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May 12, 2000
L-00-046

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555-0001

Subject: Beaver Valley Power Station (BVPS), Unit No. 1 and No. 2
BV-1 Docket No. 50-334, License No. DPR-66
BV-2 Docket No. 50-412, License No. NPF-73
License Amendment Request Nos. 263 and 138, Revision 1

Pursuant to 10 CFR 50.90, FirstEnergy Nuclear Operating Company requests an amendment to the above licenses in the form of changes to the technical specifications (TS). The proposed amendment will revise the TS surveillance standard to which ventilation charcoal must be laboratory tested as recommended by NRC Generic Letter 99-02. This License Amendment Request (LAR) completely revises the submittal previously issued on September 20, 1999, in letter L-99-145, addressing comments discussed with the NRC.

This LAR corrects the control room ventilation heater minimum output, revises the surveillance testing frequency of the BVPS Unit 1 SLCRS from 12 months to 18 months consistent with ANSI/ASME N510-1980, and revises the BVPS Unit 1 SLCRS air flow distribution surveillance criteria to be consistent with the BVPS Unit 2 SLCRS air flow distribution surveillance criteria and ANSI/ASME N510-1980. In addition, the LAR contains miscellaneous editorial changes.

This LAR is being submitted to support the issues described in Generic Letter 99-02. In letter L-99-157, dated November 19, 1999, BVPS previously indicated that a safety factor of less than 2 had been used in the BVPS Unit 1 Fuel Handling Accident (FHA) and LOCA design basis accident dose calculation for Supplemental Leak Collection & Release System (SLCRS) charcoal filter efficiency, in response to Generic Letter Question No. 4. Pursuant to Generic Letter 99-02, the BVPS Unit 1 FHA dose calculation will be promptly revised to address a SLCRS charcoal filter efficiency of 79% for organic iodine. This efficiency value represents a safety factor of 2 based on the current BVPS Unit 1 SLCRS Technical Specification 4.7.8.1.b.3 test limit of 90% for organic iodine, plus 1% for bypass leakage. When the BVPS Unit 1 FHA dose calculation is revised to address the new SLCRS charcoal filter efficiency, the modifications will be reviewed per the requirements of 10 CFR 50.59. The revised analysis is expected to show continued compliance to 10 CFR 100 and GDC 19 licensing basis criteria for dose values.

A081

The proposed TS changes for BVPS Unit No. 1 and Unit No. 2 are presented in Attachments A-1 and A-2, respectively. The safety analysis (including the no significant hazards evaluation) is presented in Attachment B.

Attachment C provides the BVPS Unit 1 and Unit 2 ventilation heater calculations to support the change in heater output.

These changes have been reviewed by the BVPS review committees. The changes were determined to be safe and do not involve a significant hazard consideration as defined in 10 CFR 50.92 based on the attached safety analysis. An implementation period of up to 60 days is requested following the effective date of this amendment.

If you have any questions regarding this matter, please contact Mr. Thomas S. Cosgrove at (724) 682-5203.

Sincerely,

Lew W Myers

Lew W. Myers

c: Mr. D. S. Collins, Project Manager
Mr. D. M. Kern, Sr. Resident Inspector
Mr. H. J. Miller, NRC Region I Administrator
Mr. D. A. Allard, Director BRP/DEP
Mr. L. E. Ryan (BRP/DEP)
Ms. Mary E. O'Reilly (FirstEnergy Legal Department)

I, Lew W. Myers, being duly sworn, state that I am Senior Vice President of FirstEnergy Nuclear Operating Company (FENOC), that I am authorized to sign and file this submittal with the Nuclear Regulatory Commission on behalf of FENOC, and that the statements made and the matters set forth herein pertaining to FENOC are true and correct to the best of my knowledge and belief.

FirstEnergy Nuclear Operating Company

Lew W. Myers
Senior Vice President - FENOC

STATE OF PENNSYLVANIA

COUNTY OF BEAVER

Subscribed and sworn to me, a Notary Public, in and for the County and State above named, this 18 th day of May, 2000.

Tracey A Baczek
My Commission Expires:

Notarial Seal
Tracey A. Baczek, Notary Public
Shippingport Boro, Beaver County
My Commission Expires Aug. 16, 2001
Member, Pennsylvania Association of Notaries

ATTACHMENT A-1

Beaver Valley Power Station, Unit No. 1
License Amendment Request No. 263, Rev. 1

The following is a list of the affected pages:

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DPR 66

PLANT SYSTEMS

SURVEILLANCE REQUIREMENTS

4.7.7.1.1 The BV-1 emergency ventilation subsystem shall be demonstrated OPERABLE:

a. At least once per 12 hours by verifying that the control room air temperature is ≤88°F.

b. At least once per 31 days by initiating flow through the HEPA filter and charcoal adsorber train and verifying that the train operates for 15 minutes.

c. At least once per 18 months or after every 720 hours of system operation or (1) after each complete or partial replacement of a HEPA filter or charcoal adsorber bank, or (2) after any structural maintenance on the HEPA filter or charcoal adsorber housing or (3) following painting, fire or chemical release in any ventilation zone communicating with the system by:

1. Verifying that the filtration system satisfies the in-place penetration and by-pass leakage testing acceptance criteria of less than 1% when tested in accordance with ANSI N510-1980 while operating the ventilation system at a flow rate of 800 - 1000 cfm.

2. Subjecting the carbon contained in at least one test canister or at least two carbon samples removed from one of the charcoal adsorbers to a laboratory carbon sample analysis and verifying a removal efficiency of ≥ 99% for radioactive methyl iodine at an air flow velocity of .68 ft/sec (+20%) with an inlet methyl iodide concentration of 1.5 to 2.0 mg/m³, ≥70% relative humidity, and 30°C (+1/2°C); other test conditions shall be in accordance with ANSI N510-1980. The carbon samples not obtained from test canisters shall be prepared by either:

a) Emptying one entire bed from a removed adsorber tray, mixing the adsorbent thoroughly, and obtaining a sample volume equivalent to at least two inches in diameter and with a length equal to the thickness of the bed, or

b) Removing a longitudinal sample from an adsorber tray using a slotted-tube sampler, mixing the adsorbent thoroughly, and obtaining a sample volume equivalent to at least two inches in diameter and with length equal to the thickness of the bed.

(Within 31 days after removal,) (delete) (1.75) (including test parameter tolerances) (delete) (ASTM D3803-1989)

(Proposed Wording)

DPR 66

SURVEILLANCE REQUIREMENTS (continued)

3. Verifying a system flow rate of 800 - 1000 cfm during system operation.

d. At least once per 18 months by:

1. Verifying that the pressure drop across the combined HEPA filters and charcoal adsorber banks is <6 inches Water Gauge while operating the ventilation system at a flow rate of 800 - 1000 cfm .

2. Verifying that on a chlorine/control room high radiation/containment phase B isolation test signal from either Unit, the system automatically closes all the series isolation ventilation system dampers which isolate the combined control room from the outside atmosphere.

3. Verifying that one emergency ventilation subsystem maintains the combined control room at a positive pressure of ≥1/8 inch Water Gauge relative to the outside atmosphere during system operation.

