EPRI Technical Report 3002025288 "Enhanced Risk-Informed Categorization Methodology for Pressure Boundary Components"

NRC Public Meeting

April 30, 2024

Introduction

- EPRI appreciates the opportunity to discuss NRC feedback on EPRI Technical Report (TR) 3002025288 “Enhanced Risk-Informed Categorization Methodology for Pressure Boundary Components”
- We look forward to an open discussion on the NRC-identified gaps in the EPRI TR 3002025288 submittal
- Focus is to ensure a robust understanding of NRC-identified gaps:
  - To ensure we fully understand the gaps and their basis
  - To consider the appropriate level of detail necessary to address the gaps
  - To determine a path forward, fully supplement in a timely manner

EPRI’s goal is to address technical and process gaps needed

Supplemental Items 2, 3, and 4

- *Supplemental Items 2, 3, and 4 have a similar theme that a detailed, specific technical basis is necessary to confirm criteria 1 through 10 (of the 14 criteria proposed in the EPRI methodology) will be adequate to provide appropriate categorization and that any reduction in margin will continue to provide reasonable assurance of adequate protection, while complying with 10 CFR 50.69*
- *Detailed technical basis is necessary to efficiently evaluate EPRI's proposed methodology will not mis-categorize pressure boundary components*

For Discussion on Supplemental Items 2, 3, and 4

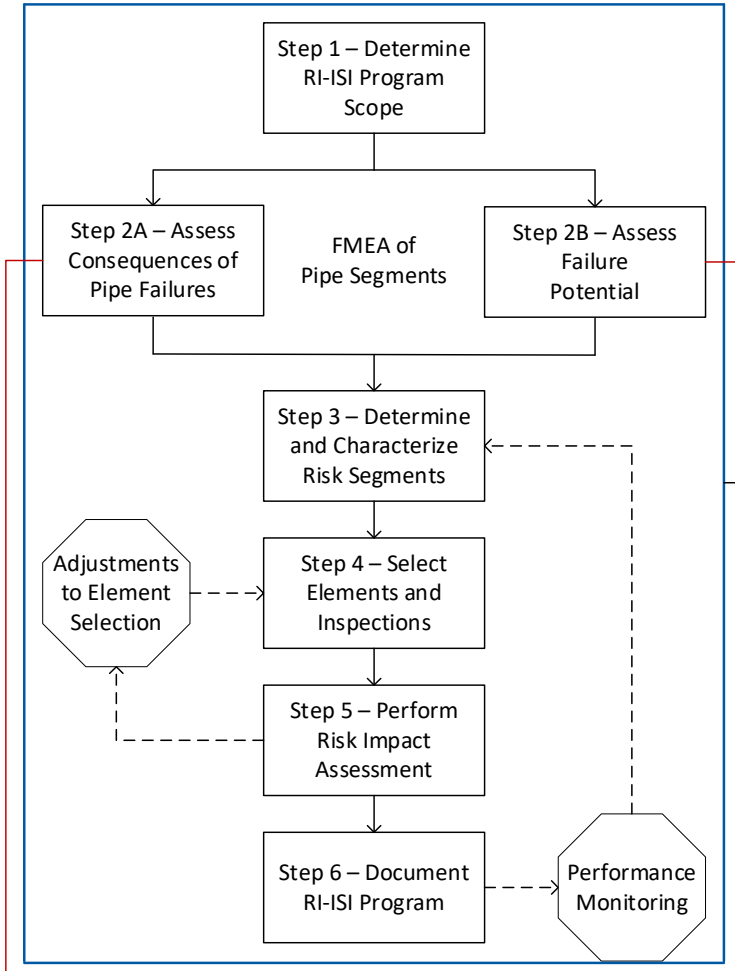
a) *NRC basis: use of risk insights to develop pre-determined criteria 1-10*

b) *Supplement Table 1 to ensure LSS categorization is robust*

c) *Ensure basis identified from RI-ISI is appropriate for 50.69 passive SSCs*

- EPRI understands the focus of supplemental Items 2, 3, and 4 is to provide the detailed, specific technical basis is necessary to confirm criteria 1 through 10 (within the entire 14 criteria) to:
  - Document its adequacy within 50.69, passive categorization
  - Ensure appropriate categorization can be reasonably assured with sufficient margin (while avoiding potential mis-categorization)

Evolution of EPRI RI-technology to Pressure Boundary Components



VY – RI-ISI Pilot Study
Partial Scope Application to Class 1 Piping Only Based on ASME Code Case N-560
SE dated November 9, 1998
ML20195C416

ANO-2 – RI-ISI Pilot Study
Full Scope Application to Class 1, 2 and 3 Piping Based on ASME Code Case N-578
SE dated December 29, 1998
Letter 2CNA129805

ANO-1 – RI-ISI Pilot Study
Partial Scope Application to Class 1 Piping Only Based on ASME Code Case N-560
SE dated August 25, 1999
Letter 1CNA089904

EPRI TR-112657, Rev B-A
Traditional RI-ISI Methodology
Revised Risk-Informed Inservice Inspection Evaluation Procedure
dated December 1999
SE dated October 28, 1999
ML993190474
Incorporates Lessons Learned from the VY, ANO-2 and ANO-1 RI-ISI Pilot Plant Applications

