Department of Energy
Washington, D.C. 20545
Docket No. 50-537
HQ:S:82:099

OCT 04 1982

Mr. Paul S. Check, Director
CRBR Program Office
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Check:

RESPONSES TO REQUEST FOR ADDITIONAL INFORMATION

Reference: Letter, P. S. Check to J. R. Longenecker, "CRBRP Request for Additional Information," dated April 9, 1982

This letter formally responds to your request for additional information contained in the reference letter.

Enclosed are responses to Questions CS 421.27, 30, 31, 34, and 58; which will be incorporated into a future PSAR Amendment.

Sincerely,

John R. Longenecker
Acting Director, Office of the
Clinch River Breeder Reactor
Plant Project
Office of Nuclear Energy

Enclosures

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Question CS421.27

In the PSAR Section 7.3, the statement is made that the initiation of containment isolation is the only Engineered Safety Feature (ESF) identified which requires a description in this Section. Chapter 6 of the PSAR denotes several systems (Annulus Filtration System, Reactor Service Building Filtration System, and the Residual Heat Removal System including SGAHRS and OHRS) in addition to the Containment Isolation System as being part of the ESF System. Justify why these systems aren't included in Section 7.3 of the PSAR. Also, the staff believes that the Sodium-Water Reactor Pressure Relief System (SWRPS) should be classified as part of the ESF System. Describe the actions to be automatically initiated or to be initiated by operators to mitigate sodium-water reactions. The discussions should include actions necessary to protect public safety or avoid an unanalyzed plant upset.

Response:

Section 7.3 as modified by Amendment 71 provides a cross-reference to PSAR Section 6.1 which identifies Engineered Safety Features (ESFs) and the sections of the PSAR where they are discussed. Additional information is provided in the response to NRC Question CS421.22.

The Sodium/Water Reactor Pressure Relief System's (SWRPRS) safety function is accomplished by the mechanical actuation of the rupture discs by pressure generated from a sodium/water reaction occurring in a steam generator module (ref. PSAR Sections 5.5.2.4 and 5.5.2.6).

Subsequently, the SWRPRS instrumentation and control has two functions. These two electrical functions have different safety consequences, and therefore, one is classified as safety-related, and the other as non-safety-related.

1) Safety-related instrument and control function: Actuation of the SWRPRS is detected immediately downstream of the rupture discs (ref. PSAR Section 5.5.2.4). A safety-related (Class 1E) signal resulting from the sensors, is transmitted to the PPS (ref. PSAR Section 7.2.1.2.2). This initiates a reactor trip and is part of the Plant Protection System. As stated in Section 7.5.6.2 this complies with requirements stated in Section 7.1.2 and 7.2.2.

2) Non-safety-related instrument and control functions: A buffered signal initiates actions as described in Section 7.5.6.1.2. Since these actions only isolate the loop affected, the ability of any other loop to remove decay heat from the reactor is not compromised. Therefore, these functions are not considered safety-related.

For automatic and operator actions in case of sodium/water reactions, see Sections 5.5.2.8, 7.5.5.3, and 7.5.6.

Question CS421.30

To extend our review, the staff (ICSB & EC&G) each require a set of one line I&C Drawings for the safety related CRBR systems. Drawings should also be provided that indicate the separation used in the CRBR design.

Response:

The NRC Staff in a telecon with the Project on 9/13/82, confirmed that the requested information is currently in their possession.

Question 421.31

Address the adequacy of the Reactor Vessel Level gauges with emphasis on the lack of diversity, the level range chosen, the method selected, and the effects of temperature on the level accuracy. Provide this same discussion for the level probes in the sodium expansion tank, the sodium dump tank, and the sodium pump tank. Also, discuss provisions made for sodium level measurements in the intermediate system.

Response:

Mutual inductance type sodium level probes are used for all continuous sodium level measurements in the reactor vessel, sodium expansion tank, sodium dump tank and the sodium pump tank. This type of level probe has been shown to be superior to other types of level probes during sodium testing of various types of level probes. Other types of level probes which were evaluated in this test program include balanced bridge type inductive level probes, displacer-float type level transducers, delta P type level transducers and time domain reflectometry transducers. The advantage of using highly reliable mutual inductance type probes outweighs any advantage that could be obtained from type diversity.

The mutual inductance level probe has a primary and secondary inductance coil. Excitation is applied to the primary coil which develops a signal in the secondary coil. The signal magnitude in the secondary coil is dependent upon the height of the sodium.

