March 16, 1982

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Docket No.: 50-537

Mr. John R. Longenecker
Licensing and Environmental Coordination
Clinch River Breeder Reactor Plant
U. S. Department of Energy, NE-561
Washington, D.C. 20545

Dear Mr. Longenecker:

SUBJECT: CLINCH RIVER BREEDER REACTOR PLANT, REQUEST FOR ADDITIONAL INFORMATION

As a result of our review of your application for a construction permit for the Clinch River Breeder Reactor Plant, we find that we need additional information in the area of Power Systems. Please provide your final responses by May 15, 1982.

The reporting and/or recordkeeping requirements contained in this letter affect fewer than ten respondents; therefore, OMB clearance is not required under P.L. 96-511.

If you desire any discussion or clarification of the information requested, please contact R. M. Stark, Project Manager (301) 492-9732.

Sincerely,

Original Signed by
Paul S. Check

Paul S. Check, Director
CRBR Program Office
Office of Nuclear Reactor Regulation

Enclosure:
As stated

cc: Service List

OFFICE	CRBRPO:NRR	CRBRPO:NRR	CRBRPO:NRR	CRBRPO:NRR			
SURNAME	RStark/bm	CThomas	WFoster	PSCheck			
DATE	3/12/82	3/15/82	3/16/82	3/16/82			

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ENCLOSURE

REQUEST FOR ADDITIONAL INFORMATION

CLINCH RIVER BREEDER REACTOR PLANT

CS 430.1 (8.2)

Provide physical layout drawings and/or additional description in the PSAR of the physical independence to be provided between the offsite power circuits in proximity of the plant to the switchyards and from the switchyard to the Class 1E onsite power system. Also provide description of physical independence between Class 1E and the offsite circuits, and between control power circuits associated with the offsite circuits protective relaying.

CS 430.2 (8.2) (3.1.3.1)

Section 3.1.3.1 of the PSAR indicates that each of the reserve transformers is capable of supplying full power required for the auxiliary ac power distribution system to supply one redundant Class 1E division load groups. Figure 8.3.1 of the PSAR in contradiction, shows reserve transformers supplying two Class 1E division loads as well as numerous non-Class 1E loads. Correct the contradiction and describe the capability and capacity of the offsite circuits, including the unit station service and reserve transformers, to supply all connected loads (Class 1E and non-Class 1E) for all modes of plant operation.

CS 430.3 (8.1)

Section 8.3.1.1 of the PSAR indicates that three independent load groups are provided with load group 1 redundant to load group 2. No description as to redundancy of load group 3 has been provided in Chapter 8 of the PSAR. Conversely, section 3.1.3.1 of the PSAR under criterion 26 response indicates that the power supplies servicing the heat transfer system are fully redundant. Clarify chapter 8 of the PSAR to indicate redundancy of the 3 divisions.

CS 430.3

This question has been deleted.

CS 430.5 (8.3.1)

You state in section 8.3.1.2.1 that "the standby onsite power supply network has provisions to manually cross-connect the 4.16 kv buses of the division 1 and 2 power supplies in case of extreme emergency." Enumerate and define each case of extreme emergency that would necessitate the use of the interconnections. For each case listed justify its noncompliance with the independence requirement of criterion 15 listed in section 3.1 of the PSAR.

CS 430.6 (8.2) (8.3.1) (8.3.2)

The response to criterion 16 in section 3.1 of the PSAR indicates that periodic tests of the transfer of power between onsite and offsite sources and between the normal offsite supply and the preferred (reserve) supply are performed only during prolonged plant shutdown periods. The response to criterion 16 implies that the power transfer has not been designed to be testable during operation of the nuclear plant as recommended by IEEE Standard 338-1977 and Regulatory Guide 1.118. In addition, it has been implied that the onsite ac and dc systems have also not been designed to be testable during operation of the nuclear plant. Describe compliance with IEEE Standard 338-1977 and Regulatory Guide 1.118 and justify areas of noncompliance.

CS430.7 (8.3.1) (8.3.2)

You state in section 8.3.1.1.2 of the PSAR under the subheading Testing and Inspection, that "In the case an emergency signal is generated during the testing, the circuit breaker cannot be closed immediately." Describe how the design implied by this statement meets the recommendations of IEEE Standard 338-1977.

CS430.8 (8.3.1) (8.3.2)

Section 8.3.1.2.11 of the PSAR indicates that conductors of the penetration are designed to withstand the maximum short-circuit currents based on the interrupting capability of the protective device associated with the penetration assembly conductors. Position C.1 of Regulatory Guide 1.63, on the other hand, states that the electric penetration assembly versus the conductor should be designed to withstand the maximum short-circuit condition. Justify non-compliance to Position C.1 of Regulatory Guide 1.63.

CS430.9 (8.3.1) (8.3.2)

You state in section 8.3.1.4 of the PSAR that environmental type test will be performed on cables and terminations that are required to function in a hostile environment. This statement implies that cables or terminations that are not required to function in a hostile environment, will not be environmentally qualified and may not be in compliance with IEEE 323-1974. Justify noncompliance.

Similarly, section 8.3.1.2.15 of the PSAR indicates that a description of environmental qualification of Class 1E equipment is found in section 3.11. Indicate that all Class 1E equipment is environmentally qualified or justify noncompliance.

CS 430.10 (8.3.1) (8.3.2)

Section 8.3.1.2.14 of the PSAR indicates that physical separation of circuits and equipment comprising or associated with the Class 1E power system, Class 1E protection systems and Class 1E equipment, will be in accordance with criteria set forth in paragraph 8.3.1.4 of the PSAR. Separation criteria described in sections 8.3.1.2.14 and 8.3.1.4 of the PSAR is not clear and does not meet the guidelines of IEEE Standard 384 and Regulatory Guide 1.75. For example, the PSAR indicates that non-Class 1E cables in panels will be separated from Class 1E cables so that they will not provide a combustion path between different divisions. Section 5.6.5 of IEEE Standard 384-1974 states that non-Class 1E cables shall be separated by six inches or a barrier. In general no criteria has been described for separation of Class 1E and non-Class 1E cables. Other examples include: (1) no criteria for separation between cables trays and conduits of another division, (2) confusing criteria for the separation of the third division (The design indicates there are three division but only two redundant divisions. Separation cirteria refers to only two redundant divisions in many cases versus the three divisions), (3) confusing definition for associated cables, (4) no criteria for separation between associated cables and non-Class 1E cables, and (5) no criteria before and after an isolation device. Revise your PSAR description of physical separation of circuits to comply with the recommendations of IEEE Standard 384-1974 and guidance of R.G. 1.75 or justify noncompliance.

