previous as-left value or the specified NTSP.

2. If the as-found value of the instrument channel trip setting differs from the previous as-left value or the specified NTSP by more than the pre-defined test acceptance criteria band (i.e., the specified AFT), then the instrument channel shall be evaluated before declaring the SR met and returning the instrument channel to service. This condition shall be entered in the plant corrective action program.

3. If the as-found value of the instrument channel trip setting is less conservative than the specified AV, then the SR is not met and the instrument channel shall be immediately declared inoperable.

4. The instrument channel setpoint shall be reset to a value that is within the as-left tolerance around the NTSP at the completion of the surveillance test; otherwise, the channel is inoperable~~. Setpoints~~ (setpoints may be more conservative than the NTSP provided that the as-found and as-left tolerances apply to the actual setpoint used to confirm channel performance).

e. ~~Changes to the program shall be made in accordance with the requirements of 10 CFR 50.59.~~

~~1. Revisions or supplements to the program shall be provided~~ ~~upon issuance~~ ~~to the NRC.~~

The program shall be specified in ~~[insert the facility FSAR reference or the name of any document incorporated into the facility FSAR by reference]~~ the Technical Requirements Manual.

Licensee Response/NRC Response/NRC Question Closure

Id	**2921**
NRC Question Number	**KAB-069**
Select Application	**Licensee Response**
Response Date/Time	**5/11/2010 2:10 PM**
Closure Statement	
Response Statement	**As requested by the NRC Reviewer on a recent phone call, KPS has reviewed the second errata to TSTF-493, Rev. 4 and will make the changes specified in the errata. A draft markup regarding these changes is attached, and supersedes the previous draft markup. Changes from the previous markup are identified by the notation "Errata 2 change" (See pages 1 and 2). These changes will be reflected in the supplement to this section of the ITS conversion amendment.**
Question Closure Date	
Attachment 1	**KAB-069 Second Markup.pdf** (2MB)
Attachment 2	
Notification	**NRC/LICENSEE Supervision** **Kristy Bucholtz** **Victor Cusumano** **Jerry Jones** **Bryan Kays** **Ray Schiele**
Added By	**Robert Hanley**
Date Added	**5/11/2010 2:16 PM**
Modified By	
Date Modified	

CTS

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INSERT 8

DOC M11 5.5.~~18~~ 16 Setpoint Control Program 25

This program shall establish the requirements for ensuring that setpoints for automatic protective devices are initially within and remain within the ~~technical specification requirements. This program~~ assumptions of the applicable safety analyses, provides a means for processing changes to instrumentation setpoints and identifies setpoint methodologies to ensure instrumentation will function as required. The program ~~also~~ shall ensures that testing of automatic protective devices related to variables having significant safety functions as delineated by 10 CFR 50.36(c)(1)(ii)(A) verify that instrumentation will function as required.

a. The program shall list the Functions in the following specifications to which it applies:

1. LCO 3.3.1, "Reactor ~~Trip~~ Protection System (R~~T~~PS) Instrumentation";
2. LCO 3.3.2, "Engineered Safety Feature Actuation System (ESFAS) Instrumentation Functions";
3. LCO 3.3.5, "Loss of Offsite Power (LOOP) Diesel Generator (DG) Start Instrumentation";
4. LCO 3.3.6, "Containment Purge and ~~Exhaust~~ Vent Isolation Instrumentation"; and
5. LCO 3.3.7, "Control Room ~~Emergency Filtration System (CREFS)~~ Post Accident Recirculation (CRPAR) Actuation Instrumentation~~;"~~."
6. ~~LCO 3.3.8, "Fuel Building Air Cleanup System (FBACS) Actuation Instrumentation;"~~
7. ~~LCO 3.3.9, "Boron Dilution Protection System (BDPS)."~~

26

b. The program shall require the Nominal Trip Setpoint (NTSP), Allowable Value (AV), As-Found Tolerance (AFT), and As-Left Tolerance (ALT) (as applicable) of the Functions described in Paragraph a. are calculated using the NRC approved setpoint methodology, as listed below. In addition, the program shall ~~contain~~ list the value of the NTSP, AV, AFT, or ALT (as applicable) for each Function described in paragraph a. and shall identify the setpoint methodology used to calculate these values.

Errata 2 change

Enclosure, Q&A to Attachment 1, Volume 16 (Chapter 5.0) 12 of 169

Errata 2 change

5.5

If the as-found value of the instrument channel trip setting is less conservative than the specified AV, then the SR is not met and the instrument channel shall be immediately declared inoperable.

CTS

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INSERT 8 (continued)

NRC Safety Evaluation dated [ ].

DOC M11

~~Technical Report EE-0116, Revision 6, "Allowable Values for North Anna Improved Technical Specifications (ITS) Table 3.3.1-1 and 3.3.2-1, Setting Limits for Surry Custom Technical Specifications (CTS), Sections 2.3 and 3.7, and Allowable Values for Kewaunee Power Station Improved Technical Specifications (ITS) Functions listed in Specification 5.5.16."~~

6

~~---------------------------------- Reviewer's Note --~~
~~List the NRC safety evaluation report by letter, date, and ADAMS accession number that approved the setpoint methodologies.~~
~~---~~

(if available)

13

1. ~~[Insert reference to NRC safety evaluation that approved the setpoint methodology.]~~

1

c. The program shall establish methods to ensure that Functions described in Paragraph a. will function as required by verifying the as-left and as-found settings are consistent with those established by the setpoint methodology.

d.

~~----------------------------------- REVIEWER'S NOTE ------------------------------------~~
~~A license amendment request to implement a Setpoint Control Program must list the instrument functions to which the program requirements of paragraph d. will be applied. Paragraph d shall apply to all Functions in the Reactor Trip System and Engineered Safety Feature Actuation System specifications unless one or more of the following exclusions apply:~~

~~1. Manual actuation circuits, automatic actuation logic circuits or to instrument functions that derive input from contacts which have no associated sensor or adjustable device, e.g., limit switches, breaker position switches, manual actuation switches, float switches, proximity detectors, etc. are excluded. In addition, those permissives and interlocks that derive input from a sensor or adjustable device that is tested as part of another TS function are excluded.~~

~~2. Settings associated with safety relief valves are excluded. The performance of these components is already controlled (i.e., trended with as-left and as-found limits) under the ASME Code for Operation and Maintenance of Nuclear Power Plants testing program.~~ 15

~~3. Functions and Surveillance Requirements which test only digital components are excluded. There is no expected change in result between SR performances for these components. Where separate as-left and as-found tolerance is established for digital component SRs, the requirements would apply.~~

~~---~~

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INSERT 8 (continued)

DOC M11

~~d.~~ The program shall identify the Functions described in Paragraph a. that are automatic protective devices related to variables having significant safety functions as delineated by 10 CFR 50.36(c)(1)(ii)(A). The NTSP of these Functions are Limiting Safety System Settings. These Functions shall be demonstrated to be functioning as required by applying the following requirements during CHANNEL CALIBRATIONS, CHANNEL OPERATIONAL TESTS, and TRIP ACTUATING DEVICE OPERATIONAL TESTS that verify the NTSP.

1. The as-found value of the instrument channel trip setting shall be compared with the previous as-left value or the specified NTSP.

2. If the as-found value of the instrument channel trip setting differs from the previous as-left value or the specified NTSP by more than the pre-defined test acceptance criteria band (i.e., the specified AFT), then the instrument channel shall be evaluated before declaring the SR met and returning the instrument channel to service. This condition shall be entered in the plant corrective action program.

3. If the as-found value of the instrument channel trip setting is less conservative than the specified AV, then the SR is not met and the instrument channel shall be immediately declared inoperable.

4. The instrument channel setpoint shall be reset to a value that is within the as-left tolerance around the NTSP at the completion of the surveillance test; otherwise, the channel is inoperable~~. Setpoints~~ (setpoints may be more conservative than the NTSP provided that the as-found and as-left tolerances apply to the actual setpoint used to confirm channel performance).

e. ~~Changes to the program shall be made in accordance with the requirements of 10 CFR 50.59.~~

~~1. Revisions or supplements to the program shall be provided~~ ~~upon issuance~~ ~~to the NRC.~~

The program shall be specified in ~~[insert the facility FSAR reference or the name of any document incorporated into the facility FSAR by reference]~~.

the Technical Requirements Manual

Licensee Response/NRC Response/NRC Question Closure

Id	**2561**
NRC Question Number	**KAB-069**
Select Application	**NRC Question Closure**
Response Date/Time	
Closure Statement	**This question is closed and no further information is required at this time to draft the Safety Evaluation.**
Response Statement	
Question Closure Date	**3/15/2010**
Attachment 1	
Attachment 2	
Notification	**NRC/LICENSEE Supervision**
Added By	**Kristy Bucholtz**
Date Added	**3/15/2010 10:41 AM**
Modified By	
Date Modified	

Licensee Response/NRC Response/NRC Question Closure

Id	**2981**
NRC Question Number	**KAB-069**
Select Application	**NRC Question Closure**
Response Date/Time	
Closure Statement	**This question is closed and no further information is required at this time to draft the Safety Evaluation.**
Response Statement	
Question Closure Date	**5/13/2010**
Attachment 1	
Attachment 2	
Notification	**NRC/LICENSEE Supervision**
Added By	**Kristy Bucholtz**
Date Added	**5/13/2010 8:48 AM**
Modified By	
Date Modified	

ITS NRC Questions

Id	**931**
NRC Question Number	**VGC-001**
Category	**Editorial**
ITS Section	**5.0**
ITS Number	**5.5**
DOC Number	
JFD Number	**13|15**
JFD Bases Number	
Page Number (s)	**103 of 167**
NRC Reviewer Supervisor	**Rob Elliott**
Technical Branch POC	**Add Name**
Conf Call Requested	**N**
NRC Question	**"In Attachment 1, Vol 16, Rev 0, Page 103 of 167 for ISTS 5.5.16 Setpoint Control Program a reviewer's Note is struck in accordance with JFD 13. It appears that the correct JFD for this item is JFD 15. JFD 13 was previously used to justify deletion of a Reviewer's Note and two non-applicable procedures in ISTS 5.5.9 Steam Generator (SG) Program on page 88 of 167. Please confirm what appears to be a typo."**
Attach File 1	
Attach File 2	
Issue Date	**11/3/2009**
Added By	**Victor Cusumano**
Date Modified	
Modified By	
Date Added	**11/3/2009 12:11 PM**
Notification	**NRC/LICENSEE Supervision** **Kristy Bucholtz**

Licensee Response/NRC Response/NRC Question Closure

Id	**551**
NRC Question Number	**VGC-001**
Select Application	**Licensee Response**
Response Date/Time	**11/3/2009 1:10 PM**
Closure Statement	
Response Statement	**After further review, Kewaunee Power Station (KPS) agrees that in Attachment 1, Volume 16, Page 103 of 167, the JFD referenced for the deletion of the ISTS 5.5.18 (ITS 5.5.16) Reviewer's Note is a typographical error and should be JFD 15, not JFD 13. A draft markup regarding this change is attached. This change will be reflected in the supplement to this section of the ITS conversion amendment.**
Question Closure Date	
Attachment 1	**VGC-001 Markup.pdf** (291KB)
Attachment 2	
Notification	**NRC/LICENSEE Supervision** **Victor Cusumano** **Robert Hanley** **Jerry Jones** **Bryan Kays** **Ray Schiele**
Added By	**Robert Hanley**
Date Added	**11/3/2009 1:12 PM**
Modified By	
Date Modified	

CTS

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INSERT 8 (continued)

15

DOC M11

Technical Report EE-0116, Revision 5, "Allowable Values for North Anna Improved Technical Specifications (ITS) Table 3.3.1-1 and 3.3.2-1, Setting Limits for Surry Custom Technical Specifications (CTS), Sections 2.3 and 3.7, and Allowable Values for Kewaunee Power Station Improved Technical Specifications (ITS) Functions listed in Specification 5.5.16."

---------------------------------- Reviewer's Note --
List the NRC safety evaluation report by letter, date, and ADAMS accession number that approved the setpoint methodologies.

15

1. [Insert reference to NRC safety evaluation that approved the setpoint methodology.] 1

c. The program shall establish methods to ensure that Functions described in Paragraph a. will function as required by verifying the as-left and as-found settings are consistent with those established by the setpoint methodology.

----------------------------------- REVIEWER'S NOTE -------------------------------------
A license amendment request to implement a Setpoint Control Program must list the instrument functions to which the program requirements of paragraph d. will be applied. Paragraph d shall apply to all Functions in the Reactor Trip System and Engineered Safety Feature Actuation System specifications unless one or more of the following exclusions apply:

1. Manual actuation circuits, automatic actuation logic circuits or to instrument functions that derive input from contacts which have no associated sensor or adjustable device, e.g., limit switches, breaker position switches, manual actuation switches, float switches, proximity detectors, etc. are excluded. In addition, those permissives and interlocks that derive input from a sensor or adjustable device that is tested as part of another TS function are excluded.

2. Settings associated with safety relief valves are excluded. The performance of these components is already controlled (i.e., trended with as-left and as-found limits) under the ASME Code for Operation and Maintenance of Nuclear Power Plants testing program. 15

3. Functions and Surveillance Requirements which test only digital components are excluded. There is no expected change in result between SR performances for these components. Where separate as-left and as-found tolerance is established for digital component SRs, the requirements would apply.

Licensee Response/NRC Response/NRC Question Closure

Id	**561**
NRC Question Number	**VGC-001**
Select Application	**NRC Question Closure**
Response Date/Time	
Closure Statement	**This question is closed. The response and draft corrected markup are adequate. Vic Cusumano**
Response Statement	
Question Closure Date	**11/6/2009**
Attachment 1	
Attachment 2	
Notification	**NRC/LICENSEE Supervision Robert Elliott**
Added By	**Victor Cusumano**
Date Added	**11/6/2009 7:47 AM**
Modified By	
Date Modified	

ITS NRC Questions

Id	**1041**
NRC Question Number	**VGC-002**
Category	**Technical**
ITS Section	**5.0**
ITS Number	**5.6**
DOC Number	
JFD Number	
JFD Bases Number	
Page Number (s)	**Attachment 1, Volume 16 page 126 of 167**
NRC Reviewer Supervisor	**Rob Elliott**
Technical Branch POC	**Add Name**
Conf Call Requested	**N**
NRC Question	**In specification 5.6.4, Post Accident Monitoring Report, two conditions are identified from LCO 3.3.3, Condition B or F. In LCO 3.3.3, Condition F is shown as being deleted, (Attachment 1 Volume 8). Is condition F of LCO 3.3.3 being deleted or should it be removed from specification 5.6.4 or is there another explanation, please explain.**
Attach File 1	
Attach File 2	
Issue Date	**11/13/2009**
Added By	**Victor Cusumano**
Date Modified	
Modified By	
Date Added	**11/13/2009 2:46 PM**
Notification	**NRC/LICENSEE Supervision**

Licensee Response/NRC Response/NRC Question Closure

Id	**791**
NRC Question Number	**VGC-002**
Select Application	**Licensee Response**
Response Date/Time	**11/16/2009 4:10 PM**
Closure Statement	
Response Statement	**After further review, Kewaunee Power Station (KPS) agrees that in Attachment 1, Volume 16, Page 126 of 167, the reference to ITS 3.3.3 Condition F should be deleted, as it is not being included in ITS 3.3.3. A new JFD (JFD 8) has been written to justify the change. Furthermore, a typographical error was noted in the CTS reference for ITS 5.6.4. The CTS cross reference should be M02, not M01. A draft markup regarding this change is attached. This change will be reflected in the supplement to this section of the ITS conversion amendment.**
Question Closure Date	
Attachment 1	**VGC-002 Markup.pdf** (733KB)
Attachment 2	
Notification	**NRC/LICENSEE Supervision** **Victor Cusumano** **Jerry Jones** **Bryan Kays** **Ray Schiele**
Added By	**Robert Hanley**
Date Added	**11/16/2009 4:12 PM**
Modified By	
Date Modified	

02

5.6 Reporting Requirements

DOC ~~M01~~ 5.6.~~5~~ 4 Post Accident Monitoring Report 4

When a report is required by Condition B ~~or F~~ of LCO 3.3.~~[3]~~, "Post Accident Monitoring (PAM) Instrumentation," a report shall be submitted within the following 14 days. The report shall outline the preplanned alternate method of monitoring, the cause of the inoperability, and the plans and schedule for restoring the instrumentation channels of the Function to OPERABLE status. 8 2

~~5.6.6 [Tendon Surveillance Report~~

~~Any abnormal degradation of the containment structure detected during the tests required by the Pre-stressed Concrete Containment Tendon Surveillance Program shall be reported to the NRC within 30 days. The report shall include a description of the tendon condition, the condition of the concrete (especially at tendon anchorages), the inspection procedures, the tolerances on cracking, and the corrective action taken.]~~ 5

6.9.b.4 5.6.~~7~~ 5 Steam Generator Tube Inspection Report 5

A report shall be submitted within 180 days after the initial entry into MODE 4 following completion of an inspection performed in accordance with the Specification 5.5.~~9~~ 7, "Steam Generator (SG) Program." The report shall include: 7

a. The scope of inspections performed on each SG~~,~~ ; 6

b. Active degradation mechanisms found~~,~~ ; 6

c. Nondestructive examination techniques utilized for each degradation mechanism~~,~~ ; 6

d. Location, orientation (if linear), and measured sizes (if available) of service induced indications~~,~~ ; 6

e. Number of tubes plugged ~~[or repaired]~~ during the inspection outage for each active degradation mechanism~~,~~ ; 2 6

f. Total number and percentage of tubes plugged ~~[or repaired]~~ to date~~,~~ ; 2 6

g. The results of condition monitoring, including the results of tube pulls and in-situ testing~~,~~ ; and 6

~~[~~h. The effective plugging percentage for all plugging ~~[and tube repairs]~~ in each SG~~, and]~~ . 2 6

~~[i. Repair method utilized and the number of tubes repaired by each repair method.]~~ 2

JUSTIFICATION FOR DEVIATIONS
ITS 5.6, REPORTING REQUIREMENTS

1. Kewaunee Power Station (KPS) is a single unit site. Therefore, the allowance provided by this reviewers Note is not needed and has not been adopted in the KPS ITS.

2. The ISTS contains bracketed information and/or values that are generic to all Westinghouse vintage plants. The brackets are removed and the proper plant specific information/value is provided. This is acceptable since the generic specific information/value is revised to reflect the current plant design.

3. Changed the ISTS 5.6.2 submittal date to be consistent with the current KPS submittal date in CTS 6.9.b.2.

4. ISTS 5.6.4, "Reactor Coolant System (RCS) PRESSURE AND TEMPERATURE LIMITS REPORT (PTLR)," is not adopted in the ITS. CTS Figures TS 3.1-1 and TS 3.1-2, which provide Reactor Coolant System heatup and cooldown limitations, respectively, were adopted in ITS 3.4.3, "RCS Pressure and Temperature (P/T) Limits." Subsequent Specifications are renumbered accordingly.

5. The bracketed ISTS 5.6.6, "Tendon Surveillance Report," is not included in the Kewaunee Power Station (KPS) ITS since KPS does not have pre-stressed concrete tendons. Subsequent Specifications are renumbered accordingly.

6. The punctuation corrections have been made consistent with the Writer's Guide for the Improved Standard Technical Specifications, TSTF-GG-05-01, Section 5.1.3.

7. ISTS 5.5.3, "Post Accident Sampling," and ISTS 5.5.6, "Pre-Stressed Concrete Containment Tendon Surveillance Program," are not included in the KPS ITS. As a result, subsequent programs in ITS Section 5.5 have been renumbered and Specification 5.5.9 is now 5.5.7.

8. Changes have been made due to changes made to another Specification. Condition F in ITS 3.3.3 has not been adopted, thus it is being deleted in ITS 5.6.4.

Enclosure, Q&A to Attachment 1, Volume 16 (Chapter 5.0) 24 of 169

Licensee Response/NRC Response/NRC Question Closure

Id	**1131**
NRC Question Number	**VGC-002**
Select Application	**NRC Question Closure**
Response Date/Time	
Closure Statement	**This question is closed and no further information is required at this time to draft the Safety Evaluation.**
Response Statement	
Question Closure Date	**12/3/2009**
Attachment 1	
Attachment 2	
Notification	**NRC/LICENSEE Supervision**
Added By	**Victor Cusumano**
Date Added	**12/3/2009 8:37 AM**
Modified By	
Date Modified	

ITS NRC Questions

Id	**1051**
NRC Question Number	**VGC-003**
Category	**Technical**
ITS Section	**5.0**
ITS Number	**5.5**
DOC Number	
JFD Number	**8**
JFD Bases Number	
Page Number (s)	**Attachment 1, Volume 16 page 20 of 167**
NRC Reviewer Supervisor	**Rob Elliott**
Technical Branch POC	**Add Name**
Conf Call Requested	**N**
NRC Question	**Attachment 1, Volume 16 page 20 of 167, A04 page 22 of 167, L02 page 28 of 167, JFD8 Each of these references cite ITS 5.5.2. These items discussed appear to be contained in ITS section 5.2. ITS 5.5.2 is associated with Primary Coolant Sources Outside Containment which does not appear to be what the items in question should reference. Please explain**
Attach File 1	
Attach File 2	
Issue Date	**11/13/2009**
Added By	**Victor Cusumano**
Date Modified	
Modified By	
Date Added	**11/13/2009 2:49 PM**
Notification	**NRC/LICENSEE Supervision**

Licensee Response/NRC Response/NRC Question Closure

Id	**801**
NRC Question Number	**VGC-003**
Select Application	**Licensee Response**
Response Date/Time	**11/16/2009 4:15 PM**
Closure Statement	
Response Statement	**After further review, Kewaunee Power Station (KPS) agrees that in Attachment 1, Volume 16, Pages 20 (DOC A04), 22 (DOC L02), and 28 (JFD 8) of 167, the Specification number referenced is a typographical error and should be 5.2.2.e, 5.2.2.c, and 5.2.2.f, respectively. A draft markup regarding this change is attached. This change will be reflected in the supplement to this section of the ITS conversion amendment.**
Question Closure Date	
Attachment 1	**VGC-003 Markup.pdf** (1MB)
Attachment 2	
Notification	**NRC/LICENSEE Supervision** **Victor Cusumano** **Jerry Jones** **Bryan Kays** **Ray Schiele**
Added By	**Robert Hanley**
Date Added	**11/16/2009 4:14 PM**
Modified By	
Date Modified	

10 CFR 50.54(m)(2)(iv). This change is designated as administrative because it does not result in technical changes to the CTS.

A03 CTS 6.2.d states that changes not affecting safety may be made to the off-site and facility organizations and that such changes that are described in the Technical Specifications shall be reported to the NRC in the form of an application for license amendment within 60 days of the implementation of the change. This allowance is not being maintained in the ITS. This changes the CTS by deleting an allowance to make certain changes to the CTS prior to actually receiving a Technical Specification change.

The purpose of CTS 6.2.d was to allow Dominion Energy Kewaunee (DEK) to make changes to the unit staff organization, such as title changes, without waiting for prior NRC approval. However, License Amendment 193 (ADAMS Accession No. ML072880065) changed the CTS by deleting all plant specific titles and replacing them with generic titles, and specifying that the plant specific titles are in administrative documents. Furthermore, as stated in CTS 6.2.a and b, the off-site and facility organization is described in the quality assurance program. Thus, with the approval of License Amendment 193, this CTS 6.2.d allowance is unnecessary - no changes that do not affect safety are necessary, since all plant-specific titles have been removed from the CTS. Therefore, this change is acceptable and is considered administrative since KPS does not believe the current CTS 6.2.d allowance can be used at this time.

A04 CTS 6.3.b states that "The shift technical advisor shall have a bachelor's degree or equivalent in a scientific or engineering discipline with specific training in the design of the Kewaunee Plant and plant transients. ITS 5.~~5~~ 2 .2.e states that "An individual shall provide advisory technical support to the unit operations shift crew in the areas of thermal hydraulics, reactor engineering, and plant analysis with regard to the safe operation of the unit. This individual shall meet the qualifications specified by the Commission Policy Statement on Engineering Expertise on Shift." This changes the CTS by referencing the Commission Policy Statement on Engineering Expertise on Shift for qualification requirements instead of specific qualifications.

The purpose of 6.3.b requirements is to specify the minimum qualification requirements for the shift technical advisor. This change is acceptable because the qualification requirements included in the Commission Policy Statement on Engineering Expertise on Shift (Generic Letter 86-04, dated February 13, 1986) encompass the current shift technical advisor qualification requirements. This change is designated as administrative because it does not result in a technical change to the CTS.

<u>MORE RESTRICTIVE CHANGES</u>

M01 CTS 6.1.a describes that the plant manager is responsible for overall plant operation. CTS 6.2.a states that the off-site organization for plant management and technical support shall be as described in the quality assurance manual. CTS 6.2.b states that the plant organization shall be as described in the quality assurance program. ITS 5.2.1 states:

Enclosure, Q&A to Attachment 1, Volume 16 (Chapter 5.0) 28 of 169

RELOCATED SPECIFICATIONS

None

REMOVED DETAIL CHANGES

None

LESS RESTRICTIVE CHANGES

L01 *(Category 1 - Relaxation of LCO Requirements)* CTS 6.2.b.1.B requires two licensed reactor operators to be on duty at all times as part of the shift complement. This requirement is being deleted from the Technical Specification since it is duplicative of 10 CFR 50.54(m)(2)(i). This is discussed in DOC A02. However, 10 CFR 50.54(m)(2)(i) only requires one licensed Operator to be on duty when in MODE 5 or 6 or defueled. This changes the CTS by only requiring one licensed Operator to be on duty when in MODE 5 or 6 or defueled.

The purpose of CTS 6.2.b.1.B is to ensure the proper number of licensed Operators are on duty as required by NRC regulations. This change is acceptable since the NRC has already approved, as documented in 10 CFR 50.54(m)(2)(i), the minimum number of Licensed Operators required to be on duty in MODES 5 and 6 and defuled. This change is designated as a less restrictive change since the LCO requirements are less restrictive than are currently required in the CTS.

L02 *(Category 1 - Relaxation of LCO Requirements)* CTS 6.2.b.1.E requires one radiation technologist to be on duty at all times as part of the shift complement. 2 ITS 5.5.2.c only requires one radiation technologist to be on duty when there is fuel in the reactor vessel. This changes the CTS by not requiring a radiation technologist to be on duty when the reactor is defueled.

The purpose of CTS 6.2.b.1.E is to ensure the proper number of radiation technologists are duty when required. This change is acceptable since the NRC has already approved, as documented in ISTS NUREG-1431, Rev. 3.0 (as well as the other four ISTS NUREGs), allowing no radiation technologists to be on duty when the reactor is defueled. This change is designated as a less restrictive change since the LCO requirements are less restrictive in the ITS than in the CTS.

L03 *(Category 1 – Relaxation of LCO Requirement)* CTS 6.2.b.7 states that "When the reactor is above the COLD SHUTDOWN condition, a qualified shift technical advisor shall be within 10 minutes of the control room." ITS 5.2.2.e requires the shift technical advisor to be on duty when the unit is in MODE 1, 2, 3, or 4, but does not require the individual to be within 10 minutes of the control room. This changes the CTS by deleting the requirement that the shift technical advisor be within 10 minutes of the control room.

Enclosure, Q&A to Attachment 1, Volume 16 (Chapter 5.0) 29 of 169

JUSTIFICATION FOR DEVIATIONS
ITS 5.2, ORGANIZATION

1. The ISTS contains bracketed information and/or values that are generic to all Westinghouse vintage plants. The brackets are removed and the proper plant specific information/value is provided. This is acceptable since the generic specific information/value is revised to reflect the current Technical Specifications.

2. CTS 6.2.c allows the plant-specific titles of those personnel fulfilling the responsibilities of the positions delineated in the Technical Specifications to be maintained in appropriate plant documents, in lieu of the ISTS requirement that they be in the FSAR/QA Plan. This allowance was approved by the NRC as part of License Amendment 193, dated 10/31/07 (ADAMS Accession No. ML072880065). Therefore, ISTS 5.2.1.a has been changed to reflect this allowance.

3. Kewaunee Power Station includes only one unit. Therefore, the words in ITS 5.2.2.a have been modified to reflect a single unit site.

4. The Reviewers Note has been deleted. This information is for the NRC reviewer to be keyed into what is needed to meet this requirement. This is not meant to be retained in the final version of the plant specific submittal.

5. Typographical error corrected.

6. ITS 5.2.2.b has been revised to allow additional time for the shift crew composition to be below the minimum requirements of 10 CFR 50.54 "when severe weather conditions exist." ITS 5.2.2.c has been revised to allow additional time for a vacant radiation protection technician when severe weather conditions exits. This change is consistent with current Kewaunee Power Station (KPS) licensing requirements.

7. The generic positions have been used. Also, the terms in 10 CFR 55.4 and 10 CFR 50.54(m) are "Senior Operator" and "Operator," not "Senior Reactor Operator" and "Reactor Operator."

8. ISTS 5.2 ~~5~~.2.f has been modified to require the shift technical advisor only in MODES 1, 2, 3, and 4, consistent with the current Technical Specifications Requirements.

Enclosure, Q&A to Attachment 1, Volume 16 (Chapter 5.0) 30 of 169

Licensee Response/NRC Response/NRC Question Closure

Id	**1141**
NRC Question Number	**VGC-003**
Select Application	**NRC Question Closure**
Response Date/Time	
Closure Statement	**This question is closed and no further information is required at this time to draft the Safety Evaluation.**
Response Statement	
Question Closure Date	**12/3/2009**
Attachment 1	
Attachment 2	
Notification	**NRC/LICENSEE Supervision**
Added By	**Victor Cusumano**
Date Added	**12/3/2009 8:38 AM**
Modified By	
Date Modified	

ITS NRC Questions

Id	**1481**
NRC Question Number	**VGC-004**
Category	**Technical**
ITS Section	**5.0**
ITS Number	**5.5**
DOC Number	**M-7**
JFD Number	**16**
JFD Bases Number	
Page Number (s)	**VOL 16 Page 95 of 167**
NRC Reviewer Supervisor	**Rob Elliott**
Technical Branch POC	**Add Name**
Conf Call Requested	**N**
NRC Question	**In TS Section 5.5.10 "Explosive Gas and Storage Tank Radioactivity Monitoring Program" (VOL 16 Page 95 of 167) you have chosen to delete the ISTS paragraph stating the methodology used to determine the quantities of radioactive gasses and liquid radwaste materials. While the methodology cited in that paragraph is bracketed, the paragraph itself is not.** **Please explain how, without a defined methodology, you ensure that this determination provides accurate and reliable results. As you state in DOC M07, your CTS does not have this program. Since there is no current method in use to retain from CTS, please describe the methodology you plan to use, and the basis for not including it in the program description.** **In JFD16 you justify the deletion by stating that the program details are described in ITS 5.5.10 parts a, b, and c. These parts do not define a methodology.**
Attach File 1	
Attach File 2	
Issue Date	**1/15/2010**
Added By	**Victor Cusumano**
Date Modified	
Modified By	
Date Added	**1/15/2010 1:45 PM**
Notification	**NRC/LICENSEE Supervision**

Licensee Response/NRC Response/NRC Question Closure

Id	**1961**
NRC Question Number	**VGC-004**
Select Application	**Licensee Response**
Response Date/Time	**1/29/2010 2:25 PM**
Closure Statement	
Response Statement	**The current methodology used at Kewaunee Power Station is the methodology described in the bracketed ISTS paragraph. This methodology is currently under KPS control; it is not in the CTS. The ITS submittal did not include this information for that reason, and this same reason has been previously accepted by the NRC during a recent ITS conversion (Davis-Besse, NRC SER dated November 20, 2008).** **However, after further review, Kewaunee Power Station (KPS) will agree to put the methodology into the ITS, since it is not believed that the methodology will change in the near future. A draft markup regarding this change is attached. This change will be reflected in the supplement to this section of the ITS conversion amendment.**
Question Closure Date	
Attachment 1	**VGC-004 Markup.pdf** (756KB)
Attachment 2	
Notification	**NRC/LICENSEE Supervision** **Jerry Jones** **Bryan Kays** **Ray Schiele**
Added By	**Robert Hanley**
Date Added	**1/29/2010 2:24 PM**
Modified By	
Date Modified	

5.5 Programs and Manuals

DOC M07

5.5.~~12~~ 10 Explosive Gas and Storage Tank Radioactivity Monitoring Program 6

This program provides controls for potentially explosive gas mixtures contained in the ~~[Waste Gas Holdup~~ Gaseous Radioactive Waste Disposal System~~]~~, ~~[~~the quantity of radioactivity contained in gas storage tanks or fed into the offgas treatment system, and the quantity of radioactivity contained in unprotected outdoor liquid storage tanks~~]~~. The gaseous radioactivity quantities shall be determined following the methodology in ~~[~~Branch Technical Position (BTP) ETSB 11-5, "Postulated Radioactive Release due to Waste Gas System Leak or Failure"~~]~~. The liquid radwaste quantities shall be determined in accordance with ~~[~~Standard Review Plan, Section 15.7.3, "Postulated Radioactive Release due to Tank Failures"~~]~~. 1 1 ~~16~~

Stet, with changes

The program shall include:

a. The limits for concentrations of hydrogen and oxygen in the ~~[Waste Gas Holdup~~ Gaseous Radioactive Waste Disposal System~~]~~ and a surveillance program to ensure the limits are maintained. Such limits shall be appropriate to the system's design criteria (i.e., whether or not the system is designed to withstand a hydrogen explosion)~~.~~ ; 1 3

b. A surveillance program to ensure that the quantity of radioactivity contained in ~~[~~each gas storage tank and fed into the offgas treatment system~~]~~ is less than the amount that would result in a whole body exposure of ≥ 0.5 rem to any individual in an unrestricted area, in the event of ~~[~~an uncontrolled release of the tanks' contents~~]~~~~,~~ ; and 7 1 3

c. A surveillance program to ensure that the quantity of radioactivity contained in all outdoor liquid radwaste tanks that are not surrounded by liners, dikes, or walls, capable of holding the tanks' contents and that do not have tank overflows and surrounding area drains connected to the ~~[Liquid Radwaste Treatment~~ Waste Disposal System~~]~~ is less than the amount that would result in concentrations less than the limits of 10 CFR 20, Appendix B, Table 2, Column 2, at the nearest potable water supply and the nearest surface water supply in an unrestricted area, in the event of an uncontrolled release of the tanks' contents. 1

The provisions of SR 3.0.2 and SR 3.0.3 are applicable to the Explosive Gas and Storage Tank Radioactivity Monitoring Program Surveillance Frequencies. 7

final version of the plant specific submittal. Therefore, the Reviewer's Note has been deleted.

