March 5, 2001

MEMORANDUM TO: File

FROM: John F. Stang, Senior Project Manager, Section 1 ***/RA/***
Project Directorate III
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

SUBJECT: DONALD C. COOK NUCLEAR PLANT, UNITS 1 AND 2 - ACCEPTANCE REVIEW REGARDING LICENSE AMENDMENT REQUEST, "RESPONSES TO GENERIC LETTER (GL) 96-06 ASSURANCE OF EQUIPMENT OPERABILITY AND CONTAINMENT INTEGRITY DURING DESIGN BASIS ACCIDENT CONDITIONS," DATED AUGUST 15, 2000, AND NOVEMBER 7, 2000 (TAC NOS. M96801 AND M96802)

During the review of the subject responses to GL 96-06, the staff determined additional information was necessary to complete its review. Attached is the draft request for additional information (RAI). In accordance with Nuclear Reactor Regulation (NRR) Office Letter 803, the draft RAI will be E-Mailed to the licensee and a conference call will be arranged to discuss the RAI. Once the Nuclear Regulatory Commission (NRC) staff and the licensee have a common understanding of the information required, the RAI will be issued formally to the licensee.

Docket Nos. 50-315 and 50-316

Attachment: As stated

ACCEPTANCE REVIEW FOR
D. C. COOK UNITS 1 AND 2
SUBMITTALS C0800-10 AND C1100-01 RESPONSES TO GL 96-06, DATED AUGUST 15, 2000 AND NOVEMBER 7, 2000

1. If a methodology other than that discussed in NUREG/CR-05220, "Diagnosis of Condensation-induced Waterhammer," was used in evaluating the effects of waterhammer, describe this alternate methodology in detail. Also, explain why this methodology is applicable and gives conservative results (typically accomplished though rigorous plant-specific modeling, testing, and analysis).

2. For both the waterhammer and two-phase flow analyses, provide the following information:

   a. Identify any computer codes that were used in the waterhammer and two-phase flow analyses and describe the methods used to benchmark the codes for the specific loading conditions involved (see Standard Review Plan Section 3.9.1).

   b. Describe and justify all assumptions and input parameters (including those used in any computer codes) such as amplifications due to fluid structure interaction, speed of sound, force reductions, and mesh sizes, and explain why the values selected give conservative results. Also, provide justification for omitting any effects that may be relevant to the analysis (e.g, fluid structure interaction, flow induced-vibration, erosion).

   c. Provide a detailed description of the "worst case" scenarios for waterhammer and two-phase flow, taking into consideration the complete range of event possibilities, system configurations, and parameters. For example, all waterhammer types and water slug scenarios should be considered, as well as temperatures, pressures, flow rates, load combinations, and potential component failures. Additional examples include:

      - the effect of void fraction on flow balance and heat transfer;
      - the consequences of steam formation, transport, and accumulation;
      - cavitation, resonance, and fatigue effects; and
      - erosion consideration

   d. Please provide the limiting piping loads for the bounding waterhammer and provide comparisons to the allowable limits for these loads. Please include results demonstrating integrity of the non-essential service water system inside containment and the results demonstrating the integrity of the system outside of the containment. Include consideration of containment isolation valves and penetrations.

   e. Licensees may find NUREG/CR-6031, "Cavitation Guide for Control Valves" helpful in addressing some aspects of the two-phase flow analyses, (Note: it is important for licensees to realize that in addition to heat transfer considerations, two-phase flow also involves structural and system integrity concerns that must be addressed).

   f. Confirm that the analyses included a complete failure modes and effects analysis (FMEA) for all components (including electrical and pneumatic failures) that could impact performance of the cooling water system and confirm that the FMEA is

documented and available for review, or explain why a complete and fully documented FMEA was not performed.

g. Explain and justify all uses of “engineering judgement.”

3. Was condensation induced waterhammer (CIWH) analyzed? Are there any long horizontal piping runs in the NESW system where CIWH could occur during system drain down following a loss of offsite power or during the refill after power was reestablished?

4. Determine the uncertainty in the waterhammer and two-phase flow analyses, explain how the uncertainty was determined, and how it was accounted for in the analyses to assure conservative results.

5. Confirm that the waterhammer and two-phase flow loading conditions do not exceed any design specifications or recommended service conditions for the piping system and components, including those stated by equipment vendors; and confirm that the system will continue to perform its design-basis isolation functions as assumed in the safety analysis report for the facility.

6. Provide a simplified diagram of the system showing major components, active components, relative elevations, lengths of piping runs, and the location of any orifices and flow restrictions. A drawing was provided for Unit 2, but not for Unit 1.

7. Describe in detail any plant modifications of procedural changes that have been made or are planned to be made to resolve the waterhammer and two-phase flow issues. Consider the circumstance by which the NESW would be isolated following a loss-of-coolant accident (LOCA) or steamline break, voided within the containment as the result of internal steam formation and subsequent opening of the insolation valves by operators for post-accident containment cooldown. Would waterhammer occur under such a scenario? What procedural safeguards are provided.

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