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Duane Arnold Energy Center

May 8, 2008

NG-08-0239
10 CFR 50.54(f)

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

Duane Arnold Energy Center
Docket 50-331
License No. DPR-49

Subject: Three Month Response to NRC Generic Letter 2008-01, "Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems"

The Nuclear Regulatory Commission (NRC) issued Generic Letter (GL) 2008-01, "Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems", dated January 11, 2008, to request that each licensee evaluate the licensing basis, design, testing, and corrective action programs for the Emergency Core Cooling Systems (ECCS), Decay Heat Removal System, and Containment Spray System, to ensure that gas accumulation is maintained less than the amount that challenges operability of these systems, and that appropriate action is taken when conditions adverse to quality are identified.

The NRC, in GL 2008-01, requested each licensee to submit a written response in accordance with 10 CFR 50.54(f) within 9 months of the date of the GL to provide the following information:

"(a) A description of the results of evaluations that were performed pursuant to the requested actions of the GL. This description should provide sufficient information to demonstrate that you are or will be in compliance with the quality assurance criteria in Sections III, V, XI, XVI, and XVII of Appendix B to 10 CFR Part 50 and the licensing basis and operating license as those requirements apply to the subject systems of the GL;

"(b) A description of all corrective actions, including plant, programmatic, procedure, and licensing basis modifications that you determined were necessary to assure compliance with these regulations; and;

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"(c) A statement regarding which corrective actions were completed, the schedule for completing the remaining corrective actions, and the basis for that schedule."

Additionally, the NRC requested that if a licensee cannot meet the requested response date, the licensee "shall provide a response within 3 months of the date of this GL". In the 3 month response, the licensee was requested to describe the alternative course of action that it proposes to take, including the basis for the acceptability of the proposed alternative course of action.

On April 3, 2008, the NRC Staff verbally granted FPL, including the Duane Arnold Energy Center, a one-month extension to the above 3-month response letter. This extension was documented by FPL, on behalf of its nuclear plants, in letter: R. Kundalkar (FPL) to USNRC, "Extension Request Regarding the Three Month Response to NRC Generic Letter 2008-01, 'Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems'," L-2008-076, dated April 9, 2008.

FPL Energy Duane Arnold, LLC (hereafter FPL Energy Duane Arnold) hereby notifies the NRC that we will not be able to fully complete the requested evaluations within the proposed nine month period and, therefore, the alternative course of action that FPL Energy Duane Arnold proposes to take, including the basis for the acceptability of the proposed alternative course of action, is described in the attachment to this letter.

This letter contains the following new commitments:

1. Complete the detailed walkdowns and evaluations of those inaccessible sections of piping of GL subject systems, not otherwise exempted, prior to startup from the next Refuel Outage (currently scheduled for early 2009).

2. Submit a supplemental report to the original nine (9) month response, for those walkdowns and evaluations completed during the 2009 Refuel Outage, within 90 days after startup from that outage.

Please contact this office if you have further questions regarding this matter.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on May 8, 2008.

Richard L. Anderson
Vice President, Duane Arnold Energy Center
FPL Energy Duane Arnold, LLC

Attachment

cc: Administrator, Region III, USNRC
Project Manager, DAEC, USNRC
Resident Inspector, DAEC, USNRC

This attachment provides the FPL Energy Duane Arnold three month response requested in NRC Generic Letter 2008-01. This response discusses:

1. the required evaluations that will not be completed by October 11, 2008
2. the alternative course of action planned, and
3. the basis for the acceptability of the alternative course of action.

For the Duane Arnold Energy Center (DAEC) the GL subject functions correspond to the following plant systems/operating modes:

High Pressure ECCS: High Pressure Coolant Injection (HPCI) – water side.

Low Pressure ECCS: Core Spray (CS) and Residual Heat Removal (RHR) – Low Pressure Coolant Injection (LPCI) mode.

