

NRC-DOE Workshop on Advanced non-LWRs

NGNP Project Experience

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Overall Licensing Process Challenges – Summary of NGNP Experience

- The existing NRC process for pre-licensing requirements development is workable and viable – it’s not “broken” based on NGNP experience
 - Existing regulatory requirements can largely be “adapted” to address many key advanced technology licensing issues
 - NRC technical staff and ACRS are open and willing to engage in developing those adaptations
- The establishment of key policy and technical requirements for modular HTGRs, like NGNP, has not been completed as planned, primarily due to a lack of consistent advocacy and sustained priority:
 - Industry stakeholders
 - DOE
 - NRC

NGNP Project Scope

- Per the Energy Policy Act of 2005 (EPAcT), the NGNP Project is to consist of the research, development, design, construction, and operation of a prototype nuclear reactor plant
- EPAcT removed major barriers that typically challenge innovative reactor development and deployment
 - Established relative priority of NGNP at both DOE and NRC
 - Addressed availability of resources
- EPAcT also directed NRC and DOE to jointly develop a description of ways in which current licensing requirements relating to light-water reactors need to be adapted for the types of prototype nuclear reactor being considered by the Project

Joint NRC-DOE Licensing Strategy (August 2008)

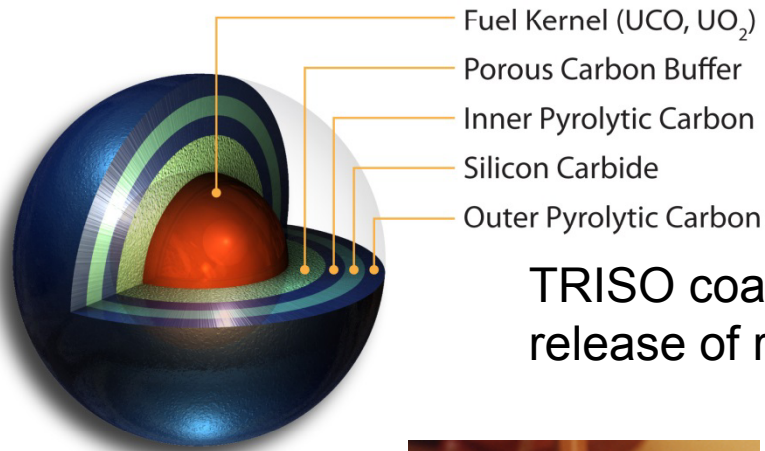
- NGNP Joint DOE-NRC Licensing Strategy (Report to Congress)
- ...the Secretary of Energy and the Commission determined that the best option for licensing the NGNP prototype would be to use a risk-informed and performance-based technical approach ... **to adapt the existing LWR technical requirements** and to establish the NGNP-unique requirements that are not addressed by existing LWR requirements and guidance.
- In general, adaptation involves:
 - Establishing the technology's safety basis
 - Determining the underlying safety basis for LWR-based regulations
 - Proposing approaches to “adapt” regulatory guidance so that those underlying bases can be applied and satisfied

NRC- DOE Licensing Strategy – 2008 (Report to Congress)

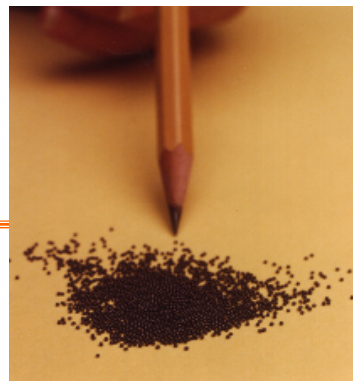
- “It will be necessary to resolve the following NRC licensing technical, policy, and programmatic issues and obtain Commission decisions on these matters”
 - Acceptable basis for event-specific mechanistic source term calculation, including the siting source term
 - Approach for using frequency and consequence to select licensing-basis events
 - Allowable dose consequences for the licensing-basis event categories
 - Requirements and criteria for functional performance of the NGNP containment as a radiological barrier



Supporting Technical Topic: HTGR Fuel – A Key Difference From LWRs



TRISO coated fuel particles form the primary barrier to release of radionuclides in a modular HTGR.



