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

Facility or Activity: Advanced Test Reactor

USQ Process No.: TRA-USQ-2004-214 Revision 1

Subject: ATR Seismic Safety Basis Deterioration

Describe the New Information/Discovery:

Recent review of long-term emergency firewater injection raw water supplies with regard to addressing final firewater modeling USQ resolution has prompted review of raw water inventories for response to seismic event loss-of-coolant accidents (LOCAs). The original seismic PRA was developed in the early 1990's and documented in the 1991 ATR probabilistic risk assessment (PRA). Relay chatter was included in the 1994 ATR PRA. The DOE Safety Evaluation Report (SER) from 1996 for the ATR Upgraded Final Safety Analysis Report identified unresolved comments regarding the status of seismic qualification. The subsequent addendum from February 20, 1998 for the first annual update addressed the open SER comments and concluded the outstanding seismic comments did not pose an unanalyzed condition for the facility because the seismic probabilistic risk assessment was considered to accurately describe the seismic risk for the facility and showed that the risk was acceptable.

The 1991 seismic PRA did not include the consideration of early failure of emergency flow or the consideration of small seismic-induced LOCAs. Draft interim seismic PRA models were developed for consideration of early failure of emergency flow in 1996, and for small seismic LOCAs in 1999.

An identified deficiency in the interim seismic PRA model is in regard to the assumption in the model that off-site commercial power could be recovered; a review of other seismic PRAs shows that other seismic PRAs do not assume that recovery of commercial power is possible. Inadequacies in the original seismic PRA model coupled with inadequate development of an interim seismic PRA including assumptions regarding recovery of off-site commercial power prior to exhausting above ground emergency makeup inventories are the subject of this Unreviewed Safety Question.

The current seismic safety basis for ATR rests on the maintenance of seismic risk at levels comparable to the seismic PRA results provided in the ATR UFSAR. The status of seismic PRA studies for ATR does not adequately support the safety basis.

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

I. PISA ASSESSMENT

a. Is there a potential inadequacy in the analytical methodology and/or tools used in the safety basis?
☐ Yes ☐ No

b. Is there a potential discrepancy between the safety basis assumptions, provisions, or conditions, in the accident analysis and the facility operation or parameters?
☐ Yes ☐ No

c. Is the actual physical condition of the facility different than as described in the safety basis (discrepant as-found condition)?
☐ Yes ☐ No

d. Has an actual or postulated operational event or incident revealed a potential inadequacy in the safety basis?
☐ Yes ☐ No

Provide an explanation of the assessment result:

Previously determined to be a positive screen per TRA-USQ-2004-214 (Revision 0).

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USQ Evaluator Print/Type Name	USQ Evaluator Signature	Date
	Original Screen Signed	10/14/04

Nuclear Facility Manager Print/Type Name	Nuclear Facility Manager Signature	Date
	Original Screen Signed	10/14/04

If the answer to ALL of the assessment questions above is No, file the completed form.

If the answer to any one of the assessment questions is Yes, there is a potentially inadequate safety analysis (PISA):

- Nuclear Facility Manager document actions (Section **II**), including interim operating restrictions, taken to place or maintain the facility in a safe condition.
- Nuclear Facility Manager execute reporting process per MCP-190, for PISA.
- USQ evaluator proceed to Section **III**.

II. DOCUMENT ACTIONS TAKEN TO PLACE OR MAINTAIN FACILITY IN A SAFE CONDITION

Prohibit power operation above 20 kW until further evaluation is completed to support power operations.

III. DETERMINATION

Identify applicable section(s) of the safety basis document(s) (i.e., SAR, BIO, TSRs, OSRs).

SAR-153 ATR Upgraded Final Safety Analysis Report, Executive Summary, and Chapters 15.6 and 15.16.

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:

   Seismic loss-of-coolant accident events are represented as design basis events in Chapter 15 of the ATR Upgraded Final Safety Analysis Report (UFSAR). Seismic PRA results from the 1991 ATR PRA (and 1994 update for relay chatter) represent residual risks and are summarized in the ATR UFSAR. When the seismic event includes primary coolant piping (PCS) leakage, mitigation of the fuel damage requires operation of the battery-backed emergency pump (M-11) and actuation of the emergency firewater injection system (EFIS). Adequate firewater flow delivery to the core given non-essential flow demands and potential seismically-induced flow demands may require two firewater pumps to operate. Firewater inventory may be depleted rapidly in less than 24 hours unless there is provision for restoring makeup from underground deepwells. Restoration of commercial power following a seismic event is required to support deepwell pump operation. The seismic PRA results from 1991 (and 1994) do not accurately reflect the facility seismic safety posture, and without restoration of commercial power prior to depleting above- ground emergency makeup inventories, the probability of seismically-induced fuel damage is increased.

