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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

AUG 2 9 1980

Docket Nos.: 50-461/462

Mr. L. J. Koch, Vice President
Illinois Power Company
500 South 27th Street
Decatur, Illinois 62325

Dear Mr. Koch:

SUBJECT: ACCEPTANCE REVIEW FOR THE CLINTON POWER STATION, UNITS 1 AND 2

On December 1, 1979, you tendered an application for operating licenses for the Clinton Power Station, Units 1 and 2. Your application included a Final Safety Analysis Report (FSAR), Environmental Report - Operating License Stage (ER), a Physical Security Plan and General Information.

We have completed our review of your tendered application and have concluded that it is sufficiently complete to permit us to initiate our safety review. Accordingly, your filing of the application should include three (3) originals signed under oath or affirmation by a duly authorized officer of your organization. In addition, your filing should include fifteen (15) copies of that portion of the application containing the general information, forty (40) copies of the Final Safety Analysis Report and forty-one (41) copies of the Environmental Report. As required by Section 50.30 of 10 CFR Part 50 and Section 51.40(b) of 10 CFR Part 51, you should retain an additional ten (10) copies of the general information, thirty (30) copies of the Final Safety Analysis Report and one hundred nine (109) copies of the Environmental Report for direct distribution in accordance with Enclosure 1 to this letter and further instructions which might be provided later. Within 10 days after filing, you must provide an affidavit that distribution has been made in accordance with this enclosure. All subsequent amendments to the Final Safety Analysis Report will require sixty (60) copies for distribution.

Our conclusion that the FSAR and ER are sufficiently complete is based on our evaluation of all information filed taken as a whole, with the realization that substantive deficiencies may exist that need to be corrected during the review.

Enclosed for your information and use is a copy of NUREG-0694 entitled "TMI Related Requirements for New Operating Licenses". This report lists the current TMI related requirements which have been approved by the Commission and apply to plants seeking a new operating license. The Clinton FSAR should be amended to satisfy the requirements of NUREG-0694. In addition, you should reference all NRC regulations in 10 CFR Parts 20; 50; 51; and 100 and cite the sections in the FSAR where they are addressed and where compliance is demonstrated, and reference any previous NRC reviews on systems or analyses which are common to the Clinton plant.

You will be advised of key milestones of the review as soon as a schedule is developed. During the course of our preliminary review of your License Application, FSAR and ER, the enclosed "Request for Additional Information" (Enclosure 2) was generated. These requests are of the type which require an early response to facilitate the ensuing detailed technical review. You should provide a schedule for responding to our "Request for Additional Information". We will then prepare our schedule for the review of Clinton.

If during the course of our review, you believe there is a need to appeal a staff position because of disagreement, this need should be brought to the staff's attention as early as possible so that the appropriate meeting can be arranged on a timely basis. A written request is not necessary and all such requests should be initiated through our staff project manager assigned to the review of your application, Bart Buckley. This procedure is an informal one, designed to allow opportunity for applicants to discuss with management, areas of disagreement in the case review.

Sincerely,

Darrell G. Eisenhut

Darrell G. Eisenhut, Director
Division of Licensing
Office of Nuclear Reactor Regulation

Enclosures:
As stated

cc w/o enclosures:
See next page

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ENCLOSURE 2

REQUEST FOR ADDITIONAL INFORMATION

Environmental Report

2.1 Definition (from Executive Order 119988 Floodplain Management)

Floodplain: The lowland and relatively flat areas adjoining inland and costal waters including floodprone areas of offshore islands, including at a minimum that area subject to a one percent or greater chance of flooding in any given year.

Section 2.2 of the Environmental Report should be modified to include the following information.

1. Provide descriptions of the floodplains of all water bodies, including intermittant water courses; within or adjacent to the site. On a suitable scale map provide delineations of those areas that will be flooded during the one-percent chance flood in the absence of plant effects (i.e., pre-construction floodplain).

2. Provide details of the methods used to determine the floodplains in response to 1. above. Include your assumptions of and bases for the pertinent parameters used in the computation of the one-percent flood flow and water elevation. If studies approved by Flood Insurance Administration (FIA), Housing and Urban Development (HUD) or the Corps of Engineers are available for the site or adjoining area, the details of analyses need not be supplied. You can instead provide the reports from which you obtained the floodplain information.

3. Identify, locate on a map, and describe all structures, construction activities and topographic alterations in the floodplains. Indicate the status of each such structure, construction activity and topographic alteration (in terms of start and completion dates) and work presently completed.

4. Discuss the hydrologic effects of all items identified in 3. above. Discuss the potential for altered flood flows and levels, both upstream and downstream. Include the potential effect of debris accumulating on the plant sturctures. Additionally, discuss the effects of debris generated from the site on downstream facilities.