4. Verifying that the heaters dissipate 5 ± 0.5 kw when tested in accordance with ANSI N510-1980.

at least 3.87 Kw and not exceeding 5.50

4.7.7.1.2 The BV-2 emergency ventilation subsystems shall be demonstrated OPERABLE:

a. At least once per 12 hours by verifying that the control room air temperature is ≤88°F.

b. At least once per 31 days by initiating flow through each HEPA filter and charcoal adsorber train and by verifying that each train operates for 15 minutes.

c. At least once per 18 months, or after every 720 hours of system operation and (1) after each complete or partial replacement of a HEPA filter or charcoal adsorber bank, or (2) after any structural maintenance on the HEPA filter or charcoal adsorber housings, or (3) following painting, fire or chemical release in any ventilation zone communicating with the system by:

1. Verifying that the filtration system satisfies the in-place penetration and by-pass leakage testing acceptance criteria of less than 1% when tested in accordance with ANSI N510-1980 while operating the ventilation system at a flow rate of 800-1000 cfm.

(Proposed Wording)

DPR 66

Within 31 days after removal,

2. Subjecting the carbon contained in at least one test canister or at least two carbon samples removed from one of the charcoal adsorbers to a laboratory carbon sample analysis and verifying a removal efficiency of ≥99% for radioactive methyl iodine at an air flow velocity of 0.70 ft/sec (±20%) with an inlet methyl iodine concentration of 1.5 to 2.0 mg/m3, ≥70% relative humidity, and 30°C (±1/2°C; other test conditions shall be in accordance with ANSI N510-1980. The carbon samples not obtained from test canisters shall be prepared by either:

   a) Emptying one entire bed from a removed adsorber tray, mixing the adsorbent thoroughly, and obtaining a sample volume equivalent to at least two inches in diameter and with a length equal to the thickness of the bed, or

   b) Removing a longitudinal sample from an adsorber tray using a slotted-tube sampler, mixing the adsorbent thoroughly, and obtaining a sample volume equivalent to at least two inches in diameter and with a length equal to the thickness of the bed.

3. Verifying a system flow rate of 800 to 1000 cfm during system operation.

d. At least once per 18 months by:

1. Verifying that the pressure drop for the combined HEPA filters and charcoal adsorber banks is less than 5.6 inches Water Gauge while operating the ventilation system at a flow rate of 800 to 1000 cfm.

2. Verifying that on a Containment Isolation Phase B/Control Room High Radiation test signal from either Unit, the system automatically closes all the series isolation ventilation system dampers which isolate the combined control room from the outside atmosphere and the system automatically starts 60 minutes later and supplies air to the control room through the HEPA filters and charcoal adsorber banks.

3. Verifying that on a chlorine test signal from either Unit, the system automatically closes all the series isolation ventilation system dampers which isolate the combined control room from the outside atmosphere.

(Proposed Wording)

DPR 66

SURVEILLANCE REQUIREMENTS, (continued)

4. Verifying that one emergency ventilation subsystem maintains the control room at a positive pressure of ≥1/8 inch Water Gauge relative to the outside atmosphere during system operation.

5. Verifying that the heaters dissipate 5 ± 0.5 kw when tested in accordance with ANSI N510-1980. (at least 3.87 Kw and not exceeding 5.50)

4.7.7.2 The bottled air pressurization system shall be demonstrated OPERABLE:

a. At least once per 31 days by verifying that the system contains a minimum of 10 bottles of air each pressurized to at least 1825 psig and by verifying that the system solenoid operated valves are powered from an operable emergency bus.

b. At least once per 18 months (be → by) verifying that:

1. A chlorine/control room high radiation/containment phase B isolation test signal from either Unit will initiate system operation.

2. Upon a partial discharge test using four out of five bottled air subsystems the system will supply ≤ 1000 cfm of air and pressurize the control room to ≥1/8 inch Water Gauge relative to the outside atmosphere during system operation.

(Proposed Wording)

(DPR 66)

PLANT SYSTEMS

3/4.7.8 SUPPLEMENTAL LEAK COLLECTION AND RELEASE SYSTEM (SLCRS)

LIMITING CONDITION FOR OPERATION

3.7.8.1 Two SLCRS exhaust air filter trains shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTION:

With one SLCRS exhaust air filter train inoperable, restore the inoperable train to OPERABLE status within 7 days or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

SURVEILLANCE REQUIREMENTS

4.7.8.1 Each SLCRS exhaust air filter train shall be demonstrated OPERABLE:

a. At least once per 31 days on a STAGGERED TEST BASIS by:

1. Initiating, from the control room, flow through the HEPA filter and charcoal adsorber train and verifying that the train operates for at least 15 minutes.

b. At least once per (18) (12) months or after every 720 hours of system operation or (1) after each complete or partial replacement of a HEPA filter or charcoal adsorber bank, or (2) after any structural maintenance on the HEPA filter or charcoal adsorber housings, or (3) following painting, fire or chemical release in any ventilation zone communicating with the system by:

1. Verifying that the charcoal adsorbers remove ≥ 99% of a halogenated hydrocarbon refrigerant test gas when they are testing in-place in accordance with ANSI N510-1975 while operating the ventilation system at a flow rate of 36,000 cfm ± 10%.

(Proposed Wording)

SURVEILLANCE REQUIREMENTS (Continued)

2. Verifying that the HEPA filter banks remove ≥ 99% of the DOP when they are tested in-place in accordance with ANSI N510-1975 while operating the ventilation system at a flow rate of 36,000 cfm ± 10%.

delete

3. Subjecting the carbon contained in at least one test canister or at least two carbon samples removed from one of the charcoal adsorbers to a laboratory carbon sample analysis and verifying a removal efficiency of ≥90% for radioactive methyl iodide at an air flow velocity of 0.9 ft/sec ± 20% with an inlet methyl iodide concentration of 0.05 to 0.15 mg/m^3, ≥95% relative humidity, and ≥125°F; other test conditions shall be in accordance with USAEC RDT Standard M-16-1T, June 1972. The carbon samples not obtained from test canisters shall be prepared by either:

delete

1.75

30°C

ASTM D3803-1989

including test parameter tolerances

a) Emptying one entire bed from a removed adsorber tray, mixing the adsorbent thoroughly, and obtaining samples at least two inches in diameter and with a length equal to the thickness of the bed, or

b) Emptying a longitudinal sample from an adsorber tray, mixing the adsorbent thoroughly, and obtaining samples at least two inches in diameter and with a length equal to the thickness of the bed.

4. Verifying a system flow rate of 36,000 cfm ± 10% during system operation.

c. At least once per 18 months by:

1. Verifying that the pressure drop across the combined HEPA filters and charcoal adsorber banks is <6 inches Water Gauge while operating the ventilation system at a flow rate of 36,000 cfm ± 10%.

(Proposed Wording)

DPR 66

SURVEILLANCE REQUIREMENTS (Continued)

delete

2. Verifying that the air flow distribution to each HEPA filter and charcoal adsorber is within ± 20% of the averaged flow per unit.

2 → 3. Verifying that the SLCRS flow is diverted through the filter train on a Containment Isolation - Phase "A" signal.

d. Verifying that the air flow distribution to each HEPA filter and charcoal adsorber is within ±20% of the averaged flow per unit after initial installation and after any maintenance affecting the flow distribution.

e

(Proposed Wording)

ATTACHMENT A-2

Beaver Valley Power Station, Unit No. 2
License Amendment Request No. 138, Rev. 1

[redacted]

The following is a list of the affected pages:

Affected Pages: 3/4 7-16
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3/4 7-18

PLANT SYSTEMS

3/4.7.7 CONTROL ROOM EMERGENCY AIR CLEANUP AND PRESSURIZATION SYSTEM

SURVEILLANCE REQUIREMENTS

4.7.7.1 The Control Room Emergency Air Cleanup and Pressurization System shall be demonstrated OPERABLE:

a. At least once per 12 hours by verifying that the control room air temperature is $\leq$ 88°F.

b. At least once per 31 days by:

1. Initiating flow through the HEPA filter and charcoal adsorber train and verifying that the train operates for 15 minutes with the heaters in operation.

