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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 421.32, 33, 39, 46, 49, 54 and 59 which will also be incorporated into a future PSAR Amendment.

Sincerely,

John R. Longenecker

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

Enclosures

cc: Service List
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Question CS421.32

Upon reviewing the PSAR Section 7.7.1.10, it is apparent that the Sodium Fire Protection System is proposed as a non-safety system. Justify this classification.

Response:

In inerted cells, piping and equipment of the Primary Heat Transport System and the Ex-vessel Storage Tank System containing radioactive sodium are located in cells with Engineered Safety Feature (ESF) steel liners (Section 6.4). Sodium fires are surpressed in these inerted cells due to the low oxygen content (2%) within the cell atmosphere and the high integrity liner preventing contact with structural concrete.

In air-filled cells, the Sodium Fire Protection System (SFPS) (Section 9.13.2) provides Engineered Safety Features (ESFs) and non-safety related features to accommodate the effects of a sodium fire. The Catch Pan System (Section 6.5) and the Aerosol Release Mitigation System (Section 6.2.7) provide the ESF protection. Associated with the ESF Aerosol Release Mitigation system are safety-related instrumentation of the Aerosol Release Limiting Instrumentation (Section 9.13.2) and the Heating, Ventilating, and Air Conditioning System (Section 9.6). Other non-safety related instrumentation (Section 9.13.2.2.3) is also provided for the SFPS which is not required to protect the health and safety of the public.

PSAR Section 7.7.1.10 has been revised in response to this question. PSAR Section 7.3 discusses instrumentation associated with Engineered Safety Features.

System	Section
Recirculating Gas	3.A.1, 3.A.2
Auxiliary Cooling Fluid	9.7.5
Inert Gas Receiving and Processing	9.5
Impurity Monitoring and Analysis	9.8.5

7.7.1.11 Balance of Plant Instrumentation and Control Systems

A number of Instrumentation and Control Systems are provided to support various Balance of Plant Systems. These systems do not perform a safety-related function, nor would their failure prevent the functioning of safety-related systems.

7.7.1.11.1 Treated Water Instrumentation and Control System

The Treated Water System includes the Portable Water System, the Normal Plant Service Water System, the Secondary Service Closed Cooling Water System, The Emergency Plan Service Water System, the Normal and Emergency Plant Chilled Water Systems, and the Makeup Water Treatment System.

Question CS421.33

Does the safety-related instrumentation in contact with a sodium or sodium potassium (PSAR Section 7.5.2.1.1) environment meet IEEE-279, Section 4.5? Include a discussion of freeze protection for this environment.

Response:

The pressure-sensing instrumentation in PSAR Section 7.5.2.1.1 meets the criteria of IEEE-279, Section 4.5. These instruments are close coupled to the large diameter piping so the Na/NaK bellows interface is less than 10 inches from the piping. The instrument is inside the piping insulation and the temperature at the Na/NaK interface is less than 20°F below that of the piping, therefore, no freeze protection is required. (The piping is always maintained at a temperature 150° above the freezing point of sodium, except when maintenance is being performed.) These instruments are mounted to drain automatically if the piping is drained.

All other instrumentation is protected from the sodium environment by wells or thimbles.

Question CS421.39

Section 7.5.4 of the PSAR deals with the Fuel Failure Monitoring (FFM) System. There are no requirements or criteria delineated in the PSAR for this system. Discuss the design criteria for this system.

Response:

The response to this question is provided in revised PSAR Section 7.5.4.

verification information and the location of the sensors and their leads will not affect the safety of the plant.

7.5.3.2 Analysis

The in-vessel sensor mounting is designed to be operable during the combined stresses imposed by the reactor coolant velocity, vibration, pressure, environment, temperature, thermal shock, and radiation in order to provide operational lifetime that will not significantly affect the reactor availability. The sensors and their lead-out conductors are sufficiently rugged so that they will not be damaged during refueling and maintenance. Thermocouples used for measuring the sodium temperature are mounted to avoid close proximity to the structures so that the temperatures sensed will be that of the coolant and not be influenced by the structures.

