OAK RIDGE National Laboratory

Moderator Reflector Assembly Conclusions

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U.S. DEPARTMENT OF ENERGY

Safety Related Requirements

MRA Hydrogen Transfer Line Requirement	The MRA hydrogen transfer lines shall be designed and fabricated to ASME B31.12	[S.03.04-2348] - MRA Leak Rate Requirement	2349
MRA Hydrogen Vessel Requirement	The MRA hydrogen vessels shall be designed to the intent of the ASME BPVC	[S.03.04-2348] - MRA Leak Rate Requirement	2354
MRA Vacuum Vessel Requirement	The MRA vacuum vessels shall be designed to the intent of the ASME BPVC	[S.03.04-2348] - MRA Leak Rate Requirement	2893
MRA Hydrogen Boundary Pressure Requirement	The MRA hydrogen boundary MAWP shall be 19 bara.	[S.03.04-2320] - MRA-CMS Interface Requirements	2357
MRA Vacuum Boundary Pressure Requirement	The MRA vacuum boundary MAWP shall be 2 bara.	[S.03.04-2320] - MRA-CMS Interface Requirements	2358
MRA Vacuum Venting Requirement	The MRA vacuum space shall be designed to support venting of hydrogen leaks without exceeding the MAWP.	[S.03.04-2320] - MRA-CMS Interface Requirements	3591
MRA Hydrogen Venting Requirement	The MRA hydrogen lines shall be designed to support venting of hydrogen after loss of transfer line vacuum without exceeding the MAWP.	[S.03.04-2320] - MRA-CMS Interface Requirements	3592
MRA-Target Assembly-Core Vessel Interface Requirements	Requirements derived from the MRA-Target Assembly-Core Vessel Interface Sheet, S01020500-IST10205	[S.03-1035] - Safe Operation,[S.03-1034] - Availability	2373
MRA Boundary Requirement	The MRA nominal boundary shall match the boundary defined in the MRA-Target Assembly-Core Vessel Interface Sheet	[S.03.04-2373] - MRA-Target Assembly-Core Vessel Requirements	2374
MRA Profile Tolerance Requirement	The MRA shall have an overall profile tolerance of +/- 1mm to the ideal boundary after installation.	[S.03.04-2373] - MRA-Target Assembly-Core Vessel Requirements	2995
MRA Deflections Requirement	The MRA outside surfaces shall not deflect more than +/- 1mm from their installed locations under any expected loading conditions.	[S.03.04-2373] - MRA-Target Assembly-Core Vessel Requirements	2994
MRA Seismic Requirement	The MRA shall be capable of withstanding the loads outlined in ASCE 7 within the limits defined by the ASME BPVC, ASME B31.12, and ASME B31.3	[S.03-1035] - Safe Operation	2894

Conclusions

- The preliminary MRA design meets STS neutron performance requirements as defined through the project KPPs and MRA-Instrument Systems Interface Sheet
- While not an explicit requirement, design for manufacturability has been a priority for MRA design resulting in reduced risk during fabrication and cost savings
- MRA requirements and interfaces are appropriately defined for the conclusion of preliminary design
- The majority of MRA requirements have been verified and those that are unverified are not expected to significantly impact design

Final Design Phase

- Update MRA design based on updated number of beamlines and QIKR location
  - Include results from latest MRA neutronics optimization
- Design changes to achieve unmet requirements
  - Dishing of reflector vessel caps
  - Additional shielding on top of MRA
  - Updated transfer line routing or additional shield block
- Analysis to address unverified requirements
  - Fatigue, piping, venting, seismic, blowdown, & further waste analyses
- Continue to adjust design to surrounding systems changes
- Evaluate neutronic performance effects of further simplification