October 4, 1991

Docket No. 52-002

MEMORANDUM FOR: Charles L. Miller, Director
Standardization Project Directorate
Division of Advanced Reactors

FROM: Conrad E. McCracken, Chief
Plant Systems Branch
Division of Systems Technology

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION ON CESSAR-DC SYSTEM 80+ DESIGN CERTIFICATION REVIEW

Plant Name: CESSAR-DC System 80+
Licensee: Combustion Engineering
Review Status: Continuing

Enclosed is a request for additional information (RAI) that resulted from a review of CESSAR-DC System 80+ in the Plant Systems Branch area of responsibility. This RAI also includes questions that resulted from SPLB's staff and its contractor reviews of Combustion Engineering responses to previously submitted RAIs.

In addition, we have included questions and comments associated with Unresolved Safety Issues (USIs) and Generic Safety Issues (GSIs) related to CESSAR-DC System 80+. These questions were developed for issues that were not identified as resolved with the resolution being contained in the Standard Review Plan (SRP).

Original signed by

Conrad E. McCracken, Chief
Plant Systems Branch
Division of Systems Technology

Enclosure:
As stated

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[RAI for CESSAR-DC]

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Enclosure

REQUEST FOR ADDITIONAL INFORMATION
ON THE DC APPLICATION FOR THE ABB-COMBUSTION
ENGINEERING SYSTEM 80+ DESIGN
DOCKET NO. 52-002
CESSAR-DC

3.4.1 Water Level (Flood) Design

The following clarifications of responses to previously submitted RAIs are requested.

410.32.C (3.4.1) The response to question 410.32.c implies that the floor drain and sump pumps supply flood protection for all safety related systems. However, in section 9.3.3 and 9.4.9, only the reactor subsphere and diesel generator sump pump systems were identified as being safety related and providing some measure of flood protection. The floor drain system (including system instrumentation) for other areas containing safety related systems were not identified as providing flood protection and were, therefore, not identified as safety related equipment. Provide information to resolve this apparent discrepancy between the information contained in Chapters 3 and 9.

410.32.g (3.4.1) Table 3.2-4 was identified (in response to question 410.32.g) as providing a list of structures to be flood protected. However, this table does not specifically identify which of the structures listed will be designed using flood loading criteria.

Additional questions from the review of Amendment I.

410.97 (3.4.1) Provide a discussion of how the Cooling Water System Structures are to be flood protected or provide a set of flood protection interface criteria for those structures not within the CESSAR design scope.

410.98 (3.4.1) An internal flood protection discussion is not provided in Section 3.4. Reference is made to discussions in Section 9.3.3. However this section discusses only piping related failures; a discussion of tank related failures provided in response to a separate RAI was not incorporated into the text of the CESSAR-DC. Provide in section 3.4 a discussion of the internal flood protection methods to be utilized in the design.

3.5 Missile Protection

The following clarifications of responses to previously submitted RAIs are needed.

410.33 (3.5.1.1.3) The response to RAIs 410.33 and 410.36-39 should be fully incorporated into the CESSAR-DC text.

410.36 (3.5.1.2) The response to RAI 410.36 does not appear to address the justification for the elimination of pressurized cover plates from the list of postulated missiles.

Additional questions from the review of Amendment I.

410.99 (3.5.1) With regard to the missiles identified in Table 3.5-2.

a. For item b, the 6" Sch. 40 Pipe, the impact area should read 5.58 instead of 34. Only the steel area of the pipe should be considered as the impact area.

b. For item e, the 12" Sch. 40 Pipe, the impact area should read 15.74 instead of 125. Again only the steel area of the pipe should be considered as the impact area.

410.100 (3.5.1) With regard to the information in Table 3.2-4. Provide the function and location of the station test structure and justify why it is not tornado wind and missile protected.

3.6.1 Plant Design for Protection Against Postulated Piping Failures in Fluid Systems Outside Containment

The following clarifications of responses to previously submitted RAIs are needed.

480.5 (3.6.1) In response to RAI 480.5 reference is made to a pipe guard. Provide descriptions and drawings to show how the pipe guard will contain ruptured high energy lines between the primary containment and its shield building.

480.34 (3.6.1) Additional questions from the review of Amendment I

a. In Section 3.6.1.3.B provide justification for the use of abutments and foundations as missile barriers and shields.

b. The reference to Sect n 3.6.2.3.3 in Section 3.3.1.3.c apparently should read Section 3.6.2.3.2.5.

3.11 Environmental Design of Mechanical and Electrical Equipment

270.1 (3.11) In response to RAI 270.1 parts a through h, a substantial amount of information that was provided in the March 15, 1991 response (LD-91-012) was not fully incorporated into the text of Section 3.11, for example the references to compliance with the requirements of 10 CFR 50.49 in response to RAI 270.1(f) has not been incorporated into the Amendment I version of the CESSAR-DC for the System 80+. The information provided in the responses to the RAIs should be fully incorporated into the text of the CESSAR-DC.

270.2 (3.11)

a. The NRC staff has not accepted IEEE Std. 323-1983. Justify the use of the definition for a mild environment from this standard for the System 80+.

b. CENPD-255-A was originally accepted for use for the components identified as being supplied by Combustion Engineering. It is not readily apparent that the program outlined in this document can simply be extended to include the BOP. Provide a justification for the use of the program for BOP equipment and an explanation of how the program will be applied to the BOP.

c. In the discussion on Radiation For Harsh And Non-Harsh Environment Equipment reference is made to radiation above 10^4 Rads as the level for which equipment will be irradiated to its anticipated TID prior to type testing. This level should be 10^4 Rads and above.

d. Table 3.11B-1 uses descriptive terms to describe the required duration of operation during a design basis accident, such as continuous, short term, varies, and intermittent. Provide a more quantitavite definition of these terms.

e. The meaning of the discussion of the testing procedure in section 3.11.5.3 is not entirely clear. Clarify the procedure to be used to test equipment not subjected to a steam environment during DBA. Verify that the equipment is to be tested during the exposure to a high humidity environment rather than the equipment is to be subjected to a high humidity environment and subsequently tested.

f. In section 3.11.5.4 reference is made to qualification by type test and/or analysis supported by partial type test data. 10 CFR 50.49 does not allow for qualification by analysis only. More fully describe what is meant by analysis and partial type test and show that this combination meets the requirements for testing and analysis allowed by 10 CFR 50.49.

5.2.5 Reactor Coolant Boundary Leakage Detection

410.101 (5.2.5) As stated in section 5.2.5.1.1.3 of the System 80+ CESSAR, "the particulate monitoring system is capable of functioning when subjected to an SSE." However, this system is not specifically identified in Table 3.2-1, Classification of Structures, Systems and Components. Therefore, clarify which system in Table 3.2-1 is the "particulate monitoring system" designed to monitor RCPB leakage.

5.4.11 Pressurizer Relief Tank

410.102 (5.4.11)

a. In Section 6.8.3 of the CESSAR the statement is made that the instrumentation requirements for the in-containment refueling water storage tank (IRWST) are described in Section 7.4.1.3. However this section was not provided in Amendment I. Therefore, provide information on the instrumentation requirements for the operation of the IRWST, including level, temperature, and pressure indication and alarms.

b. Indicate whether the steam relief system (SRS) is designed to standards and codes that would be in conformance with Reg Guide 1.26, as related to the quality group classification of the piping system, and Reg Guide 1.29 position C.2, as related to the seismic design qualification of the system.

6. CONTAINMENT SYSTEMS

6.2.1 Containment Functional Design

480.35 (6.2.1) To satisfy the requirements of GDC 16 and 50 regarding sufficient design margin, for plants in the CP stage of review, the containment design pressure should provide at least a 10% margin above the accepted peak calculated containment pressure following a LOCA, or a steam or feedwater line break. The calculated peak pressure found in Table 6.2.1-2 is 48.34 psig and, from Table 6.2.1-3, the internal design pressure is 49.0 psig. Justify the lack of a 10% margin between the peak accident pressure and the design pressure.

