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Iowa Electric Light and Power Company

November 28, 1984
NG-84-5338

Mr. James G. Keppler
Regional Administrator
Region III
U.S. Nuclear Regulatory Commission
799 Roosevelt Road
Glen Ellyn, IL 60137

Subject: Duane Arnold Energy Center
Docket No: 50-331
Op. License No: DPR-49
Bulletin 84-03, Refueling Cavity Water Seal
File: A-107d

Keppler:

Bulletin 84-03, Refueling Cavity Water Seal, requested Iowa Electric Light and Power Company to evaluate the potential for, and consequences of, a refueling cavity water seal failure with consideration given to the following:

1) Gross seal failure.
2) Maximum leak rate due to failure of active components such as inflated seals.
3) Makeup capacity.
4) Time to cladding damage without operator action.
5) Potential effect on stored fuel and fuel in transfer.
6) Emergency Operating procedures.

A summary response to Iowa Electric's evaluation of these concerns is given below.

1) Gross Seal Failure

The refueling bellows forms a seal between the reactor vessel and the surrounding primary containment drywell to permit flooding of the space (reactor well) above the vessel during refueling operations. The refueling bellows assembly consists of a stainless steel bellows, a backing plate, a spring seal, and a removable guard ring. The backing plate surrounds the outer circumference of the bellows to protect it and is equipped with a tap for testing and for monitoring leakage. The self-energizing spring seal is located in the area between the bellows and the backing plate and is designed to limit water loss in the event

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of a bellows rupture by yielding to form a seal against the backing plate. The guard ring attaches to the assembly and protects the inner circumference of the bellows. The guard ring can be removed from above to inspect the bellows. The assembly is welded to the reactor bellows support skirt flange and the reactor well seal bulkhead plate. The reactor bellows support skirt is welded to the reactor vessel shell flange and the reactor well seal bulkhead plate bridges the distance to the primary containment drywell wall.

Due to the passive design of the reactor well bellows seal, gross seal failure is considered to be a remote possibility. Should a gross seal failure occur, water loss would be significantly limited due to the self-energizing spring seal. In the event refueling bellows leakage is in excess of five gallons per minute, an alarm will annunciate in the control room.

2) Maximum Leak Rate Due to Failure of Active Components such as Inflated Seals

As described above, the refueling bellows design does not incorporate active seal components.

3) Make-up Capacity

In the event of a refueling bellows failure, gross make-up capacity for the refueling cavity can originate from two sources, Core Spray (CS), and Residual Heat Removal(RHR). Two Core Spray pumps can supply 3020 gallons per minute (gpm) each, while four RHR pumps can supply 4800 gpm each. Ample water supply exists through both the suppression pool and the river water supply system.

4) Time to Cladding Damage Without Operator Action

In the event of refueling bellows failure, fuel would only be exposed while in transit. Since it is anticipated that the refueling cavity water level can be restored and maintained by the Core Spray and/or Residual Heat Removal systems, significant time would exist to place the fuel in a safe location (either the spent fuel pool, or the reactor vessel). In order to determine the exact time to cladding damage without operator action, an additional analysis would need to be performed. Due to the passive design of the bellows seal, and the remote possibility of gross seal failure, Iowa Electric does not feel that such an evaluation is justified.

5) Potential Effect on Stored Fuel and Fuel in Transfer

Should there be a gross seal failure of the refueling bellows seal that leads to a loss of water level in the refueling cavity with the fuel

pool gate removed, a minimum water level of one foot and seven inches would remain over the spent fuel in the fuel pool. In this event, Plant Emergency Instruction II.Q.1, identified in response 6, would be implemented.

If fuel was in transfer at the time the refueling seal failed, and refueling cavity water level was found decreasing, the action taken would be either return the fuel to the vessel or the fuel pool, whichever would be quicker.

6) Emergency Operating Procedures

Actions to be taken by Operations personnel in the event of refueling accident are provided in Plant Emergency Instruction II.Q.1, "Loss of Fuel Pool Water Level." This procedure addresses actions that would be taken in the event of a loss of refueling cavity level.

Based on the passive design of Duane Arnold Energy Center's refueling bellows, seal failure would result in a minor loss of water. This water loss would be readily compensated by Core Spray and/or Residual Heat Removal systems. It is Iowa Electric's belief that a gross seal failure would not occur.

Should you have any questions regarding this response, please contact me.

This response is true and accurate to best of my knowledge and belief.

IOWA ELECTRIC LIGHT AND POWER COMPANY

BY Philip Allard EOR

Richard W. McGaughy
Manager, Nuclear Division

Subscribed and sworn to Before Me on this 28th day of NOVEMBER, 1984.

Kathleen M. Farmer

Notary Public in and for the State of Iowa

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