



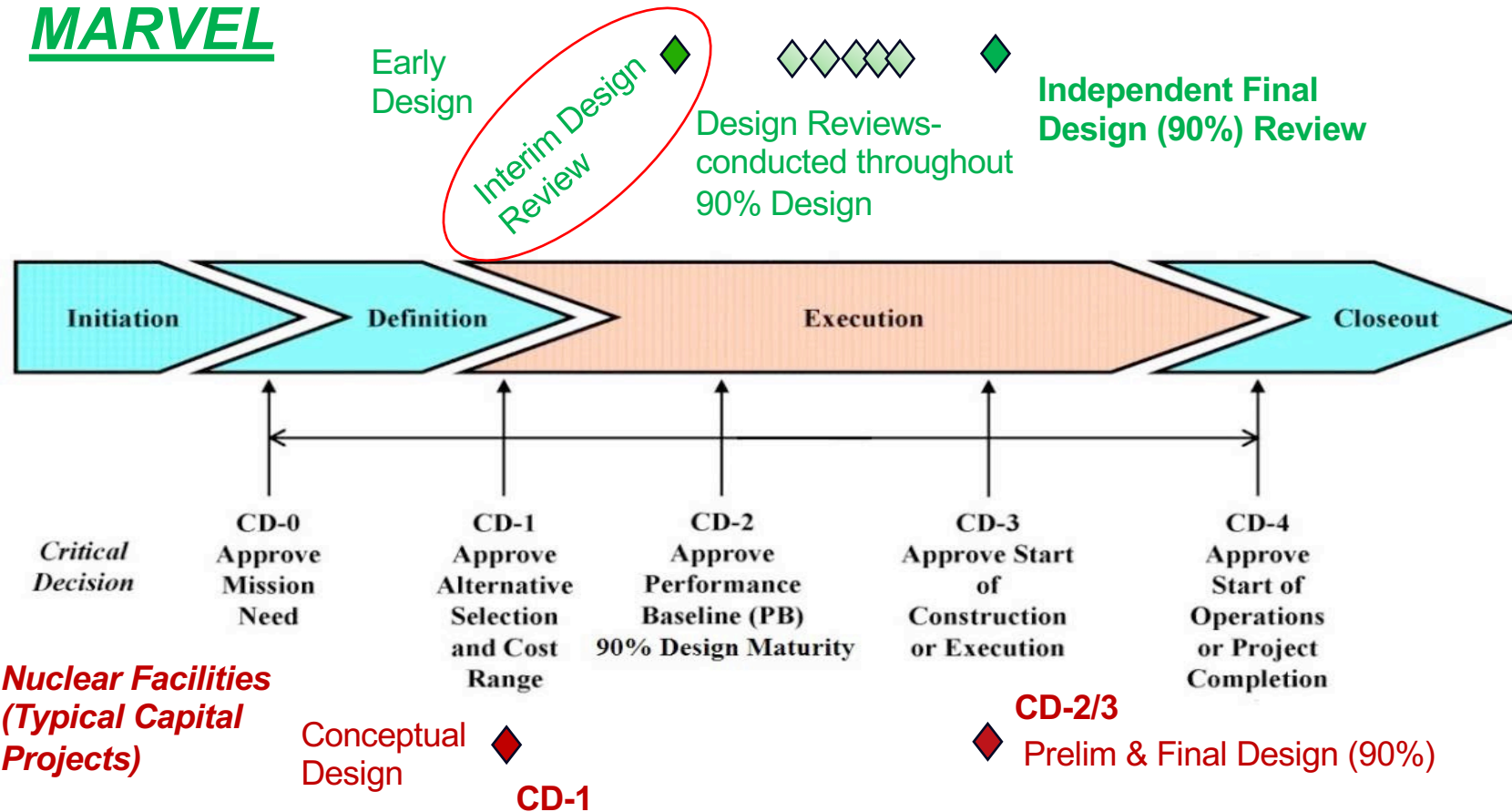
MARVEL Interim Design Review (IDR)

March 4, 2022

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IDR: Assessment of MARVEL Design Maturity

MARVEL



**Nuclear Facilities
(Typical Capital
Projects)**

Definition: Interim Design Review is a review of design quality and maturity - regardless of project phase - to assess status, completeness, and design gaps

IDR Goals and Objectives

- Multi-disciplined technical review of the MARVEL Interim Design held December 6-7, 2021 to:
 - Assess maturity & completeness of the design to date
 - Identify gaps and issues that must be resolved prior to completing final (90%) design
- IDR Objectives:
 - Validate system requirements, requirements allocation, & flow-down is adequate to verify system performance
 - Confirm design meets functional & performance requirements
 - Validate design is verifiable; risks are identified, characterized, & mitigated
 - Demonstrate sufficient maturity to proceed to final design
- Future activities: completion of detailed designs & analyses, then Final Design Review

