Implementation of 10 CFR 50.69 at Southern Nuclear

RISK-INFORMED CATEGORIZATION AND TREATMENT OF STRUCTURES, SYSTEMS AND COMPONENTS FOR NUCLEAR REACTORS

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50.69 Background

- 10 CFR 50.69 was approved in 2004
- Allows utilities to risk-inform the safety classification of systems, structures, and components
- Four risk categories are applied – *R*isk-*I*nformed *S*afety *C*lassification RISC-1, RISC-2, RISC-3, RISC-4
- Focus is on RISC-1 and RISC-2 from a safety perspective
- Focus is on RISC-3 equipment from a burden reduction perspective
- RISC-3 equipment is *eligible* for alternate treatment in lieu of "special" treatment mandated by current regulations.

50.69 Background

- South Texas exemption and graded QA program are fore-runners of the Rule
- Industry Prototype program for the 50.69 Rule being implemented at Vogtle 1&2
- Vogtle License Amendment Request submitted August 2012
- NRC approval and SER received 12/2014
- Three systems categorized to date
  - Chemical and Volume Control System (CVCS)
  - Containment Spray
  - Radiation Monitors (PERMS)

50.69 Background - Risk Categories

NEI 00-04

Categorization Process

	Safety-Related	Non-Safety-Related
Safety Significant	RISC-1	RISC-2
Low Safety Significance	RISC-3	RISC-4

50.69 Background - Categorization Process

NEI 00-04 Governs the Categorization Process. The Process must:

- Consider results and insights from the plant-specific PRA
- Determine SSC functional importance using an integrated systematic process….
- Maintain defense-in-depth
- Include evaluations that provide *reasonable confidence* that for SSCs categorized as RISC–3, sufficient safety margins are maintained and that any potential increases in core damage frequency (CDF) and large early release frequency (LERF) resulting from *changes in treatment* permitted by implementation of §§ 50.69(b)(1) and (d)(2) are small.
- Be performed by an independent decision-making panel staffed with members whose expertise includes, at a minimum, PRA, safety analysis, plant operation, design engineering, and system engineering.

50.69 Background

Programs and Disciplines Which Could Be Affected By 50.69 Implementation:

- Procurement/Supply Chain
- Maintenance Rule
- ISI/IST
- Seismic Qualification
- EQ
- Others?

50.69 Background

10CFR50.69 eliminates the following "special treatment" requirements for applications that have been designated as RISC-3:

- Quality Assurance requirements as defined in Appendix B to 10CFR Part50,
- 10CFR Part 21 reporting requirements,
- Testing, documentation, and margin requirements for EQ purposes (10CFR 50.49),
- Applicable portions of ASME in-service inspection and repair / replacement requirements (10CFR50.55a(g),
- Applicable portions of ASME O&M Code in-service testing of pumps, valves and snubbers (10CFR50.55a(f)
- Electrical component quality and qualification requirements as listed in portions of & IEEE standards 279 and 603-1991 codes and standards (10CFR 50.55a(f), (g) & (h)),
- Maintenance Rule (10CFR 50.65), except paragraph (a)(4)
- Reporting requirement (10CFR 50.72 and 50.73),
- Portions of Appendix J containment leakage testing (Options A and B),
- Seismic qualification with respect to extent of required qualification testing and specific types of analyses (sections of Appendix A to 10CFR Part 100).
- 10CFR50.55(e)

50.69 In-Service Testing "Early Win" for Vogtle

- Containment Spray Pump was categorized as RISC-3.
- IST Alternate Treatment Testing Plan which changed the requirement for Containment Spray Pump full flow testing from every 18 months to every 54 months was approved by the Plant Review Board. (Alternate treatment is to take credit for the minimum flow test).
- As a result the CS pump full flow test was removed from the Unit 1 Fall RFO.

Reasonable Assurance vs. Reasonable Confidence

10 CFR 50.69 **eliminates** a number of special treatment requirements for RISC-3 applications – these requirements provide *“reasonable assurance”* that the component will perform its safety function during design basis conditions.