2. Verifying that the bottled air pressurization system contains a minimum of 10 bottles of air each pressurized to at least 1825 psig and that each solenoid operated valve is powered from an operable emergency bus.

c. At least once per 18 months or (1) after each complete or partial replacement of a HEPA filter or charcoal adsorber bank, or (2) after any structural maintenance on the HEPA filter or charcoal adsorber housings by:

1. Verifying that the charcoal adsorbers remove $\geq$ 99.95% of a halogenated hydrocarbon refrigerant test gas when they are tested in-place in accordance with ANSI N510-1980 while operating the pressurization filtration system at a flow rate of 800 to 1000 cfm.

2. Verifying that the HEPA filter banks remove $\geq$ 99.95% of the DOP when they are tested in-place in accordance with ANSI N510-1980 while operating the pressurization filtration system at a flow rate of 800 to 1000 cfm.

3. Verifying a system flow rate of 800 to 1000 cfm during system operation.

d. At least once per 18 months or (1) after 720 hours of system operation, or (2) following painting, fire or chemical release in the vicinity of control room outside air intakes while the system is operating, subjecting the carbon contained in at least one test canister or at least two carbon samples removed from one of the charcoal adsorbers to a laboratory carbon sample analysis and verifying a removal efficiency of $\geq$ 99% for radioactive methyl iodide at an air flow velocity of 0.7 ft/sec ± 20% with an inlet methyl iodide concentration of 1.5 to 2.0 mg/m^3, $\geq$ 70% relative humidity, and 30°C ± 1/2°C; other test conditions shall be in accordance with ANSI N510-1980. The carbon samples not obtained from test canisters shall be prepared by either:

delete ± 20%

delete

delete

within 31 days after removal

1.75

delete

ASTM D3803-1989

including test parameter tolerances

(Proposed Wording)

PLANT SYSTEMS

SURVEILLANCE REQUIREMENTS (Continued)

a) Emptying one entire bed from a removed adsorber tray, mixing the adsorbent thoroughly, and obtaining samples at least two inches in diameter and with a length equal to the thickness of the bed, or

b) Emptying a longitudinal sample from an adsorber tray, mixing the adsorbent thoroughly, and obtaining samples at least two inches in diameter and with a length equal to the thickness of the bed.

e. At least once per 18 months by:

1. Verifying that the pressure drop for the combined HEPA filters and charcoal adsorber banks is less than 5.6 inches Water Gauge while operating the pressurization filtration system at a flow rate of 800 to 1000 cfm.

2. Verifying that on a Containment Isolation Phase B/Control Room High Radiation test signal, the system automatically closes all the series isolation ventilation system dampers which isolate the control room from the outside atmosphere and the system automatically starts 60 minutes later and supplies air to the control room through the HEPA filters and charcoal adsorber banks.

3. Verifying that on a chlorine test signal from the system automatically closes all the series isolation ventilation system dampers which isolate the combined control room from the outside atmosphere.

4. Verifying that the pressurization filtration system maintains the control room at a positive pressure of ≥ 1/8 inch Water Gauge relative to the outside atmosphere during system operation.

at least 3.87 kw and not exceeding 5.50

5. Verifying that the heaters dissipate 5 ± 0.5 kw when tested in accordance with ANSI N510-1980.

6. Verifying that a chlorine/control room high radiation/containment phase B isolation signal will initiate operation of the bottled air pressurization system.

7. Verifying by a partial discharge test from four out of five subsystems of the bottled air pressurization system at a discharge flow of less than 1000 cfm that the bottled air pressurization system will pressurize the control room to ≥ 1/8 inch Water Gauge relative to the outside atmosphere during system operation.

(Proposed wording)

PLANT SYSTEMS

3/4.7.8 SUPPLEMENTAL LEAK COLLECTION AND RELEASE SYSTEM (SLCRS)

LIMITING CONDITION FOR OPERATION

3.7.8.1 Two SLCRS exhaust air filter trains shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3 and 4.

ACTION:

With one SLCRS exhaust air filter train inoperable, restore the inoperable train to OPERABLE status within 7 days or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

SURVEILLANCE REQUIREMENTS

4.7.8.1 Each SLCRS exhaust air filter train shall be demonstrated OPERABLE:

a. At least once per 31 days by initiating, from the control room, flow through the "standby" HEPA filter and charcoal adsorber train and verifying that the train operates for at least 15 minutes with the heater controls operational.

b. At least once per 18 months or (1) after each complete or partial replacement of a HEPA filter or charcoal adsorber bank, or (2) after any structural maintenance on the HEPA filter or charcoal adsorber housings, or (3) following painting, fire or chemical release in any ventilation zone communicating with the system by:

1. Verifying that the charcoal adsorbers remove ≥ 99.95% of a halogenated hydrocarbon refrigerant test gas when they are tested in-place in accordance with ANSI N510-1980 while operating the ventilation system at a flow rate of 57,000 cfm ± 10%.

2. Verifying that the HEPA filter banks remove ≥ 99.95% of the DOP when they are tested in-place in accordance with ANSI N510-1980 while operating the ventilation system at a flow rate of 57,000 cfm ± 10%.

Within 31 days after removal,

3. Subjecting the carbon contained in at least one test canister or at least two carbon samples removed from one of the charcoal adsorbers to a laboratory carbon sample analysis and verifying a removal efficiency of ≥ 99% for radioactive methyl iodide at an air flow velocity of 0.7 ft/sec ± 20% with an inlet methyl iodide concentration of 1.5 to 2.0 mg/m³, ≥ 70% relative humidity, and 30°C (± ½°C), other test conditions shall be in accordance with ANSI N510-1980. The carbon samples not obtained from test canisters shall be taken with a slotted tube sampler in accordance with ANSI N509-1980.

delete

1.75

delete

ASTM D3803-1989

including test parameter tolerances

(Proposed Wording)

ATTACHMENT B

Beaver Valley Power Station, Unit Nos. 1 and 2
License Amendment Request No. 263 and 138, Rev. 1
REVISION OF CONTROL ROOM VENTILATION & SLCRS TECHNICAL SPECIFICATIONS

A. DESCRIPTION OF AMENDMENT REQUEST

This license amendment request revises the standard to which the control room ventilation charcoal and Supplementary Leak Collection and Release System (SLCRS) charcoal must be laboratory tested as specified in Beaver Valley Power Station (BVPS) Unit No. 1 Technical Specification 4.7.7.1.1.c.2 for the Control Room Emergency Habitability Systems, BVPS Unit No. 1 Technical Specification 4.7.8.1.b.3 for the SLCRS, BVPS Unit No. 2 Technical Specification 4.7.7.1.d for the Control Room Emergency Air Cleanup and Pressurization System, and BVPS Unit No. 2 Technical Specification 4.7.8.1.b.3 for the SLCRS. As documented in NRC Generic Letter 99-02, "Laboratory Testing of Nuclear-Grade Activated Charcoal," dated June 3, 1999, licensees were requested to revise their Technical Specification criteria associated with laboratory testing of ventilation charcoal to a valid test protocol, which included ASTM D3803-1989. This license amendment request revises the charcoal laboratory standard to follow ASTM D3803-1989 for each BVPS Unit.