Decay Heat Removal: RHR - Shutdown Cooling mode, LPCI mode, or Suppression Pool Cooling mode. All three (3) modes can utilize the RHR heat exchanger for decay heat removal. Shutdown Cooling mode is the normal means for removing decay heat from the core during planned shutdowns and abnormal operating occurrences/transients that result in a plant trip/scram. Suppression Pool Cooling mode is used if there is transfer of decay heat from the reactor to the suppression pool, such as a transient resulting in safety/relief valve opening or a Loss-of-Coolant Accident (LOCA). LPCI mode can also be used during a LOCA for decay heat removal by routing injection through the RHR heat exchanger as part of the long term core cooling path.

Containment Spray: RHR – Drywell Spray mode and RHR – Suppression Pool Spray mode.

FPL Energy Duane Arnold expects to complete a significant amount of the requested actions, in particular those involving reviews of plant design, licensing basis documentation, corrective actions, system operating and testing procedures. However, the GL-requested evaluations also require physical walkdowns of the subject ECCS and RHR system/modes to confirm pertinent design details (locations of high points), and as-built configurations (vent locations and configurations, piping elevations and slope, etc.). Portions of these piping systems are inaccessible during power operation due to radiation environments or an inerted atmosphere (less than 4% oxygen concentration). Some piping sections may require scaffolding or removal of insulation for access, which may not be possible during power operations due to risks to personnel (proximity to hot pipes) or to other nearby equipment during scaffold erection and disassembly (for example, instrument racks with sensitive equipment). FPL Energy Duane Arnold does not currently have a planned plant outage to conduct the walkdowns in these inaccessible areas or to build such scaffolding within the nine month period requested

by the GL (October 11, 2008). The next such opportunity is the next refuel outage, currently planned for early 2009. However, plans are currently being developed to perform preliminary "scoping" walkdowns in case an outage of sufficient duration, where the primary containment is de-inerted to perform the needed repairs, thereby providing access to these inaccessible areas within this 9 month period. Such scoping walkdowns will be used to confirm design information on drawings, look for obstructions or clearance problems that could interfere with detailed inspections at a later date, and to develop plans for building scaffolding where needed to gain access. This information is critical to perform the more-detailed evaluation walkdowns required for the GL response.

Preliminary document reviews indicate that the required detailed walkdowns of these key piping sections can be completed within the 9 month period:

- HPCI suction piping – Condensate Storage Tank (CST) to pump inlet (excluding those sections that are underground and can not be walked down)
- HPCI suction piping – Suppression pool to pump inlet
- HPCI discharge piping – Pump outlet to the Steam Tunnel penetration
- CS suction piping - Suppression pool to pump inlet
- CS discharge piping – Pump outlet to outboard injection valve
- RHR (LPCI, Suppression Pool cooling/Spray, and Drywell Spray modes) suction piping - Suppression pool to pump inlet
- RHR (LPCI and Shutdown Cooling modes) discharge piping - Pump outlet to outboard injection valve
- RHR (Shutdown Cooling mode) suction piping – outboard containment isolation valve to pump inlet
- RHR (Drywell Spray and Suppression Pool Cooling/Spray modes) discharge piping - Pump outlet to the outboard containment isolation valve for DW Spray and to the inboard isolation valves for Suppression Pool Cooling/Spray (the spray piping from this point inward to the respective spray spargers is exempted from the GL scope as it is open-ended and not kept full of water)

If, during the on-line scoping walkdowns, FPL Energy Duane Arnold discovers some portions of the above piping sections to be inaccessible, primarily due to physical interferences, risk to plant operation, or personnel safety concerns, they will be added to the inaccessible piping list for walkdowns during the Refuel Outage.

The inaccessible portions of these systems for detailed walkdowns that will be deferred until the next Refuel Outage (currently scheduled for early 2009) constitute only a portion of the overall scope of the GL. The following are the known sections of inaccessible piping.