16. ~~The program details of the Explosive Gas and Storage Tank Radioactivity Monitoring Program are described in ISTS 5.5.12 (ITS 5.5.10) part a, b, and c. Therefore, the sentence in the introductory paragraph that specifies a method to determine the explosive gas and storage tank radioactivity is not necessary. Additionally, this change is consistent with the requirements in ODCM Sections 3/4.3 and 3/4.4.~~

Not used.

17. ISTS 5.5.13.c requires the total particulate concentration of the fuel oil to be tested every 31 days. The current test frequency at KPS is 92 days (per plant procedures). ITS 5.5.11.c has been changed to be consistent with current KPS practices. KPS has reviewed the maintenance history of this test and determined that the proposed 92 day Frequency is sufficient to ensure total particulates stays within the new ITS 5.5.11.c limit of 10 mg/l. In addition, the KPS diesel storage tanks are outdoor tanks, subject to the weather. Thus, minimizing the number of times the tanks must be opened to obtain fuel oil samples will also benefit keeping snow, rain water, and other contaminants out of the storage tanks.

18. Changes are made to the ISTS which reflect the plant specific nomenclature.

19. Kewaunee Power Station (KPS) complies with Option B of 10 CFR 50, Appendix J. Therefore, the ISTS 5.5.16 Option A and combined Option A and B provisions have been deleted.

20. ISTS 5.5.16.a (ITS 5.5.14.a) contains exceptions to Regulatory Guide (RG) 1.163. The KPS Containment Leak Rate Testing Program does not take any exceptions to the RG 1.163 requirements. Therefore, these exceptions are deleted.

21. ISTS 5.5.16.b contains a statement with a bracketed value for the containment design pressure. The containment design pressure limit specified in ISTS 5.5.16.b has not been included because it currently does not exist in the KPS CTS, and because this limit does not provide any useful input to the Containment Leakage Rate Testing Program. Pa is the test pressure and thus is included in the ITS.

22. KPS does not include a separate overall air lock leakage limit; it is only included as part of the combined Types B and C leakage limit (0.60 L_a). Therefore, ISTS 5.5.16.d.2.a) has not been included. Due to this, there is no reason to include the requirements of ISTS 5.5.16.d.2.b) separate from ISTS 5.5.16.d.2. Thus it has been combined into ISTS 5.5.16.d.2. Furthermore, ISTS 5.5.16.d.2.b) states, in part, the air lock acceptance criteria for each door. The CTS 6.20.c states, in part, the air lock acceptance criteria for each air lock door seal. ITS 5.5.14.d.2) is written to address each air lock door seal. This is acceptable since the ITS is edited to reflect the text in the CTS and for clarification. Lastly, ISTS 5.5.16.d.2.b) (ITS 5.5.14.d) contains a bracketed value for the air lock door seal containment leakage rate acceptance criteria and the pressure to which each door seal is tested. The brackets have been removed for the pressure to which each door seal is tested and an acceptance criteria value of < 0.005 L_a has been

Enclosure, Q&A to Attachment 1, Volume 16 (Chapter 5.0) 35 of 169

Licensee Response/NRC Response/NRC Question Closure

Id	**1971**
NRC Question Number	**VGC-004**
Select Application	**NRC Question Closure**
Response Date/Time	
Closure Statement	**This question is closed and no further information is required at this time to draft the Safety Evaluation.**
Response Statement	
Question Closure Date	**1/29/2010**
Attachment 1	
Attachment 2	
Notification	**NRC/LICENSEE Supervision**
Added By	**Victor Cusumano**
Date Added	**1/29/2010 4:34 PM**
Modified By	
Date Modified	

ITS NRC Questions

Id	**1541**
NRC Question Number	**VGC-005**
Category	**Technical**
ITS Section	**5.0**
ITS Number	**5.5**
DOC Number	
JFD Number	**20**
JFD Bases Number	
Page Number(s)	**VOL 16 Page 100 of 167**
NRC Reviewer Supervisor	**Rob Elliott**
Technical Branch POC	**Add Name**
Conf Call Requested	**N**
NRC Question	**In VOL 16 Page 100 of 167 you delete 5.5.14.f under Containment Leakage Rate Testing Program. This section reads: "*Nothing in these Technical Specifications shall be construed to modify the testing Frequencies required by 10 CFR 50, Appendix J*."** **The justification for this deletion is in your JFD 23 and reads: "*This phrase is not consistent with the allowances in ISTS 5.5.16.a (ITS 5.5.14.a), which states that the program shall be in accordance with the guidelines contained in Regulatory Guide 1.163, "Performance-Based Containment Leak-Test Program," dated September, 1995, as modified by the following exceptions." These exceptions stated in ITS 5.5.14.a are modifications to the testing Frequencies required by 10 CFR 50, Appendix J*."** **The exceptions cited as the rationale for deleting ITS 5.5.14.f were themselves deleted in accordance with JFD 20. Given that, please explain the raional for the deletion of ITS 5.5.14.f.**
Attach File 1	
Attach File 2	
Issue Date	**1/26/2010**
Added By	**Victor Cusumano**
Date Modified	

Modified By	
Date Added	**1/26/2010 9:38 AM**
Notification	**NRC/LICENSEE Supervision**

Licensee Response/NRC Response/NRC Question Closure

Id	**2041**
NRC Question Number	**VGC-005**
Select Application	**Licensee Response**
Response Date/Time	**2/4/2010 6:45 AM**
Closure Statement	
Response Statement	**KPS agrees that no exceptions were added to the ITS and that the ISTS exceptions were not included. However, ISTS specifically allows exceptions to 10 CFR 50 Appendix J to be specified in the ISTS Program, which is in the Technical Specifications. Thus, a statement that nothing in the Technical Specifications shall be construed to modify the testing Frequencies required by 10 CFR 50, Appendix J is incorrect. The ISTS allows exceptions to be made. If in the future an exception is requested by KPS, this statement could imply that it cannot be allowed. Furthermore, the statement itself is not necessary, even if there are no exceptions. The Program clearly states the requirements, and states that it is required by 10 CFR 50.54(o) and 10 CFR 50, Appendix J, Option B, as modified by approved exemptions. Thus, the CTS already states it must comply with 10 CFR 50 Appendix J (as modified by approved exemptions). Thus a statement that this cannot be modified by another Specification is unnecessary. It appears that it may be here to ensure the Frequency exceptions of SR 3.0.2 (i.e., the 25% extension allowance) are not applied. However, SR 3.0.2 is not applicable to the Administrative Controls Chapter (or any other chapter other than Chapter 3.0) unless a specific allowance is provided (i.e., SR 3.0.2 is applicable), similar to that provided in ITS 5.5.11, Diesel Fuel Oil testing Program.**
Question Closure Date	
Attachment 1	
Attachment 2	
Notification	**NRC/LICENSEE Supervision** **Jerry Jones** **Bryan Kays** **Ray Schiele**
Added By	**Robert Hanley**
Date Added	**2/4/2010 6:49 AM**
Modified By	
Date Modified	

Licensee Response/NRC Response/NRC Question Closure

Id	**2071**
NRC Question Number	**VGC-005**
Select Application	**Licensee Response**
Response Date/Time	**2/8/2010 3:25 PM**
Closure Statement	
Response Statement	**This response supersedes the previous KPS response.**

KPS agrees that no exceptions were added to the ITS and that the ISTS exceptions were not included. However, the point is that the ISTS specifically allows exceptions to 10 CFR 50 Appendix J to be specified in the ISTS Program, which is in the Technical Specifications. Thus, a statement that nothing in the Technical Specifications shall be construed to modify the testing Frequencies required by 10 CFR 50, Appendix J is incorrect. The first sentence of ISTS 5.5.16.a (ITS 5.5.14.a) states "A program shall establish the leakage rate testing of the containment as required by 10 CFR 50.54(o) and 10 CFR 50, Appendix J, Option B, *as modified by approved exemptions*." (Italics added for emphasis) Thus, the ISTS clearly allows exceptions to be made, and a further statement saying that nothing in the Technical Specifications can be construed to modify 10 CFR 50 Appendix J is incorrect. However, KPS does note that the referenced Justification for Deviation discusses the second part of the ITS 5.5.14.a paragraph and the deleted exceptions to RG 1.163. Therefore, KPS will clarify JFD 23 to discuss the first part f the statement, as described above. Furthermore, it is believed that the deleted ISTS 5.5.16.f requirement was included in the ISTS to ensure the Frequency exceptions of SR 3.0.2 (i.e., the 25% extension allowance) are not applied. However, SR 3.0.2 is not applicable to the Administrative Controls Chapter (or any other chapter other than Chapter 3.0) unless a specific allowance is provided (i.e., SR 3.0.2 is applicable), similar to that provided in ITS 5.5.11, Diesel Fuel Oil Testing Program. In addition, the ISTS clearly states that "This program shall be in accordance with the guidelines contained in Regulatory Guide 1.163," and RG 1.163 includes the appropriate Surveillance test Frequencies and how they can be adjusted.

Question Closure Date	
Attachment 1	**VGC-005 Markup.pdf** (721KB)
Attachment 2	
Notification	**NRC/LICENSEE Supervision** **Victor Cusumano**

	Jerry Jones **Bryan Kays** **Ray Schiele**
Added By	**Robert Hanley**
Date Added	**2/8/2010 3:31 PM**
Modified By	
Date Modified	

JUSTIFICATION FOR DEVIATIONS
ITS 5.5, PROGRAMS AND MANUALS

provided consistent with CTS 6.20. This is acceptable since the generic specific information/value is revised to reflect the current plant design.

23. ISTS 5.5.16 (ITS 5.5.14) provides the requirements for the Containment Leakage Rate Testing Program. The statement in ISTS 5.5.16.f that "Nothing in these Technical Specifications shall be construed to modify the testing Frequencies required by 10 CFR 50, Appendix J" has been deleted. This phrase is not consistent with the allowances in ISTS 5.5.16.a (ITS 5.5.14.a), which states that ~~the program shall be in accordance with the guidelines contained in Regulatory Guide 1.163, "Performance-Based Containment Leak-Test Program," dated September, 1995, as modified by the following exceptions." These exceptions stated in ITS 5.5.14.a are modifications to the testing Frequencies required by 10 CFR 50, Appendix J.~~

"A program shall establish the leakage rate testing of the containment as required by 10 CFR 50.54(o) and 10 CFR 50, Appendix J, Option B, as modified by approved exemptions." Thus the ISTS clearly allows exemptions to be made. In addition, the ISTS clearly states (in the remainder of ITS 5.5.14.a) that "This program shall be in accordance with the guidelines contained in Regulatory Guide 1.163," and RG 1.163 includes the appropriate Surveillance test Frequencies and how they can be adjusted.

24. Changes made to be consistent with proposed TSTF-500, Revision 1.

25. ISTS 5.5.18, "Setpoint Control Program (SCP)," has been added consistent with proposed TSTF-493, Revision 4. Any changes to the proposed program are discussed in other Justification for Deviations. In addition, the bracketed ISTS 5.5.3, "Post Accident Sampling," and the ISTS 5.5.6, "Pre-Stressed Concrete Containment Tendon Surveillance Program," are not included in the Kewaunee Power Station (KPS) ITS. Therefore, this Specification has been renumbered in the KPS ITS as 5.5.16.

26. Changes are made to be consistent with the LCO title in Section 3.3. In addition, ISTS 3.3.8 and 3.3.9 have not been adopted in the KPS ITS.

Enclosure, Q&A to Attachment 1, Volume 16 (Chapter 5.0) 42 of 169

Licensee Response/NRC Response/NRC Question Closure

Id	**2721**
NRC Question Number	**VGC-005**
Select Application	**NRC Question Closure**
Response Date/Time	
Closure Statement	**This question is closed and no further information is required at this time to draft the Safety Evaluation.**
Response Statement	
Question Closure Date	**4/5/2010**
Attachment 1	
Attachment 2	
Notification	**NRC/LICENSEE Supervision**
Added By	**Victor Cusumano**
Date Added	**4/5/2010 3:10 PM**
Modified By	
Date Modified	

ITS NRC Questions

Id	**1621**
NRC Question Number	**VGC-006**
Category	**Editorial**
ITS Section	**5.0**
ITS Number	**5.6**
DOC Number	**LA-4**
JFD Number	
JFD Bases Number	
Page Number (s)	**Vol 16 Page 163 of 167**
NRC Reviewer Supervisor	**Rob Elliott**
Technical Branch POC	**Add Name**
Conf Call Requested	**N**
NRC Question	**Vol 16 Page 163 of 167, DOC LA04 describes the rationale behind relocating the Radiological Environmental Monitoring Program described in CTS 6.16.b.2 to the TRM. This includes: "ITS 5.6.2 still requires an annual report of the results of the *Radiological Environmental Monitoring Program*."** **It appears that the correct ITS reference should be ITS 5.6.1. Please confirm**
Attach File 1	
Attach File 2	
Issue Date	**1/27/2010**
Added By	**Victor Cusumano**
Date Modified	
Modified By	
Date Added	**1/27/2010 1:08 PM**
Notification	**NRC/LICENSEE Supervision**

Licensee Response/NRC Response/NRC Question Closure

Id	**2051**
NRC Question Number	**VGC-006**
Select Application	**Licensee Response**
Response Date/Time	**2/4/2010 6:50 AM**
Closure Statement	
Response Statement	**After further review, Kewaunee Power Station (KPS) agrees that in Attachment 1, Volume 16, Pages 163 (DOC LA04), the Specification number referenced is a typographical error and should be 5.6.1, not 5.6.2. A draft markup regarding this change is attached. This change will be reflected in the supplement to this section of the ITS conversion amendment.**
Question Closure Date	
Attachment 1	**VGC-006 Markup.pdf** (718KB)
Attachment 2	
Notification	**NRC/LICENSEE Supervision** **Robert Hanley** **Jerry Jones** **Bryan Kays** **Ray Schiele**
Added By	**Robert Hanley**
Date Added	**2/4/2010 6:53 AM**
Modified By	
Date Modified	

changes the CTS by moving the requirements for the Radiological Environmental Monitoring Program to the Offsite Dose Calculation Manual (ODCM).

The purpose of CTS 6.16.b.2 is to provide representative measurements of radioactivity in the highest potential exposure pathways, and verification of the accuracy of the effluent monitoring program and modeling of environmental exposure pathways. The removal of the requirements for this program from the Technical Specifications is acceptable because this type of information is not necessary to be included in the Technical Specifications to provide adequate
5.6.1 protection of public health and safety. ITS ~~5.6.2~~ still requires an annual report of the results of the "Radiological Environmental Monitoring Program." Also, this change is acceptable because these requirements will be adequately controlled in the ODCM. Changes to the ODCM are controlled by the ODCM change control process in ITS 5.5.1, which ensures changes are properly evaluated. This change is designated as a less restrictive removal of requirement change because the requirements for a program are being removed from the Technical Specifications.

LA05 *(Type 4 – Removal of LCO, SR, or other TS Requirements to the TRM, USAR, ODCM, NFQAPD, CLRT Program, IST Program, ISI Program, or Setpoint Control Program)* CTS Definition 1.0.o.3 contains the definition for the Process Control Program (PCP). CTS 6.16.a.1 requires written procedures for the PCP. CTS 6.17 describes the control for changes to the PCP. The ITS does not include these requirements. This changes the CTS by moving the requirements of the PCP to the USAR.

The removal of these requirements from the Technical Specifications is acceptable because this type of information is not necessary to be included in the Technical Specifications to provide adequate protection of public health and safety. The PCP implements the requirements of 10 CFR 20, 10 CFR 61, and 10 CFR 71. Compliance with these regulations is required by Kewaunee Power Station (KPS) Operating Licenses, and procedures are the method to ensure compliance with the program. Regulations provide an adequate level of control for the affected requirements and inclusion of this requirement in the Technical Specification is not necessary. Also, this change is acceptable because these details will be adequately controlled in the USAR. Any changes to the USAR are made under 10 CFR 50.59 or 10 CFR 50.71(e), which ensures changes are properly evaluated. This change is designated as a less restrictive removal of requirements because details for meeting Technical Specification and regulatory requirements are being removed from the Technical Specifications.

LA06 *(Type 4 – Removal of LCO, SR, or other TS Requirement to the TRM, USAR, ODCM, NFQAPD, CLRT Program, IST Program, ISI Program, or Setpoint Control Program)* CTS 6.19 requires reporting major modifications to the liquid, gaseous, and solid radwaste treatment system to the Commission as part of the Radioactive Effluent Release Report and explains what needs to be included in the report and the approval process. The ITS does not contain this requirement. This changes the CTS by moving the requirement for reporting major modifications to the liquid, gaseous, and solid radwaste treatment system to the Offsite Dose Calculation Manual (ODCM).

Enclosure, Q&A to Attachment 1, Volume 16 (Chapter 5.0) 46 of 169

Licensee Response/NRC Response/NRC Question Closure

Id	**2521**
NRC Question Number	**VGC-006**
Select Application	**NRC Question Closure**
Response Date/Time	
Closure Statement	**This question is closed and no further information is required at this time to draft the Safety Evaluation.**
Response Statement	
Question Closure Date	**3/11/2010**
Attachment 1	
Attachment 2	
Notification	**NRC/LICENSEE Supervision**
Added By	**Victor Cusumano**
Date Added	**3/11/2010 7:05 AM**
Modified By	
Date Modified	

ITS NRC Questions

Id	**1631**
NRC Question Number	**VGC-007**
Category	**Technical**
ITS Section	**5.0**
ITS Number	**5.5**
DOC Number	**A-8**
JFD Number	
JFD Bases Number	
Page Number (s)	**Vol 16, Page 73 of 167**
NRC Reviewer Supervisor	**Rob Elliott**
Technical Branch POC	**Add Name**
Conf Call Requested	**N**
NRC Question	**Vol 16, Page 73 of 167 DOC A08 states that CTS 6.20 *Containment Leakage Rate Testing Program* includes a statement that the provisions of CTS 4.0.b do not apply. This prevents the 25% extension allowed by CTS 4.0.b from applying to this test program..** **DOC A08 further states that removing this statement is an administrative change because it does not result in technical changes to the CTS.** **ITS 5.5.14 Containment Leakage Rate Testing Program includes a statement that provisions of ITS SR 3.0.2 are applicable to this program, thus allowing a 25% extension be added to tests in the program.** **Please explain why this is not a less restrictive change to the CTS; and if it is less restrictive, how it is consistent with the licensing basis for Kewaunee.**
Attach File 1	
Attach File 2	
Issue Date	**1/27/2010**
Added By	**Victor Cusumano**
Date Modified	
Modified By	
Date Added	**1/27/2010 1:12 PM**
Notification	**NRC/LICENSEE Supervision**

Licensee Response/NRC Response/NRC Question Closure

Id	**2131**
NRC Question Number	**VGC-007**
Select Application	**Licensee Response**
Response Date/Time	**2/9/2010 9:05 AM**
Closure Statement	
Response Statement	**KPS has re-reviewed ITS 5.5.14 and cannot find any statement in the Containment Leakage Rate Testing Program that SR 3.0.2 is applicable to the program. KPS is adopting the Option B portion of the Program, consistent with current licensing basis. KPS does note that ITS 5.5.14.e (Page 100 of 167) states that the provisions of SR 3.0.3 are applicable to the Containment Leakage rate Testing Program.**
Question Closure Date	
Attachment 1	
Attachment 2	
Notification	**NRC/LICENSEE Supervision** **Victor Cusumano** **Jerry Jones** **Bryan Kays** **Ray Schiele**
Added By	**Robert Hanley**
Date Added	**2/9/2010 9:07 AM**
Modified By	
Date Modified	

Licensee Response/NRC Response/NRC Question Closure

Id	**2141**
NRC Question Number	**VGC-007**
Select Application	**NRC Question Closure**
Response Date/Time	
Closure Statement	**Based on clarification from the licensee, the original question is withdrawn.**
Response Statement	
Question Closure Date	**2/10/2010**
Attachment 1	
Attachment 2	
Notification	**NRC/LICENSEE Supervision**
Added By	**Victor Cusumano**
Date Added	**2/10/2010 1:27 PM**
Modified By	
Date Modified	

ITS NRC Questions

Id	**1761**
NRC Question Number	**VGC-008**
Category	**Technical**
ITS Section	**5.0**
ITS Number	**5.5**
DOC Number	
JFD Number	**17**
JFD Bases Number	
Page Number(s)	**Vol 16 Page 96 of 167**
NRC Reviewer Supervisor	**Gerald Waig**
Technical Branch POC	**Singh Matharu**
Conf Call Requested	**N**
NRC Question	**The attached questions have been provided by the Electrical Engineering Branch in NRR's Division of Engineering.**
Attach File 1	**Kewaunee Diesel Fuel Oil Testing Program RAIs.doc** (31KB)
Attach File 2	
Issue Date	**2/24/2010**
Added By	**Victor Cusumano**
Date Modified	
Modified By	
Date Added	**2/24/2010 2:16 PM**
Notification	**NRC/LICENSEE Supervision**

Kewaunee Diesel Fuel Oil Testing Program.

Improved Standard Technical Specification (ISTS) Section 5.5.13c requires the total particulate concentration of the emergency diesel generator fuel oil to be tested every 31 days. The current test frequency at KPS is 92 days. The licensee has proposed a deviation to ISTS to maintain the test frequency at 92 days based on:

1. Minimizing the number of times the outdoor fuel oil storage tanks (FOSTS) are opened, minimizes the potential for introduction of foreign materials into the tanks.
2. Past history indicates that 92 day test frequency was adequate for maintaining particulate content within TS limits.

Majority of the nuclear plants have a TS requirement to test fuel oil at 31 day interval.

1) Has KPS evaluated industry operating experience (OE) to substantiate that there is a higher incidence of introduction of foreign materials into the storage tanks at the plants with 31 day frequency?
2) Has KPS investigated OE methods used to exclude introduction of foreign materials into the FOSTS?
3) Provide details on fuel oil vendor(s) and refinery used for the last 10 years to obtain fuel oil.
4) Provide details on the specification, testing and quality assurance requirements imposed on the fuel oil vendor.
5) Provide details on measures taken to assure that future fuel oil purchases will maintain the pedigree of fuel oil received on site.
6) ASTM D-975 "Standard Specification for Diesel Fuel Oils" has been revised to permit up to 5% bio-diesel to be included in commercial diesel fuel without notification to the end-user. Bio-diesel is hydrophilic (attracts water) and oxidizes rapidly in storage to form corrosive acids and insoluble polymers that can adversely affect components in the EDG system and cause rapid fuel oil filter plugging. Provide details on evaluations performed to consider impact of inadvertent introduction of bio-diesel in fuel oil for 92 days.
7) Provide details on the material, age and the last inspection performed on the storage tank liner.

Licensee Response/NRC Response/NRC Question Closure

Id	**2551**
NRC Question Number	**VGC-008**
Select Application	**Licensee Response**
Response Date/Time	**3/12/2010 10:25 AM**
Closure Statement	

Response Statement

KPS is adopting the requirement in ISTS 5.5.13.c to determine the total particulate concentration of the diesel fuel oil is within the limit. The ISTS Frequency for this test is every 31 days. However, this requirement is currently being performed at KPS every 92 days. KPS evaluated the maintenance history and has determined that the current licensing basis Frequency of 92 days is sufficient to ensure the total particulates stays within the new 10 mg/l limit. Therefore, KPS has submitted a 92 day Frequency in ITS 5.5.11.c, in lieu of the ISTS Frequency of 31 days.

It is the KPS position that this proposed ITS Frequency is acceptable for ensuring the total particulates remains within the 10 mg/limit. The NRC reviewer requested further information concerning the fuel oil at KPS. The following are the NRC questions and the KPS responses to the questions:

1. **Has KPS evaluated industry operating experience (OE) to substantiate that there is a higher incidence of introduction of foreign materials into the storage tanks at the plants with 31 day frequency?**

   KPS response: There was no OE on the INPO web site that documents foreign material introduction into the fuel oil storage tanks from sampling. However, in KPS's situation, there is neither a sample valve nor a low point drain on the fuel oil storage tanks, which are located underground. Chemistry must remove the 4 inch flange on the top of each tank and lower the sampling equipment down into the associated tank for sampling. The connection for each tank is outside of the plant buildings (i.e., the tanks are not inside any plant building) in a gravel area with the turbine building exhaust directed to the sample area. While KPS has not had a situation where foreign material was introduced into the tanks, there have been some near-misses. The carbon steel pipe is approximately 6 feet to the top of the tanks and is beginning to show signs of corrosion in the portion of the pipe that does not see fuel oil. Any increase in the sampling frequency will increase the possibility of introducing foreign material.

2. **Has KPS investigated OE methods used to exclude introduction of foreign materials into the FOSTS?**

KPS response: See response to question number 1 above.

3. **Provide details on fuel oil vendor(s) and refinery used for the last 10 years to obtain fuel oil.**

   KPS response: For the last 10 years, KPS has used two vendors. The current vendor is being used only because the first vendor went out of business. Both the current vendor and the previous vendor provide KPS fuel oil from the British Petroleum (BP) refinery in Whiting, Indiana. The fuel oil is piped from the refinery to Milwaukee, Wisconsin, where it is trucked to the KPS site.

4. **Provide details on the specification, testing and quality assurance requirements imposed on the fuel oil vendor.**

   KPS response: The purchase order for Amoco Premium fuel oil includes the requirement that the fuel oil must meet the requirements of ASTM D975-06 and that the vendor must provide laboratory results of the fuel oil from the tank that is used to supply KPS. Each fuel oil delivery is sampled and sent to an approved qualified laboratory for confirmation analysis. Over the last 30 years there have been no parameters found out of specification from the applicable revision of ASTM D975.

5. **Provide details on measures taken to assure that future fuel oil purchases will maintain the pedigree of fuel oil received on site.**

   KPS response: The purchase specification for diesel fuel oil is a QA document and requires a Procurement Technical Evaluation performed to any changes. This document includes the references (ASTM, Calculations, basis). The changes to this document would require a full QA evaluation for revision. Furthermore, the ITS Bases for SR 3.8.3.3 provides the various required ASTM Standards to which the fuel oil is to be tested. Changes to the ITS Bases are controlled by the Bases Control Program in ITS Chapter 5. Furthermore, ITS 5.5.11 requires the diesel fuel oil program to include sampling, testing requirements, and acceptance criteria, all in accordance with applicable ASTM standards. Thus, fuel oil purchases would have to continue to meet the ITS 5.5.11 program requirements.

6. **ASTM-975 "Standard Specification for Diesel Fuel Oils" has been revised to permit up to 5% bio-diesel to be included in commercial diesel fuel without notification to the end-user. Bio-diesel is hydrophilic (attracts water) and oxidizes rapidly in storage to form corrosive acids and insoluble polymers that can adversely affect components in the EDG system and cause rapid fuel oil filter plugging. Provide details on evaluations performed to consider impact of inadvertent introduction of bio-diesel in fuel oil for 92 days.**

   KPS response: This concern over Bio-diesel was communicated to KPS

in the form of an Information Notice and the response to this IN was documented in the KPS corrective action program. The KPS fuel oil purchase order specifically states that Bio-diesel will not be allowed. KPS is purchasing laboratory equipment to analyze for Bio-diesel and the contract laboratory also analyzes for Bio-diesel as part of each shipment. All results indicate less than detectable Bio-diesel.

7. Provide details on the material, age and the last inspection performed on the storage tank liner.

KPS response: The two fuel oil storage tanks are made of carbon steel and are original equipment (i.e., circa 1971). The last inspection of the two fuel oil storage tanks was completed in 2001. The results of the inspection only found some indications from initial installation and no other concerns.

Question Closure Date	
Attachment 1	
Attachment 2	
Notification	**NRC/LICENSEE Supervision** **Victor Cusumano** **Jerry Jones** **Bryan Kays** **Ray Schiele**
Added By	**Robert Hanley**
Date Added	**3/12/2010 10:23 AM**
Modified By	
Date Modified	

Licensee Response/NRC Response/NRC Question Closure

Id	**2881**
NRC Question Number	**VGC-008**
Select Application	**Licensee Response**
Response Date/Time	**5/5/2010 4:00 PM**
Closure Statement	
Response Statement	**Kewaunee Power Station (KPS) recently had an informal phone conversation with the NRC reviewer discussing his comment provided in VGC-008 and the subsequent KPS response. During the conversation, many issues were discussed concerning the sampling of diesel fuel oil at KPS. The following is a list, provided by the NRC, of the various issues discussed, including the NRC's understanding of what transpired during the phone call. For each of the listed issues, KPS is providing a confirmation or follow-up response to the issue.**

1. Sampling method, I believe the licensee said according to ASTM D4057, "Standard Practice for Manual Sampling of Petroleum and Petroleum Products."

KPS Response: Both SP-10-225, the relevant KPS-specific surveillance procedure, and CY-AA-AUX-310, the relevant Dominion fleet procedure include reference to ASTM D4057. A comparison of SP-10-225 with ASTM D4057 indicates that this sampling methodology is in accordance with ASTM D4057.

2. "All- level" sample method is used every 92 days.

KPS Response: KPS surveillance procedure SP-10-225 specifies a quarterly sampling frequency for each Diesel Fuel Oil Storage Tank. The Dominion fleet procedure CY-AA-AUX-310 specifies a 92 day sampling frequency and in accordance with the KPS surveillance procedure (i.e., SP-10-225). The "All-level" sample method is used for the fuel oil storage tanks.

3. By procedure, delivery tank is steam cleaned prior to filling by supplier.

KPS Response: By purchase order, the following quality assurance requirement is invoked: "Prior to filling, transporters and hoses are to be steam cleaned and dried. Vendor shall provide documented evidence of cleaning prior to or with shipment. All hoses to be used for off load shall be capped to prevent road contaminates from entering during transit."

4. **A certificate is provided by the fuel oil supplier indicating conformance with purchase order.**

   KPS Response: The purchase order requires that the fuel oil shall be supplied in accordance with the requirements, analysis, and limits specified in Dominion fleet procedure CY-AA-AUX-310. Per the purchase order requirement, the supplier provides a laboratory analysis report for the last shipment received at the local fuel oil facility at or before the shipment to Kewaunee, and documented evidence of steam cleaning and drying of transporter compartments prior to, or with, shipment of fuel.

5. **Fuel oil sample from delivery truck taken by onsite Chemistry personnel prior to filling the fuel oil storage tank.**

   KPS Response: KPS surveillance procedure SP-10-225 requires a fuel oil sample to be taken from the transporter, and the Immediate Fuel Oil Acceptance Criteria confirmed acceptable prior to transferring (i.e., offloading) fuel oil into a fuel oil storage tank.

6. **Fuel sample from every new delivery is sent to a recognized lab for analyses and response is required within 20 days.**

   KPS Response: KPS surveillance procedure SP-10-225 requires fuel oil samples to be sent to the offsite vendor laboratory for analysis within 5 days of obtaining the samples. The procedure states that analytical results should be received from the offsite vendor within 14 days of the vendor's receipt of the sample. Kewaunee's review and evaluation of sample analytical results are required to be completed within 30 days of sampling new diesel fuel receipt.

7. **The fuel sample from the fuel oil storage tank is taken using a tygon tube and no canisters, bacon bombs, glass containers, etc., are introduced into the tank.**

   KPS Response: The fuel oil sample from each fuel oil storage tank is taken using tygon tubing and a peristaltic pump. No sample canisters, sample thieves, bacon bombs, glass containers, etc., are introduced into the tank during the acquisition of these samples.

8. **Day tank oil is sampled every 30 days.**

   KPS Response: The current KPS Preventive Maintenance Procedure PMP-10-02 includes the DG A/B Day Tanks fuel oil sampling, and is scheduled on a monthly basis. This is consistent with the proposed ITS SR 3.8.1.5; a new surveillance procedure is in development for this purpose.

9. **Tanks are directly buried carbon steel. Check on corrosion protection**

(cathodic protection, coating, etc.).

KPS Response: The fuel oil storage tanks are buried, coal tar mastic coated carbon steel tanks. Additional corrosion protection is provided by a cathodic protection system.

10. The 'sump' part of the tank is not known, i.e. if the tank is built on a slant, the water and debris will settle at one end, which may be the suction end for the transfer pumps. Need to identify the height elevation of the suction line in relation to the elevation of the bottom of the tank to provide assurance that water and sediment will not be introduced into the EDG. 10 year cleaning did not show any concerns.

KPS Response: The fuel oil storage tanks are horizontal right circular cylinders, with no sump. Calculation C10033, Rev. 2, Safeguard's Diesel Fuel Oil Storage Volume Calculation, indicates that the installed fuel oil transfer pump suction is 4 3/8 inches above the bottom of the tank, providing reasonable assurance that water and other sediment will not be introduced into the suction of the fuel oil transfer pumps. Additionally, the quarterly fuel oil sampling (i.e., KPS surveillance procedure SP-10-225) includes a bottom sample which serves to remove settled contaminants and water. Further, the most recent cleaning and visual inspection of the underground fuel oil storage tanks indicated no unacceptable degradation.

