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-2008-614

Subject: LEP Seismic Assessment Preliminary Findings on the Primary Coolant System

Describe the New Information/Discovery:
A preliminary result of the ongoing update of the seismic qualification of PCS piping is that, when new hazard definitions and standards of analysis are applied, certain pipe supports do not satisfy the current ASME Section III criteria for the site specific design basis earthquake. The final number of affected supports is not yet known, but is expected to be in the range of three to seven. These supports would require physical strengthening before the PCS as a whole can be considered seismically qualified for the envisioned definition of the safe shutdown earthquake, which is based upon the site-specific probabilistic seismic hazard.

SAR-153 states that the PCS piping satisfies the intent of ASME Section III rules for seismic design of Class 1 piping, as of 1979.
Identify the applicable safety basis document(s) (e. g., DSA, SAR, BIO, TSRs, etc.):
SAR-153 Chapters 3, 5, and 15.6.

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.

Background:
The existing seismic analysis of the PCS was conducted according to ASME Section III, Class 1, 1973 edition rules and was based upon Housner-style response spectrum input. This analysis concluded that the PCS satisfied the intent of the ASME code, and is mentioned several times in SAR-153.

The ATR Life Extension Program (LEP) Seismic Assessment Project is currently conducting a seismic analysis of the PCS according to DOE-STD-1020, using ASME Section III Class 1, 2007 rules and the previously completed probabilistic soil-structure interaction (PSSI) analysis of TRA-670 as input. This PSSI analysis is in turn based upon the site-specific probabilistic design basis earthquake (DBE). The effect of updates in the seismic hazard and piping analysis standards has been a significant increase in the spectral peaks of the input motions, and additional technical rigor of the analysis approach. The preliminary conclusions of the new analysis indicate that several pipe supports will require strengthening in order to satisfy current codes and standards for the new and higher probabilistic DBE.

The PCS was also evaluated during experience-based walkdowns performed in 1989 to establish fragility parameters for input to the seismic Probabilistic Risk Assessment (PRA). The walkdown team concluded that the PCS piping system was seismically robust, such that seismically-induced failure of the PCS pressure boundary is a very low probability risk, below a defined screening level (median capacity > 2.0g). This conclusion was based upon expert judgment representing the state of knowledge of the seismic engineering community at the time. A large factor in this judgment was the earthquake experience data indicating that welded steel piping systems were seismically robust in general (EGG-PRP-8823 Appendix O).

Supported by the seismic fragility evaluations performed for the PRA walkdowns, the PCS pressure boundary was judged to have an insignificant probability of failure during a design basis earthquake. Applying the quantitative and qualitative results of the seismic PRA, various LOCA event sequence probabilities were defined as either condition 2, 3, 4, or beyond design basis (SAR-153-15.6).

No new walkdowns have been performed since 1989 for the purpose of experience-based seismic qualification of the PCS piping. No new effort has been undertaken to update the fragility parameters assigned to the PCS piping as part of the 1989 PRA effort. Therefore, there is no new information regarding the fragility determinations of the 1989 walkdowns.

Issue:
The potential discrepancy is that there is a pending analysis concluding that certain PCS piping supports do not comply with

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current seismic codes and standards. However, SAR-153 states that the PCS piping complies with seismic codes and standards as of 1979, and assigns low probabilities to accidents involving significant seismic damage to the PCS.

Evaluation:
SAR-153 currently recognizes the fact that the seismic hazard assessment for ATR has been updated since the PCS was analyzed to the ASME code by Davidson in 1979 (SAR-153-3.1.1.2.2). It further recognizes that codes and standards governing seismic evaluation of mechanical systems have evolved, and that the effect of these changes is a net increase in seismic demand estimates (SAR-153 Figures 3.7-1 thru 3.7-4). To evaluate the risk associated with seismic category 1 SSCs which either lack a seismic evaluation, or for which the existing seismic evaluation is dated, the SAR generally invokes the seismic PRA (SAR-153-3.1.1.2.2). Specifically for component supports including supports of PCS piping, the SAR points to the high fragility estimates of 1989 as presented in SAR-153 Chapter 3 Table 3.9-11. These fragility estimates are based upon expert walkdowns and experience data, and were not based upon the existing ASME code-based seismic analysis of the PCS (EGG-PRP-8823 Appendix O). Therefore, updates to the ASME codes or other piping analysis procedures do not affect the fragility estimates.

SAR-153 Table 5.2.1.1 lists ASA B31.1-1955 as the only design code applicable to the PCS. The standard applied during the original design analysis was taken from the then current Uniform Building Code. None of the numerous evaluations and assessments completed subsequent to original design addresses the compliance of the PCS piping system with the applicable design code. Rather, these efforts all stem from various programs which contemplated seismic upgrades.

The pending new analysis does not affect the seismic PRA that is the basis for the quantification of risk presented in the current SAR. It does not affect the basis for the assignment of LOCA accident frequencies in the current SAR, and it does not affect compliance with the applicable PCS design code. The conclusions of the pending analysis are not inconsistent with any statement in the current SAR. Therefore, it is not reasonable that these new results could have the potential to become an inadequacy in the existing safety analysis.

J. C. Chapman USQ Evaluator Print/Type Name M. B. McDonald	J C Chapman USQ Evaluator Signature	8/21/08 Date
M. B. McDonald 8/21/08 Nuclear Facility Manager Print/Type Name	M. B. McDonald Nuclear Facility Manager Signature	8/21/08 Date

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

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.

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.