ABB
ASEA BROWN BOVERI

January 29, 1992
LD-92-009

Docket No. 52-002

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

Subject: Response to NRC Requests for Additional Information

References: (A) Letter, Materials and Chemical Engineering Branch RAIs, T. V. Wambach (NRC) to E. H. Kennedy (C-E), dated August 8, 1991

(B) Letter, Structural and Geosciences Branch RAIs, T. V. Wambach (NRC) to E. H. Kennedy (C-E), dated September 26, 1991

(C) Letter, Emergency Preparedness Branch and Standard Project Directorate RAIs, T. V. Wambach (NRC) to E. H. Kennedy (C-E), dated October 9, 1991

Dear Sirs:

References (A) through (C) requested additional information for the NRC staff review of the Combustion Engineering Standard Safety Analysis Report - Design Certification (CESSAR-DC). Enclosure I to this letter provides our responses to a number of questions from those references, and Enclosure II provides corresponding revisions to CESSAR-DC.

030115

D032

ABB Combustion Engineering Nuclear Power

Combustion Engineering, Inc.
1000 Prospect Hill Road
Post Office Box 500
Windsor, Connecticut 06095-0500
Telephone (203) 688-1911
Fax (203) 285-9512
Telex 99297 COMBEN WSOR

Should you have any questions on the enclosed material, please contact me or Mr. Stan Ritterbusch of my staff at (203) 285-5206.

Very truly yours,

COMBUSTION ENGINEERING, INC.

E. H. Kennedy
Director
Nuclear Systems Licensing

gdh/lw

Enclosures: As Stated

cc: J. Trotter (EPRI)
T. Wambach (NRC)

Enclosure 1 to
LD-92-009

RESPONSE TO NRC REQUESTS FOR ADDITIONAL INFORMATION

Question 210.89

GSI-113 concerning dynamic qualification testing of large bore hydraulic snubbers is categorized in Table A1-1 of CESSAR-DC Appendix A as being superseded by other USI/GSIs and its specific resolution is not needed. However, the USI or GSI which supersedes GSI-113 is not identified. The generic guidance for resolution of Issue A-13 is inadequate for dynamic qualification of large bore snubbers. Additional guidance for conducting qualification testing of large bore hydraulic snubbers are needed due to unique procedures for verifying their operability. In fact, staff evaluation on GSI-113 is still proceeding and a resolution of the issue has not yet been concluded. Clarify which other USI/GSIs supersede this issue and explain the basis of your resolution of GSI-113.

Response 210.89

Snubbers are used as structural supports during a dynamic event such as earthquake or pipe break. During normal operation, snubbers act as passive devices which accommodate normal expansions and contractions without resistance. GSI-113 concerns dynamic qualification testing of large bore hydraulic snubbers (LBHS).

C-E considers GSI-113 to be superseded by Issue A-13 for the System 80+ design based on the following statement in NUREG-0933, page 3.113-6 (Reference 1):

" The resolution of Issue A-13, "Snubber Operability Assurance," is expected to resolve the qualification testing requirements for future plants..." According to the discussion in NUREG-0933, the only open issue concerned testing requirements for large-bore snubbers in existing plants.

The basis for the resolution of A-13 is provided in Appendix A of CESSAR-DC and is summarized below.

The resolution of Issue A-13, "Snubber Operability Assurance," was the development of draft Regulatory Guide (SC-708-4) (Reference 2) pertaining to "Qualification and Acceptance Tests for Snubbers Used in Systems Important to Safety". The System 80+ Standard Design can meet the intent of the draft Regulatory Guide by:

- o Testing of every valve for its operability.
- o Dynamic testing of a qualification snubber for spring rate at the frequencies of concern for a representative load.

- o Static testing of every snubber at full faulted load will be done.

However, dynamic testing will not be performed at full load due to limitations of testing facilities.

Assurance of snubber operability for the System 80+ Standard Design is provided by incorporating analytical, design, installation, in-service, and verification criteria. The elements of snubber operability assurance include:

1. Consideration of load cycles and travel that each snubber will experience during normal plant operating conditions.

2. Verification that the thermal growth rates of the system do not exceed the required lock-up velocity of the snubber.

3. Appropriate characterization of snubber mechanical properties in the structural analysis of the snubber-supported system.

