Entergy

Entergy Operations, Inc.
1448 S.R. 333
Russellville, AR 72802
Tel 501 858 5000

0CAN080302

August 7, 2003

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555-0001

Subject: Arkansas Nuclear One - Units 1 and 2
Docket Nos. 50-313 and 50-368
License Nos. DPR-51 and NPF-6
60-Day Response to NRC Bulletin 2003-01, Potential Impact of Debris Blockage on Emergency Sump Recirculation at Pressurized-Water Reactors

Dear Sir or Madam:

By letter dated June 9, 2003 (0CNA060301), the NRC requested licensees to provide a 60-day response to the subject bulletin that contains information requested in Option 1 or Option 2. Option 2 requests licensees to describe any interim compensatory measures that have been implemented or that will be implemented to reduce the risk which may be associated with potentially degraded or nonconforming emergency core cooling system (ECCS) and containment spray system (CSS) recirculation functions until an evaluation to determine compliance is complete.

On behalf of Arkansas Nuclear One (ANO), Units 1 and 2, Entergy is providing the following requested information for Option 2:

- **Provide operator training on indications of and responses to sump clogging**

  Entergy will train licensed operators to recognize and respond to sump clogging. The training will include identification of indications, possible responses, emergency operating procedure (EOP) and severe accident management guideline (SAMG) instructions for responding to sump clogging. In addition, consideration will be given for a simulator scenario that includes sump clogging indications and response. This training will be completed by March 31, 2004 (commitment).

  ANO does not have operator training specific to sump clogging. However, operator training addresses the monitoring of operating pumps for indications of loss of net positive suction head (NPSH), such as erratic flow or discharge pressure. Training will be developed to emphasize the instrumentation available to identify symptoms of sump blockage or degraded pump performance.

A103

- **Implement procedural modifications, if appropriate, that would delay the switchover to containment sump recirculation (e.g., shutting down redundant pumps that are not necessary to provide required flows to cool the containment and reactor core, and operating the CSS intermittently)**

  Entergy has performed a qualitative risk assessment and has determined that procedural modifications are not risk beneficial at this time. Shutting down ECCS or CSS pumps increases risk because, in the case of a failure of an operating pump, operator action would be required to restart the shut-down pump, and the pump being restarted would be subject to the potential for another demand failure (subsequent to the initial demand in response to an engineered safeguards actuation). The operator failure probability for a medium or large loss-of-coolant accident (LOCA) could be significant, given the short time available.

  Entergy believes that the risk associated with the combination of probability of the failure of the equipment to restart and the operator error probability is greater than the risk of ECCS failure due to sump clogging. At the beginning of recirculation, when recirculation flow rate is at its highest, the recirculation flow velocities at the perimeter of the screen (which would be higher than in the floor area surrounding the screen) are smaller than the incipient tumbling velocities measured by the University of New Mexico and Los Alamos (Nuclear Technology, Vol. 139, pp. 145-155), indicating that transport of debris to the sump is very unlikely, and lift of any transported debris up onto the screen to block it is even more unlikely.

  A revision to the EOPs to shut down ECCS or CSS pumps would be in conflict with the deeply ingrained operator training and the functionally-oriented design of the procedures (i.e., to provide safety functions such as reactor coolant system (RCS) inventory control via safety injection) and may not be a prudent action to take to compensate for a problem with a low probability of occurrence. Since the probability of clogging is believed to be low based on the current assessment of debris transport mechanisms, revising the EOPs (in a manner contrary to the normal safety philosophy) to avoid an unlikely event is judged at this time not to be prudent.

  Entergy's procedures delay switchover to the sump recirculation to the extent practical. The ANO-2 EOPs provide direction in accordance with CEN-152, *Combustion Engineering Emergency Procedure Guidelines*, to throttle or stop safety injection flow if certain conditions are satisfied (e.g., RCS sub-cooling, pressurizer level, etc.). Operator training reinforces the need for timely actions to throttle or stop flow. The ANO-1 EOPs provide direction in accordance with the B&W Owners Group Emergency Operating Procedures Technical Bases document 74-115-2414, *Generic Emergency Operating Guidelines*. Additional procedure changes have not been implemented at this time because detailed evaluations must be performed to ensure that operator actions to stop ECCS/CSS trains, throttle pump flow, or other steps to delay switchover do not result in conditions that are inconsistent with design basis analyses. ANO's current process for revisions to the EOPs, due to changes in vendor/Owners Group guidelines, is to evaluate and then incorporate (those deemed appropriate) recommendations from the vendor/Owners Group. Deviations from the guidelines require a site-specific justification.

- **Ensure that alternative water sources are available to refill the refueling water storage tank or to otherwise provide inventory to inject into the reactor core and spray into the containment**

  ANO's SAMGs do not adequately address alternative water sources. Entergy will enhance the ANO SAMGs by January 15, 2004 (commitment).