The Sodium level instruments, which are part of the Reactor Shutdown System, will comply with the PPS Design Requirements (see Sections 7.1.2 and 7.2.1). The design analysis for the Reactor Shutdown System applies (Section 7.2.2) and a Failure Mode and Effects analysis is performed as shown in Table C.S.1-1.

7.5.4 Fuel Failure Monitoring System

The Fuel Failure Monitoring System (FFMS) is required to:

1. Detect and locate a fuel or blanket failure in the presence of up to four other existing failures. In addition, provide system design and accommodation capability to detect and locate a fuel or blanket failure in the presence of up to 59 previously failed pins.

2. Characterize the failed pins as to burnup and other information, to permit correlation with core and blanket history, thus enhancing location capabilities.

3. Detect less than 1.5 cm^2 of fuel area exposed to sodium by providing a delayed neutron detector subsystem on each sodium loop of the Primary Heat Transport System.

The FFMS is comprised of several independently functioning subsystems, each providing information to the plant operations staff. This system does not provide reactor trip signals but does supply information for surveillance, display, and alarm purposes.

Question CS421.46

As called for in Section 7.1 of the Standard Review Plan, provide information as to how your design conforms with the following TMI Action Plan items as described in NUREG-0737:

a) II.D.3 - Relief and safety valve position indication

b) II.E.4.2 - Containment isolation dependability (positions 4, 5 and 7)

c) II.K.3 - Final recommendations

.9 - PID controller

.12 - Anticipatory reactor trip

It has been the case for light water reactors to provide an anticipatory reactor trip following a turbine trip directly from the turbine bypass and/or control valves. In the PSAR, Table 7.2-2 indicates that a turbine trip will cause a reactor trip upon a steam feedwater flow mismatch and/or steam drum level indication. Justify the lack of an anticipatory reactor trip initiated from turbine bypass or control valve closure.

Response

a) II.D.3 Direct Indication of Relief and Safety Valve Position

Position

"Reactor coolant system relief and safety valves shall be provided with a positive indication in the control room derived from a reliable valve position detection device or a reliable indication of flow in the discharge pipe."

CRBRP Design:

This item is provided to resolve a concern involving the failure of relief and safety valves to close on the reactor coolant pressure boundary. resulting in small loss of coolant events. An unambiguous indication of the position of the valves will aid the operator in detecting a failure and taking the proper corrective action. There are no relief or safety valves in the CRBRP design which provide a pathway for reactor coolant to be lost from the system; however, valves exist in the Steam Generator Auxiliary Heat Removal System (SGAHRS) and in the Steam Generator (SGS) that are directly in the heat transport path. Therefore, the concern is considered applicable to CRBRP. Included in this group of valves are the SGAHRS steam drum and superheater vent control valves and the SGS safety valves located on the superheater outlet, the evaporator outlets, and the steam drum.

In accordance with the requirements of NUREG-0737, the SGAHRS steam drum and superheater vent control valves are provided with direct position indicators in the main control room. Acoustic sensors located on the vent piping downstream of the valves will detect any steam leakage past the seat of a closed valve, and the leakage will be alarmed and annunciated in the main control room. Seismic and environmental qualification of these valves and associated instrumentation is discussed in PSAR Section 5.6.1.3.

The design of the SGS safety valves differs from that of the SGAHRS vent control valves in that the former are pilot operated valves which will open when system pressure reaches their setpoints. In addition, the evaporator outlet and superheater outlet safety valves will open when actuated by an air-operated actuator. Main control room indication of pilot stem position, not main valve stem position, is provided for these valves.