CS 430.11 (8.3.1) (8.3.2)

You state in section 8.3.1.4.E of the PSAR that only one safety division is routed in a fire hazard zone and that this one division is suitably protected so that a fire in the zone will not effect the safety functions of the other safety groups. This statement does not meet current regulatory guidelines. Current guidelines require that the one division be suitably protected so that fire in the zone will not affect the safety function of the one division located in the zone. The other safety groups must be separated by a three-hour fire rated barrier from the zone.

In addition to current guidelines, it is proposed that if the one division cannot be protected from the effects of fire in the zone (such as in areas of potential sodium fires) there must be a minimum of two remaining safety divisions outside the fire zone and separated by a barrier sufficient to contain the fire. The remaining safety divisions must be capable of safely shutting down the reactor in compliance with the single failure criteria. Indicate compliance with the above current and proposed guidelines in the PSAR or describe and justify an acceptable alternative.

CS 430.12 (8.3.1) (8.3.2)

Fire hazard zones have been defined in the PSAR as areas in which a potential fire hazard could exist as a consequence of the credible accumulation of a significant quantity of flammable material. Current regulatory guidelines define areas of credible accumulation as any open areas of the plant where transient combustables can be placed. This definition encompasses most areas of the plant including switchgear and cable spreading rooms. Revise the PSAR to incorporate the above definition or describe an alternative definition with justifications.

CS 430.13

Separation of Class 1E raceways from high energy pipelines as defined in the PSAR is to be greater than 15 feet or less than 15 feet if the pipe is suitable restrained so as not to wh[illegible] and strike the raceway. Current regulatory guidelines req[illegible]re that the Class 1E raceway be protected by a barrier so t[illegible]t pipe wipe missiles, jet impingement or environmental effects of the pipe break will not cause failure of the Class 1E raceway. Fifteen feet of space is not considered adequate protection. Indicate compliance with the above guidelines in the PSAR or propose, describe, and justify an acceptable alternative.

CS 430.14

Separation between redundant raceways as defined in the PSAR takes into consideration the presence of rotating equipment, monorails, and equipment removal paths and the possibility that heavy equipment could be lifted and dropped and possibly cause failure of two raceway channels. Minimum separation between the two raceway channels is to be such as to preclude failure of both channels. Current regulatory guidelines, however, requires protection of each raceway as well as separation so that the dropped equipment will not cause failure of either raceway. An alternative to protection would be a design that provides an additional two independent systems each capable of shutting down the reactor and separated such that neither will be affected by the dropped equipment or failure of rotating equipment. Indicate compliance with the above guidelines in the PSAR or describe and justify an acceptable alternative.

CS 430.15 (8.3.1) (8.3.2)

Section 8.3.1.2.14 of the PSAR indicates that non-Class 1E loads will be connected to one division of the Class 1E system through an isolation device.

a. The proposed design for the isolation device addresses primarily protection of the Class 1E system due to worst case faults in the non-Class 1E system. Justify why other failures of the non-Class 1E system such as hot shorts are not considered in the design of the isolation devices.

b. The isolation device is to be designed as indicated in the PSAR so that voltage on the Class 1E system buses will not drop below 70 or 80 percent of nominal given a worst case fault in the non-Class 1E system. With most Class 1E equipment designed to operate at not less than 90 percent of nominal, justify your design that allows lower voltage.

c. Describe the methods to be used to demonstrate the design capability of the isolation device.

CS 430.16 (8.3.1) (8.3.2)

Section 8.3.1.2.14 of the PSAR indicates that analyses and testing of associated circuits will be performed in accordance with paragraphs 4.5(3), 4.6.2, and 5.1.1.2 of IEEE Standard 384-1974. Describe in the PSAR and in detail the analyses and testing that will be performed. The description should include the minimum separation distance between associated and non-Class 1E cables that will be demonstrated by the proposed analyses and testing.

CS 430.17 (8.3.1) (8.3.2)

Section 8.3.1.2.22 of the PSAR indicates that the Class 1E system will be designed to assure that a design basis event will not cause loss of electric power to more than one Class 1E load group at one time. This proposed design does not meet IEEE Standard 308-1974, justify noncompliance. Also provide the results of a failure mode and effects analysis in accordance with section 4.8 of IEEE Standard 308-1974 for a design basis event that causes failure of one load group and a single failure in another load group.

CS 430.18 (8.3.1) (8.3.2)

Section 8.3.1.2.22.b of the PSAR states that "A loss of electric power to equipment that could result in a reactor power transient capable of causing significant damage to the fuel or to the plant operation. (see section 15.1.2)" The last words of the above statement "to the plant operation" are not clear and are inconsistent with section 4.1.(2) of IEEE Standard 308-1974. Provide clarification and justify noncompliance to IEEE Standard 308-1974.

CS 430.19 (8.3.1) (8.3.2)

You state in section 8.3.1.2.22 of the PSAR that indicators and controls will be provided outside the control room in compliance with section 4.4 of IEEE Standard 308-1974. Provide a description of the design provisions that assure electrical isolation between controls and indicators located in the control room and remote locations. The current staff position requires that no single failure in the control room shall cause failure at the remote location.

CS 430.20 (8.3.1) (8.3.2) Describe the source of control power to division 3 ac switchgear and diesel generator.

