Reactor Vendor Perspective for Codes and Standards: The eVinci™ Microreactor

NRC Meeting: April 4, 2024

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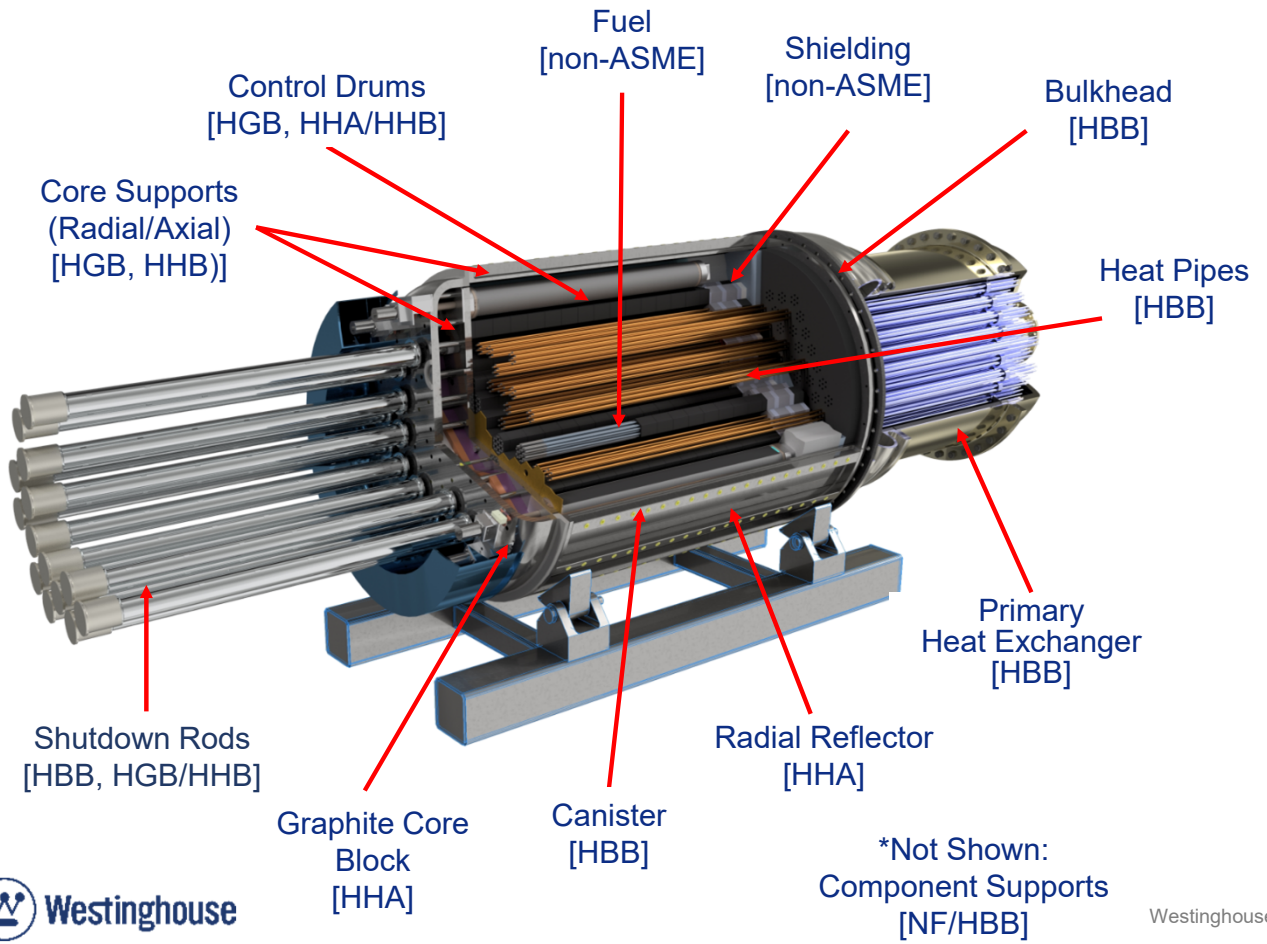
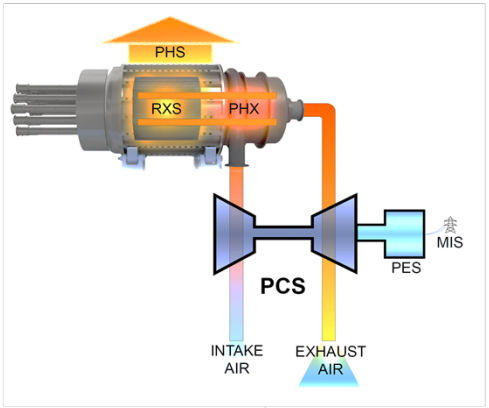
The eVinci Microreactor