This license amendment request also revises the minimum amount of output in kilowatts needed for the control room emergency ventilation system heaters at each BVPS Unit. Calculations were performed for each Unit to show that the minimum required output of control room emergency ventilation system heaters needed to reduce the incoming air relative humidity from 100% to 70% could be reduced from 4.5 kw to 3.87 kw. This license amendment request also revises BVPS Unit 1 SLCRS surveillance testing criteria to be consistent with ANSI/ASME N510-1980, the BVPS Unit 1 control room ventilation testing, and the BVPS Unit 2 SLCRS/control room ventilation testing. This license amendment request also revises minor typographical corrections and editorial changes.

B. DESIGN BASES

Each BVPS Unit No. 1 and 2 control room emergency ventilation system draws air from an outside air intake by an air pressurization fan. The air flows through a

heater which is provided to limit the relative humidity of the air to the filter banks. The fan then discharges the air through an emergency outside air filter bank which contains a charcoal filter. The filtered air is introduced into the air conditioning system to maintain the pressurized condition in the control area. The BVPS Unit 1 control room emergency ventilation system is described in Section 9.13.4 in the BVPS Unit 1 UFSAR. The BVPS Unit 2 control room emergency ventilation system is described in Section 9.4.1 in the BVPS Unit 2 UFSAR. Under accident conditions, the control room air-conditioning system outdoor air intake is closed on a CIB signal or by operator action, isolating the entire main control area from the atmosphere. Emergency air pressurization system releases air from its compressed air tanks to maintain the control room at a positive pressure. Upon depletion of the compressed air supply in 60 minutes, the control room emergency ventilation system is initiated to subsequently maintain the control room environment.

The BVPS Unit No. 1 Supplementary Leak Collection and Release System (SLCRS) is described in Section 6.6 in the BVPS Unit No. 1 UFSAR. The BVPS Unit No. 2 SLCRS is described in Section 6.5.3.2 in the BVPS Unit No. 2 UFSAR. The primary function of the SLCRS system is to ensure that radioactive leakage from the primary containment following a Design Basis Accident (DBA), or radioactive release due to a fuel handling accident, or radioactive material released in the waste gas storage area is collected and filtered for iodine removal prior to discharge to the atmosphere at the SLCRS vent. The SLCRS train consists of a leak collection exhaust fan, which exhausts air from many areas where radioactive release may occur. Each train contains a charcoal filter which is effective for radioactive iodine removal.

C. JUSTIFICATION

The proposed changes to the surveillance requirements for the laboratory testing of ventilation system charcoal are consistent with Generic Letter 99-02. The proposed change will adopt ASTM D3803-1989 as the laboratory testing standard for performing the surveillance associated with the Control Room emergency ventilation and the SLCRS charcoal filters at each BVPS Unit. This standard provides the assurance for complying with the BVPS Unit 1 and Unit 2 licensing basis as it relates to the dose limits of GDC 19 and 10 CFR Part 100 as discussed in Generic Letter 99-02. The laboratory testing surveillance change also proposes a limitation of conducting the testing within 31 days after the charcoal is removed, in

accordance with the recommended criteria described in Generic Letter 99-02 Attachment 2. Previously the Technical Specification surveillances listed no specific limitation for the time frame to conduct the laboratory testing after the charcoal was removed.

A design calculation was completed for each BVPS Unit showing that the minimum required capacity of the Control Room emergency ventilation system heaters needed to reduce the incoming air relative humidity from 100% to 70% was 3.87 kw. The current Technical Specification requirement for minimum control room emergency ventilation system heater output was 4.5 kw. This conclusion was based on the current Technical Specification requirement for flow through the filters to be a maximum of 1000 cfm, with outside conditions assumed to be 90°F and 100% relative humidity. The calculation addressed the energy needed to increase the outside air from 90°F to 102°F in order to reduce the relative humidity from 100% to 70%. The calculated heater output was determined to be 3.87 kw. Therefore, the proposed minimum level of heater output will be sufficient to meet the system design requirements.

The BVPS Unit 1 SLCRS Technical Specification surveillance 4.7.8.1.b is proposed to be changed from a frequency of every 12 months to a frequency of every 18 months. This surveillance includes the charcoal adsorber in-place test gas removal testing, the HEPA filter in-place test gas removal testing, and the charcoal adsorber sample laboratory analysis testing. The proposed surveillance interval is acceptable based on the testing history of SLCRS at BVPS Unit 1. The testing history of SLCRS at BVPS Unit 1 shows that there has never been a HEPA filter failure discovered during DOP testing performed to satisfy Technical Specification 4.7.8.1.b.2 nor a mechanical efficiency failure of an adsorber bank discovered during testing performed to satisfy Technical Specification 4.7.8.1.b.1. This proposed frequency is also consistent with the frequency listed in ANSI/ASME N510-1980, Table 1, "Tests and Recommended Test Frequency," which suggests that the in-place leak test for laboratory testing of adsorbers, for HEPA filters in-place testing, for adsorbers in-place testing be at least once every operating cycle (in addition to the criteria for after every adsorber/filter change). The current operating cycle for BVPS Unit 1 is 18 months. The current Technical Specification surveillance criteria for similar adsorber/filter testing on the BVPS Unit 1 control room emergency ventilation system (4.7.7.1.d) is 18 months, consistent with once per operating cycle. This BVPS Unit 1 Technical Specification on the control room

emergency ventilation system was revised from a frequency of 12 months to 18 months during License Amendment No. 109, dated May 20, 1987, based on the testing criteria meeting ANSI N510-1980. The current Technical Specification for similar adsorber/filter testing on the BVPS Unit 2 SLCRS (4.7.8.1.b) and control room emergency ventilation system (4.7.7.1.1.c) is also 18 months, consistent with once per operating cycle. Thus the proposed change for adsorber/filter testing on the BVPS Unit 1 SLCRS would make it consistent with both ANSI/ASME N510-1980 and similar Technical Specification criteria at both Unit 1 and Unit 2.

BVPS SLCRS Technical Specification 4.7.8.1.c.2 is proposed to be changed to verifying the air flow distribution to each HEPA filter and charcoal adsorber "after each initial installation and after any maintenance affecting the flow distribution," rather than once every 18 months. The proposed surveillance criteria is acceptable based on the testing history of SLCRS at BVPS Unit 1. The testing history of SLCRS at BVPS Unit 1 show that the flow distribution surveillance test has been performed fourteen times since 1980 with no failed test results. This change is also consistent with ANSI/ASME N510-1980, Table 1, "Tests and Recommended Test Frequency" which states the air flow distribution test should be conducted after completion of initial construction and after any major system modification or repair. This proposed change to the Unit 1 SLCRS Technical Specification frequency would make it consistent with the Unit 2 SLCRS Technical Specification 4.7.8.1.d surveillance frequency for air flow distribution testing which is "after initial installation and after any maintenance affecting the flow distribution." Air flow distribution through a ventilation system adsorber/filter should not change unless there is some modification in the system arrangement which would cause a flow distribution change. Thus the proposed BVPS Unit 1 Technical Specification frequency change is consistent with the potential causes for what could cause an actual air flow distribution alteration.