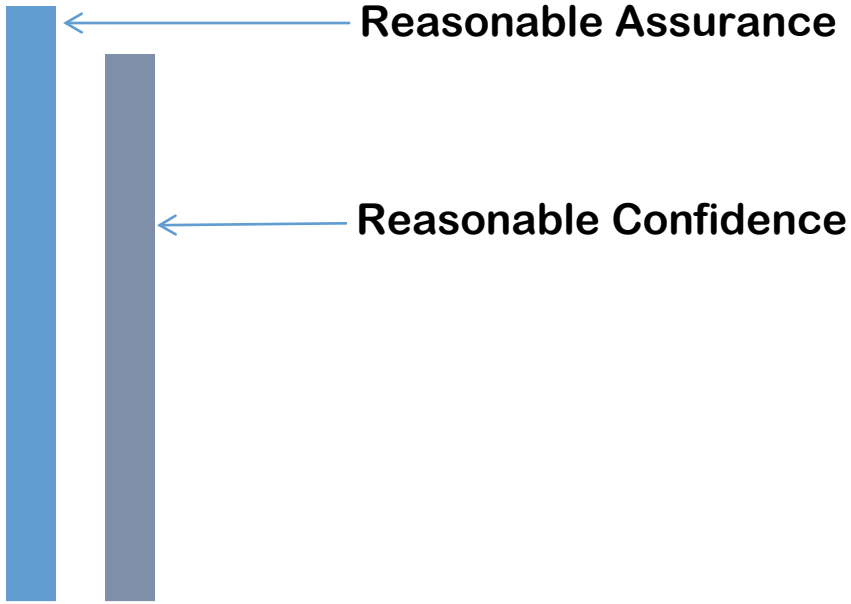
However, at the same time 10 CFR 50.69 defines requirements to be applied to RISC-3 applications to establish *"reasonable confidence"* that the component will perform its safety function during design basis conditions.

What Is Reasonable Confidence??

Reasonable confidence is defined as a level of confidence based on engineering evaluation which should be supported by facts, actions, knowledge, experience, and/or observations. Reasonable confidence is a lower level of confidence than reasonable assurance. The term actions constitutes verifications, calibrations, tests, or maintenance activities.

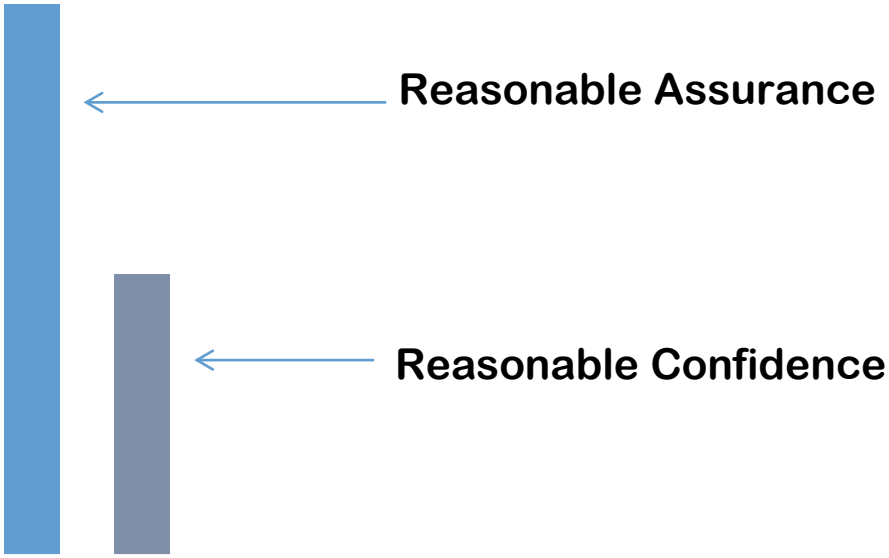
For EQ, are Reasonable Confidence and Reasonable Assurance essentially equal??

What Is Reasonable Confidence??



If Reasonable Confidence is defined as essentially equivalent to Reasonable Assurance, 50.69 provides no benefit.

What Is Reasonable Confidence??



If reasonable confidence can be defined as substantially less than reasonable assurance, benefit can be realized from 50.69 and alternate treatment.