EPRI TR-1006937
RI-BER Methodology
Extension of the EPRI Risk Informed Inservice Inspection Methodology to Break Exclusion Region Programs
dated February 2001
Incorporates Lessons Learned from RI-BER Pilot Plant Applications documented in EPRI TR-1006837

Damage Mechanism Evaluation portion of EPRI TR-112657 used to assess the susceptibility of HSS Components to DMs in the Streamlined RI-ISI Process

ASME Code Case N-716
Streamlined RI-ISI Methodology
Alternative Piping Classification and Examination Requirements
issued April 19, 2006
ASME Code Case N-716-1
Approved in RG 1.147 Revision 17
Streamlined process based on Extensive Experience with Traditional RI-ISI Methodology Applications

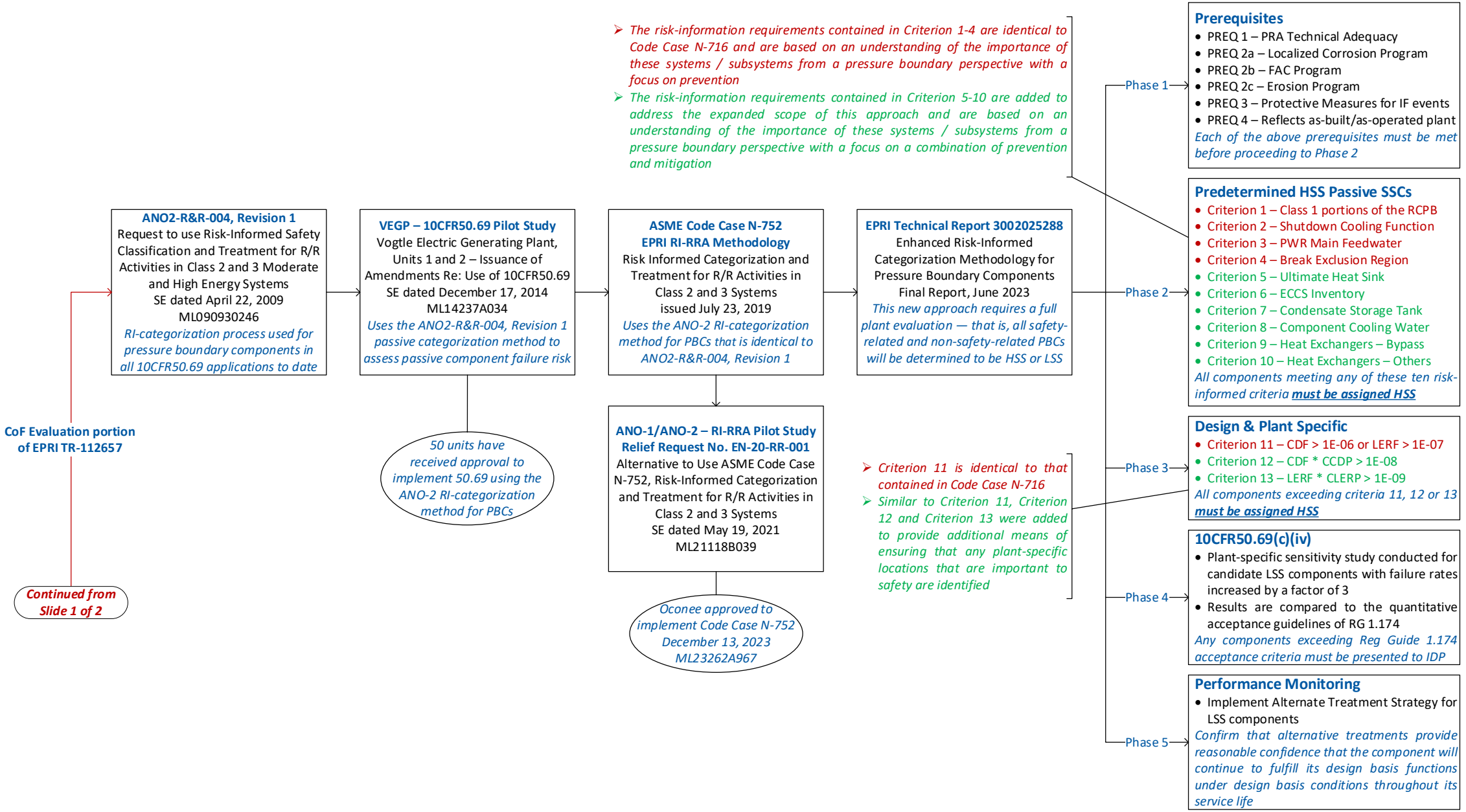
HSS Components
1 Class 1 portions of the RCPB
2 Class 1 and 2 portions of systems located in the normal shutdown cooling flowpath
3 Class 2 portions of PWR main feedwater systems
4 Break Exclusion Region piping in high energy piping systems
5 CDF > 1E-06 or LERF > 1E-07

