

CISCC Susceptibility Assessment Criteria

Resolution of NRC Comments

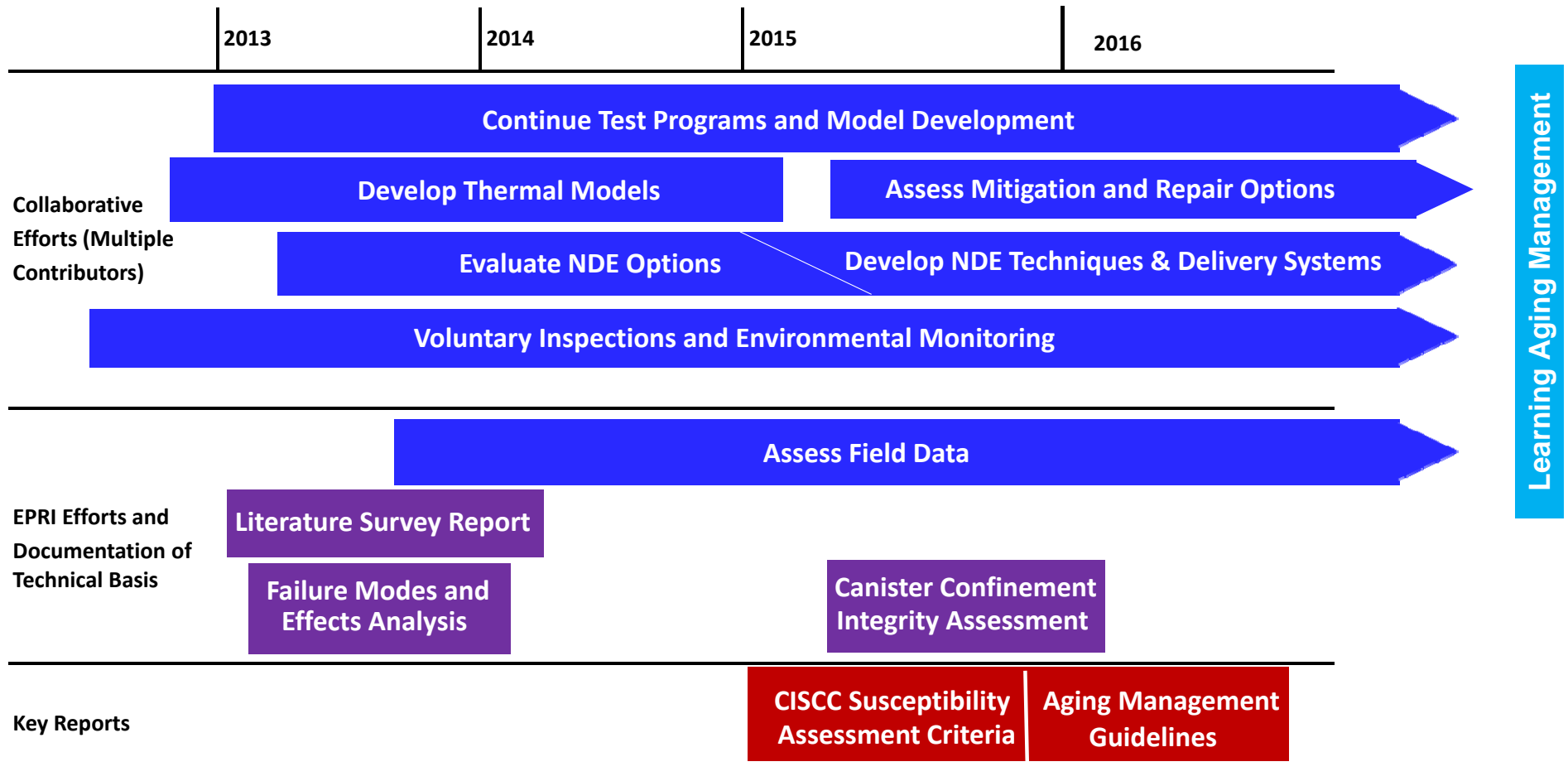
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RIRP Closure Meeting
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Overview

- Publication of EPRI's Susceptibility Assessment Criteria was an important milestone both in the closure of the RIRP and in the path to development of Chloride-Induced Stress Corrosion Cracking (CISCC) Aging Management Guidelines
- These criteria may be used by Independent Spent Fuel Storage Installation (ISFSI) managers to evaluate the potential for CISCC to occur on canisters at their site.
- The NRC has provided comments on these criteria which will be addressed in this presentation.

