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Regulatory Update on Advanced Reactors

International Workshop on Prevention and Mitigation of Severe Accidents in Sodium Fast Reactors

June 11-13, 2012 – Tsuruga, Japan

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Overview – USNRC

- **Mission: license and regulate the civilian use of byproduct, source, and special nuclear materials to ensure the adequate protection of public health and safety, promote the common defense and security, and protect the environment**
- **Regulate: commercial nuclear power plants; research and test reactors; nuclear fuel cycle facilities; medical, academic, and industrial uses of radioactive materials; decommissioning; transport, storage, and disposal of radioactive materials and wastes; and import / export of radioactive materials**
- **Independent agency established by Congress – not promote the use of nuclear energy or any specific technology or design**

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NRC – Fukushima Lessons Learned

- **NRC** participated extensively in U.S. assistance for accident response & recovery activities
- **Fukushima Lessons Learned … in progress**
  - Near Term Task Force, SECY-11-0093, July 2011 (ML11186A950)
  - Staff follow-up – SECY-11-0137, October 2011 (ML11272A111)
  - Priority scheme for recommended actions – 3 tiers
  - Stakeholder interactions – industry, public meetings
  - SECY-12-0025, February 2012 (ML12039A115)
  - Tier 1 orders and requests for information – March 2012 (licensees)
- **Applicants -** For applications not yet submitted – expect applicants to address Commission-approved Fukushima actions
- **NRC Strategic Plan –** Fukushima lessons learned included as element in strategic planning

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U.S. – Developing Interest in SMRs

Significant domestic interest in the possible licensing, construction, and operation of SMR designs.

WHAT'S DRIVING THIS INTEREST?

Industry identified potential benefits:

- Replacing aging coal plants
- Alternatives to large LWRs
- Other industrial interest in reactor applications (e.g., process heat)
- Economic Considerations
- Wider range of users
- Enhanced safety
- Environmental Considerations

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Perspective on Advanced Reactors

- **NRC is currently preparing for anticipated SMR design certification & licensing applications**
  - SMRs (integral pressurized-water reactors (iPWRs)) – near term
  - SMRs (non-LWRs) – longer term
- **Policy Statement on Regulation of Advanced Reactors (2008)**
  "… 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 [i.e., those licensed before 1997]. 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."

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Advanced Reactors – recent activities

- Vogtle & Summer (AP 1000) COLs issued – Part 52 demonstrated
- Progress on developing NRC's regulatory infrastructure
- Progress on resolving policy/regulatory/technical issues – "technology-neutral" is preferred approach
- DOE SMR funding opportunity: cost-share agreement for design and licensing (2 designs); commercial operation by 2022
- Blue Ribbon Commission on America's Nuclear Future
  - "Report to the Secretary of Energy," January 26, 2012 http://www.brc.gov/.
  - … recommended adequate Federal funding be provided to the NRC to support a robust effort to develop a regulatory framework for advanced nuclear energy systems

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Advanced Reactors – recent activities (cont)

Preparing for advanced reactor applications:

- Emphasis on preparation for review of iPWRs
- NGNP (DOE-supported HTGR design) – developing staff positions for resolution of regulatory issues
- Fast reactors (SFRs, others) – maintaining familiarity with varied designs and conducting limited vendor interactions Maintain awareness of technologies; Participate in international activities; Interactions with potential applicants; technology-neutral regulatory processes

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Risk-Informed Review

Initiatives

- Risk-insights to enhance safety focus of reviews
- Near-term focus on iPWR reviews
- Standard Review Plan (NUREG-0800) – revise guidance for review of iPWRs
- Design-Specific Review Standard
  - build on vendor's PRA and staff experience
  - guidance tailored to specific design and its safety attributes
- Current focus – mPower & NuScale
- Longer-term development of non-LWR framework
  - iPWR pilot