CS 430.21 (8.3.1) Operating experience at certain nuclear power plants which have two cycle turbocharged diesel engines manufactured by the Electromotive Division (EMD) of General Motors driving emergency generators have experienced a significant number of turbocharger mechanical gear drive failures. The failures have occurred as the result of running the emergency diesel generators at no load or light load conditions for extended periods. No load or light load operation could occur during periodic equipment testing or during accident conditions with availability of offsite power. When this equipment is operated under no load conditions insufficient exhaust gas volume is generated to operate the turbocharger. As a result the turbocharger is driven mechanically from a gear drive in order to supply enough combustion air to the engine to maintain rated speed. The turbocharger and mechanical drive gear normally supplied with these engines are not designed for standby service encountered in nuclear power plant application where the equipment may be called upon to operate at no load or light load condition and full rated speed for a prolonged period. The EMD equipment was originally designed for locomotive service where no load speeds for the engine and generator are much lower than full load speeds. The locomotive turbocharged diesel hardly ever runs at full speed except at full load. The EMD has strongly recommended to users of this diesel engine design against operation at no load or light load conditions at full rated speed for extended periods because of the short life expectancy of the turbocharger mechanical gear drive unit normally furnished. No load or light load operation also causes general deterioration in any diesel engine.

To cope with the severe service the equipment is normally subjected to and in the interest of reducing failures and increasing the availability of their equipment EMD has developed a heavy duty turbocharger drive gear unit that can replace existing equipment. This is available as a replacement kit, or engines can be ordered with the heavy duty turbocharger drive gear assembly.

To assure optimum availability of emergency diesel generators on demand, Applicant's who have in place an order or intend to order emergency generators driven by two cycle diesel engines manufactured by EMD, should be provided with the heavy duty turbocharger mechanical drive gear assembly as recommended by EMD for the class of service encountered in nuclear power plants. Discuss you plans to incorporate this improvement.

CS 430.22
(8.3.1)

Provide a detail discussion (or plan) of the level of training proposed for your operators, maintenance crew, quality assurance, and supervisory personnel responsible for the operation and maintenance of the emergency diesel generators. Identify the number and type of personnel that will be dedicated to the operations and maintenance of the emergency diesel generators and the number and type that will be assigned from your general plant operations and maintenance groups to assist when needed.

In your discussion, identify the amount and kind of training that will be received by each of the above categories and the type of ongoing training program planned to assure optimum availability of the emergency generators.

Also discuss the level of education and minimum experience requirements for the various categories of operations and maintenance personnel associated with the emergency diesel generators.

CS 430.23
(8.3.1)

Periodic testing and test loading of an emergency diesel generator in a nuclear power plant is a necessary function to demonstrate the operability, capability and availability of the unit on demand. Periodic testing coupled with good preventive maintenance practices will assure optimum equipment readiness and availability on demand. This is the desired goal.

To achieve this optimum equipment readiness status the following requirements should be met:

1. The equipment should be tested with a minimum loading of 25 percent of rated load. No load or light load operation will cause incomplete combustion of fuel resulting in the formation of gum and varnish deposits on the cylinder walls, intake and exhaust valves, pistons and piston rings, etc., and accumulation of unburned fuel in the turbocharger and exhaust system. The consequences of no load or light load operation are potential equipment failure due to the gum and varnish deposits and fire in the engine exhaust system.

2. Periodic surveillance testing should be performed in accordance with the applicable NRC guidelines (R.G. 1.108), and with the recommendations of the engine manufacturer. Conflicts between any such recommendations and the NRC guidelines, particularly with respect to test frequency, loading and duration, should be identified and justified.

3. Preventive maintenance should go beyond the normal routine adjustments, servicing and repair of components when a malfunction occurs. Preventive maintenance should encompass investigative testing of components which have a history of repeated malfunctioning and require constant attention and repair. In such cases consideration should be given to replacement of those components with other products which have a record of demonstrated reliability, rather than repetitive repair and maintenance of the existing components. Testing of the unit after adjustments or repairs have been made only confirms that the equipment is operable and does not necessarily mean that the root cause of the problem has been eliminated or alleviated.

4. Upon completion of repairs or maintenance and prior to an actual start, run, and load test, a final equipment check should be made to assure that all electrical circuits are functional, i.e., fuses are in place, switches and circuit breakers are in their proper position, no loose wires, all test leads have been removed, and all valves are in the proper position to permit a manual start of the equipment. After the unit has been satisfactorily started and load tested, return the unit to ready automatic standby service and under the control of the control room operator.

Provide a discussion of how the above requirements have been implemented in the emergency diesel generator system design and how they will be considered when the plant is in commercial operation, i.e., by what means will the above requirements be enforced.

CS 430.24 (8.3.1) The availability on demand of an emergency diesel generator is dependent upon, among other things, the proper functioning of its controls and monitoring instrumentation. This equipment is generally panel mounted and in some instances the panels are mounted directly on the diesel generator skid. Major diesel engine damage has occurred at some operating plants from vibration induced wear on skid mounted control and monitoring instrumentation. This sensitive instrumentation is not made to withstand and function accurately for prolonged periods under continuous vibrational stresses normally encountered with internal combustion engines. Operation of sensitive instrumentation under this environment rapidly deteriorates calibration, accuracy and control signal output.

Therefore, except for sensors and other equipment that must be directly mounted on the engine or associated piping, the controls and monitoring instrumentation should be installed on a free standing floor mounted panel separate from the engine skids, and located on a vibration free floor area.

If the floor is not vibration free, the panel shall be equipped with vibration mounts.

Confirm your compliance with the above requirements or provide justification for noncompliance.

CS430.25 (8.3.1) In Chapter 8 of the PSAR, you discuss three (3) emergency diesel generators. In Chapter 9, however, the discussion of emergency diesel generator auxiliary systems includes only two (2) diesel generators. Revise your PSAR so Chapters 8 and 9 are in agreement. The PSAR revisions should cover the text material, as well as applicable P&ID's and General Arrangement Drawings showing plan, elevation, and section views. Questions asked in Chapter 9 are applicable to all emergency diesel generators.

CS430.26 (8.3.1) In section 8.3.1.1.2 of the PSAR, under the heading Circuit Protection, you list the emergency diesel generator protective trips. However, there is no discussion of protection in the event of excessive jacket water temperature or turbo-charger malfunctions. Expand your PSAR to discuss these protective features, or explain why such protection is not required.

