




Duke Energy Pre-Submittal Meeting – April 14, 2021

Oconee Alloy 600 PWSCC Mitigation Acceptance Criteria

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Participants

- Dave Peltola, Engineering – Duke Energy
- Steve Roe, Engineering – Duke Energy
- Art Zaremba, Fleet Licensing Manager – Duke Energy
- Josh Duc, Fleet Licensing – Duke Energy
- Jim Axline – Structural Integrity
- Chris Lohse – Structural Integrity

Objectives for This Meeting:

- Brief NRC on Duke's reason for proposed request, proposed alternative, basis for use, and proposed timeline
- Ensure common understanding for Duke Energy's request and technical scope
- Obtain NRC feedback prior to formal submittal

Agenda

I. Reason for Request
II. Components Affected
III. ASME Code and Regulatory Requirements
IV. Proposed Alternative
V. Basis for Relief
VI. Precedents
VII. Conclusion

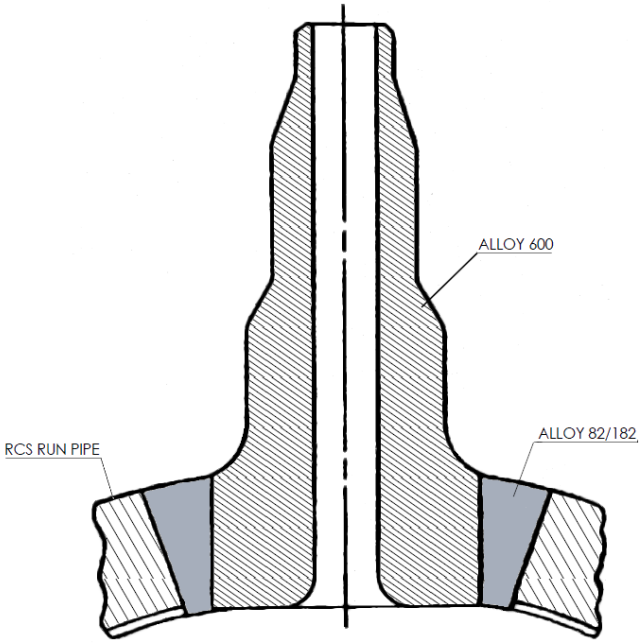
I. Reason for Request

- CC N-853 requires volumetric ultrasonic examination in accordance with Construction Code or ASME Section III, with NB-5330 acceptance criteria.

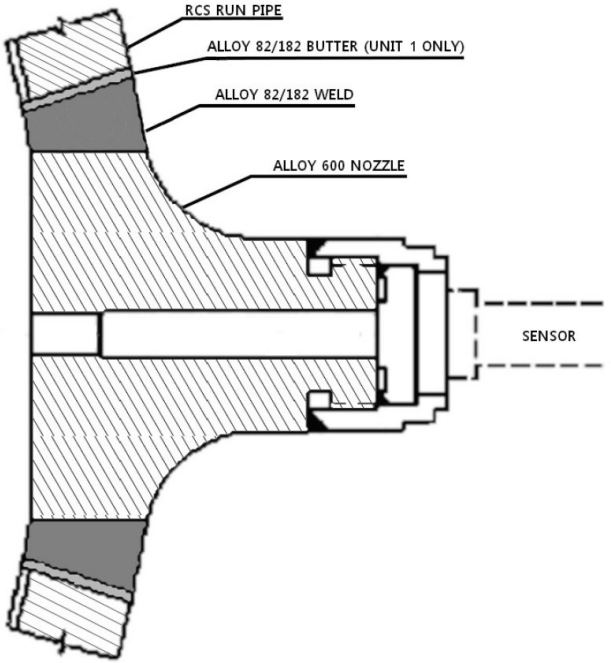
- ASME Section XI, IWB-3514 acceptance criteria is proposed in lieu of the NB-5330 acceptance criteria.

- Components Affected:
  - Reactor coolant system (RCS) hot/cold leg nozzles
    - Piping Nozzles (Unit 3 ONLY)
    - Resistance Temperature Element (RTE) Nozzles (All 3 Units)
  - Susceptible to primary water stress corrosion cracking (PWSCC)
    - Alloy 600 nozzles, Alloy 82/182 welds
  - Preemptive PWSCC mitigation via reinforcing pad and replacement nozzle in accordance with CC N-853