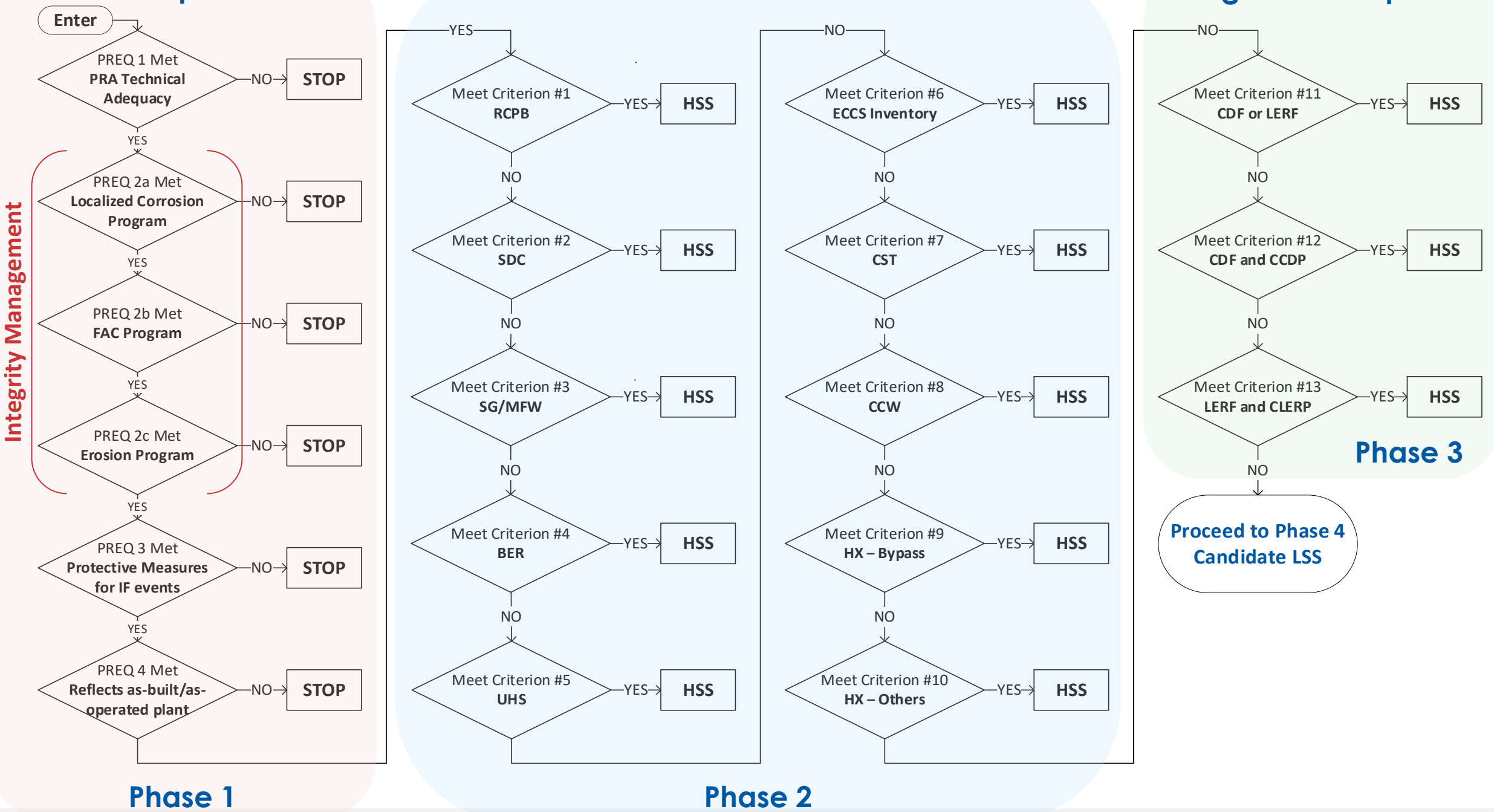
The risk-information requirements contained in Criterion 1-4 are based on an understanding of the importance of these systems / subsystems from a pressure boundary perspective with a focus on prevention. Criterion 5 included to capture plant-specific outliers important to safety.

