

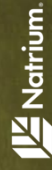
Codes & Standards for New and Advanced Reactors

NRC Regulatory Information Conference



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Natrium reactor is a TerraPower & GE Hitachi technology

Charting the Next 50 Years

- **60 years** – Natrium® design life
- **40 years** – 10 CFR 50.51(a) limitation on newly issued licenses
- **34 years** – Codes & Standards (C&S) limitation
 - ASME BPVC Section III, Division 5 for elevated temperature service conditions - currently only provides time-at-temperature properties for 300,000 hours (34 years considering outage times)

New and Advanced – C&S Endorsement Process

- **NRC Action Plan, Item 2.3 – Huge Opportunity!**
 - **Completely re-assess need for any Code endorsement**
 - Commercial/non-nuclear consensus Code **endorsement without exception** – preferred
 - Resolution of conditions **during** Code meetings
- **Efficiency Gains**
 - Conditions resolved prior to the conclusion of Code meetings while all the experts needed to make a decision are still together
 - Negates need for further downstream efforts (e.g., DG-1436)
 - Empowers staff and applicants to focus on safety-of-design vs Code nuances
 - Reduces project risk

Harmonization

- **Alignment of Code initiatives with Part 53 Rulemaking**
- **Improved alignment with NEI 18-04 as endorsed by RG 1.233:**
 - C&S are selected based on the safety significance of the functions performed by SSCs rather than based on the overall safety classification of the SSC
- **Blending with International Codes (IAEA initiative)**
- **Benefits:**
 - Acceptance and consistency across Advanced Reactor licensing applications and jurisdictions
 - Improved support for equivalency and convergence towards alignment of common outcomes and safety objectives
 - Does not mean all requirements or means to achieve outcomes must be identical
 - Benefits both applicants and regulatory staff in the licensing process
 - Supports and accelerates adoption of RIBP design methods

The Human Element - Impact on Quality Group Classifications

- **Lingering tendency** toward deterministic evaluation methods (e.g., DG-1436)
 - Designing NSRST using safety-related codes, with reductions needing to be justified, is inconsistent with the intent of NSRST as discussed in NEI 18-04
- **Potential exists** for newly proposed requirements to embrace broader scope that evaluates measures provided in other codes that augment/compliment the specific code or safety concern being evaluated for endorsement

NST & NSRST – “A Feature Not A Flaw”

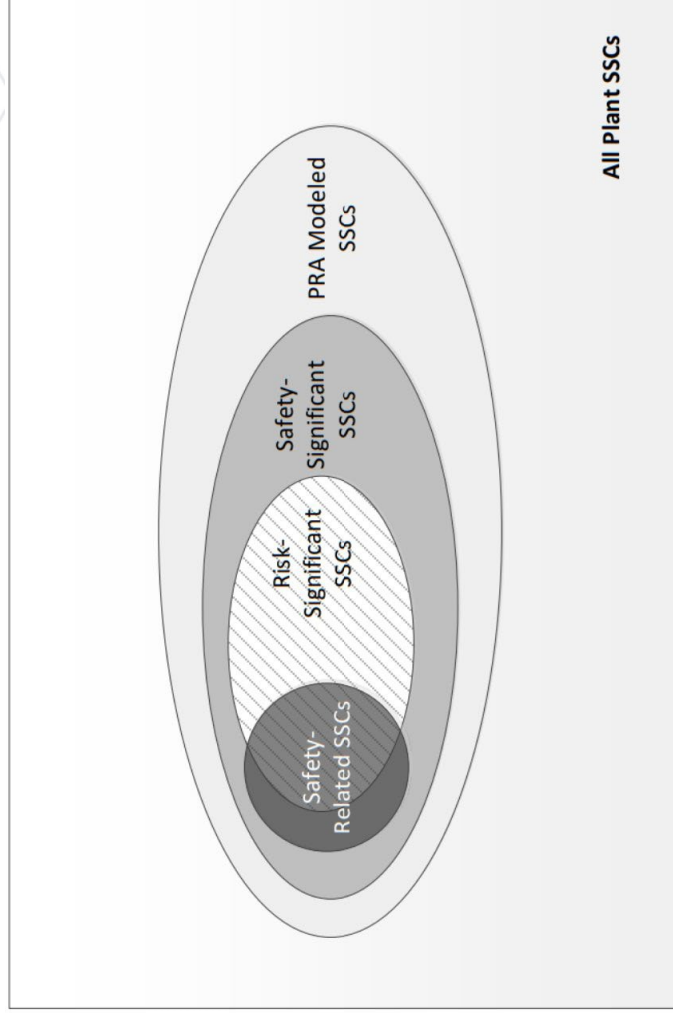
Introduced by NEI 18-04 (as endorsed by RG 1.233)

LMP allows the industry to draw system boundaries and select C&S based on evaluated risk-informed safety functions and applicable PRA Safety Functions in lieu of existing deterministic practices:

- NRC reviews and approves methodology
- NST & NSRST classified using approved methodology
- Ideally, the need for additional review would be rare and considered an exception

Safety-significant, but not safety-related

- Designed and constructed IAW commercial C&S but with special treatments applied as necessary commensurate with their risk significance



NEI 18-04 Fundamentals

What has changed?