6.2.2 Containment Heat Removal Systems, and
6.5 Containment Fission Product Control

(6.2.2 & 6.5) a. Although Section 6.5.1.3.K.3 of the CESSAR indicates that a calculation for NPSH for the containment spray pumps was performed, there is insufficient information available. As required by GDC 38 and SRP 6.2.2 Rev. 4, Item II.2, provide an NPSH analysis for the containment spray pumps to ensure that pump cavitation will not occur during any anticipated operating conditions. This analysis should be performed in accordance with Regulatory Guide 1.82, Rev. 1 and Regulatory Guide 1.1, for both the injection and recirculation phases of a postulated LOCA. The analysis should be based on maximum expected temperature of the pumped fluid and no increase in containment pressure from that present prior to postulated LOCAs. This analysis should have sufficient detail to permit the staff to determine the adequacy of the analysis.

b. Provide an evaluation of the long-term performance of the in-containment refueling water storage tank (IRWST) to provide a reliable source of water for the containment spray system during the recirculation phase of a LOCA. This requirement, in accordance with GDC 38 and SRP 6.2.2 Rev. 4, Item II.6, should include an evaluation of adequate drainage back to the IRWST of spray water, IRWST hydraulic performance, and the design features of the IRWST which preclude debris accumulation from inhibiting sufficient flow to the containment spray system. Guidance from Regulatory Guide 1.82 Rev. 1 and NUREG-0897 Rev. 1 should be used in preparing a response.

c. As stated in SRP 6.5.2 Rev. 1, Item II.1.a, the operating period of the containment spray system should not be less than 2 hours, and the system should be capable of operation in the recirculation mode, on demand, for a period of at least 1 month following the postulated accident. What is the design operating period of the containment spray system?

d. In accordance with SRP 6.5.2 Rev. 1, Item II.1.d, provide detailed information on the drop size distribution for the nozzles, such as a histogram. Designations such as "average," "mean," and "median" numbers do not provide sufficiently detailed information to permit an independent evaluation of the performance of the nozzle.

e. As stated in SRP 6.5.2 Rev. 1, Item II.1.g, the pH of the aqueous solution collected in the containment sump after completion of injection of containment spray and ECCS water, and all additives for reactivity control, fission product removal, or other purpose, should be maintained at a level sufficiently high to provide assurance that significant long-term iodine re-evolution does not occur. Long-term iodine retention with no significant re-evolution may be assumed only when the equilibrium sump pH, after mixing and dilution with the primary coolant and ECCS injection, is above 8.5. CESSAR Section 6.5.3 indicates that the long-term pH of the recirculated containment spray solution will be maintained at a minimum of 7.0. Justify the difference between the two long-term pH values.

6.2.3 Annulus Ventilation System

480.36 (6.2.3) a. Our interpretation of the containment system is that there are both a primary and a secondary containment. As such, the analyses outlined in SRP 6.2.3 Rev. 2, including the following, need to be performed:

1) Pressure and temperature response of the secondary containment to a LOCA in the primary containment

2) Pressure and temperature response of the annular region between the primary and secondary containments to a high energy line rupture within the secondary containment

b. Regulatory Guide 1.52 specifies use of HEPA filters before and after carbon filters. Provide a justification for the use of a single HEPA filter in the proposed design.

c. Is the annulus ventilation system instrumented to signal, alarm and record pressure drops and flow rates in the control room as specified in Regulatory Guide 1.52?

d. Will the system be tested in accordance with ASME/ANSI N509 and N510 as specified in Regulatory Guide 1.52.?

6.2.4 Containment Isolation System

480.37 (6.2.4) a. In accordance with SRP 6.2.4 Rev. 2, Item II.6.h, provide the classification of all systems that penetrate the containment as either essential or non-essential.

b. In accordance with SRP 6.2.4 Rev. 2, Item II.6.1, provide information on the diversity in the parameters sensed for the initiation of containment isolation to satisfy GDC 54.

c. In accordance with SRP 6.2.4 Branch Technical Position Item 1.g, provide information on the provisions which have been made to ensure that the containment purge isolation valve closure will not be prevented by debris which could potentially become entrained in the escaping air and steam.

d. In accordance with SRP 6.2.4 Branch Technical Position Item 5, provide an analysis of the radiological consequences of a LOCA, taking into account the possibility of open purge valves. The source term used should be based on a calculation under the terms of Appendix K to determine the extent of fuel failure and the concomitant release of fission products, and the fission-product activity in the primary coolant. The volume of the containment in which fission products are mixed should be justified, and the fission products from the above sources should be assumed to be released through the open purge valves during the maximum interval required for valve closure.

6.4 Habitability Systems

450.3 (6.4)

a. The text states that the control room is pressurized and that, on presence of radioactive material at both inlets, both inlets will close. Identify the source and flow rate of make-up air which balances outleakage from the pressurized control room in this mode of operation. Which areas does control room leakage enter?

b. Table 9.4-2 indicates that the air flow rate through the control room A/C unit is 6,000 cfm and that flow rate through the control room filter unit is 2,000 cfm. Is this data consistent? If it is, provide an explanation of the difference in magnitude.

c. Figure 9.4-2 does not provide an umambiguous representation of the location of the control room and control room elements relative to the containment structure. What is the position and elevation of all control room inlet and exhaust vents on the nuclear annex building? The data should allow determination of distance of the vents from any point on the containment structure.

d. Discuss the elevation and location of plant vents, including positions relative to the control room ventilation inlet.

e. Provide a list of areas considered part of the control room emergency zone.

f. What is the emergency zone volume?

g. Under accident conditions with one inlet closed, what is the expected infiltration rate?

The following comments are based on a review of the latest revision to Section 9.1.1 (Amendment I).

9.1.1 New Fuel Storage

410.103 (9.1.1) a. Section 9.1.1.1 states compliance with the "intent" of Regulatory Guide 1.13 as a design basis. Considering that Regulatory Guide 1.13 pertains to spent fuel storage, explain what parts of the Guide, and to what extent, are met by the new fuel storage design.

b. Section 9.1.1.3.3 states that "new fuel storage racks and facilities are qualified as Seismic Category I." Identify the "facilities" which are so qualified.

c. Section 9.1.1.2 does not provide sufficient descriptive information on features illustrated in the figures. For instance, what is the function of "L" insert slots and boxes? How are the "cell blockers" attached to the structure? What is the equipment in the "new fuel inspection area"? What is their seismic classification?

d. The new fuel storage capacity changed from 166 in Amendment E to 121 in Amendment I. What is the design basis for the storage capacity of the system?

e. According to SRP Section 9.1.1, the design of the new fuel storage facility is acceptable if the integrated design is in accordance with, among other criteria, General Design Criteria 61 and 62 of 10 CFR 50, Appendix A. Specific criteria necessary to meet the requirements of GDC 61 and 62 are ANS 57.1 and ANS 57.3 as they relate to the prevention of criticality and to the aspects of radiological design. Provide information on the extent of compliance of the design to ANS 57.1 and ANS 57.3.

f. According to SRP Section 9.1.1, design calculations should show that the storage racks and the anchorages can withstand the maximum uplift forces available from the lifting devices without an increase in k_{eff}. A statement in the Safety Analysis that excessive forces cannot be applied due to the design is acceptable if justification is provided.

g. It is the position of the Plant Systems Branch that the vaults and racks of the new fuel storage facility are to be designed to preclude damage from dropped heavy objects. Provide the design features included in the design which either preclude the fall of heavy objects onto the racks or preclude damage from a drop of the load with the maximum potential energy.

h. Reference to Section 9.1.1.3.1.2.D in Section 9.1.1.3.1.1, regarding potential moderators such as fire extinguishing aerosols, appears to be in error. Should it be 9.1.1.3.1.2.C?

i. According to SRP Section 9.1.1, the failure of non-seismic Category I systems or structures located in the vicinity of the new fuel storage racks should not cause an increase in k_{eff} beyond the maximum allowable. Provide analysis that this condition is met or include in your application a commitment to the above condition as a design criterion.

9.1.2 Spent Fuel Storage

The following comments are made based on the review of CE responses to previously submitted RAIs:

410.64 (9.1.2)

a. The application does not include the required discussion regarding failure of non-safety-related systems and structures and their potential effects on the integrity and coolability of the spent fuel racks. Provide this analysis.

b. The response to RAI 410.64 is adequate with the following exception: The response commits to add an insert to Section 9.1.2.2.2 in the next revision of the section. Amendment I of the Section does not contain the insert.

410.54 (9.1.2)

The response to RAI 410.54 is incomplete. Please provide the values for the maximum lifting height assumed for each case analyzed.

The following comments are based on the review of the latest revision of Section 9.1.2 (Amendment I).

410.104 (9.1.2)

a. According to SRP Section 9.1.2, the design of the spent fuel storage facility is acceptable if the integrated design is in accordance with General Design Criterion 2. Acceptance for meeting this criterion is based on conformance to position C.3 of Regulatory Guide 1.13, the applicable portions of Regulatory Guide 1.29, Regulatory Guide 1.117, and ANS 57.2 paragraphs 5.1.1, 5.1.3, 5.3.2, and 5.3.4. Discuss the spent fuel storage design with respect to these criteria. What is the meaning of Section 9.1.2.3.2 regarding the "intent" of Regulatory Guide 1.13?

b. In Section 9.1.2.3.3 provide a list of the facilities which are Seismic Category I.

c. According to SRP Section 9.1.2, design calculations should be provided to show that the spent fuel racks and any anchorage can withstand the maximum fuel equipment uplift forces without an increase in k_{eff} or a decrease in pool water inventory. A statement in the Safety Analysis that excessive forces cannot be applied due to the design of the fuel handling equipment is acceptable if justification is provided.

d. According to SRP Section 9.1.2, the design of the spent fuel storage facility is acceptable if the integrated design is in accordance with General Design Criterion 63, as it relates to monitoring systems provided to detect conditions that could result in the loss of decay heat removal capabilities, to detect excessive radiation levels, and to initiate appropriate safety functions. Acceptance for meeting this criterion is based on conformance with paragraph 5.4 of ANS 57.2. Provide the design features which satisfy GDC 63 and discuss compliance with paragraph 5.4 of ANS 57.2.

9.1.3 Pool Cooling and Purification System

The following RAI was previously submitted to CE but no response has been received:

410.67 The spent fuel pool cooling system must be designed with
(9.1.3) suitable redundancy of components that safety functions can be performed assuming a single failure of a component coincident with the loss of all offsite power. Your submittal does not provide the information necessary to verify that the system can continue to perform its intended function without offsite power. Provide the failure modes and effects analysis (FMEA) to verify that the system is capable of meeting this requirement.