To provide a backup to the pilot stem position indicators, an acoustic sensor has been added to the vent piping downstream of each SGS safety valve. These sensors will detect either a stuck open valve or any steam leakage past the seat of a closed valve. These conditions will be alarmed and annunciated in the main control room. The combination of pilot stem position indication and alarms from the acoustic sensors satisfies the NUREG-0737 requirement for positive position indication for the SGS safety valves. Information on seismic and environmental qualification of these valves and associated instrumentation is provided in PSAR Section 5.5.3.

b) Item II.E.4.2 Containment Isolation System Dependability

<u>Position (4)</u>

"The design of control systems for automatic containment isolation valves shall be such that resetting the isolation signal will not result in the automatic reopening of containment isolation valves. Reopening of containment isolation valves shall require deliberate operator action."

<u>Clarification</u>

"(4) Administrative provisions to close all isolation valves manually before resetting the isolation signals is not an acceptable method of meeting position 4.

(5) Ganged reopening of containment isolation valves is not acceptable. Reopening of isolation valves must be performed on a valve-by-valve basis, or on a line-by-line basis, provided that electrical independence and other single-failure criteria continue to be satisfied."

CRBRP Design:

CIS valve closure is controlled by initiating an isolation signal to the CIS breaker undervoltage coil. Reset of the isolation signal to the CIS breaker undervoltage coil will not automatically reset the CIS valves. Reset of the CIS valves requires the operator to manually close the CIS breaker. Individual valve control switches are provided, which will allow the operator to manually select all valves closed prior to closing the CIS breaker. This will allow each CIS valve to be individually opened under administrative control. This meets the intent of Position 4 and Clarifications 4 and 5.

Position (5)

"The containment setpoint pressure that initiates containment isolation for nonessential penetrations must be reduced to the minimum compatible with normal operating conditions."

CRBRP Design:

Containment pressure is not used to initiate automatic containment isolation. The CIS back pressure valve setpoints are chosen to assure that, upon system failure, the containment isolation valves remain closed for the highest containment pressure.

Position (7)

"Containment purge and vent isolation valves must close on a high radiation signal."

CRBRP Design:

CRBRP purge and vent lines will isolate on a high radiation signal. There are no sealed-closed purge isolation valves.

c) II.K.3 Final Recommendations

.9 Proportional Integral Derivative Controller Modification

Position

"The Westinghouse-recommended modification to the proportional integral derivative (PID) controller should be implemented by affected licensees."

CRBRP Design:

This TMI action plan requirement was provided to preclude the spurious opening of pressurizer power operated relief valves (PORVs) in Westinghouse-designed PWRs. There are no PORVs on the CRBRP reactor coolant boundary; therefore, this action plan requirement is not applicable to CRBRP.

.12 Anticipatory Trip

"Position

Licensees with Westinghouse-designed operating plants should confirm that their plants have an anticipatory reactor trip upon turbine trip. The licensee of any plant where this trip is not present should provide a conceptual design and evaluation for the installation of this trip."

CRBRP Design:

An anticipatory trip upon turbine trip is not required because the Intermediate Heat Transport System acts as a buffer between the reactor and the Steam Generator System (SGS). This arrangement loosely couples the reactor and SGS such that events in the SGS (such as turbine trip) are not immediately reflected as changes in reactor parameters. Response time of the Steam to Feedwater Mismatch is more than adequate to scram the reactor upon a turbine trip making the anticipatory trip from the bypass/control valves unnecessary.

Question CS421.49

Discuss the design of the CRBR purge system. Provide the effects of the argon purging of the cover gas spaces on the Radioactive Argon Processing System's measurement of tag samples (CRBR PSAR Section 7.5.4.1.3).

Response:

A clarifying revision has been made to PSAR Section 7.5.4.1.3. The argon purge is described in Section 9.5.1.2.1. RAPS is described in Section 11.3.

The action of RAPS is to clean the cover gas of xenon and krypton gases. This removes the fission gases (radioactive and stable xenon and krypton gases) and tag gases (stable xenon and krypton gases) released from "old" leakers and thus, improves the capability for both detection and location of newly occurring fuel pin leakers.

Connections are provided to the Plant Data Handling and Display System for signal logging and high signal alarm, and for alarm on low detector bias voltage. A separate high signal alarm is provided to the Plant Annunciator.

