NRC Pre-Submittal Call

Relief Request:
RVCH Penetration #74 Repair Long-Term Operation

Catawba Nuclear Station Unit 2

December 7, 2021

Agenda

- Introductions
- Objective and Scope
- Background
- Site-Specific Fracture Mechanics Analysis
- In-Service Inspection Plan for Repair
- Proposed Relief Request
- Timeline

Introductions

- Duke Energy – Corporate Regulatory Affairs
  - Chet Sigmon, Lee Grzeck (Manager)
- Duke Energy – Corporate Programs Engineering
  - Mark Honeycutt, Scott Karriker (Manager)
- Westinghouse Engineering
  - Anees Udyawar, Steve Marlette, Maria Rizzilli, Geoffrey Loy, Stephen Feder
- Westinghouse/PCI Welding
  - Jason Pulliam, David Burton

Objective and Scope

- Objective:
  - To present Duke Energy's need for relief for continued operation of Catawba Unit 2 beyond Cycle 25 with the repair that was implemented in Spring 2021 due to a relevant indication on penetration #74 of the Reactor Vessel Closure Head (RVCH) without defect removal per ASME Section XI requirements

- Scope:
  - Duke proposes use of the RVCH penetration #74 embedded flaw repair (EFR) through the remaining licensed plant life as an alternative to the defect removal and weld repair provisions of the ASME code

Background

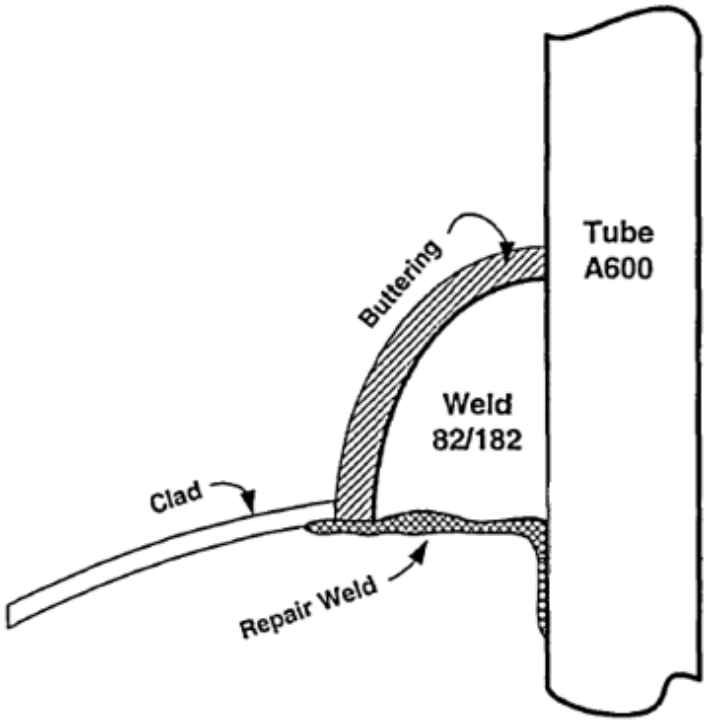
C2R24 Penetration #74 Relevant Indication

- During refueling outage C2R24 (April 2021), the Catawba 2 RVCH was volumetrically examined in accordance with 10 CFR 50.55a(g)(6)(ii)(D) and ASME Code Case N-729-6, Item B4.20, including a volumetric (UT) leak path assessment examination
- UT leak path assessment on penetration #74 revealed a change in back-wall reflectivity from prior assessments in 2007 and 2013
- Bare metal visual examination was performed on the head and identified no head penetration leakage
- Eddy current test (ECT) and liquid penetrant test (PT) surface examinations confirmed a relevant surface-connected indication in the j-groove weld on the low hill side of penetration #74

Background

C2R24 Penetration #74 Repair

- During C2R24, the j-groove weld of penetration #74 was repaired using the embedded flaw repair process described in WCAP-15987-P-A to seal off the flaw from the Reactor Coolant System (RCS) environment
- Repair is an alternative to the defect removal and weld repair provisions of ASME Section XI
- The defect remains in the j-groove weld, but is isolated from the primary water environment thus no longer susceptible to primary water stress corrosion cracking (PWSCC)
- Post-repair UT and surface NDE was performed in C2R24



Background

C2R24 One-cycle Relief Request

- Relief request RA-21-0145 {ML21114A000} was submitted to support plant startup and allow one cycle of operation with the penetration #74 repair
- RA-21-0145 stated a site-specific fracture mechanics analysis will be performed during cycle 25 to justify a longer period of operation for the repair, in which additional relief will be requested
- Verbal authorization of RA-21-0145 was provided on April 24, 2021 {ML21117A129} and the associated Safety Evaluation was issued on September 20, 2021 {ML21253A082}
- A relief request is being developed which will propose long-term operation with the penetration #74 repair as justified by a site-specific fracture mechanics analysis

Site-Specific Fracture Mechanics Analysis

- The site-specific fracture mechanics analyses performed encompass cracking in any penetration in the Catawba 2 RVCH
- Analysis for cracking in an attachment J-groove weld repaired by the EFR process considers a planar flaw which encompasses the entire J-groove weld
- Analysis postulates fatigue crack growth through the RVCH as well as through the repair weld to determine how long it would take to reach an unacceptable size
- Thickness of the repair weld layer is conservatively assumed to be less than nominal thickness for additional analytical margin and for allowance of potential removal of surface indications from PT examinations
- Fracture mechanics analysis results demonstrate acceptability beyond current licensed plant life

In-Service Inspection Plan

- Proposed ISI of the repair will ensure the penetration nozzle will continue to perform its required function
- UT of the penetration #74 nozzle will be performed during outage C2R25 (Fall 2022)
  - Subsequent UT inspection frequency will thereafter be in accordance with 10 CFR 50.55a(g)(6)(ii)(D), which requires implementation of Code Case N-729-6 with conditions, or NRC-approved alternative
- Surface examination of the repair will be performed during C2R25 (Fall 2022) and C2R26 (Spring 2024)
  - Once surface examination results are verified to be acceptable for two consecutive cycles after original installation or repair of the EFR, reinspection frequency will be every other cycle

Proposed Relief Request

- Proposed relief is specific to penetration #74
- Relief request will allow continued operation for Catawba 2 beyond cycle 25 with the RVCH penetration #74 repair
- Proposed duration of relief is the remainder of the Catawba 2 licensed plant life through the current period of extended operation which ends on December 5, 2043
- Plant-specific fracture mechanics analysis will provide justification that the proposed duration of relief is bounded by the service life of the repair

Timeline

- Penetration #74 repair is currently approved through cycle 25, which ends September 10, 2022
- Proposed relief request for long-term operation to be submitted by January 13, 2022
- Duke Energy will be seeking approval of the proposed relief request no later than September 10, 2022