The following requests and comments are based on the review of responses to previous RAIs:

410.61 (9.1.3) Provide an evaluation that assures that any failure in the nonsafety-related spent fuel pool cleanup and associated systems cannot affect the functional performance of any safety-related components in accordance with SRP 9.1.3, Section III.5 guidance. Your response by submittal dated May 15, 1991 did not adequately address this question. The referenced P&ID does not provide sufficient information to determine the affects that a failed nonsafety-related system or component will have on a safety-related component.

410.68 (9.1.3) The response to RAI 410.68 includes the statement that "the statement made in Section 9.1.3.3.1 has been corrected in Amendment I." Amendment I still contains the statement that the SFPCS has no emergency function during an accident.

410.56 (9.1.3) The response to RAI 410.56, regarding heat generation rate calculations is considered incomplete. Provide the residual decay heat release-vs-time curves generated with the ORIGEN 2 methodology to substantiate the statement of conservatism. Provide the resulting heat loads that need to be removed and a comparison of these heat loads to the design heat removal rates for the system.

410.59 (9.1.3) The response to RAI 410.59 is considered not adequate. The description of the system in Section 9.1.3 does not contain the details of the information requested, and the design bases, as stated in Section 9.1.3, are not specific enough to ensure that the design will satisfy the requirements stated. Include, in terms of design bases or design description, the commitment that the following general features will be included in the design:

- A leakage detection system to detect component or system leakage.

- Components and headers of the system to be designed to provide individual isolation capabilities to assure system function, control system leakage, and allow system maintenance.

- Design provisions to be included to assure the capability to detect leakage of radioactivity or chemical contamination from one system to another and to preclude long term corrosion, organic fouling or the spread of radioactivity.

410.55 (9.1.3) a. The response to RAI 410.55(a) is considered not adequate. Provide, as a minimum, the heat removal rates required to meet the design bases criteria for normal and abnormal conditions, and the design heat removal rates for these conditions.

d. The response to RAI 410.55(d) is considered not adequate. It did not respond to items (4) and (5).

410.105 (9.1.3) Section 9.1.3.3.1, Availability and Reliability, of your submittal states that "a cooling train may be shut down for limited periods of time for maintenance or replacements of malfunctioning components." However, it does not provide sufficient information to determine the rate of pool heatup and, thus, the allowable unavailability of the system, for normal and abnormal conditions. Please provide this information.

281.34 (9.1.3) The response to RAI 281.34 indicated that Section 9.1.3.3 would be revised to include part of the response. Amendment I of Section 9.1.3.3 does not include the revision.

The following comments are based on the review of the latest revision of Section 9.1.3 (Amendment I):

110.106 (9.1.3)

a. Section 9.1.3.2.1 states that the spent fuel pool cooling system is "safety-related, Quality Group C." Indicate whether or not the system is designed to seismic Category I requirements. If not, confirm that the following systems are designed to seismic Category I requirements and are protected against tornadoes: the fuel pool make-up water system and its source; and, the fuel pool building and its ventilation and filtration system. Confirm that the make-up, and ventilation and filtration systems can withstand a single failure. Also, confirm that the transient temperature used in evaluating combined loads on structures is the boiling temperature of water.

b. It is the position of the Plant Systems Branch that the design must meet the requirements of 10 CFR 20.1(c) as it relates to radiation doses being kept as low as reasonably achievable (ALARA). In meeting this regulation Regulatory Guide 8.8, positions C.2.f(2) and C.2.f(3) are used as a basis for acceptance. Discuss the features of the design which satisfy the above positions.

9.1.4 Fuel Handling System

410.107 (9.1.4) a - Evaluate the structural design features of the refueling cavity water seal that would preclude a leak or failure from occurring. Include the possibility of a fuel assembly or other structure dropping on the seal.

b - If a seal failure/leak occurred, determine the time to lower a fuel assembly below the reactor vessel flange level before unacceptable dose rates from a lowered water level above spent fuel in the reactor core.

c - For a postulated seal failure/leak, evaluate containment dose rates from a lowered level above spent fuel in reactor core.

d - For a postulated seal failure/leak, evaluate the following parameters: makeup capacity, emergency procedures, fully loaded spent fuel pool thermal-hydraulic and dose effects including dose rate to someone trying to manually close the transfer tube valve to hydraulically isolate the spent fuel pool from the leak, time to cladding damage without operator action. Specifically provide the maximum allowable time to isolate the spent fuel pool from the transfer tube and refueling pool before there are unacceptably high dose rates in the spent fuel pool area and inadequate spent fuel pool cooling due to the level dropping below the minimum NPSH requirement above the elevation of the pool cooling suction inlet piping.

410.108 (9.1.4) Provide numerical values of dose rate at appropriate locations above and around the spent fuel pool with its design maximum loading. Has the effect of higher than anticipated fuel enrichment and burnup been incorporated in the spent fuel pool shielding design?

9.1.4 The following comments are based on the review of the latest revision to Section 9.1.4, Amendment I:

410.109 (9.1.4) a. It is the position of the Plant Systems Branch that the design for both light and heavy fuel handling load systems must conform to the requirements of General Design Criterion 2, as it relates to the ability of structures, equipment, and mechanisms to withstand the effects of earthquakes. The acceptance is based on meeting Regulatory Guide 1.29, position C.1 and C.2, and positions C.1 and C.6 of Regulatory Guide 1.13. In the safety evaluation area of the section specifically address the conformance of the design to the above guidelines.

b. It is the position of the Plant Systems Branch that the design of the fuel/load handling systems must conform to the requirements of General Design Criterion 61 as it relates to a radioactivity release as a result of fuel damage, and the avoidance of excessive personnel radiation exposure. Acceptance is based on the guidelines of positions C.3 and C.5 of Regulatory Guide 1.13, ANS 57.1/ANSI-N208, ANS 57.2/ANSI-N210, and guidelines in NUREG-0554, and NUREG-0612. In the safety evaluation area of the section, specifically address the conformance of the design features to each of the above guidelines.

9.2 Plant Auxiliary Water Systems

9.2.1 Station Service Water System (SSWS)

410.110 (9.2-9.2.1) a. The system P&IDs do not identify the class of piping and equipment which comprise the SSWS. The only class breaks provided on these P&IDs are the Class 3/Class 4 breaks at the vents. Provide additional piping and equipment classification identification on the system P&IDs.

b. Plant layout drawings need to be provided to support the resolution of the following issues:

- In order to assess the separation of redundant components from a common missile or pipe break hazard, plant layout drawings are to be reviewed to confirm that the SSWS pumphouse is constructed with walls between pumps of the same division, as well as between pumps of different divisions.

- The plant layout drawings will also indicate if piping runs cross yards and this will alow the reviewer to assess the systems susceptibility to the freezing of piping.

c. Sheet 1 of Figure 9.2-1 identifies two valves that have been assigned the same number (i.e., SW-1356). A similar condition exists on Sheet 3 of Figure 9.2-3 with valve number SW-2356.

d. Similarly, Table 9.2.1-3 identifies butterfly valves SW-1356 and SW-2356 as 'active valves' even though these valves are manually operated valves (i.e., have no operators). In addition, the table indicates that the safety position of valves SW-1356 and SW-2356 is open. These valves are upstream of the removed spool piece and an open position would only be acceptable subsequent to the re-installation of the spool piece.

e. Table 9.2.1-2 should be revised to provide design information on the SSWS heat exchangers. For example, the design heat duty (i.e., Btu/Hr), and shell and tube side data including inlet and outlet temperatures, flow and pressure.

9.2.2 Component Cooling Water System (CCWS)

410.111 (9.2.2) a. The CESSAR should provide a justification that a pipe break in the non-essential portion of the CCWS (e.g., downstream of CC-102 or CC-202) would not adversely threaten the integrity of safety related components and systems which could be affected by flooding which results from the break (i.e., due to CCW Surge Tank inventory release).

b. Similar to Question 1 above, the CESSAR should address more fully the ramifications associated with the failure of the single isolation valve to the non-essential portion of the system.

c. The following issues should be addressed in the CESSAR:

- The use of a check valve as a containment isolation valve (e.g., valves CC-1507 and CC-2507) requires justification within the CESSAR text.

- The Class 2 motor-operated isolation valve on the Surge Tanks will fail open as indicated on the CESSAR figures. The line on which this valve is installed is a Class 4 line indicating it could not be expected to survive a seismic event. Could this jeopardize the inventory in the surge tank?

