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Rachel Doss– Core Barrel Focus Group Update

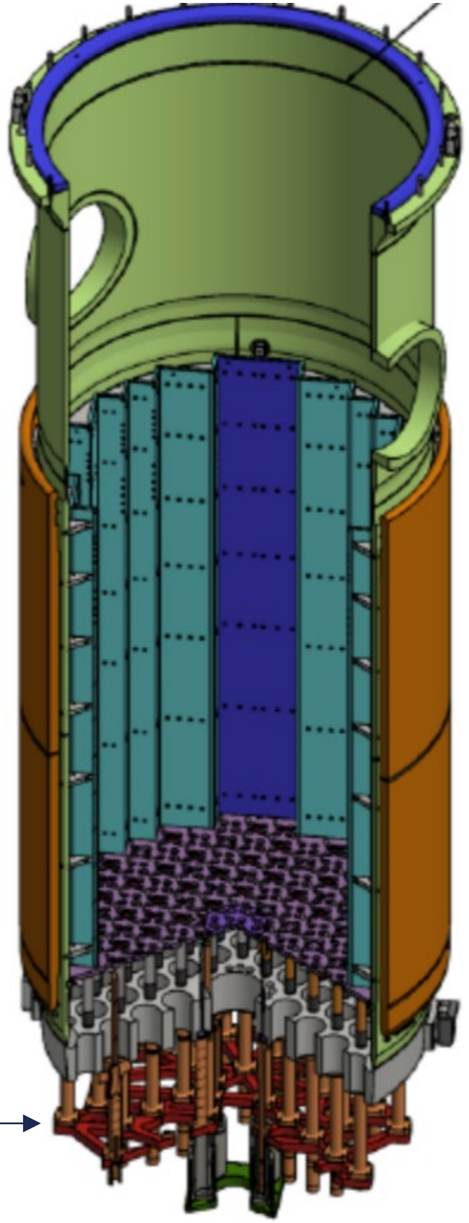
Industry/NRC Materials Technical Exchange Meeting 6/15/23

Agenda

- Background: OE and MRP-227
- Core Barrel Focus Group
- Interim Guidance
- Next Steps
- Swim Lanes