Criteria or tolerances not specifically identified within the Technical Specifications for laboratory carbon sample analysis of BVPS Control Room and SLCRS ventilation charcoal filters will be controlled to the requirements of ASTM D3803-1989. Thus the testing tolerances were deleted for the listed laboratory carbon sample analysis parameters. The changes in testing criteria for BVPS Unit 1 Technical Specification 4.7.8.1.b.3 are consistent with ASTM D3803-1989 criteria.

The addition of the unit license number at the top of the page is an editorial administrative change to address site records criteria. Other editorial changes include changing the word "be" in BVPS Unit 1 Technical Specification 4.7.7.2.b to "by" which was a typographical error. Changing "m3" to "m^3" in Technical Specification 4.7.7.1.2.c.2 is an editorial correction. The "≥" symbol was added to Technical Specification 4.7.8.1.b.2. The "≥" symbol was in the original BVPS Unit 1 Technical Specification 4.7.8.1.b.2, but was inadvertently excluded in the issued page from Technical Specification, Amendment 56 (which did not revise 4.7.8.1.b.2). Vertical lines, which are now not commonly used, are being removed from BVPS Unit Technical Specification pages 3/4 7-20 and 3/4 7-21. BVPS Unit 2 Technical Specification 4.7.7.1.d removed an inadvertent extra "s" from the word "system."

D. SAFETY ANALYSIS

The proposed changes to the surveillance requirements for the laboratory testing of ventilation system charcoal are consistent with Generic Letter 99-02. The proposed change will adopt ASTM D3803-1989 as the laboratory testing standard for performing the surveillance associated with the Control Room emergency ventilation and the SLCRS charcoal filters at each BVPS Unit. This standard provides the assurance for complying with the BVPS Unit 1 and Unit 2 licensing basis as it relates to the dose limits of GDC 19 and 10 CFR Part 100 as discussed in Generic Letter 99-02. Thus this change ensures that the licensing basis is maintained.

The proposed change to the minimum required capacity of the Control Room emergency ventilation system heaters to 3.87 kw is acceptable because this lower value will continue to meet the system design criteria for reducing the incoming air relative humidity from 100% to 70%. Therefore, the proposed minimum level of heater output will be sufficient to meet the system design requirements providing continued acceptable control room emergency ventilation system operation.

The BVPS Unit 1 SLCRS Technical Specification surveillance 4.7.8.1.b is proposed to be changed from a frequency of every 12 months to a frequency of every 18 months. The proposed surveillance interval is acceptable based on the BVPS Unit 1 testing history showing no mechanical efficiency failures of an adsorber bank nor any HEPA filter failures discovered during DOP testing pursuant to Technical

Specification 4.7.8.1.b.1 or 4.7.8.1.b.2. The proposed frequency is also consistent with the frequency listed in ANSI/ASME N510-1980, Table 1, "Tests and Recommended Test Frequency," which provides a surveillance frequency acceptable for testing of nuclear air cleaning systems. Thus the proposed change for adsorber/filter testing on the BVPS Unit 1 SLCRS would continue to provide an acceptable testing frequency to verify system operation.

BVPS SLCRS Technical Specification 4.7.8.1.c.2 is proposed to be changed to verifying the air flow distribution to each HEPA filter and charcoal adsorber "after each initial installation and after any maintenance affecting the flow distribution," rather than once every 18 months. The proposed surveillance interval is acceptable based on the BVPS Unit 1 testing history showing no failed test results in the fourteen flow distribution surveillance tests performed since 1980 pursuant to Technical Specification 4.7.8.1.c.2. The proposed frequency is also consistent with the frequency listed in ANSI/ASME N510-1980, Table 1, "Tests and Recommended Test Frequency," which provides a surveillance frequency acceptable for testing of nuclear air cleaning systems. Thus the proposed change for adsorber/filter testing on the BVPS Unit 1 SLCRS would continue to provide an acceptable testing frequency to verify system operation.

The addition of the unit license number at the top of the page is an editorial administrative change to address site records criteria. Other editorial changes include changing the word "be" in BVPS Unit 1 Technical Specification 4.7.7.2.b to "by" which was a typographical error. BVPS Unit 2 Technical Specification 4.7.7.1.d removed an inadvertent extra "s" from the word "system."

E. NO SIGNIFICANT HAZARDS EVALUATION

The no significant hazard considerations involved with the proposed amendment have been evaluated. The evaluation focused on the three standards set forth in 10 CFR 50.92(c), as quoted below:

> The Commission may make a final determination, pursuant to the procedures in paragraph 50.91, that a proposed amendment to an operating license for a facility licensed under paragraph 50.21(b) or paragraph 50.22 or for a testing facility involves no significant hazards consideration, if operation of the facility in accordance with the proposed amendment would not:

(1) Involve a significant increase in the probability or consequences of an accident previously evaluated; or

(2) Create the possibility of a new or different kind of accident from any accident previously evaluated; or

(3) Involve a significant reduction in a margin of safety.

The following evaluation is provided for the no significant hazards consideration standards.

1. Does the change involve a significant increase in the probability or consequences of an accident previously evaluated?

The proposed changes to the surveillance requirements for the laboratory testing of ventilation system charcoal are consistent with Generic Letter 99-02. The proposed change will adopt ASTM D3803-1989 as the laboratory testing standard for performing the surveillance associated with the Control Room emergency ventilation and the SLCRS charcoal filters at each BVPS Unit. Thus this proposed change will not involve a significant increase in the probability or consequences of a previously evaluated accident since this standard provides the assurance for continuing to comply with the BVPS Unit 1 and Unit 2 licensing basis for ventilation filter testing.

The change in the control room emergency ventilation system heater minimum output at both BVPS Units does not change the system ability to meet its design bases. The change in the BVPS Unit 1 SLCRS testing frequency for adsorber/filter in-place testing and the adsorber laboratory testing does not change the SLCRS system's ability to meet its design bases. The change in the BVPS Unit 1 SLCRS testing frequency for SLCRS air flow distribution testing does not change the SLCRS system's ability to meet its design bases.

2. Does the change create the possibility of a new or different kind of accident from any accident previously evaluated?

   The proposed license amendment to the control room emergency ventilation system and SLCRS at both BVPS Units does not change the way the system is operated. The proposed changes only involve changes to the surveillance testing. These testing modifications do not alter these systems' ability to perform their design bases. Therefore, these proposed changes do not create the possibility of a new or different kind of accident from any previously evaluated accident since the control room emergency ventilation system and SLCRS will continue to operate in accordance with their design bases.

3. Does the change involve a significant reduction in a margin of safety?

   The proposed amendment does not involve revisions to any safety limits or safety system setting that would adversely impact plant safety. The proposed amendment does not affect the ability of system, structures or components important to the mitigation and control of design bases accident conditions within the facility. In addition, the proposed amendment does not affect the ability of safety systems to ensure that the facility can be maintained in a shutdown or refueling condition for extended periods of time.

   The proposed license amendment to the control room emergency ventilation system and SLCRS at both BVPS Units does not change the way the system is operated. The proposed changes only involve changes to the surveillance testing. These testing modifications do not alter these systems' ability to perform their design bases.

