March 15, 1985

Docket Nos. 50-315
and 50-316

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Mr. John Dolan, Vice President
Indiana and Michigan Electric Company
c/o American Electric Power Service Corporation
1 Riverside Plaza
Columbus, Ohio 43216

Dear Mr. Dolan:

In our review of the Indiana and Michigan Electric Company December 15, 1983 (AEC:NRC:0585D) submittal on testing of the pressurizer safety and relief valves, we have identified additional information we will need to complete the review. The information we need is identified in the enclosure. It is requested that IMEC respond by May 1, 1985 or provide a response schedule in the near future.

Sincerely,

/s/SAVarga

Steven A. Varga, Chief
Operating Reactors Branch #1
Division of Licensing

Enclosure:
As stated

cc w/enclosure:
See next page

ORB#1:DL
CParrish
03/14/85

ORB#1:DL
DWigginton/ts
03/14/85

BC-ORB#1:DL
SVarga
03/15/85

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REQUEST FOR ADDITIONAL INFORMATION

TMI ACTION NUREG-0737 (II.D.1)

FOR

D. C. COOK

UNITS 1 AND 2

DOCKET NO.: 50-315 AND 50-316

MARCH 1985

Questions related to the selection of transients and valve inlet conditions:

1. Results from the EPRI tests on the Crosby 6M6 safety valve indicated that the test blowdowns exceeded the 5% value given in the valve specifications. If the plant-specific expected blowdowns also exceed 5%, the pressure might be sufficiently decreased such that adequate core cooling might not be achieved for decay heat removal. Expected blowdowns for Cook 1 and 2 at their current ring settings were not provided. Discuss the consequences of potentially higher blowdowns. Discuss the adequacy of decay heat core cooling at the expected reduced pressures.

2. The Westinghouse Inlet Fluid Conditions Report states that the conditions resulting from cold overpressure transients were presented for only those plants for which Westinghouse performed the specific design and analysis for their cold overpressurization protection system. Cook 1 and 2 were not among the plants which had their cold overpressurization protection systems designed and analyzed by Westinghouse. Cook 1 and 2 do however use the PORVs for cold overpressure protection. The report further states that the fluid conditions for the cold overpressurization event may vary between steam and water. The submittal did not state the expected inlet fluid conditions for the cold overpressurization event. Discuss the range of expected fluid conditions for the varying types of fluid discharge and identify test data demonstrating operability over the range of expected conditions.

3. The Westinghouse Inlet Fluid Conditions Report stated that liquid discharge through both the safety and relief valves is predicted for an FSAR feedline break event. The Westinghouse report

provided expected peak pressure and pressurization rates for specific plants having an FSAR feedline break analysis. The Cook unit 1 plant was not included in this list of plants having such an FSAR analysis. The Cook unit 2 plant was included in the list of plants having an FSAR feedline break analysis. The plant submittal did not discuss the feedline break event. The NUREG-0737, however, requires analysis of accidents and occurrences referenced in Regulatory Guide 1.70, Revision 2, and one of the accidents so required is the feedline break. Provide a discussion on the feedwater line break event for Cook 1 and 2 identifying the fluid pressure, pressurization rate, fluid temperature, valve flow rate, and time duration for the event. Assure that the fluid conditions were enveloped in the EPRI tests and demonstrate operability of the safety and relief valves for this event. Further, assure that the feedline break event was considered in analysis of the safety/relief valve piping system.

4. The Westinghouse valve inlet fluid conditions report indicates that a spurious initiation of high pressure injection at power is expected to result in water discharge through the safety valves for four-loop Westinghouse plants. The analysis presented in the submittal, however, considered only steam discharge through the safety valves. Justify one of the following: (a) that the safety valves will indeed discharge only steam, or (b) that a steam discharge will result in more severe dynamic loads than a water discharge transient.