5. Provide the details of your analysis used in response to 4. above. The level of detail is similar to that identified in item 2. above.

6. Identify non-floodplain alternatives for each of the items (structures, construction activities and topographic alterations) identified in 3. above. Alternately, justify why a specific item must be in the floodplain.

7. For each item in 6. above that cannot be justified as having to be in the floodplain either show that all non-floodplain alternatives are not practicable or commit to re-locating the structure, construction activity or topographic alteration out of the floodplain.

Final Safety Analysis Report

3.1 Section 3.4.1.2 of the FSAR states that plant structures are designed to withstand the effects of groundwater conditions at the site. Please clarify whether or not a permanent dewatering system has been installed at the Clinton site.

040.1
(3.10)
(3.11)

In order to ensure that your environmental qualification program conforms with General Design Criteria 1, 2, 4 and 23 of Appendix A and Sections III and XI of Appendix B to 10 CFR Part 50, and to the national standards mentioned in Part II "Acceptance Criteria" (which includes IEEE Std 323 contained in Standard Review Plan Section 3.11, the following information on the qualification program is required for all Class 1E equipment.

1. Identify all Class 1E Equipment, and provide the following:

   a. Type (functional designation)
   b. Manufacturer
   c. Manufacturer's type number and model number
   d. The equipment should include the following, as applicable:

      1) Switchgear
      2) Motor control centers
      3) Valve operators
      4) Motors
      5) Logic equipment
      6) Cable
      7) Diesel generator control equipment
      8) Sensors (pressure, pressure differential, temperature and neutron)
      9) Limit Switches
      10) Heaters
      11) Fans
      12) Control Boards
      13) Instrument racks and panels
      14) Connectors
      15) Electrical penetrations
      16) Splices
      17) Terminal blocks

2. Categorize the equipment identified in (1) above into one of the following categories:

   a. Equipment that will experience the environmental conditions of design basis accidents for which it must function to mitigate said accidents, and that will be qualified to demonstrate operability in the accident environment for the time required for accident mitigation with safety margin to failure.

   b. Equipment that will experience environmental conditions of design basis accidents through which it need not function for mitigation of said accidents, but through which it must not fail in a manner detrimental to plant safety or accident mitigation, and that will be qualified to demonstrate the capability to withstand any accident environment for the time during which it must not fail with safety margin to failure.

   c. Equipment that will experience environmental conditions of design basis accidents through which it need not function for mitigation of said accidents, and whose failure (in any mode) is deemed not detrimental to plant safety or accident mitigation, and need not be qualified for any accident environment, but will be qualified for its non-accident service environment.

   d. Equipment that will not experience environmental conditions of design basis accidents and that will be qualified to demonstrate operability under its normal or abnormal service environment. This equipment would normally be located outside the reactor containment.

3. For each type of equipment in the categories of equipment listed in (2) above provide separately the equipment design specification requirements, including:

   a. The system safety function requirements.

   b. An environmental envelope as a function of time which includes all extreme parameters, both maximum and minimum values, expected to occur during plant shutdown, normal operation, abnormal operation, and any design basis event (including LOCA and MSLB), including post event conditions.

   c. Time required to fulfill its safety function when subjected to any of the extremes of the environmental envelope specified above.

   d. Technical bases should be provided to justify the placement of each type equipment in the categories 2.b and 2.c listed above.

4. Provide the qualification test plan, test set-up, test procedures, and acceptance criteria for at least one of each group of equipment

of (1.d) as appropriate to the category identified in (2) above. If any method other than type testing was used for qualification (operating experience, analysis, combined qualification, or on-going qualification), describe the method in sufficient detail to permit evaluation of its adequacy.

5. For each category of equipment identified in (2) above, state the actual qualification envelope simulated during testing (defining the duration of the hostile environment and the margin in excess of the design requirements). If any method other than type testing was used for qualification, identify the method and define the equivalent "qualification envelope" so derived.

6. A summary of test results that demonstrates the adequacy of the qualification program. If analysis is used for qualification, justification of all analysis assumptions must be provided.

7. Identification of the qualification documents which contain detailed supporting information, including test data, for items 4, 5 and 6.

In addition, in accordance with the requirements of Appendix B of 10 CFR 50, the staff requires a statement verifying: 1) that all Class 1E equipment has been (OL) or will be (CP) qualified to the program described above, and 2) that the detailed qualification information and test results are (or will be) available for an NRC audit.

4.1 There is no description of vulnerability to common mode failures in Section 4.6.4.1 of the FSAR. Please provide sufficient plan and elevation layout drawings to provide the bases for establishing that the reactivity control systems when used in single or multiple redundant modes are not vulnerable to common mode failure or reference in the FSAR where this information may be located.