- Similarly, could the failure of the non-seismic Class 4 overflow line from the CCW Surge Tank to the CCW Sump adversely impact the inventory in the surge tank in a seismic event?

d. The CESSAR should address the ability of the CCWS surge tanks to maintain a continuous water supply to the essential portions of the CCWS assuming a break in the non-seismic portions of the non-essential piping and the failure to isolate of valves CC-102 and CC-202. This discussion should include an analysis of the time to manually isolate these valves and/or to the time necessary to install the SSWS spool piece.

e. Table 9.2.2-4 should be revised to identify the design volume of the surge tanks to allow for an evaluation of the adequacy of this volume.

f. Figure 9.2.2-1 should also be revised to identify the interface between the CCWS and the Demineralized Water System. While the Demineralized Water System is the primary make-up system, it is not reflected on the CESSAR figures.

g. Section 9.2.2.2.2.6, "Loss Of Offsite Power", should be revised to more specifically address the response of the CCWS to a loss of offsite power event (e.g., by assuming a two-hour or eight-hour LOOP). The CESSAR should describe the timing of diesel generator loading and the re-start of the

CCWS in regards to the heat load in the reactor coolant system. The current discussion is inadequate to evaluate the CCWS design against the criteria in SRP Paragraph III.3.g.

h. The location of the radiation monitors would prevent their use during periods when the non-essential portions of the CCWS is isolated from the rest of the system (e.g., during accidents or off-normal events). Therefore, the adequacy of this design requires further justification or the monitors should be relocated.

i. While SRP Paragraph III.4.c requires conductivity monitors to be installed, the CESSAR does not indicate that monitors are to be provided. The CESSAR should provide additional justification if these monitors are not to be provided.

9.2.6 Condensate Storage System (CSS)

410.112 (9.2.6) a. A P&ID should be provided to support the review of this system, in regards to system isolation from safety-related systems (e.g., Emergency Feedwater System) since this system provides no safety-related function.

- The isolation provisions of this system should be discussed in the CESSAR.

b. Would the rupture of the non-seismic Condensate Storage Tank(s) result in flooding? Would this affect safety related equipment or result in contamination of surrounding area?

9.2.9 Chilled Water System (CWS)

410.113 (9.2.9) a. A P&ID should be provided for the Chilled Water Systems (CWS) to allow for a review of system isolation between the essential and normal portions of the CWS. The sketch provided is inadequate to support a review of the design adequacy of the system.

b. The Safety analysis should indicate that the Essential Chilled Water System would be protected from pipe breaks, pipe whip, tornado missile damage, jet impingement or severe environmental conditions. Please provide this information.

9.3.1 Compressed Air Systems

410.114 (9.3.1) a. Part (a) to the response to Question 410.81 referenced CESSAR Figure 9.3.1-1 which had been incorporated in Amendment I. Please respond to the following on this figure.

1. Confirm that the outboard motor-operated containment isolation valve and the associated inboard check valve represent the only safety-related portion of the Compressed Air System.

2. The figure reflects three (3) instrument air compressors while Section 9.3.1.2.1 states that "Instrument air is supplied by two, 100% capacity instrument air compressors."

3. This figure does not indicate whether valve operators are manual, motor or air operated. This information is needed to determine the isolation capability provided by the design

b. Part (b) to the response to Question 410.81 indicates that Table 9.3.1-1, "Active Safety-Related Components Serviced By Instrument Air", had been included in Amendment I. This table was not provided with Appendix I and revisions to Section 9.3.1 do not include any reference to this table.

c. Part (c) to the response to Question 410.81 stated: "To assure separation of the air systems, the systems have no interconnections." However, Section 9.3.1.2.1 of the CESSAR (Amendment I) indicates: "In the event of low instrument air pressure, the Station Air System will automatically supply air to the Instrument Air System. This air will be supplied through two oil removal filters to the instrument air compressors discharge header."

The text in Section 9.3.1.2.1 is inconsistent with the response to Question 410.81, Part (c) cited above. In addition, the connection between the IA System and the Service Air System could not be identified on Figure 9.3.1-1.

d. The CESSAR should be revised to address the following questions on the design of the Compressed Air System.

1. Confirm that the Instrument Air System is not safety-related and not seismically qualified [except as noted in Item (1) of Question (a) above.]

2. Is the Instrument Air System to operate with one compressor operating at a time? If so, is there a setpoint which would actuate the other (or one of the other two) compressors? If one IA compressor is operated at a time, would the failure of this operating compressor result in the movement of all safety related (and non-safety related) air operated valves to their fail-safe condition? Would this increase the probability of shutdowns during normal operation?

3. Provide P&IDs for the Station Air System and Breathing Air System.

4. Figure 9.3.1-1 indicates that, except for a single check valve, there is no separation between the portion of the IA System that supplies safety related components and systems and the portion that supplies non-safety related components and systems. Could this result in an increased potential for the failure of non-safety related valves to adversely affect the operability of safety related valves (and, therein, cause more shutdowns)?

5. Section 9.3.1.1 indicates that the IA System will provide oil free air to safety related components. However, the text does not identify whether this will be achieved via filtration or the use of 'dry' compressors. This issue should be clarified.

6. Information provided in Part (d) of the response to Question 410.81 should be incorporated into the CESSAR for completeness.

e. The Standard Review Plan requires the air quality to comply with the quality standards specified in ANSI MC 11.1-1976 (ISA S7.3). The ANSI standard requires a dew point for indoor installations to be at least 10°C below the minimum temperature expected. In addition, it specifies that: "In no case, should the dew point at line pressure exceed 2°C (approximately 35°F)." Contrary to this requirement, Section 9.3.1.2.1 indicates that the Instrument Air System is to be dried to a dew point of 30°F to 39°F by refrigerated air dryers. The current design does not, therefore, comply with the ANSI standard and should be justified.

f. Provide a list of instrumentation supplied by the Instrument Air System. Identify which of these instruments are essential to safe shutdown or accident mitigation, and evaluate the effects of loss of instrument air on these instruments. (This question was previously submitted as Question 410.51.)

9.3.3 Equipment and Floor Drainage System

410.115 (9.3.3) a. The figures provided in section 9.3.3 do not indicate where changes in system component safety classification occur. In particular, Figure 9.3.3-1 does not show the classification for the containment isolation valves and penetrations. Additionally, the check valves which provide backflow protection for areas containing safety related equipment should be Safety Class 3 and Seismic Category I. The classification for these components should also be provided on the appropriate figures.

b. Table 3.2-1 identifies the sump pumps for the reactor building subsphere as being Safety Class 3 and Seismic Category I. The figures in Section 9.3.3 do not indicate that these pumps are so classified. Modify both the text and the figures to indicate that these sump pumps are Safety Class 3 and Seismic Category I. Additionally, the instrumentation required to control these pumps must also be identified as being safety related since the pumps provide flood protection.

c. The text and Figure 11.2 indicate that there is a separate equipment drain system, discharging to the Equipment Waste Tanks. However the drainage system (with the exception of the Diesel Generator Sump Pump System) is not discussed to the same level of detail as the floor drainage system. Similarly, several inputs to the drain headers are identified in the several sheets of Figure 11.2-1 for which no system description or P&IDs are provided, particularly the Turbine Building and Radwaste Building drain systems. Identify whether these portions of the drain system are to be included within the scope of the CESSAR System 80+. If so, provide system descriptions, safety evaluations, and P&IDs for these portions of the system. If these portions are to be considered beyond the scope of the standardized design, provide a set of interface criteria for the plant specific applicant that will allow for the design of a system that will meet the requirements identified in SRP Section 9.3.3.

d. Figure 11.2-1 refers to Auxiliary and Fuel Building discharges to the equipment and floor drain headers. This is not consistent with the figures in section 9.3.3 which refer to Nuclear Annex and subsphere sumps. Verify that the references to the Auxiliary and Fuel Building discharges are in fact the discharges from the areas identified in section 9.3.3.

9.4.1 Control Building Ventilation System

410.116 (9.4.1) a. The system diagrams indicate that each fresh air intake is isolated from ductwork used by the other inlet by a single damper. Reconcile this design with the single failure criterion.

b. The system diagrams indicate that the by-pass for the emergency filter trains are separated from the balance of the system by a single damper. Provide justification as to why two dampers not needed to meet the single failure criterion?

c. Provide P&IDs showing redundant smoke, toxic gas and radiation monitors for the control room system.

d. Table 9.4-2 presents flow data for control room-related areas which appear to be flows through recirculation units located in those areas. Is this the proper interpretation of the data for the control room mechanical equipment room, the operation support center, the men and women change rooms, the break room, the shift assembly and offices area, the radiation access control area and the essential electrical room?

e. What are the design values for air flow rates for all flow paths in the control building for normal and accident conditions? Your response should include areas shown in Figure 9.4-2, such as the essential electrical room, for which normal inlet flow is indicated but for which the exit flow path is not identified.

f. Are fresh air intakes protected against the effects of high winds, rain, snow, ice and trash?

g. Regulatory Guide 1.52 specifies placement of HEPA filters before and after carbon absorbers in the atmospheric clean-up system. Provide a justification for the use of a single HEPA filter in the proposed design.

h. Are the ducts leak tested in accordance with ASME/ANSI-N509?

i. What is the maximum hydrogen concentration in battery rooms served by this system?

j. This section does not provide an explicit statement as to the seismic category of the control building and the control building does not appear in the list of structures in Table 3.2-1. What is the seismic category of the control building?

k. Table 3.2-1, titled, Classification of Structures, Systems and Components, does not list dampers for the control building system. Is the table, as provided in Amendment I, complete for all ventilation systems and all components? If not, provide a complete listing of ventilation system components required in Table 3.2-1.