Pathway to CISCC Aging Management Guidelines



Susceptibility Assessment Criteria Report (September 2015)

- **Criteria define site conditions and canister parameters associated with earlier potential for CISCC initiation and growth**
- Criteria allow ranking of canisters to set priorities for inspection and other aging management efforts
- Document includes
 - Factors Affecting Susceptibility to CISC
 - **ISFSI Susceptibility Assessment Criteria**
 - **Canister Susceptibility Assessment Criteria**
 - Guidance for Use of Rankings
 - Summary of Susceptibility Assessment Criteria and Conclusions
 - Modeling Overview
 - Chloride Aerosol Deposition (Model Description)
 - Atmospheric Absolute Humidity Assessment (Guidance for Data Gathering and Calculation)

NRC Comment Resolution

- Comments provided by the NRC have been addressed with line by line specific responses provided on 4/7/2016
- This summary presentation bins the comments into the following categories:
 - Feedback that can be incorporated into EPRI's Aging Management Guidelines
 - Comments that require additional explanation of EPRI's approach
 - Comments that require clarification of EPRI's scope definition
- EPRI does not intend to publish revised Susceptibility Assessment Criteria at this time. The criteria are a part of the industry's learning aging management strategy. Revision may be considered after additional inspection data has been acquired or if new experimental data becomes available.

Feedback that can be Incorporated into EPRI's Aging Management Guidelines (1/4)

- NRC Comments 5, 15, 23, 28, 29, and 35 relate to the need to account for local variations in saline sources and weather and to gather data to validate the susceptibility assessment criteria's approach to ranking
 - These comments will be addressed by adding emphasis to the aging management guidelines recommending the use of standard methods for measuring site specific humidity and corrosivity (wet candle) both for the purposes of validating the model and for the purposes of more accurately ranking sites which may have an unaccounted for chloride source (such as an evaporation pond) or lack a representative nearby climate station. Guidance will note that while a minimum of one year of data is necessary to account for seasonal variations, a longer monitoring period is recommended.

Feedback that can be Incorporated into EPRI's Aging Management Guidelines (2/4)

- NRC Comments 9, 11, 12, and 13 relate to impacts that fabrication and welding processes may have on CISCC susceptibility
 - EPRI's aging management guidelines will emphasize the importance of using any available fabrication information relative to annealing, grinding, variations in level of cold work, and rework/repairs when considering CISCC susceptibility.

Feedback that can be Incorporated into EPRI's Aging Management Guidelines (3/4)

- NRC comments 2 and 34 ask for specifics on what new information may be needed and may become available and how it should be incorporated into future changes to Susceptibility Assessments.
 - Additional guidance on the types of additional data of interest (site measurements of climate/corrosivity, inspection results and laboratory data) and the use of this data will be provided in EPRI's aging management guidelines. NEI 14-03 provides a framework for collecting and sharing relevant inspection and operating experience data, and calls for evaluating this data during "tollgate" assessments. EPRI's Extended Storage Collaboration Program provides a venue for sharing of relevant laboratory testing and site measurement data.

Feedback that can be Incorporated into EPRI's Aging Management Guidelines (4/4)

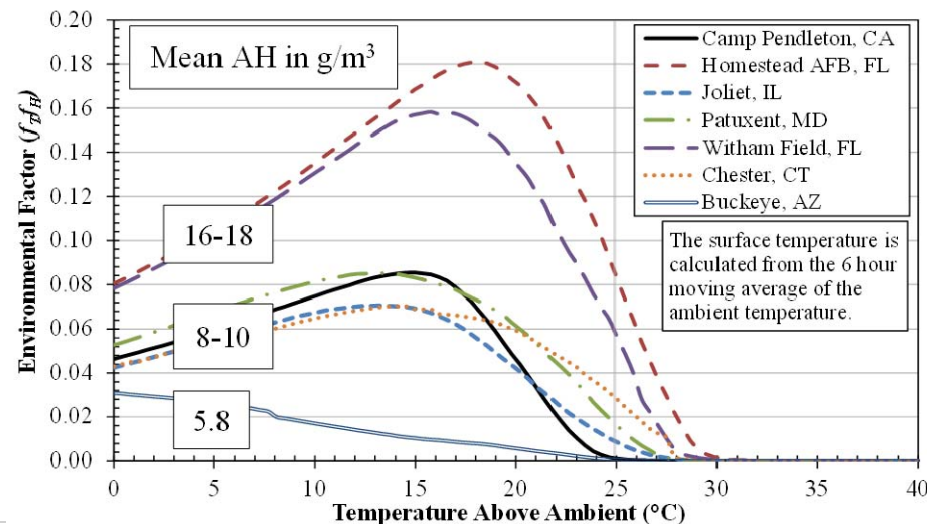
- NRC Comments 4, 6, 7, 8, 10, and 21 offer editorial suggestions to provide more clarity or precision.
 - These suggested improvements will be considered and incorporated as appropriate where there is overlap between the content of the susceptibility criteria report and the aging management guidelines.