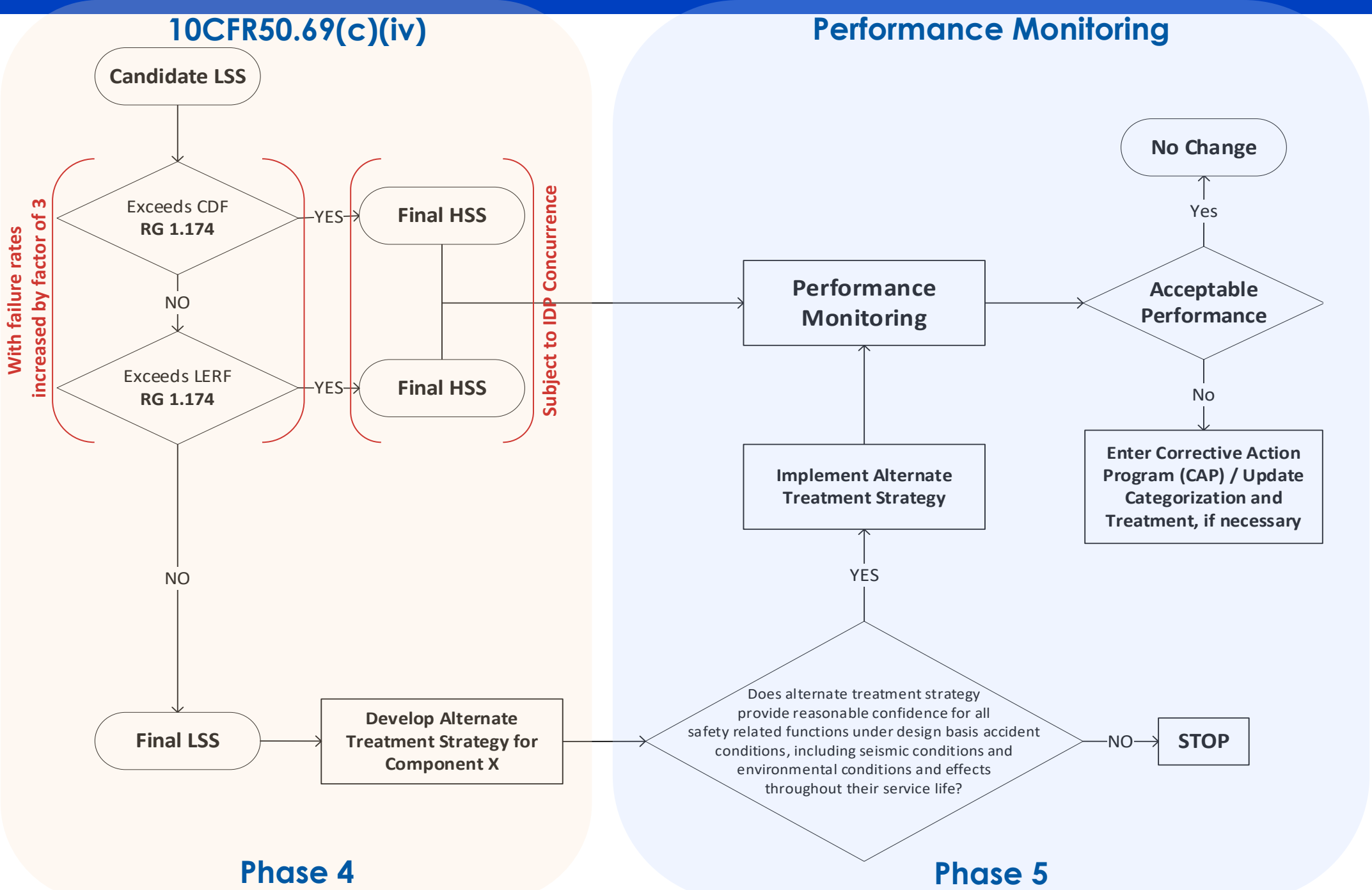
Consequence of Failure Evaluation portion of EPRI TR-112657 used for the RI-categorization of pressure boundary components

Continued on Slide 2 of 2

Evolution of EPRI RI-technology to Pressure Boundary Components







For Discussion on Supplemental Items 2, 3, and 4

- EPRI will supplement the existing basis in the TR submittal

- Focus of our discussion is to understand the expectation and needs to what needs to be supplemented and the level of detail