F. NO SIGNIFICANT HAZARDS CONSIDERATION DETERMINATION

Based on the considerations expressed above, it is concluded that the activities associated with this license amendment request satisfy the requirements of 10 CFR 50.92(c) and, accordingly, a no significant hazards consideration finding is justified.

G. ENVIRONMENTAL CONSIDERATION

This license amendment request changes a requirement with respect to the installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20. It has been determined that this license amendment request involves no significant increase in the amounts, and no significant change in the types of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. This license amendment request may change requirements with respect to installation or use of a facility component located within the restricted area or change an inspection or surveillance requirement; however, the category of this licensing action does not individually or cumulatively have a significant effect on the human environment. Accordingly, this license amendment request meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b) no environmental impact statement or environmental assessment need be prepared in connection with the issuance of this license amendment request.

H. UFSAR CHANGES

This proposed license amendment would not result in any changes to either the BVPS Unit 1 or Unit 2 UFSAR.

ATTACHMENT C

Beaver Valley Power Station, Unit No. 1 and No. 2
License Amendment Request Nos. 263 and 138, Rev. 1

[redacted]

BV-1 and BV-2 Control Room Heater Calculations

Duquesne Light Company A1.002D

Nuclear Engineering Department

DESIGN ANALYSIS / CALCULATION COVER SHEET

2/95

Design Analysis | X |	Alternate Calculation | |	Unit | 1 |	Page 1 of 6
CALCULATION TITLE (Indicative of the Objective): **Required Capacity of the BV-1 Control Room Heaters (VS-E-13A, 13B)**			QA Category | X | NUCLEAR | | II SAFETY RELATED | | III | | F

System No.	Building	Calculation No.	Rev.	Add.	Seismic
44A	Service Bldg.	8700-DMC-3427	0	0	YES | X | NO | |

Prepared by / Date	Checked by / Date	Confirmation Required	
		Yes	No
W. R. Emery WRE 3/17/98	Tim Basich 3-24-98		X
Approved by / Date	**EA Review by / Date**		
TM Goodbar 3/26/98	N/A RJB 3/26/98		

CROSS REFERENCE DATA			
TER	N/A		
DCP	N/A		
EM	113956		
MWR	N/A		
Temporary Mod.	N/A		
Supersedes Calc, Rev, Add	N/A		
Supplement Calc, Rev, Add	N/A		
Purchase Order No.	BV-514, D036330		
Pipe Line No.	N/A		
Cable/Raceway No.	N/A		
Software, Rev. used	N/A		
Referenced Drawings			
	8700-RB-2D, Rev. 19	8700-RB-17J, Rev. 14	8700-RE-18AL, REV. 6
	8700-RM-444A-4, Rev. 6	8700-RB-17K, Rev. 12	8700-RE-47H, Rev. 19
Equipment Mark No.			
	VS-E-13A		
	VS-E-13B		
Additional Data			
	TS 4.7.7.1.1, d-4	BV-1-UFSAR 9.13.4	1OM Chapter 44A
	ANSI N510-1980	8700-10.001-0958, Rev. A	

FOR INFORMATION ONLY
THIS DOCUMENT SHALL NOT BE USED TO PERFORM PHYSICAL WORK OR CONDUCT ACTIVITIES WHICH DIRECTLY AFFECT PLANT QUALITY.

1.0 Objective

This Design Analysis determines the minimum required KW output of the Unit 1 Control Room Emergency Pressurization System Heaters (VS-E-13A,13B) needed to reduce the incoming air relative humidity from 100% to 70%. The required delta-T across these heating units is also determined for the following two cases:

1) Demonstrate that both heating elements are energized.

2) Demonstrate that the KW Output is sufficient to reduce the relative humidity of incoming air from 100% to 70%.

The minimum required bus voltage for the A-Train and B-Train is also determined for the minimum Heater KW output.

2.0 Design Inputs

2.1 Temperature of Air Entering Heater: 90F
(Outdoor Site Design Base Temperature; 1972 ASHRAE Fundamentals, Table 1, pg. 679)

2.2 Relative Humidity of Air Entering Heater: 100%

2.3 Relative Humidity of Air Leaving Heater: 70%
(1OM-44A.1.C, Issue 4, Rev. 2, pg. 3 of 11)

2.4 Standard Atmospheric Pressure: 14.696 psia

2.5 Capacity of the Heaters: 5 KW +/- 10%
(Two Stage-two 2.5 KW Heating Elements)

2.6 Psychrometric Chart (Attachment-I)

3.0 References

3.1 EM No. 113956: Required Capacity of Unit 1 Control Room Heaters VS-E-13A, 13B.

3.2 Unit 1 TS 3.7.7.1

3.3 Unit 1 UFSAR, Sect 9.13.4, & Figure 9.13-2, Rev. 14.

3.4 Unit 1 OM Chapter 44A.1.B & C; 1OST-44A.2,3

3.5 ANSI/ASME 510-1980: Testing of Nuclear Air-Cleaning Systems.

3.6 8700-10.001-0958: Tutco Duct Heaters.

3.7 ASHRAE Fundamentals 1972, Table 1, pg. 679.

3.8 Air Conditioning and Refrigeration, Chapman & Hall, Limited, 1958.

3.9 Drawings:

3.9.1 VOND 8700-RM-444A-4, Rev. 6

3.9.2 FLOW 8700-RB-2D, Rev 19

3.9.3 8700-RB-17J, Rev. 14

3.9.4 8700-RB-17K, Rev. 12

4.0 Method of Analysis

Technical Specification TS 4.7.7.1.1 specifies that the Unit 1 Control Emergency Pressurization System must be verified for an 800 cfm to 1000 cfm air flow rate. The minimum required KW output needed to supply 70% Relative Humidity (or less) air to the charcoal filters was determined using the worse case conditions of 1000 cfm with outdoor conditions of 90F and 100% RH.

The minimum required delta-T measured across a heater needed to verify that both heating elements are energized was determined using 2.5 KW + 10%, 800 cfm, and 0% relative humidity. In this case, the maximum delta-T with one heating element failed would occur with the maximum potential KW (2.5 KW +10%), minimum air flow requirements, and no humidity.

The minimum required delta-T measured across the heater needed to verify that the heater output is sufficient to reduce the relative humidity of the incoming air from 100% to 70% is also determined using 800 cfm and 0% relative humidity.

Minimum required bus voltage for each train was determined for the minimum required Heater KW Output, as requested by EM No. 113956.

5.0 Assumptions

Please see Section 2.0, Design Inputs and Section 4.0, Method of Analysis.

6.0 Nomenclature, Acronyms, Definitions

Please see Section 7.0, Body of Analysis

7.0 Body of Analysis

Determine the minimum required Kilowatt Output of preheaters VS-E-13A, 13B to reduce the relative humidity of the air entering the charcoal beds from 100% to 70%:

Outdoor Conditions: 90F @ 100% RH (Reference 3.7 and Design Input 2.1)

The air temperature must be increased from 90F to 102F to reduce the relative humidity from 100% to 70% (ATTACHMENT-I).