CS430.27 (9.11) The PSAR section covering onsite communications should be expanded to include the following information:

a) Identify all areas from which it will be necessary for plant personnel to communicate with the control room or the emergency shutdown panel during and/or following transients and/or accidents (including fires) in order to mitigate the consequences of the event and to attain a safe, cold plant shutdown.

b) Indicate the types of communication that will be available in each of the above areas to provide adequate communications under all normal operating and design basis accident conditions, including the safe shutdown earthquake.

CS430.28 (9.11) The final design of the onsite communications system(s) will be reviewed with regard to functional capability under all normal operating conditions and accident conditions. Therefore, the PSAR should be expanded, to the extent practicable, to include the following:

a) A list of all working stations including location and the types of communication system(s) provided at each location.

b) The maximum sound levels that will exist at each of the above identified working stations for all transient and accident conditions.

c) The maximum background noise level that will exist at each working station during normal operation and accident conditions and yet reliably expect effective communication with the control room using the communication system(s) available at that station.

d) Communication systems performance requirements and test procedures (including frequency) which will be imposed to ensure that effective communication with the control room or emergency shutdown panel is possible under all conditions.

e) A discusion of protective measures to be taken to ensure functional onsite communication systems, including considerations for component failure, loss of power, and severing of a communication line or trunk as a result of an accident or fire.

CS 430.29 (9.12) Provide a tabulation of vital areas where emergency lighting is required for safe shutdown of the reactor and evacuation of personnel in the event of an accident.

CS 430.30 (9.12) Identify the types of lighting that will be provided in the above tabulated vital areas. Show that lighting will be available in the event of a design basis accident, including the safe shutdown earthquake.

CS 430.31 (9.12) For all vital areas identified, indicate that illumination levels during accident conditions will be adequate for performance of any tasks associated with safe shutdown of the reactor, and for maintaining the reactor in a safe shutdown condition. Demonstrate that sufficient lighting will be available in the vital areas in the event of a prolonged loss of offsite power. Illumination levels should be in conformance with applicable sections of the Illumination Engineering Society (IES) Lighting Handbook.

CS 430.32 (9.14.1) Provide a general arrangement drawing for the Emergency Diesel Generator Fuel Oil Storage and Transfer System. Show storage tank locations and piping runs in relation to the diesel generator building and any other structures in the vicinity. Include section views, as necessary, for clarity.

CS 430.33 (9.14.1)

Describe the instruments, controls, sensors and alarms provided for monitoring the diesel engine fuel oil storage and transfer system, and describe their function. Identify the temperature, pressure, and level sensors which alert the operator when these parameters are exceeded, and state where the alarms are annunciated. Discuss the system interlocks provided , to the extent practical.
Provide a discussion of the testing and maintenance program which will be implemented to ensure a highly reliable instrumentation, controls, sensors, and alarm system.

CS 430.34 (9.14.1)

Provide a discussion of the design provisions which will be used to protect the fuel oil storage tank fill and vent lines from damage by tornado missiles.

CS 430.35 (9.14.1)

Expand the PSAR to include a discussion of the fuel oil storage tank and how your design will conform to the requirements of ANSI N-195 and R.G. 1.137. Provide specific information on:

1) The method to be used in calculating the capacity of the fuel oil storage tanks.

2) The types of coatings or coating systems to be used to prevent internal and external corrosion of the fuel oil storage tanks and underground piping.

3) A discussion of the cathodic protection system which will be applied to the fuel oil storage tanks, or the rationale of why cathodic protection will not be used.

CS 430.36 (9.14.1)

Expand the PSAR to include a discussion of the following:

1) The means for detecting or preventing growth of algae in the diesel fuel oil storage tanks. If it were detected, describe the methods which will be employed for cleaning the affected tanks(s).

2) The method(s) to be employed for removal of water from the diesel fuel oil storage tanks and the day tanks, should water accumulate in either tank.

3) The provisions to be made to prevent the entrance of deliterious material into the diesel fuel oil storage tanks during filling, and as a consequence of adverse environmental conditions.

CS 430.37 (9.14.1)

Assume an unlikely event has occurred requiring operation of a diesel generator for a prolonged period that would require replenishment of fuel oil without interrupting operation of the diesel generator. What provision will be made in the design of the fuel oil storage fill system to minimize the creation of turbulence of the sediment in the bottom of the storage tank. Stirring of this sediment during addition of new fuel has the potential of causing the overall quality of the fuel to become unacceptable and could potentially lead to the degradation or failure of the diesel generator.

CS 430.38 (9.14.1) In the PSAR, you state that fuel can be delivered to the site within 24 hours. Expand your PSAR to include a discussion of how the fuel will be delivered, both in normal operations and in the event of extremely unfavorable environmental conditions. In your discussion, include the sources where quality diesel fuel is available and the distances to be traveled from the source to the site, to the extent practical.

CS 430.39 (9.14.1) Discuss the design considerations that will determine the physical location of the diesel engine fuel oil day tank(s) at your facility. Assure that the proposed physical location of the fuel oil day tank(s) meet(s) the requirements of the diesel engine manufactures.

CS 430.40 (9.14.1) What is the purpose of the standby motor driven fuel oil pump shown of Figure 9.14.7? Expand the PSAR to include a description of this pump, its function, the pump control scheme, and the source of electrical power for the motor.

CS 430.41 (9.14.1) What is the source of electrical power for the diesel fuel oil transfer pumps? Also, provide the salient pump characteristics; i.e., capacity, discharge head, NPSH requirements, and motor HP, to the extent possible.

CS 430.42 (9.14.1) Discuss the precautionary measures that will be taken to assure the quality and reliability of the fuel oil supply for emergency diesel generator operation. Include the type of fuel oil, impurity and quality limitations as well as diesel index number or its equivalent, cloud point, entrained moisture, sulfur, particulates and other deliterious insoluble substances; procedure for testing newly delivered fuel, periodic sampling and testing of on-site fuel oil (including interval between tests), interval of time between periodic removal of condensate from fuel tanks and periodic system inspection. In your discussion include reference to industry (or other) standard which will be followed to assure a reliable fuel oil supply to the emergency generators.

CS 430.43 (9.14.1) Discuss what precautions have been taken in the design of the fuel oil system in locating the fuel oil day tank and connecting fuel oil piping in the diesel generator room with regard to possible exposure to ignition sources such as open flames and hot surfaces.

