OAK RIDGE National Laboratory

NRC Advanced Reactor Licensing Activities

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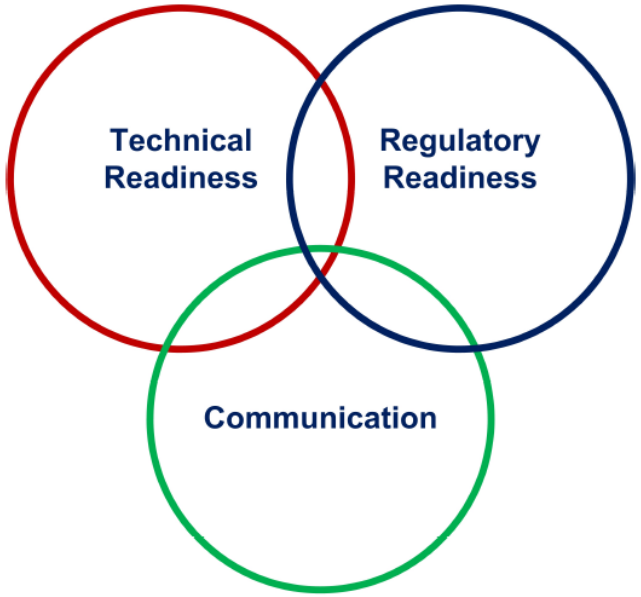
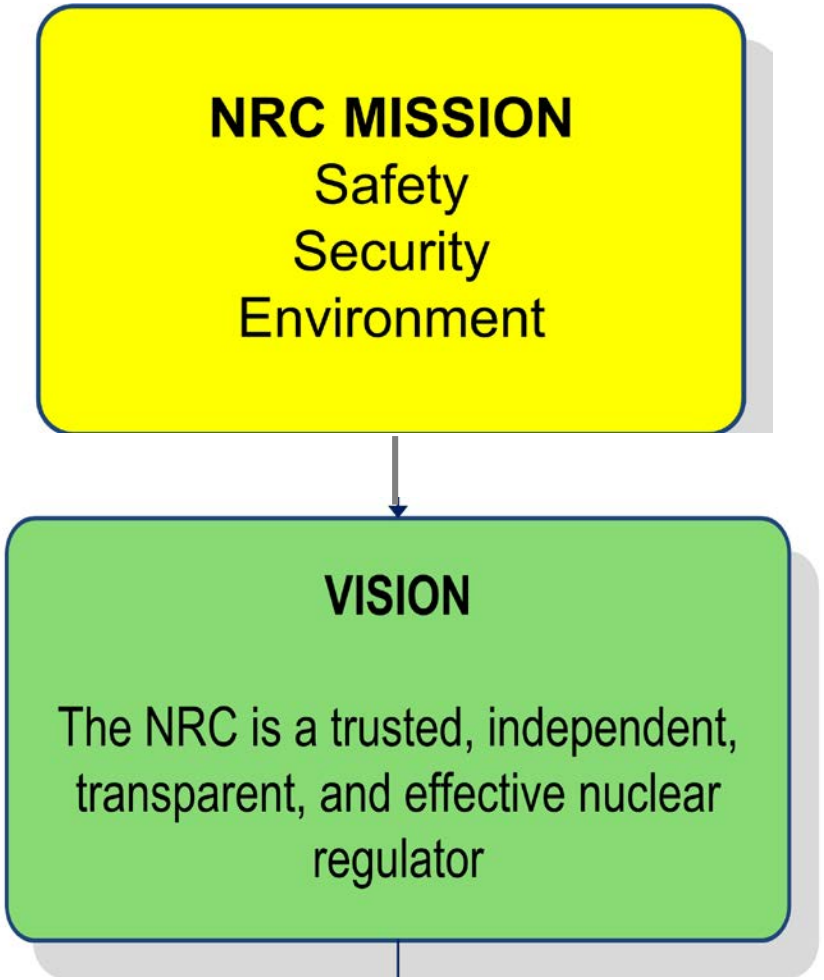
NRC Has Issued Several Policy Statements on the Regulation of Advanced Reactors (SECY-08-0134)

- Regarding advanced reactors, the Commission expects, as a minimum, at least the same degree of protection of the environment and public health and safety and the common defense and security that is required for current generation light-water reactors (LWRs). Furthermore, the Commission expects that advanced reactors will provide enhanced margins of safety and/or use simplified, inherent, passive, or other innovative means to accomplish their safety and security functions

