INL USQ PROCESS
REASONABILITY DETERMINATION/POTENTIAL INADEQUACY IN THE SAFETY ANALYSIS (PISA) FORM
(DO NOT USE FOR PROPOSED CHANGES)

Facility or Activity: ATR

USQ Process No.: RTC-USQ-2008-451

Subject: Canal Bulkhead Seal Leakage with Air-Pillow Seal Deflated

Describe the New Information/Discovery:

Sections of the ATR canal may be isolated from each other through the installation of full-height or short bulkheads. The full-height bulkheads shown in drawing 121118 and short bulkheads shown in drawing 442927 have similar seal designs consisting of a Presray Corporation inflatable seal with a passive J-seal / wedge-seal backup. The ATR canal irradiated fuel storage area is isolated from other canal areas by short bulkheads. These bulkheads and seals are required by the Technical Safety Requirements (TSR) to be operable to mitigate potential canal draining from cask handling accidents.

Recently, a full-height canal bulkhead was installed in the storage canal just west of the working canal, and the west end water level was lowered about eight feet to allow access for a construction project. Leakage past the inflated bulkhead seals was initially greater than expected, then reduced to an acceptable level by increasing the air pressure. The maximum air pressure did not exceed the normal operating band for the air seal. While installed and in use the inflated seal failed and the resulting leakage through the backup J-seal greatly increased to an estimated 300 gpm. The canal level behind the bulkhead was maintained through use of the normal makeup system; no safety system actuation was required.

Continued heavy lifting in the canal area, with the air seal out of service, is allowed by the current TSR provided the pre-established conditions are met. These include establishing makeup capability based on the J-seal leak rate. EDF TRA-ATR-935 performs a leakage analysis for ATR canal short bulkhead J-seals, and concludes that canal makeup of 30 gpm will maintain the canal level at the height of the short bulkhead. Based on the estimated leakage during the recent air seal failure, the leak rate through the J-seal may be much greater than the J-seal leakage and emergency makeup to the irradiated fuel storage area assumed in the safety basis. The leakage through the air seal may also be greater than assumed. The canal configuration does not allow for immediate in-place leak testing of all bulkhead or seals.

Identify the applicable safety basis document(s) (e. g., DSA, SAR, BIO, TSRs, etc.):

SAR-153, Upgraded Final Safety Analysis Report for the Advanced Test Reactor Section 9.1 Fuel Storage and Handling, Section 9.3 Compressed Air System, Section 15.8 Fuel Canal and Cask Handling Events

TSR-186 Technical Safety Requirements for the Advanced Test Reactor LCO 3/4 .5.5 Cask Handling and Irradiate Fuel Element Storage

I. REASONABILITY DETERMINATION (Reasonability determinations made as part of the ATR Design Basis Reconstitution effort may be documented per SP-10.2.4.9)

Is it reasonable that the potential for an inadequate safety analysis exists based on the new information or discovery described above? ☒ Yes ☐ No

If "Yes," proceed to Sections II, III, and IV.
If "No," provide an explanation and basis for the reasonability determination.

G. L. Sharp		6/20/08
USQ Evaluator Print/Type Name	USQ Evaluator Signature	Date
M. B. McDONOUGH		6/20/08
Nuclear Facility Manager Print/Type Name	Nuclear Facility Manager Signature	Date

If the answer to the question above is "No," file the completed form. Do not complete Section II, III, or IV.

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If the answer to the question above is "Yes," complete Section II, III, and IV.

II. PISA DECLARATION

What is the basis for concern that the safety basis may not be bounding or may be otherwise inadequate? Provide an explanation.

Fuel damage in the canal irradiated fuel storage area is considered beyond design basis, in part, due to the calculated air seal leak rate, J-seal leak rate, and the makeup system capability. The accident analyses assumed that the worst case canal bulkhead leakage with the air-pillow seal deflated is enveloped by 30 gpm. A lower leak rate is assumed with the air seals inflated. The operability of the canal irradiated fuel storage area makeup systems is based on the enveloping bulkhead leakage. If the leakage is greater than 30 gpm, the intended safety function of the fuel storage canal makeup system may not be accomplished. Leakage in excess of canal makeup flow may result in fuel damage in the irradiated fuel storage area for Condition 3 or 4 events. Postulated fuel damage in the irradiated fuel storage area is not within the existing ATR safety basis.

A PISA exists. Complete the following actions

- Nuclear Facility Manager document actions (below) including interim operating restrictions taken to place or maintain the facility in a safe condition.
- Nuclear Facility Manager execute reporting process for PISA per LWP-9301 and LWP-13830.
- Qualified USQ evaluator proceed to Section III.

ACTIONS TAKEN TO PLACE OR MAINTAIN FACILITY IN A SAFE CONDITION AND THE BASIS FOR THE SELECTION OF ANY INTERIM CONTROLS.

The canal irradiated fuel storage area bulkhead air-pillow seal was inflated at the time of discovery. There were also no in-progress heavy lifts. Therefore, the facility was in a safe condition and no actions were necessary at the time of discovery.

The leakage through the seals may be greater than assumed in the accident analyses. The canal configuration also does not allow for immediate in-place leak testing of applicable bulkheads or seals. Therefore, to ensure that facility operation remains within the safety basis analysis, no cask or heavy lifts with potential to cause a canal drain event are permitted. This includes heavy lifts in the canal area, at the canal transfer station, and the ATRC canal area (e.g., the security enhancement device). Lifts north of the canal, over the canal drains, are permitted with the canal drain covers installed.

