REQUEST FOR ADDITIONAL INFORMATION
Volume 2 – Preclosure
Chapter 2.1.1.7, Set 10 - Design of Structures, Systems and Components Important to Safety and Safety Controls
(RAI #1 - #8)

The following questions pertain to DOE's design of the surface heating, ventilation, and air-conditioning (HVAC) important-to-safety (ITS) systems. These systems are described in SAR Section 1.2.2.3, Section 1.2.4.4 for the Canister Receipt and Closure Facility (CRCF), Section 1.2.5.5 for the Wet Handling Facility (WHF), and Section 1.2.8.3 for the Emergency Diesel Generator Facility (EDGF). This information is required to determine compliance with 10 CFR 63.21(c) and 63.112(f).

RAI #1

Provide the following information:

a) A description of the specific portions of the guidance and standards that are used in the design of:

   i) HEPA filter plenums,
   ii) adjustable speed drives, and
   iii) air handling units (e.g., for the air handling units described on page B8-16 of BSC, 2008ac for the CRCF and page 1.2.8-23 of the SAR for the EDGF).

   DOE identifies principal codes and standards in Table 1.2.2-12 of the SAR starting on page 1.2.2-64 and regulatory guidance documents in Table 1.2.2-9 of the SAR starting on page 1.2.2-53 but it is not clear what parts of these codes and standards that DOE intends to use for design of the above equipment.

b) The design methodologies for ITS structures, systems, and components (SSCs) such as exhaust fans, dampers, HEPA filter plenums, including an explanation on how the design methodologies are in accordance with the codes and standards. For example, for the CRCF, see page 1.2.4-64 of the SAR.

c) An explanation of the extent to which the standards identified in Table 1.2.2.-12 of the SAR are used in the design of the ITS HVAC systems. For example, ANSI/ANS-57.9-1992, Section 6.5 pertains to HVAC systems. Explain if this section is being applied to the HVAC system design for the surface facilities in its entirety or if only portions of the section are being applied.

d) A description of the design of the ducts to maintain sufficient transport velocities. DOE identifies on page 1.2.4-59 of the SAR that the ducts are sized to maintain sufficient transport velocities and minimize particulates settling out.

e) Justification of the rated capacities and ventilation flow rates shown in Figure 1.2.5-87 of the SAR on page 1.2.5-311 for the WHF ITS HVAC electrical and battery rooms' ventilation flow diagram. For example, DOE shows exhaust fans having rated capacities of 1000 CFM and fan coil units having rated capacities of 6000 CFM. Explain how DOE determined the ventilation flow rates shown in the figure and designed the components to support the rated capacities shown in the figure.

RAI #2

Provide the design bases, design criteria, relationship to preclosure safety analysis, and HVAC design (including design assumptions) pertaining to the following:

a) Hydrogen removal requirements for hydrogen generated while charging batteries for the WHF, CRCF, and EDGF. For example, DOE identifies on page 1.2.4-60 of the SAR for the CRCF that the battery room exhaust has sufficient volume changes per hour to preclude the accumulation of hydrogen. Explain what is meant by sufficient volume changes and how the system was designed to preclude the accumulation of hydrogen.

b) Cooling requirements to meet the temperature criteria for ITS electrical equipment for the WHF, CRCF, and EDGF. For example, DOE identifies indoor design temperatures in Table 1.2.4-8 of the SAR on page 1.2.4-97 for the CRCF. Explain how DOE determined the temperature criteria, and how the HVAC system is designed to meet the temperature criteria.

c) Overall filtration efficiency for the surface nuclear confinement HVAC system in the WHF and CRCF for the event sequences involving a filtered radionuclide release.

d) DOE describes on page 1.2.8-22 of the SAR that the generator rooms in the EDGF are each provided with temperature-activated ITS exhaust fans to maintain the temperature below 120 °F. Explain how DOE determined this temperature criterion and explain how the HVAC subsystem is designed to meet this requirement.

RAI #3

Provide the technical basis for the HVAC system mission times.

a) DOE refers to ISG-03 on page B7-9 of BSC, 2008ac with regard to a 720-hour mission time. DOE also includes a 24-hour mission time for surface nuclear confinement HVAC systems in the WHF. Explain how the mission times relate to maintenance and test intervals for the HVAC systems.

b) For components in the standby train, DOE uses a 360-hour mission time and indicates on page B7-9 of BSC, 2008ac that this mission time is used because DOE is taking into account the difference in failure rates for active and standby systems. Explain how the 360-hour mission time takes into account the differences in failure rates.

RAI #4

For the surface nuclear confinement HVAC system, DOE identifies an interlock that prevents both HVAC exhaust trains from operating at the same time. For example, DOE identifies this interlock on page B7-5 of BSC, 2008ac. Explain the following:

a) How this interlock is included when developing the probability of failure for this system, and if this interlock can be a single point of failure for the system.

b) How the Adjustable Speed Drive (ASD) functions with the interlock. The text on page B7-4 of BSC, 2008ac indicates that the ASD shuts down the operating train; whereas, Figure 1.2.4-101 of the SAR appears to indicate that the interlock shuts down the operating train.

RAI #5

Provide the following references which describe the design and performance of the HVAC systems:

a) Bechtel SAIC Company, LLC. 2007. “CRCF 1 Equipment Sizing and Selection Calculation (ITS).” 060-M8C-VCT0-00500-000-00B. Las Vegas, Nevada: Bechtel SAIC Company.

b) Bechtel SAIC Company, LLC. 2007. “CRCF 1 Heating and Cooling Load Calculation (Tertiary non ITS).” 060-M8C-VCT0-00400-000-00D. Las Vegas, Nevada: Bechtel SAIC Company.

c) Bechtel SAIC Company, LLC. 2007. “CRCF1 Air Pressure Drop Calculation (ITS).” 060-M8C-VCT0-00600-000-00B. Las Vegas, Nevada: Bechtel SAIC Company.

d) BSC 2007. WHF Equipment sizing and Selection Calculation (ITS). 050-M8C-VC0000500-000-00B. Las Vegas, Nevada: Bechtel SAIC Company.

e) BSC 2007. WHF Air Pressure drop Calculation (ITS), 050-M8C-VC00-00600-00000A, Las Vegas, Nevada: Bechtel SAIC Company.