NRC Has Issued a Non-LWR Vision and Strategy Document to Address Advanced Reactor (non-LWR) Licensing (ML16356A670) December 2016

- Three strategic objectives are identified
  - Enhancing technical readiness
  - Optimizing regulatory readiness
  - Optimizing communication





The Vision/Strategies Has Been Divided Into Time Periods For Implementation

- Six near-term strategies (0-5 years)
  - Acquire/develop sufficient knowledge, technical skills, and capacity to perform non-LWR regulatory reviews
  - Acquire/develop sufficient computer codes and tools to perform non-LWR regulatory reviews
  - Develop guidance for a flexible non-LWR regulatory review process within the bounds of existing regulations, including the use of conceptual design reviews and staged review
  - Facilitate industry codes and standards needed to support the non-LWR life cycle(including fuels and materials)
  - Identify and resolve technology-inclusive policy issues that impact the regulatory reviews, siting, permitting, and/or licensing of non-LWR nuclear power plants (NPPs)
  - Develop and implement a structured, integrated strategy to communicate with internal and external stakeholders having interests in non-LWR technologies
- Mid-term (5-10 years and long-term >10 years) strategies are under development

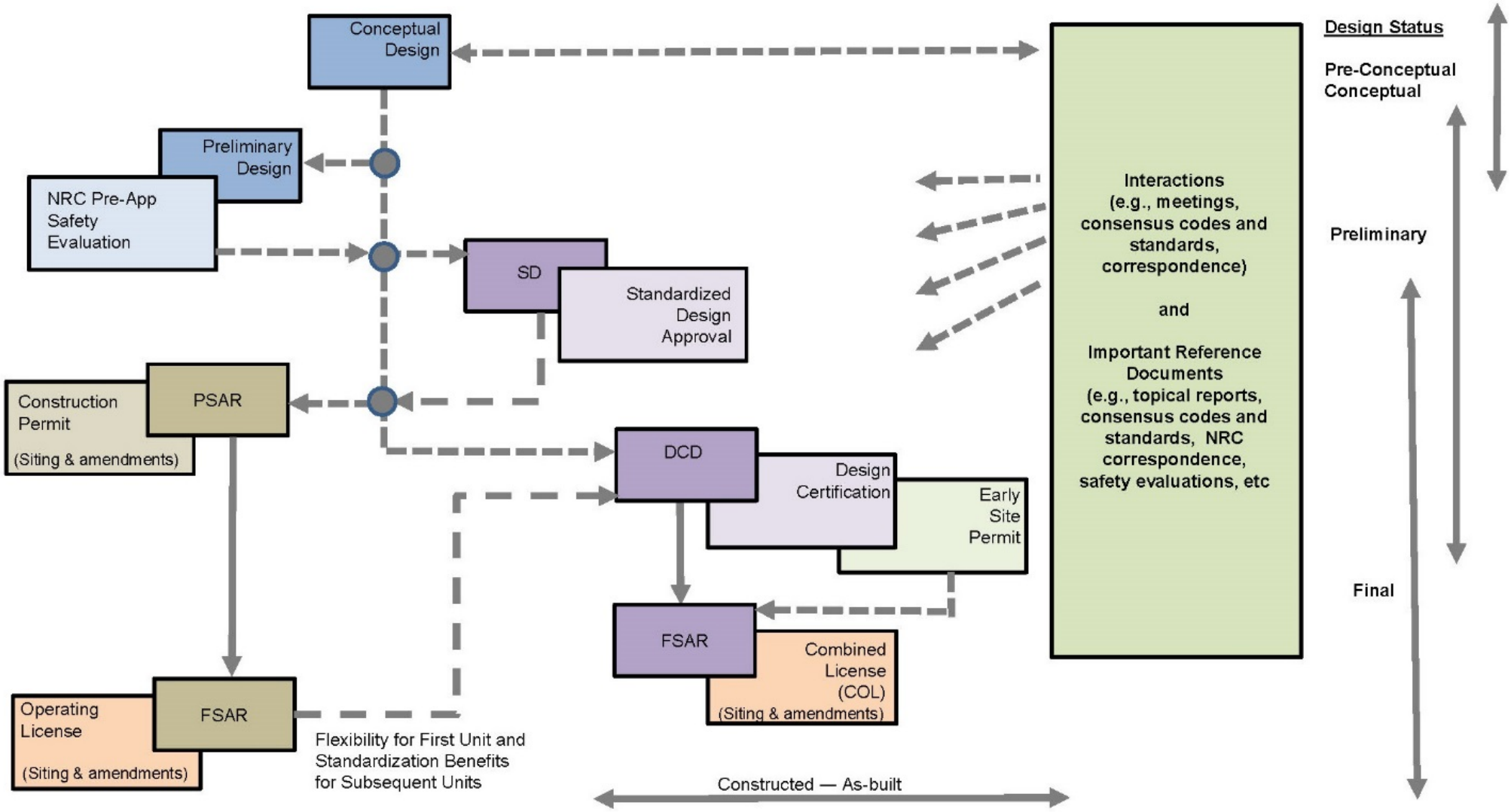
Implementation Action Plans (IAPs) Have Been Developed for Each of the Strategies