II. Components Affected

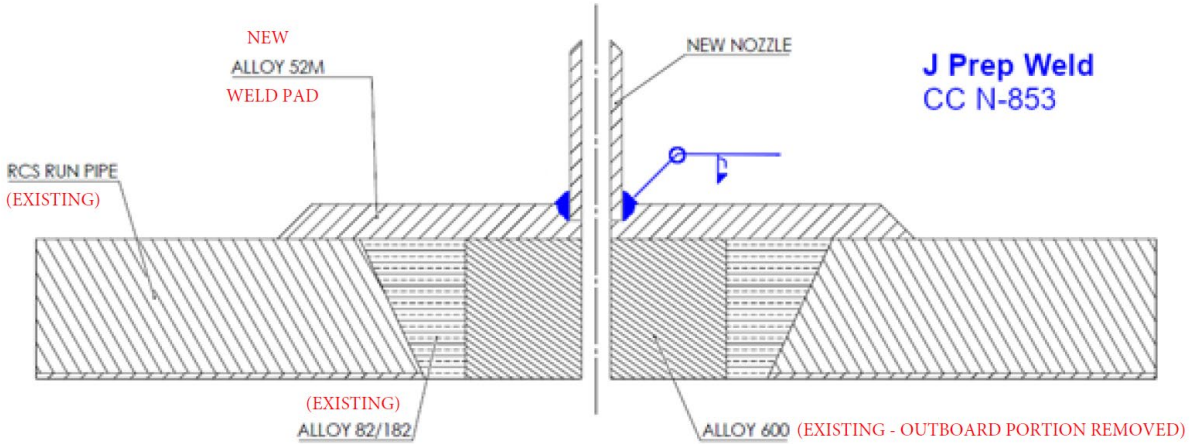


Sketch of Example Existing Nozzle Configuration



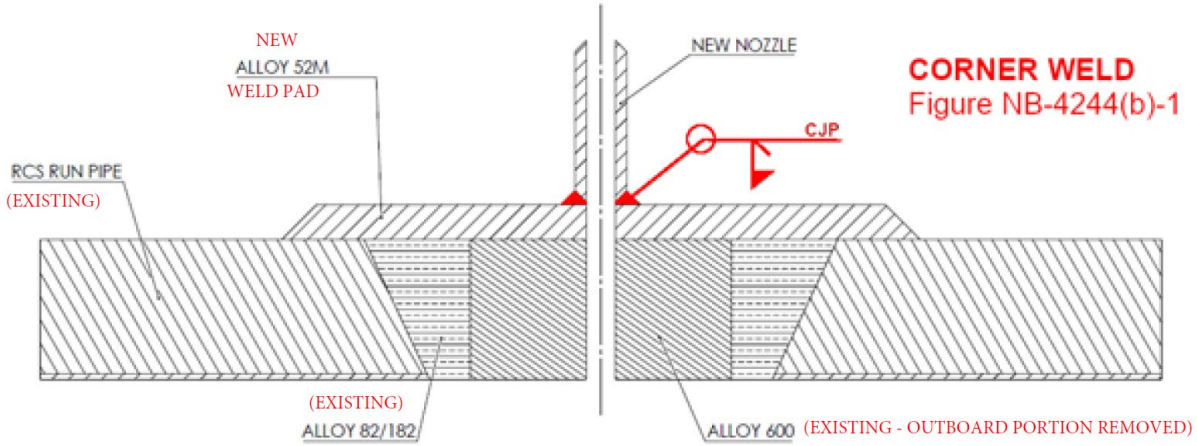
Sketch of Example Existing Fast RTE Nozzle Configuration

II. Components Affected



Sketch of Example Repaired Nozzle Configuration with Code Case N-853 J Groove Weld

II. Components Affected



Sketch of Example Repaired Nozzle Configuration with Alternative (Previously Approved) Full Penetration Corner Weld

III. ASME Code Edition and Requirements

- ASME Section XI Code of Record is the 2007 Edition with 2008 Addenda
- Fifth 10-year inspection interval ending July 15, 2024
- ASME Section XI, Code Case (CC) N-722-1
- ASME Section XI, CC N-853
  - NRC approval for ONS February 26, 2020 (ML20055F571)

IV. Proposed Alternative

- RCS nozzle / weld PWSCC mitigation per CC N-853
- CC N-853 requires volumetric ultrasonic examination in accordance with Construction Code or ASME Section III, with NB-5330 acceptance criteria which, similar to the radiographic acceptance standards, allows for no indications (cracks, lack of fusion, or incomplete penetration).
- **ASME Section XI, IWB-3514 acceptance criteria is proposed in lieu of NB-5330**, as it is based on ultrasonic examination which will avoid potential outage re-work that provides no safety or quality benefit
- Duration of Alternative
  - Implementation allowed for the remainder of the current interval
  - Once implemented, physical repair duration is for the life of each Unit

V. Basis for Relief

- Alternative provides acceptable level of quality and safety - 10 CFR 50.55a(z)(1)
  - NB-5330 acceptance criteria is similar to the radiographic examination criteria and would reject many flaws that are not significant to the weld pad structural integrity
  - IWB-3514 has been used since the 1980s for inspecting planar flaws in IWB-2500 inspected components with a good service history
  - Other welded repairs already allow the use of IWB-3514 examination criteria
  - Correction of rejected flaw would require
    - Remove portion of pad, reweld and reexamine
    - Removal/rewelding significantly alters residual stress field, potentially producing less optimal stress field for arresting PWSCC crack growth
  - Correcting a NB-5330 structurally insignificant flaw would detrimentally impact the pad stress field used to protect the pressure boundary
  - Avoids unnecessary risk to personnel safety during outage (dose, injuries, etc.)

VI. Precedents

- The weld pads are similar to Full Structural Weld Overlays (FSWOs), used to mitigate stress corrosion cracking in dissimilar metal piping butt welds
  - Both the FSWOs and the CC N-853 weld pads are deposited using 52M weld wire and the Gas Tungsten Arc Welding (GTAW) weld process.
  - The material and weld process for both applications are subjected to the same potential fabrication issues
  - Pre-service examination of FSWOs at ONS used IWB-3514 from 2006 – 2010

- Oconee FSWOs (RR ML062430314, SER ML071280781)
  - Approved acceptance criteria of ASME Code, Section XI, Code Case N-504-2 and Nonmandatory Appendix Q in lieu of those of NB-5330 of ASME Code, Section III
  - Discusses in detail the concerns with utilizing ASME Code, Section III acceptance criteria based on radiography

VII. Conclusion

- For the reasons discussed in this presentation, Duke Energy believes that the proposed alternative provides an acceptable level of quality and safety.
- Duke Energy plans to submit no later than May 2021.
- Upcoming Fall 2021 and Spring 2022 outages could benefit by use of this relief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