- HPCI discharge piping – Entry into Steam Tunnel to Reactor Pressure Vessel (RPV)
- CS discharge piping - Outboard injection valve to RPV
- RHR (LPCI and Shutdown Cooling modes) discharge piping - Outboard injection valve to RPV

- RHR (Shutdown Cooling mode) suction piping – RPV to outboard containment isolation valve

As noted above, the RHR - Drywell Spray mode pump discharge piping is exempt from full flow testing (it is not required to actually spray the containment with water to demonstrate system operability) and is normally not kept filled, as this is open-ended piping within the primary containment boundary. Similarly for the Suppression Pool Cooling/Spray modes of RHR, the piping from the inboard containment isolation valve to its sparger inside the Torus is open-ended and not kept filled. Thus, these sections of piping are considered exempt from the GL actions.

In addition, as noted above, there is a portion of the HPCI suction piping that is underground and thus, permanently inaccessible. FPL Energy Duane Arnold plans to exclude this portion of piping from detailed walkdowns, given that the likelihood of void accumulation that could affect system operability in this portion of piping being very low, based upon routine surveillance testing, under both minimum and full flow conditions.

These systems are routinely tested in accordance with Technical Specification and In-service Testing (IST) programs and no significant issues with accumulated gas that challenge system operability have been identified at DAEC[1]. These tests ensure that full flow is achieved within the assumed accident recovery times and no obvious equipment issues associated with accumulated gas voiding (net positive suction head (NPSH), waterhammer, pump cavitations, etc.) have been noted during these tests. These on-line tests and routine evolutions during plant shutdowns (decay heat removal) and refuel outages (ECCS injection to the vessel for refuel cavity flood-up) cover most of the design basis alignments of these systems for both suction and discharge piping and consistently demonstrate their operability. However, as part of the 9 month response to the GL, FPL Energy Duane Arnold will re-validate these procedural steps, in particular, those for filling and venting piping segments after maintenance, to minimize the potential for error that could introduce voiding that could negatively impact the operability of these systems.

The DAEC is a Boiling Water Reactor and does not rely upon nitrogen or air-charged accumulators as part of its design of the GL subject piping systems and thus, there are limited scenarios where significant gas entrainment is possible, particularly in the suction piping of these pumps. For example, the suction piping for the CS pumps and RHR pumps in the LPCI, Drywell Spray, and Suppression Pool Cooling/Spray modes exits the bottom of the suppression pool and has no other high points (by design) from that point to the actual pump inlet. RHR – Shutdown Cooling mode suction valves are interlocked with RHR suction valves from the suppression pool to preclude inadvertent draining of the reactor vessel to the suppression pool, which also precludes voiding these piping sections during transfers between modes. The HPCI system has a design

[1] As noted in the GL, the turbulent penetration found on the HPCI injection piping was determined to have minimal safety significance. In addition, corrective actions have been completed to install a keep-fill system and all of the HPCI discharge piping has been designed to the loading conditions from the potential waterhammer should the piping not remain full.

feature to swap its suction source from the CST (normal alignment) to the Suppression Pool under conditions of either low CST level or high Suppression Pool level. This design feature is an implicit assumption in the accident analysis as the suction source is assumed to be from the Suppression Pool. Consequently, the instrument setpoint for the low CST level transfer accounts for vortexing during the transition and thus, minimizes the likelihood of any air intrusion into the suction piping. In addition, the suction valves from the CST and Suppression Pool are interlocked in a "make-before-break" logic (i.e., the Suppression Pool suction valves must indicate full open before the CST suction valves receive their close signal), this also assures that the suction piping to the HPCI pump is kept full during this transition. The operating procedures and surveillance testing procedures that confirm this design feature have cautions in them to preclude draining these piping sections. All subject system operating instructions have detailed fill and vent steps for system restoration or re-alignment from alternate modes back to safety injection mode. Prior to initiating Shutdown Cooling mode of RHR, which is infrequently utilized (only during plant shutdowns), the Operators back flush the piping to pre-warm it to minimize thermal stresses, which would also likely remove any voids that may have accumulated over time since the last shutdown.