- Strategy 1 involves training and acquiring workforce skill related non-LWRs
  - MSR, SFR, and mHTGR seminars are being held for the staff
- Strategy 2 evaluation of current computer codes and tools and determine need for new codes
  - Six functional areas were identified
    - Reactor kinetics and criticality
    - Fuel performance
    - Thermal-fluid phenomena
    - Severe accident phenomena
    - Offsite consequence activities
    - Materials and component integrity

IAPs Have Been Developed For Each of the Strategies (continued)

- Strategy 3 (flexible regulatory review process)
  - Establish criteria
    - Advanced Reactor Design Criteria (RG1.232)
  - Non-LWR licensing bases and accident sets (DG1353)
  - Identify regulatory framework gaps
  - Regulatory review “roadmap” includes pre applications interaction and staged reviews (ML17312B567)
  - Update guidance for prototype testing and research and test reactors
    - Included in roadmap
  - Emergency preparedness response rule making (SECY-16-0069)
    - Consequence-oriented, risk-informed, performance-based, and technology inclusive approach

Licensing Process, Using One-step Or Two-step Process



Strategy 3 Being Developed Within Cooperation With NEI/DOE

- NEI Technology Working Groups (MSR, Fast, Gas)
- NEI/DOE Licensing Modernization Project (RIPB selection of licensing bases events, classification and treatment of SSC, DID)
  - Basis for DG 1353
- NEI non-power reactor Standard Review Plan NUREG 1537 for MSR research/test reactors

Strategy 4 Facilitate Industry Codes and Standards Needed to Support the Non-LWR Life Cycle

- OMB Circular119 requires use of standards by regulators, if possible
- Working with SDOs (ASME, ANS, IEEE, ASTM etc.)
  - Annual standards forum (Sept. 11, 2018)
  - ANS advanced reactor standards workshop
    - Focused on needs from TWGs
    - ASME Section III Division 5 (high temperature materials)
    - DOE sponsored SFR standards gap analysis (ORNL/SR-2017/520)
      - 19 standards need revision or development (12)
    - NRC recently issued SOW for MSR standards gap analysis

Strategy 5 Identify and Resolve Technology-inclusive Policy Issues That Impact the Regulatory Reviews, Siting, Permitting, and/or Licensing of Non-LWR Nuclear Power Plants (NPPs)

- Working in cooperation with NEI/DOE/NIC
  - SECY-14-0095 Operator Staffing for SMRs and Multi-module NPP (NUREG 0711 Rev. 3)
  - NEI proposed security white paper physical security requirements commensurate with the potential consequences to public health and safety and the common defense and security under consideration for rulemaking
  - Functional containment performance criteria
  - Use of HALEU

Strategy 6 Enhance Communications With Stakeholders

- Period stakeholder meetings (every 6 weeks)
  - NEI regulatory working group
  - Designers
  - UCS
  - DOE
  - National Labs.
  - GAIN
  - NIC
- NRC home page https://www.nrc.gov/reactors/new-reactors/advanced.html

NRC Issued SECY 18-0060 Achieving Modern Risk-informed Regulation, May 2018

- Create a new rule for non-LWRs, 10CFR 53, to provide optional performance-based, technology-inclusive set of safety criteria for licensing the design and operation of advanced reactor technologies
- Create a new rule to define high-level performance-based I&C safety design principles and develop associated regulatory guidance that documents the acceptable standards that may be used to meet these principles.
- Transform the agency review process: to expand the systematic use of qualitative and
- Quantitative risk and safety insights; thereby, enabling staff to scale the scope of review and level of detail needed to make a finding of reasonable assurance of adequate protection, beginning with the licensing reviews for reactors