Question Closure Date	
Attachment 1	
Attachment 2	
Notification	**NRC/LICENSEE Supervision** **Victor Cusumano** **Jerry Jones** **Bryan Kays** **Ray Schiele**
Added By	**Robert Hanley**
Date Added	**5/5/2010 3:58 PM**
Modified By	
Date Modified	

Licensee Response/NRC Response/NRC Question Closure

Id	**2891**
NRC Question Number	**VGC-008**
Select Application	**NRC Question Closure**
Response Date/Time	
Closure Statement	

this question is closed per the below e mail. The JFD is acceptable based on the additional information docketed with this database.
V Cusumano

From: Matharu, Gurcharan
To: Cusumano, Victor; Mathew, Roy
Cc: Tam, Peter; Bucholtz, Kristy; Waig, Gerald; Wilson, George; Wolfgang, Robert; Elliott, Robert
Subject: RE: ME 2139 - Kewaunee TS 5.5 Diesel Fuel Oil Testing Program RAI Close-out
Date: Thursday, May 06, 2010 9:58:54 AM

Vic,
This e-mail confirms my concurrence to the responses provided by Kewaunee for LAR
converting Current Technical Specification (CTS) requirements to Standard Technical
Specification (STS) format related to Emergency Diesel Generator (EDG) Fuel Oil Storage
Tank (FOST) sampling.
Specifically, Kewaunee CTS does not require sampling of EDG fuel oil in the FOSTs. The
licensee currently has plant procedures (non-TS) that call out testing the particulate
concentration of the fuel every 92 days, and they would like to maintain that frequency
rather than adopting the 31 days in the STS.
The licensee has provided details on current procedures that ensure that new particulate
or bio-diesel products are not introduced into the FOSTs. The licensee has not noticed
significant moisture or particulate accumulation in the FOSTs during the clean up required
every 10 years. The licensee will sample the day tanks every month (per STS requirement)
providing assurance that any excessive moisture and sediment build up in the FOSTs that
gets carried into the day tanks will be detected during the monthly surveillance. Based on
the licensee's responses to staff 's request for additional information and subsequent
supplemental questions related to fuel oil sampling methods, the staff finds the proposed
sampling of fuel oil in the FOSTs, every 92 days instead of 31 days, as acceptable.
Please retain all the responses provided by the licensee, related to this

discussion, as part
of the supporting documentation.
Roy Mathew is currently acting Branch Chief. I am forwarding this e-mail to him for EEEB
concurrence.
Gurcharan Singh Matharu
NRR-DE-EEEB

Response Statement	
Question Closure Date	**5/6/2010**
Attachment 1	
Attachment 2	
Notification	**NRC/LICENSEE Supervision**
Added By	**Victor Cusumano**
Date Added	**5/6/2010 9:22 AM**
Modified By	
Date Modified	

ITS NRC Questions

Id	**1891**
NRC Question Number	**VGC-009**
Category	**Technical**
ITS Section	**5.0**
ITS Number	**5.5**
DOC Number	
JFD Number	
JFD Bases Number	
Page Number (s)	**In Vol 16, on page 90 of 167**
NRC Reviewer Supervisor	**Rob Elliott**
Technical Branch POC	**Add Name**
Conf Call Requested	**N**
NRC Question	**In Vol 16, on page 90 of 167 in TS 5.5.9 (several places) you reference Reg Guide 1.52 Revision 1. The Standard Tech Specs reference Revision 2. What justification is there for not using Rev 2 or Rev 3, and going back to Rev 1 of this Reg Guide?**
Attach File 1	
Attach File 2	
Issue Date	**3/18/2010**
Added By	**Victor Cusumano**
Date Modified	
Modified By	
Date Added	**3/18/2010 9:42 AM**
Notification	**NRC/LICENSEE Supervision**

Licensee Response/NRC Response/NRC Question Closure

Id	**2821**
NRC Question Number	**VGC-009**
Select Application	**Licensee Response**
Response Date/Time	**4/22/2010 2:10 PM**
Closure Statement	
Response Statement	**The current Kewaunee Power Station (KPS) commitment is to Regulatory Guide (RG) 1.52, Rev 1, with respect to replacement HEPA filters and charcoal adsorbers. Therefore, this is the current version of the RG KPS uses as guidance to perform the inplace HEPA filters and charcoal adsorbers. However, KPS has reviewed Revision 2 of the RG and will adopt the Revision 2 testing methods for these two tests. A draft markup regarding this change is attached. Note that this attached change includes changes due not only to this response, but also includes changes identified in the KPS responses to VGC-010 and VGC-011. This change will be reflected in the supplement to this section of the ITS conversion amendment. In addition, a clean draft markup of ITS 5.5.9, which shows how the ISTS Markup will look when the revision to the ITS submittal is made (i.e., the Rev. 1 version of the ISTS Markup), is also included to assist in understanding the changes.**
Question Closure Date	
Attachment 1	**VGC-009, 10, 11 Markup.pdf** (1MB)
Attachment 2	**draft ITS 5.5.9, Rev. 1 markup.pdf** (76KB)
Notification	**NRC/LICENSEE Supervision** **Victor Cusumano** **Jerry Jones** **Bryan Kays** **Ray Schiele**
Added By	**Robert Hanley**
Date Added	**4/22/2010 2:11 PM**
Modified By	
Date Modified	

ITS A01 ITS 5.5

3. Performance Requirements

Add proposed 5.5.9 generic program statement and SR 3.0.2 and SR 3.0.3 applicability statement A05

5.5.9.a, 5.5.9.b ~~5.5.9.b~~ A. The results of the in-place cold DOP and halogenated hydrocarbon tests at design flows on HEPA filters and charcoal adsorber banks shall show ≥ 99% DOP removal and ≥ 99% halogenated hydrocarbon removal. M13

Add proposed design flow values

5.5.9.c B. The results of laboratory carbon sample analysis from the Shield Building Ventilation System and the Auxiliary Building Special Ventilation System carbon shall show ≥ 97.5% radioactive methyl iodide removal when tested in accordance with ASTM D3803-89 at conditions of 30°C, 95% RH for the Shield Building Ventilation System and 30°C, 95% RH for the Auxiliary Building Special Ventilation System.

5.5.9.a, 5.5.9.b C. Fans shall operate within ± 10% of design flow when tested.

d. If the internal pressure of the reactor containment vessel exceeds 2 psi, the condition shall be corrected within 8 hours or the reactor shall be placed in a subcritical condition. See ITS 3.6.4

e. The reactor shall not be taken above the COLD SHUTDOWN condition unless the containment ambient temperature is > 40°F. See ITS 3.6.5

3.12 CONTROL ROOM POST-ACCIDENT RECIRCULATION SYSTEM

~~**APPLICABILITY**~~

~~Applies to the OPERABILITY of the Control Room Post-Accident Recirculation System.~~

~~**OBJECTIVE**~~

~~To specify OPERABILITY requirements for the Control Room Post-Accident Recirculation System.~~

SPECIFICATION

a. The reactor shall not be made critical unless both trains of the Control Room Post-Accident Recirculation System are OPERABLE.

b. Both trains of the Control Room Post-Accident Recirculation System, including filters, shall be OPERABLE or the reactor shall be shut down within 12 hours, except that when one of the two trains of the Control Room Post-Accident Recirculation System is made or found to be inoperable for any reason, reactor operation is permissible only during the succeeding 7 days. See ITS 3.3.7 and 3.7.10

c. During testing the system shall meet the following performance requirements:

Add proposed 5.5.9 generic program statement and SR 3.0.2 and SR 3.0.3 applicability statement A05

5.5.9.a, 5.5.9.b 1. The results of the in-place cold DOP and halogenated hydrocarbon tests at design flows on HEPA filter and charcoal adsorber banks shall show ≥ 99% DOP removal and ≥ 99% halogenated hydrocarbon removal. Add proposed design flow values M13

5.5.9.c 2. The results of the laboratory carbon sample analysis from the Control Room Post-Accident Recirculation System carbon shall show ≥ 95% radioactive methyl iodide removal when tested in accordance with ASTM D3803-89 at conditions of 30°C, and 95% RH.

5.5.9.a, 5.5.9.b 3. Fans shall operate within ±10% of design flow when tested.

4.4 CONTAINMENT TESTS

APPLICABILITY

Applies to integrity testing of the steel containment, shield building, auxiliary building special ventilation zone, and the associated systems including isolation valves.

OBJECTIVE

To verify that leakage from the containment system is maintained within allowable limits in accordance with 10 CFR Part 50, Appendix J.

SPECIFICATION

a. Integrated Leak Rate Tests (Type A)

Perform required visual examinations and leakage rate testing in accordance with the Containment Leakage Rate Testing Program. See ITS 3.6.1

As a one-time exception to the Containment Leakage Rate testing Program, the first Type A test following the Type A test performed in April 1994 shall be required no later than October 2009.

b. Local Leak Rate Tests (Type B and C)

Perform required air lock, penetration, and containment isolation valve leakage testing in accordance with the Containment Leakage Rate Testing Program. See ITS 3.6.1, 3.6.2, and 3.6.3

c. Shield Building Ventilation System

A06

5.5.9 1. At least once per operating cycle or once every 18 months, whichever occurs first, the following conditions shall be demonstrated:

5.5.9.d a. Pressure drop across the combined HEPA filters and charcoal adsorber banks is < 10 inches of water and the pressure drop across any HEPA filter bank is < 4 inches of water at the system design flow rate (±10%). L02 M13

Add proposed design flow values

b. Automatic initiation of each train of the system. See ITS 3.6.10

c. Deleted

2. Shield Building Ventilation System Filter Testing

5.5.9 a. The in-place DOP test for HEPA filters shall be performed (1) at least once per 18 months and (2) after each complete or partial replacement of a HEPA filter bank or after any maintenance on the system that could affect the HEPA bank bypass leakage.

5.5.9 b. The laboratory tests for activated carbon in the charcoal filters shall be performed (1) at least once per 18 months for filters in a standby status or after 720 hours of filter operation, and (2) following painting, fire, or chemical release in any ventilation zone communicating with the system.

5.5.9 c. Halogenated hydrocarbon testing shall be performed after each complete or partial replacement of a charcoal adsorber bank or after any maintenance on the system that could affect the charcoal adsorber bank bypass leakage.

d. Each train shall be operated at least 15 minutes every month. See ITS 3.6.10

5.5.9.e
5.5.9
5.5.9.e

3. An air distribution test on these HEPA filter banks will be performed after any maintenance or testing that could affect the air distribution within the systems. The test shall be performed at design flow rate (±10%). The results of the test shall show the air distribution is uniform within ±20%.[1]

Add proposed design flow values M13

4. Each train shall be determined to be operable at the time of its periodic test if it produces measurable indicated vacuum in the annulus within 2 minutes after initiation of a simulated safety injection signal and obtains equilibrium discharge conditions that demonstrate the Shield Building leakage is within acceptable limits. See ITS 3.6.8

(1) In WPS letter of August 25, 1976 to Mr. Al Schwencer (NRC) from Mr. E. W. James, we relayed test results for flow distribution for tests performed in accordance with ANSI N510-1975. This standard refers to flow distribution tests performed upstream of filter assemblies. Since the test results upstream of filters were inconclusive due to high degree of turbulence, tests for flow distribution were performed downstream of filter assemblies with acceptable results (within 20%). The safety evaluation attached to Amendment 12 references our letter of August 25, 1976 and acknowledges acceptance of the test results. A07

4.17 CONTROL ROOM POSTACCIDENT RECIRCULATION SYSTEM

APPLICABILITY

Applies to testing and surveillance requirements for the Control Room Postaccident Recirculation System in TS 3.12.

OBJECTIVE

To verify the performance capability of the Control Room Postaccident Recirculation System.

SPECIFICATION

A06

5.5.9 a. At least once per operating cycle or once every 18 months, whichever occurs first, the following conditions shall be demonstrated:

5.5.9.d 1. Pressure drop across the combined HEPA filters and charcoal adsorber banks is < 6 inches of water and the pressure drop across any HEPA bank is < 4 inches of water at the system design flow rate (± 10%). Add proposed design flow values L02 M13

2. Automatic initiation of the system on a high radiation signal and a safety injection signal. See ITS 3.7.10

5.5.9 b. 1. The in-place DOP test for HEPA filters shall be performed (1) at least once per 18 months and (2) after each complete or partial replacement of a HEPA filter bank or after any maintenance on the system that could affect the HEPA bank bypass leakage.

5.5.9 2. The laboratory tests for activated carbon in the charcoal filters shall be performed (1) at least once per 18 months for filters in a standby status or after 720 hours of filter operation, and (2) following painting, fire, or chemical release in any ventilation zone communicating with the system.

5.5.9 3. Halogenated hydrocarbon testing shall be performed after each complete or partial replacement of a charcoal adsorber bank or after any maintenance on the system that could affect the charcoal adsorber bank bypass leakage.

4. Each train shall be operated at least 10 hours each month. See ITS 3.7.10

found in ITS 5.5.13. This change is designated as more restrictive because it imposes additional programmatic requirements in the Technical Specifications.

M10 The CTS does not include a requirement for Battery Monitoring and Maintenance Program. The ITS includes a requirement for this program. This changes the CTS by adding the ITS 5.5.15, "Battery Monitoring and Maintenance Program."

The Battery Monitoring and Maintenance Program is included to provide for battery restoration and maintenance. The specific wording associated with this program may be found in ITS 5.5.15. This change is acceptable because it supports implementation of the requirements of the ITS. This change is designated as more restrictive because it imposes additional programmatic requirements in the Technical Specifications.

M11 The CTS does not have a program for Setpoint Control. ISTS 5.5.18 (ITS 5.5.16) requires a program to satisfy the regulatory requirement of 10 CFR 50.36(c)(1)(ii)(A) that Technical Specifications will include items in the category of limiting safety system settings (LSSS), which are settings for automatic protective devices related to those variables having significant safety functions. This changes the CTS by incorporating the requirements of ISTS 5.5.18 (ITS 5.5.16).

The purpose of the program is to establish, implement, and maintain instrument setpoint controls for automatic protective devices related to those variables having significant safety functions. This change is designated as more restrictive because it imposes new programmatic requirements in the Technical Specifications.

NSERT DOC M13

RELOCATED SPECIFICATIONS

None

REMOVED DETAIL CHANGES

LA01 *(Type 3 – Removing Procedural Details for Meeting TS Requirements or Reporting Requirements)* CTS 6.18.b.1 requires changes to the ODCM to be documented and records of reviews performed to be retained as required by the quality assurance program. CTS 6.18.b.2 requires changes to the ODCM to be effective after review and acceptance by the PORC. ITS 5.5.1.c.1 requires changes to the ODCM to be documented and records of reviews performed to be retained. ITS 5.5.1.c.2 requires changes to the ODCM to become effective after the approval of the plant manager. This changes the CTS by moving the record retention requirements reference and the PORC review and approval requirements to the Nuclear Facility Quality Assurance Program Description (NFQAPD). DOC M01 describes the addition of the plant manager approval.

The removal of these details, which are related to meeting Technical Specification requirements, from the Technical Specifications is acceptable because this type of information is not necessary to be included in the Technical

INSERT M13

CTS 3.6.c.3.A, 3.6.c.3.C, 3.8.a.9.b.1, 3.8.a.9.b.3, 3.12.c.1, 3.12.c.3, 4.4.c.1.a, 4.4.c.3, 4.4.d.1, 4.12.a.1, and 4.17.a.1 require certain Ventilation System filter tests to be performed at the system design flow rate. However, no specific value of the various Ventilation System design flow rates is provided. ITS 5.5.9.a, b, d, and e require performance of similar Ventilation System filter tests, and include the specific value of the design flow rate for each required Ventilation System. This changes the CTS by adding the specific design flow rate values into the filter test requirements of the ITS.

The various Ventilation System filter tests are performed at the system design flow rate. However, the specific values are currently controlled in plant procedures and the USAR. This change will add the values into the Technical Specifications, and thus any change will require NRC approval in lieu of changing it by the 10 CFR 50.59 process. Therefore, this change is considered acceptable. This change is designated as more restrictive because new Ventilation System design flow rate values are being included in the ITS that are not required in the CTS.

Specifications to provide adequate protection of public health and safety. ITS 5.5.1 still retains the requirement for changes to the ODCM to be documented and retained. Also, this change is acceptable because these types of procedural details will be adequately controlled in the NFQAPD. Any changes to the NFQAPD are made under 10 CFR 50.54(a), which ensure changes are properly evaluated. This change is designated as a less restrictive removal of detail change because procedural details for meeting Technical Specifications requirements are being removed from the Technical Specifications.

LA02 *(Type 4 - Removal of LCO, SR, or other TS requirement to the TRM, USAR, ODCM, NFQAPD, CLRT Program, IST Program, ISI Program, or Setpoint Control Program)* CTS 4.2.a and 4.2.a.1 provide requirements for the In-Service Inspection Program. The ITS does not include In-Service Inspection Program requirements. This changes the CTS by moving these requirements from the Technical Specifications to the In-Service Inspection (ISI) Program.

The removal of these requirements is acceptable because this type of information is not necessary to be included in the Technical Specifications to provide adequate protection of public health and safety. The Technical Specifications still retain requirements for the affected components to be OPERABLE. Also, this change is acceptable because these requirements will be adequately controlled by the ISI Program, which is required by 10 CFR 50.55a. Compliance with 10 CFR 50.55a is required by the Kewaunee Operating License. This change is designated as a less restrictive removal of requirement change because requirements are being removed from the Technical Specifications.

LESS RESTRICTIVE CHANGES

L01 *(Category 1 – Relaxation of LCO Requirements)* CTS 6.20.b states, in part, that the leakage rate acceptance criteria prior to unit startup for the Type A test is $< 0.75\ L_a$. ITS 5.5.14.d.1 states, in part, that the leakage rate acceptance criteria prior to unit startup for the Type A test is $\leq 0.75\ L_a$. This changes the CTS by allowing the leakage rate to be exactly equal to $0.75\ L_a$ in lieu of being $< 0.75\ L_a$.

The purpose of ITS 5.5.14.d.1 is to ensure that prior to a unit startup the overall containment leakage rate with a certain amount of margin, does not exceed the value assumed in the accident analysis. This change is acceptable because the acceptance criteria limit in ITS 5.5.14.d.1 (the $1.0\ L_a$ limit) continues to ensure the containment leakage is within the value assumed in the accident analysis. The 10CFR50 Appendix J Option B states that for Type A tests the leakage rate must not exceed the allowable leakage rate (L_a) with margin, as specified in the Technical Specifications. The ITS now provides a margin that includes allowing the limit to be exactly $0.75\ L_a$. This change is designated as less restrictive because the acceptance criteria applicable prior to a unit startup for the Type A leakage tests is now allowed to be exactly equal to $0.75\ L_a$ in lieu of being $< 0.75\ L_a$.

INSERT L02

Enclosure, Q&A to Attachment 1, Volume 16 (Chapter 5.0) 70 of 169

L02 *(Category 1 – Relaxation of LCO Requirements)* CTS 4.4.c.1.a provides the pressure drop test acceptance criteria for the Shield Building Ventilation System (SBVS) and the Auxiliary Building Special Ventilation (ASV) System. The acceptance criteria are a pressure drop across the combined HEPA filters and charcoal adsorber banks < 10 inches of water and a pressure drop across any HEPA filter bank < 4 inches of water. CTS 4.17.a.1 provides the pressure drop test acceptance criteria for the Control Room Post Accident Recirculation (CRPAR) System. The acceptance criteria are a pressure drop across the combined HEPA filters and charcoal adsorber banks < 6 inches of water and a pressure drop across any HEPA filter bank < 4 inches of water. ITS 5.5.9.d provides the pressure drop test acceptance criteria for all three systems, and requires the pressure drop across the combined prefilters, HEPA filters, and charcoal adsorber banks to be < 6.3 inches of water for the SBVS and the ASV System, and < 2.4 inches of water for the CRPAR System. This changes the CTS by reducing the acceptance criteria for the combined dP, including the prefilters as part of the combined dp test, and deleting the HEPA filter only dP criteria.

Performance testing demonstrating that dP is within prescribed limits assures that fans operate within ± 10% of design flow, and thus ensures that filters perform adequately to satisfy the accident analyses. That is, if the performances are as specified, the calculated doses would be less than the guidelines stated in 10CFR Part 100 for the accidents analyzed.

During the development of Design Basis Documents for these ventilation systems it was identified that the analytical basis for the CTS dP acceptance criteria could not be verified. KPS has recently performed calculations, based on a newly developed analytical basis. These calculations have determined that the current dP acceptance criteria are non-conservative. KPS has implemented, in procedures, these more restrictive acceptance criteria. This change to the CTS replace the non-conservative dp acceptance criteria with the current acceptance criteria from the recent calculation. This change is acceptable because it will incorporate newly calculated, and more conservative, dP acceptance criteria.

Combined dP testing across the prefilter, HEPA filter and charcoal adsorber banks, per the ISTS format, in lieu of CTS combined HEPA filter and charcoal adsorber bank and HEPA-only dP testing, will still adequately demonstrate that the filters are not clogged and capable of performing their design function.

The change related to the reduction of the combined dP limit is more restrictive, since it is reducing the limit and adding another component (prefilter) to the testing. However, the change related to removing the HEPA filter only dP limit is less restrictive. Therefore, this change is designated as less restrictive because the acceptance criteria applicable to the HEPA filter only dP test is being deleted.

Regulatory Positions C.5.c and C.5.d of

5.5 Programs and Manuals

5.5.11 Ventilation Filter Testing Program (VFTP)

9 safety related ~~ASTM D3803-1989 and AG-1, and using~~

DOC A05, 4.4.c.1.a, 4.12.a.1, 4.17.a.1

A program shall be established to implement the following required testing of Engineered Safety Feature (ESF) filter ventilation systems at the frequencies specified in [Regulatory Guide], and in accordance with [Regulatory Guide 1.52, Revision 2, ASME N510-1989, and AG-1].

1, and Stet INSERT 2 ANSI 1975, ~~as guidance~~ Stet ATSM D3803-1989,

3.6.c.3.A, 3.6.c.3.C, 3.8.a.9.b.1, 3.8.a.9.b.3, 3.12.c.1, 3.12.c.3

safety related listed below using ≤ 1.0 1 Stet

a. Demonstrate for each of the ESF systems 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 2, and ASME N510-1989] at the system flowrate specified below [± 10%].

ANSI 1975 ~~as guidance~~ design Stet

ESF Ventilation System	Flowrate
[ ]	[ ]

INSERT 3

Regulatory Position C.5.c of

Regulatory Position C.5.d of

3.6.c.3.A, 3.6.c.3.C, 3.8.a.9.b.1, 3.8.a.9.b.3, 3.12.c.1, 3.12.c.3

safety related listed below ≤ 1.0 Stet using 1

b. Demonstrate for each of the ESF systems 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 2, and ASME N510-1989] at the system flowrate specified below [± 10%].

ANSI 1975 ~~as guidance~~ design Stet

ESF Ventilation System	Flowrate
[ ]	[ ]

INSERT 4

3.6.c.3.B, 3.8.a.9.b.2, 3.12.c.2

safety related listed below and AG-1

c. Demonstrate for each of the ESF systems that a laboratory test of a sample of the charcoal adsorber, when obtained as described in [Regulatory Guide 1.52, Revision 2], 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.

of 95%

ESF Ventilation System	Penetration	RH	Face Velocity (fps)
[ ]	[See Reviewer's Note]	[See Reviewer's Note]	[See Reviewer's Note]

INSERT 5

---REVIEWER'S NOTE---
The use of any standard other than ASTM D3803-1989 to test the charcoal sample may result in an overestimation of the capability of the charcoal to adsorb radioiodine. As a result, the ability of the charcoal filters to perform in a manner consistent with the licensing basis for the facility is indeterminate.

6 11 14 1 14 11 1 10 1 14 11 3 10 1 14 11 1 14 14 15

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4.4.c.2.a, 4.4.d.1, 4.17.b.1 The test described in Specification 5.5.9.a shall be performed once per 18 months and after each complete or partial replacement of the high efficiency particulate air (HEPA) filter bank and any maintenance on the system that could affect the HEPA bank bypass leakage.

4.4.c.2.c, 4.4.d.1, 4.17.b.3 The test described in Specification 5.5.9.b shall be performed after each complete or partial replacement of a charcoal adsorber bank or maintenance on the system that could affect the charcoal adsorber bank bypass leakage.

4.4.c.2.b, 4.4.d.1, 4.17.b.2 The test described in Specification 5.5.9.c shall be performed once per 18 months for filters in a standby status or after 720 hours of filter operation, and following painting, fire, or chemical release in any ventilation zone communicating with the system.

4.4.c.1.a, 4.4.d.1, 4.17.a.1 The test described in Specification 5.5.9.d shall be performed once per 18 months.

4.4.c.3, 4.4.d.1 The test described in Specification 5.5.9.e shall be performed after any maintenance or testing that could affect the air distribution within the systems.

14

INSERT 3

Safety Related System	Flow Rate (cfm)
Shield Building Ventilation System (SBVS)	5700
Auxiliary Building Special Ventilation (ASV) System	9000
Control Room Post Accident Recirculation (CRPAR) System	2500

14

INSERT 4

Safety Related System	Flow Rate (cfm)
SBVS	5700
ASV System	9000
CRPAR System	2500

14 **INSERT 5**

Safety Related System	Penetration
SBVS	$\leq$ 2.5%
ASV System	$\leq$ 2.5%
CRPAR System	$\leq$ 5%

Enclosure, Q&A to Attachment 1, Volume 16 (Chapter 5.0) 74 of 169

5.5 Programs and Manuals

5.5.~~11~~ 9 Ventilation Filter Testing Program (continued) 6

ASTM D 3803-1989 is a more stringent testing standard because it does not differentiate between used and new charcoal, it has a longer equilibration period performed at a temperature of 30°C (86°F) and a relative humidity (RH) of 95% (or 70% RH with humidity control), and it has more stringent tolerances that improve repeatability of the test.

Allowable Penetration = [(100% - Methyl Iodide Efficiency * for Charcoal Credited in Licensee's Accident Analysis) / Safety Factor]

When ASTM D3803-1989 is used with 30°C (86°F) and 95% RH (or 70% RH with humidity control) is used, the staff will accept the following:

Safety factor ≥ 2 for systems with or without humidity control. 15

Humidity control can be provided by heaters or an NRC-approved analysis that demonstrates that the air entering the charcoal will be maintained less than or equal to 70 percent RH under worst-case design-basis conditions.

If the system has a face velocity greater than 110 percent of 0.203 m/s (40 ft/min), the face velocity should be specified.

*This value should be the efficiency that was incorporated in the licensee's accident analysis which was reviewed and approved by the staff in a safety evaluation.

4.4.c.1.a, 4.4.d.1, 4.12.a.1, 4.17.a.1

safety related | listed below | Stet | 11 | ~~12~~ | 1

d. Demonstrate for each of the ~~ESF~~ systems that the pressure drop across the combined HEPA filters, the prefilters, and the charcoal adsorbers is less than the value specified below when tested in accordance with [Regulatory Guide 1.52, Revision 2, and ASME N510-1989] at the system flowrate specified below [± 10%].

Stet | ANSI N510-1975 | ~~design~~ | ~~10~~ | 1

ESF Ventilation System	Delta P	Flowrate
[ ]	[ ]	[ ]

INSERT 6 | 14

[e. Demonstrate that the heaters for each of the ESF systems dissipate the value specified below [± 10%] when tested in accordance with [ASME N510-1989].

ESF Ventilation System	Wattage]
[ ]	[ ]

INSERT 7 | 14

DOC A05

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

Enclosure, Q&A to Attachment 1, Volume 16 (Chapter 5.0) 75 of 169

14

INSERT 6

Safety Related System	Combined Delta P (in. wc)	~~HEPA only Delta P (in. wc)~~	Flow Rate (cfm)
SBVS	< ~~10~~ 6.3	~~< 4~~	5700
ASV System	< ~~10~~ 6.3	~~< 4~~	9000
CRPAR System	< ~~6~~ 4	~~< 4~~	2500

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INSERT 7

Demonstrate for each of the safety related systems listed below that when tested at the system ~~design~~ specified below flowrate (± 10%) the air distribution is uniform within ± 20%.

Safety Related System	Flow Rate (cfm)
SBVS	5700
ASV System	9000

JUSTIFICATION FOR DEVIATIONS
ITS 5.5, PROGRAMS AND MANUALS

9. The Inservice Testing Program (ISTS 5.5.8) has been modified to state that the IST Program provides control for ASME Code Class 1, 2, and 3 "pumps and valves" in place of the current "components." 10 CFR 50.55a(f) provides the regulatory requirements for the IST Program. It specifies that ASME Code Class 1, 2, and 3 pumps and valves are the only components covered by an IST Program. 10 CFR 50.55a(g) provides regulatory requirements for an Inservice Inspection (ISI) Program. It specifies that ASME Code Class 1, 2, and 3 components are covered by the ISI Program, and that pumps and valves are covered by the IST Program in 10 CFR 50.55a(f). The ISTS does not include ISI Program requirements as these requirements have been relocated to a plant specific document. Therefore, the components to which the IST Program applies (i.e., pumps and valves) have been added for clarity. In addition, the statement "The program shall include the following:" has been deleted because not all of the statements that follow are really part of the program requirements. Furthermore, the terms weekly, semiannually, and every 9 months have been deleted since these terms are not used in the ASME OM Code.

Not used.

10. ~~ITS 5.5.9.a, b, and d include a requirement for the system nominal flowrate value to be specified. ITS 5.5.9.a, b, and d do not include the specific nominal flowrate. ITS 5.5.9.a, b, and d specify that the flowrate is the "system design flowrate." This is consistent with the CTS, since the CTS does not include specific values for each of the safety related ventilation systems. The CTS (CTS 3.6.c.3.C, 3.12.c.3, 4.4.c.1.a, 4.4.c.3, and 4.17.a.1) only includes the requirement that the tests be conducted at the system design flowrate (±10%).~~

11. ISTS 5.5.11 uses the term "Engineered Safety Feature (ESF)" to describe the ventilation systems tested as part of this Specification. The three ventilation systems covered in ITS 5.5.9 are the Shield Building Ventilation System (SBVS), Auxiliary Building Special Ventilation (ASV) System, and Control Room Post Accident Recirculation (CRPAR) System. The KPS CRPAR System is not an ESF. Therefore, the term has been changed to "safety related," since all three of the ventilations systems are safety related.

12. The Reviewer's Note to ISTS 5.5.9.c and the subsequent wording states alternate tube repair criteria that are currently permitted by the plant technical specifications should be provided in the ITS. ISTS 5.5.9.f (ITS 5.5.7.f), including the Reviewer's Note, states, in part, the tube repair methods currently permitted by plant technical specifications should be provided in the ITS. The bracketed allowance to provide steam generator tube repair criteria and methods are not included since the current KPS Steam Generator Program does not allow repair; only plugging is allowed.

13. Kewaunee Power Station has steam generators with Alloy 690 thermally treated tubing. Therefore the third option is maintained, consistent with the current Technical Specifications.

14. Changes are made to the ISTS which reflect the current licensing bases for KPS.

15. The Reviewer's Note contains information for the NRC reviewer to be keyed into what is needed to meet this requirement. This is not meant to be retained in the

Enclosure, Q&A to Attachment 1, Volume 16 (Chapter 5.0) 77 of 169

5.5 Programs and Manuals

5.5.11 Ventilation Filter Testing Program (VFTP)

9 safety related Regulatory Positions C.5.c and C.5.d of 6

DOC A05, 4.4.c.1.a, 4.12.a.1, 4.17.a.1

A program shall be established to implement the following required testing of Engineered Safety Feature (ESF) filter ventilation systems at the frequencies specified in [Regulatory Guide], and in accordance with [Regulatory Guide 1.52, Revision 2, ASME N510-1989, and AG-1]. 11 14 1

ASTM D3803-1989, INSERT 2 ANSI 1975, 14

3.6.c.3.A, 3.6.c.3.C, 3.8.a.9.b.1, 3.8.a.9.b.3, 3.12.c.1, 3.12.c.3

safety related listed below Regulatory Position C.5.c of 11

a. Demonstrate for each of the ESF systems 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 2, and ASME N510-1989] at the system flowrate specified below [± 10%]. 1

≤ 1.0 ANSI 1975

ESF Ventilation System	Flowrate
[ ]	[ ]

INSERT 3 14

safety related listed below ≤ 1.0 11

3.6.c.3.A, 3.6.c.3.C, 3.8.a.9.b.1, 3.8.a.9.b.3, 3.12.c.1, 3.12.c.3

b. Demonstrate for each of the ESF systems 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 2, and ASME N510-1989] at the system flowrate specified below [± 10%]. 3

Regulatory Position C.5.d of ANSI 1975

ESF Ventilation System	Flowrate
[ ]	[ ]

INSERT 4 14

safety related listed below 11

3.6.c.3.B, 3.8.a.9.b.2, 3.12.c.2

c. Demonstrate for each of the ESF systems that a laboratory test of a sample of the charcoal adsorber, when obtained as described in [Regulatory Guide 1.52, Revision 2], 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. 1

and AG-1 of 95% 14

ESF Ventilation System	Penetration	RH	Face Velocity (fps)
[ ]	[See Reviewer's Note]	[See Reviewer's Note]	[See Reviewer's Note]

INSERT 5 14

---REVIEWER'S NOTE---
The use of any standard other than ASTM D3803-1989 to test the charcoal sample may result in an overestimation of the capability of the charcoal to adsorb radioiodine. As a result, the ability of the charcoal filters to perform in a manner consistent with the licensing basis for the facility is indeterminate. 15

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INSERT 2

4.4.c.2.a, 4.4.d.1, 4.17.b.1 The test described in Specification 5.5.9.a shall be performed once per 18 months and after each complete or partial replacement of the high efficiency particulate air (HEPA) filter bank and any maintenance on the system that could affect the HEPA bank bypass leakage.

4.4.c.2.c, 4.4.d.1, 4.17.b.3 The test described in Specification 5.5.9.b shall be performed after each complete or partial replacement of a charcoal adsorber bank or maintenance on the system that could affect the charcoal adsorber bank bypass leakage.