4. For engineered, large bore snubbers, issuance of a design specification to the snubber supplier, describing the required structural and mechanical performance of the snubber with respect to: activation level, release rate, spring rate, dead band, and drag. Subsequent verification will be done to ensure that specified design and fabrication requirements were met.

   a. Rod velocity at valve closure shall be tested on each snubber to confirm activation level.

   b. The release rate (bleed rate) of each snubber shall be tested statically at full faulted load.

   c. The spring rate of each snubber will be tested statically at full faulted load. Dynamic spring rate will be calculated based on dynamic test data of a similar qualification snubber.

   d. Dead band will be included in the dynamic spring rate determination.

   e. Frictional resistance to movement (drag) will be verified by testing.

   f. Dynamic faulted load testing will not be performed. Dynamic testing of large bore snubbers at full load is not practical due to limitations of testing facilities.

g. Dynamic tests shall be done at room temperature and at design temperature if practical, for a qualification unit.

h. The application of at least 5 x 10^6 cycles of an axial vibration with a low amplitude is not appropriate for large bore snubbers used as major component supports and will not be performed.

5. Verification that snubbers are properly installed and operable prior to plant operation, through visual inspection and through measurement of thermal movements of snubber-supported systems during start-up tests.

6. A snubber in-service inspection and testing program, which includes periodic maintenance and visual inspection, inspection following a faulted event, a functional testing program, and repair or replacement of snubbers failing inspection or test criteria.

In summary, dynamic qualification testing of System 80+ Standard Design LBHS will meet the intent of the draft Regulatory Guide (SC-708-4).

A proposed CESSAR-DC change has been prepared to describe the verification that will be performed to ensure that specified design and fabrication requirements are met.

<u>Reference</u>

1. NUREG-0933, "A Status Report on Unresolved Safety Issues", U.S. Nuclear Regulatory Commission.

2. DRAFT Regulatory Guide (SC-708-4), February 1981.

Question 252.07

Section 5.4.1.1 Pump Flywheel Integrity

By letter dated October [illegible], 1989, CE stated in a response to the staff's question Q252.11, that the CESSAR-DC requirement of a minimum dynamic stress intensity factor of 100 ksi (sqrt*in) for the reactor coolant pump flywheel is more conservative than the 150 ksi (sqrt*in) for the static stress intensity factor as recommended in SRP 5.4.1.1. Provide data to prove this statement.

Response 252.07

The data to show that a dynamic stress intensity factor of 100 ksi $\sqrt{in}$ is more conservative than a static stress intensity of 150 ksi $\sqrt{in}$ is shown in Figure A-4200-1 of Appendix A of Section XI of the ASME B&PV Code. The data is for typical flywheel materials such as SA-533, Grade B, Class 1 and SA-508, Class 2 or Class 3. The figure shows that a material which demonstrates a minimum static stress intensity factor of 150 ksi $\sqrt{in}$ at flywheel operating temperature would not provide a minimum dynamic stress intensity factor of 100 ksi $\sqrt{in}$. The property K_{Ia} on Figure A-4200-1 is defined as crack arrest critical stress intensity and is the same as dynamic stress intensity.

Question 252.08

Section 5.4.1.1 Pump Flywheel Integrity

Section 5.4.1.1 provides material properties and an inspection program; however, the section lacks a description of the flywheel itself. Provide the design, fabrication and material specifications of the flywheel.

Response 252.08

The design, fabrication and material specifications for the flywheel are determined by the reactor coolant pump motor supplier in accordance with the requirements stated in Section 5.4.1.1. Depending on the motor supplier's design philosophy, the material selection may be plate or forging material. A typical plate material is A-533, Grade B, Class 1 and a typical forging material is A-508, Class 2 or Class 3. The method of securing the flywheel to the shaft is by either a shrink fit or a combination of keys and keyways and a light shrink fit. Calculated flywheel stresses must be in accordance with the allowable stress criteria of Section 5.4.1.1. Each flywheel is also subjected to the non-destructive examinations required by Section 5.4.1.1.

Question 281.41

Table 6.1-4 should include greases in Table 6.1-4 Limitorque Valves, such as Exxon Nebula EPO and EPI and Sun Oil 50EP.

Response 281.41

Table 6.1-4 will be revised to add the following information:

Item	Material	Approximate Amount
Limitorque Operator lubricant, Valve Tag Nos. SI-614, -624, -634, -644, -651, -652, -653, -654, RC-430, -431, -432 & -433	NEBULA EP-0 and/or EP-1	40 Gal.

NOTE: For Limitorque Nuclear Containment Units NEBULA EP-0 and EP-1 are the only approved lubricants for SMB-000 to 5.

Question 810.2

Please describe the methods/equipment which will be utilized to assure that:

a. The technical support center (TSC) is provided with a reliable power supply for habitability and communications equipment during station blackout or loss of vital DC accident scenarios.

b. The TSC habitability system provides TSC personnel protection from radiological hazards under accident conditions "to the same degree as control room personnel."

c. The TSC habitability system continues to provide TSC personnel protection "to the same degree as control room personnel" throughout the lifetime of the facility.

