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VICE PRESIDENT
SUPPLY

March 20, 1984

U. S. Nuclear Regulatory Commission
Office of Nuclear Reactor Regulation
Washington, D. C. 20555

ATTENTION: Mr. Darrell G. Eisenhut, Director
Division of Licensing

SUBJECT: Calvert Cliffs Nuclear Power Plant
Unit Nos. 1 & 2, Docket Nos. 50-317 & 50-318
Generic Letter 83-41; Fast Cold Starts of Diesel Generators

Gentlemen:

We are providing the following in response to your request for voluntary participation regarding questions raised in Generic Letter 83-41. Enclosure (1) is a tabular listing of the type of diesel generator starts and the frequency of starting cycles based on surveillance testing, corrective maintenance activities, operability testing associated with entry into Technical Specification action statements, and actual demands for the one year period requested in the Generic Letter. Two tables are provided on Enclosure (1). Table A has been segregated in a manner that reflects the specific concerns of Generic Letter 83-41, (i.e. Fast Cold Starts of Diesel Generators). Table B integrates all classes of diesel generator starts including those referenced in the Generic Letter. This has been done to support our assessment of the effects of frequent starts on the diesel generators.

We have separated the various types of diesel generator starting cycles into four classes and have provided a definition for each class. The type of requirement that is satisfied by each diesel generator start is also indicated. Clarifying comments regarding the classification scheme used in Enclosure (1) are provided below.

CLASS A (Prelubed with Manual Loading)

This classification includes testing associated with surveillance and post-maintenance requirements. Surveillance testing under Class A is performed to meet the requirements for monthly and refueling cycle operability testing for the Engineered Safety Features Actuation System (ESFAS) and AC Electrical Power Distribution System. Additionally, testing under this classification is performed to meet the operability requirements specified in action statements associated with AC Electrical Power sources. Operability testing for post-maintenance activities is also grouped under Class A.

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All testing associated with surveillance and post-maintenance requirements for the diesel generators is normally performed in such a manner as to minimize the wear on diesel components during starting cycles. (The only exception to this operating philosophy is explained under Class C.) This is accomplished by prelubricating the diesel manually prior to any controlled starting sequence. Following start-up of the diesel, the generator is manually loaded by an Operator from the Control Room thereby minimizing unnecessary fast loading transients, characteristic of (automatic sequencing) actual demand starts.

CLASS B (Prelubed with Sequenced Loading)

Diesel generator starts associated with this classification are performed during shutdown /refueling conditions to satisfy surveillance requirements for the ESFAS. The purpose of this class of testing is to verify the proper integrated response of the ESFAS and operability of the diesel generator load sequencer. The diesel generator is prelubed prior to start-up; however, loading of the generator is performed automatically by the load sequencer.

CLASS C (Non prelubed with Sequenced Loading)

Class C starts are performed on a refueling cycle frequency to satisfy the surveillance requirements associated with AC Electrical Power Sources. The purpose of Class C starts is to verify operability of the diesel generator to start within an assumed time interval, automatically load, and supply emergency loads from an ambient condition. The diesel **is not** prelubricated prior to start-up and the generator is automatically loaded by the load sequencer to meet the intent of ambient starting conditions.

CLASS D (Actual Demands)

Class D starts involve unscheduled demands on the diesel generators, (i.e., starts from ambient conditions without prelubrication). However, automatic closure of the diesel generator output breaker onto a 4KV safety bus is contingent upon the existence of an undervoltage condition on the selected bus the diesel generator is aligned to supply.

Class D starts have been subdivided into two categories on Enclosure (1). The two cases reflect where a diesel generator may either start without automatically closing in on a bus or start, and close in on the bus, and have loads automatically sequenced onto the bus.

For all classes of diesel generator starts the jacket cooling water and lubricating oil systems are continuously maintained in a prewarmed state by auxiliary heaters.

The Generic Letter requested our assessment of the effects of frequent fast cold starts on diesel generator reliability and availability. Based on maintenance experience at our facility, we feel that the following observations support our opinion that frequent fast cold starts and controlled starts of the diesel generators have the potential to cause excessive wear on rotating elements and thereby degrade safety.

Past inspections of #12 diesel generator (our most frequently operated machine) have produced two notable deficiencies. Both deficiencies involve out-of-specification clearances on machined rotating parts associated with the upper and lower crankshaft (lead angle clearance) and impeller lobe clearances on the scavenging air blower. The clearances associated with the lobes of the blower are directly related to the crankshaft lead angle since the driver for each lobe is directly coupled to the output of each crankshaft. Both of these deficiencies have been determined to be a result of dimensional deformation of the shaft keys in the lobe drive shafts and the vertical drive assembly shaft which transmits the torsional load of both the upper and lower crankshafts. Dimensional deformation of the shaft keys is caused primarily by the forces applied on the diesel generator due to the instantaneous engine slowdown resulting when sudden load is applied.

The principal contributors to sudden load applications include: 1) the sudden application of sequential electrical loads similar to those produced by the Loss of Coolant Accident (LOCA) Sequencer during actual demand or simulated demand starts, and 2) paralleling operations during surveillance testing to demonstrate operability of the diesel generator. Of these two operational events, paralleling operations have the greatest potential for producing severe load conditions.