7.5.4.1.3 Failed Fuel Location Subsystem

The Failed Fuel Location Subsystem (FFLS) locates a fuel or blanket failure in the presence of up to four existing failures. Stable xenon and krypton isotopes of differing ratios are placed within each fuel and radial blanket assembly pin in the total approximate amount of 2 standard cubic centimeters for the purpose of locating leakers. All individual pins of a given assembly contain the same unique mixture of tag gases. If a pin failure occurs, a fraction of the tag gases and fission gas in the pin escapes to the reactor cover gas plenum. The failure occurrence is detected by the Cover Gas Monitoring Subsystem (CGMS) in the Reactor Service Building which continuously measures the activity of the radionuclides in the cover gas. A failure alarm by the CGMS will initiate operation of the FFLS, which is also located in the Reactor Service Building. This operation involves the passing of approximately 5 standard cubic feet of cover gas through a charcoal trap which is cryogenically cooled with liquid nitrogen. This process preferentially traps the xenon and krypton gases. The trap is then heated and the concentrated gases are transported to the mass spectrometer which analyzes the tag gas isotope ratios. The failed assembly is identified by matching the results of the mass spectrometer analysis with previously determined analysis of all gas tags in the reactor, with suitable correction for burnout, production, and background.

A charcoal trap will obtain a sample of cover gas from the reactor plenum as soon as possible before the argon purge sweeps the tag gases out of the reactor plenum, and they are lost to the Radioactive Argon Processing System (RAPS) via the equalization line and overflow vessel (see Figure 9.5-2). The purging action by RAPS dilutes the released tag gas concentration in the reactor cover gas plenum by a factor of 1.7 per hour.

7.5.4.1.4 Test and Inspection

Prior to reactor startup, selected instruments are tested by inserting electrical test signals into the signal conditioner near the sensor. By observation of the indicators, recorders, or alarms, the operating personnel can determine whether the instrument is functioning properly. Each fission gas detector will be designed for the provision to be exposed to a calibrated, long-lived source, consisting of a radioactive isotope with a decay emission of different energy than those originating from fission gases, for testing the sensors. The fission gas detection systems will contain a provision for inserting a gas sample of known activity, for initial calibration of the detectors, and for correlating detector response to the calibrated test source with the gas sample activity. Each delayed neutron monitoring system will be designed for the provision to be exposed to a calibrated radioactive source for on-line calibration of the detector system.

Question 421.54

Section 7.1.2.1 of the PSAR states the PPS includes the Reactor Shutdown System (RSS), the Containment Isolation System (CIS), and the Shutdown Heat Removal System (SHRS).

Table 7.5-1 of the PSAR states that the following are safety-related sub-systems and part of the PPS.

Wide Range Flux Monitoring
Power Range Flux Monitoring
Reactor Inlet Pressure
Primary and Intermediate Flow on Heat Transport Loops
Evaporation Sodium Outlet Temperature on Heat Transport Loops
Primary/Secondary Pump Speed on Sodium Pumps
Feedwater Flow on Steam Generator
Feedwater Temperature on Steam Generator
Superheat Steam Temperature on Steam Generator
Steam Drum Pressure on Steam Generator
Superheat Steam Pressure on Steam Generator
Rupture Discs Operation on Sodium-Water Reactor Pressure Relief

Why aren't these subsystems covered as part of the PPS in Section 7.1.2.1 of the PSAR?

Response:

The safety related instrumentation in Table 7.5-1 identified in the question is PPS instrumentation and is described in Section 7.5 in accordance with the Standard Format and Content (SFAC).

Section 7.1.2.1 describes the design bases for the safety related systems. Since this instrumentation is a part of the PPS, the same design bases described in 7.1.2.1 have been applied to the design of this instrumentation. For clarity, 7.1.2.1 has been modified to so state.

Compliance with guides or standards applicable to specific I&C systems or equipment are described in the paragraphs related to those systems. In addition to meeting the requirements of the Regulatory Guides and IEEE Standards, the safety-related equipment will be designed to meet the applicable requirements of the RDT Standards listed in Table 7.1-4. The instrument error and other performance consideration are addressed in the description of individual subsystems.