CS 430.44 (9.14.1) What is the purpose of the piping run identified as 3-HBDW-D6B on Figure 9.14.1? Also, what is the actual location of line 2-HBCW-D4 on Figure 9.14.1; i.e., inside or outside the diesel generator building?

CS 430.45 (9.14) Diesel generator auxiliary systems should be designed to Seismic Category 2, ASME Section III, Class 3, or Quality Group C requirements in conformance with Regulatory Guides 1.26 and 1.29. Expand your PSAR to include a discussion of the engine mounted fuel oil piping and components, and provide the industry standards that were used in the design, manufacture, and inspection of the piping and components. Also, show on the appropriate drawings where the Quality Group Classification changes from Quality Group C.

Provide similar discussions and drawings for the other diesel generator auxiliary systems, i.e., lubricating oil, cooling water, air starting, and combustion air intake and exhaust systems, to the extent practical.

CS 430.46 (9.14) Identify all high and moderate energy lines and systems that will be installed in the diesel generator room. Discuss the measures that will be taken in the design of the diesel generator facility to protect the safety related systems, piping and components from the effects of high and moderate energy line failure to assure availability of the diesel generators when needed.

CS 430.47 (9.14) The diesel generator structures are designed to seismic and tornado criteria and are isolated from one another by a reinforced concrete wall barrier. Describe the barrier (including openings) in more detail and its capability to withstand the effects of internally generated missiles resulting from a crankcase explosion, failure of supports for one or all of the starting air receivers, or failure of any high or moderate energy line and initial flooding from the cooling system so that the assumed effects will not result in loss of an additional generator.

CS 430.48 (9.14) Expand the PSAR to include a discussion of non-seismic systems or structures in the diesel generator building or near the fuel oil storage tanks and piping. Show that the failure of any non-seismic system or structures will not result in damage to any of the diesel generator auxiliary systems with the attendant loss of its respective diesel generator.

CS 430.49 (9.14.2)

Expand your PSAR to include a section on how the diesel generator cooling water system design conforms to the design criteria and bases detailed in SRP 9.5.5 (NUREG-0800). Provide justification for non-conformance, as applicable.

CS 430.50 (9.14.2)

Describe the instrumentation, controls, sensors and alarms provided for monitoring of the diesel engine cooling water system and describe their function. Discuss the testing necessary to maintain and assure a highly reliable instrumentation, controls, sensors, and alarm system, and where the alarms are annunciated. Identify the temperature, pressure, level, and flow (where applicable) sensors which alert the operator when these parameters exceed the ranges recommended by the engine manufacturer and describe what operator actions are required during alarm conditions to prevent harmful effects to the diesel engine. Discuss the systems interlocks provided, to the extent practical.

CS 430.51 (9.14.2)

Provide a more complete description of how the diesel generator cooling water system functions. Include a description of all components that make up, or interface with the cooling water system, and describe their function. Show how cooling water temperature is maintained at a predetermined level during operation in any condition from no load to maximum load. Include seismic and quality group classifications.

CS 430.52 (9.14.2)

In PSAR sections 9.14.2.2 d and e, you discuss the diesel engine jacket water "keepwarm" system for use when the engine is not running. The information presented in these PSAR sections and on Figure 9.14-2 is not sufficient for a comprehensive review of the system design and function. Therefore, expand your PSAR to include a complete description of the cooling water system design and functions with respect to the "keepwarm" or standby mode of operation. Show that the entire cooling water system is maintained at 125°F. Include details of the circulating pump, electric heater, source of power, flow path, and controls scheme. Revise Fig. 9.14-2, as required. In the event of a failure in this system, describe how the failure will be detected, and what actions must be taken by the operator(s) to insure that diesel engine standby temperatures are maintained. Provide seismic and quality group classifications for this system.

CS 430.53 (9.14.2)

A three-way, air operated temperature control valve is shown on Figure 9.14-8. Provide more detail on this valve and how it operates. Describe the control air system, including the air supply, how the pressure is regulated, consequences of a malfunction resulting in either too high or too low pressure, provisions for manual override, if any, alarms and indications, and any other pertinent data, to the extent practical.

CS 430.54 (9.14.2) Indicate the measures to preclude long-term corrosion and organic fouling in the diesel engine cooling water system that would degrade system cooling performance, and the compatibility of any corrosion inhibitors or antifreeze compounds used with the materials of the system. Indicate if the water chemistry is in conformance with the engine manufacturer's recommendations, or the plan to verify conformance.

CS 430.55 (9.14.2) Describe the provisions made in the design of the diesel engine cooling water system to assure that all components and piping are filled with water.

CS 430.56 (9.14.2) In the PSAR, you state that the expansion tank has sufficient capacity to replace water evaporated in the jacket water system. The final design of the cooling water system will be reviewed with regard to the system capacity for makeup due to minor system leaks at pump shaft seals, valve stems, and other components, and to maintain required NPSH on the system circulating pump. Therefore, to the maximum extent possible, expand your PSAR to provide the size of the expansion tank and location. Demonstrate by analysis that the expansion tank size will be adequate to maintain required pump NPSH and makeup water for seven days containuous operation of the diesel engine at full rated load without makeup, or provide a seismic Category I, safety Class 3 makeup water supply to the expansion tank.

CS 430.57 (9.14.2) Provide a tabulation showing the individual and total heat removal rates for each major component and subsystem of the diesel generator cooling water system. Discuss the design margin (excess heat removal capability) included in the design of major components and subsystems.

CS 430.58 (9.14.2) Recent licensee event reports have shown that tube leaks are being experienced in the heat exchangers of diesel engine jacket cooling water systems. Provide a discussion on the provisions which will be made to detect tube leakage, and the corrective actions that will be taken. Include jacket water leakage into the lube oil system (standby mode), lube oil leakage into the jacket water (operating mode), jacket water leakage into the engine combustion air intake and governor oil systems (operating or standby modes). Provide the permissable inleakage or outleakage in each of the above conditions which can be tolerated without degrading engine performance or causing engine failure. The discussion should also include the effects of jacket water/service water systems leakage,to the extent practical.