Comments that Require Additional Explanation of EPRI's Approach (1/5)

- NRC Comments 16, 17, 18, 20, and 25 request clarification of the basis for particular statements in the criteria report
 - The particular references, calculations, and considerations are identified in the detailed response sheet.

Comments that Require Additional Explanation of EPRI's Approach (2/5)

- NRC comment 19 questioned the use of the mean absolute humidity to assess conditions for crack initiation and growth
 - Mean absolute humidity was found to correlate well with the combined temperature/humidity factor (calculated with consideration of fraction of time when $AH > \text{threshold}$ in flaw growth and tolerance report)



Comments that Require Additional Explanation of EPRI's Approach (3/5)

- NRC Comments 24, 26, and 27 relate to understanding the basis for the ranking factors associated with cooling towers.
 - The intent of the +1 adjustment factor for a non-saline cooling tower is to account for potential effects of additives compared to a site with no cooling tower. Greater fidelity on this item is not achievable with readily available information. Information from the Hope Creek surface sample was considered in the decision to define separate factors for low-saline and high-saline cooling towers.

Comments that Require Additional Explanation of EPRI's Approach (4/5)

- NRC Comments 22, 31, 32, 33, and 36 relate to the uncertainties in how selected susceptibility parameters actually affect CISCC initiation and growth.
 - The uncertainties associated with CISCC initiation at low chloride loads are an important consideration when weighting the effects of canister storage duration and canister storage environment. The assessment criteria are intended to be used as an initial assessment of conditions in order to prioritize the inspections necessary to identify SCC and/or precursors. The learning aging management approach taken by the industry will ensure that additional information and lessons learned will be incorporated as they become available.

Comments that Require Additional Explanation of EPRI's Approach (5/5)

- NRC Comments 30 and 37 relate to truncation of susceptibility factors
 - The rankings can be thought of as facilitating the grouping of sites and canisters into categories of “reduced,” “moderate,” and “elevated” susceptibility. The criteria allow for the possibility that canisters in less susceptible environments will become similarly susceptible to CISCC initiation after a longer duration but still within the timeframe of interest. Eliminating the truncation would be necessary if the industry or regulator were seeking to minimize the population of sites where canisters are inspected to something on the order of 1 to 3 sites.

Comments that Require Clarification of EPRI's Scope Definition (1/2)

- NRC Comments 3, 14, 39 and 41 relate to CISCC data gaps
 - EPRI's scope for the susceptibility assessment criteria report was focused on developing criteria based on available data, the report was not intended to provide significant discussion of the remaining CISCC data gaps or how they may be closed. The uncertainty in available CISCC data will be addressed by developing learning aging management approaches that acknowledge the need for new data and include flexibility to incorporate that data when it becomes available.

Comments that Require Clarification of ERPI's Scope Definition (2/2)

- NRC comments 38, 40, 42, 43, 44, and 45 also relate to issues beyond the scope of the Susceptibility Criteria Report
 - The report was not intended to address regulatory compliance.
 - The report considers extended storage at a licensed ISFSI, it does not address transportation.
 - The report appendix A provides discussion of previous modeling work that was completed in an effort to understand the plausibility and potential significance of CISCC degradation of welded canisters.

Beyond the RIRP – CISCC Aging Management Guidelines

- EPRI will publish recommendations in fall of 2016
 - Inspection scope, frequency, expansion criteria, and evaluation criteria will be spelled out, or incorporated by reference
 - Inspection methods, mitigation, and repair will be discussed in a more qualitative manner based on best available technologies
- EPRI will continue to support ASME Task Group for ISI of Welded Canisters
 - EPRI supporting staff and contractor experts to serve on key subcommittees
 - Additional EPRI staff attending and presenting as appropriate
- Anticipate that ASME will incorporate portions of EPRI CISCC aging management guidelines in code case



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