9.4.2 Fuel Building Ventilation System

410.117 (9.4.2)

a. Provide P&IDs which show redundant radiation monitors.

b. Does the design allow for in-service testing as specified in the SRP?

c. System diagrams indicate that the filtration system by-passes employ a single damper. How is this feature reconciled with the single failure criteria?

d. Table 8.3.1-2, titled Division 1 Class 1E Loads, does not list the fuel building ventilation system fans or filtration system heaters. Is this table complete?

e. Regulatory Position C.2 of Regulatory guide 1.52 specifies placement of HEPA filters before and after carbon absorbers. Provide a justification for the use of a single HEPA filter in the proposed design.

f. Is testing in accordance with ASME/ANSI AG-1-1988 equivalent to testing in accordance with ASME/ANSI N509 & N510?

9.4.4 Diesel Building Ventilation System

410.118 (9.4.4)

a. Provide a diagram that includes the intake and exhaust vents, fans, dampers, heating/cooling elements, filters and other major system components. The diagram should provided some indication that air flow patterns will provide effective heat transfer to the exhaust air.

b. What is the elevation of the fresh air intake vents?

c. Is the building built to Seismic Category I standards?

d. Provide a description of the diesel generator space heaters identified in Table 8.3.1-2.

9.4.5 Subsphere Building Ventilation System

410.119 (9.4.5) a. Does the design permit in-service testing of all essential components?

b. What effect does failure of the non-essential supply fan have on exhaust fan function? What is the air flow rate through the exhaust filtration unit with and without the supply fan? What is the pressure drop across the exhaust fan with and without the supply fan?

c. What is the elevation of the fresh air intakes above plant grade?

d. Is the system instrumented to monitor and alarm pressure drop and flow rates as suggested in Regulatory Position C.2 of Regulatory Guide 1.140?

e. Are the fresh air intakes protected against adverse environmental conditions, high winds, rain, snow, ice, etc?

f. Regulatory Guide 1.52 specifies placement of HEPA filters before and after carbon absorbers. Provide a justification for the use of a single HEPA filter in the proposed design.

9.4.6 Containment Cooling And Ventilation System

410.120 (9.4.6) The CESSAR states, on p 9.4-27, that the containment high volume purge mitigates the consequences of fuel handling accidents to within 10CFR100 limits and, on p 9.4-30, that the system is not an ESF. Reconcile the apparent contradiction.

9.4.8 Station Service Water Pump Structure Ventilation System

410.121 (9.4.8) a. Provide a diagram showing all system components and general configuration of the serviced areas.

b. What is the elevation above plant grade of the fresh air intakes?

9.4.9 Nuclear Annex Ventilation System

410.122 (9.4.9) a. What are the heat loads and system design parameters for the cooling units in the essential equipment areas served by this system?

b. Provide system diagrams showing locations, components and configuration of the nuclear annex ventilation and cooling system.

c. Does the design provide for in-service inspection of essential components?

d. Is the Nuclear Annex Building constructed to Seismic Category I standards?

e. Does essential equipment function in loss of off-site power?

f. Clarify the meaning of the reference to the Subsphere Building Ventilation System in Section 9.4.9.4.

9.5 Fire Protection

280.2 (9.5.1.1) NUREG-0800 is not a sufficient fire protection design basis for the System 80+ design. Please commit to the current NRC fire protection guidance provided in SRP Section 9.5.1 (BTP CMEB 9.5-1), July 1981) and supplemental guidance issued by the COmmission. Three examples of such supplemental guidance are (1) Generic Letter 81-12, which contains informaiton on safe shutdown methodology; (2) Generic Letter 86-10, which contains important technical information, such as conformance with National Fire Protection Association codes and standards; and (3) the Commission's staff requirements memorandum (SRM) dated June 26, 1990.

280.3 (9.5.1.1) In Section 9.5.1.1.2.c, the applicant indicates that where redundant channels of safety related divisions are located in the same fire area automatic sprinklers and fire detectors are provided. This philosophy seems inconsistent with the 3-hour fire rated separation criteria described in Section 9.5.1.4, Safe Shutdown Following Fire. It is our position, advanced reactor designs should fully demonstrate that redundant divisions and channels of safety related and non-safety related systems including the necessary support systems required to achieve and maintain safe shutdown conditions are maintained free from fire damage and separated by 3-hour fire barriers. For those areas where separation can not be achieved, please identify the functions which could potentially be lost due to fire and the impact that these lost functions may have on the plants ability to achieve and maintain safe shutdown conditions.

280.4 (9.5.1.1)

a. In Section 4.5.1.1.2.c, the applicant provides for separation of redundant divisions and channels by at least 20 feet without intervening combustibles in the annulus and at the containment penetrations. This level of separation may not be sufficient to assure both redundant divisions are maintained free from fire damage. The staff recognizes the need for open communication between compartments inside the containment so that pressure following a high-energy line break can be relieved and equalized. Therefore, the use of structural walls inside the containment as fire barriers to separate safety-related systems (cabling, components, and equipment), even though such walls may not fully enclose the equipment requiring separation, is acceptable. However, care must be taken in actual system layout to ensure that line-of-site exposure between components requiring separation does not exist and that a sufficient labyrinth exists between the separated components to ensure that fire does not spread. Since the containment is considered to be a single fire area, the separation of redundant shutdown equipment, including associated cables, should be such that one shutdown division will remain free of fire damage.

b. In addition, this separation criteria seems to be inconsistent with the criteria identified by SRP section C.b.(2)(b), in that no detection or automatic fixed suppression is provided for these areas. Please provide additional justification as to why the proposed level of fire protection is equivalent to the level required by the SRP.

280.5 (9.5.1.3) Figure 9.5.1-4 is not clear concerning possible communication between the Division I and II Diesel Generator Rooms and their supporting facilities.

280.6 (9.5.1.3) Section 9.5.1.4, Safe Shutdown Following Fire, indicates that each division and redundant channel of safety related equipment are separated by 3-hour fire barriers. Section 9.5.1.6.2, Ventilation Systems indicates that the ventilation systems are division-specific so that fire or smoke cannot migrate through the ventilation ducts to an area containing the redundant division. In addition, the applicant's response to question 280.1, indicated that the system 80+ design does not have connections (door or ventilation openings) between redundant safety-related divisions. However, in section 9.5.1.3.2.1, 9.5.1.3.2.4, and 9.5.1.6.2, the applicant indicates fire dampers are used. In order to get a better understanding on how fire spread and smoke migration is controlled by the HVAC design, please describe the system logic for the smoke and the fire control modes of operation. In addition, describe those cases where fire dampers are used within a division-specific ventilation system.

280.7 (9.5.1.3) Section 9.5.1.3.2.6, Fire Insulating Material, indicates that there may be cases where fire insulating materials for cabling may be necessary. It is our position, for advance reactor designs, complete divisional separation by 3-hour fire rated barriers provides the most conservative approach towards assuring that one train of systems necessary to achieve and maintain safe shutdown is free from fire damage. Please justify how the use of cable fire insulating material provides the same equivalent level of fire protection to that afforded by spatial separation and a 3-hour fire barrier wall assembly.

280.8 (9.5.1.3) Section 9.5.1.3.4 states that an engineering analysis would be provided for materials which do not meet or have not been tested in accordance with UL 84 or UL 251. An engineering analysis alone will not be acceptable for materials which do not meet or have not been tested to the UL 85 or UL 251 qualification. Such materials will be required to pass the appropriate test prior to use in the System 80+ design.

280.9 (9.5.1.3) Confirm that sealed beam, battery powered emergency lighting units have a minimum 8-hour battery capacity.

280.10 (9.5.1.4) The third paragraph states that separation of electrical power, control and instrumentation must comply with the requirements of IEEE 384-1. They must also be physically separated in accordance with the requirements of Appendix R to 10 CFR Part 50, Section III.G.2.a using 3-hour fire rated barriers.

The fourth paragraph states that, "cables of redundant safety-related divisions and channels enter the Reactor Building on Elevation 81+0, Division 1, which consists of channels A and C, enters the reactor building from opposite sides, as does Division 2, which consists of channels B and D." Figures 9.5.1-3 and 9.5.1-4 do not show these division 1 and 2 cables entering on opposite sides. Please clarify.

280.11 Section 9.5.1.4, Safe Shutdown Following a Fire, discusses
(9.5.1.5) electrical separation and independence. Please provide a discussion on how the System 80+ design addresses high-low pressure interface and fire induced spurious operation concerns and SRP 9.5.1, position C.5.…(7).

280.12 Section 9.5.1.5.2, Water Distribution System, Hydrants, and
(9.5.1.5) Hose Houses, the applicant indicates that hydrants with 2-2 1/2 inch gated nozzles will be used on site. These type of hydrants are sufficient to support fire brigade use however, if off-site assistance is needed and a fire engine is needed to relay water from one of these hydrants to a remote fire location, the capability to supply a fire engine with adequate water may be limited. Consideration should be given to providing fire hydrants which will support the use of fire apparatus if off-site fire fighting assistance is needed.

280.13 In reviewing figure 9.5.1-1,Fire Protection Water Distribution System,
(9.5.1.5) it is noted that a single pipe break in the the piping section between the two fire pump discharge lines could render the total fire system inoperable. This condition exists, under limited conditions, at other places on the underground fire water loop (i.e., loss of fire water to onsite structures). This does not seem to be consistent with the criteria discussed in section 9.5.1.5.2, Water Distribution System, Hydrants, and Hose Houses.

