

**Proposed Alternative in accordance with 10 CFR 50.55a (z)(2) -  
Complying with Requirement Would Result in Hardship or Unusual Difficulty Without a  
Compensating Increase in the Level of Quality and Safety**

**1. ASME Code Component Affected:**

- Component: Containment Liner
- Description: Instrument Tunnel Sump (Incore Pit) Liner
- Component Number: SUMPLF07DRWIT

**2. Applicable Code Edition and Addenda:**

ASME Boiler and Pressure Vessel Code, Section XI, *Rules for Inservice Inspection of Nuclear Power Plant Components*, 2007 Edition through 2008 Addenda.

**3. Applicable Code Requirement:**

IWA-4422, *Defect Evaluation and Examination*

IWA-4422.2.2, *Defect Removal Followed by Welding or Brazing*, paragraph (a) states the following:

Surface examination of the defect removal area is required prior to welding, except as provided below.

- (1) A surface examination is not required when the defect is eliminated by removing the full cross-section of the weld or base material.
- (2) When surface examination of the excavation cannot be performed or will not provide meaningful results, surface examination of the excavation is not required. The acceptability of any remaining portion of the defect may be established by evaluation in accordance with IWA-4422.1(b) in lieu of the surface examination. Alternative NDE methods may be used to characterize any remaining portion of the defect.
- (3) If final volumetric examination will be performed on the completed repair, the final volumetric examination method is the same as the method used to detect the defect, and the volume to be examined includes the location of the original defect, surface examination of the defect removal area is not required.

**4. Reason for Request:**

Pursuant to 10 CFR 50.55a, "Codes and standards," paragraph (z)(2), an alternative to the Section XI, IWA-4422.2.2(a) surface examination requirement is proposed. The basis of the request is that complying with the IWA-4422.2.2(a) requirement would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

On October 20, 2023, during Callaway's refueling outage (RFO), inservice inspection (ISI) on the Instrument Tunnel Sump (Incore Pit) was performed (Reference 1) in accordance with Callaway's Containment Pressure Boundary ISI Program procedure (Reference 2). During this inspection, Quality Control (QC) inspectors identified localized pits on the liner plate wall and floor. This condition was

captured in Callaway's Corrective Action Program (Reference 3) and a job package was generated to repair the identified pits (Reference 4). Excavation was performed to get all indications (i.e., corroded, pitted, and eroded areas) to smooth base metal. Subsequently, a pre-weld visual examination of the defect removal areas was performed. However, a IWA-4422.2.2(a) pre-weld surface examination of the defect removal area was not performed before the start of weld repairs on the liner. This condition was not identified until the conduct of an internal audit in the Fall of 2024. (Reference 5).

In accordance with IWA-4422.2.2(a), Callaway is required to perform a pre-weld surface examination per IWA-4422.2.2(a) prior to welding repairs. To restore compliance with IWA-4422.2.2(a), Callaway must perform the missed pre-weld surface examinations on the Instrument Tunnel Sump liner defect removal areas which would require an unplanned plant shut down, re-excavation of the the base metal repairs (BMRs), perform the missed pre-weld surface exams, and complete new BMRs and post-weld exams and tests on the liner. This relief request is proposing to postpone a plant shutdown until Callaway's next scheduled RFO in the Spring of 2025, and perform ultrasound tests (UTs), in lieu of BMR rework and pre-weld surface exams, on the Instrument Tunnel Sump liner welds that were completed in the Fall of 2023.

The technical justification for the proposed alternative is discussed in the next section of this relief request.

## **5. Propose Alternative and Basis for Use:**

As an alternative, Ameren Missouri proposes performing UTs on the welds completed in the Fall of 2023 on the Instrument Tunnel Sump liner during Callaway's next scheduled RFO in the Spring of 2025. This alternative would be done in lieu of the surface examination requirements prescribed in subparagraph IWA-4422.2.2(a). The basis for the proposed alternative is that the activities necessary to restore compliance with IWA-4422.2.2(a) (i.e., unplanned shutdown, BMR re-excavation, pre- and post-weld exams) would result in hardship or unusual difficulty without a compensating level of quality or safety.

### Justification:

#### A. Instrument Tunnel Sump Design Information

The Instrument Tunnel Sump is a collection point for reactor coolant leakage in containment and is open to containment atmospheric pressure and temperature. Sump level instrumentation is capable of detecting reactor coolant system leakage. The minimum detectable change in level is 25 gpm.

The liner plate of the Instrument Tunnel Sump is ASME Section XI, Class MC (IWE), ¼" thick Carbon Steel (SA-285). As a containment liner, the primary function of the Instrument Tunnel Sump liner plate is to ensure that the containment structure is leak tight. Behind the containment liner is the post-tensioned concrete containment structure. The concrete structure supports all structural loads, and no credit is taken for the liner for the pressure design of the containment structure.

Due to the post-tensioning of the concrete containment structure, the liner plate is under compression. As such, if no concrete voids exist behind the liner plate, the liner is able to perform its leak tight design function with only a few mils of thickness due to the strain of the liner being directly related to the strain in the concrete structure. In particular, the Instrument Tunnel Sump liner is located on the base slab of the containment concrete structure which is several feet thick. This section of the liner is not in an area where tight rebar lattices exist that might hinder the placement of concrete which could result in small voids in the containment structure.