The CS and RHR pump discharge piping (common sections for the LPCI, Shutdown Cooling, Suppression Pool Cooling/Spray and Drywell Spray modes), has a "keep fill" pump and low pressure alarms in the Control Room to alert the operators of a potential problem in the system, which could lead to draining in these piping sections and introducing voids. Alarm response procedures have clear direction to minimize such potential voiding. The HPCI pump discharge piping has both a high pressure and low pressure keep fill system, with similar procedural control as CS and RHR for minimizing the likelihood of draining or introducing voids into these piping sections.

The LOCA analysis required by 10 CFR 50.46 for the DAEC currently demonstrates over 500°F of margin to the regulatory limit, using conservative inputs for system response times, injection flow rates, and application of the single failure criterion. Thus, the safety impact of any potential voiding on delaying ECCS injection would be minor. In addition, neither decay heat removal nor containment spray functions have a time-critical response in the DAEC accident analysis. Therefore, any potential delays in system response time due to minor voiding in discharge piping would not have a significant safety impact.

We acknowledge the Staff's assertion that the current TS language for surveillance testing on "keep fill" may not be sufficient in breadth or depth for the identified concern for gas entrainment. However, the resolution for such TS improvements is being left to the Technical Specification Task Force (TSTF) to provide an approved template (TSTF Traveler) for making such changes to individual licensee's TS. The development of such a template hinges on the results of the evaluations of a large number of licensees to address all the various plant designs. Consequently, it is not likely that such a template will be made available to FPL Energy Duane Arnold within the 9 month period for our required GL response. FPL Energy Duane Arnold will take such a TSTF Traveler into advisement when it is made publicly available for adoption by the Staff. In the interim, any needed clarifications to the UFSAR and TS Bases will be made in accordance with

the provisions of 10 CFR 50.59 and the TS Bases Control Program (TS Section 5.5.10), respectively. Any identified non-conservatism in the existing TS Surveillances or Actions will be handled through the DAEC Corrective Action Program using the guidelines of NRC Administrative Letter 98-10.

FPL Energy Duane Arnold has confidence that the DAEC ECCS, Decay Heat Removal, and Containment Spray Systems can fulfill their required functions, based upon our 30 years of operating experience, which includes system walkdowns, detailed evaluations, and special testing for other regulatory issues (e.g., BN 88-04, BN 93-02, BN 96-03, GL 89-10, GL 96-06, etc.). FPL Energy Duane Arnold will complete as much of the requested GL actions within the requested 9 month period as is practical, based upon in-plant accessibility of the subject systems. Thus, FPL Energy Duane Arnold anticipates the requested 9-month response to the GL will initially include the results of the review of the design and licensing basis documentation, operating instructions/procedures (in particular, those for filling and venting of systems as part of return to service or re-alignment from alternate modes back to safety injection mode), and the results of the scoping and detailed walkdowns completed at that time, along with any identified corrective actions, with accompanying plans and schedules for resolution.

In the interim, FPL Energy Duane Arnold will continue to monitor industry generic efforts and will incorporate such additional information and any plant-specific lessons learned from other licensees, as applicable to the DAEC.

Based upon the above, FPL Energy Duane Arnold believes that completing performance of the detailed walkdowns and subsequent evaluations of a portion of piping sections, outside the requested 9 month period, but no later than startup from the next refuel outage (early 2009) is an acceptable alternative course of action.

Accordingly, FPL Energy Duane Arnold makes the following commitments:

a) Complete the detailed walkdowns and evaluations of those inaccessible sections of piping of GL subject systems, not otherwise exempted, prior to startup from the next Refuel Outage (currently scheduled for early 2009).

b) Submit a supplemental report to the original nine (9) month response, for those walkdowns and evaluations completed during the 2009 Refuel Outage, within 90 days after startup from that outage.