IDR Process Overview

- Participants - 12 Reviewers chosen based on expertise in one or more topical areas:
 - Review package provided 2 weeks prior to review
 - One day, one morning of presentations by topical experts; discussion scheduled through, comments recorded
 - Approximately two weeks of additional review and comment
 - Written and verbal comments compiled
 - Compiled comments validated for completeness/correctness
 - Preliminary actions proposed for execution during preliminary/final design
 - Resolutions will be reviewed at final design review
- Structural Design and I&C - not reviewed:
 - Reviews targeted for late-March
 - Resolutions will be reviewed at final design review

Key Outcomes

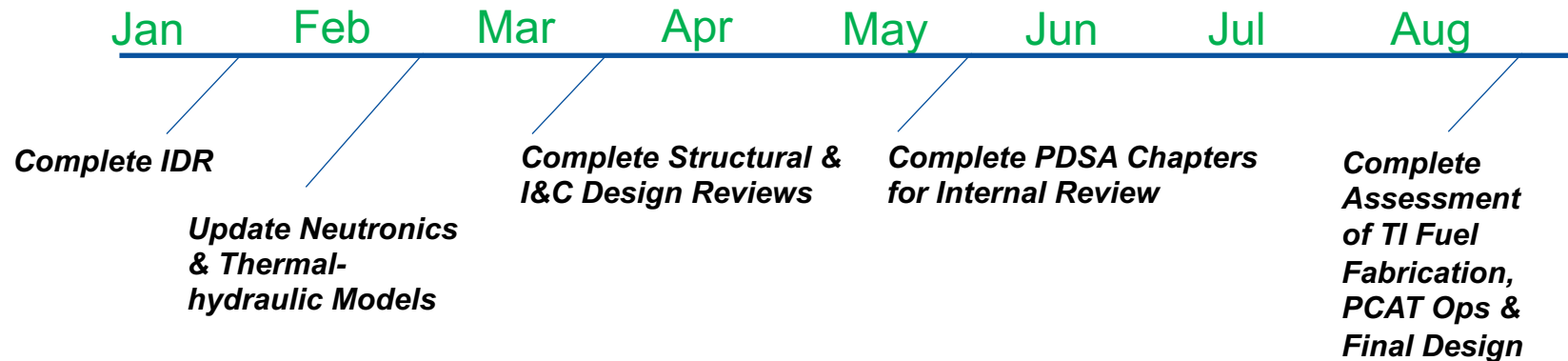
- MARVEL - unique potential to accelerate development and demonstration of:
 - Use of microreactors in combined heat and power processes
 - Integration of microreactors in microgrids
- MARVEL has made significant progress since Red Team Review in Fall 2020
- Rigorous multi-discipline review completed with 108 written and verbal comments recorded
- Resolutions (for comments that are actionable) identified – to be verified during final design review
- MARVEL design will be improved for the depth and breadth of the review

Sample of Key Technical Issues Identified

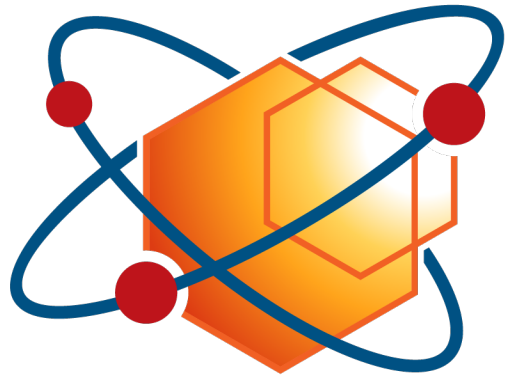
- Recent design changes affect many SSCs, code calculations, and reliability. These need to mature prior to final design.
- Wide-ranging comments on design maturity from materials and parts performance to human factors.
- Detailed D&D plan is needed.
- Incorporation of PCAT results may not be available in time to incorporate in final design (technical and schedule risks)
- Common cause failures reliability of control drums not sufficiently addressed – consider more contingencies
- Safety function of the guard vessel needs to be verified.
- Management of technical and project risk from fuel fabrication needs to be incorporated in project planning.

Path Forward

- Immediately address reactivity control and associated thermal hydraulic performance with additional calculations and modeling
- Develop comment resolutions (review with DOE) – incorporate in project planning and schedule
- Conduct structural and I&C interim design reviews
- Proceed with design towards 90% design review



Questions?



MRP Microreactor
Program