  The EOPs do not address alternative water sources to refill the borated water storage tank (BWST) for ANO-1 or the refueling water tank (RWT) for ANO-2. Entergy controls the BWST and RWT above low level alarm setpoints/administrative low-level limits and below administrative upper level limits. Therefore, additional volume in the BWST/RWT above that required by technical specifications and assumed in safety injection and containment spray pump NPSH analyses is available. The administrative low-level limits include consideration for instrument uncertainties and provide margin so that violations of technical specification lower limits are avoided. Even if the low-level alarm setpoint/administrative low-level limit were raised, the extra sump inventory that could be credited would not significantly increase available NPSH.

  The ANO-1 BWST and the ANO-2 RWT are not crossconnected and therefore do not provide an alternative water source for the opposite unit.

  For the design basis accident (DBA), the containment building and sump temperatures will increase above the pre-accident ambient temperature due to release of RCS liquid into containment. This will result in a small reduction in required NPSH per the guidance of NUREG-0897, *Containment Thermal Sump Performance*. Less severe accidents (which result in lower containment peak pressures and temperatures) will still result in substantially elevated sump temperatures. Therefore, credit can be taken for reduced NPSH requirements due to increased sump temperature. Also, while the ANO-1 and ANO-2 sumps and safety injection and containment spray pumps were not designed around crediting the "increase in containment pressure" during accident conditions (i.e., the design meets Regulatory Guide 1.1, *NPSH for Emergency Core Cooling and Containment Heat Removal System Pumps*), for the DBA, containment overpressure during this entire accident provides a large increase in NPSH available.

- **Implement a more aggressive containment cleaning and increased foreign material controls**

  Entergy implements an aggressive containment building closeout process to leave the ANO-1 and ANO-2 containment buildings as clean as practical following an outage. Items authorized to remain in containment during power operations are verified to be in their evaluated locations and secured in place. A site procedure is utilized to verify the containment building is ready for heatup and power operations. Once the containment building is ready for closeout, operations personnel inspect containment for loose debris which could be transported to the sump.

  If during an outage the sump is accessed, foreign material exclusion controls are implemented, and items taken into and out of the sump are logged. Also, once the sump closeout inspection has been completed, personnel access to the internal sump area is prohibited.

Provisions are in place per site procedures to maintain the post-outage conditions should a containment building entry be required. In these cases, the areas of containment affected by the entry are verified to have no loose debris present which could be transported to the sump.

- **Ensure containment drainage paths are unblocked**

  Entergy performs a thorough sump closeout inspection during refueling outages in accordance with site procedures. During this inspection, the sump inlets are visually verified to be unrestricted and free of debris. Sump components are inspected for evidence of structural distress or corrosion. At both ANO units, this inspection verifies that each critical floor drain (which is routed to the sump) is in its proper configuration with required gratings and screens in place. Hydraulic communication with the sump by verifying water is free to flow from the drains to the sump will be proceduralized by September 15, 2003 (commitment).

- **Ensure sump screens are free of adverse gaps and breaches**

  After major work in containment is completed and equipment has been properly stored, the sump cleanliness and integrity inspection is performed in accordance with site procedures. During this inspection, the sump screens are inspected to ensure no openings in the sump screen, or around the screen penetrations are larger than the screen mesh size. The screen mesh is sized to ensure that there are no detrimental effects on the ECCS.

Furthermore, the following additional information is provided on the design of the ANO-1 and ANO-2 sumps and sump screens. The sump screens are robust and rugged structures. For ANO-1, the sump screen is primarily a strong triangular structure formed by sloped structural panels. At the base of the triangular structure is a narrow horizontal section. The ANO-2 sump screen is a rectangular box with vertical walls. The screened structures are divided into separate compartments housing the independent ECCS/CSS suction lines for redundancy. The compartments are separated by a steel divider plate with screen wire mesh. The ANO-1 screen has a structural steel frame constructed from relatively short, stiff, wide flange sections. The ANO-2 structural steel frame is constructed from heavy angle sections. The stainless steel wire mesh screens are protected by grating panels. In the unlikely event of the collapse of the screen or grating panel in one compartment, the other screened compartment would be protected by the screened divider plate. The screen in the divider plate would protect the inlet in the undamaged compartment.

Entergy is actively participating in industry efforts to address the potential concerns for sump blockage. This submittal contains three regulatory commitments as discussed in the first, third, and fifth bullets. Should you have any questions concerning this submittal, please contact Ms. Natalie Mosher at (479) 858-4635.

I declare under penalty of perjury that the foregoing is true and correct. Executed on August 7, 2003.

Sincerely,

Glenn R. Ashley

Glenn R. Ashley
Manager, Licensing

GRA/nbm

cc: Mr. Thomas P. Gwynn
Regional Administrator (Acting)
U. S. Nuclear Regulatory Commission
Region IV
611 Ryan Plaza Drive, Suite 400
Arlington, TX 76011-8064

NRC Senior Resident Inspector
Arkansas Nuclear One
P.O. Box 310
London, AR 72847

U. S. Nuclear Regulatory Commission
Attn: Mr. John Minns
Washington, DC 20555-0001

U. S. Nuclear Regulatory Commission
Attn: Mr. Thomas W. Alexion
Washington, DC 20555-0001