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

Seismic loss-of-coolant accident events are represented as design basis events in Chapter 15 of the ATR Upgraded Final Safety Analysis Report (UFSAR). When the seismic event includes primary coolant piping (PCS) leakage, mitigation of the fuel damage requires operation of the battery-backed emergency pump (M-11) and actuation of the emergency firewater injection system (EFIS). Inadequate firewater flow delivery to the core would increase the consequences of the design basis seismic events.

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 probability of EFIS failure, initially or long-term, may be increased. The probability of deepwell pump failure or non-restoration of commercial power needed to operate deepwell pumps may be increased.

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 consequences of deepwell pump failure or non-restoration of commercial power needed to operate deepwell pumps may be increased.

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 PISA does not create the possibility of an accident of a different type, not previously evaluated in the safety basis.

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:

The PISA does not create the possibility of a malfunction of equipment important to safety of a different type than previously evaluated in the safety basis.

IIIc: POTENTIAL FOR REDUCTION IN A MARGIN OF SAFETY

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

   Inadequate EFIS flow, interruption of EFIS flow, or cessation of EFIS flow due to depletion of above-ground emergency makeup inventories would reduce the margin of safety needed to protect ATR fuel.

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:

   Review of raw water inventories for the firewater injection system for response to seismic event loss-of-coolant accidents (LOCAs) has identified a deficiency in the interim seismic PRA model in regard to the assumption in the model that off-site commercial power could be recovered; a review of other seismic PRAs shows that other seismic PRAs do not assume that recovery of commercial power is possible. Inadequacies in the original seismic PRA model coupled with inadequate development of an interim seismic PRA including assumptions regarding recovery of off-site commercial power prior to exhausting raw water above-ground emergency makeup inventories and firewater pump injection adequacy pose an Unreviewed Safety Question.

NOTE: If USQ determination result is positive, additional notification for ORPS is required per MCP-190.

IV. APPROVAL/CONCURRENCE SIGNATURES

APPROVAL:

T Thatcher USQ Evaluator Print/Type Name	T Thatcher USQ Evaluator Signature	10/14/04 Date
R.T. McCracken USQ Reveiwer Print/Type Name	R.T. McC USQ Reviewer Signature	10-14-04 Date
D.W. Sutherland Nuclear Facility Manager Print/Type Name	Sutherland Nuclear Facility Manager Signature	10/14/04 Date

CONCURRENCE:

Alan P Hoskins Independent Review Committee Chair Print/Type Name	Alan P Hoskins Independent Review Committee Chair Signature	10/14/04 Date

The following pages are the original USQ screen signatures.

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The current seismic safety basis for ATR rests on the maintenance of seismic risk at levels comparable to the seismic PRA results provided in the ATR UFSAR. The status of seismic PRA studies for ATR does not adequately support the safety basis.

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SAR-153 ATR Upgraded Final Safety Analysis Report, Executive Summary, and Chapters 15.6 and 15.16.

Applicable Technical References:

S. A. Atkinson to R. T. McCracken and J. E. Dwight, "Seismic Safety Authorization Basis Per UFSAR," Atki-03-98, March 25, 1998.

S. A. Eide, et al., Advanced Test Reactor Probabilistic Risk Assessment, Revision 1, EGG-PRP-8823, EG&G Idaho Inc., September 1991.

T. A. Thatcher et al., Update to the Advanced Test Reactor Probabilistic Risk Assessment (Level 1, 2 and 3) Including Shutdown Operations), EGG-PRP-11229, May 1994.

R. G. Lange (DOE NE-40) to R. V. Furstenau (DOE-ID), Approval of Advanced Test Reactor (ATR) Safety Analysis Report (SAR) Safety Evaluation Report Addendum, February 20, 1998, with attached Approval Authorization and SER Addendum.

PLN-588, TRA NPH Assessment Plan, January 29, 2004.

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☐ Yes ☒ No

d. Has an actual or postulated operational event or incident revealed a potential inadequacy in the safety basis?
☐ Yes ☒ No

Provide an explanation of the assessment result:

The current seismic safety basis for ATR rests on the maintenance of seismic risk at levels comparable to the seismic PRA results provided in the ATR UFSAR. The status of seismic PRA studies for ATR does not adequately support the safety basis.

T Thatcher	T Thatcher RRM 10-14-04	10/14/04
USQ Evaluator Print/Type Name	USQ Evaluator Signature	Date
D.W. Suthers	[signature]	10/14/04
Nuclear Facility Manager Print/Type Name	Nuclear Facility Manager Signature	Date

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