5.1 Section 5.1 of the FSAR does not adequately address the extent of isolability of any fluid system as provided by the use of isolation valves between the radioactive and nonradioactive sections of the system, isolation valves between the reactor coolant pressure boundary (RCPB) and connected systems, and passive barriers between the RCPB and other systems. Please provide this information in order to continue our review.

5.2 The reactor core isolation system is described in Section 5.4.6 of the FSAR. Describe how this system conforms to the General Design Criteria 34, 55, 56 and 57.

040.2
(8.2)
(RSP)

Recent operating experience has shown that adverse effects on the safety-related power system and safety related equipment and loads can be caused by sustained low or high grid voltage conditions. We therefore require that your design of the safety related electrical system meet the following staff positions. Supplement the description of your design in the FSAR to show how it meets these positions or provide appropriate analyses to justify non-conformance with these positions.

1. In addition to the undervoltage scheme provided to detect loss of offsite power at the safety busses, we require that an additional level of voltage protection for the onsite power system be provided with a time delay and that this additional level of voltage protection shall satisfy the following criteria:

   a) The selection of voltage and time set points shall be determined from an analysis of the voltage requirements of the safety-related loads at all onsite system distribution levels;

   b) The voltage protection shall include coincidence logic on a per bus basis to preclude spurious trips of the offsite power source;

   c) The time delay selected shall be based on the following conditions:

(1) The allowable time delay, including margin, shall not exceed the maximum time delay that is assumed in the FSAR accident analyses;

(2) The time delay shall minimize the effect of short duration disturbances from reducing the availability of the offsite power source(s); and

(3) The allowable time duration of a degraded voltage condition at all distribution system levels shall not result in failure of safety systems or components;

d) The voltage sensors shall automatically initiate the disconnection of offsite power sources whenever the voltage set point and time delay limits have been exceeded;

e) The voltage sensors shall be designed to satisfy the applicable requirements of IEEE Std. 279-1971, "Criteria for Protection Systems for Nuclear Power Generating Stations"; and

f) The Technical Specifications shall include limiting condition for operation, surveillance requirements, trip set points with minimum and maximum limits, and allowable values for the second-level voltage protection sensors and associated time delay devices.

2. We require that the current system designs automatically prevent load shedding of the emergency buses once the onsite sources are supplying power to all sequenced loads on the emergency buses. The design shall also include the capability of the load shedding feature to be automatically reinstated if the onsite source supply breakers are tripped. The automatic bypass and reinstatement feature shall be verified during the periodic testing identified in Position 3.

In the event an adequate basis can be provided for retaining the load shed feature when loads are energized by the onsite power system, we will require that the setpoint value in the Technical Specifications, which is currently specific as "...equal to or greater than..." be amended to specify a value having maximum and minimum limits. The licensee' bases for the setpoints and limits selected must be documented.

3. We require that the Technical Specifications include a test requirement to demonstrate the full functional operability and independence of the onsite power sources at least once per 18 months during shutdown. The Technical Specifications shall include a requirement for tests: (1) simulating loss of offsite power; (2) simulating loss of offsite power in conjunction with a safety feature actuation signal; and (3) simulating interruption and subsequent reconnection of onsite power sources to their respective buses. Proper operation shall be determined by:

a) Verifying that on loss of offsite power the emergency buses have been de-energized and that the loads have been shed from the emergency buses in accordance with design requirements.

b) Verifying that on loss of offsite power the diesel generators start on the autostart signal, the emergency buses are energized with permanently connected loads, the auto-connected shutdown loads are energized through the load sequencer, and the system operates for five minutes while the generators are loaded with the shutdown loads.

c. Verifying that on a safety features actuation signal (without loss of offsite power) the diesel generators start on the autostart signal and operate on standby for five minutes.

d) Verifying that on loss of offsite power in conjunction with a safety features actuation signal the diesel generators start on the autostart signal, the emergency buses are energized with permanently connected loads, the auto-connected emergency (accident) loads are energized through the load sequencer, and the system operates for five minutes while the generators are loaded with the emergency loads.

e) Verifying that on interruption of the onsite sources the loads are shed from the emergency buses in accordance with design requirements and that subsequent loading of the onsite sources is through the load sequencer.

4. The voltage levels at the safety-related buses should be optimized for the full load and minimum load conditions that are expected throughout the anticipated range of voltage variations of the offsite power source by appropriate adjustment of the voltage tap settings of the intervening transformers. We require that the adequacy of the design in this regard be verified by actual measurement and by correlation of measured values with analysis results. Provide a description of the method for making this verification; before initial reactor power operation, provide the documentation required to establish that this verification has been accomplished.