PV = MRT (Reference 3.8, Eq. 1.4)

Pabs = 14.696 psia X 144 sq in/sq ft = 2116.2 lb/sq ft

R = 53.35 ft-lb/lbm (Reference 3.8, Table 1.5)

Tabs = 90F + 460F = 550F

v = V/M (cu ft/lbm): Specific Volume of dry air.

v = RT/P = 53.35 ft-lb/lbm X 550F / 2116.2 lb/sq ft =

13.87 cu ft/lbm (dry air)

Required System Flow Rate: 800 cfm - 1000 cfm (Tec. Spec.4.7.7.1.1, c-3)

Worse case mass flow rate of air:

m = 1000 cfm X 60 min/hr / 13.87 cu ft/lbm = 4325.9 lbm/hr

q_{sh} = m X Cp (T_2 - T_1)

q_{sh} = Sensible Heat of Dry Air

Cp = Specific Heat of Dry Air (0.24 BTU/lbm-F)
(Ref. 3.8, Table 1.2)

(T_2 - T_1) = Temp. Rise Through the Heaters (Attachment-I)

qsh = 4325.9 lbm/hr X 0.24 BTU/lbm-F (102F - 90F)= 12,458.6 BTUH or
3.65 KW

Superheat of Moisture:

q(superheat/lbm of dry air) = w x Cps(t - td)

td = Dew-point temperature (90F)

t = Dry-bulb temperature (102F)

w = Humidity Ratio (0.0315 lbm vapor/lbm of dry air, Attachment-I)

Cps = Specific Heat of Superheated Steam (0.45 BTU/lbm-F) (Ref.3.8, pg. 24)

q(superheat/lbm) =

0.0315 (lbm vapor/lbm dry air) X 0.45 BTU/lbm-F (102F-90F) = 0.1701 BTU/lbm

q(total superheat) = 0.1701 BTU/lbm X 4325.9 lbm/Hr =

735.8 BTUH or 0.22 KW

Total Required KW Output: 3.65 KW + 0.22 KW = **3.87 KW**

Determine the required delta-T across the heating unit to demonstrate if both heater coils are energized:

Assume that one heater failed:

Heater Output (one element): 2.5 KW + 10% = 2.75 KW

Worse Case Conditions:

800 cfm, 0% RH, 2.75 KW heating element output

q_{sh} = m x Cp x delta-T

q_{sh} = 2.75 KW X 3413 BTUH/KW = 9385.8 BTUH

m = 800 cu ft/min x 60 min/Hr / 13.87 cu ft/lbm =

3460.7 lbm/Hr

9385.8 BTUH = 3460.7 lbm/Hr x 0.24 BTU/lbm-F x delta-T

delta-T = 9385.8 BTUH / 3460.7 lbm/Hr x 0.24 BTU/LBM-F =

11.3 F

A temperature rise of 11.3F or greater is required to demonstrate that both heater coils are energized.

The measured delta-T necessary to demonstrate the minimum required KW Output of 3.87 KW is:

q_{sh} = 3.87 KW X 3413 BTUH/KW = 13208.3 BTUH

delta-T = 13208.3 BTUH/3460.7 lbm/Hr X 0.24 BTU/LBM-F = **15.9 F**

The minimum required bus voltage necessary for the heater output to be 3.87 KW is determined as follows:

From the last performance of 1BVT 01.44.02 on 11/15/96:

VS-E-13A:	4.8 KW	239.9 volts	20.2 amps
VS-E-13B:	5.0 KW	245.5 volts	20.4 amps

$P = E^2 / R$, $R = E^2 / P$

P = power (watts)

E = Volts

R= resistance (ohms)

VS-E-13A: $R = (239.9 \text{ volts})^2 / 4{,}800 \text{ watts} = 11.99 \text{ ohms}$
VS-E-13B: $R = (245.5 \text{ volts})^2 / 5{,}000 \text{ watts} = 12.05 \text{ ohms}$

Minimum required KW output is 3.87 KW:

VS-E-13A: $E^2 = P \times R$,

$E^2 = 3{,}870 \text{ watts} \times 11.99 \text{ ohms} = 46401.3$

E = **215.4** volts

VS-E-13B:

$E^2 = 3870 \text{ watts} \times 12.05 \text{ ohms} = 46633.5$

E = **215.9** volts

8.0 Summary of Conclusions

The minimum required KW output of VS-E-13A,13B to assure that air entering the charcoal filters is 70% Relative Humidity or less is 3.87 KW.

If a measured delta-T across these heaters is to be used to determine if both heating elements are energized, this delta-T must be 11.3 F or greater. This delta-T must be 15.9F, or greater, to demonstrate that the heater output is at least 3.87 KW.

For the output of the heaters to be 3.87 KW, the A-Train and B-Train voltages must be at least 215.4 volts and 215.9 volts, respectively.

9.0 Attachments

9.1 ATTACHMENT-I: Psychrometric Chart

9.2 ATTACHMENT-II: Design Review Checklist

Duquesne Light Company A1.002D
Nuclear Engineering Department
DESIGN ANALYSIS / CALCULATION COVER SHEET

2/95

Design Analysis | X |	Alternate Calculation | |	Unit | II |	Page 1 of 6
CALCULATION TITLE (Indicative of the Objective): **Required Capacity of the BV-II Control Room Heaters (2HVC-CH222A, 222B)**			QA Category ! X ! I NUCLEAR ! ; II SAFETY RELATED | | III | | F

System No.	Building	Calculation No.	Rev.	Add.	Seismic
44A	Service Bldg.	10080-DMC-3431	0	0	YES | X | NO | |

Prepared by / Date	Checked by / Date	Confirmation Required	
		Yes	No
W. R. Emery WRE 3/27/98	Tim Bosick 4-1-98		X
Approved by / Date	**EA Review by / Date**		
D Sockosi 4/1/98	N/A D J Zyn 4/2/98		

CROSS REFERENCE DATA	
TER	N/A
DCP	N/A
EM	113680
MWR	N/A
Temporary Mod.	N/A
Supersedes Calc, Rev, Add	12241-B-207, Rev. 0
Supplement Calc, Rev, Add	N/A
Purchase Order No.	2BV-157
Pipe Line No.	N/A
Cable/Raceway No.	N/A
Software, Rev. used	N/A
Referenced Drawings	
	VOND 10080-RM-444A-2, Rev 10 FLOW 10080-RB-84C, Rev 25
	10080-RB-39A, Rev 11
Equipment Mark No.	
	2HVC-CH222A
	2HVC-CH222B
Additional Data	TS 4.7.7.1.e.5, 10080-2510.800-157-002, Rev U ANSI N510-1980

1.0 Objective

This Design Analysis determines the minimum required KW output of the Unit 2 Control Room Emergency Pressurization System Heaters (2HVC-CH222A, CH222B) needed to reduce the incoming air relative humidity from 100% to 70%. Also determined are:

1) The required delta-T measured across these heaters to demonstrate that the above minimum KW Output is available.

2) The minimum required bus voltage for the A-Train and B-Train needed to produce the minimum required KW Output.

2.0 Design Inputs

2.1 Temperature of Air Entering Heater: 90F
(Outdoor Site Design Base Temperature; 1972 ASHRAE Fundamentals, Table 1, pg. 679)

2.2 Relative Humidity of Air Entering Heater: 100%

2.3 Relative Humidity of Air Leaving Heater: 70%
(2BVS-157: Ventilation Filter Assemblies, Sect. 1-16)

2.4 Standard Atmospheric Pressure: 14.696 psia

2.5 Capacity of the Heaters: 5 KW +/-10%
(Single Stage one 5 KW Heating Element)

2.6 Psychrometric Chart (Attachment-I)

3.0 References

3.1 EM No. 113680: Required Capacity of Unit 2 Control Room Heaters, 2HVC-CH222A, 222B.

3.2 Unit 2 TS 3.7.7

3.3 Unit 2 UFSAR, Sects 6.4,& 9.4; Figure 9.4-1; and Tables 6.4-1, Rev. 2 and 9.4-1, Rev. 7

3.4 Unit 2 OM Chapter 44A.1C; & Figure Nos. 44-6, & 44-8

3.5 ANSI/ASME 510-1980: Testing of Nuclear Air-Cleaning Systems.

3.6 10080-2510.800-157-002,Sect. IX, Rev. U: Ventilation Filter Assemblies.