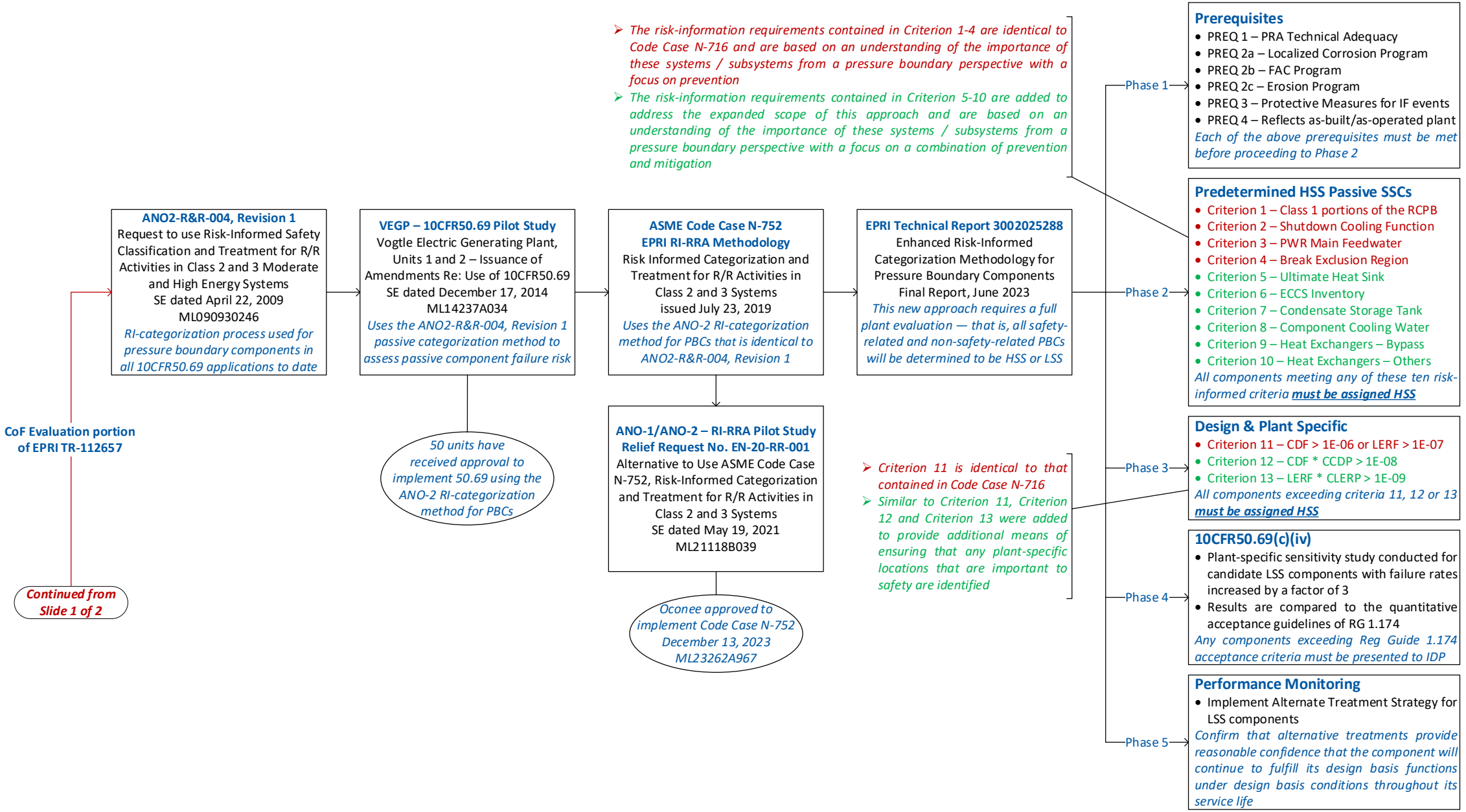
DISCUSSION Items 2, 3, 4

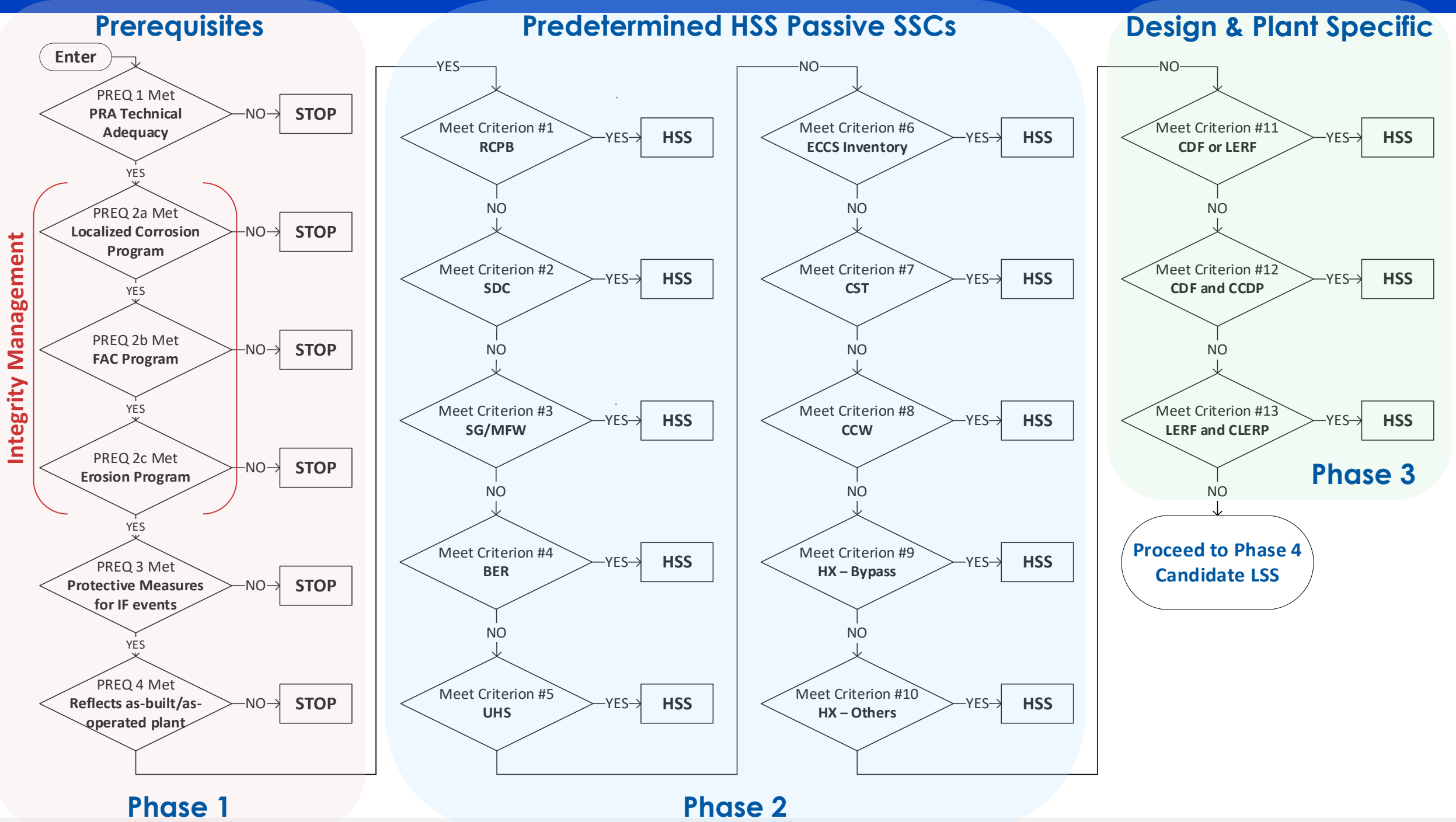
For Discussion on Supplemental Item 1

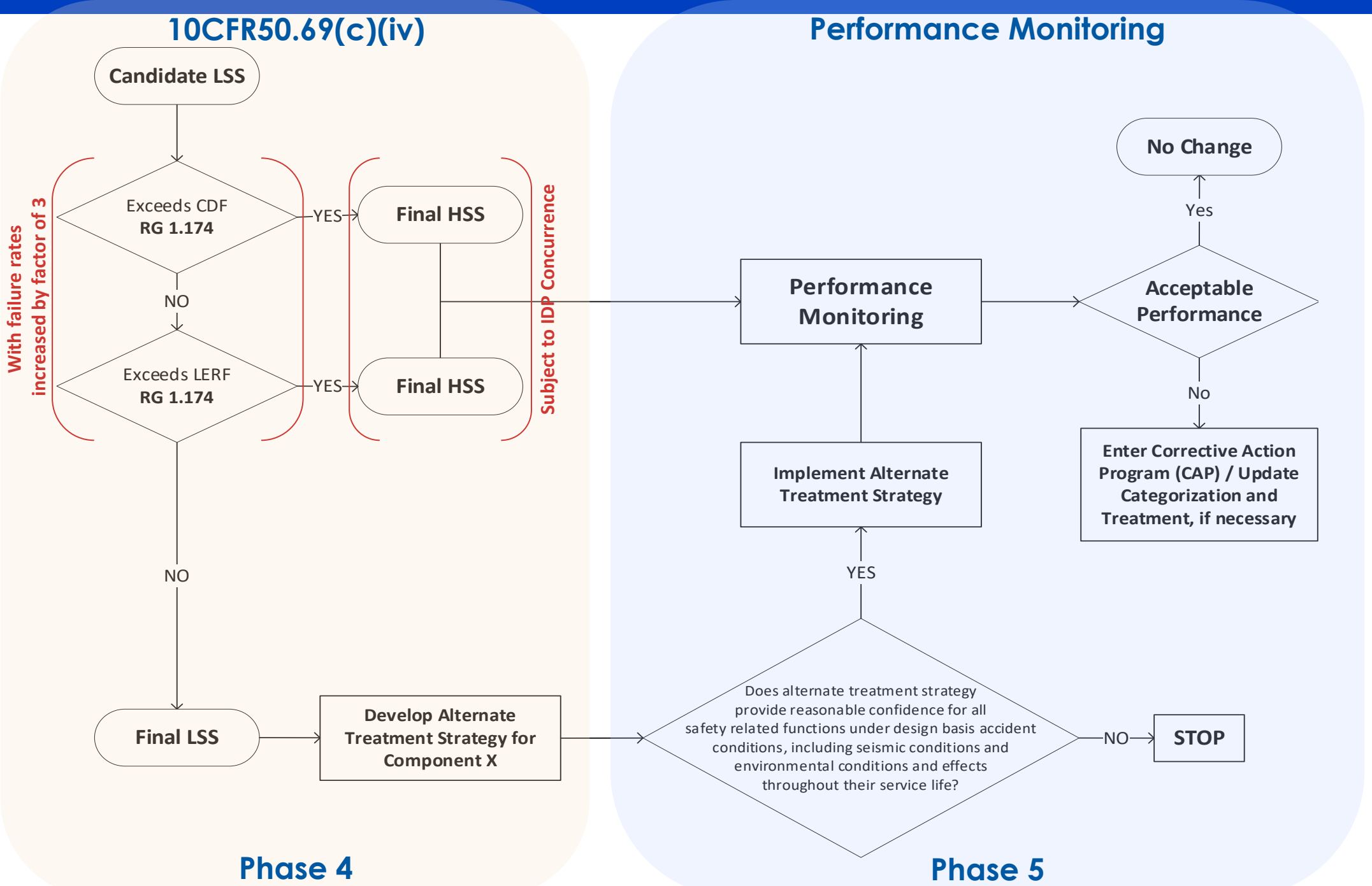
- *Recognizing that there are 14 criteria, generic criteria 1-10 have not been demonstrated to be applicable to the range of designs*
  - *Basis a: how different types and designs are reflected in the guidance*
  - *Basis b: how an integrated, systematic methodology based on*
    - *Current plant configuration and*
    - *Industry operating experience*

- EPRI built the guidance with insights from different types and designs of NSSS suppliers, systems, components, risk insights, OpE
  - Elements in the submittal include such considerations
  - EPRI understands NRC identified a gap and can supplement with understanding of level of detail
- Intent of guidance is to be integrated, systematic; in line with 50.69 existing guidance
  - EPRI can supplement and reinforce the intended integrated/systematic element of guidance