040.3 (8.3.1) Recent experience with Nuclear Power Plant Class 1E electrical system equipment protective relay applications has established that relay trip setpoint drifts with conventional type relays have resulted in premature trips of redundant safety related system pump motors when the safety system was required to be operative. While the basic need for proper protection for feeders/equipment against permanent faults is recognized, it is the staff's position that total non-availability of redundant safety systems due to spurious trips in protective relays is not acceptable.

Provide a description of your circuit protection criteria for safety systems/equipment to avoid incorrect initial setpoint selection and the above cited protective relay trip setpoint drift problems.

040.4
(8.3.1)

Provide a listing of the following for the containment electrical penetrations by voltage Class: $I^2t$ ratings, maximum predicted fault currents (short circuit and ground fault), identification of maximizing faults, protective equipment setpoints, and expected clearing times.

Provide a description of the physical arrangement utilized in your design to connect the field cables inside containment to the containment penetrations, e.g. connectors, splices, or terminal blocks. Provide supportive documentation that these physical interfaces are qualified to withstand a LOCA or steam line break environment.

040.5
(8.3)

We request that you perform a review of the electrical control circuits for all safety related equipment, so as to assure that disabling of one component does not, through incorporation in other interlocking or sequencing controls, render other components inoperable. All modes of test, operation, and failure should be considered. Describe and state the results of your review.

040.6
(8.3)

It has been noted during past reviews that pressure switches or other devices were incorporated into the final actuation control circuitry for large horsepower safety-related motors which are used to drive pumps. These switches or devices preclude automatic (safety signal) and manual operation of the motor/pump combination unless permissive conditions such as lube oil pressure are satisfied. Accordingly, identify any safety-related motor/pump combinations which are used in the Clinton design that operate as noted

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above. Also, describe the redundancy and diversity which is provided for the pressure switches or permissive devices that are used in this manner.

040.7 (6.3) (8.3) Identify all electrical equipment, both safety and non-safety, that may become submerged as a result of a LOCA. For all such equipment that is not qualified for service in such an environment provide an analysis to determine the following:

1. The safety significance of the failure of this electrical equipment (e.g. spurious actuation or loss of actuation function) as a result of flooding.

2. The effects on Class 1E electrical power sources serving this equipment as a result of such submergence, and

3. Any proposed design changes resulting from this analysis.

040.8 (8.3) Provide the results of a review of your operating, maintenance, and testing procedures to determine the extent of usage of jumpers or other temporary forms of bypassing functions for operating, testing, or maintaining of safety related systems. Identify and justify any cases where the use of the above methods cannot be avoided. Provide the criteria for any use of jumpers for testing.

040.9 (8.3) Diesel generator alarms in the control room: A review of malfunction reports of diesel generators at operating nuclear plants has uncovered that in some cases the information available to the control room operator to indicate the operational status of the diesel generator may be imprecise and could lead to misinterpretation. This can be caused by the sharing of a single annunciator station to alarm conditions that render a diesel generator unable to respond to an automatic emergency start signal and to also alarm abnormal, but not disabling, conditions. Another cause can be the use of wording of an annunciator window that does not specifically say that a diesel generator is inoperable (i.e., unable at the time to respond to an automatic emergency start signal) when in fact it is inoperable for that purpose.

Review and evaluate the alarm and control circuitry for the diesel generators in your design to determine how each condition that renders a diesel generator unable to respond to an automatic emergency start signal is alarmed in the control room. These conditions include not only the trips that lock out the diesel generator start and require manual reset, but also control switch or mode switch positions that block automatic start, loss of control voltage, insufficient starting air pressure or battery voltage, etc. This review should consider all aspects of possible diesel generator operational conditions, for example test conditions and operation from local control stations. One area of particular concern is the unreset condition following a manual stop at the local station which terminates a diesel generator test and prior to resetting the diesel generator controls for enabling subsequent automatic operation.

Provide the details of your evaluation, the results and conclusions, and a tabulation of the following information:

(a) all conditions that render the diesel generator incapable of responding to an automatic emergency start signal for each operating mode as discussed above;

(b) the wording on the annunciator window in the control room that is alarmed for each of the conditions identified in (a);

(c) any other alarm signals not included in (a) above that also cause the same annunciator to alarm;

(d) any condition that renders the diesel generator incapable of responding to an automatic emergency start signal which is not alarmed in the control room; and

(e) any proposed modifications or additional interface requirements resulting from this evaluation.

040.10 (8.2) Describe your design provisions for testing the transfer of power sources to the safety-related distribution system (i.e. from the main generator supply to the preferred power system on loss of the unit). Include in your design description the capability for testing during plant operation (SRP Section 8.2, Part III, item 3).