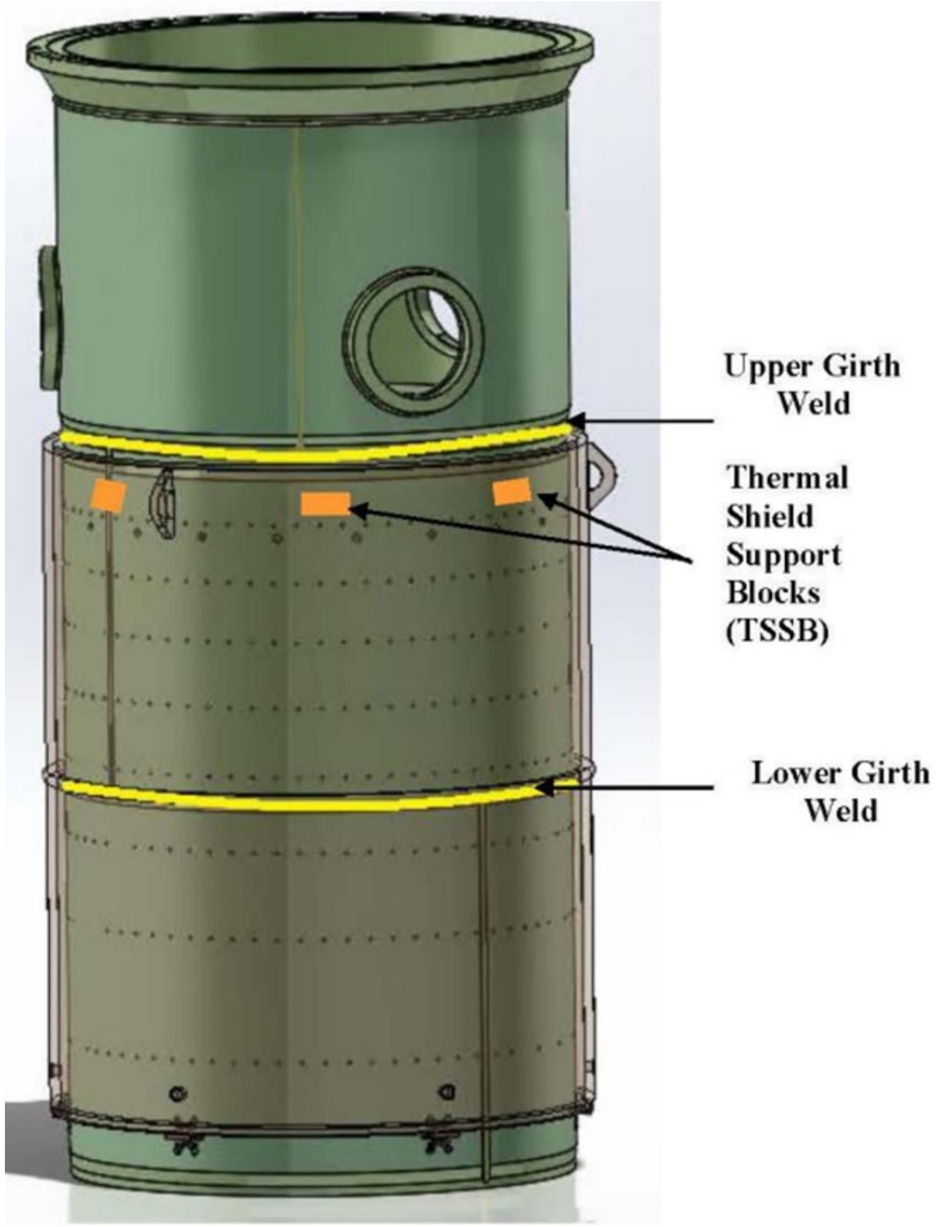
Background

- The primary function of the core barrel is to support the core
  - It also directs coolant through the fuel
- In the event of failure of a circumferential weld and a complete separation of the core barrel, a secondary core support structure is in place to protect the core and to ensure that the plant can be brought to a safe shutdown
  - Downward movement of the lower portion of the core barrel is limited to ensure continued engagement of the fuel alignment pins with the fuel as well as engagement of the control rods within the fuel
  - The lower radial keys maintain alignment of the lower portion of the core barrel with the top portion to ensure the control rods can still be inserted and maintain fuel alignment



Background: OE

- An indication was detected during a general visual VT-3 ASME Section XI B-N-3 exam of a 3-loop core barrel in fall 2022:
  - Linear indication at the upper girth weld (UGW) identified on the core barrel inner diameter (ID) surface
  - Indication was circumferential and approximately 12” in length
- Extent of condition VT-1/EVT-1 was performed at the UGW:
  - 100% coverage of the UGW ID and OD surfaces
  - Identified four additional indications on the ID and no relevant indications on the OD
- UT was performed on all five indications:
  - The five indications ranged from 1.1” to 17.76” in length and 37% to 92% in through-wall depth



Background: MRP-227

- The upper girth weld cracking OE observed in Fall of 2022 has several aspects that indicate the need to enhance the current MRP-227 examination requirements:
  - Cracking that could not be dispositioned by analysis alone was observed in the UGW
  - The UGW is designated as an Expansion component in MRP-227 Revision 1-A rather than as a Primary component
  - This cracking would have been missed if a one-sided surface inspection (as permitted by MRP-227) had been conducted from the other surface
- It is unknown how long the cracks have been present, and they may have initiated prior to operation beyond the end of the plant's original 40-year operating license

Core Barrel Focus Group

- A joint core barrel focus group was set up to coordinate industry activities related to:
  - Understanding technical issues associated with recent core barrel cracking
  - Coordinate an agreed upon industry approach to resolving issues
  - The goal is generic applicability and overarching recommendations
- Membership includes PWROG, EPRI, NSSS Vendors, and utility personnel
- First core barrel focus group meeting held on Feb. 9th in Charlotte
- Second core barrel focus group meeting held as part of the PWROG meeting on April 17th

Interim Guidance (1/2)

- A key topic of discussion for the core barrel focus group was the need to promptly address revisions to the MRP-227 Revision 1-A guidance.
- MRP-227 Interim Guidance was issued 5/19/2023 as MRP-2023-005
  - Addresses Westinghouse and Combustion Engineering (CE) designs
  - NEI 03-08 “Needed” guidance to be implemented at the next planned core barrel removal coinciding with MRP-227 examinations
  - The guidance is effective as of May 1, 2024
  - Expansion inspections triggered by the UGW examination to components that require a core barrel removal are not required to implement the Expansion exam changes until the first outage after May 1, 2026
  - This guidance was discussed with the NRC-NRR on May 31, 2023