Particles

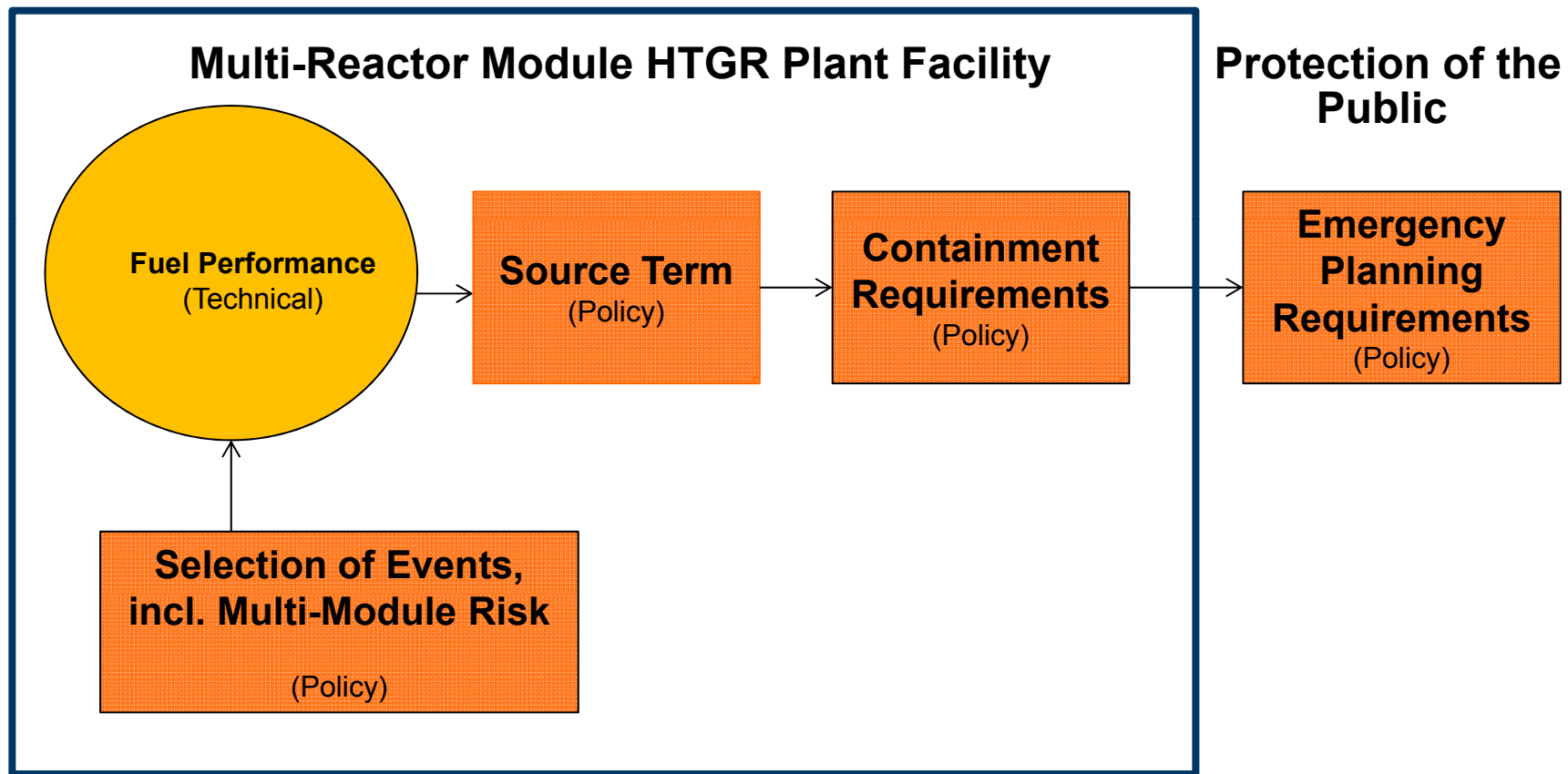


Compacts



Fuel Elements

HTGR Policy and Technical Issue Relationships



NGNP Adaptation and NRC Interaction Summary (2008 – 2013)

- Submittal of NGNP white papers
 - Summarized safety bases and proposed adaptations
 - Contained specific outcome objectives for NRC dialogue
- Interaction with NRC staff and ACRS
 - Convened approximately 25 NRC public meetings
 - Responded to approximately 500 requests for information
 - ACRS reviewed draft staff assessment results in 3 meetings
- NRC staff then issued a written assessment of the NGNP proposals for adaptation (July 2014)

2014 NRC Assessment Results: Fuel Performance – Technical Issue

- The NRC's assessment of NGNP reflected considerable progress in this technical area when compared to the last focused NRC review (1980's)
- NRC Assessment Formal Feedback on NGNP (July 2014):
 - Approaches to NGNP fuel qualification are **generally reasonable**
 - AGR Fuel development and testing activities is being conducted in a **rigorous manner**

2014 NRC Assessment Results: Commission Policy Issues

- On the critical topic of establishing an event selection process, the NRC staff indicated that “... it is premature at this time for the NRC staff to take a position on any of the elements of the approach for licensing-basis event selection proposed by DOE/INL”.
- NRC staff cited current Commission-directed activities related to Near Term Task Force Recommendation 1 and NUREG-2150 as the reason for postponing its NGNP feedback on this policy topic.
- It is noted that these Commission-directed efforts are updates or enhancements to historical LWR-based approaches that will take some time to establish and implement within the operating fleet. Advanced reactor developers are left with significant regulatory uncertainty for an undetermined period of time.