040.11 (8.1) GDC-17 states that the safety function for each of the offsite systems (assuming the other system is not functioning) shall be to provide sufficient capacity and capability to assure that: (a) specified acceptable fuel design limits and design conditions for the reactor coolant pressure boundary are not exceeded as a result of anticipated operational occurrences and (b) the core is cooled and containment integrity and other vital functions are maintained in the event of the postulated accidents. We require that the adequacy of the transformers (auxiliary and ESF) be verified by the voltage analysis at transient and steady state. This is in order to assure that the transformers are capable of starting and operating the loads with the worst combined condition (the minimum expected grid voltage and the maximum combined loads).

040.12 (8.2) On figure 8.2-1, it appears that the 138 Kv transmission lines do cross under the 345 Kv transmission lines. Confirm that those do or do not cross one another. Provide further information on configuration of the transmission lines to the Clinton Power Station switchyard if the above mentioned 345 Kv line fell on the 138 Kv line.

040.13 (8.3) In the FSAR paragraph 8.3.1.1.2, it is described that generator differential, engine overspeed and loss of exciter are the emergency protective trips for the Division 1 and 2 diesel generators. An acceptable design should provide two or more independent measurements of each of these trip parameters except the engine overspeed and generator differential.

040.14 (8.3) Provide the bases that the HPCS diesel generator has different protective tripping scheme from the Division 1 and 2.

040.15 (8.3) Explain justification that the HPCS diesel generator shall be capable of starting and accelerating to rated speed, within specified time, all loads on the HPCS bus, although voltage and frequency drop will exceed the limits specified in Regulation Guide 1.9.

040.16 (8.3) The chosen voltage setpoint and time delay associated with the undervoltage protection must assure that the safety related equipment is not subjected to a voltage below that recommended by the manufacturer and ANSI C84.1-1973 for a period of time long enough to cause malfunction and/or thermal damage. We require information regarding starting and operating characteristics. and thermal capability of the safety related equipment in terms of the voltage current and time.

040.17 (3.2) Table 3.2-1 is incomplete with regards to the design characteristics for diesel generator systems. The diesel engine cooling water, lubrication, and parts of the combustion air systems are not included in the table. Revise the table accordingly.

040.18 (3.2) The FSAR text and table 3.2-1 states that the diesel engine mounted components and piping for the fuel, cooling water, lubrication and air starting system are designed Seismic Category I Quality Group C. Provide the industry standards that were used in the design, manufacture, and inspection of the engine mounted piping and components.

040.19 (8.3) RSP 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 on 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. Confirm your compliance with this requirement.

040.20 (8.3) 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.

040.21 (8.3) RSP 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 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.

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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 senstive 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 or equipped with vibration mounts.

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

040.23 (9.5.2) The information regarding the onsite communications system (Section 9.5.2) does not adequately cover the system capabilities during transients and accidents. Provide the following information:

(a) Identify all working stations on the plant site where it may 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 maximum sound levels that could exist at each of the above identified working stations for all transients and accident conditions.

(c) Indicate the types of communication systems available at each of the above identified working stations.

(d) Indicate the maximum background noise level that could exist at each working station and yet reliably expect effective communication with the control room using:

1. the page party (public address) communications systems, and
2. any other additional communication system provided that working station.

(e) Describe the performance requirements and tests that the above onsite working stations communication systems will be required to pass in order to be assured that effective communication with the control room or emergency shutdown panel is possible under all conditions.

(f) Identify and describe the power source(s) provided for each of the communications systems.

(g) Discuss the protective measures taken to assure a functionally operable onsite communication system. The discussion should include the considerations given to component failures, loss of power, and the severing of a communication line or trunk as a result of an accident or fire.

040.24 (9.5.3) Identify the vital areas and hazardous areas where emergency lighting is needed for safe shutdown of the reactor and the evacuation of personnel in the event of an accident. Tabulate the lighting system provided in your design to accommodate those areas so

040.25 (9.5.4) Describe the instruments, controls, sensors and alarms provided for monitoring the diesel engine fuel oil storage and transfer system and describe their function. Discuss the testing necessary to maintain and assure a highly reliable instrumentation, controls, sensors and alarm sy. m and where the alarms are annunciated. Identify the temperatur, pressure and level sensors which alert the operator when these parameters are 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 system interlocks provided. (SRP 9.5.4, Part III, item 1).

040.26 (9.5.4) The diesel generator structures are designed to seismic and tornado criteria and are isolated from one another by a reinforced concrete wall barriers. Describe the barriers (including openings) in more detail and its capability to withstand the effects of internally generated missiles resulting from a crankcase explosion, failure of 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. (SRP 9.5.4, Part III, Item 2).