4.4.c.2.b, 4.4.d.1, 4.17.b.2 The test described in Specification 5.5.9.c shall be performed once per 18 months for filters in a standby status or after 720 hours of filter operation, and following painting, fire, or chemical release in any ventilation zone communicating with the system.

4.4.c.1.a, 4.4.d.1, 4.17.a.1 The test described in Specification 5.5.9.d shall be performed once per 18 months.

4.4.c.3, 4.4.d.1 The test described in Specification 5.5.9.e shall be performed after any maintenance or testing that could affect the air distribution within the systems.

14

INSERT 3

Safety Related System	Flow Rate (cfm)
Shield Building Ventilation System (SBVS)	5700
Auxiliary Building Special Ventilation (ASV) System	9000
Control Room Post Accident Recirculation (CRPAR) System	2500

14

INSERT 4

Safety Related System	Flow Rate (cfm)
SBVS	5700
ASV System	9000
CRPAR System	2500

Enclosure, Q&A to Attachment 1, Volume 16 (Chapter 5.0) 79 of 169

5.5 Programs and Manuals

5.5.~~11~~ 9 Ventilation Filter Testing Program (continued) 6

~~ASTM D 3803-1989 is a more stringent testing standard because it does not differentiate between used and new charcoal, it has a longer equilibration period performed at a temperature of 30°C (86°F) and a relative humidity (RH) of 95% (or 70% RH with humidity control), and it has more stringent tolerances that improve repeatability of the test.~~

~~Allowable Penetration = [(100% - Methyl Iodide Efficiency * for Charcoal Credited in Licensee's Accident Analysis) / Safety Factor]~~

~~When ASTM D3803-1989 is used with 30°C (86°F) and 95% RH (or 70% RH with humidity control) is used, the staff will accept the following:~~

~~Safety factor ≥ 2 for systems with or without humidity control.~~ 15

~~Humidity control can be provided by heaters or an NRC-approved analysis that demonstrates that the air entering the charcoal will be maintained less than or equal to 70 percent RH under worst-case design-basis conditions.~~

~~If the system has a face velocity greater than 110 percent of 0.203 m/s (40 ft/min), the face velocity should be specified.~~

~~*This value should be the efficiency that was incorporated in the licensee's accident analysis which was reviewed and approved by the staff in a safety evaluation.~~

~~---~~

4.4.c.1.a, 4.4.d.1, 4.12.a.1, 4.17.a.1

d. Demonstrate for each of the ~~ESF~~ safety related systems listed below that the pressure drop across the combined HEPA filters, the prefilters, and the charcoal adsorbers is less than the value specified below when tested in accordance with ~~[Regulatory Guide 1.52, Revision 2, and~~ ~~ASME~~ ANSI N510-~~1989~~ 1975 at the system flowrate specified below ~~[~~± 10%~~]~~. 11 1

~~ESF Ventilation System~~	~~Delta P~~	~~Flowrate~~
~~[ ]~~	~~[ ]~~	~~[ ]~~

INSERT 6 14

~~[~~e. ~~Demonstrate that the heaters for each of the ESF systems dissipate the value specified below [± 10%] when tested in accordance with [ASME N510-1989].~~

~~ESF Ventilation System~~	~~Wattage]~~
~~[ ]~~	~~[ ]~~

INSERT 7 14

DOC A05

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

Enclosure, Q&A to Attachment 1, Volume 16 (Chapter 5.0) 80 of 169

14 **INSERT 6**

Safety Related System	Combined Delta P (in. wc)	Flow Rate (cfm)
SBVS	< 6.3	5700
ASV System	< 6.3	9000
CRPAR System	< 4	2500

14 **INSERT 7**

Demonstrate for each of the safety related systems listed below that when tested at the system flowrate specified below (± 10%) the air distribution is uniform within ± 20%.

Safety Related System	Flow Rate (cfm)
SBVS	5700
ASV System	9000

Licensee Response/NRC Response/NRC Question Closure

Id	**3361**
NRC Question Number	**VGC-009**
Select Application	**NRC Question Closure**
Response Date/Time	
Closure Statement	**This question is closed and no further information is required at this time to draft the Safety Evaluation. Review conducted by Harold Walker of SCVB.**
Response Statement	
Question Closure Date	**6/2/2010**
Attachment 1	
Attachment 2	
Notification	**NRC/LICENSEE Supervision**
Added By	**Victor Cusumano**
Date Added	**6/2/2010 6:34 AM**
Modified By	
Date Modified	

ITS NRC Questions

Id	**1901**
NRC Question Number	**VGC-010**
Category	**Technical**
ITS Section	**5.0**
ITS Number	**5.5**
DOC Number	
JFD Number	
JFD Bases Number	
Page Number (s)	**Vol 16, on page 90 of 167**
NRC Reviewer Supervisor	**Rob Elliott**
Technical Branch POC	**Add Name**
Conf Call Requested	**N**
NRC Question	**In Vol 16, on page 90 of 167 in TS 5.5.9 (several places) when discussing your proposed use of Reg Guide 1.52 you have replaced the words "in accordance with" with "using". What is the justification for this substitution, and how do you interpret the two differently in how they affect your commitment to and application of the subject document.**
Attach File 1	
Attach File 2	
Issue Date	**3/18/2010**
Added By	**Victor Cusumano**
Date Modified	
Modified By	
Date Added	**3/18/2010 9:43 AM**
Notification	**NRC/LICENSEE Supervision**

Licensee Response/NRC Response/NRC Question Closure

Id	**2831**
NRC Question Number	**VGC-010**
Select Application	**Licensee Response**
Response Date/Time	**4/22/2010 2:15 PM**
Closure Statement	
Response Statement	**Currently, Kewaunee Power Station (KPS) conducts ventilation filter tests (as applicable) in accordance with ASTM D3803-1989 and AG-1 and using the guidance of Regulatory Guide (RG) 1.52, Rev. 1, and ANSI N510-1975. However, KPS has reviewed the current licensing basis and will delete the term "using the guidance." The tests will be in accordance with the listed documents, as applicable (i.e., RG 1.52, Rev. 2 (note that the revision has changed as stated in the KPS response to VGC-009) and ANSI N510-1975). A draft markup regarding this change is attached to the KPS response to VGC-009. Note that the attached change includes changes due not only to this response, but also includes changes identified in the KPS responses to VGC-009 and VGC-011. This change will be reflected in the supplement to this section of the ITS conversion amendment. In addition, a clean draft markup of ITS 5.5.9, which shows how the ISTS Markup will look when the revision to the ITS submittal is made (i.e., the Rev. 1 version of the ISTS Markup), is also included and attached to the KPS response to VGC-009 to assist in understanding the changes.**
Question Closure Date	
Attachment 1	
Attachment 2	
Notification	**NRC/LICENSEE Supervision** **Victor Cusumano** **Robert Hanley** **Jerry Jones** **Bryan Kays** **Ray Schiele**
Added By	**Robert Hanley**
Date Added	**4/22/2010 2:15 PM**
Modified By	
Date Modified	

Licensee Response/NRC Response/NRC Question Closure

Id	**3371**
NRC Question Number	**VGC-010**
Select Application	**NRC Question Closure**
Response Date/Time	
Closure Statement	**This question is closed and no further information is required at this time to draft the Safety Evaluation. Review conducted by Harold Walker of SCVB.**
Response Statement	
Question Closure Date	**6/2/2010**
Attachment 1	
Attachment 2	
Notification	**NRC/LICENSEE Supervision**
Added By	**Victor Cusumano**
Date Added	**6/2/2010 6:35 AM**
Modified By	
Date Modified	

ITS NRC Questions

Id	**1911**
NRC Question Number	**VGC-011**
Category	**Technical**
ITS Section	**5.0**
ITS Number	**5.5**
DOC Number	
JFD Number	
JFD Bases Number	
Page Number (s)	**In Vol 16, on page 90 of 167 in TS 5.5.9 (several places) when discussing your proposed use of Reg G**
NRC Reviewer Supervisor	**Rob Elliott**
Technical Branch POC	**Add Name**
Conf Call Requested	**N**
NRC Question	**In Vol 16, on page 90 of 167 in TS 5.5.9 (and several other places throughout the submittal) you have deleted the reference to plant-specific flowrates. I understand that work is in process for the recalculation of these values at Kewaunee. Please provide a justification for their exclusion, or a plan for their inclusion.**
Attach File 1	
Attach File 2	
Issue Date	**3/18/2010**
Added By	**Victor Cusumano**
Date Modified	
Modified By	
Date Added	**3/18/2010 9:44 AM**
Notification	**NRC/LICENSEE Supervision**

Licensee Response/NRC Response/NRC Question Closure

Id	**2841**
NRC Question Number	**VGC-011**
Select Application	**Licensee Response**
Response Date/Time	**4/22/2010 2:15 PM**
Closure Statement	
Response Statement	**The current Kewaunee Power Station (KPS) licensing basis is as the proposed ISTS markup shows. That is, the specific flow rates are not identified in the CTS; only a statement that the flow rates are the design flows. However, KPS has re-reviewed the issue and will include the current design flows in the ITS. Furthermore, due to a recent calculation that recalculated the design flows, the dp acceptance criteria for ITS 5.5.9.d has also been affected. Therefore, the dp acceptance criteria has also been changed and is included as part of this change. A draft markup regarding this change is attached to the KPS Response to VGC-009. Note that the attached change includes changes due not only to this response, but also includes changes identified in the KPS responses to VGC-009 and VGC-010. This change will be reflected in the supplement to this section of the ITS conversion amendment. In addition, a clean draft markup of ITS 5.5.9, which shows how the ISTS Markup will look when the revision to the ITS submittal is made (i.e., the Rev. 1 version of the ISTS Markup), is also included and attached to the KPS response to VGC-009 to assist in understanding the changes. Furthermore, the calculations that support the design flows and the dp acceptance criteria for the three affected systems (Shield Building Ventilation System, Auxiliary Building Special Ventilation System, and Control Room Post Accident Recirculation System) are attached to this response.**
Question Closure Date	
Attachment 1	**Calcs for VGC-011 Response.pdf** (5MB)
Attachment 2	
Notification	**NRC/LICENSEE Supervision** **Victor Cusumano** **Jerry Jones** **Bryan Kays** **Ray Schiele**
Added By	**Robert Hanley**
Date Added	**4/22/2010 2:21 PM**
Modified By	
Date	

Modified

ZACHRY NUCLEAR ENGINEERING, INC.
CALCULATION TITLE SHEET

CLIENT: **Dominion Energy Kewaunee, Inc**

PROJECT: **HVAC Calculations**

CALCULATION TITLE: **Shield Building Ventilation Pressure Loss**

KPS CALCULATION NO.: **12123 Revision 1**

PPC CALCULATION NO.: **09-059 Revision A**

JOB NO.: **051470**

COMPUTER CODE & VERSION (if applicable): PROTO-HVAC v. 1.01

ZACHRY NUCLEAR ENGINEERING, INC. PROPERTY CODE (if applicable): 000551

QA CLASSIFICATION: Safety Related ☒ **Yes** ☐ **No**

REV	TOTAL NO. OF PAGES	ORIGINATOR/DATE	VERIFIER/DATE	APPROVAL/DATE
1	371	Matthew Andel 10/6/09 Matthew Andel	10/6/09 Michael Norwood	10/7/09 Christopher D'Angelo

** DO NOT REVISE THIS CALCULATION **

**OBTAIN ORIGINAL FROM CLIENT **

Page i of iv

Form No.: P030101 sheet 1 of 1 Rev.: 0-01 Date: 5/09 Ref.: P 3-1

Enclosure, Q&A to Attachment 1, Volume 16 (Chapter 5.0) 89 of 169

ZACHRY NUCLEAR ENGINEERING, INC	CALC NO. 12123	REV 1	PAGE ii OF iv
GROTON, CONNECTICUT	ORIGINATOR Matthew Andel		DATE 10/5/09
	VERIFIED BY Michael Norwood		JOB NO. 051470
CLIENT Dominion Energy Kewaunee, Inc	PROJECT HVAC Calculations		
TITLE Shield Building Ventilation Pressure Loss			

Revision History

Revision	Revision Description
0	Original Issue
1	Revised to determine maximum allowed DP for HEPA and Charcoal filters at tech spec flow rates as well as at recommended flow rates as determined by calculation C11858

Enclosure, Q&A to Attachment 1, Volume 16 (Chapter 5.0) 90 of 169

ZACHRY NUCLEAR ENGINEERING, INC GROTON, CONNECTICUT	CALC NO. 12123	REV 1	PAGE iii OF iv
	ORIGINATOR Matthew Andel		DATE 10/5/09
	VERIFIED BY Michael Norwood		JOB NO. 051470
CLIENT Dominion Energy Kewaunee, Inc	PROJECT HVAC Calculations		
TITLE Shield Building Ventilation Pressure Loss			

CALCULATION VERIFICATION FORM

1. VERIFICATION METHOD:

	Yes	N/A
A. Approach Checked	☒	
B. Logic Checked	☒	
C. Arithmetic Checked	☒*	☐
D. Alternate Method (Provide documentation)	☐*	☒
E. Other	☐*	☒

*Describe below.

2. EXTENT OF VERIFICATION:

Complete calculation (including attachments /appendices) has been reviewed to determine impact of revision on un-revised areas.

A. IDV of Complete calculation (including attachments/appendices).	☒
B. IDV of revised areas of Calculation only.	☐
C. Other (describe below):	☐

3. DOCUMENTATION OF VERIFICATION

A. IDV documentation as attachment with Calc	☒	B. IDV documentation forwarded to QA	☐	C. IDV documentation is this form and any continuation pages only.	☐

Errors Detected
See Attachment J

Error Resolution
See Attachment J

*Verification Method:

Verified that Inputs are correct and correctly used, outputs are reasonable, and calculations of SCFM and sums of pressure drops are correct. Verified that PROTO-HVAC cases are aligned correctly.

Other Comments

Extra References Used

(Attach extra sheets if needed (Use Form P030114))
THE APPROACH, LOGIC, AND METHODOLOGY OF THE CALCULATION IS ACCEPTABLE. THE **GUIDELINES DEFINED IN PARA. 7.5.4** (AS APPLICABLE) OF P 3-1 HAVE BEEN MET. THE OVERALL CALCULATION IS FOUND TO BE VALID AND CONCLUSIONS TO BE CORRECT AND REASONABLE:

IDV Signature: [signature] Printed Name: Michael Norwood Date: 10/6/09

Form No.: P030103 sheet 1 of 1 Rev.: 0-01 Date: 5/09 Ref.: P 3-1

ZACHRY NUCLEAR ENGINEERING, INC GROTON, CONNECTICUT	CALC NO. 12123	REV 1	PAGE iv OF iv
	ORIGINATOR Matthew Andel		DATE 10/5/09
	VERIFIED BY Michael Norwood		JOB NO. 051470
CLIENT Dominion Energy Kewaunee, Inc	PROJECT HVAC Calculations		
TITLE Shield Building Ventilation Pressure Loss			

TABLE OF CONTENTS

	LIST OF ATTACHMENTS	
Attachment	**Subject Matter**	**Total Pages**
A	Calculation 12123, Revision 1 – PROTO-HVAC Model Inputs	138
B	Calculation 12123, Revision 1 – Output Reports for Benchmark	39
C	Calculation 12123, Revision 1 – Output Reports for Vendor Supplied Pressure Drops	39
D	Calculation 12123, Revision 1 – Output Reports for Design Flow Rate -10%	39
E	Calculation 12123, Revision 1 – Work Order Data Referenced in Calculation	67
F	Calculation 12123, Revision 1 – E-mail “RE: RAS for SBV system”	2
G	Calculation 12123, Revision 1 – Excerpts from HVAC Systems Duct Design	2
H	Calculation 12123, Revision 1 – Filter Component Information from PO#K300	8
I	Calculation 12123, Revision 1 – Visio Schematic of Model	2
J	Calculation 12123, Revision 1 – IDV Comment and Resolution Form	2
K	Calculation 12123, Revision 1 – Client Comments for Revision 1	13

Total number of pages in Attachments 351

Complete Calculation (total number of pages) 371

Enclosure, Q&A to Attachment 1, Volume 16 (Chapter 5.0) 92 of 169

ZACHRY NUCLEAR ENGINEERING, INC GROTON, CONNECTICUT	CALC NO. 12123	REV 1	PAGE 1 OF 16
	ORIGINATOR Matthew Andel		DATE 10/5/09
	VERIFIED BY Michael Norwood		JOB NO. 051470
CLIENT Dominion Energy Kewaunee, Inc	PROJECT HVAC Calculations		
TITLE Shield Building Ventilation Pressure Loss			

1.0 PURPOSE

The purpose of this calculation is to determine the recommended system flow rate for the Shield Building Ventilation (SBV) system and to compare the filter component pressure drops at this flow rate to the technical specification filter component pressure drops.

2.0 BACKGROUND

Currently there is conflicting information regarding the proper design flow rate of the SBV system. Reference 5.1 states that the SBV System Design Flow rate is 5,000 SCFM. Reference 5.2 states that the SBV System flow rate is 6,000 CFM ±10%. The Reference 5.33 and 5.34 SBV filter test procedures state that the SBV fan flow during SBV filter testing should be between 4,500 and 6,600 CFM. The technical specifications (tech spec) state that the allowable SBV system flow rate is the system design flow rate ±10%. The maximum permissible value of 6,600 CFM given in the test procedures is higher than the Reference 5.1 design flow rate of 5,000 CFM +10% (5,500 CFM). Further, the Reference 5.24 through 5.27 test data show that the actual SBV flow rates are around 5,700 SCFM, which is also above 5,500 CFM. From this conflicting information, the recommended system design flow rate needs to be determined. A PROTO-HVAC model of the SBV system will be constructed and used to determine the required system design flow rate. After the correct SBV design flow rate is determined, the pressure drops across the filter and certain filter components at the design flow rate and the design flow rate -10% (tech spec minimum permissible value) will be compared to the current tech spec pressure drops.

3.0 INPUTS AND ASSUMPTIONS

3.1 DESIGN INPUTS

3.1.1 Duct physical information, such as lengths, number and type of fittings, and damper information, was taken from References 5.1 through 5.8 and Reference 5.21.

3.1.2 Fan curve data was provided by Reference 5.9.

3.1.3 Test data filter pressure drop and flow information for all filter components was provided by References 5.24 through 5.27. An uncertainty analysis was not performed for this calculation because test data uncertainty information was not available.

3.1.4 Vendor supplied pressure drop values for clean filter conditions for the electric heating coil, prefilter, and charcoal filter were provided by Reference 5.19. Reference 5.19 includes components purchased for the filter assemblies in this calculation. Reference 5.20 confirms that the data pages in Attachment H are from Reference 5.19.

Enclosure, Q&A to Attachment 1, Volume 16 (Chapter 5.0) 93 of 169

<table>
<tr><td rowspan="3">ZACHRY NUCLEAR ENGINEERING, INC

GROTON, CONNECTICUT</td><td>CALC NO. 12123</td><td>REV 1</td><td>PAGE 2 OF 16</td></tr>
<tr><td colspan="2">ORIGINATOR Matthew Andel</td><td>DATE 10/5/09</td></tr>
<tr><td colspan="2">VERIFIED BY Michael Norwood</td><td>JOB NO. 051470</td></tr>
<tr><td>CLIENT Dominion Energy Kewaunee, Inc</td><td colspan="3">PROJECT HVAC Calculations</td></tr>
<tr><td colspan="4">TITLE Shield Building Ventilation Pressure Loss</td></tr>
</table>

3.1.5 The acceptable airflow range for the SBV charcoal filters is 4,510 SCFM – 6,600 SCFM per Reference 5.23.

3.1.6 Where duct sections contained more than 2 different angled bends, subsequent bends were input as Misc. K fixed resistances, as calculated per Reference 5.28.

3.2 ASSUMPTIONS

3.2.1 For all analyses in this calculation, it is assumed that the SBV system is operating with the modulating dampers positioned to maintain an annulus pressure of -0.6" WC based on Reference 5.10, section 1.4.

3.2.2 It is assumed that dampers CD34124 and CD34127 in the recirculation lines are positioned at 5/8 open (33.75° from centerline in PROTO-HVAC model) and dampers CD34125 and CD34128 in the exhaust lines are positioned at 3/8 open (56.25° from centerline in PROTO-HVAC model) when these dampers are in service. The SBV Monthly test data in References 5.11 through 5.17 all list the dampers positioned thusly. All other dampers are either fully opened or fully closed based on the train being run.

3.2.3 It is assumed that atmospheric pressure at Kewaunee Power Station is 14.375 psia based on the analysis in Reference 5.18.

3.2.4 The clean pressure drop across the moisture separator is assumed to be 0.09" WG at 5,776 SCFM (.067" WG at 5,000 SCFM) because this is the lowest value for this component from the Reference 5.24 through 5.27 test data. This is a reasonable clean DP because it is considerably less than the value of 0.5" WG given in Reference 5.32 for when the moisture separator should be changed due to a dirty filter.

3.2.5 For all analyses, air conditions of 70°F and 50% relative humidity were assumed, which are typical conditions for HVAC applications.

3.2.6 Reference 5.1 shows four backdraft dampers downstream of fans 1A and 1B without tags. For the PROTO-HVAC model, these dampers were labeled as "BD" followed by the number of the duct in which they are located. The backdraft damper in duct 17.1 is given the number 171 to avoid complications in using a decimal point in the label.

3.2.7 Reference 5.8 shows dampers without tags just upstream of the duct outlets. For the PROTO-HVAC model, these dampers were labeled as "Damper" followed by the number of the duct in which they are located.

3.2.8 It is assumed that all filter components, with the exception of the heater and charcoal filter, become clogged at the same rate. This is conservative because if only one filter component

ZACHRY NUCLEAR ENGINEERING, INC	CALC NO. 12123	REV 1	PAGE 3 OF 16
GROTON, CONNECTICUT	ORIGINATOR Matthew Andel		DATE 10/5/09
	VERIFIED BY Michael Norwood		JOB NO. 051470
CLIENT Dominion Energy Kewaunee, Inc	PROJECT HVAC Calculations		
TITLE Shield Building Ventilation Pressure Loss			

became clogged rather than all becoming clogged, the reported pressure drop for the clogged filter would be higher than what is reported when the clogging is distributed among all components.

3.2.9 The maximum combined filter pressure drop permissible across the charcoal and HEPA filter banks is assumed to be 10 in WG and the maximum permissible pressure drop across a HEPA filter bank is 4 in WG, per Reference 5.29.

3.2.10 The Reference 5.26 test data does not contain a DP for the moisture separator (demister), so the pressure drop for this component was assumed the same as that given in the Reference 5.24 data.

3.2.11 It is assumed that the flow resistance of the heaters will not increase above the value given in Reference 5.19. The heaters are heating coils and not filters and are thus not likely to become clogged with debris the way filters become clogged. Thus, for all analyses, the Reference 5.19 pressure drop and flow values, or the equivalent resistance at a different flow rate, were used for the heater.

3.2.12 It is assumed that the pressure drop across the charcoal filters will not increase beyond the values given in the Reference 5.24 through 5.27 test data because the charcoal filters do not filter particulate matter.

3.2.13 The pressure drop across the HEPA filters for vendor specified clean conditions is assumed to be 0.789" WG since the Reference 5.19 data did not specify a pressure drop for the HEPA filters. This value was obtained as follows: The total filter pressure drop for clean conditions through the filters is 3$\pm$0.3in WG per Reference 5.20, which means the lowest pressure drop can be 2.7" WG. This value will be used to determine the HEPA pressure drop because the minimum possible DP will yield the highest flow rate, and for case run in section 6.2 where this value is used, the objective is to maximize the flow rate. The sum of the pressure drops across the filter components, excluding the HEPA filters is 1.122 in WG per Reference 5.19 and Assumptions 3.2.4 and 3.2.11. The pressure drop across the HEPA filters is calculated as the difference between the total pressure drop and the non-HEPA pressure drop, 2.7" WG -1.122" WG = 1.578" WG. The pressure drop for each HEPA filter bank is half this value, 0.789" WG.

3.2.14 The maximum SBV system flow rate is assumed to be the design flow rate +10% and the minimum is assumed to be the design flow rate -10%, per Reference 5.29.

3.2.15 All analysis was done for one train operation because filter testing is done one train at a time per References 5.33 and 5.34 and all test data is thus for one train operation. Flow rate and pressure drop values are specified on a per train basis.

3.2.16 The material for all ducts except duct #1 and 7 was assumed to be "Galvanized Sheet Duct (12 joints/100 ft)" from the PROTO-HVAC library. The material for duct #1 and 7 is "Spiral

ZACHRY NUCLEAR ENGINEERING, INC GROTON, CONNECTICUT	CALC NO. 12123	REV 1	PAGE 4 OF 16
	ORIGINATOR Matthew Andel		DATE 10/5/09
	VERIFIED BY Michael Norwood		JOB NO. 051470
CLIENT Dominion Energy Kewaunee, Inc	PROJECT HVAC Calculations		
TITLE Shield Building Ventilation Pressure Loss			

Galvanized Duct (12 joints/100 ft)" from the PROTO-HVAC library per Reference 5.7. It was assumed that this material applied to the entire duct section, not just the section shown on the Referenced drawing. This reference also indicates that several other duct sections are constructed of spiral galvanized duct. However, during the benchmarking process, the roughness of these ducts was changed from galvanized sheet duct to spiral galvanized duct, and this change had a negligible impact on the calculated flow rates; the flow rates were reduced very slightly. Since the calculated flows were already below the test flows, the galvanized sheet duct was used to better match the test flow rates.

3.2.17 Flow rate values in Reference 5.19 were assumed to be in SCFM, as this is typical for fan curve flow rates.

3.2.18 The location of the heaters in the filter assembly is assumed to be after the 2nd bank of HEPA filters. The arrangement of the filter components in the flow path is inconsequential since the components are all in series and total pressure drop is simply the sum of component pressure drops.

4.0 METHODOLOGY

This calculation has been developed using PROTO-HVAC Version 1.01. The PROTO-HVAC software was developed and validated in accordance with Zachry's Nuclear Software Quality Assurance Program (SQAP), Reference 5.22. This program meets the requirements of 10CFR50 Appendix B, 10CFR21, and ANSI NQA-1, and was developed according to the guidelines and standards contained in ANSI/IEEE Standard 730/1984 and ANSI NQA-2b-1991.

The creation of the Shield Building Ventilation System model database consisted of the following steps:

1. Define the system from a schematic as a network of connecting node points.

2. Gather detailed data including duct lengths, fitting and component information for the ducting and components between each node point.

3. Enter this information into the appropriate field within PROTO-HVAC. Once this system data has been entered into the database, system operation can be evaluated for the desired operating conditions.

Three case files were created to complete the analyses in the calculation. File SBV-BENCHMARK.DBD was used for the analysis in section 6.1 to compare the PROTO-HVAC results to test data. After the model was benchmarked, this case was used to determine the recommended system design flow rate. File SBV-VENDCLEAN.DBD was used in section 6.2

to determine system flow rates under vendor-specified clean filter pressure drops and to determine whether these flow rates were considerably higher than the benchmark flow rates in order to determine the maximum anticipated system flow rate. File SBV-MINFLOW.DBD was used in section 6.4 to determine the filter component pressure drops that would yield the minimum flow rate of the recommended design flow rate -10%.

Fan performance is modeled with the fan curve on page 135 of Attachment A. On the fan curve, several pressure data points for flow values lower than 4,500 SCFM were artificially added to the curve to create a fan curve that had a continuously decreasing discharge pressure with increasing flow. This type of fan curve is required for PROTO-HVAC to converge successfully. The actual fan curve does not have continuously decreasing discharge pressure with increasing flow for flow rates below approximately 4,500 SCFM, so below this value the curve was modified to create a constantly decreasing discharge pressure. For flow rates above 4,500 SCFM, the fan curve in the PROTO-HVAC model is accurate. Since in the model the fan is operating on its curve at a value above 4,500 SCFM, when the model converges the fan operating point will be on the accurate portion of the fan curve and model accuracy will not be affected. If the model is used in the future for flow rates less than 4,500 SCFM, the fan curve will have to be changed to obtain accurate results.

Once the model was created, it was benchmarked against the Reference 5.24 through 5.27 test data. Model Filter component DPs were set to match the filter DPs given in the test data at the flow rates given in the test data. The model was run to obtain a calculated system flow rate and a comparison was made between the calculated flow rates and the test flow rates. With the model adequately benchmarked, the calculated flows and test flows were used to determine the proper design flow rate for the system. Once the design flow rate was determined, the component filter pressure drops that yielded the minimum permissible system flow of the design value -10% were determined to compare these values to the tech. spec. component filter pressure drop values.

PROTO-HVAC calculates flow in ACFM, so calculated flows were corrected to SCFM as follows:

$$Q_s = Q_f \times \frac{\rho_f}{\rho_s} \qquad \text{(equation 1)}$$

Where,

$Q_f \equiv$ actual volume flow rate (ACFM)

$Q_s \equiv$ standard volume flow rate (SCFM)

$\rho_s \equiv$ air density at standard conditions, 0.075 lb_m/ft^3 (Reference 5.30)

$\rho_f \equiv$ air density at the applicable duct section (lb_m/ft^3)

Enclosure, Q&A to Attachment 1, Volume 16 (Chapter 5.0) 97 of 169

ZACHRY NUCLEAR ENGINEERING, INC	CALC NO. 12123	REV 1	PAGE 6 OF 16
GROTON, CONNECTICUT	ORIGINATOR Matthew Andel		DATE 10/5/09
	VERIFIED BY Michael Norwood		JOB NO. 051470
CLIENT Dominion Energy Kewaunee, Inc	PROJECT HVAC Calculations		
TITLE Shield Building Ventilation Pressure Loss			

5.0 REFERENCES

5.1 Kewaunee Power Station Drawing M-602, "Flow Diagram Reactor & Shield Bldg Ventilation", Revision BD

5.2 Calculation CN-CRA-00-2, "Kewaunee – LOCA Doses with Increased Control Room Unfiltered Inleakage", Revision 3

5.3 Kewaunee Power Station Drawing M-627, "Ventilation – Aux Bldg Elevation 657'-6" ", Revision AK

5.4 Kewaunee Power Station Drawing M-628, "Ventilation – Aux Bldg Elevation 642' – 3" ", Revision AH

5.5 Kewaunee Power Station Drawing M-637, "Ventilation Sections & Details", Revision X

5.6 Kewaunee Power Station Drawing M-638, "Ventilation Sections & Details", Revision W

5.7 Kewaunee Power Station Drawing M-652, "Ventilation Shield Building", Revision H

5.8 Kewaunee Power Station Drawing M-653, "Ventilation Shield Building", Revision F

5.9 Kewaunee Power Station Drawing XK-362-6, "Performance Curve For Shield Bldg Vent Recirc1A&1B", Revision 0

5.10 KNPP System Description KW-MANUAL-000-SD-24, "Shield Building Ventilation System (SBV)", Revision 2.

5.11 KW100413455, "SBV Train A Monthly Test" dated January 27, 2009 (see Attachment E)

5.12 KW100419813, "SBV Train A Monthly Test, dated February 24, 2009 (see Attachment E)

5.13 KW100440529, "SBV Train A Operability Test", dated April 23, 2009 (see Attachment E)

5.14 KW100406423, "SBV Train B Monthly Test", dated January 6, 2009 (see Attachment E)

5.15 KW100414763, "SBV Train B Monthly Test", dated February 3, 2009 (see Attachment E)

5.16 KW100421209, "SBV Train B Monthly Test", dated March 3, 2009 (see Attachment E)

5.17 KW100429722, "SBV Train B Monthly Test", dated April 3, 2009 (see Attachment E)

ZACHRY NUCLEAR ENGINEERING, INC GROTON, CONNECTICUT	CALC NO. 12123	REV 1	PAGE 7 OF 16
	ORIGINATOR Matthew Andel		DATE 10/5/09
	VERIFIED BY Michael Norwood		JOB NO. 051470
CLIENT Dominion Energy Kewaunee, Inc	PROJECT HVAC Calculations		
TITLE Shield Building Ventilation Pressure Loss			

5.18 Calculation C10021, Revision 1, “Method for Determining Diesel Generator Damper Operating Times After Loss of Air-Start Compressors”

5.19 Purchase order PO#K300 (see Attachment H)

5.20 E-mail from Jennifer Mueller to Matthew Fallacara, “RE: Fw: Charcoal Filters” dated 12/22/08. (see Attachment H)

5.21 Kewaunee Power Station Drawing XK-300-2, “Shield Building Vent Filter Assem – 1A&1B Kewaunee Nuclear Plant Wisconsin Public Service Corp”, Revision G

5.22 Proto-Power Corporation SQAP-93948, “Software Quality Assurance Plan (SQAP)”, Revision H

5.23 Calculation C11858, “Allowable Design Airflow Rates Through Charcoal Filters”, Revision 0

5.24 Work Order KW100294113, “PM24-545: Charcoal and HEPA Filter Testing”, dated 4/21/09 (see Attachment E)

5.25 Work Order 100272062, “PM24-546: Charcoal & HEPA Filter Testing”, dated 4/16/09 (see Attachment E)

5.26 Work Order 07-5404, dated 10/26/07 (see Attachment E)

5.27 Work Order 07-5405, dated 10/15/07 (see Attachment E)

5.28 HVAC Systems Duct Design, Sheet Metal and Air Conditioning Contractors’ National Association, Inc., 1981 Edition (see Attachment G)

5.29 Technical Specifications for Kewaunee Power Station, Amendment 206, dated 6/01/2009

5.30 Proto-Power Document UD-93948-03, “User Documentation (UD) for Ventilation System Thermal Hydraulic Modeling Software - PROTO-HVAC”

5.31 E-mail from Brian O’Connell to Matthew Andel, “RE: RAS for SBV system”, dated 8/17/2009 (see Attachment F)

5.32 Vendor Technical Manual KW-VTM-000-FARR-0001 (XK-300-53), Revision 4

5.33 Procedure SP-24-122A, “Shield Building Vent (SBV) Train A Filter Testing”, Revision 5

5.34 Procedure SP-24-122B, “Shield Building Vent (SBV) Train B Filter Testing”, Revision 5

Enclosure, Q&A to Attachment 1, Volume 16 (Chapter 5.0) 99 of 169

ZACHRY NUCLEAR ENGINEERING, INC	CALC NO. 12123	REV 1	PAGE 8 OF 16
GROTON, CONNECTICUT	ORIGINATOR Matthew Andel		DATE 10/5/09
	VERIFIED BY Michael Norwood		JOB NO. 051470
CLIENT Dominion Energy Kewaunee, Inc	PROJECT HVAC Calculations		
TITLE Shield Building Ventilation Pressure Loss			

5.35 Zachry Nuclear Engineering Quality Assurance Manual, Revision 18

5.36 Kewaunee Power Station Drawing XK-362-4, "Axivane Fan Model 21 1/4 – 17 1/2 3450 2 Stage With Accessories", Revision A.