G.L. Sharp	[signature]	6/25/08
Safety Analyst Print/Type Name	Safety Analyst Signature	Date
M.B. McNOUGH	M.B. McNough	6/20/08
Nuclear Facility Manager Print/Type Name	Nuclear Facility Manager Signature	Date

Is independent technical review required? Yes ☐ No ☒

M.B. McNough
Nuclear Facility Manager Signature or Initials

Independent Reviewer Print/Type Name	Independent Reviewer Signature	Date

III. USQ DETERMINATION

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Identify applicable section(s) of the safety basis document(s) (e.g., DSA, SAR, BIO, TSRs, etc.).

SAR-153 Chapters 3, 6, 9, 12, 15, and 16
TSR-186 Section 3.5.5

IIIa: POTENTIAL FOR AN INCREASE IN PROBABILITY OR CONSEQUENCE OF AN ACCIDENT OR MALFUNCTION EVALUATED IN THE SAFETY BASIS

1. Could the PISA increase probability of occurrence of an accident previously evaluated in the safety basis?
Yes ☐ No ☒
Explain:

Failure of a canal bulkhead seal to adequately control canal leakage (with or without the air seal pressurized) does not initiate a canal drain accident or challenge irradiated fuel storage conditions. Hence, there is no increase in the probability of occurrence of an accident previously evaluated in the safety basis.

2. Could the PISA increase the consequences of an accident previously evaluated in the safety basis?
Yes ☒ No ☐
Explain:

The canal bulkheads and seals (air seal and J-seal) are relied on in the accident analysis to maintain the canal water level above the fuel in the irradiated fuel storage area. Greater than assumed leakage through the seals could challenge the capability of the canal makeup systems resulting in damage to the stored fuel. Therefore, the PISA could increase the consequences of an accident previously evaluated in the safety basis.

3. Could the PISA increase the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the safety basis? Yes ☒ No ☐
Explain:

The PISA challenges the ability to perform the intended safety function, which is to minimized inventory loss from the canal irradiated fuel storage area in response to a canal drain event. The potential for the bulkhead seals to allow leakage in excess of the leakage assumed in the accident analysis represents an increase in the probability of occurrence of a malfunction of equipment important to safety.

4. Could the PISA increase the consequences of a malfunction of equipment important to safety previously evaluated in the safety basis? Yes ☒ No ☐
Explain:

The ATR safety basis concludes that fuel damage due to uncovering the stored irradiated fuel is not credible and, therefore, does not include an analysis for this event. The combination of the canal bulkheads (including the seals) and canal makeup system is relied on to ensure this condition. The potential failure of the bulkhead seals to adequately control leakage could result in fuel damage. Hence, there is a potential increase in the consequences of a malfunction of equipment important to safety.

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IIIb: POTENTIAL FOR CREATION OF AN UNANALYZED ACCIDENT OR MALFUNCTION OF A DIFFERENT TYPE

5. Could the PISA create the possibility of an accident of a different type than previously evaluated in the safety basis? Yes ☐ No ☒
Explain:

The bulkhead seal performance requirements are associated with canal drain accident sequences. The seal performance does not initiate any accident, or contribute to any unique accident type.

6. Could the PISA create the possibility of a malfunction of equipment important to safety of a different type than previously evaluated in the safety basis? Yes ☐ No ☒
Explain:

Bulkhead seal performance is considered in the safety basis. Failure of the seals to perform consistent with the safety basis assumptions does not represent a different type of failure that previously evaluated.

IIIc: POTENTIAL FOR REDUCTION IN A MARGIN OF SAFETY

7. Could the PISA reduce a margin of safety as defined in the safety basis? Yes ☒ No ☐
Explain:

The canal bulkheads and seals (air seal and J-seal) are relied on in the accident analysis to maintain the canal water level above the fuel in the irradiated fuel storage area. Greater than assumed leakage through the seals could challenge the capability of the canal makeup systems resulting in damage to the stored fuel. Therefore, the PISA could reduce the margin of safety.

IIId: USQ DETERMINATION CONCLUSION

8. Based on the responses to questions 1 – 7 above, does the PISA constitute an Unreviewed Safety Question?
Yes ☒ No ☐
Explain:

As discussed above, the PISA potentially increases the consequences of an accident evaluated in the safety basis, potentially increases the probability of a malfunction of equipment, potential increases the consequences of a malfunction of equipment, and potentially reduces the margin of safety with respect to the current safety basis. Therefore, the PISA constitutes an unreviewed safety question.

If "No," is a Safety Basis document revision required at next annual update? ☐ Yes ☐ No

NOTE: If USQ determination result is positive, additional notification for ORPS is required per LWP-9301.

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IV. APPROVAL/CONCURRENCE SIGNATURES

APPROVAL:

G. L. Sharp USQ Evaluator Print/Type Name	USQ Evaluator Signature	6/30/08 Date
M.B McDONOUGH Nuclear Facility Manager Print/Type Name	M. B. McDonough Nuclear Facility Manager Signature	6/30/08 Date

CONCURRENCE:

A. P. Hoskins Independent Review Committee Chair Print/Type Name	A P Hoskins Independent Review Committee Chair Signature	6-30-08 Date