UNITED STATES
NUCLEAR REGULATORY COMMISSION
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June 6, 2016

MEMORANDUM TO: Bo Pham, Acting Deputy Director
Division of Spent Fuel Management
Office of Nuclear Material Safety
and Safeguards

FROM: Darrell S. Dunn, Materials Engineer **/RA/**
Renewal and Materials Branch
Division of Spent Fuel Management
Office of Nuclear Material Safety
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SUBJECT: SUMMARY OF APRIL 28, 2016, PUBLIC MEETING WITH THE NUCLEAR ENERGY INSTITUTE ON CLOSURE OF THE CHLORIDE INDUCED STRESS CORROSION CRACKING REGULATORY ISSUE RESOLUTION PROTOCOL

Background

The U.S. Nuclear Regulatory Commission (NRC) staff held a Category 2 public meeting with the Nuclear Energy Institute (NEI), and the Electrical Power Research Institute (EPRI) on April 28, 2016, to discuss closure of the Chloride Induced Stress Corrosion Cracking (CISCC) Regulatory Issue Resolution Protocol (RIRP). The meeting included a summary of the responses to NRC comments on the EPRI report, "Susceptibility Assessment Criteria for Chloride-Induced Stress Corrosion Cracking (CISCC) of Welded Stainless Steel Canisters for Dry Cask Storage Systems."

The meeting was noticed on April 13, 2016 (ML16104A316). The meeting agenda is included in Enclosure 1. The meeting attendance list is provided in Enclosure 2. Presentations given by the NRC, EPRI and NEI were made publically available prior to the meeting (ML16113A126).

Discussion

Mark Richter (NEI) presented a summary of the issue titled, "Dry Spent Fuel Storage Canister Chloride Induced Stress Corrosion Cracking RIRP N-10-01." The NEI presentation included background information indicating that spent fuel storage canisters fabricated from austenitic stainless steels including types 304, 304L and 316L may be susceptible to CISCC in chloride

containing environments. The presentation outlined the goals of the RIRP including determining the environments where CISCC of the canister materials could initiate, time scales for CISCC to occur, susceptibility assessment criteria, development of a consistent approach for licensees and certificate of compliance (CoC) holders to address CISCC and a stable and predictable regulatory environment. Milestones from the beginning of the CISCC RIRP were identified and included public meetings, the development and revisions to the research and development roadmap, and the development of screening criteria for storage canisters. In summarizing, Mark Richter stated that the RIRP was successful in making significant advances in understating CISCC and the ability to assess susceptibility in marine or other chloride containing environments.

Mark Lombard (NRC) presented the NRC summary of the CISCC RIRP which was initiated by the NRC in February 2010. The CISCC RIRP followed the methodology described in NEI 10-03 Revision 0, "Used Fuel Storage and Transportation Issue Resolution Protocol," ML111010247 and included phases for identification, screening, planning, implementation, and closure. In addition to the RIRP meetings, and the CISCC issue was also discussed at many NRC sponsored public meetings including independent spent fuel storage installation (ISFSI) license renewals, CoC renewals, the NRC Regulatory Information Conference (RIC) and the Division of Spent Fuel Management Regulatory Conference (REG CON). Mark Lombard, listed multiple completed NRC publications including generic communications, NRC research and testing on CISCC, and standard review plans and aging management guidance. Important reports addressing CISCC produced by EPRI were also discussed along with aging management guidance from NEI and the Institute of Nuclear Power Operations (INPO) Industry Dry Cask Storage Operating Experience Database that is currently under development.

Shannon Chu (EPRI) presented the EPRI response to resolve NRC comments on the EPRI CISCC Susceptibility Assessment Report. The EPRI Susceptibility Assessment Report includes criteria to define site conditions and canister parameters associated with the potential for CISCC initiation and growth. In addition, the report includes criteria to allow ranking of canisters to set priorities for inspection and aging management efforts. The EPRI presentation divided up the NRC comments into multiple categories including: (1) feedback that can be incorporated into EPRI's Aging Management Guidelines; (2) comments that require additional explanation of EPRI's approach; and (3) comments that require clarification of EPRI's scope definition. EPRI has provided specific responses to the NRC comments and revision of the Susceptibility Assessment Report will not be conducted in response to the NRC comments, however, revision of the report may be considered after additional inspection data has been acquired or if new experimental data becomes available. Shannon Chu stated that EPRI will publish the EPRI Aging Management Guidelines in the fall of 2016. The Aging Management Guidelines for CISCC will address inspection scope, frequency, expansion criteria, and evaluation criteria. Inspection methods, mitigation, and repair will be discussed in a more qualitative manner based on best available technologies. In addition, EPRI will continue to support the American Society of Mechanical Engineers Boiler and Pressure Vessel (ASME B&PV) Code Task Group for developing inservice inspection (ISI) requirements and acceptance criteria for welded stainless steel canisters.