3.7 ASHRAE Fundamentals 1972, Table 1, pg. 679.

3.8 Air Conditioning and Refrigeration, Chapman & Hall, Limited, 1958

3.9 2BVS-157,Rev. 4: Ventilation Filter Assemblies, American Air Filter

3.10 Direct and Alternating Currents, Loew & Bergseth, 1954

3.11 Drawings:

3.11.1 VOND 10080-RM-444A-2, Rev. 10

3.11.2 FLOW: 10080-RB-84C, Rev. 25

3.11.3 10080-RB-39A, Rev. 11

4.0 Method of Analysis

Technical Specification TS 4.7.7.c.3 specifies that the Unit 2 Control Room Emergency Pressurization System must be verified for an 800 cfm to 1000 cfm air flow rate. The minimum required KW output needed to supply 70% Relative Humidity, or less, air (2BVS-157) to the charcoal filters was determined using the worse case conditions of 1000 cfm with outdoor conditions of 90F and 100% RH.

The minimum required delta-T measured across a heater needed to verify that the heater is operable is established using the above determined minimum required KW output of the heaters, 800 cfm air flow rate, and 0% relative humidity. In this case, the maximum delta-T with the minimum Heater output will occur with the minimum allowable air flow rate and 0% relative humidity.

Minimum required bus voltage for each train was also determined for the minimum required Heater KW Output, as requested by EM No. 113680

5.0 Assumptions

Please see Section 2.0, Design Inputs and Section 4.0, Method of Analysis.

6.0 Nomenclature, Acronyms, Definitions

Please see Section 7.0, Body of Analysis.

7.0 Body of Analysis

Determine the minimum required Kilowatt Output of preheaters 2HVC-CH222A, CH222B to reduce the relative humidity of the air entering the charcoal beds from 100% to 70%:

Outdoor Conditions: 90F @ 100% RH (Reference 3.7 and Design Input 2.1).

The air temperature must be increased from 90F to 102F to reduce the relative humidity from 100% to 70% (ATTACHMENT I).

PV = MRT (Reference 3.8, Eq. 1.4)

Pabs = 14.696 psia X 144 sq in/sq ft = 2116.2 lb/sq ft

R = 53.35 ft-lb/lbm (Ref. 3.8, Table 1.5)

Tabs = 90F + 460F = 550F

v = V/M (cu ft/lbm): Specific Volume of dry air.

v = RT/P = 53.35 ft-lb/lbm X 550F / 2116.2 lb/sq ft =

13.87 cu ft/lbm (dry air)

Required System Flow Rate: 800 cfm - 1000 cfm (Tec. Spec.4.7.7.1.1, c-3)

Worse case mass flow rate of air:

m = 1000 cfm X 60 min/hr / 13.87 cu ft/lbm = 4325.9 lbm/hr

$q_{sh} = m \times Cp \ (T_2 - T_1)$

q_{sh} = Sensible Heat of Dry Air

Cp = Specific Heat of Dry Air (0.24 BTU/lbm-F) (Ref. 3.8,Table 1.2)

$(T_2 - T_1)$ = Temp. Rise Through the Heaters (Attachment-I)

q_{sh} = 4325.9 lbm/hr X 0.24 BTU/lbm-F (102F - 90F)= 12,458.6 BTUH or 3.65 KW

Superheat of Moisture:

q(superheat/lbm of dry air) = w x Cps(t - td)

td = Dew-point temperature (90F)

t = Dry-bulb temperature (102F)

w = Humidity Ratio (0.0315 lbm vapor/lbm of dry air, Attachment-I)

Cps = Specific Heat of Superheated Steam (0.45 BTU/lbm-F) Ref 3.8, pg 74

q(superheat/lbm) =
0.0315 (lbm vapor/lbm dry air) X 0.45 BTU/lbm-F (102F-90F) =

0.1701 BTU/lbm

q(total superheat) = 0.1701 BTU/lbm X 4325.9 lbm/Hr =

735.8 BTUH or 0.22 KW

Total Required KW Output: 3.65 KW + 0.22 KW = **3.87 KW**

Determine the required delta-T across the heating units to demonstrate that the above 3.87 KW is available:

Heater Output: 3.87 KW

Worse Case Conditions: 800 cfm, 0% RH

q_{sh} = m x Cp x delta-T

q = 3.87 KW X 3413 BTUH/KW = 13208.3 KW

m = 800 cu ft/min x 60 min/Hr / 13.87 cu ft/lbm =

3460.7 lbm/Hr

13208.3 BTUH = 3460.7 lbm/Hr x 0.24 BTU/lbm-F x delta-T

delta-T = 13208.3 BTUH / 3460.7 lbm/Hr x 0.24 BTU/LBM-F =

15.9 F

A measured temperature rise of 15.9 F (or greater) across the heaters, is required to demonstrate that the minimum required 13.87 KW is available.

The minimum required bus voltage necessary for the heater outputs to be 3.87 KW is determined as follows:

From the last performance of 2BVT 01.44.02, Issue 2, Rev 2 for Train-A (12/5/96) and Train-B (3/12/97):

2HVC-CH222A:	4.65 KW	479.6 volts	5.60 amps
2HVC-CH222B:	4.93 KW	478.8 volts	5.95 amps

E = KW X 1000/1.73 X I X PF (Reference 3.10, page 385)

E = volts

I = current (amps)

KW = power

PF = power factor (1 for resistance heat)

Reff = KW/I^2 (ohms)

Reff = Effective Resistance (ohms)

2HVC-CH222A: Reff = 4.65 KW X 1000 / (5.60 amps)^2 = 148.3 ohms

2HVC-CH222B: Reff = 4.93 KW X 1000 / (5.95 amps)^2 = 139.3 ohms

I^2 = KW X 1000 / Reff

2HVC-CH222A:

I^2 = 3.87 KW X 1000 / 148.3 ohms = 26.1

I = 5.11 amps

E = KW X 1000 / 1.73 X I =

3.87 KW X 1000 / 1.73 X 5.11 amps = **437.8 volts**

2HVC-CH222B

I^2 = 3.87 KW X 1000 / 139.3 ohms = 27.8

I = 5.27 amps

E = 3.87 KW X 1000 / 1.73 X 5.27 amps = **424.5 volts**

8.0 Summary of Conclusions

The minimum required KW output of 2HVC-CH222A, CH222B to assure that air entering the charcoal filters is 70% Relative Humidity or less is 3.87 KW.

If a measured delta-T across these heaters is to be used to determine if the heaters are producing 3.87 KW, this delta-T must be 15.9 F or greater.

For the output of the heaters to be 3.87 KW, the A-Train and the B-Train voltages must be at least 437.8 volts and 424.5 volts, respectively.

9.0 Attachments

9.1 ATTACHMENT-I: Psychrometric Chart

9.2 ATTACHMENT-II: Design Review Checklist