040.27 9.5.4) Describe your design provisions made to protect the fuel oil storage tank fill lines from damage by tornado missiles. (SRP 9.5.4, Part II).

040.28 (9.5.4) Discuss the means for detecting or preventing growth of algae in the diesel fuel storage tank. If it were detected, describe the methods to be provided for cleaning the affected storage tank. (SRP 9.5.4, Part III, Item 4).

040.29 (9.5.4) In section 9.5.4.2 you state that corrosion inhibiting coatings will be used for the diesel fuel oil storage tanks to assure adequate corrosion protection to minimize fuel oil contamination. This statement is too general. Expand the FSAR to include a more explicit description of proposed protection of any underground piping. Where corrosion protective coatings are being considered (piping and tanks) include the industry standards which will be used in their application. Also discuss what provi..ons will be made in the design of the fuel oil storage and transfer system in the use of a impressed current type cathodic protection system, in addition to water proof protective coatings, to minimize corrosion of burried piping or equipment. If cathodic protection is not being considered, provide your justification. (SRP 9.5.4, Part II, and Part III, Item 4).

040.30 (9.5.4) In Section 9.5.4.3 you state that diesel fuel oil is available from local distribution sources or another IP station. Identify the sources where diesel quality fuel oil will be available and the distances required to be travelled from the source(s) to the plant. Also discuss how fuel oil will be delivere. onsite under extremely unfavorable environmental conditions. (SRP 9.5.4, Part III, Item 5b).

040.31 (9.5.4) 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. (SRP 9.5.4, Part III, Item 6).

040.32 (9.5.4) (9.5.5) (9.5.6) (9.5.7) (9.5.8) 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 availablity of the diesel generators when needed. (SRP 9.5.4, Part III, Item 8 SRP 9.5.5, Part III, item 4, SRP 9.5.6, Part III, item 5; SRP 9.5.7, Part III, item 3; SRP 9.5.8, Part III, item 6c).

040.33 (9.5.4) Section 9.5.4.1 emergency diesel engine fuel oil storage and transfer system (EDEFSS) does not specifically reference ANSI Standard N195 "Fuel Oil Systems for Standby Diesel Generators". Indicate if you intend to comply with this standard in your design of the EDEFSS; otherwise provide justification for non-compliance. (SRP 9.5.4, Rev. 1, Part II, item 12).

040.34 (9.5.4) 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. (SRP 9.5.4, Part III, items 3 and 4).

040.35 (9.5.4) Discuss the design considerations that have determined the physical location of the diesel engine fuel oil day tanks at your facility. Assure that the selected physical location of the fuel oil day tanks meet the requirements of the diesel engine manufacturer. (SRP 9.5.4, Part III, item 5(c).)

040.36 (9.5.4) 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 has been 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.

040.37 (9.5.4) You state in section 9.5.4.3 that the diesel generator fuel oil storage tank is provided with an individual fill and vent line. Indicate where these lines are located outdoors and the height these lines are terminated above finished ground grade. Discuss the provisions made in your design to prevent entrance of water into the storage tank during adverse environmental conditions, such as flooding.

040.38 (9.5.4) Provide the source of power for the motor driven fuel oil transfer pump and diesel engine motor driven fuel oil booster pump and the motor characteristics, i.e., motor hp., operating voltage, phase(s) and frequency. Also include pump capacity and discharge head. Revise the FSAR accordingly.

040.39 (9.5.4) RSP You state in FSAR section 9.5.4.3 that the vent lines for the diesel oil storage and day tanks are physically separated so that a single accident could not possible plug more than one vent line. The NRC's Accident Analysis Branch assumes that separation is not a criteria for tornado missile protection, since one tornado missile could damage more than one vent.

We require the vent line from each diesel tank be designed to seismic Category 1, Class C requirements. Also the portion of the vent line and flame arrestor exposed above the diesel generator building roof should be protected from damage by tornado missiles. Revise your system design accordingly.

040.40 (9.5.5) Section 9.5.5 indicates that the function of the diesel generator cooling water system is to dissipate the heat transferred through the: 1) engine water jacket, 2) lube oil cooler; and 3) engine air water coolers. Provide information on the individual component heat removal rates (but/hr), flow (lbs/hr) and temperature differential (°F) and the total heat removal rate required. Also provide the design margin (excess heat removal capacity) included in the design of major components and subsystems . (SRP 9.5.5, Part III, Item 1).

040.41 (9.5.5) Provide the results of a failure mode and effects analysis to show that failure of a piping connection between subsystems (engine water jacket, lube oil cooler, and engine air inter-cooler) does not cause total degradation of the diesel generator cooling water system. (SRP 9.5.5, Part III, Item 1a).