It is noted, however, that Callaway calculated the minimum wall thickness required for the containment liner for conditions of generalized and localized thinning by conservatively assuming different size voids in the concrete containment structure immediately behind the liner plate (Reference 6). This calculation concluded that a liner wall thickness of 1/8" (or 0.125") is allowed conservatively assuming a localized defect or wall thinning of less than 5" in diameter (i.e., assuming a 5" diameter concrete void behind the liner plate).

#### B. Instrument Tunnel Sump Liner Inspection and Examinations

During the IWE inspection of the Instrument Tunnel Sump liner in the Fall of 2023, QC inspectors identified (25) twenty-five localized pits on the liner wall and floor. Using a pit-gauge, the measurements of the pits ranged from 0.0625" to 0.1875" in depth and 0.250" to 1.125" in diameter (Reference 7). The minimum wall criterion of 1/8" was not met for (23) twenty-three of these localized pits. This condition was captured in Callaway's Corrective Action Program (Reference 3), and a job package was generated to repair the pits (Reference 4).

Excavation on the defects (i.e., pitting from corrosion) was performed to get all indications to base metal so that all corroded, pitted, and eroded areas were removed. A pit depth gage was utilized before and after excavation, and each pit was confirmed to be less than 5" in diameter. Pre-weld visual examinations of the defect removal areas were performed after excavation. These examinations verified that all excavations were to base metal with no through-wall pitting observed. These examinations provided reasonable assurance that no unidentified flaws were left prior to performing the weld build-up. Engineering personnel also performed a sound check in and around the identified localized pits and did not detect any hollow cavities behind the liner, based on the low-frequency sounds produced and lack of high pitch echoing.

The BMRs on the liner plate were completed by qualified welders and the weld filler material used was in accordance with Callaway's welding program procedure (Reference 8). Following the BMRs, QC inspectors performed visual (VT-1) and magnetic particle (MT) surface examinations per QC examination procedures (Reference 9 and 10). These post-weld examinations provided evidence that there were no surface flaws around any of the weld build-up locations and that the surface of the liner is intact (defect free). With the satisfactory completion of the post-weld VT-1 and MT examinations, there is reasonable assurance that the containment liner plate is intact and able to perform its leak tight function.

#### C. Hardship or Unusual Difficulty

To restore compliance with ASME Section XI, IWE-4422.2.2(a) and perform the pre-weld surface examination on the Instrument Tunnel Sump pits identified in the Fall of 2023, Callaway would first be required to shut down the plant. In particular, Callaway would need to shut down the plant to at least MODE 5, Cold Shutdown, to remove reactor vessel incore instrumentation to access the Instrument Tunnel Sump. Thus, restoring compliance with IWE-4422.2.2(a) would first necessitate an unplanned shutdown.

In general, a plant shut down is complex in nature and involves a significant amount of time to schedule, plan, and execute. Accordingly, executing an unplanned shutdown involves greater risks to plant personnel and equipment. Elevated risks include a higher potential for human performance errors, plant transients (i.e., reactivity, pressure, temperature), and risk management challenges, potentially resulting in challenges to plant and personnel safety.

Secondly, to restore compliance with IWE-4422.2.2(a), the BMRs completed in the Fall of 2023 on the liner require re-excavation. However, re-excavation introduces the risk of creating new weld defects, causing further damage to the liner, and removing additional liner material.

In conclusion, performing UTs on the BMRs completed in the Fall of 2023 on the Instrument Tunnel Sump liner during Callaway's next scheduled RFO in the Spring of 2025 will provide reasonable assurance that no defects exist at the liner weld repair locations. This proposed alternative would be done in lieu of the surface examination requirements prescribed in subparagraph IWA-4422.2.2(a). Further, activities necessary to immediately restore compliance with IWA-4422.2.2(a) (i.e., unplanned shutdown, BMRs re-excavation, and pre- and post-weld exams) would result in hardship or unusual difficulty without a compensating level of quality or safety. Finally, re-excavation of the BMRs on the Instrument Tunnel Sump liner and pre-weld surface examinations would only be performed if the UT results on the BMRs indicate a need for such action as determined by the requirements of IWE-5250, *Corrective Action*.

#### **6. Duration of Proposed Alternative:**

The relief request will remain in effect until Callaway's end of plant life or until such a time when base metal repairs on the Instrument Tunnel Sump liner are needed at the previously repaired locations.

#### **7. References:**

1. Job 20513454.000, "Containment Pressure Boundary Inspection of Incore Sump"
2. ESP-ZZ-01016, "ASME Section XI IWE Containment Pressure Boundary Inspection"
3. CR 202307749, "IWE Zone 31 Incore Tunnel Sump (SUMPLF07DRWIT) Inspection Results"
4. Job 20003148.496, "Base Metal Weld Repair of Sump Liner"
5. CR 202406120, " Job 20003148.496 Contains Multiple Instances of Non-Compliance with APA-ZZ-00662 and ASME Section XI"
6. Calculation ZZ-475, "Evaluate the Minimum Wall Thickness of the Containment Liner Required to for Conditions of Generalized and Localized Thinning"
7. Job 20513454.500, "General Visual Inspection Report"
8. APA-ZZ-00661, "Administration of Welding"
9. QCP-ZZ-05040, "Visual Examination to ASME VT-1"
10. QCP-ZZ-05010, "Magnetic Particle Examination"