CS 430.59 (9.14.2) The diesel generators are required to start automatically on loss of all offsite power and in the event of a DBA . The diesel generator sets should be capable of operation at less than full load for extended periods without degradation of performance or reliability. Should a DBA occur with availability of offsite power, discuss the design provisions and other parameters that have been considered in the selection of the diesel generators to enable them to run unloaded (on standby) for extended periods without degradation of engine performance or reliability. Expand your PSAR to include and explicitly define the capability of your design with regard to this requirements.

CS 430.60 (9.14.2) Provide the source of power for the diesel engine motor driven jacket water keepwarm pump and electric jacket water heater. Provide the motor and electric heater characteristics, i.e., motor hp., operating voltage, phase(s), frequency and kw output as applicable. Also include the pump capacity and discharge head, if available.

CS 430.61 (9.14.3) Expand your PSAR to include a section on how the emergency diesel engine air starting system will conform to the design criteria and bases detailed in SRP 9.5.6 (NUREG-0800). Provide justification for non-conformance, as applicable.

CS 430.62 (9.14.3) Expand your PSAR to include a detailed description of the diesel engine mounted portion of the air start system. Include such things as the function of the air line to the fuel rack, activation of the air start solenoid and air relay valves, type and number of air start motors, and any other pertinent data, if available.

CS 430.63 (9.14.3) Describe the operation of the emergency diesel engine air start system. Begin with an engine start signal and continue through engine running. Include all components in the system and the function of each. Show how a component failure will not result in total failure of an engine air start system. Also, state whether the air start system, once activated, will continue to operate until all compressed air is exhausted, or will it shut down after a specified period of time to allow successive starting attempts. Refer to Figure 9.14-3, as applicable.

CS 430.64 (9.14.3) Describe the air dryers in the air start system. State whether they are refrigerant or dessicant type, and the air quality levels they will maintain. Provide a discussion of how the compressed air quality will be monitored, and the provisions that will be made in your operation and maintenance programs to ensure consistently high quality compressed air to the receivers.

CS 430.65 (9.14.3)

Describe the instrumentation, controls, sensors and alarms provided for monitoring the diesel engine air starting system, and describe their function. Describe the testing necessary to maintain a highly reliable instrumentation, control, sensors and alarm system and where the alarms are annunciated. Identify the temperature, pressure and level sensors which alert the operator when these parameters exceed the ranges recommended by the engine manufacturer and describe any operator actions required during alarm conditions to prevent harmful effects to the diesel engine. Discuss system interlocks provided, to the extent practical.

CS 430.66 (9.14.4)

Expand your PSAR to include a section on how the emergency diesel engine lubricating oil system will conform to the design criteria and bases detailed in SRP 9.5.7 (NUREG-0800). Provide justification for non-compliance.

CS 430.67 (9.14.4)

Expand your description of the emergency diesel engine lubricating oil system. The PSAR text should include a detailed system description of what is shown on Figure 9.14-4. The PSAR text should also describe: 1) components and their function, 2) instrumentation, controls, sensors and alarms, and 3) a diesel generator starting sequence for a normal start and an emergency start. Also Figure 9.14-4 should show the diesel engine lubrication circuits, to the extent practical.

CS 430.68 (9.14.4)

An emergency diesel generator unit in a nuclear power plant is normally in the ready standby mode unless there is a loss of offsite power, an accident, or the diesel generator is under test. Long periods on standby have a tendency to drain or nearly empty the engine lube oil piping system. On an emergency start of the engine as much as 5 to 14 or more seconds may elapse from the start of cranking until full lube oil pressure is attained even though full engine speed is generally reached in about five seconds. With an essentially dry engine, the momentary lack of lubrication at the various moving parts may damage bearing surfaces producing incipient or actual component failure with resultant equipment unavailability.

The emergency condition of readiness requires this equipment to attain full rated speed and enable automatic sequencing of electric load within ten seconds. For this reason, and to improve upon the availability of this equipment on demand, it is necessary to establish as quickly as possible an oil film in the wearing parts of the diesel engine. Lubricating oil is normally delivered to the engine wearing parts by one or more engine driven pump(s). During the starting cycle, the pump(s) accelerates slowly with the engine and may not supply the required quantity of lubricating oil where needed fast engough. To remedy this condition, as a minimum, an electrically driven lubricating oil pump, powered from a reliable DC power supply, should be installed in the lube oil system to operate in parallel with the engine driven main lube pump. The electric driven prelube pump should operate only during the engine cranking cycle or until satisfactory lube oil pressure is established in the engine main lube distribution header. The installation of this prelube pump should be coordinated with the respective engine manufacturer. Some diesel engines include a lube oil circulating pump as an integral part of the lube oil preheating system which is in use while the diesel engine is in the standby mode. In this case an additional prelube oil pump may not be needed.

Confirm your compliance with the above requirement or provide your justification for not installing an electric prelube oil pump.

CS 430.69 (9.14.4) Several fires have occurred at some operating plants in the area of the diesel engine exhaust manifold and inside the turbocharger housing which have resulted in equipment unavailability. The fires were started from lube oil leaking and accumulating on the engine exhaust manifold and accumulating and igniting inside the turbocharger housing. Accumulation of lube oil in these areas, on some engines, is apparently caused from an excessively long prelube period, generally longer than five minutes, prior to manual starting of a diesel generator. This condition does not occur on an emergency start since the prelube period is minimal.

When manually starting the diesel generators for any reason, to minimize the potential fire hazard and to improve equipment availability, the prelube period should be limited to a maximum of three to five minutes unless otherwise recommended by the diesel engine manufacturer. Confirm your compliance with this requirement or provide your justification for requiring a longer prelube time interval prior to manual starting of the diesel generators. Provide the prelube time interval your diesel engine will be exposed to prior to manual start.

CS 430.70 (9.14.4) A three-way, air operated, temperature control valve in the lube oil discharge circuit is shown on Figure 9.14-4. Provide more detail on this valve and how it operates. Describe the control air system and how it is used to regulate lube oil temperature. Indicate the source of the control air, and show how the pressure is regulated, the consequences of a malfunction resulting in either too high or too low pressure, any provisions for manual override, all alarms and indications, and any other pertinent data, to the extent practical.