040.42 (9.5.5) **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 compatability 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 manufacturers recommendations. (SRP 9.5.5, Part III, Item 1c.)**

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040.43 (9.5.5) 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. (SRP 9.5.6, Part III, item 1c).

040.44 (9.5.5) 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. (SRP 9.5.5, Part III, Item 2).

040.45 (9.5.5) The diesel generators are required to start automatically on loss of all offsite power and in the event of a LOCA. 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 LOCA 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 FSAR to include and explicitly define the capability of your design with regard to this requirement. (SRP 9.5.5, Part III, Item 7).

040.46 (9.5.5) You state in section 9.5.5.2 each diesel engine cooling water system is provided with an expansion tank to provide for system expansion and for venting air from the system. In addition to the items mentioned, the expansion tank is to provide for minor system leaks at pump shafts seals, valve stems and other components, and to maintain required NPSH on the system circulating pump. 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 make up water for seven days continuous operation of the diesel engine at full rated load without makeup, or provide a seismic Category I, safety class 3 make up water supply to the expansion tank.

040.47 (9.5.5) Provide the source of power for the electric jacket water heater. Provide electric heater characteristics, i.e., operating voltage, phase(s), frequency and kw output as applicable. Also provide sufficient information to justify that the thermo-syphon action of the engine cooling water will keep the lube oil as well as the engine block warm to enhance engine starting. Otherwise, provide a motor driven jacket water keep warm pump. Revise the FSAR accordingly.

040.48 (9.5.5) You state in section 9.5.5.2 that "ethylene glycol antifreeze will be added only as required in severe weather conditions." Provide additional details on quantity of antifreeze to be added to the coolant system, weather conditions that would require addition of antifreeze, and the procedures used to assure that antifreeze would be added when required.

040.49 (9.5.6) Provide a discussion of the measures that have been taken in the design of the standby diesel generator air starting system to preclude the fouling of the air start valve or filter with moisture and contaminants such as oil carryover and rust. (SRP 9.5.6, Part III, item 1).

040.50 (9.5.6) 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. Revise your FSAR accordingly. (SRP 9.5.6, Part III, item 1).

040.51 (9.5.6) Your description of the diesel engine starting system in FSAR section 9.5.6.2 does not conform to what is shown on figure 9.5.4. The text states that the both air receivers are charged by a common air compressor while the figure shows individual compressors. Revise your FSAR accordingly.

040.52 (9.5.6) RSP A study by the University of Dayton has shown that accumulation of water in the starting air system has been one of the most frequent causes of diesel engine failure to start on demand. Condensation of entrained moisture in compressed air lines leading to control and starting air valves, air start motors, and condensation of moisture on the working surfaces of these components has caused rust, scale and water itself to build up and score and jam the internal working parts of these vital components thereby preventing starting of the diesel generators

In the event of loss of offsite power the diesel generators must function since they are vital to the safe shutdown of the reactor(s). Failure of the diesel engines to start from the effects of moisture condensation in air starting systems and from other causes have lowered their operational reliability to substantially less than the desired reliability of 0.99 as specified in Branch Technical Position ICSB (PSB) 2 "Diesel Generator Reliability Testing" and Regulatory Guide 1.108 "Periodic Testing of Diesel Generator Units Used as Onsite Electric Power Systems at Nuclear Power Plants."

In an effort toward improving diesel engine starting reliability we require that compressed air starting system designs include air dryers for the removal of entrained moisture. The two air dryers most commonly used are the dessicant and refrigerant types. Of these two types, the refrigerant type is the one most suited for this application and therefore is preferred. Starting air should be dried to a dew point of not more than 50°F when installed in a normally controlled 70°F environment, otherwise the starting air dew point should be controlled to at least 10°F less than the lowest expected ambient temperature.

Revise your design of the diesel engine air starting system accordingly, describe this feature of your design.

040.53 (9.5.6) Provide the source of power for the diesel engine air starting system compressors and motor characteristics, i.e., motor hp, operating voltage, phase(s), and frequency. Revise your FSAR accordingly.

040.54 (9.5.7) 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. (SRP 9.5.7, Part II, Items 8a, 8b, 8c, Part III, Item 1.)

040.55 (9.5.7) 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. (SRP 9.5.7, Part III, Item 1c).

040.56 (9.5.7) Describe the instrumentation, controls, sensors and alarms provided for monitoring the diesel engine lubrication 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 action required during alarm conditions to prevent harmful effects to the diesel engine. Discuss systems interlocks provided. Revise your FSAR accordingly. (SRP 9.5.7, Part III, item 1e).

040.57 (9.5.7) Expand your description of the diesel engine lube oil system. The FSAR text should include a detail system description of what is shown on figures 9.5.5 and 9.5.7. The FSAR test 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 a emergency start. Revise your FSAR accordingly.

