



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

YERA

Docket No. 50-364

JUL 31 1980

Mr. F. L. Clayton, Jr., Senior Vice
President
Alabama Power Company
Post Office Box 2641
Birmingham, Alabama 35291

Dear Mr. Clayton:

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION FOR FARLEY 2 OPERATING LICENSE
APPLICATION

As a result of our continuing review of the operating license application for the Joseph M. Farley Nuclear Plant Unit 2, we have developed the enclosed request for additional information.

Please provide the information requested in the enclosure. Our review schedule is based on the assumption that the additional information requested by the Materials Engineering Branch will be available for our review by August 15, 1980 and that the additional information requested by the Power Systems Branch will be available by March 15, 1981. If you cannot meet these dates, please inform us within 7 days after receipt of this letter so that we may revise our scheduling.

Sincerely,

A handwritten signature in cursive script, appearing to read "R. Tedesco".

Robert L. Tedesco, Assistant Director
for Licensing
Division of Licensing

Enclosure:
Request for Additional
Information

cc w/enclosure:
See next page

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cc: Mr. Alan R. Barton
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ENCLOSURE

REQUEST FOR ADDITIONAL INFORMATION
JOSEPH M. FARLEY NUCLEAR PLANT UNIT 2
DOCKET NO. 50-364

Requests from the following branch in NRC are included in this enclosure. Requests and pages are numbered sequentially with respect to requests transmitted following issuance of SER Supplement No. 3.

<u>BRANCH</u>	<u>PAGE NO.</u>
Materials Engineering Branch	121-8
Power Systems Branch	040-1 through 040-12

121.0

MATERIALS ENGINEERING BRANCH - INSERVICE INSPECTION SECTION

121.4

We will require that the periodic inservice examination of steam generator tubes be included in your inservice inspection program. Your inservice inspection program should be in accordance with Regulatory Guide 1.83 (Revision 1, 1975) and NUREG-0452, Revision 2, "Standard Technical Specifications for Westinghouse Pressurized Water Reactors." Discuss your intent to comply with Regulatory Guide 1.83 and NUREG-0452 and provide detailed bases for all exceptions.

In addition, Appendix 3A should indicate your compliance with Regulatory Guide 1.83.

040.0

POWER SYSTEMS BRANCH040.1
(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).

040.2
(9.5.8)

Experience at some operating plants has shown that diesel engines have failed to start due to accumulation of dust and other deleterious 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 responses also consider the condition when Unit 1 is in operation and Unit 2 is under construction (abnormal generation of dust).

040.3
(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 PSAR/FSAR to include and explicitly define the capability of your design with regard to this requirement. (SRP 9.5.5, Part III, Item 7).

040.4
(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).

040.5
(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 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.

040.6
(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 deleterious 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).

040.7
(9.5.6)
RSP

A study of 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 desiccant 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.

040.8
(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.

040.9
(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.

040.10
(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 prior to manual starting of the diesel generators. Provide the prelube time interval your diesel engine will be exposed to prior to manual start.

040.11
(9.5.7)
RSP

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 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.

040.12
(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 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.

040.13
(8.3)
RSP

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

040-12

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.

040.14
(8.3)

Provide the design characteristics for the diesel engine (engine horsepower, number of cylinders, manufacturer, model number) and any other pertinent information.