In response to the above concerns, we have modified our inspection procedures to incorporate measurements of the critical clearances for trending and preventive maintenance purposes. The General Supervisor-Operations has also been alerted to the need to minimize the frequency differential between the diesel generator and the oncoming bus frequency during manual paralleling operations. These measures are benefical in monitoring and potentially minimizing the deficiencies noted. However, we feel that modifying action statements associated with the Limiting Conditions for Operation could be effective in reducing the exposure of these critical parts to such wear.

Generic Letter 83-28, Required Actions Based on Generic Implications of Salem ATWS Events, section 3.2.3, requires appropriate reviews of any post-maintenance test requirements in existing Techincal Specifications which are preceived to degrade rather than enhance safety. This requirement, although expressed in a more specific area involving post-maintenance activities, is reemphasized as a more generic concern (for all phases of operation) in NUREG-1024, Technical Specifications Enhancing the Safety Impact, section 3.1 (Test Frequencies) and 3.2 (Action Statements).

Calvert Cliffs Technical Specification 3/4.8.1, AC Sources, has an associated action statement (item d.) which requires among other actions, reverification of back-up diesel generator operability every eight hours following entry into the action statement as a result of one inoperable diesel generator. Entry into this action statement is limited to no greater than 72 hours. NUREG-1024, section 3.2, Action Statements, concludes: ". . .The action statements of some Technical Specifications seem to be structured more as a punitive measure against utilities that have safety equipment out of service rather than as a function of the significance of the equipment outage from the standpoint of risk to the public." In our opinion, the provisions of this action statement impose measures that (when evaluated in light of the potential for degrading safety) appear to be more punitive than those action statements designed to optimize overall risk by specifying appropriate testing frequencies.

In our review of the information provided in Enclosure (1) we observed that a minimum of approximately 9% (averaged among 3 diesel generators) of the total number of starts experienced by the diesel generators in the one year period are as a result of operability testing associated with Technical Specification action statement 3.8.1.1.d. We feel that the potential for degraded conditions can be minimized by modifying the actions required by the Technical Specification. Correspondingly, we have proposed to include this item for action in our response to Generic Letter 83-28, section 3.2.3.

A review of the diesel generator starts listed under Class A of Enclosure (1) indicates a relatively large number of starts due to surveillance testing. Although we plan to request (in our response to Generic Letter 83-28) that the NRC review the action statements associated with applicable Technical Specifications for the purpose of evaluating the impact of excessive starts on safety ,we would discourage any conclusions that would result in defining an upper limit (e.g., no greater than one start per month for surveillance testing) on the number of surveillance tests performed on a monthly basis.

Based on our operating experience and recommendations by the diesel generator manufacturer we feel that as a minimum, biweekly or weekly test intervals to demonstrate operability are appropriate for the following reasons.

1. Proper lubrication of moving parts is a critical factor in extending diesel generator life. Prelubrication of the diesel generator prior to starting is effective in minimizing wear on major components. However, many critical components of the engine are only lubricated during operation. As an example, cylinder walls do not receive the benefit of prelubrication but during operation an oil film is deposited on the walls of each cylinder. If allowed to stand static for a long period of time (i.e., monthly), this oil film will eventually disperse and conditions develop where corrosion becomes an important factor in decreasing the life of the machine. Similar circumstances are prevalent throughout the engine; the governor assembly is another prime example.

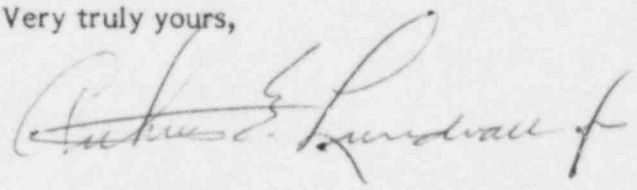
2. Engine cooling water leakage across the tube sheet of the lube oil cooler represents another critical area of concern. Monthly surveillance is normally performed by oil sample analysis and is effective in detecting small leaks across the heat exchanger. However, weekly operational tests provide a more reliable means of detecting the effects of major leakage which may otherwise go undetected during the monthly interval.

3. Familiarity with diesel generator operations is also enhanced when Operators are exposed to more frequent runs of the equipment.

4. Of a secondary benefit, trend analysis of diesel generator operating parameters is more meaningful when reviewed on a frequent basis.

We appreciate the opportunity of providing the requested information. Should you have further questions regarding this reply, we will be pleased to discuss them with you.

Very truly yours,



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ENCLOSURE (1)

REPLY TO GENERIC LETTER 83-41

TABLE A

NONLUBRICATED FAST COLD STARTS
(Period - December 1, 1982 to December 1, 1983)

CLASS C	#11 DG	#12 DG	#21 DG
Number of Starts (Surveillance)	1	2	1
CLASS D			
Number of Starts (Actual Demands with Auto Sequencing)	4	5	0

TABLE B

ALL CLASSES OF DIESEL GENERATOR STARTS
(Period - December 1, 1982 to December 1, 1983)

CLASS A			
Number of Starts:			
-Surveillance Testing	90	135	86
-Post-Maintenance Testing	5	10	8
-Tech Spec Action Statement Testing	49	49	52
CLASS B			
Number of Starts - Surveillance Testing	4	8	4
CLASS C			
Number of Starts - Surveillance Testing	1	2	1
CLASS D			
Number of Starts:			
-Without automatic load sequencing	0	3	4
-With automatic load sequencing	4	5	0