040.58 (9.5.7) Provide the source of power for the diesel engine motor driven oil pumps, and motor characteristics, i.e., motor hp, operating voltage, phase(s) and frequency. Also provide the pump capacity and discharge head. Revise your FSAR accordingly.

040.59 (9.5.7) RSP 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 perior to manual starting of the diesel generators. Provide the prelube time interval your diesel engine will be exposed to prior to manual start.

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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 enough. 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 intregal 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.

040.61 (9.5.8) 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. Revise your FSAR accordingly. (SRP 9.5.8, Part III, item 1 & 4).

040.62 (9.5.8) 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. (SRP 9.5.8, Part III, item 3).

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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. (SRP 9.5.8, Part III, item 5).

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Show by analysis 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.

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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. In your response also consider the condition when Unit 1 is in operation and Unit 2 is under construction (abnormal generation of dust).

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040.66 (9.5.8) The diesel engine exhaust silencers and associated piping are located on the roof of the diesel generator building, and are exposed to tornado missiles. A tornado missile could damage all the diesel engine exhaust piping so that the exhaust systems for all engines become restricted or blocked. ~~This is an unacceptable situation~~. In addition Table 3.2-1 shows this portion of the system as non-seismic. If such failure modes could cause a loss to diesels, a seismic Category I, tornado missile protected diesel engine exhaust system should be provided.

040.67 (10.1) Provide a general discussion of the criteria and bases of the various steam and condensate instrumentation systems in section 10.1 of the FSAR. The FSAR should differentiate between normal operation instrumentation and required safety instrumentation.

040.68 (10.2) Expand your discussion of the turbine speed control and overspeed protection system. Provide additional explanation of the turbine and 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 references 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 systems. 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).

040.69 (10.2) The FSAR discusses the main steam stop and control, and reheat stop and intercept valves. Show that a single failure of any of the above valves cannot disable the turbine overspeed trip functions. (SRP 10.2, Part III, Item 3).

040.70 (10.2) In the turbine generator section discuss: 1) the valve closure times and the arrangement for the main steam stop and control and the reheat stop and intercept valves in relation to the effect of a failure of a single valve on the overspeed control functions; 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.)

040.71 (10.2) Provide the closure times for the quick acting extraction steam and air operated stop valves installed in the extraction steam lines to the first, second, third, fourth, fifth. and sixth feedwater heaters. Show that stable turbine operation will result after a turbine trip. (SRP 10.2, Part III, Item 4).

040.72 (10.2) Provide a discussion of the inservice inspection program for throttle-stop, control, reheat stop and interceptor steam valves and the capability for testing essential components during turbine generator system operation. (SRP 10.2, Part III, items 5 and 6).

040.73 (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).

040.74 (10.2) In section 10.2.3.6 you discuss briefly in-service inspection and exercising of the main steam turbine stop and control and reheater stop and intercept valves. You do not discuss the in-service 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 all the above valves. Also provide the time interval between periodic valve exercising to assure the extraction steam valves will close on turbine trip.

040.75 (10.2) Provide a complete list of turbine generator protective trips. Separate these trips into two categories, 1) those that will trip the turbine due to mechanical faults, and 2) those that will trip the turbine due to generator electric faults.

040.76 (10.2) Describe with the aid of drawings, the bulk hydrogen storage facility including its location and distribution system. Include the protective measures considered in the design to prevent fires and explosions during operations such as filling and purging the generator, as well as during normal operations.

040.77 (10.4.1) Provide a tabulation in your FSAR 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, 9) normal and 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).

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

040.78 (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).

040.79 (10.4.1) Discuss the possible mechanisms for hydrogen production in the exhaust steam side of the condenser and provide expected production rate of hydrogen in SCFM. Discuss how you prevent hydrogen buildup in the main condenser (SRP 10.4.1, Part III, item 1).

040.80 (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).

040.81 (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).

040.82 (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).

040.83 (10.4.1) In section 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 FSAR. (SRP 10.4.1, Part II).

040.84 (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).

040.85 (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).

040.86 (10.4.4) Provide 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 accomodate without reactor control rod motion or steam bypassing. (SRP 10.4.4, Part III, items 1 and 2).

040.87 (10.4.4) Provide the maximum electric load step change that the condenser dump system and atmospheric dump system will permit without reactor trip.

040.88 (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)

040.89 (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 FSAR. (SRP 10.4.4, Part II).

040.90 (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).

040.91 (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).

13.1 Appendix 13.B, which describes the Emergency Plan for the Clinton Power Station, should be updated to comply with the recently amended rule on emergency planning published in the Federal Register on August 19, 1980 (45 F.R.55402) and NUREG-0654 - FEMA - REP -1.