280.14 Section 9.5.1.5.3, Automatic Sprinkler Systems, indirectly infers
(9.5.1.5) that the preaction sprinkler systems are air/nitrogen supervised. Please verify if these systems are supervised and revise the system description to reflect the method of supervision.

280.15 Section 9.5.1.5.4, Fire Hose and Standpipe Systems, the criteria
(9.5.1.5) being proposed by the applicant for the seismic water supply to manual fire fighting hose stations is not consistent with the criteria identified in SRP section C.6.c.(4). Please justify how the pressure tank concept provides equivalent fire fighting capabilities to that required by the SRP.

280.16 In Section 9.5.1.5.5, the statement is made that "water based
(9.5.1.5) extinguisher rated at 10 B.C. is installed." No water based extinguishers are approved for Class C (electrical) fires.

280.17 In Section 9.5.1.5.6, Fire Detection and Alarm System, the
(9.5.1.5) applicants fire detection system design philosophy and proposed areas to be covered by detection does not follow the guidance provided by SRP section C.6.a. Please justify how the proposed fire detection philosophy provides an equivalent level of detection capability to that required by SRP 9.5.1.

280.18 In Section 9.5.1.5.6 the applicant indicates the use of manual fire
(9.5.1.5) alarm pull stations. The description associated with the fire detection/alarm system does not discuss the distribution of these devices or the coverage philosophy. Please describe the distribution and the philosophy behind the use of these devices.

280.19 Please explain how ventilation systems are designed to provide
(9.5.1.3) smoke control capabilities. The kinds of specific information required include:

- use, if any, of smoke and/or fire dampers,
- number of air changes per unit time when the HVAC system is operating in 100% exhaust mode.
- HVAC pressure balance between an area with a fire and adjacent areas.

280.20 What protection is provided for filters against fouling by
(9.5.1.6) smoke/soot with potential for failure due to excessive pressure drop across the filters.

280.21 Are moisture separators required or provided upstream of charcoal
(9.5.1.6) and HEPA filter to protect them from potential damage due to water that may become entrained in the exhaust system?

280.22 In Section 9.5.1.6.4, Reactor Coolant Pump Motor Oil Collection
(9.5.1.6) System, the description does not indicate if the reactor coolant pump oil collection drain tanks are provided with level indication which is alarmed and annunciated in the control room. Please discuss how the tank levels are monitored.

280.23 Please specify that breathing air compressors are located in areas
(9.5.1.6) that are free of any airborne contaminants. In addition, please specify that breathing air compressors shall be oil free and shall conform to the appropriate OSHA requirements.

280.24 In Section 9.5.1.7.1, Fire Pumps, the applicant indicates that
(9.5.1.7) the hydrostatic test pressure for the suction and discharge piping is 200 psi. The static head of the pump may exceed 200 psi. The criteria recommended by NFPA 24 is static plus 50 psi. Please provide justification as to why this criteria is not being considered.

280.25 In Section 9.5.1.7, Startup and Recurring System Tests and
(9.5.1.7) Inspections, the reoccurring tests described do not represent a consistent testing program which would meet the provisions of the tests recommended by current STS. As a minimum, these tests should assure total system operability (i.e., testing of the battery for the diesel fire pumps, fire detection circuit testing, fire door testing, fire barrier testing, etc). Please provide a description of testing which will demonstrate full system functional operability.

280.26 In Section 9.5.1.9.3, Fire Brigade Organization, Training, and
(9.5.1.9) Records, the proposed system is not consistent with the guidance provided in SRP section C.3. Please provide additional information which assures that the training, drills, practice sessions, brigade equipment will meet the guidance of the SRP.

9.5.4 - 9.5.9 Diesel Generator Support Systems

410.123 (9.5.4-9.5.9) With regard to the recommendations of NUREG/CR-0660, additional information is needed to address the following concerns.

1. For the control of dust in the diesel generator building provide assurance that instruments will be mounted in dust tight enclosures and those requiring ventilation will be provided with filtered louvers and gasketed doors, air for building ventilation is taken through an intake at least 20 feet above ground, and measures will be taken to paint exposed concrete floors.

2. All instruments not required to be mounted on the engine itself are required to be mounted on a free standing floor mounted cabinet to limit the effects of vibration due to diesel engine operation. Verify that the instrument panels discussed in Chapters 8 and 9 of the SSAR meet this requirement.

3. The following should be addressed as an interface requirement: personnel training for diesel generator operation including manufacturer recommended surveillance testing, preventative maintenance and root cause analysis all of which should be incorporated into the diesel generator operation.

9.5.4 Diesel Generator Engine Fuel Oil System

410.124 (9.5.4)

a. Section 9.5.4.3 alternately states that "buried piping and tanks are protected...by an impressed current cathodic protection system" and "impressed current cathodic protection (if provided) system surveillances." Clarify whether such a system is part of the diesel generator engine fuel oil system design.

b. Section 9.5.4.2.1 states that the four fuel oil tanks are "centrally located and integrally connected with normally closed isolation valves." This statement is interpreted to mean that the storage tanks which are not identified in the plant layout diagrams are in close proximity to each other which could violate separation criteria for redundant systems. Provide justification for the apparent lack of separation. Additionally, the location of the fuel oil recirculation system is not identified. Is this system, and the associated safety grade isolation valves, located above ground, below ground, or housed within a structure? Identify the means provided to protect the safety related interfaces from natural phenomena.

c. Provide justification for the lack of flame arrestors on the fuel oil storage and day tanks as required by ANSI standard N195.

d. No temperature indications or controls appear to be provided for the fuel oil system. Therefore provide an interface requirement that will ensure that the fuel oil cloud point is lower than the 3 hour minimum soak temperature to insure ignition as required in Reg Guide 1.137.

e. Figure 9.5.4-1 shows provisions for drains in the fuel oil day tank but the text does not discuss the means to control water accumulation in the day tank. Provide a discussion of the control of water in the fuel oil day tank that addresses the recommendations of NUREG/CR-0660.

9.5.5 Diesel Generator Engine Cooling Water System

410.125 a. The diesel generator is required to be able to operate for
(9.5.5) extended periods with less than full electrical power generation required without degradation of performance or reliability. Provide an interface requirement that will ensure that procedures to prevent excessive light load operation will be developed. As an example, a requirement that the diesel will be operated at 25% load for 1 hour after 8 hours of continuous light load operation or as per manufacturers recommendations is sufficient.

b. A three way thermostatic control valve regulates flow through the shell side of the jacket water cooler. Verify that this valve will be of the Amot type or equivalent as recommended by NUREG/CR-0660.

9.5.6 Diesel Generator Engine Starting Air System

410.126 Verify that the air dryers of the diesel generator engine starting
(9.5.6) air system will be capable of supplying air with a dew point of not more than 50°F for a normally controlled 70°F environment or dewpoint at least 10°F lower than the lowest expected ambient temperature.

9.5.7 Diesel Generator Lube Oil System

410.127 The lube oil system includes a continuously operating prelube
(9.5.7) pump. Figure 9.5.7-1 shows local indication of pump discharge pressure and differential pressure across the prelube oil filter. However, no alarms are provided, as required, to alert the operator of prelube pump failures. Either provide a means to alarm pump failure or verify that the system low pressure alarms will actuate a diesel generator trouble signal in the control room when the diesel is in the standby mode, as well as during diesel generator operation, and the prelube pump fails.

9.5.8 Diesel Generator Engine Air Intake and Exhaust System

410.128 (9.5.8) The recommended height for the intake of the Diesel generator engine intake and exhaust system is 20 feet from ground level to the bottom of the intake. Section 9.5.8.3 states that the diesel intake air is taken at a height of 10 feet above grade. Either provide justification for not placing the air intake as recommended in NUREG/CR-0660 and SRP Section 9.5.8 or modify the design to meet the recommendations.

9.5.9 Diesel Generator Sump Pump System

410.129 (9.5.9)

a. It is unclear where the Diesel Generator Sump Pump System connects to the Equipment and Floor Drainage System. Provide information identifying the connection between the systems.

b. Since the pumps in the system are required for flood protection for the diesel generators, the instrumentation required for pump operation should also be safety related. Provide verification that the instrumentation for the sump pumps are of the appropriate safety class and seismically qualified.

10.0 STEAM AND POWER CONVERSION SYSTEM

10.2 Turbine Generator

410.130 (10.2) a. Provide a system piping and instrumentation diagram (P&ID) which shows the general arrangement of the turbine generator system (TGS) and associated equipment with respect to safety-related structures, systems and components. This should include the relative location of major components, instruments and valves (i.e. main steam stop and control valves, reheat stop and intercept valves, extraction steam valving).

b. Provide information confirming that the extraction check valves will be capable of closing within the time limits required to maintain stable conditions following a TGS trip.

c. Provide information which verifies that the main steam stop, control, reheat stop and intercept valve closure times are within the required limits.

d. Provide a description of TGS speed-load control during normal operation. Verify that the speed governor action of the electro-hydraulic control system fully cuts off steam at approximately 103% of rated turbine speed by closing the control and intercept valves.

e. Verify if there are safety-related systems or components located in the turbine building or close to the TGS. Verify that the physical layout of the TGS provides protection to these components/systems from the effects of high or moderate energy piping failures.