6.0 CALCULATIONS AND RESULTS

6.1 BENCHMARK COMPARISON

The Reference 5.24 through 5.27 test data was used to benchmark the PROTO-HVAC model to measured flow and pressure drop information. Benchmarking was done for each train, A and B. Benchmarking was done by setting the filter component pressure drop and corresponding flow rate in the model to match the test data (see Table 2 and Table 4 for measured flow rates), and then running the model and comparing the calculated fan flow rate to the measured fan flow rate. The DP and flow values for each train were averaged together, and the average values were used in the PROTO-HVAC model. A verification was done to compare the equivalent component DPs at the average flow rates to the average DP values in Table 1 and Table 2 and this showed that the error introduced in averaging these values was less than the amount of significant figures reported in the tables. For Train A, the pressure drop test data for the filter components is listed in Table 1 and the benchmarking results are in Table 2. For Train B, the pressure drop test data is listed in Table 3 and the benchmarking results are in Table 4. The model file "SBV-BENCHMARK.DBD" was used for this analysis, and pertinent output reports are included in Attachment B.

Table 1 – Test Data For Train A Filter Component Pressure Drop

Filter Component	4/21/09 DP (in WG)	10/26/07 DP (in WG)	Avg DP (in WG)
Moisture Separator (Demister)	0.09	0.09[1]	0.09
Pre-Filter	0.13	0.15	0.14
HEPA Filter 1	0.9	1.0	0.95
Charcoal Bank	0.9	0.9	0.9
HEPA Filter 2	0.9	0.9	0.9
Heater	0.1@5000 SCFM[2]	0.1@5000 SCFM[2]	0.1@5000 SCFM[2]

1. See Assumption 3.2.10
2. See Assumption 3.2.11

Table 2: Benchmark Results for Train A

Measured Flow 4/21/09 (SCFM)	Measured Flow 10/26/07 (SCFM)	Average Measured Flow (SCFM)	Calc. Flow (ACFM)	Calc. Flow (SCFM)	% Error
5776	5694	5735	5,891	5,624	-1.94

Enclosure, Q&A to Attachment 1, Volume 16 (Chapter 5.0) 100 of 169

ZACHRY NUCLEAR ENGINEERING, INC GROTON, CONNECTICUT	CALC NO. 12123	REV 1	PAGE 9 OF 16
	ORIGINATOR Matthew Andel		DATE 10/5/09
	VERIFIED BY Michael Norwood		JOB NO. 051470
CLIENT Dominion Energy Kewaunee, Inc	PROJECT HVAC Calculations		
TITLE Shield Building Ventilation Pressure Loss			

Table 3 - Test Data For Train B Filter Component Pressure Drop

Filter Component	4/16/09 DP (in WG)	10/15/07 DP (in WG)	Avg DP (in WG)
Moisture Separator (Demister)	0.1	0.1[1]	0.1
Pre-Filter	0.1	0.1	0.1
HEPA Filter 1	0.8	0.9	0.85
Charcoal Bank	0.9	0.95	0.93
HEPA Filter 2	0.8	0.9	0.85
Heater	0.1@5000 SCFM[2]	0.1@5000 SCFM[2]	0.1@5000 SCFM[2]

1. See Assumption 3.2.10
2. See Assumption 3.2.11

Table 4: Benchmark Results for Train B

Measured Flow 4/16/09 (SCFM)	Measured Flow 10/15/07 (SCFM)	Average Measured Flow (SCFM)	Calc. Flow (ACFM)	Calc. Flow (SCFM)	% Error
5911	5590	5751	5,837	5,572	-3.11

The above benchmark results serve as a general indication of the validity of the model, since the percent error in the calculated values is less than 5%.

6.2 FLOW RATE WITH VENDOR-SUPPLIED COMPONENT PRESSURE DROPS

Each train of the SBV system was run with the vendor component pressure drops given for clean filter conditions. The flow rate entered into the model corresponding to the pressure drop is 5,000 SCFM. Where the vendor data gave a component pressure drop at a flow rate other than 5,000 SCFM, the pressure drop was converted to a value at 5,000 SCFM using the following formula:

$$\Delta P_2 = \frac{\Delta P_1 Q_2^2}{Q_1^2} \qquad \text{(equation 2)}$$

where:

Q_1 = given flow rate
ΔP_1 = pressure drop at Q_1
Q_2 = flow rate for which pressure drop is desired
ΔP_2 = pressure drop at Q_2

The pressure drops used for both trains are given in Table 5, below:

Form No.: P030105 sheet 1 of 1 Rev.: 0-01 Date: 5/09 Ref.: P 3-1

ZACHRY NUCLEAR ENGINEERING, INC GROTON, CONNECTICUT	CALC NO. 12123	REV 1	PAGE 10 OF 16
	ORIGINATOR Matthew Andel		DATE 10/5/09
	VERIFIED BY Michael Norwood		JOB NO. 051470
CLIENT Dominion Energy Kewaunee, Inc	PROJECT HVAC Calculations		
TITLE Shield Building Ventilation Pressure Loss			

Table 5 – Vendor Supplied Clean Filter Component Pressure Drops at 5,000 SCFM

Moist. Sep. DP	Prefilter DP (in WG)	Hepa 1 DP (in WG)	Charcoal DP (in WG)	Hepa 2 DP (in WG)	Heater DP (in WG)
0.067[1]	.037	0.789[2]	0.918	0.789[2]	0.1

1. See Assumption 3.2.4
2. See Assumption 3.2.13

The model was run using the Table 5 pressure drops to determine the system flow rate under these filter conditions. The system flow rates calculated for each train, as determined using the PROTO-HVAC Fan Status Report (included in Attachment C), are given in Table 6, below. The model file "SBV-VENDCLEAN.DBD" was used for this analysis and the pertinent output reports are included in Attachment C.

Table 6 – Calculated System Flow rates for Vendor Supplied Filter DPs

	flow rate (ACFM)	flow rate (SCFM)
Train A	5837	5565
Train B	5761	5523

The analysis in this section was completed to determine if the system flow rates when the filters were at clean conditions as specified in the vendor data would be substantially higher than the flow rates observed in the test data. When the component pressure drops in Table 5 are converted to the equivalent pressure drops at the test flow rates of 5,735 SCFM for Train A and 5,751 SCFM for Train B, the total filter resistance is higher than the filter resistance given in the test data, and thus the system flow rates are lower, as indicated in Table 6. If the flow rates determined here were substantially higher than the test data flow rates, the higher flow rates would be an indication of the maximum possible system flow rate. Since the calculated system flow rates obtained when using the vendor supplied clean filter DPs are less than the flow rates calculated when using the test data filter DPs in Section 6.1, this means that the current system filters are less restrictive than the filters meeting the vendor specified flow and DP values for clean filters and it is conservative to use the benchmark case as the clean filter case.

6.3 Recommended System Design Flow Rate

The recommended SBV system design flow rate is 5,700 SCFM. In order for the charcoal filters to effectively remove contaminants from the air flow, the flow through the filters must be between 4,510 SCFM – 6,600 SCFM, per Reference 5.23, and 5,700 SCFM is soundly within this range. The Reference 5.2 accident analysis uses a SBV system flow rate of 6,000 SCFM ±10%, which gives a range of 5,400 SCFM – 6,600 SCFM, and 5,700 SCFM is within this range also. References 5.33 and 5.34 state that the fan flow must be between 4,500 SCFM and 6,600 SCFM when the system is tested, and 5,700 SCFM is also within this range. If ±10% is applied to 5,700 SCFM, the flow range is 5,130 SCFM – 6,270 SCFM, and this range is within the flow

ZACHRY NUCLEAR ENGINEERING, INC GROTON, CONNECTICUT	CALC NO. 12123	REV 1	PAGE 11 OF 16
	ORIGINATOR Matthew Andel		DATE 10/5/09
	VERIFIED BY Michael Norwood		JOB NO. 051470
CLIENT Dominion Energy Kewaunee, Inc	PROJECT HVAC Calculations		
TITLE Shield Building Ventilation Pressure Loss			

limits discussed above for the charcoal filter effective contaminant removal, the accident analysis, and the actual operating point on the fan curve given the system resistance with clean filters. The PROTO-HVAC analyses and test data show that the SBV system flow is around 5,700 SCFM, and given the system resistance using vendor supplied component pressure drops for clean filters, it is unlikely that the system flow rate will be substantially above 5,700 SCFM in the current configuration. Since the model and test data show system operation of approximately 5,700 SCFM and 5,700 SCFM meets all the requirements discussed for fan flow, charcoal filter flow, and accident analysis flow, it is recommended that 5,700 SCFM be the SBV system design flow rate.

6.4 MINIMUM FLOW WITH DIRTY FILTERS

The component pressure drops were increased above the test data values until the system flow was reduced to the minimum permissible value of the design flow rate -10%, which is 5,130 SCFM. The average test data pressure drops were used as the starting values rather than the vendor supplied clean pressure drops because the test data pressure drops are less restrictive than the vendor supplied clean pressure drops, as shown in Section 6.2. The test data pressure drops were converted to pressure drops at 5,130 SCFM from the average test data flow rates using equation 2 to facilitate the comparison in DP between design flow and minimum flow. The values used as the starting values for each component are given in Table 7.

Table 7 – Starting Component DP values at 5,130 SCFM

Filter Component	Train A	Train B
Moisture Separator (Demister)	0.072	0.08
Pre-Filter	0.112	0.08
HEPA Filter 1	0.76	0.676
Charcoal Bank	0.72	0.74
HEPA Filter 2	0.72	0.676
Heater	0.105	0.105

The pressure drop across the heater was kept at its benchmarked value, as this component is not likely to become clogged with debris. The charcoal filter pressure drop was also kept at its benchmarked value because the charcoal filter does not remove particulate matter. All other filter component pressure drops were increased by the same percentage from their test data value until the system flow rate for each train reached the target of 5,130 SCFM. The pressure drops at this condition are reported in Table 8 for both trains. The model file "SBV-MINFLOW.DBD" was used for this analysis and the pertinent output reports are included in Attachment D. The pressure drop data in the table was obtained from the DP values input into the fixed resistance field of the duct section data window in PROTO-HVAC.

ZACHRY NUCLEAR ENGINEERING, INC GROTON, CONNECTICUT	CALC NO. 12123	REV 1	PAGE 12 OF 16
	ORIGINATOR Matthew Andel		DATE 10/5/09
	VERIFIED BY Michael Norwood		JOB NO. 051470
CLIENT Dominion Energy Kewaunee, Inc	PROJECT HVAC Calculations		
TITLE Shield Building Ventilation Pressure Loss			

Table 8 – Filter Pressure Drops at 5,130 SCFM

Train	Moist. Sep DP (in WG)	Prefilter DP (in WG)	Hepa 1 DP (in WG)	Charcoal DP (in WG)	Hepa 2 DP (in WG)	Heater DP (in WG)	HEPA and Charcoal DP (in WG)	Total DP (in WG)
Train A	0.217	0.337	2.288	0.72	2.167	0.105	5.175	5.834
Train B	0.242	0.242	2.042	0.74	2.042	0.105	4.824	5.413

For both trains, both the total filter pressure drop and the HEPA filter pressure drops are considerably below the Assumption 3.2.9 maximum values.

6.5 Motor Horsepower Required

Reference 5.9 shows that the SBV fan blade setting is halfway between #8 and #10. Using the horsepower curves for a #8 and #10 blade to extrapolate the fan BHP at 5,700 SCFM halfway between these 2 HP curves gives 20HP. Per Reference 5.10 and 5.36, the SBV fan serial number is SF 27913. Reference 5.10 states that the motor with this serial number is 25 HP, thus the SBV fan motor is sufficient for the recommended design flow rate of 5,700 SCFM.

7.0 Conclusions and Recommendations

7.1 Summary Of Results

7.1.1 FLOW RESULTS

The proper design flow rate of the SBV system has been determined to be 5,700 SCFM based on the PROTO-HVAC analysis and system test data. 5,700 SCFM is acceptable for the filter flow rate as it is within the acceptable range given in Design Input 3.1.5. It is also within the acceptable range for SBV fan flow that is given in References 5.33 and 5.34 of 4,500 and 6,600 CFM. 5,700 SCFM is below the flow rate of 6,000 SCFM used in Reference 5.2, so this reference will need to be evaluated to determine the impact of this lower flow on the Reference 5.2 analysis.

7.1.2 FILTER PRESSURE DROP RESULTS

The technical specification for the SBV filter units states that the pressure drop across the combined HEPA filters and charcoal adsorber banks must be less than 10" WG and must be less than 4" WG across any HEPA filter bank. at the system design flow rate (± 10%). The fan static pressure for the no-flow condition is 11" WG, as determined from Reference 5.9, and the filter components must be able to withstand this pressure. The pressure at the no-flow condition is less than the maximum fan total pressure of 14.5" WG which occurs at approximately 4,500 SCFM. The vendor technical manual (Reference 5.32) for the filters lists the following pressure drop

Enclosure, Q&A to Attachment 1, Volume 16 (Chapter 5.0) 104 of 169

ZACHRY NUCLEAR ENGINEERING, INC	CALC NO. 12123	REV 1	PAGE 13 OF 16
GROTON, CONNECTICUT	ORIGINATOR Matthew Andel		DATE 10/5/09
	VERIFIED BY Michael Norwood		JOB NO. 051470
CLIENT Dominion Energy Kewaunee, Inc	PROJECT HVAC Calculations		
TITLE Shield Building Ventilation Pressure Loss			

limits for when filter components should be replaced:

Moisture Separator 0.5" WG
Prefilter 0.5" WG
HEPA filter 3.0" WG
Charcoal adsorber n/a

A table summarizing the train A and B PROTO-HVAC calculated values and the limiting DP values discussed above is below.

Table 9 – Summary of Filter DP Values

Train	Moist. Sep DP (in WG)	Prefilter DP (in WG)	Hepa 1 DP (in WG)	Charcoal DP (in WG)	Hepa 2 DP (in WG)	Heater DP (in WG)	HEPA and Charcoal DP (in WG)	Total DP (in WG)
Train A calculated	0.217	0.337	2.288	0.72	2.167	0.105	5.175	5.834
Train B calculated	0.242	0.242	2.042	0.74	2.042	0.105	4.824	5.413
Tech spec limit	n/a	n/a	4	n/a	4	n/a	10	n/a
Fan static pressure at 0 CFM (in WG)	11							
Vendor recommended max pressure	0.5	0.5	3	n/a	3	n/a	n/a	n/a
Margin calculated from train with higher component DP and lower maximum allowable value	0.258	0.163	0.712	n/a	0.833	n/a	4.825	n/a

Comparing the calculated values to the limiting values discussed above shows that all calculated values are below all pertinent limiting values. The Reference 5.33 and 5.34 procedures have administrative limits for filter DP values that were set due to CR 323062. The calculated pressure drops determined in this calculation should be used to replace the administrative DP limits in those references.

7.1.3 PROTO-HVAC Files Used

The following PROTO-HVAC database files were used in the analyses for this calculation:

SBV-BENCHMARK.DBD, 478kb, 9/8/2009 1:38pm
SBV-VENDCLEAN.DBD, 460kb, 9/8/2009 5:27pm
SBV-MINFLOW.DBD, 460kb, 9/15/2009 4:06pm

The files listed above have been prepared, documented and independently verified in accordance with Proto-Power's Quality Assurance Manual, Reference 5.35. These files are suitable for use with flow rates above 4,500 SCFM as discussed in section 4.0. The results in this calculation are valid for the as-modeled configuration which was benchmarked to test data.

Enclosure, Q&A to Attachment 1, Volume 16 (Chapter 5.0) 105 of 169

ZACHRY NUCLEAR ENGINEERING, INC GROTON, CONNECTICUT	CALC NO. 12123	REV 1	PAGE 14 OF 16
	ORIGINATOR Matthew Andel		DATE 10/5/09
	VERIFIED BY Michael Norwood		JOB NO. 051470
CLIENT Dominion Energy Kewaunee, Inc	PROJECT HVAC Calculations		
TITLE Shield Building Ventilation Pressure Loss			

7.2 LIMITING ACCIDENT SCENARIOS

The SBV system is only in operation following a loss of coolant accident (LOCA) per Reference 5.10; thus a LOCA is the limiting accident scenario for the SBV system.

7.3 ACCEPTANCE CRITERIA

7.3.1 The system flow rate for the SBV filter conditions should not exceed 6,600 SCFM per Design Input 3.1.5. The recommended system design flow rate of 5,700 SCFM is below this value, as are all calculated and test data flow rates.

7.3.2 The maximum allowed filter DPs should not exceed the vendor recommended pressure drop values given. Table 9 shows that the calculated maximum allowable filter DPs at the minimum allowable system flow are below the vendor recommended values.

7.4 IMPACT TO SYSTEMS, STRUCTURES AND COMPONENTS

This calculation impacts the Shield Building Ventilation System filter maximum DP. Documents impacted by this change are listed in section 7.14.

7.5 CONSERVATIVENESS OF CALCULATION AND AVAILABLE MARGIN

The calculation is conservative since it uses minimum allowable flow rates when calculating pressure drops. Based on the margin values calculated in Table 9, the filter component with the lowest margin available is the Train A prefilter, with a margin of 0.163" WG.

7.6 UNCERTAINTY OF RESULTS

An uncertainty analysis was not performed for this calculation. Uncertainty may either be covered in the licensing basis or calculated in another calculation if needed in the future.

7.7 CONSISTENCY WITH DESIGN AND OPERATION OF PLANT

There is currently an inconsistency between plant operation and the SBV system design flow rate. The SBV System Design Flow is listed differently in different documents as described in section 2.0 and the SBV test data flow rates show different values. The results of this calculation resolve this discrepancy by recommending a system design flow rate. This will also resolve CA081875 (CR106464) which addresses the issue of the different flow rate values.

7.8 INPUT ASSUMPTIONS

see section 3.2

7.9 EQ PROGRAM LICENSING BASIS REQUIREMENTS

This calculation does not deal with area temperatures and therefore has no effect on the EQ Program.

7.10 OPEN ITEMS (NEW OR CLOSURE)

This calculation will resolve CA081875 (CR106464) and CA128813 (CR323062). CA081875 addresses the discrepancies in SBV flow rate among the fan acceptance criteria given in SP-24-122A&B, filter design flow rate, and flow rate used in calculation CN-CRA-00-2. The results of this calculation show that the actual SBV flow rate is 5,700 SCFM. To resolve the discrepancy in flow rates, the SBV system design flow rate should be changed to 5,700 SCFM. This flow rate is within the range of the fan flow acceptance criteria. Reference 5.23 shows that 5,700 SCFM is an acceptable flow rate for the system filters. A new corrective action will need to be initiated to revise CN-CRA-00-2 as recommended in CA081875 since the 6,000 SCFM used in CN-CRA-00-2 will need to be changed to 5,700 SCFM. A procedure change as recommended in CA081875 will need to be initiated for SP-24-122A and SP-24-122B to change the maximum DP values listed for the filters and the allowable flow rates.

CA128813 calls for calculation 12123 to be revised to determine the maximum allowed DP for the HEPA and charcoal filters. The maximum allowed DPs for these components have been determined and are presented in Table 9. The results in this table may be used to initiate a follow-on to revise tech spec 4.4.c.1.a as indicated in CA128813.

7.11 REASONABLE ASSURANCE OF SAFETY

There are no reasonable assurance of safety (RAS) issues associated with this calculation since RASs generally do not apply to the SBV system as it is tech spec equipment, per Reference 5.31.

7.12 SUPERSEDED CALCULATIONS

This calculation supersedes Revision 0 of calculation 12123 and calculation 1171.M3.

7.13 IMPACTED CALCULATIONS

Calculation CN-CRA-00-2 is impacted since the SBV flow rate used in that calculation is 6,000 SCFM and this calculation changes the SBV system flow rate to 5,700 SCFM. Based on a review of the Dominion Portal, this calculation does not impact any other calculations.

Enclosure, Q&A to Attachment 1, Volume 16 (Chapter 5.0) 107 of 169

ZACHRY NUCLEAR ENGINEERING, INC GROTON, CONNECTICUT	CALC NO. 12123	REV 1	PAGE 16 OF 16
	ORIGINATOR Matthew Andel		DATE 10/5/09
	VERIFIED BY Michael Norwood		JOB NO. 051470
CLIENT Dominion Energy Kewaunee, Inc	PROJECT HVAC Calculations		
TITLE Shield Building Ventilation Pressure Loss			

7.14 IMPACTED PROCEDURES AND DOCUMENTS

The results of this calculation may be used to update the USAR section 5.5.5 and Technical Specification 4.4.c.1a. The results of this calculation may be used to resolve CA081875 (CR106464) and CA128813 (CR323062). Procedure SP-24-107C, SP-24-107D, SP-24-122A and SP-24-122B may require updates. Drawings M-602, OPERM-602 and XK-300-2 may require updates.

7.15 ANOMALIES

The fan curve in the PROTO-HVAC model does not match the actual fan curve for values below 4,500 SCFM. This was done to allow the PROTO-HVAC model to converge as discussed in section 4.0 and does not affect the accuracy of the calculation since the flow rates herein are above 4,500 SCFM. If this PROTO-HVAC model is used for SBV flow rates below 4,500 SCFM the fan curve will have to be modified to give accurate results.

7.16 EFFECTIVENESS OF CALCULATION

The purpose of the calculation has been met.

Enclosure, Q&A to Attachment 1, Volume 16 (Chapter 5.0) 108 of 169

ZACHRY NUCLEAR ENGINEERING, INC.
CALCULATION TITLE SHEET

CLIENT: **Dominion Energy Kewaunee, Inc**

PROJECT: **HVAC Calculations**

CALCULATION TITLE: **Control Room Post Accident Recirculation Filter Pressure Drop**

CALCULATION NO.: **09-047 Revision A**

JOB NO.: **051470**

COMPUTER CODE & VERSION (if applicable): PROTO-HVAC V1.01

ZACHRY NUCLEAR ENGINEERING, INC. PROPERTY CODE (if applicable): 000586

QA CLASSIFICATION: Safety-Related

REV	TOTAL NO. OF PAGES	ORIGINATOR/DATE	VERIFIER/DATE	APPROVAL/DATE
A	257	~~10/2/09~~ 10/5/09 CJF Christopher J. Forrest	~~10/2/09~~ SRD 10/5/09 Stuart R. Douglass	10/6/09 Christopher M. D'Angelo

Page i of iv

Form No.: P030101 sheet 1 of 1 Rev.: 0-01 Date: 5/09 Ref.: P 3-1

ZACHRY NUCLEAR ENGINEERING, INC GROTON, CONNECTICUT	CALC NO. 09-047	REV A	PAGE ii OF iv
	ORIGINATOR Christopher J. Forrest		DATE 10/1/2009
	VERIFIED BY Stuart R. Douglass		JOB NO. 051470
CLIENT Dominion Energy Kewaunee, Inc	PROJECT HVAC Calculations		
TITLE Control Room Post Accident Recirculation Filter Pressure Drop			

Revision History

Revision	Revision Description
A	Original Issue

Form No.: P030102 sheet 1 of 1 Rev.: 0-01 Date: 5/09 Ref.: P 3-1

ZACHRY NUCLEAR ENGINEERING, INC GROTON, CONNECTICUT	CALC NO. 09-047	REV A	PAGE iii OF iv
	ORIGINATOR Christopher J. Forrest		DATE 10/1/2009
	VERIFIED BY Stuart R. Douglass		JOB NO. 051470
CLIENT Dominion Energy Kewaunee, Inc	PROJECT HVAC Calculations		
TITLE Control Room Post Accident Recirculation Filter Pressure Drop			

CALCULATION VERIFICATION FORM

1. VERIFICATION METHOD:

	Yes	N/A
A. Approach Checked	☒	
B. Logic Checked	☒	
C. Arithmetic Checked	☒*	☐
D. Alternate Method (Provide documentation)	☐*	☒
E. Other	☐*	☒

*Describe below.

2. EXTENT OF VERIFICATION:

Complete calculation (including attachments /appendices) has been reviewed to determine impact of revision on un-revised areas.

A. IDV of Complete calculation (including attachments/appendices).	☒
B. IDV of revised areas of Calculation only.	☐
C. Other (describe below):	☐

3. DOCUMENTATION OF VERIFICATION

A. IDV documentation as attachment with Calc	☐	B. IDV documentation forwarded to QA	☐	C. IDV documentation is this form and any continuation pages only.	☒

Errors Detected
See Attachment E.

Error Resolution
See Attachment E.

*Verification Method:
Verified that methodology thoroughly and correctly satisfies calculation purpose.
Verified accuracy of design inputs, assumptions, and calculations.

Other Comments
None

Extra References Used
None

(Attach extra sheets if needed (Use Form P030114))
THE APPROACH, LOGIC, AND METHODOLOGY OF THE CALCULATION IS ACCEPTABLE. THE **GUIDELINES DEFINED IN PARA. 7.5.4** (AS APPLICABLE) OF P 3-1 HAVE BEEN MET. THE OVERALL CALCULATION IS FOUND TO BE VALID AND CONCLUSIONS TO BE CORRECT AND REASONABLE:

IDV Signature: [signature] Printed Name: Stuart R. Douglass Date: 10/5/09

Form No.: P030103 sheet 1 of 1 Rev.: 0-01 Date: 5/09 Ref.: P 3-1

ZACHRY NUCLEAR ENGINEERING, INC GROTON, CONNECTICUT	CALC NO. 09-047	REV A	PAGE iv OF iv
	ORIGINATOR Christopher J. Forrest		DATE 10/1/2009
	VERIFIED BY Stuart R. Douglass		JOB NO. 051470
CLIENT Dominion Energy Kewaunee, Inc	PROJECT HVAC Calculations		
TITLE Control Room Post Accident Recirculation Filter Pressure Drop			

TABLE OF CONTENTS

	LIST OF ATTACHMENTS	
Attachment	**Subject Matter**	**Total Pages**
A	Zachry Nuclear Engineering, Inc. Calculation 09-047, Revision A – "PROTO-HVAC™ Model Benchmark Data"	67
B	Zachry Nuclear Engineering, Inc. Calculation 09-047, Revision A – "PROTO-HVAC™ Output Reports for Analysis Cases"	127
C	Zachry Nuclear Engineering, Inc. Calculation 09-047, Revision A – "Excerpt from PO K300 – Pioneer Engineering - Apparatus Data for Filter Assembly"	6
D	Zachry Nuclear Engineering, Inc. Calculation 09-047, Revision A – "Excerpt from PO K362 – Vaneaxial Fans for Ventilation Systems "	11
E	Zachry Nuclear Engineering, Inc. Calculation 09-047, Revision A – "IDV Comment and Resolution Form"	13
F	Zachry Nuclear Engineering, Inc. Calculation 09-047, Revision A – "Client Comments for Revision A"	11

Total number of pages in Attachments 235

Complete Calculation (total number of pages) 257

ZACHRY NUCLEAR ENGINEERING, INC GROTON, CONNECTICUT	CALC NO. 09-047	REV A	PAGE 1 OF 18
	ORIGINATOR Christopher J. Forrest		DATE 10/1/2009
	VERIFIED BY Stuart R. Douglass		JOB NO. 051470
CLIENT Dominion Energy Kewaunee, Inc	PROJECT HVAC Calculations		
TITLE Control Room Post Accident Recirculation Filter Pressure Drop			

1.0 PURPOSE

The purpose of this calculation is to evaluate the bases of the current Technical Specification Control Room Post Accident Recirculation (CRPAR) filter DP limits. Zachry's PROTO-HVAC analysis software will be used to determine the maximum allowable differential pressure for the minimum design flow rate through the CRPAR filter units.

2.0 BACKGROUND

This calculation was originated under Task Release Number 2.0256.1 as clarified by Proto-Power Proposal No. 010KWE-P033 dated July 13, 2007. As such, this calculation has been developed under Zachry's Nuclear Quality Assurance Program and formatted in accordance with Dominion Procedure GNP-04.03.04. Owner Acceptance Material was completed and incorporated by Dominion.

The current Technical Specification on the CRPAR filter units states that the pressure drop across the combined HEPA filters and charcoal adsorber banks must be less than 6 inches of water and the pressure drop across any HEPA bank must be less than 4 inches of water at the system design flow rate (± 10%). No other calculation currently exists for the Control Room Post Accident Recirculation Filters that provides the basis for the Tech Spec allowed filter DP.

Enclosure, Q&A to Attachment 1, Volume 16 (Chapter 5.0) 113 of 169

ZACHRY NUCLEAR ENGINEERING, INC GROTON, CONNECTICUT	CALC NO. 09-047	REV A	PAGE 2 OF 18
	ORIGINATOR Christopher J. Forrest		DATE 10/1/2009
	VERIFIED BY Stuart R. Douglass		JOB NO. 051470
CLIENT Dominion Energy Kewaunee, Inc	PROJECT HVAC Calculations		
TITLE Control Room Post Accident Recirculation Filter Pressure Drop			

3.0 INPUTS AND ASSUMPTIONS

3.1 DESIGN INPUTS

3.1.1 The design air flow rate is 2500 SCFM per Reference 5.3. This design flow rate is supported by the analysis in Reference 5.12.

3.1.2 The pressure drop across a clean prefilter is 0.07 in WC at 1150 CFM per Reference 5.14.

3.1.3 The pressure drop across a clean charcoal adsorber is 0.6 in WC at 208 CFM per Reference 5.14.

3.1.4 The rated capacity for the CRPAR HEPA filter component is 625 CFM per Reference 5.14.

3.1.5 There are four required prefilters arranged in parallel per Reference 5.4.

3.1.6 There are four required HEPA filters arranged in parallel per Reference 5.4.

3.1.7 There are 12 required charcoal filters arranged in parallel per Reference 5.4.

3.1.8 Test data used in benchmarking was taken from References 5.9 (A Train Test Date: 10/23/2007) and 5.10 (B Train Test Date: 10/18/2007), and is presented in Attachment A.

3.1.9 The combined pressure drop across a clean filter assembly is 2 in WC at 4000 CFM per Reference 5.4.

3.1.10 The vendor recommended replacement filter DP for the prefilter and HEPA filter components is 0.5 in WC and 3.0 in WC respectively, per Page 4 of Reference 5.6. Filter component part numbers were matched from Reference 5.4 to the Spare Parts List, (Page 4 of Reference 5.6) Instructions on Recommended Spare Parts List indicate that the HEPA filter should be changed when pressure drop reaches 3.0 in W and the DC-22 prefilter should be changed when its pressure drop reaches 0.5 in W.

3.1.11 The fan brake horsepower at the minimum system flow of 2250 SCFM (Design Input 3.1.1, Assumption 3.2.5), read from the fan curve in Reference 5.15, is equal to 4.8 hp.

3.1.12 The rated motor horsepower is 7.5 HP per Reference 5.7 and Reference 5.8

Form No.: P030105 sheet 1 of 1 Rev.: 0-01 Date: 5/09 Ref.: P 3-1

Enclosure, Q&A to Attachment 1, Volume 16 (Chapter 5.0) 114 of 169

ZACHRY NUCLEAR ENGINEERING, INC GROTON, CONNECTICUT	CALC NO. 09-047	REV A	PAGE 3 OF 18
	ORIGINATOR Christopher J. Forrest		DATE 10/1/2009
	VERIFIED BY Stuart R. Douglass		JOB NO. 051470
CLIENT Dominion Energy Kewaunee, Inc	PROJECT HVAC Calculations		
TITLE Control Room Post Accident Recirculation Filter Pressure Drop			

3.1.13 Reference 5.7 shows a maximum horsepower rating (including service factor) of 9.2 HP. It is noted that the A-C Motor Performance Curve from Reference 5.8 shows a service factor of 1.0, but the curves in Reference 5.8 are from testing dated in 1966 where as information in Reference 5.7 is reflective of the actual installed system dated in 1972.

3.2 ASSUMPTIONS

3.2.1 It is assumed that the prefilter and HEPA filter resistances increase at the same rate, on a percentage basis. No information was found that would indicate that the prefilter or HEPA filter clogs at a quantifiable rate as compared to the other.

3.2.2 It is assumed that all radioactive iodine in particulate form is captured by the prefilter and HEPA filter banks. The purpose of the charcoal adsorber bank is to treat radioactive iodine in its element and organic forms (Reference 5.16). Therefore, for this analysis, the resistance of the charcoal filter will not increase as the filter assembly is dirtied.

3.2.3 It is assumed that the system is running in 100% recirculation. This assumption is consistent with system operation as it is benchmarked to system test results.

3.2.4 It is assumed that infiltration into the Control Room envelope will not have a significant effect on the results of this calculation, and therefore is not included in this analysis. The basis for this assumption is that the CR envelope air mass is constant at steady state, such that infiltration at a low pressure region is equal to exhaust from a high pressure region. The result is equivalent to a parallel flow path in 100% recirculation mode that should be manifested in the benchmark test data.