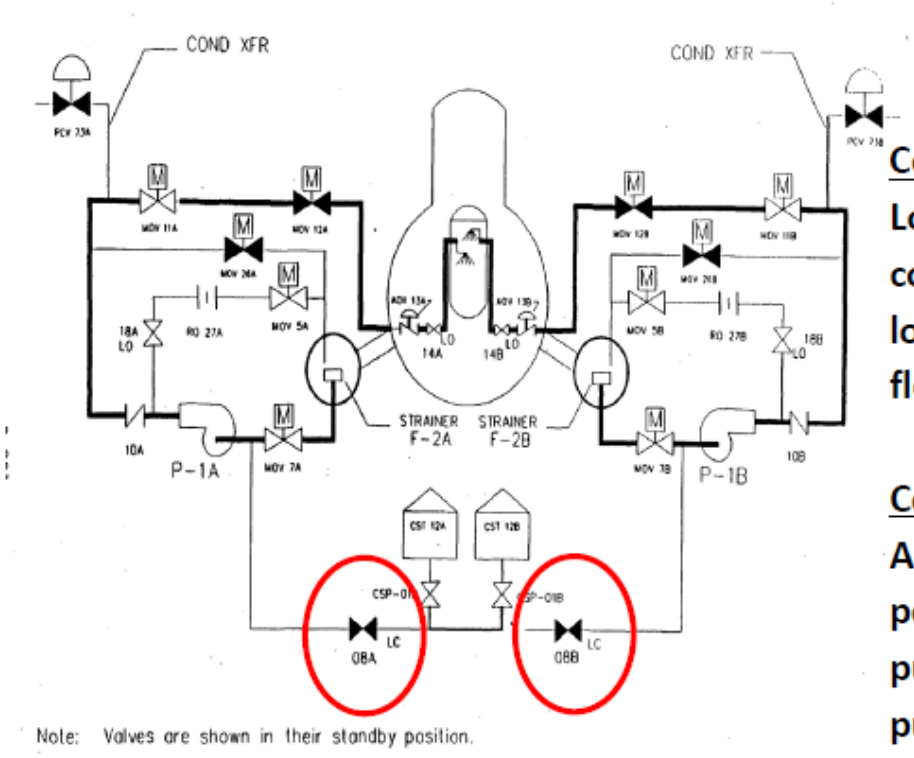
Evolution of EPRI RI-technology to Pressure Boundary Components







Supplemental Item 1 – Example 1



Note: Valves are shown in their standby position.

Configuration:

Low Pressure Core Spray system in a BWR/4 (Mark I containment). Piping to pump suction from each CST to locked-closed valves 08A and 08B located in the grade level floor of a Reactor Building Crescent area.

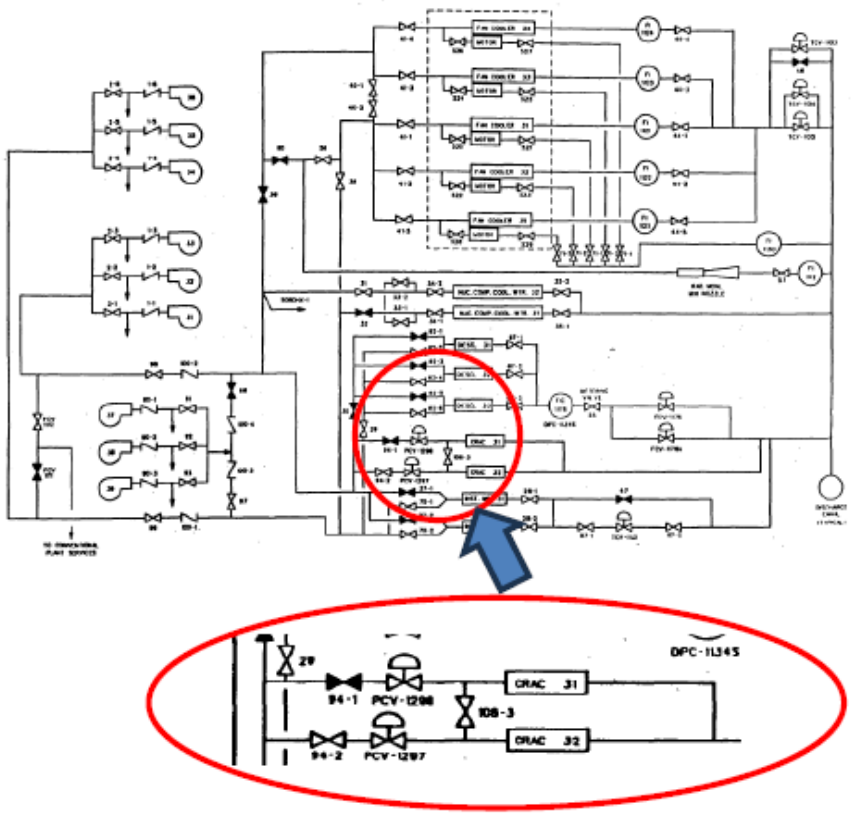
Concern:

A single rupture of either line in each Crescent Area has the potential to result in flood and spray damage to a core spray pump, LPCI/RHR pump on one loop, and either HPCI or RCIC pump controls. Damage to the pumps is risk significant.

EPRI TR 3002025288:

This could be categorized as LSS since it falls outside the scope of Criterion 7 which only addresses failures associated with the CST for PWRs as HSS.