CS 430.71 (9.14.4) Describe the instrumentation, controls, sensors and alarms provided for monitoring the emergency diesel engine lubricating oil system, and describe their function. Describe the testing necessary to maintain a highly reliable instrumentation, control, sensors and alarm system and where the alarms are annunciated. Identify the temperature, pressure and level sensors which alert the operator when these parameters exceed the ranges recommended by the engine manufacturer and describe any operator actions required during alarm conditions to prevent harmful effects to the diesel engine. Discuss system interlocks provided. Coordinate the text material with the instrumentation and controls shown on Figure 9.14-4, to the extent practical.

CS 430.72 (9.14.4) A lube oil storage tank in the diesel generator room is shown on Figures 1.2-77 and 9.14-4. Explain the purpose of this tank, and state whether the stored lube oil will be used to replenish the emergency diesel engine sump during normal operation and prolonged emergency (seven days) operation. If this is the case, then the storage tank and interconnecting piping must meet Seismic Category 1 and ASME Section III Class 3 requirements. Revise your PSAR accordingly.

CS 430.73 (9.14.4) What measures have been taken to prevent entry of deliterious materials into the engine lubrication oil system due to operator error during recharging of lubricating oil or normal operation? What provisions have been made to prevent corrosion of the storage tank interior surfaces with resulting contamination of the stored lube oil?

CS 430.74 (9.14.4) For the diesel engine lubrication system in Section 9.5.7 provide the following information: 1) define the temperature differentials, flow rate, and heat removal rate of the interface cooling system external to the engine and verify that these are in accordance with recommendations of the engine manufacturer; 2) discuss the measures that will be taken to maintain the required quality of the oil, including the inspection and replacement when oil quality is degraded; 3) describe the protective features (such as blowout panels) provided to prevent unacceptable crankcase explosion and to mitigate the consequences of such an event; and 4) describe the capability for detection and control of system leakage, to the extent practi cal.

CS 430.75 (9.14.5) Provide a description of the emergency diesel engine combustion air intake and exhaust system complete with text material and P&IDs. This description should conform to RG 1.70 and SRP 9.5.8 (NUREG-0800). Revise your PSAR accordingly.

CS 430.76 (9.14.5) Describe the instrumentation, controls, sensors and alarms provided in the design of the diesel engine combustion air intake and exhaust system which alert the operator when parameters exceed ranges recommended by the engine manufacturer and describe any operator action required during alarm conditions to prevent harmful effects to the diesel engine. Discuss systems interlocks provided, to the extent practical.

CS 430.77 (9.14.5) Provide the results of an analysis that demonstrates that the function of your diesel engine air intake and exhaust system design will not be degraded to an extent which prevents developing full engine rated power or cause engine shutdown as a consequence of any meteorological or accident condition. Include in your discussion the potential and effect of fire extinguishing (gaseous) medium, recirculation of diesel combustion products, or other gases that may intentionally or accidentally be released on site, on the performance of the diesel generator, to the extent practical.

CS 430.78 (9.14.5) Discuss the provisions made in your design of the diesel engine combustion air intake and exhaust system to prevent possible clogging, during standby and in operation, from abnormal climatic conditions (heavy rain, freezing rain, dust storms, ice and snow) that could prevent operation of the diesel generator on demand.

CS 430.79 (9.14.5) Show that a potential fire in the diesel generator building together with a single failure of the fire protection system will not degrade the quality of the diesel combustion air so that the remaining diesel will be able to provide full rated power.

CS 430.80 (9.14.5) Experience at some operating plants has shown that diesel engines have failed to start due to accumulation of dust and other deliterious material on electrical equipment associated with starting of the diesel generators (e.g., auxiliary relay contacts, control switches - etc.). Describe the provisions that have been made in your diesel generator building design, electrical starting system, and combustion air and ventilation air intake design(s) to preclude this condition to assure availability of the diesel generator on demand.

Also describe under normal plant operation what procedure(s) will be used to minimize accumulation of dust in the diesel generator room; specifically address concrete dust control,to the extent practical.

CS 430.81 (10.2) Expand your discussion of the turbine speed control and overspeed protection system. Provide additional explanation of the generator electrical load following capability for the turbine speed control system with the aid of system schematics (including turbine control and extraction steam valves to the heaters). Tabulate the individual speed control protection devices (normal, emergency and backup), the design speed (or range of speed) at which each device begins operation to perform its protective function (in terms of percent of normal turbine operating speed). In order to evaluate the adequacy of the control and overspeed protection system, provide schematics and include identifying numbers to valves and mechanisms (mechanical and electrical) on the schematics. Describe in detail, with reference to the identifying numbers, the sequence of events in a turbine trip including response times, and show that the turbine stabilizes. Provide the results of a failure mode and effects analysis for the overspeed protection system. Show that a single steam valve failure cannot disable the turbine overspeed trip from functioning. (SRP 10.2, Part III, items 1, 2, 3 and 4)

CS 430.82 (10.2) The turbine speed control and overspeed protection system does not incorporate stop and intercept valves between the high pressure and low pressure elements of the main turbine. Provide a discussion why such valves are not required, and show that the turbine stabilizes following a trip without the aid of stop and intercept valves. Revise your PSAR accordingly.

CS 430.83 (10.2) In the turbine generator section discuss: 1) the valve closure times and the arrangement for the main steam stop and control valves in relation to the effect of a failure of a single valve on the overspeed control fucntions; 2) the valve closure times and extraction steam valve arrangements in relation to stable turbine operation after a turbine generator system trip; 3) effects of missiles from a possible turbine generator failure on safety related systems or components. (SRP 10.2, Part III, items 3, 4)

CS 430.84 (10.2) Expand your PSAR to include a discussion of the steam extraction valves design and operation. Provide the closure times for the extraction steam valves installed in the extraction steam lines to the feedwater heaters. Show that stable turbine operation will result after a turbine trip. (SRP 10.2, Part II, item 4)

CS 430.85 (10.2) Provide a discussion of the inservice inspection program for throttle-stop and control steam valves and the capability for testing essential components during turbine generator system operation. (SRP 10.2, Part III, items 5 and 6)

CS 430.86 (10.2) Discuss the effects of a high and moderate energy piping failure or failure of the connection from the low pressure turbine to condenser on nearby safety related equipment or systems. Discuss what protection will be provided the turbine overspeed control system equipment, electrical wiring and hydraulic lines from the effects of a high or moderate energy pipe failure so that the turbine overspeed protection system will not be damaged to preclude its safety function. (SRP 10.2, Part III, item 8).