3.2.5 This calculation assumes a ±10% tolerance for the system flow rate as allowed by Reference 5.13.

3.2.6 An uncertainty analysis was not performed for this calculation. It is assumed that uncertainty may either be covered in the licensing basis or calculated in another calculation if needed in the future.

3.2.7 It is assumed that drive inefficiencies between the CRPAR fan and its motor are minimal and will not significantly affect the motor evaluation in this calculation. Reference 5.7 shows that the fan is powered directly from the output shaft of the motor, supporting this assumption. Therefore, drive inefficiencies are not considered in this evaluation.

Enclosure, Q&A to Attachment 1, Volume 16 (Chapter 5.0) 115 of 169

4.0 METHODOLOGY AND ACCEPTANCE CRITERIA

4.1 METHODOLOGY

4.1.1 SOFTWARE REQUIREMENTS AND MODEL CONSTRUCTION

This calculation has been developed using PROTO-HVAC Version 1.01. The PROTO-HVAC software was developed and validated in accordance with Zachry's Nuclear Software Quality Assurance Program (SQAP), Reference 5.1. This program meets the requirements of 10CFR50 Appendix B, 10CFR21, and ANSI NQA-1, and was developed according to the guidelines and standards contained in ANSI/IEEE Standard 730/1984 and ANSI NQA-2b-1991.

The following steps were taken to develop the CRPAR filter model for this analysis:

The ACC system model from Reference 5.11 was modified for use in this calculation. The model developed in Reference 5.11 models the CRPAR filter assembly as a single duct section using the total clean DP and flow input from Reference 5.4. This calculation modifies the model from Reference 5.11 to model the individual filter components with their respective design resistances taken from Reference 5.14. Table 1 shows which duct sections were deleted and which were added.

Table 1 – Modified Duct Sections of the PROTO-HVAC Model

Deleted Ducts:	Added Ducts:
104	104.1
	104.2
	104.3
	104.5
	126.0
110	110.1
	110.2
	110.3
	110.5
	127.0

Prefilter, HEPA, and charcoal filter duct sections were added in place of the filter assembly duct section from the previous database according to Reference 5.4.

Table 2 shows the points that were input into PROTO-HVAC and used as the fan curve for the 2-Stage CRPAR Fans (Joy Model Number 18-14-3450). These points were taken from the

ZACHRY NUCLEAR ENGINEERING, INC	CALC NO. 09-047	REV A	PAGE 5 OF 18
GROTON, CONNECTICUT	ORIGINATOR Christopher J. Forrest		DATE 10/1/2009
	VERIFIED BY Stuart R. Douglass		JOB NO. 051470
CLIENT Dominion Energy Kewaunee, Inc	PROJECT HVAC Calculations		
TITLE Control Room Post Accident Recirculation Filter Pressure Drop			

certified curve found in Reference 5.15 and included in Attachment D. This curve was found to be consistent with the design point of 6.12 in WC (total pressure) at a design flow of 2500 SCFM, found on the fan drawing (Reference 5.7).

Table 2 – Fan Curve for 2 Stage Vaneaxial CRPAR Fans

Fan Flow (SCFM)	Total Pressure (in-wg)
1000.00	10.40
1500.00	9.30
2000.00	8.05
2500.00	6.16
2750.00	4.75
3000.00	2.70
3200.00	0.20

A Fan Curve Data Report is included in Attachment A to show the use of this curve in the PROTO-HVAC model.

4.1.2 MODEL BENCHMARKING

The following cases were run to benchmark the model against test data.

Case 1 (Bench-1): Train A operation

This case was modeled with the filter component DPs at the test flow found in the A train test data, contained in Attachment A. The CRPAR Fan control damper (PAR_Fan1A_Damp) was adjusted until the fan flow matched the test flow observed in the 2007 test data (Reference 5.9, Attachment A). The pressure differential across the filter calculated by PROTO-HVAC was compared to the pressure differential observed during testing.

Case 2 (Bench-2): Train B operation

This case was modeled with the filter component DPs at the test flow found in the B train test data, contained in Attachment A. The CRPAR Fan control damper (PAR_Fan1B_Damp) was adjusted until the fan flow matched the test flow observed in the 2007 test data (Reference 5.10, Attachment A). The pressure differential across the filter calculated by PROTO-HVAC was compared to the pressure differential observed during testing.

Enclosure, Q&A to Attachment 1, Volume 16 (Chapter 5.0) 117 of 169

ZACHRY NUCLEAR ENGINEERING, INC	CALC NO. 09-047	REV A	PAGE 6 OF 18
GROTON, CONNECTICUT	ORIGINATOR Christopher J. Forrest		DATE 10/1/2009
	VERIFIED BY Stuart R. Douglass		JOB NO. 051470
CLIENT Dominion Energy Kewaunee, Inc	PROJECT HVAC Calculations		
TITLE Control Room Post Accident Recirculation Filter Pressure Drop			

4.1.3 CASE RUNS WITH CLEAN FILTER COMPONENTS

The CRPAR filter was modeled with clean filter DPs, in Cases 3 and 4. The air flow through the filter was calculated by PROTO-HVAC, and verified to not exceed the maximum allowable system flow per Reference 5.13 (2750 scfm).

Case 3 (Clean-1): Train A Operation (Clean Filter)

Case 4 (Clean-2): Train B Operation (Clean Filter)

Table 3, below, shows the clean filter DPs used in cases 3 and 4. A clean prefilter cell has a pressure drop of 0.07 in WC at a flow of 1150 SCFM (Design Input 3.1.2), and Design Input 3.1.5 states that there are four prefilters arranged in parallel in one CRPAR filter assembly. For filter cells arranged in parallel, the flow associated with the clean pressure drop is the flow associated with a clean filter cell multiplied by the number of filter cells in parallel. Therefore the clean prefilter pressure drop in the CRPAR filter assembly is 0.07 in WC at a flow of 4600 SCFM.

Similarly, a clean charcoal filter cell has a pressure drop of 0.6 in WC at a flow of 208 SCFM (Design Input 3.1.3), and Design Input 3.1.7 states that there are twelve (12) charcoal filter cells arranged in parallel in one CRPAR filter assembly. Therefore, the clean charcoal pressure drop in the CRPAR filter assembly is 0.6 at a flow of 2496 SCFM. Note: the dirty case DBD uses a resistance of 0.602 in WC @ 2500 SCFM, which is equivalent to 0.6 in WC @ 2496 SCFM.

Design Input 3.1.9, states that the clean filter pressure drop across the entire CRPAR filter assembly is 2.0 in WC at a flow of 4000 SCFM. Equation 2 along with Design Inputs 3.1.2 and 3.1.3 were used to find the clean filter pressure drops for the Prefilter and Charcoal filter at a flow rate of 4000 SCFM. These values were found to be 0.05 in WC for the Prefilter and 1.54 in WC for the Charcoal filter.

Table 3 – Clean Filter Component DP Information

	Clean DP (in WC)	Clean DP at 4000 SCFM (in WC)
Prefilter	0.07 @ 4600 SCFM	0.05
HEPA	0.16 @ 2500 SCFM	0.41
Charcoal	0.6 @ 2496 SCFM	1.54
	Total:	**2.00**

Form No.: P030105 sheet 1 of 1 Rev.: 0-01 Date: 5/09 Ref.: P 3-1

The clean HEPA filter DP was calculated by subtracting the clean filter pressure drops for the Prefilter and Charcoal filter from the total pressure drop across a clean filter assembly at a common flow rate of 4000 SCFM.

Clean HEPA dp @ 4000 SCFM = 2.0 – 1.54 – 0.05 = 0.41 in WC @ 4000 SCFM

4.1.4 Case Runs with Dirty Filter Components

Prefilter and HEPA filter component resistances were increased by the same percentage (Assumption 3.2.1), for each train, to simulate dirtying the filter, until the minimum design flow value was met. Even though the prefilter has a smaller resistance as compared to the HEPA, dirtying both the prefilter and HEPA filters is more conservative than only dirtying the HEPA filter because it will result in a lower dirty DP value for the HEPA filter. There is a certain DP value (total filter DP) that will allow the minimum flow of 2250 SCFM through the system. That total filter DP will remain the same no matter how many different filter components it is split amongst. Therefore, if the total filter DP is split between a Pre, HEPA and Charcoal, rather than just the HEPA and Charcoal, the result is a lower (more conservative) dirty HEPA DP.

Case 5 (Dirty-1): Train A Operation (Flow rate of 2250SCFM)

Case 6 (Dirty-2): Train B Operation (Flow rate of 2250SCFM)

These cases represent the minimum allowable flow (2500SCFM – 10%) as allowed by Reference 5.13. Cases 5 and 6 give maximum allowable pressure drops for the Post Accident Recirculation Filter components for each train.

Due to the fact that Proto-HVAC outputs flows in ACFM as opposed to SCFM, flows were corrected using the following equation.

$$Q_s = Q_f \times \frac{\rho_f}{\rho_s} \qquad \text{(Equation 1)}$$

Where,

$Q_f \equiv$ actual volume flow rate (ACFM)
$Q_s \equiv$ standard volume flow rate (SCFM)
$\rho_s \equiv$ air density at standard conditions, 0.075 lb_m/ft^3 (Reference 5.2)
$\rho_f \equiv$ air density at the applicable duct section (lb_m/ft^3)

Enclosure, Q&A to Attachment 1, Volume 16 (Chapter 5.0) 119 of 169

The reported results for all cases used actual fan flows to compare component DPs. These results were only compared with the acceptance criteria at actual fan flows, and not with manufacturer's DP information at nominal flows. For any DP information that was used as input using component DPs for nominal filter flow, the following equation was used to convert values.

$$DP_a = DP_n \times \left(\frac{Q_a}{Q_n}\right)^2 \qquad \text{(Equation 2)}$$

Where,

$Q_a \equiv$ actual volume flow rate (SCFM)
$Q_n \equiv$ nominal volume flow rate (SCFM)
$DP_a \equiv$ component DP at actual volume flow (in WC)
$DP_n \equiv$ component DP at nominal volume flow (in WC)

4.1.5 CRPAR Fan Motor Evaluation

With Assumption 3.2.7, the drive efficiency is taken to equal 1.0, therefore the required motor horsepower is simply the brake horsepower of the fan, read from the fan curve.

The motor for the CRPAR fan will be evaluated based on comparing the brake horsepower of the fan, read at the minimum flow (Design Input 3.1.11), to the rated horsepower of the motor (Design Input 3.1.13). The correct fan and motor performance curves were found by selecting the curves that were marked with the CRPAR fan serial number (SF-27914) in Reference 5.8.

4.2 Acceptance Criteria

4.2.1 The flow rate of model cases which represent clean CRPAR filter assemblies should not exceed the maximum allowable flow rate of 2750 SCFM (Design Input 3.1.1, Assumption 3.2.5).

4.2.2 The maximum allowed DP, for the minimum allowable flow rate of 2250 SCFM (Design Input 3.1.1, Assumption 3.2.5), of dirtied CRPAR filters should not exceed the vendor recommended replacement pressure drops of 0.5 for the Prefilter and 3.0 for the HEPA filter (Design Input 3.1.10).

Enclosure, Q&A to Attachment 1, Volume 16 (Chapter 5.0) 120 of 169

ZACHRY NUCLEAR ENGINEERING, INC	CALC NO. 09-047	REV A	PAGE 9 OF 18
GROTON, CONNECTICUT	ORIGINATOR Christopher J. Forrest		DATE 10/1/2009
	VERIFIED BY Stuart R. Douglass		JOB NO. 051470
CLIENT Dominion Energy Kewaunee, Inc	PROJECT HVAC Calculations		
TITLE Control Room Post Accident Recirculation Filter Pressure Drop			

5.0 References

5.1 Zachry, SQAP-93948, Revision H, "Software Quality Assurance Plan (SQAP)".

5.2 Zachry Document UD-93948-03, Revision B, "User Documentation (UD) for Ventilation System Thermal Hydraulic Modeling Software - PROTO-HVAC".

5.3 Kewaunee Power Station Drawing M-603 Revision BD, Flow Diagram – Air Conditioning Administration Bldg & Control Room

5.4 Kewaunee Power Station Drawing XK-300-1, Revision D2, Control Room Post Accident Recirculating Filter Assembly – 4000 CFM

5.5 Kewaunee Power Station Drawing M-628 Revision AH, Ventilation – Aux Bldg Elevation 642'-3"

5.6 XK-300-53, Revision 4, FARR-0001 Vendor Technical Manual

5.7 XK-362-5, Revision 0, Axivane Fan Model 18-14-3450; 2 Stage with Accessories

5.8 VTM-JOYMA-0002 (141422-1), Revision 2, AXIVANE FAN OPERATORS HANDBOOK FAN SERIAL NO'S.: SF-27911, SF-27912, SF-27914 AND SF-27914-1, SF-27915, SF-28034

5.9 SP-25-119A, Revision 2, "Control Room Post Accident (CRPA) Train A Recirculation Filter Testing". Performed 10/23/2007 (See Attachment A)

5.10 SP-25-119B, Revision 2, "Control Room Post Accident (CRPA) Train B Recirculation Filter Testing". Performed 10/18/2007 (See Attachment A)

5.11 Calculation C11267, Revision 1, "Control Room Air Conditioning, Two Fan Operation"

5.12 Calculation C11858, Revision 0, "Allowable and Optimal Design Airflow Rates Through Charcoal Filter

5.13 Technical Specifications for Kewaunee Power Station, Amendment No. 137 Dated 06/09/98

Enclosure, Q&A to Attachment 1, Volume 16 (Chapter 5.0) 121 of 169

5.14 Kewaunee Power Station Purchase Order #K300 (excerpt contained in Attachment C)

PO#K300 – This purchase order includes components purchased for the filter assembly in this calculation. Attachment C includes the information from this PO that is relevant to this calculation.

5.15 Kewaunee Power Station Purchase Order #K362 (excerpt contained in Attachment D)

PO#K362 – This purchase order includes the two stage CRPAR fans (Model Number 18-14-3450). Attachment D includes the fan curve from this PO that was used in the PROTO-HVAC model and referenced in this calculation.

5.16 US NRC, Regulatory Guide 1.52, Rev. 3, "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", June 2001.

5.17 ASME N509-2002, Nuclear Power Plant Air-Cleaning Units and Components, March 26, 2003

6.0 CALCULATIONS AND RESULTS

6.1 BENCHMARK

The model has been benchmarked to match the test data, provided in Attachment A, using the benchmark cases discussed in Section 4.1.2. For benchmarking purposes, the filter components have been modeled using the test data shown in Table 4, and provided in Attachment A for each train. PROTO-HVAC has the ability to enter a given differential pressure and flow rate for any element and it then calculates the equivalent element pressure loss coefficient (K).

Table 4: 2007 Test Data of CRPAR Filter Pressure Drop

	A Train	**B Train**
Test Date	10/23/2007	10/18/2007
Prefilter DP (in WC)	0.1	0.2
HEPA DP (in WC)	0.5	0.6
Charcoal DP (in WC)	0.5	0.5
Total DP (in WC)	**1.1**	**1.3**
CRPAR Fan Flow (SCFM)	**2353**	**2443**

ZACHRY NUCLEAR ENGINEERING, INC GROTON, CONNECTICUT	CALC NO. 09-047	REV A	PAGE 11 OF 18
	ORIGINATOR Christopher J. Forrest		DATE 10/1/2009
	VERIFIED BY Stuart R. Douglass		JOB NO. 051470
CLIENT Dominion Energy Kewaunee, Inc	PROJECT HVAC Calculations		
TITLE Control Room Post Accident Recirculation Filter Pressure Drop			

Each train was run individually iterating the positions of control dampers, PAR_Fan1A_Damp (for Case 1) and PAR_Fan1B_Damp (for Case 2) controlling CRPAR fan flow to match the test data. The final positions of the CRPAR Fan 1A and 1B control dampers was found to be 55.80 degrees and 52.48 degrees, respectively, from the duct centerline. All other dampers were in their wide open positions with the certified fan curve from the manufacturer. No other model modifications were made when performing the benchmark.

The benchmark agreement with test data is shown in Table 5 with the associated filter differential pressure. Applicable PROTO-HVAC output reports for the benchmark cases were taken from CRPAR-DP-BENCH.DBD (Dated: 9/23/2009 11:44 AM, Size: 564 KB) and are included in Attachment A.

Table 5: Benchmark Cases 1 and 2 (Trains A and B Operating Independently)

	Flow (ACFM)	Density (lbm/ft3)	Flow (SCFM)	2007 Test Filter DP (in WC)	Model Filter DP (in WC)	DP Percent Error (%)
Train A (Bench Case 1)	2384.67	0.0740	2352.87	1.1	1.1261	2.373
Train B (Bench Case 2)	2479.51	0.0739	2443.14	1.3	1.3310	2.385

6.2 CALCULATED FLOW WITH CLEAN FILTER COMPONENTS

Cases 3 and 4 serve as the normal operating cases for each train with clean filters. It should be noted that under design Post Accident Recirculation conditions, with clean filters, Train A runs at 2,396.46 SCFM and Train B runs at 2,494.99 SCFM. These flows are within the design ±10% range, and will not increase beyond these values. These flow rates were obtained using clean filters which resulted in the following observed pressure drops across the filter components shown in Table 6. The data for this case was taken from CRPAR-DP-CLEAN.DBD (Dated: 9/23/2009 12:08 PM, Size 560 KB), and complete analysis results are provided in Attachment B.

Table 6: Single Fan Operation, Clean Filters (Cases 3 and 4)

	Flow (ACFM)	Density lbm/ft^3	Flow (SCFM)	Filter Component dPs (in WC)			Total Filter DP (in WC)
				Prefilter	HEPA	Charcoal	
A Train (Case 3)	2428.84	0.0740	2396.46	0.0195	0.1506	0.5667	0.7368
B Train (Case 4)	2532.13	0.0739	2494.99	0.0211	0.1631	0.6144	0.7986

ZACHRY NUCLEAR ENGINEERING, INC	CALC NO. 09-047	REV A	PAGE 12 OF 18
GROTON, CONNECTICUT	ORIGINATOR Christopher J. Forrest		DATE 10/1/2009
	VERIFIED BY Stuart R. Douglass		JOB NO. 051470
CLIENT Dominion Energy Kewaunee, Inc	PROJECT HVAC Calculations		
TITLE Control Room Post Accident Recirculation Filter Pressure Drop			

6.3 MAXIMUM DP WITH DIRTY FILTER COMPONENTS

The results from the minimum flow analysis, Cases 5 and 6, are shown below in Table 7. The analysis was iterated by varying the component resistances for the prefilter and HEPA filter components, based on Assumption 3.2.1, until the minimum flow of 2250SCFM was achieved for each train. The data for this case was taken from CRPAR-DP-DIRTY.DBD (Dated: 9/23/2009 1:00 PM, Size 564 KB), and complete analysis results are provided in Attachment B.

Table 7: Minimum Flow of 2250 SCFM with Dirty Filters (Cases 5 and 6)

	Flow (ACFM)	Density (lbm/ft^3)	Flow (SCFM)	Filter Component dPs (in WC)			Total Filter DP (in WC)
				Prefilter	HEPA	Charcoal	
A Train (Case 5)	2283.51	0.0739	2250.02	0.1732	1.3275	0.5009	2.0016
B Train (Case 6)	2289.71	0.0737	2250.02	0.2721	2.0860	0.5024	2.8605

Using the normal operation case as a starting point, the component resistances for the prefilter, and HEPA filter of each train were increased in PROTO-HVAC to simulate dirtying of the filter assemblies. The resistances continued to be refined until the minimum design flow was achieved through each CRPAR fan. As shown in Table 7, this yielded an A Train HEPA DP of 1.3275 in WC and a total filter DP of 2.0016 in WC, and a B Train HEPA DP of 2.0860 in WC and a total filter DP of 2.8605 in WC. The calculated dirty total filter DPs, corrected to the design flow using Equation 2 are 2.4711 in WC for the A Train, and 3.5314 in WC for the B Train. It should be noted that none of the filter component DPs reached their vendor recommended design limits for filter replacement as required in Section 4.2. Based on these results the Dirty A train is the bounding train for allowable component DPs.

6.4 CRPAR FAN MOTOR EVALUATION

Using the methodology in Section 4.1.5 and drive efficiency assumed to equal 1.0 (Assumption 3.2.7), the rated motor horsepower (Design Input 3.1.13) must be greater than the brake horsepower of the fan at minimum flow (4.8 hp @ 2250 SCFM, Design Input 3.1.11).

The required motor horsepower was found to be 4.8 HP at a flow of 2250 SCFM. This value is below the maximum horsepower rating of the motor 9.2 HP (Design Input 3.1.13).

It is noted that the motor speed reported on the A-C Motor Performance Curves is 3510 rpm, where as the operating speed of the fan, as reported on the fan curve, is 3450 rpm. This difference is considered to be insignificant for the purposes of this evaluation, and will not have an appreciable effect on the results.

ZACHRY NUCLEAR ENGINEERING, INC	CALC NO. 09-047	REV A	PAGE 13 OF 18
GROTON, CONNECTICUT	ORIGINATOR Christopher J. Forrest		DATE 10/1/2009
	VERIFIED BY Stuart R. Douglass		JOB NO. 051470
CLIENT Dominion Energy Kewaunee, Inc	PROJECT HVAC Calculations		
TITLE Control Room Post Accident Recirculation Filter Pressure Drop			

7.0 CONCLUSIONS AND RECOMMENDATIONS

7.1 SUMMARY OF CRPAR FILTER PRESSURE DROP LIMIT BASES

7.1.1 Current Technical Specification Limits

The current Technical Specification for the CRPAR filter units (Reference 5.13) states that the pressure drop across the combined HEPA filters and charcoal adsorber banks must be less than 6 inches of water and the pressure drop across any HEPA bank must be less than 4 inches of water at the system design flow rate (± 10%).

7.1.2 CRPAR Fan Maximum Static Pressure

Section 4.6 of Reference 5.17 provides design pressure requirements for air-cleaning units and components that must withstand fan peak pressure. Reference 5.5 shows that the CRPAR filters are on the inlet side of their respective CRPAR fans. The design requirement provided by Reference 5.17 states that air-cleaning units and components located on the inlet side of fans which can be isolated by closure of an upstream damper, or potentially plugged components shall be designed to withstand a negative internal pressure equal to or more negative than the peak pressure of the fans.

The certified CRPAR fan curve, included in Attachment D, shows the static pressure of the fan at shutoff to be 12.348 in WC, at standard conditions. This value is greater than static pressures within the operating flow region of the fan. Therefore, 12.348 in WC at 0 SCFM of flow is the maximum static pressure of the CRPAR Fan. The CRPAR fan design point of 6.00 in WC (6.12 in WC total pressure) at 2500 SCFM, shown in Reference 5.7, is within 0.04 in WC of the fan curve included in Attachment D.

7.1.3 CRPAR Fan Motor Evaluation

The CRPAR fan motor size was evaluated to be acceptable based on the requirements of the fan. The motor horsepower from Design Input 3.1.13 was found to be greater than the brake horsepower of the fan required at minimum flow (Design Input 3.1.11).

The required motor horsepower was found to be 4.8 HP at a flow of 2250 SCFM. This value is below the maximum power rating of the motor (9.2 HP).

It is noted that the motor speed reported on the A-C Motor Performance Curves is 3510 rpm, where as the operating speed of the fan, as reported on the fan curve, is 3450 rpm. This difference is considered to be insignificant for the purposes of this evaluation, and will not have an appreciable effect on the results.

ZACHRY NUCLEAR ENGINEERING, INC GROTON, CONNECTICUT	CALC NO. 09-047	REV A	PAGE 14 OF 18
	ORIGINATOR Christopher J. Forrest		DATE 10/1/2009
	VERIFIED BY Stuart R. Douglass		JOB NO. 051470
CLIENT Dominion Energy Kewaunee, Inc	PROJECT HVAC Calculations		
TITLE Control Room Post Accident Recirculation Filter Pressure Drop			

7.1.4 Vendor Recommended Pressure Drop for Filter Replacement

The vendor technical manual for the FARR CRPAR filter assembly (Reference 5.6) recommends the following pressure drop limits for which filter components should be replaced:

Prefilter: 0.5 in WC

HEPA Filter: 3.0 in WC

Charcoal Adsorber: N/A

The maximum total pressure drop across the CRPAR filter, applying the vendor recommended DP information would be 4.1 in WC. This includes the above Prefilter and HEPA DPs plus the clean DP value of 0.6 at 2500 SCFM for the charcoal adsorber bank (Design Input 3.1.3 and 3.1.7). There is no recommended replacement DP listed in the filter vendor technical manual for the charcoal adsorber DP, suggesting that charcoal filter life is not monitored by DP. This is consistent with Assumption 3.2.2 stating that the charcoal adsorber DP was not increased for this analysis.

Enclosure, Q&A to Attachment 1, Volume 16 (Chapter 5.0) 126 of 169

ZACHRY NUCLEAR ENGINEERING, INC	CALC NO. 09-047	REV A	PAGE 15 OF 18
GROTON, CONNECTICUT	ORIGINATOR Christopher J. Forrest		DATE 10/1/2009
	VERIFIED BY Stuart R. Douglass		JOB NO. 051470
CLIENT Dominion Energy Kewaunee, Inc	PROJECT HVAC Calculations		
TITLE Control Room Post Accident Recirculation Filter Pressure Drop			

7.2 SUMMARY OF PROTO-HVAC ANALYSIS RESULTS

BENCHMARK:	Flow (ACFM)	Density (lbm/ft3)	Flow (SCFM)	2007 Test Filter dP (in WC)	Model Filter dP (in WC)	dP Percent Error (%)
Train A (Bench Case 1)	2384.67	0.0740	2352.87	1.1	1.1261	2.373
Train B (Bench Case 2)	2479.51	0.0739	2443.14	1.3	1.3310	2.385

CLEAN:	Flow (ACFM)	Density (lbm/ft3)	Flow (SCFM)	Filter Component dPs (in WC)			Total Filter DP (in WC)
				Prefilter	HEPA	Charcoal	
A Train (Case 3)	2428.84	0.0740	**2396.46**	0.0195	0.1506	0.5667	0.7368
B Train (Case 4)	2532.13	0.0739	**2494.99**	0.0211	0.1631	0.6144	0.7986

DIRTY:	Flow (ACFM)	Density (lbm/ft3)	Flow (SCFM)	Filter Component dPs (in WC)			Total Filter DP (in WC)
				Prefilter	HEPA	Charcoal	
A Train (Case 5)	2283.51	0.0739	2250.02	0.1732	1.3275	0.5009	**2.0016**
B Train (Case 6)	2289.71	0.0737	2250.02	0.2721	2.0860	0.5024	**2.8605**

After reviewing the clean case and dirty case of the Post Accident Recirculation filter analyses, it is recommended that the maximum allowable DP for filter component replacement be updated with the values found in this calculation. The maximum allowable total filter DP for a minimum design flow of 2250 SCFM was found to be 2. 0016 in WC for the A Train and 2.8605 in WC for the B Train. The calculated dirty total filter DPs, corrected to the design flow using Equation 2 are 2.4711 in WC for the A Train, and 3.5314 in WC for the B Train. These values bound the flow within its design limit and meet the acceptance criteria of Section 4.2.

The results are based on the as-modeled configuration which was benchmarked to test data included in Attachment A.

7.3 RECOMMENDATIONS

Consideration should be given to updating test procedures to reflect the maximum allowable filter DPs found by this analysis.

7.4 ACCEPTANCE CRITERIA

7.4.1 The flow rate of model cases which represent clean CRPAR filter assemblies should not exceed the maximum allowable flow rate of 2750 SCFM (Design Input 3.1.1, Assumption 3.2.5).

For the clean filter cases, the results met the acceptance criteria above and in Section 4.2.1. As shown in Section 6.2, the calculated filter flows with clean filter components were below the maximum allowable flow rate.

7.4.2 The maximum allowed DP, for the minimum allowable flow rate of 2250 SCFM (Design Input 3.1.1, Assumption 3.2.5), of dirtied CRPAR filters should not exceed the vendor recommended replacement pressure drops of 0.5 for the Prefilter and 3.0 for the HEPA filter (Design Input 3.1.10).

For the dirty filter cases, the results met the acceptance criteria above and in Section 4.2.2. As shown in Section 6.3, when the filters were dirtied from the benchmark flow rate, the minimum flow rate was reached before the DP exceeded the maximum DP listed in the vendor tech manual. See Section 7.3 for recommendation on more appropriate filter DP limits for replacement, based on this analysis.

7.5 IMPACT TO SYSTEMS, STRUCTURES AND COMPONENTS

This calculation impacts the Control Room Air Conditioning (ACC) System Post Accident Recirculation (CRPAR) filter maximum DP. No system, structure, or component is impacted by this calculation since the calculation does not require a change to the physical plant.

ZACHRY NUCLEAR ENGINEERING, INC GROTON, CONNECTICUT	CALC NO. 09-047	REV A	PAGE 17 OF 18
	ORIGINATOR Christopher J. Forrest		DATE 10/1/2009
	VERIFIED BY Stuart R. Douglass		JOB NO. 051470
CLIENT Dominion Energy Kewaunee, Inc	PROJECT HVAC Calculations		
TITLE Control Room Post Accident Recirculation Filter Pressure Drop			

7.6 CONSERVATIVENESS OF CALCULATION AND AVAILABLE MARGIN

The table below shows a comparison between clean and dirty DPs at a reference flow of 2500 SCFM.

	Flow (SCFM)	dP at specified flow (in WC)	**dP at 2500 SCFM (in WC)**
A Train clean HEPA	2396.46	0.1506	**0.1639**
A Train dirty HEPA	2250.02	1.3275	**1.6389**
A Train Total Clean DP	2396.46	0.7368	**0.8018**
A Train Total Dirty DP	2250.02	2.0016	**2.4711**
B Train clean HEPA	2494.99	0.1631	**0.1638**
B Train dirty HEPA	2250.02	2.0860	**2.5753**
B Train Total Clean DP	2494.99	0.7986	**0.8018**
B Train Total Dirty DP	2250.02	2.8605	**3.5314**

7.7 UNCERTAINTY OF RESULTS

Benchmarking results are shown in Table 5, and in Section 7.2. The benchmark results show a percent difference of about 2.5% for each train between plant data and model performance. The benchmark results are based on the surveillance procedure CRPAR filter test results in Attachment A. However, the results of this test may no longer be valid due to equipment degradation that may have occurred since it was performed.

An uncertainty analysis was not performed for this calculation. Uncertainty may either be covered in the licensing basis or calculated in another calculation if needed in the future.

7.8 CONSISTENCY WITH DESIGN AND OPERATION OF PLANT

Plant procedures should be updated to reflect the maximum allowable differential pressures across the CRPAR filter assemblies at the design flow rate.

7.9 IMPACTED PROCEDURES AND DOCUMENTS

SP-25-119A, "Control Room Post Accident (CRPA) Train A Recirculation Filter Assembly Testing", Revision 3

ZACHRY NUCLEAR ENGINEERING, INC GROTON, CONNECTICUT	CALC NO. 09-047	REV A	PAGE 18 OF 18
	ORIGINATOR Christopher J. Forrest		DATE 10/1/2009
	VERIFIED BY Stuart R. Douglass		JOB NO. 051470
CLIENT Dominion Energy Kewaunee, Inc	PROJECT HVAC Calculations		
TITLE Control Room Post Accident Recirculation Filter Pressure Drop			

SP-25-119B, "Control Room Post Accident (CRPA) Train B Recirculation Filter Assembly Testing", Revision 3

SP-25-263A, "Control Room Post Accident Recirc Train A Operability Test", Revision K.

SP-25-263B, "Control Room Post Accident Recirc Train B Operability Test", Revision K.

7.10 OPEN ITEMS (NEW OF CLOSURE)

The results of this calculation will contribute to resolving CA128817 (CR323062).

ZACHRY NUCLEAR ENGINEERING, INC.
CALCULATION TITLE SHEET

CLIENT: Dominion Energy Kewaunee, Inc

PROJECT: HVAC Calculations

CALCULATION TITLE: Zone Special Ventilation Exhaust

KPS CALCULATION NO.: 12104 Revision 1

ZACHRY CALCULATION NO.: 09-041 Revision A

JOB NO.: 051470

COMPUTER CODE & VERSION (if applicable): PROTO-HVAC v. 1.01

ZACHRY NUCLEAR ENGINEERING, INC. PROPERTY CODE (if applicable): 000550

QA CLASSIFICATION: Safety Related ☒ **Yes** ☐ **No**

REV	TOTAL NO. OF PAGES	ORIGINATOR/DATE	VERIFIER/DATE	APPROVAL/DATE
1	393	Jason Cody 10/9/09 Jason Cody	10/9/09 Michael Norwood	10/13/09 Christopher M. D'Angelo

** DO NOT REVISE THIS CALCULATION **

**OBTAIN ORIGINAL FROM CLIENT **

ZACHRY NUCLEAR ENGINEERING, INC GROTON, CONNECTICUT	CALC NO. 12104	REV 1	PAGE ii OF v
	ORIGINATOR Jason A. Cody		DATE October 9, 2009
	VERIFIED BY Michael A. Norwood		JOB NO. 051470
CLIENT Dominion Energy Kewaunee, Inc	PROJECT HVAC Calculations		
TITLE Zone Special Ventilation Exhaust			

Revision History

Revision	Revision Description
0	Original Issue
1	Revised to determine maximum allowed dP for HEPA and Charcoal filters at tech spec flow rates through the modification of the PROTO-HVAC model developed in 08-050C. Modifications made to the PROTO-HVAC model developed in 08-050C consist of: • Appropriate nodes and duct sections were added to explicitly model the prefilter, cooling coil, HEPA filter, and charcoal filter components of the AHU filter assemblies. • Reran benchmark cases with filter pressure drop values taken from test data. • Deleted all analysis cases. • Added analysis cases 3 through 8 as described in Section 4. • Modified the ASV System exhaust fan performance curve to match the curve from KPS Purchase Order (PO) file K-362. The fan curve from KPS PO file K-362 is included in Attachment H. This calculation is identified as 12104 Revision 1 throughout. This calculation is identified in Zachry Nuclear Engineering's calculation database as 09-041 Revision A as identified here and on the Zachry Nuclear Engineering Calculation Cover Sheet (Page i). This calculation is being revised under Task Release Number 2.0256.6 as clarified by Proto-Power Proposal No. 010KWE-P033 dated July 13, 2007. As such, this calculation revision has been developed under Zachry Nuclear Engineering's Nuclear Quality Assurance Program and formatted in accordance with Dominion Procedure GNP-04.03.04, Revision 12. Owner Acceptance Material is to be completed and incorporated by Dominion.