EQ Special Treatment

Under 10 CFR 50.69, these EQ special treatment activities may be replaced with alternate treatment:

- required component replacements due to expiration of EQ-mandated qualified lives
- procurement and qualification requirements for replacement EQ components.

Applying Alternate Treatment to EQ

- In order to maximize the potential benefit for EQ, candidates for alternate treatment must be identified well ahead of their scheduled replacement, and EQ engineers or work planners must **intervene** to identify components eligible for alternate treatment.
- A special evaluation will be performed to establish reasonable confidence that a RISC-3 EQ component can perform its safety function during DBE environmental conditions. These evaluations will become part of the EQ Central File in the EQDP corresponding to the RISC-3 component being evaluated (even though technically the component is no longer in the EQ Program).

Accident Function Assessment

An alternate treatment evaluation for EQ components is called an Accident Function Assessment.

EPRI Report 1009748 provides guidance for performing Accident Function Assessment (AFA). An AFA is an *assessment that establishes reasonable confidence that a device will perform its design basis function under the design basis normal and accident environments throughout its service life.*

Accident Function Assessment

Two types of AFAs could be developed for EQ. The type of AFA chosen depends on the alternate treatment selected for a component.

1. **Allow the existing component to stay in service past its EQ "qualified life"**
2. **Evaluate commercially procured components to be used as replacements for "qualified" components.**

A design change may be necessary to implement alternate treatment.

There are no prescriptive rules for performing an AFA.

Elements of an EQ AFA

- Identification of component
- Device description
- Device attributes important to accident functionality
- Identification of existing special treatment provided by EQ Program
- Identification of accident conditions
- Identification of normal conditions

Elements of an EQ AFA

- Assessment of environmental capability – using alternate treatment
- Summary of AFA conclusions
- Maintenance, surveillance, and calibration requirements
- Installation requirements
- Procurement instructions
- References

Elements of an AFA

What exactly is "Alternate Treatment" for EQ components?

- Focusing the life assessment on critical material rather than on all materials;
- Take into account the severity of the harsh environment;
- Establishing material service life using published material capability data rather than accelerated aging limitations;
- Determining temperature effects on service life using representative information rather than conservative EQ values (for example, using a more *representative* activation energy or actual temperatures rather than conservative ones);
- Extending service life based on operating experience with non-safety-related equipment or equipment used in other applications or industries;
- Applying excess thermal margin from accident simulation to service life;
- Using in-service inspection and testing as the basis for continued use;
- Commercial vendor documentation, Equivalency Evaluations, Technical Evaluations, Limited Testing

Vogtle 50.69 EQ "Early Win"

"Early Win" test case for the Vogtle EQ Program – Hills-McCanna 1-inch manual diaphragm valve 2-1208-U4-296.

- This valve is included in the Mechanical EQ Program at Vogtle
- Thermal and radiation qualified life are both 60 years
- Cycle testing establishes a qualified life of 15 years based on the in-service cycle frequency.
- However, cycle life is limited to 5 years based on ASME Code Case N-31, which limits these types of valve to one-third of the cycle life established by testing. (Code Case N-31 has since been incorporated into Section III of the ASME Code).
- ASME Code requirements are considered "Special Treatment."

Vogtle 50.69 EQ "Early Win"

Alternate treatment is to establish qualified life based on vendor testing.

Eliminating "special treatment" allows the valve to remain installed for up to 15 years instead of 5 years.

For components which receive alternate treatment, the Rule requires enhanced inspection and testing:

"Inspection and testing. Periodic inspection and testing activities must be conducted to determine that RISC– 3 SSCs will remain capable of performing their safety-related functions under design basis conditions; and

Corrective action. Conditions that would prevent a RISC–3 SSC from performing its safety-related functions under design basis conditions must be corrected in a timely manner."

Vogtle 50.69 EQ "Early Win"

Enhanced Testing for 2-1208-U4-296

- This valve is not in the ISI or IST Programs.
- Diaphragm failure would be indicated by unexpected flow of boric acid back to the Boric Acid Storage Tank.
- This flow will be observed during 18-month Boric Acid Transfer Pump testing.
- Procedure will be revised to prompt operators to line up valves and observe for unexpected flow in Flow Indicator 2FI-40001 during Boric Acid Pump test.

Questions?