10.3 Main Steam Supply System (MSSS)

410.131 (10.3) a. Confirm that the MSSS design includes the capability to detect and control leakage and isolate portions of the system in the event of excessive leakage or component malfunctions. List the specific instrumentation which provides the initiating signals to close the MSIVs and/or turbine stop valves to limit the release of steam.

b. Provide information which confirms that non-seismic Category I portions of the MSSS or other systems located close to essential portions of the system, or of non-seismic Category I structures that house, support or are close to essential portions of the MSSS, do not preclude operation of the essential portions of the MSSS.

c. Provide a tabulation and descriptive text of all flow paths that branch off the main steam lines between the MSIVs and the turbine stop valves. The descriptive information should include the following for each flow path:

(1) System identification
(2) Maximum steam flow in pounds per hour
(3) Type of shut-off valve(s)
(4) Size of valve(s)
(5) Quality of valve(s)
(6) Design code of valve(s)
(7) Closure time of all valve(s)
(8) Actuation method of valve(s)
(9) Motive power source for the valve actuating mechanism

d. In the event of a main steam line break, termination of steam flow for all systems identified in question c (above), except those that can be used for mitigation of the accident, is required to bring the reactor to a safe cold shutdown. For those systems required for accident mitigation, provide verification that the SAR describes what design features have been incorporated to assure closure of the steam shut-off valve(s), and what operator actions, if any, are required.

e. Provide information that addresses the potential for steam hammer and relief valve discharge loads, and techniques used to minimize such occurrences.

10.4.1 Main Condensers (MC)

410.132 (10.4.1) a. Provide information regarding measures provided to prevent loss of vacuum, corrosion and/or erosion of MC tubes. Describe any procedures that are followed to detect and correct these conditions.

b. Describe the instrument and control features provided for the MC system to verify that the MC is operating in a correct mode.

c. Verify that means have been provided for detecting, controlling and correcting condenser cooling water leakage into the condensate. Verify that permissible levels of cooling water inleakage have been defined to assure that condensate/feedwater quality is maintained within safe limits.

10.4.5 Circulating Water System (CWS)

410.133 (10.4.5) a. Verify that the design includes provisions to minimize hydraulic transients and their effect upon the functional capability and the integrity of CWS components.

b. Verify that the capability exists to detect leaks and secure the CWS quickly and effectively.

10.4.7 Condensate and Feedwater System

410.134 (10.4.7) a. Verify that the system piping is designed according to the requirements of General Design Criterion 4 and consistent with Branch Technical Position ABS 10-2 to preclude hydraulic instabilities from occurring in the piping for all modes of operation.

b. Verify that feedwater control valve and controller designs with respect to waterhammer potential have been addressed and that plant operating and maintenance procedures have been reviewed to assure that precautions to avoid waterhammer occurrences have been provided.

c. Verify that the capability exists to detect and control leakage from the system.

11.0 RADIOACTIVE WASTE MANGEMENT

GENERAL: The design of the radioactive management systems, as it appears in the CESSAR is in a conceptual stage and does not contain the detail necessary to conduct a thorough review in accordance with the requirements of SRP 11.0. For this reason, the requests for additional information below are general in nature. More specific questions may be expected when a detailed design, appropriate for certification, has been presented.

11.1 Source terms

410.135 (11.1) a. In calculating the primary and secondary coolant activities CESSAR assumes a primary to secondary coolant leakage of 75 lbs/hr rather than the NUREG-0017 guideline value of 100 lbs/hr. Explain the basis for the CESSAR assumption.

b. Section 2.2.10.1 of NUREG-0017 indicates that releases from containment are based on 4 purges/yr and a 1000 ft^3/min continuous ventilation rate for plants equipped with small-diameter purge lines. CESSAR Section 11.3.6.1 assumes 2 purges/year and a continuous venting rate of 12.5 scfm (1250 scfm release rate operating 1% of the time). Explain the basis for the CESSAR assumptions.

c. In the calculation of secondary coolant concentrations, NUREG-0017 assumes .1% steam carryover for particulates. CESSAR assumes 0.5%. Explain the basis for the CESSAR assumption.

d. In spite of statements made in several sections of the CESSAR to the effect that methodology and assumptions used in the calculation of source terms and releases are consistent with NUREG-0017, parameters discussed above were not consistent with guidelines values in NUREG-0017. Provide the values of all relevant parameters used a) in the establishment of primary and secondary coolant concentrations, and b) in the execution of the GALE Code. If those are different from the guideline values provided in NUREG-0017, provide the basis for their use. Specify the type of treatment used to control secondary coolant chemistry. Guidance as to the data needed by the staff for radioactive source term calculations is provided in Appendix B of Regulatory Guide 1.112.

e. The section needs to make a differentiation between design basis failed fuel rate, coolant concentrations, etc., for the source term used for the design of the waste management systems, compliance with 10 CFR 20, and one time accidental releases, and the NUREG-0017, .12%, "expected" failed fuel rate for the source term used to satisfy 10 CFR 50 Appendix I, to meet the "as low as is reasonably achievable" criterion.

f. Section 11.1.1.3.3 states that a maximum value of 2.5 microcurie/gram is maintained to limit in-plant airborne concentrations of tritium to within acceptable levels. Describe how the tritium concentration is controlled. Provide the assumptions, methodology and analysis performed to determine the average and maximum levels of tritium concentrations. Is the shim bleed rate value of 830 gpd, stated in the section, a typographical error?

11.2 Waste Management systems

410.136 (11.2)

a. General: The design of the liquid waste management system appears to be in a conceptual stage. It does not include the detail necessary for a review in accordance with the requirements of SRP Section 11.2. For design certification, the CESSAR is expected to contain the type and depth of information delineated in SRP Section 11.2, Part I, Items 1 through 10.

b. Provide the design basis for the system with regard to the percentage of failed fuel.

c. Provide P&ID drawings for the Liquid Waste Management System.

d. One of the specific criteria necessary to meet the relevant requirements of the Commission regulations is that the concentrations of radioactive materials in liquid effluents released to an unrestricted area should not exceed the limits in 10 CFR 20, Appendix B, Table II, Column 2. Provide radionuclide discharge concentrations for normal liquid releases, including operational occurrences, for expected discharges and dilution factors. Provide conservative site specific dilution factors required to maintain the above concentrations. Note that the source term should be based on design basis failed fuel rate.

e. Section 11.2.1.1 (C) states that "..the consequences of accidental releases from the LWMS must not exceed the Standards of Protection Against Radiation, 10 CFR 20." Provide the limiting values referred, and include information on the assumptions, type of accidents considered, methodology, and analysis to demonstrate compliance with this design criterion. A reference to a section of the CESSAR where this specific information may be found will be adequate. Note that section 15.7.1 has been deleted from CESSAR.

f. Provide the functional design basis requirements for the liquid waste management system, and a design evaluation addressing these requirements.

g. Provide a design evaluation to demonstrate the capability of the system to process waste in the event of a single major equipment item failure, to accept additional wastes during operations which result in excessive liquid waste operation, and to process wastes at design basis fission product leakage levels, i.e., from 1% of the fuel producing power.

11.3 Gaseous Waste Management Systems

410.137 (11.3) a. General: The design of the gaseous waste management system appears to be in a conceptual stage. It does not include the detail necessary for a thorough review in accordance with the requirements of SRP Section 11.3. For design certification, the CESSAR is expected to contain the type and depth of information delineated in SRP Section 11.3, Part I, Items 1 through 6.

b. Provide the design basis of the system with regard to the percent of failed fuel.

c. Provide the functional design basis requirement for the Gaseous Waste Management System and a design evaluation addressing these requirements.

d. Provide P&ID drawings for the Gaseous Waste Management System.

e. The design bases for the system should also include: General Design Criterion 3, as it relates to providing protection to gaseous handling and treatment systems from the effects of an explosive mixture of hydrogen or oxygen, and General Design Criterion 61, as it relates to radioactivity control in gaseous waste management systems and ventilation systems associated with fuel storage and handling areas. Include these design criteria and address them in the design evaluation section.

f. One of the design requirements of the gaseous waste treatment system is compliance with 10 CFR 20.106, as it relates to radioactivity in effluents to unrestricted areas. Provide the assumptions, methodology, and analysis to demonstrate that the concentrations of radioactive materials in gaseous effluents released to an unrestricted area do not exceed the limits specified in 10 CFR 20, Appendix B, Table II, Column 1. Note that the source term should be based on design basis failed fuel.

g. Gaseous Waste Mangement Systems, where the potential for an explosive mixture of hydrogen and oxygen exists, should either be designed to withstand the effects of a hydrogen explosion or be provided with dual gas analyzers with automatic control functions to preclude the formation or buildup of explosive material. Address the duality and the automatic control characteristics of the design. Discuss the settings of the alarms associated with the hydrogen explosion protection.

h. Section 11.3.7.2 contains some information on the effects and consequences in a case of GWMS leak or failure. Provide the conservative assumptions used in the analysis and the basis for the atmospheric diffusion factor used.