RAI #6

For the surface nuclear confinement HVAC systems in the WHF and CRCF and the surface nonconfinement HVAC system in the EDGF, justify that the systems have independent trains as described in the design criteria on page 1.2.4-91 of the SAR for the CRCF, page 1.2.5-89 of the SAR for the WHF, and page 1.4.1-25 of the SAR for the EDGF. Some examples needing clarification follow:

a) DOE describes on page B7-4 of BSC, 2008ac that the adjustable speed drives communicate during the transfer from the operating train to the standby train. Explain how these trains are independent if the adjustable speed drives communicate during the transfer. Clarify if a software failure on the adjustable speed drives is accounted for in the SAPHIRE models and if a failure of the adjustable speed drives to communicate can be a single point of failure.

b) DOE shows in Figure B7.4-4 of BSC, 2008ac on page B7-20, “Train A Sensors Controllers Failure Train B Startup not Initiated” as a contributor for Train B failure at switchover. The fault tree appears to show components in one train contributing to failure of the other train.

c) Provide the analyses DOE used to determine that components, events, or actions would not affect both trains for those HVAC systems in which independence is identified in the design criteria.

RAI #7

Explain how the fault tree models support the probability of failure values identified in the nuclear safety design bases. The following provides some examples requiring clarification:

a) For the surface nuclear confinement HVAC system in the CRCF, Figure B7.4-3 of BSC, 2008ac shows basic events such as, “Vestibule Door Open During Receipt/Export” and “Operators Open 2 [or More] Vestibule Doors in CRCF.”

    i) Explain if the receipt and export activities and the operator error in attempting to open two or more vestibule doors relates to activities associated with the event sequence.

    ii) Explain if there are other activities in the period of time following the radionuclide release that operators would be performing that can contribute to failure of the HVAC system to perform its safety function during the mission time but have not been identified in the model.

b) For the surface HVAC systems, DOE identifies that each supply and exhaust fan is interlocked with its corresponding discharge damper on page 1.2.4-63 of the SAR. Explain if this interlock is ITS and how this interlock is included when developing the probability of failure for the HVAC systems.

c) For the surface nuclear confinement HVAC subsystem supporting the cooling of ITS electrical equipment and battery rooms, DOE identifies on page 1.2.4-60 of the SAR an interlock between the exhaust fans and the fan coil units. In addition, DOE identifies the operation of the refrigerant compressors controlled by a signal from a temperature sensor/transmitter determined by a signal selector.

   i) Explain how failures of these components (i.e., sensor/transmitter, interlock) were included when developing the probability of failure for the HVAC subsystem. Clarify if the interlock is ITS.

   ii) Explain how operator errors (e.g., operator actions associated with the signal selector) were included when developing the probability of failure for the HVAC subsystem.

d) For the surface nonconfinement HVAC system in the EDGF, DOE identifies two ITS subsystems on page 1.2.8-22 of the SAR. Provide the location of the fault tree models supporting the probability of failure identified in the nuclear safety design basis on page 1.4.1-25 of the SAR. Explain how the exhaust fan probability of failure shown in Figure B8.4-12 of BSC, 2008ac on page B8-52 supports the nuclear safety design basis. Specify what components in Figures 1.2.8-25 and 1.2.8-26 of the SAR on pages 1.2.8-121 and 1.2.8-123, respectively are ITS.

e) For the surface nuclear confinement HVAC system in the WHF, DOE identifies in Table 1.2.5-3 of the SAR on page 1.2.5-88 an unavailability of less than or equal to 1×10^{-3} as part of a nuclear safety design basis. DOE shows on page A-72 of BSC, 2008bq basic event, “HVAC-FAIL-DURING-PREP” for which the SAPHIRE model has a mean probability of failure of 1.1×10^{-3}. Explain how the nuclear safety design basis is being met.

f) Explain how DOE accounts for failure of non-ITS fire/smoke dampers in its failure models for the HVAC systems.

g) Figure B8.2-13 of BSC, 2008ac on page B8-17 shows HEPA filter plenums. Explain how DOE includes failures associated with the HEPA filter plenums in the SAPHIRE models. In addition, DOE shows operating and standby units in this figure. Explain how control is transferred to the standby units, what initiates the transfer, and how the transfer is included in the SAPHIRE models.

RAI #8

Explain how DOE accounts for loss of cooling to ITS electrical equipment and battery rooms in the CRCF, WHF, and EDGF in terms of its effect on equipment other than failure of HVAC system exhaust fans. For example, explain how loss of cooling to ITS electrical equipment and battery rooms can affect interlocks, radiation monitors, or other equipment that operators may rely on to prevent them from performing an unsafe action.

References:

BSC. 2008ac. "Canister Receipt and Closure Facility Reliability and Event Sequence Categorization Analysis." 000–PSA–CR00–00200–000. Rev. 00A CACN 001. Las Vegas, Nevada: Bechtel SAIC Company, LLC.

BSC. 2008bq. "Wet Handling Facility Reliability and Event Sequence Categorization Analysis." 050–PSA–WH00–00200–000. Rev. 00A. CACN 001. Las Vegas, Nevada: Bechtel SAIC Company, LLC.