Supplemental Item 1 – Example 2

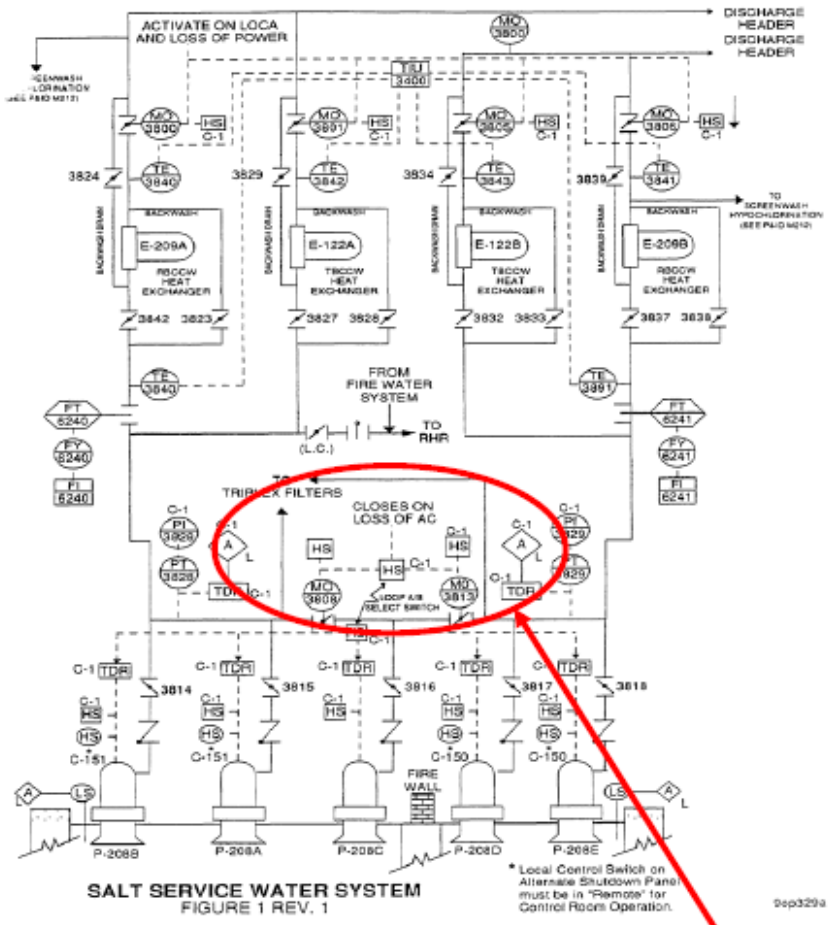


Configuration:
Common service water line in a 4-loop Westinghouse (pre-GDC) PWR from the Essential Header to both Control Room Air Conditioning (CRAC) unit condensers CRAC-31 and CRAC-32.

Concern:
A single rupture could pose a control room habitability issue since both CRAC units are impacted and radiological calculations at this plant has computed a post-accident source term in the Turbine Hall outside the control room doors. Damage to the pumps is risk significant.

EPRI TR 3002025288:
The staff is concerned that this would be categorized as LSS, per the EPRI proposed methodology, because the conditions of Criteria 1-10 may not be met. And, since control room HVAC is not modeled in most licensee model-of-records, there is no entry into Criteria 11-13 as a safety-net to determine as HSS.

Supplemental Item 1 – Example 3



SALT SERVICE WATER SYSTEM
FIGURE 1 REV. 1

Valves MO-3408 & MO-3813 are normally open and shut on loss of AC.

Configuration:

Salt Service Water system in a BWR/3 (Mark I containment). A single train system which will isolate to two trains on a LOOP or accident signal.

Concern:

A single rupture while both trains operating together could result in a catastrophic loss of cooling before isolation.

EPRI TR 3002025288:

Criterion 8 addresses this condition only for PWR plants.

For Discussion on Supplemental Item 1

- EPRI understands the NRC-identified issue:
  - Enhance basis and implementation of the different types and designs being reflected in the guidance
  - Reinforce the integrated, systematic methodology (consistent with existing overall guidance for 50.69)
  - We also understand the examples 1, 2, 3 are to highlight specific NRC concerns

- Focus of our discussion is to understand the expectation and needs to what needs to be supplemented and the level of detail
  - Review of the examples indicate the enhanced methodology would not allow for mischaracterization of HSS versus LSS
  - EPRI can supplement to reinforce/strengthen these aspects

DISCUSSION Item 1

For Discussion on Supplemental Item 5

- *Operating experience shows that smaller SSCs fail at a higher rate than larger SSCs and that some smaller diameter piping with high CCDP could be categorized as LSS.*

- EPRI understands the NRC indicated supplemental information provided by EPRI included the type of information the staff is seeking.
  - We would like to discuss the information and the level of detail to ensure EPRI actions to supplement follow the expectation

DISCUSSION Item 5

Supplemental Item 6

- Pipe rupture initiating event frequencies could change with new treatments, such as: changes due to revised inspection, quality control, and repair/replacement activities. It is not apparent to the RNC staff that these changes are accounted for in the method.
  - The supplemental information provided by EPRI for NRC Item 6 includes sufficient information for the staff's acceptance review

- EPRI appreciates the NRC feedback on this issue
- EPRI will be prepared to address additional questions on this item, if any, beyond the acceptance review

DISCUSSION Item 6

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