Safety through passive heat pipe technology, enabling a very low-pressure reactor





Parameter	eVinci
Power	15 MWt
Fuel Cycle	8 years
Fuel (Enrichment)	TRISO (19.75%)
Coolant	Heat Pipes
Moderator	Graphite
Power Conversion	Open-Air Brayton
Efficiency	~34%
Decay Heat Removal	Radial Conduction

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Pre-Application Engagement – White Papers

Current Status:
https://www.nrc.gov/reactors/new-reactors/advanced/licensing-activities/pre-application-activities/evinci.html

#	Topic	Submittal Wave	#	Topic	Submittal Wave	#	Topic	Submittal Wave
1	Facility Level Design Description	Submitted - 1	13	Advanced Logic System®(ALS) v2	Submitted - 3	25	Inservice Inspection Program/Inservice Testing Program	Submitted – 5
2	Principal Design Criteria	Submitted - 1	14	Component Qualification	Submitted- 3	26	Post-Accident Monitoring System	Submitted – 5
3	Safety and Accident Analysis Methodologies	Submitted - 1	15	Emergency Plan Zone Sizing Methodology	Submitted - 3	27	Equipment Qualification	Submitted – 5
4	Licensing Modernization Project Implementation	Submitted - 1	16	Physical Security	Submitted - 3	28	Probabilistic Risk Assessment and Transportation Risk Assessment	Submitted – 5
5	Regulatory Analysis	Submitted - 2	17	Heat Pipe Design, Qualification, and Testing	Submitted - 3	29	Fire Protection	Submitted – 5
6	Deployment Model	Submitted - 2	18	Nuclear Design	Submitted - 3	30	Cyber Security	Submitted – 5
7	Safeguards Information Plan	Submitted - 2	19	U.S Transportation Strategy	Submitted - 3	31	Radiation Protection and Contamination Methodology	Submitted – 6
8	Test and Analysis Process	Submitted - 2	20	Phenomena Identification and Ranking Table (PIRT)	Submitted - 4			
9	Functional Containment and Mechanistic Source Term	Submitted - 2	21	Integral Effects and Transient Testing	Submitted - 4			
10	Composite Material Qualification and Testing	Submitted - 2	22	Refueling and Decommissioning	Submitted - 4			
11	Fuel Qualification and Testing	Submitted - 3	23	Seismic Methodology	Submitted - 4			
12	Code Qualification	Submitted - 3	24	Operations and Remote Monitoring	Submitted - 4			

Westinghouse perspective on NRC future actions

- Alignment on terminology and expectations for standards of ANS, ASME, IEEE, and NEI
- Continued cooperation with industry to address gaps for non-LWR technologies
- Timely endorsement of new and updated codes and standards via Regulatory Guidance
- Guidance on how to address explicitly passive features, specifically for I&C

Application of ASME III, Div. 5 to eVinci microreactor design

- Metallic materials for several components are not in Div. 5 or may go beyond the Div. 5 temperature limits; materials for non-metallic components may not fall within selection in Div. 5
- Reactor supports may be above Div. 1 temperature limits; no rules in Div. 5, Subsection HF for high temperature component supports, may use NF or HBB
- Use Div. 5 rules as guidance for reactor component designs
  - Develop internal design and qualification methods based on Div. 5 where applicable
- Initial classification of components and structures; define jurisdictional boundaries
  - Metallic reactor vessel, non-metallic core components, metallic core supports
- Use Div. 5 materials where possible; otherwise, App. HBB-Y provides guidance for metallic material development & testing
  - Testing based on justified needs for design
  - Material testing to address environmental effects (e.g. irradiation, oxidation, etc.) not explicitly addressed in Div. 5

ASME Section XI and OM to eVinci microreactor design

- Support of new codes and standards through participation in consensus committees will reduce churn and increase perspective while implementing new concepts into new reactor designs
- A focus on implementation and compliance during the development process will provide greater benefit to the industry
  - Balance amongst all stakeholders in the consensus process
- Address long operation intervals of many advanced reactor designs
  - Continued support and development of methodologies, techniques, and guidance for increased intervals
  - Guidelines/expectations for alternatives (interim staff guidance)
  - To drive processes with a focus on benefits to plant health
- In-service testing can continue to progress with the adoption of ASME OM2

IEEE/IEC Application to eVinci microreactor design

- There is a disconnect between SSC classification per NEI 18-04 and design, qualification, and quality requirements per IEEE 497 for non-LWR technologies specifically for passive features
  - Westinghouse has been engaged in and is following the ongoing work through IEEE and IEC
- Continued involvement in IEEE and IEC, as well as NEI for industry consensus
- No significant roadblock that would prevent complying with IEEE/IEC standards