2014 NRC Assessment Results: Commission Policy Issues (cont.)

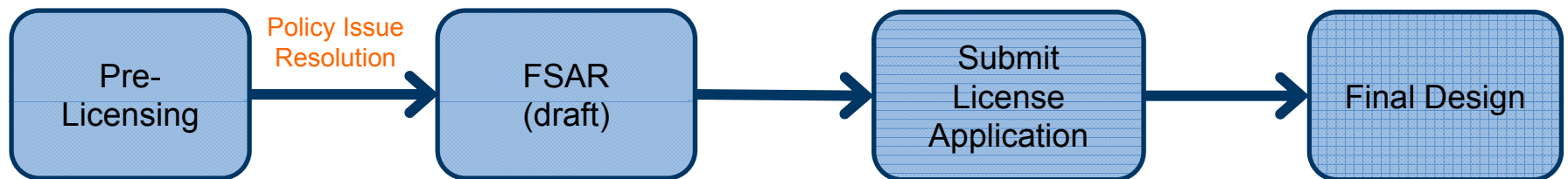
- For the other policy issues, the NRC staff indicates that “it may be appropriate” for the Commissioner to consider and address them.
 - **Commission consideration of regulatory or policy issues may be appropriate** in determining whether the site boundary dose acceptance criteria and associated dose calculations for use in the evaluation of site suitability and emergency planning for SMR designs should be revised or whether new requirements for SMRs should be established.
 - **It may be appropriate for the Commission to review** the specific criteria applied to evaluate a modular HTGR functional containment concept for both a prototype plant and subsequent standard plants.
 - ... **future Commission policy guidance may be appropriate**... regarding offsite radiological releases
- No timeline is given for if/when these requests for Commission action will occur.

All Commission Policy Issues Remain Unresolved – Why?

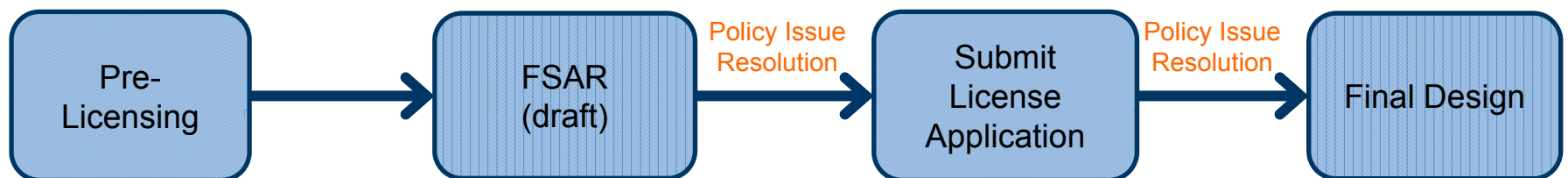
- DOE and industry generally agree with the NRC technical staff's conclusions on these issues, but they remain unresolved
- NRC has not clearly established when “it’s appropriate” to initiate Commission action on key policy issue decisions
- DOE hasn’t requested that NRC finish its work in resolving these Commission policy issues
- Industry stakeholders are not currently pushing for policy and technical requirements issue resolution in a coordinated or integrated way

Policy Uncertainty Makes Investment Too Risky For Commercial Sector

Approach Summarized in Commission's Advanced Reactor Policy



NGNP Experience Regarding Policy Issue Resolution



\$20M → **\$300M** → **\$800M**

Overall Licensing Process Conclusions – Summary of NGNP Experience

- The existing NRC process for pre-licensing requirements development is workable and viable – it’s not “broken” based on NGNP experience
 - Existing regulatory requirements can largely be “adapted” to address many key advanced technology licensing issues
 - NRC technical staff and ACRS confirmed that the adaptation approaches proposed by NGNP are reasonable
- The establishment of key policy and technical requirements for modular HTGRs, like NGNP, has not been completed as planned primarily due to a lack of consistent advocacy and sustained priority
 - Industry stakeholders
 - DOE
 - NRC
- Overall result is that regulatory uncertainty has not yet been addressed and retired