7.1.2.1 Design Basis

The Plant Protection System (PPS) includes the Reactor Shutdown System (RSS), the Containment Isolation System and the Shutdown Heat Removal Systems.

The Reactor Shutdown System consists of a Primary and a Secondary System either of which is designed to initiate and carry to completion trip of the control rods and sodium coolant pumps to prevent the results of postulated fault conditions from exceeding the allowable limits. Table 4.2-35 shows the basis for Primary and Secondary RSS performance for the defined fault categories. The performance limits for the fuel and cladding are identified in Section 4. The reactor Shutdown Systems are described in Section 7.2.

The Containment Isolation System (CIS) is designed to react automatically to prevent or limit the release of radioactive material to the outside environment. The system acts to isolate the interior of the containment by closing the containment isolation valves in the event that radioactive material is released within the containment. Radiation monitors within the containment boundary are used to activate the CIS. A description of this system is given in Section 7.3.

The Shutdown Heat Removal Instrumentation and Control System is designed to provide assurance against exceeding acceptable fuel and reactor coolant system damage limits following normal and emergency shutdowns. The description of this instrumentation and control is given in Section 7.4 for the removal through the auxiliary steam/water system (Steam Generator Auxiliary Heat Removal System (SGAHRS) and Outlet Steam Isolation System (OSIS)) and Section 7.6 for removal through the NaK to air system (Direct Heat Removal System (DHRS)).

Sufficent instrumentation and associated display equipment will be provided to permit effective determination of the status of the reactor at any time. Section 7.5 provides a description of the instrumentation provided. The above design bases have been applied to the PPS instrumentation listed in Table 7.5-1 and described in Section 7.5. In Section 7.9, a description of the control room, control room layout, operator-control panel interface, instrument and display groupings and habitability are given.

In the areas where the rupture of the steam or feedwater lines can occur, the field instrumentation and control shall be qualified to survive the resulting higher temperature and pressure transient.

Question CS421.59

Table 7.1.4 gives a list of RDT Standards applicable to Safety Related Instrumentation and Control Systems. The RDT standards are intended for use by non-commercial reactors, therefore the staff does not normally require compliance with these standards. However, since the applicant is taking credit for their applicability, we have reviewed the CRBR design using criteria noted in RDT Standard C16-1T and the following items were noted:

1. Section 7.2.2 of the PSAR states:

   "The Plant Protection System meets the safety-related channel performance and reliability requirements of the NRC General Design Criteria, RDT Standard C16-1T, IEEE Standard 279-1971, applicable NRC Regulatory Guides and other appropriate criteria and standards."

   RDT Standard C16-1T states in Section 3.1.3 the following:

   "The PPS does not directly include the reactor operator in implementing a Protective Function. However, manual control devices for manual initiation of each and every Protective Action are required for defense against unanticipated events. These manual control devices are considered part of the PPS."

   Section 7.2.2 of the PSAR also states:

   "The Plant Protection System includes means for manual initiation of each protective action at the system level with no single failure preventing initiation of the protective action. Manual initiation depends upon the operation of a minimum of equipment because the manual trip directly operates the scram breakers, solenoid scram valve power supply, or equivalent for Shutdown Heat Removal and Containment Isolation System."

   Are the RSS, the Shutdown Heat Removal System, and the Containment Isolation System the only systems of the PPS that initiate a Protective Action?

2. RDT C16-1T states the following in Section 3.2.3.4:

   "The PPS shall limit the consequences of:

   - two concurrent independent Unlikely Faults,

   - other combinations of concurrent independent faults designated by the RSD (Responsible System Designer),

   to a severity level less than that of the Design Basis Accident."

   Has the analysis for the PPS been based to include the two above conditions?