Questions related to valve operability:

5. The Cook 1 and 2 plant safety valves are Crosby 6M6 and were tested by EPRI. EPRI testing of the 6M6 was performed at varying ring settings. The submittal did not provide details discussing the applicable EPRI tests which demonstrates the operability of the plant safety valves. The submittal did not provide the present Cook 1 and 2 safety valve ring settings. If the plant current ring settings were not used in the EPRI tests, the results may not be directly applicable to the Cook 1 and 2 safety valves. Identify the Cook 1 and 2 safety valve ring settings. If the plant specific ring settings were not tested by EPRI, explain how the expected values for flow capacity, blowdown, and the resulting backpressure corresponding to the plant-specific ring settings were extrapolated or calculated from the EPRI test data. Identify these values so determined and evaluate the effects of these values on the behavior of the safety valves.

6. The EPRI Inlet FLuid Justification Report suggested a method for demonstrating safety valve stability. This method compares the total pressure drop for the in-plant safety valves and piping to the applicable EPRI test safety valve and piping combinations. The total pressure drop is composed of a frictional and acoustic wave component evaluated under steam conditions. The Cook 1 and 2 plant submittal did not provide pressure drop calculations or any other methods to demonstrate safety valve stability. Provide the necessary documentation and discussion demonstrating stability for the Cook 1 and 2 plant safety valves at the expected inlet conditions, ring settings and inlet piping configuration.

7. The Cook Units 1 and 2 were modified by draining the loop seals, such that steam is present at the valve inlet. The Crosby 6M6 safety valves for the Cook units 1 and 2 were designed for loop

seal operation and as such have valve internals compatible for water at the valve inlet. Are the Cook 1 and 2 safety valves internals to be modified to steam internals versus loop seal internals? If no change is planned, discuss valve operability with the loop seal internals on steam.

8. During testing of the Masoneilan 20,000 series PORV, stroke time was found to be sensitive to actuator supply pressure and actuator supply pressure and actuator supply line size. To achieve the 2 second stroke time requirement, the line size was increased and the actuator supply pressure was increased to 60 psig. Review of the EPRI Safety and relief valve selection and justification report for the Masoneilan PORV (drawing A 8529 Rev. B) indicated that a maximum of 55 psig is allowed to the actuator to prevent component damage. Provide a discussion on the action being taken by Cook 1 and 2 to assure the required stroke time will be achieved without potentially damaging components.

9. The Westinghouse valve inlet fluid conditions report states that liquid discharge could be expected through the safety valves for both the feedline break and extended high pressure injection events. During some tests, the EPRI 6M6 test safety valve experienced some chatter and flutter while discharging liquid. Testing was terminated after observing chattering to minimize valve damage. Inspection revealed some valve damage which was presumably caused by the valve chatter and flutter. Liquid discharge for Cook 1 and 2 may conceivably occur for longer periods of time than the EPRI testing. Thus longer periods of valve chattering may cause severe valve damage. Discuss the implications this may have on the operability and reliability of the Cook 1 and 2 safety valves. Identify any actions that will be taken to inspect for valve damage following safety valve lift events.

10. NUREG-0737 Item II.D.1 requires that the plant-specific PORV control circuitry be qualified for design-basis transients and accidents. Please provide information which demonstrates that this requirement has been fulfilled.

Questions related to the thermal hydraulic analysis:

11. A single pressurizer pressure-time history was provided to TES by the American Electric Power Service Corporation for use in the subject analysis. As a result, it was not possible to evaluate the appropriateness of the selected valve inlet conditions with respect to those discussed in the EPRI Valve Inlet Conditions Report for Westinghouse Designed Plants (EPRI-NP-2296). The selection of the pressurizer-time history should be justified in relationship to the EPRI report.