Code Selection and Special Treatments

LMP approach is not intended as an outright replacement of deterministic, regulation-based design but is a necessary exercise due to the changes in reactor technology and to focus on specific PRA Safety Functions (PSFs)

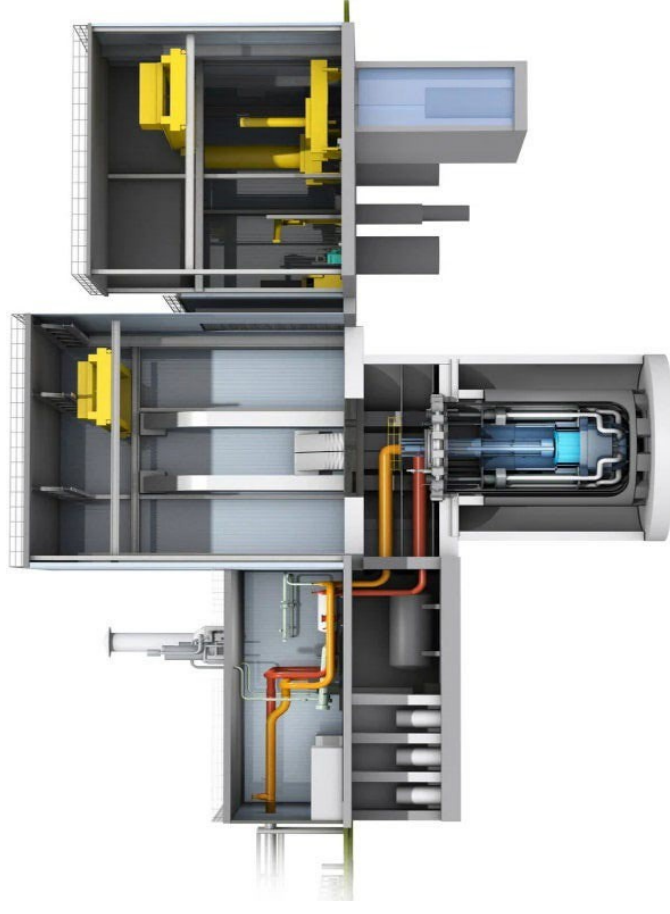
- Not entirely new concept – borrowing existing practices from current design methods
- Goal of increased assurance requires an understanding of the source of the PRA risk information
- Special treatment selection must consider the PSF applicability and reactor technology
- Systematic process to determine adequacy of C&S and identify special treatments

Code Selection and Special Treatments

- Special treatment is the application of requirements that provide **increased assurance** beyond normal industrial practices that SSCs perform their design-basis functions
- Special treatment definition implies all SSCs (even SR) start at a “normal industrial” baseline (i.e., NST commercial-grade)
 - Typically, default special treatment profile for SR SSCs is the use of nuclear C&S and established NPP Programs
- While narrow application of special treatments is desired, use of holistic, proven, consistent methods for increased assurance is a more effective process
- NSRST SSCs, like NST SSCs, are not safety-related and should default to the use of established, commercial-grade, non-nuclear C&S
 - Supplementing with selective design augmentations (e.g., external hazard protection) and other programmatic treatments for NSRST SSCs provides increased assurance
- Endorsing commercial C&S as an acceptable baseline streamlines future license applications

Lessons Learned

- **Simultaneous design and PRA** during early design, and particularly regarding external hazards, is a challenge
- **Internal understanding of LMP**, especially as delta to existing C&S/RG practices, requires proactive investigation, training, and communication measures
- **Ability to communicate** risk-informed licensing basis between the applicant and regulator (results vs process based) is key to effective and efficient compliance and oversight
- **Small SR footprint** provides opportunity to use commercial industry C&S for majority of build contracts



Acronym List

ACRS	Advisory Committee on Reactor Safeguards	NEI	Nuclear Energy Institute
ASME	The American Society of Mechanical Engineers	NPP	Nuclear Power Plant
BPV	Boiler and Pressure Vessel	NRC	Nuclear Regulatory Commission
C&S	Codes and Standards	NST	Non-Safety-Related with No Special Treatment
CFR	Code of Federal Regulations	NSRST	Non-Safety-Related with Special Treatment
DOE	Department of Energy	PRA	Probabilistic Risk Assessment
DG	Draft Guide	PSF	PRA Safety Function
IAEA	International Atomic Energy Agency	RG	Regulatory Guide
IAW	In accordance with	RIPB	Risk-Informed and Performance-Based
LMP	Licensing Modernization Project	SSC	Structures, Systems, and Components
MD	Management Directive	SR	Safety-Related