3. RDT C16-1T states the following in Section 3.2.4:

"The Protective Functions established by the RSD as required in Section 3.2 shall be listed in a tabular format containing, but not limited to, the following column headings:

- o Protective Function;
- o Incident, or excursion requiring the specified Protection Action;
- o reference to design basis documentation;
- o monitored variable, including important limitations;
- o Protective Action required;
- o time permitted for completion of Protective Action;
- o critical plant variable (not necessarily a measured variable);
- o permissible limit on critical variable;
- o Protection Margin;
- o worse case Set Point;
- o required or acceptable Instrument Accuracy;
- o nominal Set Point;
- o remarks."

4. RDT C16-1T states the following in Section 3.3:

"<u>3.3 Essential Performance Requirements (EPR)</u>

The EPR for all relevant PPS equipment shall be determined using the results of the analyses that establish each of the required Protective Functions, together with the environmental conditions to which the Protective Subsystem(s) in question will be subjected. The most stringent performance requirements so determined shall be the basis for the equipment specifications.

<u>3.3.1 Range of Environmental Conditions</u>

The Design Basis shall contain a statement of the range of environmental conditions under which the PPS must perform during normal, abnormal, and accident conditions, for example:

- o transient and steady-state conditions of the electric power supply (voltage, frequency);

- o transient and steady-state conditions of other utility supplies (coolant, compressed air or gas, etc.);
- o temperature;
- o humidity;
- o pressure;
- o vibration;
- o radiation.

3.3.2 Credible Single Events

The Design Basis shall contain a list of the malfunctions, accidents, and natural events against which the PPS is to have defenses, for example:

- o falling objects;
- o single structural failures;
- o leaking or broken supply piping (local flooding);
- o local fires;
- o local explosions;
- o missiles;
- o lightning;
- o wind;
- o earthquake.

3.3.3 Instrument Channels

The Essential Performance Requirements of each Instrument Channel shall be determined from the requirements for each Protective Function tabulated as required by Section 3.2 and shall be documented by the PPS designer. The following are examples of Instrument Channel EPR's which should be listed:

- o accuracy,
- o response time,
- o repeatability,
- o sensitivity,
- o gain,
- o range,

- o span,
- o range of environmental conditions and utility supplies within which the EPR must be me.,
- o range of environmental conditions and utility supplies within which the EPR need not be met, but damage to the PPS Components is not incurred.

3.3.4 Logic Elements

The EPR of the Logic Elements shall be determined for the limiting Protective Function tabulated as required by Section 3.2, and shall be documented by the PPS designer. The following are examples of logic element EPR's which should be listed:

- o response time,
- o hysteresis,
- o range of environmental conditions and utility supplies within which the EPR must be met,
- o range of environmental conditions and utility supplies within which the EPR need not be met, but damage to the PPS Components is not incurred.

Provided that these ranges differ from those specified for the Instrument Channels.

3.3.5 Actuators

The EPR of the Actuators shall be determined for the limiting Protective Function tabulated as required by Section 3.2, and shall be documented by the PPS designer. The following are examples of Actuator EPR's which should be listed:

- o design life;
- o device release time;
- o acceleration;
- o environmental conditions;
- o force, horsepower, torque;
- o reliability;
- o velocity;
- o control valve stroke time;
- o pneumatic operator fill time;
- o structural constraints.

NOTE: This list of EPR's refers mainly to control (shim, safety) rods and valves. A conceptually related list should be prepared for other devices.

3.3.6 Power Sources

The Design Basis shall list the characteristics of the essential load requirements and the length of time each must be carried and state the required source of power for each.

3.3.7 Testing

The Design Basis shall identify and provide justification for the type of testing (either periodic, monitoring, or none) which will be used to confirm the ability of each item of PPS equipment to meet each of its EPR's."

Are these to be found in the Design Basis? They are not found in the PSAR or SDD.

5. RDT C16-1T states the following in Section 4.4:

"PPS equipment and its installation shall be of a quality consistent with the reliability requirements of paragraph 4.1.2. Prior to initial reactor operation, it shall be established for the entire PPS that all Components are fundamentally capable of meeting the requirements set forth in the Design Basis, and the quality assurance program requirements set forth in Section 5. Compliance with applicable requirements of MIL-N-52335 is recommended but not required."