12. Overpressure transients cause the pressurizer sprays to activate which adds moisture to the steam volume. When the safety or relief valves open they would thus pass a steam-water mixture. The hydrodynamic effects of the water slug discharge case for the safety valves was analyzed in the original TES reports (TR-5364-3 and TR-5364-4). It has been concluded that the steam-water mixture conditions is enveloped by the steam and loop seal discharge cases and need not be addressed. However, it was not clear in the submittal if the relief valve piping analysis included the relief valve opening on water at the expected overpressure and temperature conditions. The piping analysis report contained in the submittal does not present a description or results of the PORV fluid transient analysis. Provide an explanation on whether this steam-water case was considered in selecting the transients that produces the maximum loading on the PORV piping system.

13. The REPIPE momentum equations contain an acceleration term which, when used with RELAPS results, commonly introduces spurious spikes into the calculated fluid forces for liquid discharge situations. These spikes can be avoided by using a large time

step in the REPIPE calculations, but this may result in losing the peak force values. In the event that liquid discharge resulting from cold overpressurization transients needs to be considered, an assessment of the use of REPIPE in conjunction with RELAP5 should be provided.

Questions related to the structural analysis:

14. Bending moments are induced on the safety and relief valves during the time they are required to operate because of discharge loads and thermal expansion of the pressurizer vessel and inlet piping. The Teledyne Engineering Services (TES) Report (TR-5364-3 & TR-5364-4) provided the bending moment components for the safety and relief valves. Make a comparison of the predicted Cook 1 and 2 safety and relief valve bending moments to the tested valve bending moments to demonstrate that the operability of the valves are not impaired.

15. According to results of EPRI tests, high frequency pressure oscillations of 170-260 Hz typically occur in the piping upstream of the safety valve while loop seal water passes through the valve. An evaluation of this phenomenon is documented in the Westinghouse report WCAP 10105 and states that the acoustic pressures occurring prior to and during safety valve discharge are below the maximum permissible pressure. The study discussed in the Westinghouse report determined the maximum permissible pressure for the inlet piping and established the maximum allowable bending moments for Level C Service Condition in the inlet piping based on the maximum transient pressure measured or calculated. While the internal pressures are lower than the maximum permissible pressure, the pressure oscillations could potentially exite high frequency vibration modes in the piping, creating bending moments in the inlet piping that should be combined with moments from other appropriate mechanical loads. Provide one of the following:
(1) a comparison of the expected peak pressures and bending moments with the allowable values reported in the WCAP report or
(2) justification for other alternate allowable pressure and bending moments with a similar comparison with peak pressures and moments induced in the plant piping.

16. Further information is required to evaluate the structural analyses of the safety valve and PORV piping systems. The submittal states that the TMRSAP computer program was used to perform the structural analyses. Provide a description of the methods used in this program and explain how the program has been verified for the type of transient analyzed. Describe the methods used to model the connections to the pressurizer and relief tanks and the safety valve bonnet assemblies and PORV actuators. Also the submittal presents the calculated values for forces and moments on the pressurizer and quench tank nozzles and moments on the valve flanges. It does not, however, present a statement on the acceptability of these forces and moments. Provide a statement regarding the acceptability of these nozzle loads.

17. The piping analysis report presents calculated pipe stresses for load combinations corresponding to emergency conditions and states that normal and upset conditions were shown to be acceptable in TES Technical Reports TR-5364-3 and TR-5364-4. The loading combinations used for the emergency condition are identified in the submittal and are in accord with recommendations of the EPRI PWR Safety and Relief Valve Test Program Guide for Application of Valve Test Program Results in Plant-Specific Evaluation, March 1982. Specify which load combinations and stress limits were used for the normal and upset conditions. The EPRI Guide also recommends that the Class 1 portion of the piping be analyzed for a faulted condition where SSE and fluid transient loads are combined. Provide justification for not including the recommended load combination for faulted condition in the Class 1 portion of the piping.

18. The analysis report lists the load combinations that were considered for the pipe supports. The load combinations listed meet recommendations of the EPRI Guide except that they do not include a combination for a faulted condition nor do they identify acceptance criteria used. Justify not including a faulted condition in the evaluation of the pipe supports and explain what acceptance criteria were used to evaluate support adequacy.