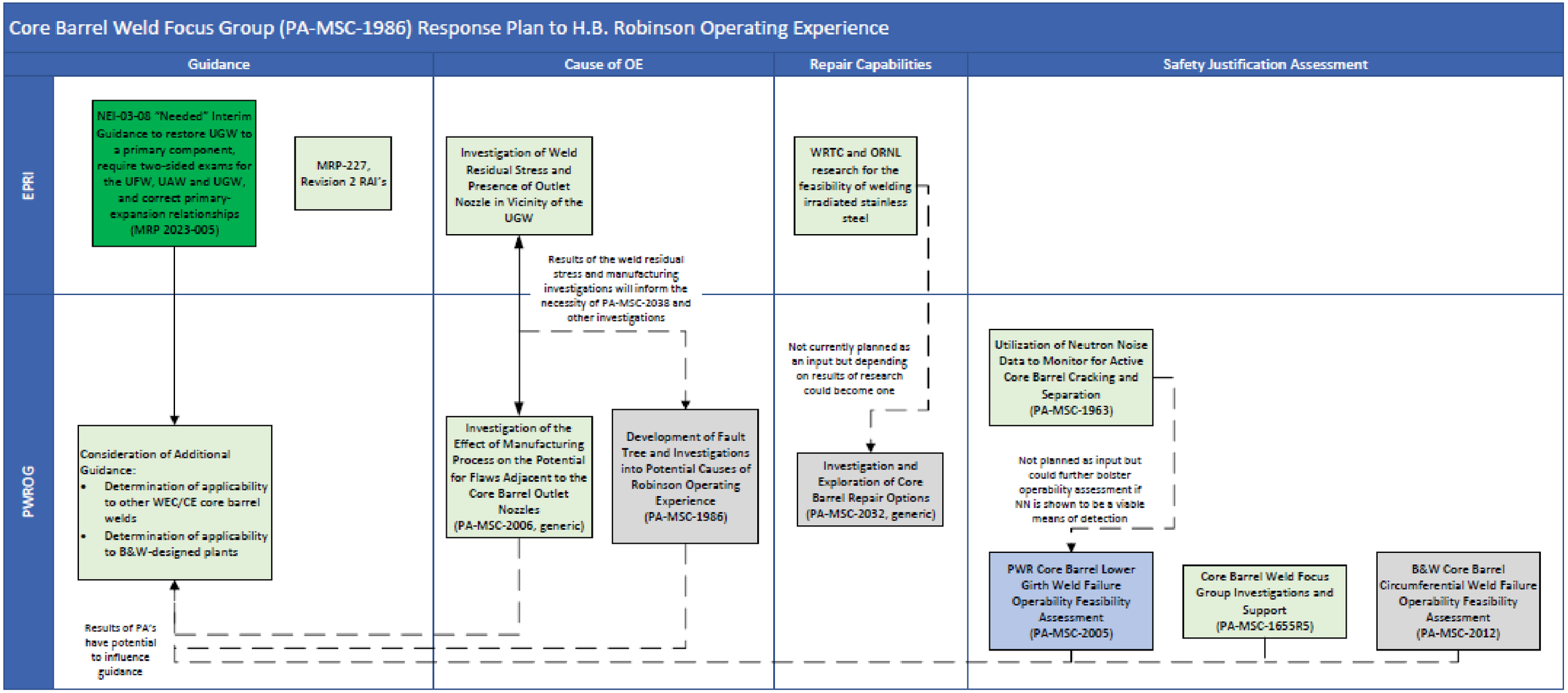
Interim Guidance(2/2)

- Noteworthy changes in MRP-2023-005 include:
  - Promote upper girth weld to a Primary component
  - Perform enhanced visual (EVT-1), eddy current (ET), examination of both surfaces (ID surface and OD surface) or volumetric (UT) examination of one surface when performing examinations on upper girth weld, upper flange weld, or upper axial weld
  - Address Primary and Expansion relationships
- The discussion of the inspection guidance is ongoing and may lead to additional interim guidance

Next Steps

- Propose Projects
  - ❑ PWROG - Development of Fault Tree for Potential Causes of Cracking
  - ❑ PWROG - Investigation and Exploration of Core Barrel Repair Options
  - ❑ PWROG – B&W Core Barrel Circumferential Weld Failure Operability Feasibility Assessment
- Initiate Approved Projects
  - ❑ PWROG - PWR Core Barrel Lower Girth Weld Failure Operability Feasibility Assessment
- Continue Ongoing Projects and Activities
  - ❑ PWROG - Investigation of the Effect of Manufacturing Process on the Potential for Flaws Adjacent to the Core Barrel Outlet Nozzles
  - ❑ EPRI - Investigation of Weld Residual Stress and Presence of Outlet Nozzle in Vicinity of the UGW
  - ❑ WRTC and ORNL - Research for the feasibility of welding irradiated stainless steel
  - ❑ PWROG - Utilization of Neutron Noise Data to Monitor for Active Core Barrel Cracking and Separation
  - ❑ PWROG – Consideration if additional core barrel interim guidance is necessary
  - ❑ EPRI – MRP-227, Revision 2 RAIs

Swim Lanes for Supporting Projects



Questions?