Enclosure, Q&A to Attachment 1, Volume 16 (Chapter 5.0) 132 of 169

ZACHRY NUCLEAR ENGINEERING, INC GROTON, CONNECTICUT	CALC NO. 12104	REV 1	PAGE iii OF v
	ORIGINATOR Jason A. Cody		DATE October 9, 2009
	VERIFIED BY Michael A. Norwood		JOB NO. 051470
CLIENT Dominion Energy Kewaunee, Inc	PROJECT HVAC Calculations		
TITLE Zone Special Ventilation Exhaust			

CALCULATION VERIFICATION FORM

1. VERIFICATION METHOD:

	Yes	N/A
A. Approach Checked	☒	
B. Logic Checked	☒	
C. Arithmetic Checked	☒*	☐
D. Alternate Method (Provide documentation)	☐*	☒
E. Other	☐*	☒

*Describe below.

2. EXTENT OF VERIFICATION:

Complete calculation (including attachments /appendices) has been reviewed to determine impact of revision on un-revised areas.

A. IDV of Complete calculation (including attachments/appendices). ☒

B. IDV of revised areas of Calculation only. ☐

C. Other (describe below): ☐

3. DOCUMENTATION OF VERIFICATION

A. IDV documentation as attachment with Calc ☒

B. IDV documentation forwarded to QA ☐

C. IDV documentation is this form and any continuation pages only. ☐

Errors Detected
See Attachment J.

Error Resolution
See Attachment J.

*Verification Method:
Hand calculation of % Errors and calculated SCFM contained in Tables 1, 2, and 3 was performed. The approach, logic, and methodology were reviewed. The inputs were verified and determined to be appropriate. The results and conclusions were verified to be reasonable and appropriate.

Other Comments

Extra References Used

(Attach extra sheets if needed (Use Form P030114))
THE APPROACH, LOGIC, AND METHODOLOGY OF THE CALCULATION IS ACCEPTABLE. THE **GUIDELINES DEFINED IN PARA. 7.5.4** (AS APPLICABLE) OF P 3-1 HAVE BEEN MET. THE OVERALL CALCULATION IS FOUND TO BE VALID AND CONCLUSIONS TO BE CORRECT AND REASONABLE:

IDV Signature: ____________ Printed Name: Michael Norwood Date: 10/9/09

Form No.: P030103 sheet 1 of 1 Rev.: 0-01 Date: 5/09 Ref.: P 3-1

ZACHRY NUCLEAR ENGINEERING, INC GROTON, CONNECTICUT	CALC NO. 12104	REV 1	PAGE iv OF v
	ORIGINATOR Jason A. Cody		DATE October 9, 2009
	VERIFIED BY Michael A. Norwood		JOB NO. 051470
CLIENT Dominion Energy Kewaunee, Inc	PROJECT HVAC Calculations		
TITLE Zone Special Ventilation Exhaust			

TABLE OF CONTENTS

Enclosure, Q&A to Attachment 1, Volume 16 (Chapter 5.0) 134 of 169

ZACHRY NUCLEAR ENGINEERING, INC GROTON, CONNECTICUT	CALC NO. 12104	REV 1	PAGE v OF v
	ORIGINATOR Jason A. Cody		DATE October 9, 2009
	VERIFIED BY Michael A. Norwood		JOB NO. 051470
CLIENT Dominion Energy Kewaunee, Inc	PROJECT HVAC Calculations		
TITLE Zone Special Ventilation Exhaust			

	LIST OF ATTACHMENTS	
Attachment	**Subject Matter**	**Total Pages**
A	Calculation 12104, Revision 1 – Benchmark Data	59
B	Calculation 12104, Revision 1 – Operation with Clean Filters	107
C	Calculation 12104, Revision 1 – Operation at 8,100 Scfm (Maximum Allowable Filter DP)	107
D	Calculation 12104, Revision 1 – Pioneer "Apparatus Data for Filter Assembly"	16
E	Calculation 12104, Revision 1 – Vendor Technical Manual FARR-0001	30
F	Calculation 12104, Revision 1 – VISIO Schematic	3
G	Calculation 12104, Revision 1 – Technical References	11
H	Calculation 12104, Revision 1 – ASV System Exhaust Fan Curve	2
I	Calculation 12104, Revision 1 – ASV System Work Orders	5
J	Calculation 12104, Revision 1 – IDV Comments	8
K	Calculation 12104, Revision 1 – Client Comments	17

Total number of pages in Attachments	365
Complete Calculation (total number of pages)	393

Enclosure, Q&A to Attachment 1, Volume 16 (Chapter 5.0) 135 of 169

ZACHRY NUCLEAR ENGINEERING, INC GROTON, CONNECTICUT	CALC NO. 12104	REV 1	PAGE 1 OF 23
	ORIGINATOR Jason A. Cody		DATE October 9, 2009
	VERIFIED BY Michael A. Norwood		JOB NO. 051470
CLIENT Dominion Energy Kewaunee, Inc	PROJECT HVAC Calculations		
TITLE Zone Special Ventilation Exhaust			

1.0 PURPOSE

The purpose of this calculation is to determine the Auxiliary Building Special Ventilation System (ASV) flow rates with clean filters and to determine the maximum allowable pressure drops for the filter components based on minimum flow requirements. The filter assemblies are identified on Reference 5.3 as component numbers 169-081 and 169-082 for Train A and Train B, respectively.

This calculation will also evaluate the motor horsepower requirements for the ASV System exhaust fans to verify that the motors are not overloaded when operating with filter assemblies at the maximum allowable pressure drops. The fans are identified on Reference 5.3 as component numbers 132-201 and 132-202 for Train A and Train B, respectively.

2.0 BACKGROUND

The original calculation 12104 produced by Pioneer Service & Engineering Co. calculated pressure drops at flow rates above that which the Tech Specs allow. In addition, the minimum flow allowed by Tech Specs was not addressed. It is noted, however, that the original calculation was the basis for the fan and motor selection for the ASV System and was based on the total system pressure.

The manufacturer's fan curve from Reference 5.35 is included as Attachment H.

3.0 INPUTS AND ASSUMPTIONS

3.1 INPUTS

3.1.1 Per Reference 5.3, each train of the ASV System is designed to provide an airflow rate of 9,000 Scfm.

3.1.2 The maximum allowable airflow rate is 9,900 Scfm per Reference 5.1 based on charcoal adsorber residence time requirements.

3.1.3 Duct physical geometry, component information, and boundary conditions were obtained from References 5.3 through 5.13 and 5.23.

3.1.4 Test data for the ASV System is provided by References 5.14 and 5.34.

Enclosure, Q&A to Attachment 1, Volume 16 (Chapter 5.0) 136 of 169

3.1.5 The pressure drop across a clean prefilter is 0.07 in wg at 1,150 Scfm per Reference 5.18.

3.1.6 The pressure drop across a clean charcoal adsorber is 1.0 in wg at 333 Scfm per Reference 5.18.

3.1.7 The rated capacity for the ASV HEPA filters is 1,000 Scfm per Reference 5.20 which yields a resistance of 1.0 in wg per Reference 5.19.

3.1.8 There are nine required prefilters arranged in parallel per Reference 5.23. The resulting pressure drop across this arrangement of clean prefilters is 0.07 in wg at 10,350 Scfm which is equivalent to 0.05 in wg at the design flow rate of 9,000 Scfm based on the ratio of the flows squared.

3.1.9 Both the upstream and downstream HEPA filter sections consist of nine HEPA filters arranged in parallel per Reference 5.23. The resulting pressure drop across this arrangement of clean HEPA filters is 1 in wg at 9,000 Scfm.

3.1.10 There are 27 required charcoal adsorbers arranged in parallel per Reference 5.23. The resulting pressure drop for this arrangement of clean charcoal adsorbers is 1 in wg at 8,991 Scfm.

3.1.11 The electric heating coil has a resistance of 0.1 in wg at 9,000 Scfm per Reference 5.18.

3.1.12 The manufacturer's recommended replacement pressure drop for the prefilter and HEPA filter components is 0.5 in wg and 3 in wg, respectively (Ref. 5.20). Charcoal adsorbers are not replaced based on the pressure drop across the adsorber (Ref. 5.20).

3.1.13 The performance curve for the ASV System exhaust fan is from Reference 5.35.

3.1.14 The ASV System exhaust fan is a vaneaxial fan directly connected to a 25 hp motor with a maximum motor load of 29 hp inclusive of the service factor (Ref. 5.37).

3.1.15 An uncertainty analysis is not performed for this calculation because instrument uncertainty is not included with the test data. Uncertainty may either be addressed in the licensing basis or determined in another calculation if needed in the future.

Enclosure, Q&A to Attachment 1, Volume 16 (Chapter 5.0) 137 of 169

3.2 ASSUMPTIONS

3.2.1 It is assumed that the filter housing sections between the filters offer negligible resistance and are therefore modeled as extensions of the filters.

3.2.2 It is assumed that particulate debris is captured by the prefilter and HEPA filter located upstream of the charcoal adsorber. This assumption is considered appropriate based on the following:

- Prefilters are required when inlet particulate concentration and particle size could render the HEPA filter ineffective prematurely and are recommended when it is desired to increase HEPA filter life (Ref. 5.2). Therefore, the purpose of the prefilter is to prevent excessive particulate loading of the HEPA filter.

- HEPA filters are required when filtration of inlet particulate matter requires a minimum efficiency of 99.97% for particles equal to 0.3 micrometer in size (Ref. 5.2). Therefore, any appreciable particulate loading will occur in the prefilter and HEPA filter upstream of the charcoal adsorber.

3.2.3 It is assumed that the pressure drop across the charcoal adsorber does not increase over time. This assumption is based on 99.97% of inlet particles equal to 0.3 micrometer in size (or larger) being removed from the inlet airstream by the prefilter and upstream HEPA filter. In addition, Reference 5.20 does not specify a replacement pressure drop for the charcoal adsorber indicating that particulate loading is not a factor in determining the service life of the adsorber. Therefore, it is reasonable to expect that there will be no appreciable increase in pressure drop across the charcoal adsorber due to particulate loading.

3.2.4 It is assumed that the pressure drop across the heating coil does not increase over time. This assumption is based on the heating coil being located downstream of the prefilter and the geometry of the coil as shown on Reference 5.23. The heating coil is not expected to collect particulate matter to the point at which the resistance to airflow will increase appreciably.

3.2.5 It is assumed that the pressure drop of the HEPA filter downstream of the charcoal adsorber will increase over time due to the collection of charcoal fines from the adsorber. This assumption is based on the Reference 5.2 requirement to provide filtration downstream of adsorbers used in ESF air-cleaning units.

Enclosure, Q&A to Attachment 1, Volume 16 (Chapter 5.0) 138 of 169

ZACHRY NUCLEAR ENGINEERING, INC GROTON, CONNECTICUT	CALC NO. 12104	REV 1	PAGE 4 OF 23
	ORIGINATOR Jason A. Cody		DATE October 9, 2009
	VERIFIED BY Michael A. Norwood		JOB NO. 051470
CLIENT Dominion Energy Kewaunee, Inc	PROJECT HVAC Calculations		
TITLE Zone Special Ventilation Exhaust			

3.2.6 It is assumed that the system experiences no infiltration and is running in 100% recirculation. This assumption is considered appropriate and conservative based on the following:

- The system normally operates with some amount of exhaust flow leaving the system through the Auxiliary Building vent stack and some amount of recirculation flow being discharged back into the Zone SV. These flow paths are essentially parallel flow paths on the discharge side of the fans. If one of the discharge flow paths is blocked-off, the system flow rate must necessarily decrease because the fan is now trying to push all of the flow through only one path. In other words, the system resistance downstream of the fan has increased. The system's tolerance for upstream resistance will be less when the downstream resistance has increased. Therefore, the allowable filter pressure drop will be lower when the system operates in recirculation mode in order to maintain fan output above 8,100 Scfm and the assumption is conservative.

- It is reasonable to expect that the resistances on the upstream side of the fans (including the filters) will predominate for this system because there is very little ductwork downstream of the fans. Therefore, the results of the calculation are less sensitive to the downstream resistance than they are to the upstream resistance. This is demonstrated by the close agreement between the test data of References 5.14 and 5.34 and the results of the benchmark cases.

3.2.7 Since no infiltration is assumed, the hot chemical lab and sample room area shown on Reference 5.3 is not part of the flow path.

3.2.8 It is assumed that the conditions in the SV equipment room area, where the ASV System discharges to, are 68°F and 50% relative humidity. Per Reference 5.16, these are the standard air conditions with a corresponding air density of 0.075 lb_m/ft^3.

3.2.9 It is assumed that the tolerance for the system flow rate is ± 10%. This assumption is based on the system flow rate tolerance provided in Reference 5.24.

Enclosure, Q&A to Attachment 1, Volume 16 (Chapter 5.0) 139 of 169

ZACHRY NUCLEAR ENGINEERING, INC GROTON, CONNECTICUT	CALC NO. 12104	REV 1	PAGE 5 OF 23
	ORIGINATOR Jason A. Cody		DATE October 9, 2009
	VERIFIED BY Michael A. Norwood		JOB NO. 051470
CLIENT Dominion Energy Kewaunee, Inc	PROJECT HVAC Calculations		
TITLE Zone Special Ventilation Exhaust			

4.0 METHODOLOGY AND ACCEPTANCE CRITERIA

4.1 METHODOLOGY

This calculation has been developed using PROTO-HVAC Version 1.01. The PROTO-HVAC software was developed and validated in accordance with Zachry's Nuclear Software Quality Assurance Program (SQAP), Reference 5.22. This program meets the requirements of 10CFR50 Appendix B, 10CFR21, and ANSI NQA-1, and was developed according to the guidelines and standards contained in ANSI/IEEE Standard 730/1984 and ANSI NQA-2b-1991.

The creation of the ASV System model database consisted of the following steps:

1. The ASV System model from Reference 5.21 was modified for use in this calculation. The filter assemblies are modeled in 08-050C as single duct sections using a measured pressure drop as the total filter resistance. This calculation models the individual filter components with varying pressure drop values depending on the case alignment. A VISIO schematic of the system is provided in Attachment F.

2. Prefilter, HEPA, and charcoal adsorber duct sections were added in place of the filter assembly duct section from the previous database according to Reference 5.23.

3. Perform runs to benchmark the model against test data. The following case alignments contained in PROTO-HVAC file 12104_BENCHMARK.DBD are used for benchmarking.

   Case 1: A Train Benchmarking

   Case 2: B Train Benchmarking

   Pressure drop data recorded in References 5.14 and 5.34 for the individual filter components are entered in the PROTO-HVAC file in order to match the condition of the system at the time it was tested.

Enclosure, Q&A to Attachment 1, Volume 16 (Chapter 5.0) 140 of 169

ZACHRY NUCLEAR ENGINEERING, INC GROTON, CONNECTICUT	CALC NO. 12104	REV 1	PAGE 6 OF 23
	ORIGINATOR Jason A. Cody		DATE October 9, 2009
	VERIFIED BY Michael A. Norwood		JOB NO. 051470
CLIENT Dominion Energy Kewaunee, Inc	PROJECT HVAC Calculations		
TITLE Zone Special Ventilation Exhaust			

4. Perform runs for two train and single train operation with clean filter resistances as specified in References 5.18 through 5.20. These cases will verify that the flow rate through each filter assembly does not exceed 9,000 Scfm +10%, or 9,900 Scfm (see Input 3.1.1 and Assumption 3.2.9) with clean filters installed in the system. System flow rates will be highest when clean filters are installed in the system because clean filters have less resistance to flow. The following case alignments contained in PROTO-HVAC file 12104_CLEAN.DBD are used to evaluate system flow rates with clean filters.

   Case 3: A Train Clean

   Case 4: B Train Clean

   Case 5: 2 Train Clean

5. Perform runs for two train and single train operation to determine the maximum allowable filter pressure drops based on a minimum flow rate of 9,000 Scfm -10%, or 8,100 Scfm (see Input 3.1.1 and Assumption 3.2.9) through each filter assembly. The flow rate through a filter is varied by increasing component resistances for each filter assembly until the target flow rate is met. The prefilter and HEPA filter resistances upstream of the charcoal adsorber are increased to the manufacturer's recommended replacement values to simulate particulate loading (see Assumption 3.2.2) and the resistance of the HEPA filter downstream of the charcoal adsorber is increased until flow drops to 8,100 Scfm. The following case alignments contained in PROTO-HVAC file 12104_8100.DBD are used to find the maximum allowable filter pressure drops.

   Case 6: A Train 8,100 SCFM

   Case 7: B Train 8,100 SCFM

   Case 8: 2 Train 8,100 SCFM

It is noted that a unique PROTO-HVAC file is required for each flow rate evaluated since component resistance is not a case related parameter. Therefore, component resistances can not be varied between cases within a single PROTO-HVAC file.

Enclosure, Q&A to Attachment 1, Volume 16 (Chapter 5.0) 141 of 169

ZACHRY NUCLEAR ENGINEERING, INC GROTON, CONNECTICUT	CALC NO. 12104	REV 1	PAGE 7 OF 23
	ORIGINATOR Jason A. Cody		DATE October 9, 2009
	VERIFIED BY Michael A. Norwood		JOB NO. 051470
CLIENT Dominion Energy Kewaunee, Inc	PROJECT HVAC Calculations		
TITLE Zone Special Ventilation Exhaust			

The PROTO-HVAC output reports list volume flow rates in Acfm as opposed to Scfm. Therefore, mass flow rates are used to calculate volume flow rates in Scfm using the following equation adapted from page 2.2 of Reference 5.25:

$$Q_s = \frac{\dot{m}\,(60\,s/\min)}{\rho_s} \qquad \text{(Eq. 1)}$$

Where,

Q_s ≡ standard volume flow rate (Scfm)

$\dot{m}$ ≡ air mass flow rate, lb_m/s

ρ_s ≡ air density at standard conditions, 0.075 lb_m/ft^3 (see Assumption 3.2.8)

<u>Motor Horsepower</u>

Since the motor is directly coupled to the fan, the motor power output will be the same as the fan brake horsepower. Therefore, the required motor horsepower is read directly from the horsepower curve from Reference 5.35. The maximum required horsepower occurs at minimum flow.

Enclosure, Q&A to Attachment 1, Volume 16 (Chapter 5.0) 142 of 169

ZACHRY NUCLEAR ENGINEERING, INC GROTON, CONNECTICUT	CALC NO. 12104	REV 1	PAGE 8 OF 23
	ORIGINATOR Jason A. Cody		DATE October 9, 2009
	VERIFIED BY Michael A. Norwood		JOB NO. 051470
CLIENT Dominion Energy Kewaunee, Inc	PROJECT HVAC Calculations		
TITLE Zone Special Ventilation Exhaust			

4.2 ACCEPTANCE CRITERIA

Performance of the system with clean filters is evaluated to ensure that the maximum achievable system flow rate does not exceed 9,000 Scfm +10%, or 9,900 Scfm. The maximum allowable system flow rate from Reference 5.1 is 9,900 Scfm based on charcoal adsorber residence time.

Performance of the system with dirty filters is evaluated to ensure that the minimum achievable system flow rate does not drop below the minimum allowable system flow rate. The minimum allowable system flow rate is 8,100 Scfm based on the design flow rate -10%. The recommended overall filter assembly pressure drop is based on the limiting train, A or B, in order to provide one set of values.

In addition, pressure drops across individual filter components are evaluated to ensure that manufacturer's recommended replacement pressure drops are not exceeded. Lifetime of the charcoal adsorbers is not measured as a function of their resistance to airflow. Therefore, there is no specific acceptance criterion for the charcoal adsorbers with respect to pressure drop.

The maximum motor load is evaluated at minimum flow conditions to ensure that the required motor horsepower does not exceed the maximum allowable motor load of 29 hp.

Enclosure, Q&A to Attachment 1, Volume 16 (Chapter 5.0) 143 of 169

ZACHRY NUCLEAR ENGINEERING, INC GROTON, CONNECTICUT	CALC NO. 12104	REV 1	PAGE 9 OF 23
	ORIGINATOR Jason A. Cody		DATE October 9, 2009
	VERIFIED BY Michael A. Norwood		JOB NO. 051470
CLIENT Dominion Energy Kewaunee, Inc	PROJECT HVAC Calculations		
TITLE Zone Special Ventilation Exhaust			

5.0 REFERENCES

5.1 Calculation C11858, Allowable Design Airflow Rates Through Charcoal Filters, Revision 0

5.2 ASME Standard N509-2002, Nuclear Power Plant Air-Cleaning Units and Components

5.3 Dominion Drawing M-604, Flow Diagram – Aux Building Zone SV Vent & Air Conditioning, Revision BM

5.4 Dominion Drawing M-627, Ventilation – Aux Bldg. Elevation 657' – 6", Revision AK

5.5 Dominion Drawing M-628, Ventilation – Aux Bldg Elevation 642' – 3", Revision AH

5.6 Dominion Drawing M-630, Ventilation – Aux Bldg. Elevation 606' – 0", Revision AK

5.7 Dominion Drawing M-632, Ventilation – Aux Bldg Elevation 586' – 0", Revision Z

5.8 Dominion Drawing M-640, Ventilation Section & Details, Revision AG

5.9 Dominion Drawing M-641, Ventilation Section & Details, Revision T

5.10 Dominion Drawing M-642, Ventilation Section & Details, Revision T

5.11 Dominion Drawing M-645, Ventilation Section & Details, Revision U

5.12 Dominion Drawing M-683, Ventilation – Auxiliary Building Equipment Location – El 657' – 6", Revision F

5.13 Dominion Drawing A-201, Property Plot Plan, Revision V

5.14 Kewaunee Power Station Work Order KW100278150, PM14-708: Charcoal and HEPA Filter Testing, dated 5/1/09 (see Attachment I)

5.15 SP-14-026A, Auxiliary Bldg Special Ventilation Train A Operability Test, Revision 10

5.16 Zachry Document UD-93948-03, User Documentation (UD) for Ventilation System Thermal Hydraulic Modeling Software - PROTO-HVAC, Revision B

Enclosure, Q&A to Attachment 1, Volume 16 (Chapter 5.0) 144 of 169

ZACHRY NUCLEAR ENGINEERING, INC GROTON, CONNECTICUT	CALC NO. 12104	REV 1	PAGE 10 OF 23
	ORIGINATOR Jason A. Cody		DATE October 9, 2009
	VERIFIED BY Michael A. Norwood		JOB NO. 051470
CLIENT Dominion Energy Kewaunee, Inc	PROJECT HVAC Calculations		
TITLE Zone Special Ventilation Exhaust			

5.17 Kewaunee Power Station Environmental Qualification Plan, Revision 26

5.18 Kewaunee Power Station Purchase Order K-300 (see Attachment D)

5.19 ASME AG-1-2003, Code on Nuclear Air and Gas Treatment (see Attachment G)

5.20 Kewaunee Power Station Vendor Technical Manual FARR-0001 (XK-300-53), Metal Media Filters MZ Type, Revision 4 (see Attachment E)

5.21 Calculation NAI-1380-001, Kewaunee Nuclear Power Plant Auxiliary Building Zone SV Cooling Analysis, Revision 0 (Attachment H thereto, Proto-Power Corporation Calculation 08-050, Aux Building Zone SV Exhaust System PROTO-HVAC Model Development, Revision C)

5.22 Zachry Software Quality Assurance Plan (SQAP) 93948, Revision H

5.23 Dominion Drawing XK-300-8, Zone SV Exh. Filter Assem., Revision E

5.24 Technical Specifications for Kewaunee Power Station, Amendment 206, dated 6/01/2009

5.25 2005 ASHRAE Handbook, Fundamentals (see Attachment G)

5.26 Jorgensen, Robert, ed. *Fan Engineering*. Buffalo: Howden Buffalo Inc., 1999 (see Attachment G)

5.27 U.S. Nuclear Regulatory Commission Generic Letter 99-02, Laboratory Testing of Nuclear-Grade Activated Charcoal, dated June 3, 1999

5.28 U.S. Nuclear Regulatory Commission Generic Letter 99-02 (Errata), dated August 23, 1999

5.29 Letter to Document Control Desk, U.S. Nuclear Regulatory Commission, from Mark E. Reddemann, Site Vice President, Nuclear Management Company, dated November 20, 2000

5.30 NUCON Bulletin 11B31, NUCON Radioiodine Adsorbents, November, 2001 (Revised April, 2006)

5.31 Kewaunee Power Station System Description, System No. 14 Auxiliary Building Special Ventilation and Steam Exclusion (ASV)

5.32 Calculation 100235, Zone SV and Corrected Air Flows, Revision 0

ZACHRY NUCLEAR ENGINEERING, INC GROTON, CONNECTICUT	CALC NO. 12104	REV 1	PAGE 11 OF 23
	ORIGINATOR Jason A. Cody		DATE October 9, 2009
	VERIFIED BY Michael A. Norwood		JOB NO. 051470
CLIENT Dominion Energy Kewaunee, Inc	PROJECT HVAC Calculations		
TITLE Zone Special Ventilation Exhaust			

5.33 Kewaunee Power Station Document SDBD-KPS-ABV, System Design Basis Document for Auxiliary Building Ventilation Systems, Revision 1

5.34 Kewaunee Power Station Work Order KW100275486, PM14-709: Charcoal and HEPA Filter Testing, dated 4/24/09 (see Attachment I)

5.35 Kewaunee Power Station Purchase Order K-362 (see Attachment H)

5.36 2004 ASHRAE Handbook, HVAC Systems and Equipment (see Attachment G)

5.37 Kewaunee Power Station Drawing XK-362-2, SZ 25-1/4-17-1/2-3450, Zone SV Exhaust Fan w/25 HP, Revision 0

Enclosure, Q&A to Attachment 1, Volume 16 (Chapter 5.0) 146 of 169

6.0 CALCULATIONS AND RESULTS

6.1 Benchmark

The model has been benchmarked to match Reference 5.14 and Reference 5.34 test data using the benchmark cases discussed in Section 4. The pressure drops for the various filter components are modeled using test data from References 5.14 and 5.34. PROTO-HVAC has the ability to enter a given differential pressure and flow rate for any component and it then calculates the equivalent component pressure drop coefficient (K). For example, the resistance for the Train A prefilter has been entered in the model as 0.10 in WC at 9,332 Scfm based on the Reference 5.14 test data. The model was then run with all other dampers in their wide open positions. No other model modifications were made when performing the benchmark.

The benchmark agreement with test data for Train A and Train B operation is shown in Table 1. The PROTO-HVAC mass flow rates are converted to volume flow rates in Scfm using equation 1. The PROTO-HVAC fan static pressures (SP) are determined by taking the difference in static pressure between the fan inlet and outlet nodes.

Table 1: Benchmark Results

	Test Results		PROTO-HVAC Results				
Train	Flow (Scfm)	Fan SP (in wg)	m-dot (lb_m/s)	Flow (Scfm)	Fan SP (in wg)	Flow Error (%)	Fan SP Error (%)
A (Case1)	9,332	7.257	11.9256	9,540.5	7.5886	2.23	4.57
B (Case 2)	9,314.3	6.8284	12.2245	9,779.6	7.3183	5.00	7.17

Note: Train A test data is from Reference 5.14 and Train B test data is from Reference 5.34.

The pressure drop data for the individual filter components from References 5.14 and 5.34 are not compared to the results from the benchmark cases since the pressure drop data used in the model are taken directly from the test data. Therefore, any difference in the filter pressure drop values between the benchmark cases and the test data can be attributed to differences in flows.

Applicable PROTO-HVAC output reports for the benchmark cases are generated by 12104_BENCHMARK.DBD and are included in Attachment A.

ZACHRY NUCLEAR ENGINEERING, INC GROTON, CONNECTICUT	CALC NO. 12104	REV 1	PAGE 13 OF 23
	ORIGINATOR Jason A. Cody		DATE October 9, 2009
	VERIFIED BY Michael A. Norwood		JOB NO. 051470
CLIENT Dominion Energy Kewaunee, Inc	PROJECT HVAC Calculations		
TITLE Zone Special Ventilation Exhaust			

6.2 Maximum Flow with Clean Filters

Cases 3 through 5 represent system operation with filter component pressure drops at their clean values per References 5.18 through 5.20. The results from Cases 3 through 5 are reported in Table 2 (the results for Case 5 are annotated parenthetically with the applicable train). These cases verify that the system will not operate above the maximum flow rate of 9,900 Scfm with clean filters. The flow rates for these cases are less than 9,900 Scfm, but within 9,000 Scfm ±10%. The pressure drops are determined by taking the difference in static pressures at the inlet and outlet nodes of the individual filters components.

The calculated flow rates from Cases 3 and 4 are slightly below the calculated flow rates from the Cases 1 and 2. Cases 1 and 2 use filter resistances based on pressure drop values reported in References 5.14 and 5.34. This indicates that the filter components were clean during the performance of References 5.14 and 5.34. However, the calculated flow rates from Cases 1 and 2 are below 9,900 Scfm. Therefore, the system will not operate with flow rates in excess of 9,900 Scfm with clean filters.

Table 2: Maximum Flow with Clean Filters

Train	m-dot (lb_m/s)	Flow (Scfm)	Prefilter DP (in wg)	HEPA 1 DP (in wg)	Charcoal DP (in wg)	HEPA 2 DP (in wg)
A (Case 3)	11.8811	9,504.9	0.06	1.15	1.16	1.16
B (Case 4)	12.1737	9,739.0	0.06	1.21	1.21	1.21
2 Trains (Case 5)	11.7394 (A) 12.0373 (B)	9,391.5 (A) 9,629.8 (B)	0.06 (A) 0.06 (B)	1.12 (A) 1.18 (B)	1.13 (A) 1.19 (B)	1.13 (A) 1.19 (B)

Applicable PROTO-HVAC output reports for the clean filter cases are generated by 12104_CLEAN.DBD and are included in Attachment B.

Enclosure, Q&A to Attachment 1, Volume 16 (Chapter 5.0) 148 of 169

ZACHRY NUCLEAR ENGINEERING, INC GROTON, CONNECTICUT	CALC NO. 12104	REV 1	PAGE 14 OF 23
	ORIGINATOR Jason A. Cody		DATE October 9, 2009
	VERIFIED BY Michael A. Norwood		JOB NO. 051470
CLIENT Dominion Energy Kewaunee, Inc	PROJECT HVAC Calculations		
TITLE Zone Special Ventilation Exhaust			

6.3 Minimum Flow with Dirty Filters

Cases 6 through 8 represent system operation with dirty filters. The results for Cases 6 through 8 are reported in Table 3 (the results for Case 8 are annotated parenthetically with the applicable train). The results for the single train operation cases are used to determine maximum allowable filter pressure drops since the system is designed to provide the design flow rate with one train operating (Ref. 5.31). Therefore, the single train cases are limiting for filter pressure drops. The two train operation case, Case 8, is included for information to demonstrate system performance with two trains operating with dirty filters.

Flow rates were decreased to the minimum value by increasing filter resistances in PROTO-HVAC to simulate filter dirtying. Because the results of the benchmark cases show that the PROTO-HVAC calculated flows exceed the flows measured during testing, the target flows for the dirty filter cases are greater than 8,100 Scfm according to the percent error for each train. For example, the flow error for the Train A benchmark case is 2.23%. Therefore, the target flow rate in PROTO-HVAC must be 8,280.63 Scfm to ensure that the actual flow rate in the system does not drop below 8,100 Scfm.

The pressure drops are determined by taking the difference in static pressures at the inlet and outlet nodes of the individual filters components.

Table 3: Minimum Flow with Dirty Filters

Train	m-dot (lb_m/s)	Flow (Scfm)	Prefilter DP (in wg)	HEPA 1 DP (in wg)	Charcoal DP (in wg)	HEPA 2 DP (in wg)
A (Case 6)	10.3508	8,280.64	0.33	2.62	0.88	1.64
B (Case 7)	10.6313	8,505.04	0.35	2.76	0.93	1.64
2 Trains (Case 8)	10.2424 (A) 10.5232 (B)	8,193.92 (A) 8,418.56 (B)	0.32 (A) 0.34 (B)	2.56 (A) 2.70 (B)	0.86 (A) 0.91 (B)	1.61 (A) 1.60 (B)

Form No.: P030105 sheet 1 of 1 Rev.: 0-01 Date: 5/09 Ref.: P 3-1

The resulting total pressure drop for the Train A filter assembly is 5.47 in wg at a flow rate of 8,280.64 Scfm. The combined pressure drop across the Train A HEPA and charcoal filters is 5.14 in wg at a flow rate of 8,280.64 Scfm. These pressure drops are equivalent to 6.46 in wg and 6.07 in wg, respectively, at a flow rate of 9,000 Scfm based on a ratio of the flows squared. The prefilter pressure drop is equivalent to 0.39 in wg at 9,000 Scfm and the individual HEPA filter pressure drop is equivalent to 1.94 at 9,000 Scfm based on a ratio of the flows squared. The individual HEPA filter pressure drop is conservatively based on the pressure drop across HEPA 2.