CS 430.87 (10.2) In the PSAR, you do not discuss the inservice inspection, testing and exercising of the extraction steam valves. Provide a detail description of: 1) the extraction steam valves, and 2) your inservice inspection and testing program for these valves. Also provide the time interval between periodic valve exercising to assure the extraction steam valves will close on turbine trip.

CS 430.88 (10.2) Provide P&IDs for the generator hydrogen control and bulk storage system. Identify all components in the system, and revise the PSAR text to include a description of the components and their function in the systems. Show the bulk hydrogen storage system in relation to other buildings on the site.

CS 430.89 (10.3) As explained in issue No. 1 of NUREG-0138, credit is taken for all valves downstream of the Main Steam Isolation Valve (MSIV) to limit blowdown of a second steam generator in the event of a steam line break upstream of the MSIV. In order to confirm satisfactory performance following such a steam line break provide a tabulation and descriptive text (as appropriate) in the PSAR of all flow paths that branch off the main steam lines between the MSIV's and the turbine stop valves. For each flow path originating at the main steam lines, provide the following information:

a) System identification
b) Maximum steam flow in pounds per hour
c) Type of shut-off valve(s)
d) Size of valve(s)
e) Quality of the valve(s)
f) Design code of the valve(s)
g) Closure time of the valve(s)
h) Actuation mechanism of the valve(s) (i.e., Solenoid operated, motor operated, air operated diagram valve, etc.)
i) Motive or power source for the valve actuating mechanism

In the event of the postulated accident, termination of steam flow from all systems identified above, except those that can be used for mitigation of the accident, is required to being the reactor to a safe cold shutdown. For these systems describe what design features have been incorporated to assure closure of the steam shut-off valve(s). Describe what operator actions (if any) are required.

If the systems that can be used for mitigation of the accident are not available or decision is made to use other means to shut down the reactor describe how these systems are secured to assure positive steam shut-off. Describe what operator actions (if any) are required.

If any of the requested information is presently included in the PSAR text, provide only the references where the information may be found.

CS 430.90 (10.4.1) Provide a tabulation in your PSAR showing the physical characteristics and performance requirements of the main condensers. In your tabulation include such items as: 1) the number of condenser tubes, material and total heat transfer surface, 2) overall dimensions of the condenser, 3) number of pauses, 4) hot well capacity, 5) special design features, 6) minimum heat transfer, 7) normal and maximum steam flows, 8) normal and maximum cooling water temperature, () normal and maximum exhaust steam temperature with no turbine by-pass flow and with maximum exhaust steam temperature with no turbine by-pass flow and with maximum turbine by-pass flow, 10) limiting oxygen content in the condensate in cc per liter, and 11) other pertinent data. (SRP 10.4.1, part III, item 1)

CS 430.91 (10.4.1) Discuss the effect of main condenser degradation (leakage, vacuum, loss) on reactor operation. (SRP 10.4.1, Part III, item 1)

CS 430.92 (10.4.1) Discuss the measures taken: 1) to prevent loss of vacuum, and 2) to prevent corrosion/errosion of condensertubes and components. (SRP 10.4.1, Part III, item 1)

CS 430.93 (10.4.1) Indicate and describe the means of detecting and controlling radioactive leakage into and out of the condenser and the means for processing excessive amounts. (SRP 10.4.1, Part III, item 2)

CS 430.94 (10.4.1) Discuss the measures taken for detecting, controlling and correcting condenser cooling water leakage into the condensate stream. (SRP 10.4.1, Part III, item 2)

CS 430.95 (10.4.1) Provide the permissible cooling water inleakage and time of operation with inleakage to assure that condensate/feedwater quality can be maintained within safe limits. (SRP 10.4.1, Part III, item 2)

CS 430.96 (10.4.1) In sectin 10.4.1.4 you have discussed tests and initial field inspection but not the frequency and extent of inservice inspection of the main condenser. Provide this information in the PSAR. (SRP 10.4.1, Part II).

CS 430.97 (10.4.1) Indicate what design provisions have been made to preclude failures of condenser tubes or components from turbine by-pass blowdown or other high temperature drains into the condenser shell. (SRP 10.4.1, Part III, item 3)

CS 430.98 (10.4.1) Discuss the effect of loss of main condenser vacuum on the operation of the main steam isolation valves (SRP 10.4.1, Part III, item 3)

CS 430.99 (10.4.4) Provides additional description (with the aid of drawings) of the turbine by-pass system (condenser dump valves and atmosphere dump valves) and associated instruments and controls. In your discussion include: 1) the size, principle of operation, construction and set points of the valves, 2) the malfunctions and/or modes of failure considered in the design of the system, and 3) the maximum electric load step change the reactor is designed to accommodate without reactor control rod motion or steam bypassing. (SRP 10.4.4, Part III, items 1 and 2)

CS 430.100 (10.4.4) Provide a P&ID for the turbine by-pass system showing system components and all instrumentation. (SRP 10.4.4, part III, item 1)

CS 430.101 (10.4.4) Provide the maximum electric load step change that the condenser dump system and atmospheric dump system will permit without reactor trip.

CS 430.102 (10.4.4) In section 10.4.4.4 you have discussed tests and initial field inspection but not the frequency and extent of inservice testing and inspection of the turbine by-pass system. Provide this information in the PSAR. (SRP 10.4.4, Part II).

CS 430.103 (10.4.4) Provide the results of an analysis indicating that failure of the turbine by-pass system high energy line will not have an adverse effect or preclude operation of the turbine speed control system or any safety related components or systems located close to the turbine by-pass system. (SRP 10.4.4, Part III, item 4)

CS 430.104 (10.4.4) Provide the results of a failure mode and effects analysis to determine the effect of malfunction of the turbine by-pass system on the operation of the reactor and main turbine generator unit. (SRP 10.4.4., Part III, item 4)

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