Are these intentions to show or is it documented somewhere that the instrumentation meets the requirements set forth in the Design Basis? This type of information is not found in the PSAR or SDD.

6. RDT C16-1T states the following in Section 4.5.7:

"Instrument Channel Bypass shall not be provided unless justified by the RSD. If justified, provisions may be made for permanently installed arrangements to routinely bypass single Instrument Channels in only those systems that have "extra" redundancy, such as 2-of-4 or 1-of-3 systems. Bypasses are not allowed in designs have 1-of-2 taken twice. The system must be able to carry out every Protective Function after any internal Random Failure at all times. These provisions shall meet the following requirements.

a. Means shall be provided to limit the number of Instrument Channels that can be bypassed at a given time in order that redundancy shall be maintained.

b. The fact that any Instrument Channnel is bypassed shall be visually and audibly annunciated in the control room. The annunciation shall identify the Instrument Channel being bypassed. Reset of the audible annunciation shall require a deliberate manual action by the operator.

c. Test means shall be provided for the purpose of confirming proper Instrument Channel reconnection after removal of a Bypass.

d. The means provided for bypassing shall not cause the violation of any of the requirements of this Standard. Particular attention shall be given to meeting the requirements of Section 4.2.

Unanticipated conditions may require instrument Channel Bypasses until formal bypassing means can be designed and installed. Also, certain maintenance and troubleshooting operations may require temporary Bypasses. Such Bypasses are potentially unsafe and are to be avoided as a means for routinely altering Protective Functions. When such Bypasses cannot be avoided, supervised Instrument Channel Bypasses must be applied manually on an individual basis. Adequate administrative control is required to insure that a sufficient number of Instrument Channels will not be bypassed to negate a Protective Function and that such a Bypass is removed when no longer required. Additionally, provisions are necessary to confirm that the Instrument Channel operates properly after the Bypass is removed. Administrative control of such temporary Bypasses shall meet the intent of the requirements of this paragraph, a through d above. See also paragraph 4.8.3."

The requirement allows instrument channel bypasses, but does not allow bypassing of entire systems which provide protective functions. Has an exception been taken to this requirement?

7. If bypassing of the PPS systems is accomplished by operating mode selection then Section 4.5.8 of RDT C16-1T states:

"The PPS shall be arranged so that the required protection is obtained automatically when the reactor operating mode is selected."

For any PPS bypasses using operating mode selection, do they meet the requirement of Section 4.5.8?

8. RDT C16-1T, Section 4.5.9 states the following:

"The operator shall be provided with accurate, complete, and timely information pertinent to the plant conditions requiring Protective Action and to the status of each Protective Subsystem and the PPS as a whole. This information shall include but not be limited to the following:

a. A recording or indication of each plant variable required to be monitored in order to provide Protective Action (see paragraph 4.6.3.2). If a sampled data system is used, the sampling frequency shall be consistent with the maximum rate of change of the recorded variable.

b. Status of bypasses.

c. Indication of the position of Actuators. (On-off, open-closed, or variable position indication shall be dictated by the operating mode of the Actuator in question). The status shall be monitored by the most practical means consistent with paragraph 4.5.1.

d. State of each Instrument Channel output Bistable in the PPS. The fact that a channel output Bistable has tripped shall be visually and audibly annunciated in the control room and reset of the visual annunciator shall require deliberate manual action by the plant operator. The audible annunciator may be reset automatically.

e. State of all Operation System equipment which has major influence on the PPS operation.

f. State of all specially controlled conditions for PPS equipment."

Review of the PSAR and SDD does not provide information to whether each PPS Bistable is designed to provide visual and audible annunciation in the reactor control room. do the bistables meet this requirement?

