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

Facility or Activity: NMIS

USQ Process No.: RTC-USQ-2007-582

Subject: ETR Stack Drop Analysis

Describe the New Information/Discovery:

The analysis for the stack drop done in EDF-5715, "Ground Shock Estimations for the Explosive Demolition of the ETR Waste Gas Stack" applied inappropriate frequencies for the calculation of PPV for the NMIS facility. It also did not apply a PPV to the damage criteria for the ground motion from the impact of the stack topple to the facility.

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

SAR-154, "Safety Analysis Report for the Nuclear Materials Inspection and Storage Facility"
TSR-154, "Nuclear Material Inspection and Storage Facility (NMIS) TRA-621"

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.

The evaluation in EDF-5715 considered two aspects of the ETR stack drop. First aspect was the consequences of the shock wave from the explosion of the charges used to topple the stack. There are no issues with this portion of the analysis. The second aspect was the consequence of the ground motion from the impact of the stack when toppled. The analysis approach was to determine a PPV that corresponded to the ATR seismic trigger level [0.01 g] that would shut down the reactor due to an earthquake. This is the same criterion [ATR seismic trip at 0.01 g] that is used at NMIS to determine the necessity of complying with TSR inspection requirements of safety significant equipment after an earthquake. The ATR based PPVs calculated in the analysis indicate that the seismic trip at ATR will initiate at PPVs of 0.25 inches/second or below. However it does not simultaneously indicate that the trip will occur prior to reaching a PPV of 0.25 inches/second at NMIS. The ATR PPVs were calculated assuming a frequency of 2.5 Hertz. They were calculated for the three distances listed below.

Distance from the ETR stack [feet]	*PPV [inches/second]*
60	*1*
225	*0.5*
660	*0.25*

The NMIS facility is approximately 458 feet from the stack and using the same frequency a corresponding PPV can be extrapolated as 0.295 inches/second. To calculate the PPV for the NMIS facility a frequency based on the building structure or soil characteristics would have been more appropriate. Using the frequency for the area soil characteristics [12 Hertz] a NMIS PPV of 0.051 inches/second results. The PPV value corresponding to NMIS should have been calculated and compared to building damage criteria in applicable sources such as the following documents:

- *MIL-HDBK-1007/3, Department Of Defense, Handbook Soil Dynamics and Special Design Aspects, 15 November 1997.*
- *Sedovic, Bulletin of the Association for Preservation Technology, Vol. 16, No. 3 / 4, National Park Service (1984), pp. 52-61, "Assessing the Effect of Vibrations on Historic Buildings."*
- *Mayne, Paul W., "Ground Vibrations During Dynamic Compaction," Vibration Problems in Geotechnical Engineering, Proceedings of a Symposium by the Geotechnical Engineering Div. in conjunction with the ASCE Convention in Detroit, Mich., Oct. 22, 1985, ASCE, 0-87262-492-7, 1985*

From these documents it can be determined that a predicted PPV below 0.25 inches/second indicates that building damage will not occur from ground motion due to the impact of the stack topple. EDF-5715 did not make this comparison when calculating the PPV corresponding with the ATR seismic trip. The NMIS extrapolated value of 0.295 inches/second using the ATR frequency does not meet the damage criteria of 0.25 inches/second. However EDF-5715 also states that measurements of similar stack drops have indicated that predicted values are 50%

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greater than actual values giving a predicted value of 0.148 inches/second for NMIS. This is verified by the measured values of the ETR stack drop listed in VDR 114029, CDI-#1-05-903, "TRA 753 Exhaust Stack Demolition / #24880-111637," Controlled Demolition Inc., 2737 Merryman's Mill Road, Maryland, March 30, 2005. At 437 feet the measured PPV value was 0.135 inches/second. Although not demonstrated in the original EDF this information indicates that a predicted PPV value for NMIS would have indicated that no damage would have occurred prior to the ATR seismic trip. The modified extrapolated value, the measured value and the value using the soil frequency are all less than 0.25 inches/second PPV. It can be concluded that there is no PISA even though the original analysis was limited by not extending the discussion further to demonstrate the full impact on the NMIS facility.

C. Satterwhite		August 8, 2007
USQ Evaluator Print/Type Name	USQ Evaluator Signature	Date
M. Heberling		8-13-07
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.

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.

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

Safety Analyst Print/Type Name	Safety Analyst Signature	Date
Nuclear Facility Manager Print/Type Name	Nuclear Facility Manager Signature	Date

Is independent technical review required? Yes ☐ No ☐

Nuclear Facility Manager Signature or Initials

Independent Reviewer Print/Type Name	Independent Reviewer Signature	Date

III. USQ DETERMINATION

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