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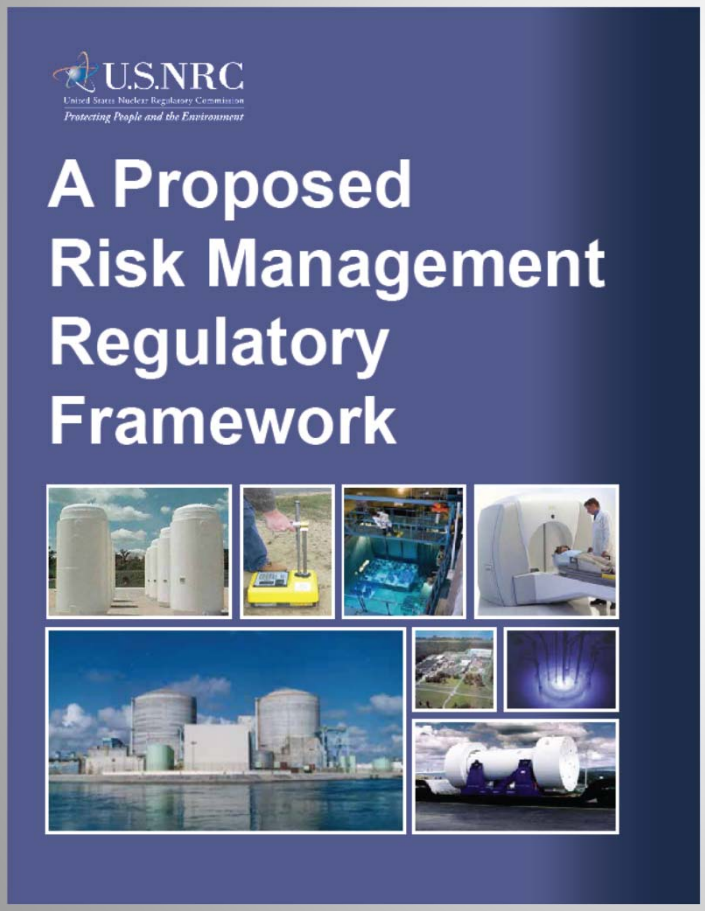
NUREG-2150 April 2012 [ML12109A277]



Task Force –

Commissioner Apostolakis

- Risk-informed, performance-based
- “all” NRC licensees
- Undergoing Commission review

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ANS 54.1, "Nuclear Safety Criteria and Design Process for Sodium Cooled Nuclear Power Plants"

- Working group formed 2009 to rewrite standard (withdrawn 1989)
  - Representatives from industry, DOE labs, NRC and universities, (including representatives from France and Japan)
- Provide the process for establishing the design criteria
  - Based on existing general design criteria for LWRs
  - Revised to address unique design aspects of SFR
  - Generally deterministic in nature
- Incorporate risk-informed / performance-based criteria where possible
- Use risk informed information to select licensing basis events
- Schedule – working group draft – June 2012 (ANS meeting); issue draft for review late 2012

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Pre-application activities

- B&W mPower
  - Ongoing DC pre-application activities
  - Preparing Design-Specific Review Standard
- Clinch River Construction Permit (TVA)
  - Discussing regulatory framework
  - CP application anticipated 4Q2013-4Q2014
- NuScale
  - Ongoing DC pre-application activities
  - Preparing Design-Specific Review Standard
- Westinghouse
  - Initiated pre-application activities 2011
- Holtec International
  - Initial pre-application interactions
- Fast Reactor Designs [preliminary interactions]
  - GE Hitachi Nuclear Energy (GEH) – PRISM
  - Toshiba Corporation – 4S
  - Gen4 Energy Inc. (G4E) – lead-bismuth coolant

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Early Interaction with Stakeholders

- **Public regulatory workshops**
- **Pre-application activities with vendors**
- **Interactions are critical to ensuring regulatory stability and predictability**
- **Meaningful pre-application engagements:**
  - Familiarize staff with design
  - Identify policy issues unique to SMRs
  - Identify technical issues unique to SMRs
  - Minimize surprises

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Identification of Regulatory Issues

Issues being addressed regarding SMRs:

- **Annual Fees**
- **Risk-Informed Licensing**
- **License Multi-Module Facilities**
- **Control Room Staffing**
- **Insurance and Liability regulatory requirements**
- **Emergency Planning Requirements**
- **Decommissioning Funding**
- **Mechanistic Source Term**
- **Security and Safeguards Requirements**
- **Manufacturing Licenses**
- **Merchant Plant Financial Qualification Reviews**

Regulatory Issues – SMRs

Annual Fees	Completed (2/7/2011)	N/A (Memo)	**ML110380251**
Risk-Informed Licensing	Completed (2/18/2011)	SECY-11-0024	**ML110110691**
License Multi-Module Facilities	Completed (6/12/2011)	SECY-11-0079	**ML110620459**
Control Room Staffing	Completed (7/22/2011)	SECY-11-0098	**ML111870574**
• **Prototype Reactor License** • **Operational Programs** • **Install Reactor Modules During Operation**	Completed (8/22/2011)	SECY-11-0112	**ML110460434**
Insurance and Liability	Completed (12/22/2011)	SECY-11-0178	**ML113340133**
Feasibility Study for SMRs	Completed (11/2/2011)	SECY-11-0156	**ML112690353**
Emergency Planning Requirements	Completed (10/28/11) Due 06/14/2013	SECY-11-0152 SECY-13-XXXX	**ML112570439**
Decommissioning Funding	Completed (12/22/2011)	SECY-11-0181	**ML112620358**
Mechanistic Source Term	Completed (12/29/11) Due1/21/2013	N/A (Memo) SECY-13-XXXX	**ML113410366**
Security Requirements	Completed (12/29/11)	SECY-11-0184	**ML112991113**
Manufacturing Licenses	2012	SECY-12-XXXX	
Merchant Plant Financial Qualification Reviews	To be determined	To be determined	