9. RDT C16-1T, Section 4.6.3, states the following:

"4.6.3.1 Monitoring - Continuous testing in the form of monitoring signals within the PPS shall be applied in accordance with the following requirements:

a. In general, capability for continuous monitoring shall be provided to detect those failures or conditions that could potentially result in the inability to implement a Protection Function(s) from the failure of a sufficient amount of equipment either simultaneously or in a time interval shorter than the interval between periodic on-line tests. The required time interval between tests shall be determined in accordance with Section 4.1.2.

b. Monitoring shall be provided in Protective Subsystems that do not employ coincidence and also have a required interval between tests shorter than the planned reactor operating interval.

An unsafe Failure detected in any one Protective Channel of a group of three or more Protective Channels comprising a given Protective Subsystem shall cause an alarm automatically. If detected unsafe Failures accumulate to the point that only one Protective Channel remains with no detected failure, provisions shall be made to automatically initiate a controlled action of the remaining Protective Channel Actuators. (This controlled action need not be as rapid as the intended Protective Actio...)

4.6.3.2 Surveillance - The PPS shall be physically arranged and instrumented so that surveillance, through the use of all available information, can be performed with the objective of detecting the need for calibration, Component Failure, Incipient Failure, or other forms of degradation that might escape detection by other means. Bistable input signals for each PPS Instrument Channel shall be displayed clearly, continuously, and individually (also see paragraph 4.5.9)."

Review of the PSAR and the SDD does not provide information to determine whether the continuous monitoring and surveillance requirements are met. Does the PPS meet the requirements of Section 4.6.3?

10. RDT C-16-1T, Sections 4.7.b & c state the following:

"b. The number of power supplies and the arrangement of their circuits for supplying power to the PPS shall be such that in the event of a loss of all off-site power, an Internal Random Failure cannot prevent implementation of any Protective Function due to loss of power."

"c. The consideration of power supply Failures shall include the effects of increases and decreases in voltage of ac and dc supplies, and the effects of increases and decreases in the frequency of ac supplies. Also see paragraph 4.2.3."

Review of the PSAR and SDD does not provide information to determine whether the requirement was considered and met. Do the power supplies for the PPS meet the requirements of Section 4.7.b and c?

11. RDT C-16-1T, Section 5.2, requires the following:

"The following shall be provided in or with the PPS System Design Description(s) (SDD):

a. The Design Basis, containing all information required in paragraph 3 of this Standard.

b. Identification of all the criteria and requirements which the PPS shall meet. Where exceptions to this Standard are proposed, the justification for each such exception shall be included in the SDD.

c. Where justification for certain provisions are required by this Standard, and such provisions are proposed for a PPS, the justification for including these provisions shall be included in the SDD. (For example, see paragraphs 3.3.7, 4.5.1, and 4.5.7.)

d. Identification of the Protective Subsystem(s) which are provided to implement each Protective Function.

e. Description of each Protective Subsystem and the PPS as a whole, including description of all interfaces between the PPS and other systems.

f. A statement of the criteria which will be met by important monitoring and surveillance equipment (see paragraph 3.1.4), and a description of this equipment.

g. A statement of the criteria which will be met by Operation System equipment proposed for use as specified in paragraph 3.2.3.1, and a description of this equipment."

Is the SDD going to be updated to include items a, b, c, d, e, f and g above?

12. The summary of SDD Number 99 states that the PPS includes the Reactor Shutdown System (RSS) and the Containment Isolation System (CIS). This is in contradiction to the PSAR, Section 7.1.2.1, which includes the Shutdown Heat Removal Systems.

    Also, since SDD No. 99 is for the PPS, why are not all the safety related systems identified in Table 7.5-1 as PPS included in this description.

Response:

All references to RDT Standard C16-1T have been removed from the PSAR.

CRBRP is applying appropriate IEEE Standards to the design of Safety Related Instrumentation and Control Systems in accordance with current NRC positions enumerated in the Standard Review Plan. The technical requirements of these standards have been determined to be adequate and appropriate for use on the Project. Accordingly, RDT Standard C16-1T is not used as a basis for licensing, although it may be used in the engineering process. All references to RDT Standard C16-1T have been removed from Chapter 7 of the PSAR.

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