Response 810.2

a. The TSC equipment which provides for habitability and communications is powered from a permanent non-safety bus which is powered from a combustion turbine on loss of offsite power.

b. CESSAR-DC Section 13.3.3.1.6 which states "to the same degree as control room personnel" is intended to mean "to the same degree as control room personnel, so far as the maximum permissible radiation exposure is concerned while the TSC is habitable". The mark-up of CESSAR-DC Section 13.3.3.1.6 is attached to this response and will be incorporated under the next amendment. The TSC habitability system is a non-safety system. The TSC is maintained at a 1/8" water gauge positive pressure with respect to surrounding areas during post-accident conditions. A common supply air header is shared by the TSC and the control room. Upon detection of radiation, toxic gas or smoke at the outside air intake, the dampers on the outside air intake are closed and the air is recirculated through the TSC filter unit. Should both intakes close, the operator can override the intake monitors and, by inspection of the control room readouts, select the least contaminated intake. This will ensure pressurization of the TSC. The TSC is then maintained in an emergency recirculation mode. The TSC is provided with shielding protection from direct radiation from an external radioactive cloud and internal radioactive sources. The combined effect of all radiation protection measures is designed to be adequate to limit the overall calculated radiation exposure to the personnel inside the TSC to the requirements of GDC 19. The habitability of the TSC is further discussed in CESSAR-DC Section 13.3.3.1.6.

c. The TSC habitability system is comprised of equipment that is designed to be replaceable over the life of the facility.

Proposed CESSAR-DC changes have been prepared to amplify the discussion of TSC ventilation provisions and radiation protection for personnel in the TSC.

Question 810.3

What provisions have been made to house and equip an on-site operations support center (OSC)?

Response 810.3

A response to this question has been submitted in RAI 810.1 transmitted by LD-91-013, dated March 15, 1991.

Enclosure II to
LD-92-009

PROPOSED REVISIONS TO THE COMBUSTION ENGINEERING STANDARD SAFETY ANALYSIS REPORT

respect to: activation level, release rate, spring rate, dead band, and drag as specified in the draft Regulatory Guide SC-708-4 (Reference 3)

such as earthquake or pipe break, but during normal operation act as passive devices which accommodate normal expansions and contractions without resistance.

Assurance of snubber operability for the System 80+ Standard Design is provided by incorporating analytical, design, installation, in-service, and verification criteria. The elements of snubber operability assurance include:

1. Consideration of load cycles and travel that each snubber will experience during normal plant operating conditions.

2. Verification that the thermal growth rates of the system do not exceed the required lock-up velocity of the snubber.

3. Appropriate characterization of snubber mechanical properties in the structural analysis of the snubber-supported system.

4. For engineered, large bore snubbers, issuance of a design specification to the snubber supplier, describing the required structural and mechanical performance of the snubbers with subsequent verification that the specified design and fabrication requirements were met.

Insert 1

5. Verification that snubbers are properly installed and operable prior to plant operation, through visual inspection and through measurement of thermal movements of snubber-supported systems during start-up tests.

6. A snubber in-service inspection and testing program, which includes periodic maintenance and visual inspection, inspection following a faulted event, a functional testing program, and repair or replacement of snubbers failing inspection or test criteria.

In summary, during the design of safety-related systems or components for which snubbers are to be used, sufficient consideration is given as to their unique application, (i.e., their response to normal, upset and faulted conditions and the effect of these responses on the associated system and/or component). Thus the design, specification, installation, and in-service operability of snubbers meets the intent of SRP Section 3.9.3 and this issue is resolved for the System 80+ Standard Design.

REFERENCES

1. NUREG-0933, "A Status Report on Unresolved Safety Issues", U.S. Nuclear Regulatory Commission, April 1989.

Q 210.89

Insert 1

System 80+ Standard Design will meet the intent of the draft Regulatory Guide (Reference 3).

a. Rod velocity at valve closure shall be tested on each snubber to confirm activation level.

b. The release rate (bleed rate) of each snubber shall be tested statically at full faulted load.

c. The spring rate of each snubber will be tested statically at full faulted load. Dynamic spring rate will be calculated based on dynamic test data of a similar qualification snubber.

d. Dead band will be included in the dynamic spring rate determination.

e. Frictional resistance to movement (drag) will be verified by testing.

f. Dynamic faulted load testing will not be performed. Dynamic testing of large bore snubbers at full load is not practical due to limitations of testing facilities.

g. Dynamic tests shall be done at room temperature and at design temperature if practical, for a qualification unit.

h. The application of at least 5×10^6 cycles of an axial vibration with a low amplitude is not appropriate for large bore snubbers used as major component supports and will not be performed.

2. NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants -- LWR Edition", U.S. Nuclear Regulatory Commission.

3. DRAFT Regulatory Guide (SC-708-4), February 1981.

particulates and potential radioactive iodines from a portion of the return air, and delivers the filtered air to the inlet of the main air-handling unit.