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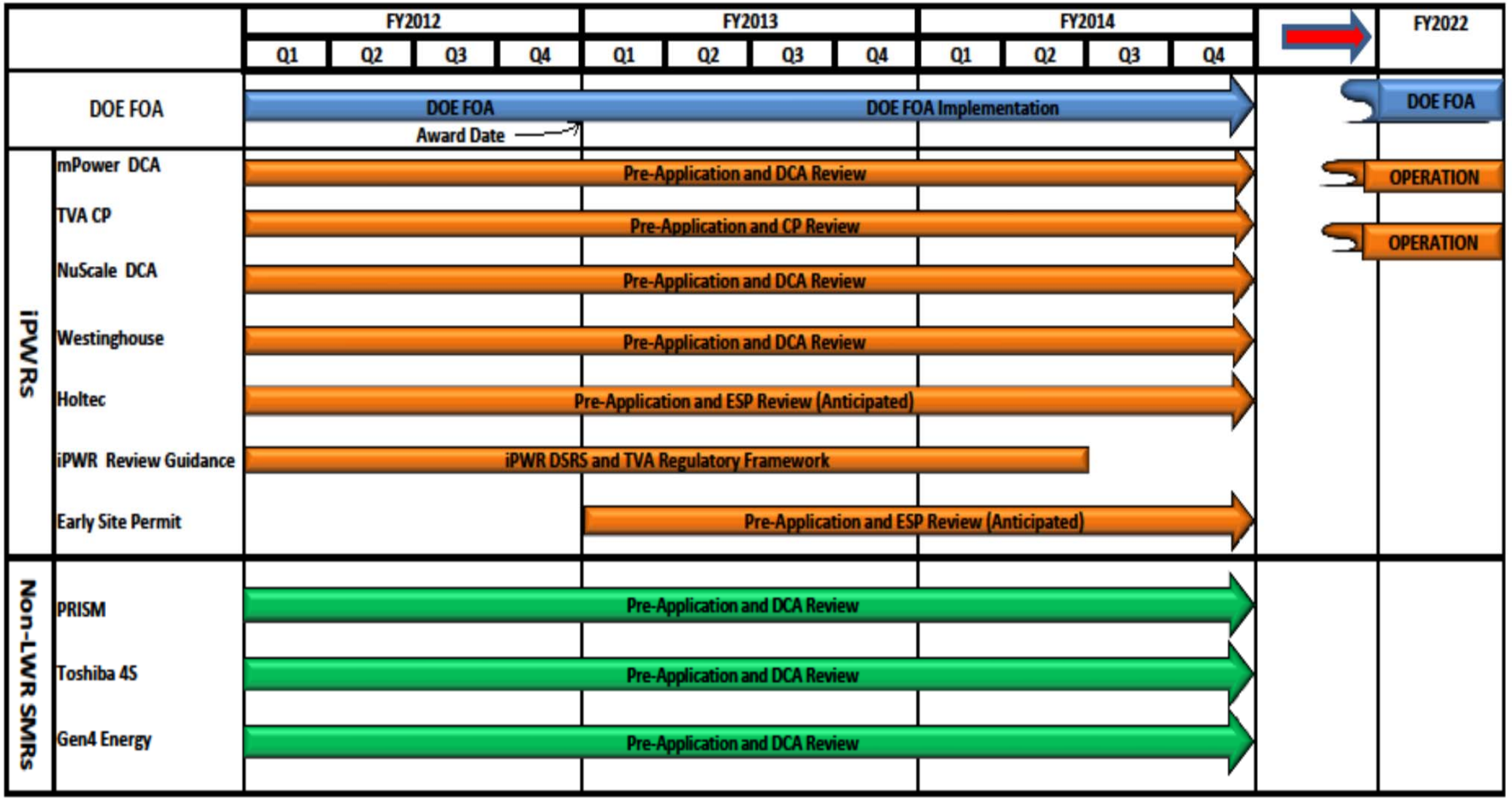
Advanced Reactor Regulatory Activities



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Information:

http://www.nrc.gov/

http://www.nrc.gov/reactors/advanced.html