11.4 Solid Waste Management System

410.138 (11.4) a. General: The design of the Solid Waste Management System, as it appears in the CESSAR, is in a conceptual stage. It does not include the detail necessary to conduct a thorough review in accordance with the requirements of SRP Section 11.4. For design certification, the CESSAR is expected to contain the type and depth of information delineated in SRP Section 11.4. Part I, Items 1 through 9.

b. The design criteria for the SWMS should also include: GDC 60 as it relates to the radioactive waste management systems being designed to control releases of radioactive materials to the environment; GDC 63 and 64 as they relate to the radioactive waste systems being designed for monitoring radiation levels and leakage; 10 CFR 71 as it relates to radioactive material packaging; and 10 CFR 20.106 as it relates to radioactivity in effluents to unrestricted areas. Include these criteria in the design basis and address them in the design evaluation section.

c. Provide P&ID drawings for the SWMS.

d. Provide the specific design features and codes and standards where the design follows the guidance of Regulatory Guide 1.143.

e. Section 11.4.3, feature A, discusses provisions in the design to accommodate leased equipment. Explain how this feature assists in meeting the design criteria stated in section 11.4.1.1.

f. Discuss how the design meets all relevant guideline requirements of Branch Technical Position ETSB 11-3 attached to SRO Section 11.4.

g. Section 11.4.4 states that "...accidental releases from this system, when evaluated on a conservative basis, will not exceed the limits of 10 CFR 20." Provide the bases for this assessment; i.e., What is the conservative basis? What kind of an accident was considered? How was it analyzed? Provide the results of the analysis (consequences) and compare to the 10 CFR 20 limits which are referred to in the section.

11.5 Process and Effluent Radiological Monitoring and Sampling Systems

410.139 (11.5) a. The design of the process and effluent radiological monitoring and sampling systems, as it appears in the CESSAR, is in a conceptual stage. It does not contain the detail necessary to conduct a thorough review in accordance with the requirements of SRP Section 11.5. For design certification, the CESSAR is expected to contain the type and depth of information delineated in SRP Section 11.5, Part I, Items 1 and 2 (FSAR level).

b. Provide plant specific numbers, indicating the specific location for each type monitor for the gaseous process and effluent monitors, the liquid process and effluent monitors, the airborne radiation monitors, and the area radiation monitors.

c. In accordance with SRP 11.5, the design should provide for monitoring the exhaust from the turbine gland seal condenser seperately or direct the exhaust to the plant vent. There is not sufficient information in the section to assess compliance.

d. The design of the process and effluent monitoring systems must meet the guidelines of Appendix 11.5-A of SRP 11.5, position C and Table 2 of Regulatory Guide 1.97, and position C of Regulatory Guide 4.15. CESSAR should address whether the administrative and procedural controls will meet the above guidelines.

e. Provide the details of the system for monitoring effluents that result from accidents, showing conformance with Table 2 and position C of Regulatory Guide 1.97.

Requests for Additional Information for USIs, GSIs and TMI Items

GSI 51: Proposed Requirements for Improved Reliability of Open Cycle Station Service Water (SWS)

730.1 (GSI 51) Provide additional details on the proposed testing and maintenance requirements. In particular address

a) the need for periodic visual inspection and inspection of water samples for biological fouling organisms (items A and D of the recommended program to resolve Generic Issue 51; Generic Letter 89-13, Enclosure 1.)

b) the capability to clean all SWS surfaces.

GSI 57: Effects of Fire Protection System Actuation on Safety Related Equipment

730.2 (GSI 57) Identify the criteria used to determine which equipment is to be shielded and which conduit ends are to be sealed from the effects of fire protection system sprays.

GSI 83: Control Room Habitability

730.3 (GSI 83)

a. Although the method for the performance of a radiological analysis is discussed, the results of this analysis are not provided. Additionally, the required toxic chemical release analysis is not addressed. The results of these analyses are to be provided.

b. Provide the following information as identified in Attachment 1 to safety issue III.d.3.4.

1) item 2i - automatic isolation capability-damper closing time, damper leakage and area
item 2j - chlorine detectors or toxic gas (local or remote)
item 2k - self contained breathing apparatus availability (number)
item 2l - bottled air supply (hours supply)
item 2m - emergency food and potable water supply (how many days and how many people)
item 2o - potassium iodide drug supply
2) item 3 - Onsite storage of chlorine and other hazardous chemicals
a - total amount and size of container
b - closest distance from the control-room air intake
3) item 5 - Technical specifications for the chlorine detection system and control room emergency filtration system including the capability to maintain the control room pressurization at 1/8 in water gauge, verification of isolation by test signals and damper closure times, and filter testing requirements.

GSI 93: Steam Binding of Auxiliary Feedwater System Pumps

730.4 (GSI 93) a. Describe the surveillance procedures for the temperature sensor located between the flow control valve and the isolation valve on each Emergency Feedwater subtrain. In particular, is this sensor to be monitored once per shift? Is the alarm associated with this sensor monitored or "on-line" continuously?

b. Describe the guidelines to be used to set the procedures for recognizing the effects of steam binding of the AFW pumps and for restoring the AFW System to operable status following a steam binding incident.

GSI 106: Piping and Use of Highly Combustible Gases in Vital Areas

730.5 (GSI 106) Contrary to the statement in Appendix A the hydrogen lines are not described as seismic category I, sleeved or containing shutoff valves in Section 9.4.10. Since no P&IDs are provided these contradictory statements need to be clarified. In section 9.4.10 it is specifically stated that all hydrogen piping is non-seismic.

GSI 125.II.07: Reevaluate Provisions to Automatically Isolate Feedwater from Steam Generator During a Line Break

730.6 (GSI 125.11.7) Describe the guidelines to be used to develop procedures that call for the appropriate operator action during and following the steam line break incident.

HYDROGEN CONTROL ISSUES

USI A-48: Hydrogen Control Measures and Effects of Hydrogen Burns on Safety Equipment

USI 121: Hydrogen Control for Large Dry PWR Containments

TMI Action Item II.B.8: Rulemaking Proceeding on Degraded Core Accidents

730.7 (USI 48/121)

a. In addressing USI 121 CE states that the equipment needed to mitigate the effects of a degraded core accident will be identified and a best estimate determination of the environment (including the effects of HMS actuation) to which this equipment will be exposed will be determined. CE should perform this analysis and the information should be provided as part of the CESSAR submittal. The equipment to be protected should be identified and the expected environmental conditions should also be identified.

b. The statement is made that the Hydrogen Management System (HMS) igniters are positioned in areas where hydrogen may accumulate most rapidly. Only a few such areas are identified in Section 6.2.5. The total number and capacity of the igniters is not specified nor are their locations. Provide this information. Similarly the statement is made that the containment structure facilitates natural circulation. Provide the analysis that was used to justify this statement and therefor shows a low likelihood of localized combustible mixtures.

USI C-17: Interim Acceptance Criteria for Solid Agents for Radioactive Wastes

730.8 (USI C-17) Design Basis Criterion (C) in Section 11.4.1.1 specifies that the solid waste system must produce a packaged waste suitable for shipment to and acceptance at a licensed burial facility. Requirements for such acceptance appear in 10 CFR 61.56, and in NRC Branch Technical Position 11-3. Provide justification that the solid waste to be shipped for disposal meets the requirements of 10 CFR 61.56 (a) (1) through (a) (6), and BTP 11-3 regarding the maximum free liquid allowable in the solid waste and the means provided for its detection.

TMI Action Item II.E.1.1: Auxiliary Feedwater Evaluation

730.9 (II.E.1.1)

a. There appears to be a discrepancy between the description of the flow control valve on each subtrain of the EFWS and the graphical representation in Figure 10.4.9-1. In one instance the valve is shown to be a motor operated valve (Figure 10.4.9-1) instead of an air or pneumatic flow control valve as shown in Appendix 10A. Clarify the discrepancy and if the valve is air operated identify the failed state of the valve on a loss of air and describe how the air supply was included in the system reliability analysis of Appendix 10A.

b. In the reliability analysis of Appendix 10A different failure probabilities are used for the two motor driven pumps failure to run, 1.918E-03 and 6.384E-04. Explain the difference.

c. Similarly explain the difference in the probabilities used for the failure of the distribution valves in EFW subtrain A1 and subtrain A2.

TMI Action Item II.E.4.1: Containment Design -- Dedicated Penetrations

730.10 (II.E.4.1) In accordance with TMI Action Item II.E.4.1, Clarification 3, all components furnished to satisfy the dedicated hydrogen penetration requirement must be safety-grade. Provide a statement on the compliance with this requirement and any updates necessary on Figure 6.2.5-1 showing changes in equipment classification.

TMI Action Item II.E.4.2: Containment Design -- Isolation Dependability

730.11 (II.E.4.2)

a. TMI Action Item II.E.4.2, Position 5, states that the containment setpoint pressure that initiates containment isolation for non-essential penetrations must be reduced to the minimum compatible with normal operating conditions. Clarification 6 of the same action item states that the pressure setpoint for initiating containment isolation should be far enough above the maximum expected pressure inside containment during normal operation so that inadvertent containment isolation does not occur during normal operation due to instrument drift or fluctuation due to the accuracy of the pressure sensor. A margin of 1 psi above the maximum expected containment pressure should be adequate to account for instrument error. What is the maximum expected containment pressure under normal operating conditions? At what pressure is containment isolation initiated?

b. In accordance with TMI Action Item II.E.4.2, Position 3, all systems labelled as non-essential must be automatically isolated by the containment isolation signal. Provide a statement on the compliance with this requirement.