To compensate for sodium temperature changes a temperature compensation circuit is integral with the signal condition equipment and works on the concept of resistance changing with temperature. The compensation circuit measures the voltage and current in the primary coil and evaluates changes to determine the resistance change and automatically adjusts the output of the signal conditioner based on the resistance change.

The reactor vessel contains four narrow range probes, three of which are used by the Primary Reactor Shutdown System, and two wide range probes which are designated to the part of the Accident Monitoring (AM) System. The measurement range chosen for the narrow range probes (30 inches) is based on a range which is wide enough to cover the normal operating ranges of the sodium level in the reactor vessel but is narrow enough that the uncertainty associated with the measurement is minimized.

The measurement range chosen for the wide range probes (189 inches) is based on the ability to monitor the sodium level down to the level of the reactor vessel outlet nozzles.

Each Primary pump contains two redundant wide range probes (80.5 inches) to monitor sodium level over the full elevation of the pump tank.

Sodium level measurement is accomplished in the intermediate system via the sodium pump and expansion tank, the intermediate sodium pumps have a single wide range probe (86.9 inches) installed in the pump tank which monitors the full range of the sodium level in the pump tank. Two level probes are installed in the sodium expansion tank, a wide range probe to measure the full range of anticipated steady state and transient sodium levels in the tank and a narrow range probe for accuracy during fill of the system. The wide range level probe in the expansion tank also provides a signal for a high and low level alarm. The pump tank level probe provides a signal for a high and low level alarm, and isolation of IHTS argon cover gas system.

Two wide range level probes are installed in each sodium dump tank. These probes are arranged with overlap to provide for monitoring sodium levels during sodium fill and drain operations of the Intermediate Heat Transport System.

Question CS421.34

PSAR Section 7.5.2.1.2 states in part that a signal is provided to the control room indicating that the pony motor is running. The staff requires more information with regard to the CRBR pony motor instrumentation and control system. In particular, the initiation signals for the pony motors, manual initiation capability, qualifications for the system, and the design criteria for the system should be discussed. PSAR Section 7.5.6.1.1 states in part that the sodium pony motor is tripped upon a large leak detection. Discuss the safety aspects of this trip and provide the staff information on other signals that will trip the pony motors.

Response:

The pony motor runs continuously during all modes of plant operation except during sodium pump or drive system maintenance. Therefore, there is no need for automatic or manual initiation signals except for the start-stop switch.

Normal pony motor start is through a permissive sequence circuit which starts the external lubricating oil cooling system and high pressure lube oil pump, and when the oil system achieved flow and pressure the pony motor starts. Once started the loss of flow or pressure will not result in a pony motor trip. This method of starting is not classified as safety-related.

In the safety-related mode, pony motor operation does not require the use of the external lubricating oil cooling system or high pressure lube oil pump. This function is carried out by a start-stop switch on the main control panel in the control room.

The non-safety permissive sequence starting circuit is isolated from the safety circuit and will not prevent the operation of the safety function. The safety circuit will be qualified per WARD-D-0165 (Ref. 13 of PSAR Section 1.6).

There is available in the control room, pony motor speed and current indications. Pony motor current indication is provided via the PDH&DS. These circuits are non-safety related.

The only condition which results in an automatic IHTS pony motor trip (the PHTS pony motor is not tripped) is a large sodium/water reaction which results in a rupture disc rupturing. The safety aspects of this trip are specifically addressed in the response to Question CS421.27.

Question CS421.58

Recent review of a plant (Waterford) revealed a situation where heaters are to be used to control temperature and humidity within insulated cabinets housing electrical transmitters that provide input signals to the reactor protection system. These cabinet heaters were found to be unqualified and a concern was raised since possible failure of the heaters could potentially degrade the transmitters, etc.

Please address the above design as it pertains to CRBR. If cabinet heaters are used then describe as a minimum the design criteria used for the heaters.

Response:

The only CRBRP IE equipment which use cabinet heaters are the Sodium Pump Drive System PPS Breakers. The heaters are Class 1E and are qualified to temperature and humidity environments of 125oF and 90% relative humidity.

When heaters are used in IE cabinets, it is a CRBRP requirement to environmentally qualify them according to IEEE 323, if the heaters are required to enable the equipment in the cabinet to perform its safety function.