Insert 1

The Technical Support Center air-handling system consists of an air-handling unit, return air and smoke purge fans, and an emergency filter unit. The computer room air-handling system consists of two 100% air-handling units and associated fans. Both the Technical Support Center and computer room air-handling systems are non-safety and non-seismic. E

The balance of control building air-handling systems consists of two redundant air-handling units, each with roughing filters, essential chilled water cooling coils and fans serving Division I electrical rooms, channel A and channel C. Two equal units are serving Division II channel B and D. Each Division will function with one of the redundant air handling units delivering filtered, conditioned air to the various electrical equipment rooms. Chilled water is supplied from the essential chilled water system. Each Division also contains redundant battery rooms with fan operating continuously to prevent buildup of hydrogen fumes. The safe shutdown area is served by Division II. I

Return air from the various essential electrical equipment areas is mixed with a portion of outside air for ventilation, is filtered and conditioned in the air-handling unit, and is delivered to the rooms through supply ductwork. Duct-mounted heating coils provide final adjustments to temperature in selected equipment rooms. E

The Operation Support Center, Men's Change, Women's Change, Break Room, Shift Assembly and Offices, Radiation Access Control two non-essential Elec. Rms, CEDM control and Cas. and Sec. Group areas all are served by an individual air handling unit consisting of a centrifugal fan, non essential chilled water coil and roughing filter. I

As shown on Figure 9.4-2 all of these areas can receive outside air from the cleanest of two sources described for the control room. The roof exhaust fan shown serving the men's change, the women's change and the break room is actually located approximately 80 feet from the outside air intake.

9.4.1.3 Safety Evaluation

The air-handling system serving the control room proper consists of two completely redundant, independent, full-capacity cooling systems. Each system is powered from independent, Class 1E power sources and headered on separate essential chilled water systems. E

Q810.2

Insert 1

The TSC is maintained at a 1/8" water gauge positive pressure with respect to surrounding areas during post-accident conditions. A common supply air header is shared by the TSC and the control room. Upon detection of radiation, toxic gas or smoke at the outside air intake, the dampers on the outside air intake are closed and the air is recirculated through the TSC filter unit. Should both intakes close, the operator can override the intake monitors and, by inspection of the control room readouts, select the least contaminated intake. This will ensure pressurization of the TSC. The TSC is then maintained in an emergency recirculation mode. The TSC is provided with shielding protection from direct radiation from an external radioactive cloud and internal radioactive sources. The combined effect of all radiation protection measures is designed to be adequate to limit the overall calculated radiation exposure to the personnel inside the TSC to the requirements of GDC 19.

H. A separate room adequate for at least three persons to be used for private NRC consultations.

13.3.3.1.6 **Habitability**

TSC personnel are protected from radiological hazards, including direct radiation and airborne radioactivity from in-plant sources under accident conditions, to the same degree as control room personnel. Applicable criteria are specified in General Design Criterion 19, Standard Review Plan 6.4, and NUREG-0737, "Clarification of TMI Action Plan Requirements," Item II.B.2.

Insert 2

To ensure adequate radiological protection of TSC personnel, radiation monitoring systems are provided in the TSC. These systems continuously indicate radiation does rates and airborne radioactivity concentrations inside the TSC while it is in use during an emergency. These monitoring systems shall include local alarms with trip levels set to provide early warning to TSC personnel of adverse conditions that may affect the habitability of the TSC. Detectors are able to distinguish the presence or absence of radioiodines at concentrations as low as 10^{-7} microcuries/cc.

If the TSC becomes uninhabitable, the TSC plant management function can be performed in the control room. Reference the site-specific SAR for habitability details. Control Building HVAC is discussed in Section 9.4.1.

13.3.3.1.7 **Communications**

The TSC is the primary onsite communications center for the nuclear power plant during an emergency. It has reliable voice communications to the control room, the OSC, the emergency operations facility (EOF), and the NRC. The primary functions of this voice communication system are plant management communications and the immediate exchange of information on plant status and operations. Provisions for communications with State and local operations centers are provided in the TSC to provide early notification and recommendations to offsite authorities prior to activation of the EOF. E

The TSC voice communications facilities includes means for reliable primary and backup communication. The TSC voice communications will include private telephones, commercial telephones, radio networks, and intercommunication systems as appropriate to accomplish the TSC functions during emergency operating conditions. The licensee provides a means for TSC telephone access to commercial telephone common-carrier services that may be susceptible to loss of power during emergencies. The licensee ensures that spare commercial telephone lines to the plant are available for use by the TSC during emergencies.

Q 810.2

Insert 2

so far as the maximum permissible radiation exposure is concerned while the TSC is habitable.