Darrell Dunn (NRC) presented a summary of the CISCC issue and described the potential for CISCC of welded stainless steel canisters. A summary of the NRC test results that were published in NUREG/CR-7030 (ML103120081) and NUREG/CR-7170 (ML14051A417) as well as information presented by the NRC in previous CISCC RIRP public meetings were described. The NRC comments on the EPRI CISCC Susceptibility Assessment report were focused on model parameters, parameter interactions, discussions where additional detail may be

beneficial and potential regulatory considerations. The comments were specific to addressing (1) fabrication effects and residual stress; (2) local chloride and water vapor sources on environmental parameters; (3) cooling tower water chemistry; (4) incorporating operating experience and new information; and (5) susceptibility assessment criteria validation. The development and technical considerations for the example Aging Management Program (AMP) included in NUREG-1927 Revision 1 which specifically addresses CISCC of welded stainless steel canisters were described. The NRC clarified that the AMP in NUREG-1927 Revision 1 is an example and is not the only acceptable approach to addressing the potential for CISCC. It was noted that the NRC is also participating in the ASME B&PV Code Task Group for developing ISI requirements and acceptance criteria for welded stainless steel canisters. In addition to the NRC staff, the ASME task group includes, dry storage system vendors, NRC licensees, EPRI, industry consultants, and Department of Energy (DOE) laboratory staff. The current NRC sponsored efforts were also discussed including application of nondestructive examination to dry storage systems, review of specific systems and development of aging management tables and example aging management programs.

One member of the public asked questions on CISCC during transportation. The NRC staff clarified that CISCC is only a concern during storage. During transportation, the canisters containing spent fuel are loaded into transportation casks which are sealed pressure vessels that meet all of the regulatory requirements of NRC regulations in the *Code of Federal Regulations* (CFR) Title 10 Part 71. The commenter also inquired about the voluntary inspections conducted to date and asked why the inspections were voluntary and not mandatory. The NRC staff clarified that the voluntary inspections discussed in the public meeting are conducted to evaluate the performance and designs of prototype robotics for inspection system delivery and were not actual inspections of canisters. The NRC staff stated that additional testing of these robotic delivery systems will be conducted.

CAC No. A33007

Enclosures:
1. Meeting Agenda
2. Meeting Attendees

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MEETING AGENDA

Chloride-Induced Stress Corrosion Cracking Regulatory Issue Resolution Protocol Meeting

April 28, 2016
1:30 – 4:00 p.m. (Eastern Daylight Time)

Two White Flint North Building, Room: T-8A01

Purpose: Closure of the chloride induced stress corrosion cracking (CISCC) Regulatory Issue Resolution Protocol (RIRP), and discussion of NRC Staff comments on the Electrical Power Research Institute (EPRI) Report on Susceptibility Assessment Criteria for CISCC of Welded Stainless Steel Canisters for Dry Cask Storage Systems.

Agenda:

- Welcome, introductions, and meeting objectives
- Nuclear Energy institute (NEI) Presentation on Spent Fuel Storage Canister Chloride Induced Stress Corrosion Cracking - RIRP N-10-01
- EPRI Presentation on responses to NRC comments to the Report on Susceptibility Assessment Criteria for CISCC of Welded Stainless Steel Canisters for Dry Cask Storage Systems
- NRC Presentation on CISCC and Aging Management Programs
- Public questions or comments
- Wrap-up and closing remarks
- Meeting adjourned

NRC/NEI/EPRI CISCC RIRP Public Meeting April 28, 2016 Attendance List

Name	Organization
Darrell Dunn	NRC/NMSS
Stephan Anton	Holtec
Kimberly Manzione	Holtec
Kristina Banovac	NRC/NMSS
Rick Reid	Electrical Power Research Institute
Rod McCullum	Nuclear Energy Institute
Paul Plante	3 Yankees
Mark Richter	Nuclear Energy Institute
Hundal Jung	AREVA TN
Greg Oberson	NRC/RES
Gina Davis	NRC/NMSS
Mark Lombard	NRC/NMSS
Damaris Marcano	NRC/NMSS
Bo Pham	NRC/NMSS
John Wise	NRC/NMSS
Al Csontos	NRC/NMSS
Donald Chung	NRC/NMSS
Michael Moran	Southern California Edison
Zita Martin	Tennessee Valley Authority
Tim Gregoire	American Nuclear Society
Kenn Hunter	Exelon
Keith Waldrop	Electrical Power Research Institute
Randal Granaas	San Onofre Nuclear Generating Station
Mark Joseph	Structural Integrity Associates, Inc.
Gary Stevens	Structural Integrity Associates, Inc.
John Broussard	Dominion Engineering, Inc.
Kevin Fuhr	Dominion Engineering, Inc.