The resulting total pressure drop for the Train B filter assembly is 5.68 in wg at a flow rate of 8,505.04 Scfm. The combined pressure drop across the Train B HEPA and charcoal filters is 5.33 in wg at a flow rate of 8,505.04 Scfm. These pressure drops are equivalent to 6.36 in wg and 5.97 in wg, respectively, at a flow rate of 9,000 Scfm based on a ratio of the flows squared. The prefilter pressure drop is equivalent to 0.39 in wg at 9,000 Scfm and the individual HEPA filter pressure drop is equivalent to 1.84 at 9,000 Scfm based on a ratio of the flows squared. The individual HEPA filter pressure drop is conservatively based on the pressure drop across HEPA 2.

Applicable PROTO-HVAC output reports for the dirty filter cases are generated by 12104_8100.DBD and are included in Attachment C.

The fan brake horsepower at a flow rate of 8,100 Scfm is approximately 20 hp (see Attachment H). Therefore, the motor horsepower at minimum flow conditions with dirty filters is 20 hp.

Enclosure, Q&A to Attachment 1, Volume 16 (Chapter 5.0) 150 of 169

ZACHRY NUCLEAR ENGINEERING, INC GROTON, CONNECTICUT	CALC NO. 12104	REV 1	PAGE 16 OF 23
	ORIGINATOR Jason A. Cody		DATE October 9, 2009
	VERIFIED BY Michael A. Norwood		JOB NO. 051470
CLIENT Dominion Energy Kewaunee, Inc	PROJECT HVAC Calculations		
TITLE Zone Special Ventilation Exhaust			

7.0 CONCLUSIONS AND RECOMMENDATIONS

7.1 Summary of ASV System Filter Pressure Drop Limits

7.1.1 Current Technical Specification Limits

The current Technical Specification for the ASV System filter assemblies (Ref. 5.24) states that the pressure drop across the combined HEPA filters and charcoal adsorber banks must be less than 10 inches of water and the pressure drop across an individual HEPA bank must be less than 4 inches of water at the system design flow rate (± 10%).

7.1.2 ASV System Exhaust Fan Maximum Static Pressure

Section 4.6 of Reference 5.2 provides design pressure requirements for air-cleaning units and components that must withstand fan peak pressure. Reference 5.3 shows that the ASV System filter assemblies are on the inlet sides of the fans. The design requirement provided by Reference 5.2 states that air-cleaning units and components located on the inlet side of fans which can be isolated by closure of an upstream damper, or potentially plugged components shall be designed to withstand a negative internal pressure equal to or more negative than the peak pressure of the fans.

The manufacturer's fan curve from Reference 5.35 does not contain sufficient information to ascertain the peak pressure of the ASV System exhaust fans. However, typical fan curves for axivane fans shown on page 11-5 of Reference 5.26 and page 18.3 of Reference 5.36 indicate that peak pressures of axivane fans at shutoff are higher than the pressure developed in the region of stable operation. Therefore, it is reasonable to expect that the peak static pressure for the ASV System exhaust fans is in excess of 9.4 in wg.

Enclosure, Q&A to Attachment 1, Volume 16 (Chapter 5.0) 151 of 169

7.1.3 Vendor Recommended Pressure Drop for Filter Replacement

The vendor recommended pressure drop for filter replacement is as follows (Ref. 5.20):

Prefilter: 0.5 in wg

HEPA Filter 3.0 in wg

Charcoal Adsorber: N/A

Applying the vendor recommended pressure drop values would result in a maximum total pressure drop across the ASV System filter assemblies of 7.5 in wg at 9,000 Scfm. This includes the pressure drop attributable to the prefilter, two HEPA filters, and the charcoal adsorber, but does not included the resistance attributable to the heating coil. Reference 5.20 does not include a replacement pressure drop for the charcoal adsorber indicating that charcoal adsorber life is not monitored by pressure drop. This is consistent with Assumption 3.2.3 stating that the charcoal adsorber pressure drop is not increased for this analysis.

7.2 Summary of PROTO-HVAC Analysis Results

Tables 4 through 6 provide a summary of the PROTO-HVAC analysis results.

7.2.1 Benchmark Cases

Table 4: Benchmark Results

	Test Results		PROTO-HVAC Results				
Train	Flow (Scfm)	Fan SP (in wg)	m-dot (lb_m/s)	Flow (Scfm)	Fan SP (in wg)	Flow Error (%)	Fan SP Error (%)
A (Case1)	9,332	7.257	11.9256	9,540.5	7.5896	2.23	4.57
B (Case 2)	9,314.3	6.8284	12.2245	9,779.6	7.3183	5.00	7.17

ZACHRY NUCLEAR ENGINEERING, INC GROTON, CONNECTICUT	CALC NO. 12104	REV 1	PAGE 18 OF 23
	ORIGINATOR Jason A. Cody		DATE October 9, 2009
	VERIFIED BY Michael A. Norwood		JOB NO. 051470
CLIENT Dominion Energy Kewaunee, Inc	PROJECT HVAC Calculations		
TITLE Zone Special Ventilation Exhaust			

7.2.2 Clean Filter Cases

Table 5: Clean Filter Results

Train	m-dot (lb_m/s)	Flow (Scfm)	Prefilter DP (in wg)	HEPA 1 DP (in wg)	Charcoal DP (in wg)	HEPA 2 DP (in wg)
A (Case 3)	11.8811	9,504.9	0.06	1.15	1.16	1.16
B (Case 4)	12.1737	9,739.0	0.06	1.21	1.21	1.21
2 Trains (Case 5)	11.7394 (A) 12.0373 (B)	9,391.5 (A) 9,629.8 (B)	0.06 (A) 0.06 (B)	1.12 (A) 1.18 (B)	1.13 (A) 1.19 (B)	1.13 (A) 1.19 (B)

7.2.3 Dirty Filter Cases

Table 6: Dirty Filter Results

Train	m-dot (lb_m/s)	Flow (Scfm)	Prefilter DP (in wg)	HEPA 1 DP (in wg)	Charcoal DP (in wg)	HEPA 2 DP (in wg)
A (Case 6)	10.3508	8,280.64	0.33	2.62	0.88	1.64
B (Case 7)	10.6313	8,505.04	0.35	2.76	0.93	1.64
2 Trains (Case 8)	10.2424 (A) 10.5232 (B)	8,193.92 (A) 8,418.56 (B)	0.32 (A) 0.34 (B)	2.56 (A) 2.70 (B)	0.86 (A) 0.91 (B)	1.61 (A) 1.60 (B)

The following pressure drops are the maximum allowable based on maintaining a minimum flow rate of 8,100 Scfm through the filter assemblies (all pressure drops reported correspond to the pressure drop at the design flow rate of 9,000 Scfm):

Prefilter:	0.39 in wg
Individual HEPA Bank:	1.84 in wg
Combined Charcoal Adsorber and HEPA Banks:	5.97 in wg

These pressure drops are based on Train B operation which is limiting. These values bound the flow within its design limit and meet the acceptance criteria of Section 4.2.

Enclosure, Q&A to Attachment 1, Volume 16 (Chapter 5.0) 153 of 169

7.3 Recommendations

It is recommended that the procedures identified in Section 7.9 be revised to reflect the maximum allowable pressure drops discussed in Section 7.2.

7.4 Acceptance Criteria

7.4.1 The maximum allowable system flow rate is 9,900 Scfm based on charcoal adsorber residence time (Ref. 5.1). The maximum calculated flow rate with clean filters is 9,779.6 (Case 2). Therefore, the maximum flow rate criterion is met.

7.4.2 The minimum allowable flow rate is 8,100 Scfm based on the design flow rate -10%. The maximum allowable filter pressure drops listed in Section 7.2 result in a flow rate of 8,100 Scfm through Train B which is limiting. Therefore, the minimum flow rate criterion is met.

7.4.3 The maximum allowable pressure filter pressure drops must not exceed manufacturer's recommended replacement pressure drops. The maximum allowable pressure drops listed in Section 7.2 do not exceed the manufacturer's recommended replacement pressure drops. Therefore, the manufacturer's recommended replacement pressure drop criterion is met.

7.4.4 The required motor horsepower when operating at the minimum system flow rate must not exceed the maximum allowable horsepower rating of the motor. The maximum motor horsepower is 20 hp at the minimum flow rate of 8,100 Scfm. The ASV System exhaust fan motor has a maximum allowable load of 29 hp. Therefore, the motor horsepower criterion is met.

7.5 Impact to Systems, Structures and Components

This calculation impacts the maximum allowable pressure drops for filter components in the ASV System filter assemblies (components 169-081 and 169-082).

Enclosure, Q&A to Attachment 1, Volume 16 (Chapter 5.0) 154 of 169

ZACHRY NUCLEAR ENGINEERING, INC GROTON, CONNECTICUT	CALC NO. 12104	REV 1	PAGE 20 OF 23
	ORIGINATOR Jason A. Cody		DATE October 9, 2009
	VERIFIED BY Michael A. Norwood		JOB NO. 051470
CLIENT Dominion Energy Kewaunee, Inc	PROJECT HVAC Calculations		
TITLE Zone Special Ventilation Exhaust			

7.6 Conservativeness of Calculation and Available Margin

The maximum allowable filter resistances are conservatively based on Train B operation which has a more restrictive flow path than Train A.

System operation is conservatively modeled in 100% recirculation (see Assumption 3.2.6).

Dirtying the prefilter and HEPA filter upstream of the charcoal adsorber to the manufacturer's recommended replacement pressure drop conservatively minimizes the allowable increase in the downstream HEPA filter's pressure drop. The recommended HEPA filter pressure drop is based on the results for the downstream HEPA filter. Therefore, the recommended replacement pressure drop for the HEPA filters is conservatively low.

The maximum calculated flow rates through Train A and Train B with clean filters are 9,540.5 Scfm and 9,779.6 Scfm, respectively. The maximum allowable flow rate is 9,900 Scfm; therefore, the available margin based on flow rates with clean filters is 359.5 Scfm for Train A and 120.4 Scfm for Train B.

The available margin between the clean filter resistance and the dirty filter resistance at a design flow rate of 9,000 Scfm is as follows:

The prefilter resistance can vary from a clean state of 0.05 in wg at 9,000 Scfm to a dirty state of 0.39 in wg at 9,000 Scfm.

The HEPA filter resistance can vary from a clean state of 1 in wg at 9,000 Scfm to a dirty state of 1.84 in wg at 9,000 Scfm.

The total resistance across the two HEPA filters and the charcoal adsorber can vary from a clean state of 3 in wg at 9,000 Scfm to a dirty state of 5.97 in wg at 9,000 Scfm.

The total resistance across the entire filter assembly, not including the heating coil, can vary from a clean state of 3.05 in wg at 9,000 Scfm to a dirty state of 6.36 in wg at 9,000 Scfm.

The available margin for ASV System exhaust fan motor load is 9 hp at minimum flow conditions.

Enclosure, Q&A to Attachment 1, Volume 16 (Chapter 5.0) 155 of 169

ZACHRY NUCLEAR ENGINEERING, INC GROTON, CONNECTICUT	CALC NO. 12104	REV 1	PAGE 21 OF 23
	ORIGINATOR Jason A. Cody		DATE October 9, 2009
	VERIFIED BY Michael A. Norwood		JOB NO. 051470
CLIENT Dominion Energy Kewaunee, Inc	PROJECT HVAC Calculations		
TITLE Zone Special Ventilation Exhaust			

7.7 Uncertainty of Results

Benchmarking results are shown in Table 1 and Section 7.2. The benchmark results show that plant data and PROTO-HVAC model performance agree within 2.23% for Train A (Case 1) and 5.00% for Train B (Case 2) based on flow. The benchmark results are based on the Reference 5.14 and Reference 5.34 test data. The flow error indicates that the PROTO-HVAC calculated flow rates are not conservative. The non-conservative flow error is accounted for in the minimum flow analysis cases by increasing the target flow rate by an amount equal to the percent error for each train.

An uncertainty analysis was not performed for this calculation. Uncertainty may either be addressed in the licensing basis or determined in another calculation if needed in the future.

7.8 Consistency with Design and Operation of Plant

Plant procedures should be updated to reflect maximum allowable pressure drops across the ASV System filter assemblies. See Sections 7.3 and 7.9.

7.9 Impacted Procedures and Documents

SP-14-026A, Auxiliary Bldg Special Ventilation Train A Operability Test

SP-14-026B, Auxiliary Bldg Special Ventilation Train B Operability Test

SP-14-026C, Auxiliary Bldg Special Ventilation Train A (ASV) Monthly Test

SP-14-026D, Auxiliary Bldg Special Ventilation Train B (ASV) Monthly Test

ZACHRY NUCLEAR ENGINEERING, INC GROTON, CONNECTICUT	CALC NO. 12104	REV 1	PAGE 22 OF 23
	ORIGINATOR Jason A. Cody		DATE October 9, 2009
	VERIFIED BY Michael A. Norwood		JOB NO. 051470
CLIENT Dominion Energy Kewaunee, Inc	PROJECT HVAC Calculations		
TITLE Zone Special Ventilation Exhaust			

7.10 Open Items (New or Closure)

Corrective Action CA009965 is assigned to the KPS Recovery Team and encompasses all HVAC calculations being revised as part of the HVAC Calculation Recovery Project. This calculation revision affects CA009965; however, revisions to additional calculations may be required to close CA009965.

This calculation will help resolve issues identified in CR323062 and related CA128806. CA128806 assigns an action to Engineering Recovery to revise this calculation to determine the maximum allowable differential pressure for the HEPA and charcoal filters. Revision 1 of this calculation closes CA128806.

7.11 Limiting Accident Scenarios

Both trains of the ASV System start upon a steam exclusion signal, a high radiation signal from the Auxiliary Building normal ventilation system exhaust monitors R13 and R14, or a safety injection signal (Ref. 5.31). This calculation considers that one of these signals is present and the ASV System is operating with only Train B in operation. This scenario is limiting as the maximum allowable pressure drops through the Train B filter assembly are lower than the maximum allowable pressure drops through the Train A filter assembly. Single train operation is limiting as the system is designed to produce sufficient negative pressure in the Zone SV with only one train in operation. Two train operation produces greater exhaust flow and is, therefore, less limiting for the purposes of this calculation.

7.12 EQ Program Licensing Basis Requirements

This calculation does not deal with area temperatures and therefore has no effect on the EQ Program.

7.13 Reasonable Assurance of Safety

There is no need for a Reasonable Assurance of Safety for this calculation and there is currently no open RAS that this calculation effects.

7.14 Superseded Calculations

This calculation supersedes Revision 0 of calculation 12104, Zone SV Exhaust Calculation for System 1B.

7.15 Impacted Calculations

Based on a review of the Dominion Portal, this calculation does not provide input into any other calculations.

7.16 Anomalies

There are no anomalies identified.

7.17 Other Considerations

The results of this calculation are based on the as-modeled system configuration which was benchmarked to the test data from References 5.14 and 5.34. The allowable filter pressure drops recommended in this calculation are valid as long as the benchmark data used herein matches actual system performance. Physical changes to the system (e.g., removal or repositioning of dampers) could require re-benchmarking which may result in different allowable pressure drops.

7.18 Effectiveness of Calculation

The purpose of the calculation has been met.

Enclosure, Q&A to Attachment 1, Volume 16 (Chapter 5.0) 158 of 169

Licensee Response/NRC Response/NRC Question Closure

Id	**3381**
NRC Question Number	**VGC-011**
Select Application	**NRC Question Closure**
Response Date/Time	
Closure Statement	**This question is closed and no further information is required at this time to draft the Safety Evaluation. Review conducted by Harold Walker of SCVB.**
Response Statement	
Question Closure Date	**6/2/2010**
Attachment 1	
Attachment 2	
Notification	**NRC/LICENSEE Supervision**
Added By	**Victor Cusumano**
Date Added	**6/2/2010 6:35 AM**
Modified By	
Date Modified	

ITS NRC Questions

Id	**1921**
NRC Question Number	**VGC-012**
Category	**Technical**
ITS Section	**5.0**
ITS Number	**5.5**
DOC Number	
JFD Number	
JFD Bases Number	
Page Number (s)	**Vol 16, page 99 of 167**
NRC Reviewer Supervisor	**Rob Elliott**
Technical Branch POC	**Add Name**
Conf Call Requested	**N**
NRC Question	**In Vol 16, page 99 of 167 in TS 5.5.14, the containment design pressure plant-specific value is removed from 5.5.14 b. Please explain the difficulty leaving this information in your TS causes, and a justification for its removal.**
Attach File 1	
Attach File 2	
Issue Date	**3/18/2010**
Added By	**Victor Cusumano**
Date Modified	
Modified By	
Date Added	**3/18/2010 9:45 AM**
Notification	**NRC/LICENSEE Supervision**

Licensee Response/NRC Response/NRC Question Closure

Id	**2701**
NRC Question Number	**VGC-012**
Select Application	**Licensee Response**
Response Date/Time	**4/5/2010 9:05 AM**
Closure Statement	
Response Statement	**After further review, Kewaunee Power Station (KPS) agrees to include the containment design pressure value in the ITS. However, due to this change, KPS is also modifying ITS 5.5.14.b and c. Specifically, the CTS 6.20 requirements do not include the maximum calculated internal design pressure. CTS 6.20 includes the test pressure, which is higher than the maximum calculated internal design pressure for the LOCA. Therefore, ITS 5.5.14.b has been modified to include the maximum calculated internal design pressure for the LOCA and ITS 5.5.14.c has been modified to clarify the 46 psig pressure limit is the peak test pressure. Furthermore, due to these changes, two minor Bases changes have been made to ITS 3.6.1 and ITS 3.6.4. A draft markup regarding this change is attached. This change will be reflected in the supplement to this section of the ITS conversion amendment.**
Question Closure Date	
Attachment 1	**VGC-012 Markup.pdf** (2MB)
Attachment 2	
Notification	**NRC/LICENSEE Supervision** **Victor Cusumano** **Jerry Jones** **Bryan Kays** **Ray Schiele**
Added By	**Robert Hanley**
Date Added	**4/5/2010 9:06 AM**
Modified By	
Date Modified	

ITS A01 ITS 5.5

6.20 CONTAINMENT LEAKAGE RATE TESTING PROGRAM

5.5.14.a A program shall be established to implement the leakage rate testing of the containment as required by 10 CFR 50.54(o) and 10 CFR 50, Appendix J, Option B, as modified by approved exemptions. The program shall be in accordance with the guidelines contained in Regulatory Guide 1.163, "Performance-Based Containment Leak-Test Program," dated September 1995. ~~The provisions of TS 4.0.b do not apply to the test frequencies specified in the Containment Leakage Rate Testing Program.~~ A08 The provisions of TS 4.0.c are applicable to the Containment Leakage Rate Testing Program. 5.5.14.e

Add proposed calculated containment internal pressure and containment design pressure M12

5.5.14.b The peak calculated containment internal pressure for the design basis loss-of-coolant accident is less than the containment internal test pressure, ~~P_a~~. The maximum allowable 5.5.14.c leakage rate (L_a) is 0.2 weight percent of the contained air per 24 hours at the peak test 5.5.14.b pressure ~~(P_a)~~ of 46 psig. C

For penetrations which extend into the auxiliary building special ventilation zone, the combined leak rate from these penetrations shall not exceed $0.10L_a$. For penetrations which are exterior to both the shield building and the auxiliary building special ventilation zone, the combined leak rate from these penetrations shall not exceed $0.01L_a$. If leak rates are exceeded, repairs and retest shall be performed to demonstrate reduction of the combined leak rate to these values. See ITS 3.6.3

5.5.14.d Leakage rate acceptance criteria:

5.5.14.d.1 a. The containment leakage rate acceptance criterion is $\leq 1.0L_a$.

5.5.14.d.1 b. Prior to unit startup following testing in accordance with this program, the leakage rate acceptance criteria are $< 0.6L_a$ for Type B and C tests and ~~<~~ ≤ $0.75L_a$ for the Type A test. L01

5.5.14.d.1 c. The personnel and emergency air lock leakage rates, when combined with the cumulative Type B and C leakage, shall be $< 0.6L_a$. A09 5.5.14.d.2 For each air lock door seal, the leakage rate shall be $< 0.005L_a$ when tested to ≥ 10 psig.

Add Proposed ITS 5.5.4 M03

Add Proposed ITS 5.5.5 M04

Add Proposed ITS 5.5.10 M07

Add Proposed ITS 5.5.11 M08

Add proposed ITS 5.5.13 M09

Add proposed ITS 5.5.15 M10

Add proposed ITS 5.5.16 M11

found in ITS 5.5.13. This change is designated as more restrictive because it imposes additional programmatic requirements in the Technical Specifications.

M10 The CTS does not include a requirement for Battery Monitoring and Maintenance Program. The ITS includes a requirement for this program. This changes the CTS by adding the ITS 5.5.15, "Battery Monitoring and Maintenance Program."

The Battery Monitoring and Maintenance Program is included to provide for battery restoration and maintenance. The specific wording associated with this program may be found in ITS 5.5.15. This change is acceptable because it supports implementation of the requirements of the ITS. This change is designated as more restrictive because it imposes additional programmatic requirements in the Technical Specifications.

M11 The CTS does not have a program for Setpoint Control. ISTS 5.5.18 (ITS 5.5.16) requires a program to satisfy the regulatory requirement of 10 CFR 50.36(c)(1)(ii)(A) that Technical Specifications will include items in the category of limiting safety system settings (LSSS), which are settings for automatic protective devices related to those variables having significant safety functions. This changes the CTS by incorporating the requirements of ISTS 5.5.18 (ITS 5.5.16).

The purpose of the program is to establish, implement, and maintain instrument setpoint controls for automatic protective devices related to those variables having significant safety functions. This change is designated as more restrictive because it imposes new programmatic requirements in the Technical Specifications.

INSERT M12

RELOCATED SPECIFICATIONS

None

REMOVED DETAIL CHANGES

LA01 *(Type 3 – Removing Procedural Details for Meeting TS Requirements or Reporting Requirements)* CTS 6.18.b.1 requires changes to the ODCM to be documented and records of reviews performed to be retained as required by the quality assurance program. CTS 6.18.b.2 requires changes to the ODCM to be effective after review and acceptance by the PORC. ITS 5.5.1.c.1 requires changes to the ODCM to be documented and records of reviews performed to be retained. ITS 5.5.1.c.2 requires changes to the ODCM to become effective after the approval of the plant manager. This changes the CTS by moving the record retention requirements reference and the PORC review and approval requirements to the Nuclear Facility Quality Assurance Program Description (NFQAPD). DOC M01 describes the addition of the plant manager approval.

The removal of these details, which are related to meeting Technical Specification requirements, from the Technical Specifications is acceptable because this type of information is not necessary to be included in the Technical

M12 CTS 6.20 states that the peak calculated containment internal pressure for the design basis loss of coolant accident is less than the containment internal test pressure. The containment internal test pressure is defined as P_a in the CTS. ITS 5.5.14.b contains a specific value for the calculated peak containment internal pressure for the design basis loss of coolant accident and the containment design pressure. The calculated peak containment internal pressure for the design basis loss of coolant accident is defined as P_a in the ITS. This changes the CTS by adding a specific value for the calculated peak containment internal pressure for the design basis loss of coolant accident and a value for the containment design pressure.

The peak calculated containment internal pressure for the design basis loss of coolant accident is derived from the maximum containment pressure which is given as 44.6 psig at 19.9 seconds in USAR Table 14.3.5-8. The same maximum containment pressure was also reviewed and approved by the NRC as documented in the NRC Safety Evaluation for License Amendment 172 (the KPS Stretch Power Uprate), section 3.8.2.1.2.2, dated February 27, 2004 (ML040430633). The containment design pressure of 46 psig is also documented in the USAR and was reviewed and approved in the original USAR approval. This change is designated as more restrictive because it imposes new values that were not included in the CTS.

5.5 Programs and Manuals

6.20 5.5.~~16~~ 14 Containment Leakage Rate Testing Program (continued) 6

~~[OPTION B]~~ 19

6.20 a. A program shall establish the leakage rate testing of the containment as required by 10 CFR 50.54(o) and 10 CFR 50, Appendix J, Option B, as modified by approved exemptions. This program shall be in accordance with the guidelines contained in Regulatory Guide 1.163, "Performance-Based Containment Leak-Test Program," dated September, 1995~~, as modified by the following exceptions:~~ .

~~1. The visual examination of containment concrete surfaces intended to fulfill the requirements of 10 CFR 50, Appendix J, Option B testing, will be performed in accordance with the requirements of and frequency specified by the ASME Section XI Code, Subsection IWL, except where relief has been authorized by the NRC.~~ 20

~~2. The visual examination of the steel liner plate inside containment intended to fulfill the requirements of 10 CFR50, Appendix J, Option B, will be performed in accordance with the requirements of and frequency specified by the ASME Section XI Code, Subsection IWE, except where relief has been authorized by the NRC.~~

~~[3. . . .]~~

6.20 b. The calculated peak containment internal pressure for the design basis loss of coolant accident, P_a, is ~~[45~~ 46 44.6 psig~~]~~. ~~The containment design pressure is [50 psig].~~ 46 Stet with changes 1 ~~21~~

6.20 c. The maximum allowable containment leakage rate, L_a, at ~~P_a~~ 46 psig (Peak Test Pressure), shall be ~~[ ]~~ 0.2% of containment air weight per day. 14 1

d. Leakage rate acceptance criteria are:

6.20.a, 6.20.b 1. Containment leakage rate acceptance criterion is 1.0 L_a. During the first unit startup following testing in accordance with this program, the leakage rate acceptance criteria are < 0.60 L_a for the Type B and C tests and ≤ 0.75 L_a for Type A tests.

6.20.c 2. Air lock door seal leakage testing acceptance criteria ~~are:~~

~~a) Overall air lock leakage rate is≤ [0.05 L_a] when tested at ≥ P_a.~~ 22

~~b) F~~for each door, seal is a leakage rate ~~is~~ of ~~≤ [0.01 L_a]~~ < 0.005 L_a when pressurized to ~~[~~≥ 10 psig~~]~~.

final version of the plant specific submittal. Therefore, the Reviewer's Note has been deleted.

16. The program details of the Explosive Gas and Storage Tank Radioactivity Monitoring Program are described in ISTS 5.5.12 (ITS 5.5.10) part a, b, and c. Therefore, the sentence in the introductory paragraph that specifies a method to determine the explosive gas and storage tank radioactivity is not necessary. Additionally, this change is consistent with the requirements in ODCM Sections 3/4.3 and 3/4.4.

17. ISTS 5.5.13.c requires the total particulate concentration of the fuel oil to be tested every 31 days. The current test frequency at KPS is 92 days (per plant procedures). ITS 5.5.11.c has been changed to be consistent with current KPS practices. KPS has reviewed the maintenance history of this test and determined that the proposed 92 day Frequency is sufficient to ensure total particulates stays within the new ITS 5.5.11.c limit of 10 mg/l. In addition, the KPS diesel storage tanks are outdoor tanks, subject to the weather. Thus, minimizing the number of times the tanks must be opened to obtain fuel oil samples will also benefit keeping snow, rain water, and other contaminants out of the storage tanks.

18. Changes are made to the ISTS which reflect the plant specific nomenclature.

19. Kewaunee Power Station (KPS) complies with Option B of 10 CFR 50, Appendix J. Therefore, the ISTS 5.5.16 Option A and combined Option A and B provisions have been deleted.

20. ISTS 5.5.16.a (ITS 5.5.14.a) contains exceptions to Regulatory Guide (RG) 1.163. The KPS Containment Leak Rate Testing Program does not take any exceptions to the RG 1.163 requirements. Therefore, these exceptions are deleted.

Not used.

21. ~~ISTS 5.5.16.b contains a statement with a bracketed value for the containment design pressure. The containment design pressure limit specified in ISTS 5.5.16.b has not been included because it currently does not exist in the KPS CTS, and because this limit does not provide any useful input to the Containment Leakage Rate Testing Program. Pa is the test pressure and thus is included in the ITS.~~

22. KPS does not include a separate overall air lock leakage limit; it is only included as part of the combined Types B and C leakage limit (0.60 L_a). Therefore, ISTS 5.5.16.d.2.a) has not been included. Due to this, there is no reason to include the requirements of ISTS 5.5.16.d.2.b) separate from ISTS 5.5.16.d.2. Thus it has been combined into ISTS 5.5.16.d.2. Furthermore, ISTS 5.5.16.d.2.b) states, in part, the air lock acceptance criteria for each door. The CTS 6.20.c states, in part, the air lock acceptance criteria for each air lock door seal. ITS 5.5.14.d.2) is written to address each air lock door seal. This is acceptable since the ITS is edited to reflect the text in the CTS and for clarification. Lastly, ISTS 5.5.16.d.2.b) (ITS 5.5.14.d) contains a bracketed value for the air lock door seal containment leakage rate acceptance criteria and the pressure to which each door seal is tested. The brackets have been removed for the pressure to which each door seal is tested and an acceptance criteria value of < 0.005 L_a has been

BASES

BACKGROUND (continued)

a. All penetrations required to be closed during accident conditions are either:

1. Capable of being closed by an OPERABLE automatic containment isolation system ; or 4

2. Closed by manual valves, blind flanges, or de-activated automatic valves secured in their closed positions, except as provided in LCO 3.6.3, "Containment Isolation Valves~~,~~" ; 4

b. Each air lock is OPERABLE, except as provided in LCO 3.6.2, "Containment Air Locks~~,~~" ; and 4

c. All equipment hatches are closed~~,~~ ~~and~~ . 5

~~[d. The pressurized sealing mechanism associated with a penetration is OPERABLE, except as provided in LCO 3.6.[ ].]~~ 5

APPLICABLE SAFETY ANALYSES

The safety design basis for the containment is that the containment must withstand the pressures and temperatures of the limiting Design Basis Accident (DBA) without exceeding the design leakage rate.

The DBAs that result in a challenge to containment OPERABILITY from high pressures and temperatures are a LOCA, a main steam line break, and a ~~rod ejection accident (REA)~~ RCCA ejection (Ref. 2). In addition, release of significant fission product radioactivity within containment can occur from a LOCA or ~~REA~~ RCCA ejection. In the DBA analyses, it is assumed that the containment is OPERABLE such that, for the DBAs involving release of fission product radioactivity, release to the environment is controlled by the rate of containment leakage. The containment ~~was designed with~~ has an allowable leakage rate of ~~[0.1]~~ 0.2% of containment air weight per day (Ref. 3). This leakage rate, used in the evaluation of offsite doses resulting from accidents, is defined in 10 CFR 50, Appendix J, Option ~~[A]~~[B] (Ref. 1), as L_a: the maximum allowable containment leakage rate at the calculated peak containment internal pressure (P_a) resulting from the limiting design basis LOCA. The allowable leakage rate represented by L_a forms the basis for the acceptance criteria imposed on all containment leakage rate testing. L_a is assumed to be ~~[0.1]~~ 0.2% per day in the safety analysis at ~~P_a =~~ ~~[46.3]~~ 46 psig (Peak Test Pressure) (Ref. 3).

Satisfactory leakage rate test results are a requirement for the establishment of containment OPERABILITY.

The containment satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii).

Enclosure, Q&A to Attachment 1, Volume 16 (Chapter 5.0) 167 of 169

B 3.6 CONTAINMENT SYSTEMS

B 3.6.4A Containment Pressure (Atmospheric, Dual, and Ice Condenser) 1

and simultaneous start of all four containment fan-coil units and both trains

BASES

BACKGROUND

The containment pressure is limited during normal operation to preserve the initial conditions assumed in the accident analyses for a loss of coolant accident (LOCA) or steam line break (SLB). These limits also prevent the containment pressure from exceeding the containment design negative pressure differential with respect to the outside atmosphere in the event of inadvertent actuation of the Containment Spray System. 2

main M annulus

Containment pressure is a process variable that is monitored and controlled. The containment pressure limits are derived from the input conditions used in the containment functional analyses and the containment structure external pressure analysis. Should operation occur outside these limits coincident with a Design Basis Accident (DBA), post accident containment pressures could exceed calculated values. 2

integrity analyses

APPLICABLE SAFETY ANALYSES

Containment internal pressure is an initial condition used in the DBA analyses to establish the maximum peak containment internal pressure. The limiting DBAs considered, relative to containment pressure, are the LOCA and SLB, which are analyzed using computer pressure transients. The worst case LOCA generates larger mass and energy release than the worst case SLB. Thus, the LOCA event bounds the SLB event from the containment peak pressure standpoint (Ref. 1). 2

M MSLB effects of those of LOCA are more severe LOCA MSLB

The initial pressure condition used in the containment analysis was [17.7] psia ([3.0] psig). This resulted in a maximum peak pressure from a LOCA of [53.9] psig. The containment analysis (Ref. 1) shows that the maximum peak calculated containment pressure, ~~P_a,~~ results from the limiting LOCA. The maximum containment pressure resulting from the worst case LOCA, [44.1] psig, does not exceed the containment design pressure, [55] psig. 3 2

2.15 16.85 ~~44.4~~ 44.6 MSLB 45.68 46 maximum allowed internal

The containment was also designed for an external pressure load equivalent to [-2.5] psig. The inadvertent actuation of the Containment Spray System was analyzed to determine the resulting reduction in containment pressure. The initial pressure condition used in this analysis was [-0.3] psig. This resulted in a minimum pressure inside containment of [-2.0] psig, which is less than the design load. 3 3 3 2

0.8 14.7 psia (0.0 psig) 13.917 psia (-0.783 psig) and simultaneous start of all four containment fan-coil units and both trains

Licensee Response/NRC Response/NRC Question Closure

Id	**2791**
NRC Question Number	**VGC-012**
Select Application	**NRC Question Closure**
Response Date/Time	
Closure Statement	**The licensee response was reviewed by Harold Walker in the Containment and Ventilation Branch and was found to be acceptable per his e-mail dated 4/14/2010.** **This question is closed and no further information is required at this time to draft the Safety Evaluation.**
Response Statement	
Question Closure Date	**4/20/2010**
Attachment 1	
Attachment 2	
Notification	**NRC/LICENSEE Supervision**
Added By	**Victor Cusumano**
Date Added	**4/20/2010 7:37 AM**
Modified By	
Date Modified	