Site-Specific License Renewal for the Three Mile Island, Unit 2 (TMI-2) Independent Spent Fuel Storage Installation (ISFSI)

September 25, 2013

TMI-2 ISFSI Representatives

- ***U.S. Department of Energy, Idaho Office (DOE-ID) and Headquarters (DOE-EM)***
  - *Steven Ahrendts, Facility Director (DOE-ID)*
  - *Barbara Beller, Licensing Manager (DOE-ID)*
  - *Nancy Buschman, Senior Technical Advisor (DOE-EM)*
  - *Kenneth Whitham, Assistant Manager, Facility and Materials Disposition (DOE-ID)*
- ***CH2M-WG Idaho, LLC (CWI)***
  - *Gregory Hall, Manager, ISFSI Management / Project Manager, TMI-2 ISFSI License Renewal / TMI-2 ISFSI Manager*

Discussion Topics

- ***Provide Information to the NRC***
  - *DOE-ID's planned submittal of a License Renewal Application (LRA) for the TMI-2 ISFSI*
  - *Overview of Approach*
  - *Schedule*
  - *Transition from OCRWM 0333P, Revision 10 to ASME NQA-1 (2008) with Addenda (2009)*
- ***Obtain NRC Feedback***
  - *Approach*
  - *NUREG-1927 clarifications*
    - *Core debris (fuel in storage) in scope?*
    - *Appendix E – Component-Specific Aging Management (remote visual inspection)*

Discussion Topics (cont.)

- ***Background***
  - *TMI-2 PWR and Core Debris (photos)*
  - *TMI-2 ISFSI*
- ***License Renewal Approach***
- ***Schedule***
- ***Scoping Results***
- ***Aging Management Program***
- ***Remote Visual Inspection***
- ***Summary***
- ***Discussion***

Background – TMI-2 Pressurized Water Reactor (PWR)

- ***Licensed in February 1978, began commercial operation in December 1978, and experienced an accident is March 1979.***
- ***Reactor defueled from October 1985 to April 1990 during which 342+ canisters (debris, knockout and filter canisters) were shipped to Idaho National Laboratory (INL).***
- ***Babcock & Wilcox (B&W) PWR design containing 177 fuel assemblies.***
- ***Assemblies were B&W PWR design, 15x15 pin square array (225 pin locations), only 204 rods filled with uranium dioxide pellets, Zircaloy-4 cladding, uranium enrichments of 2.96%, 2.64%, and 1.98% (maximum initial enrichment of 2.98%)***

Background – TMI-2 PWR (cont.)

- ***Operational problems, subsequent attempts to recover operations after the reactor scram led to a partial draining loss of cooling water, led to a partial meltdown of the fuel assemblies and damage to the reactor internals because of the latent heat in the reactor core.***
- ***Core burnup approximately 3,175 MWD/MTU, or 10% of the typical burnup experienced by a standard PWR assembly.***
- ***Average decay heat generation expected per canister is 29 watts (maximum <60 watts, design basis <80 watts, 860 watts total per DSC)***
- ***Core debris is in stainless steel defueling canisters.***
- ***Defueling canisters stored at TAN-607 Hot Shop and Fuel Storage Pool from April 1990 to April 2001.***

Background – TMI-2 ISFSI

- ***NUHOMS-12T spent fuel storage system located at the INL.***
- ***Licensed in March 1999 (SNM-2508, Docket 72-20).***
- ***Reactor core debris transferred from TAN-607 to the TMI-2 ISFSI from March 1999 to April 2001.***
- ***ISFSI consists of 30 HSMs (29 with loaded DSCs).***
- ***Current license term expires March 2019.***

Background – TMI-2 ISFSI (cont.)

Background – TMI-2 ISFSI License

- ***Byproduct, Source and/or Special Nuclear Material***
  - *Radioactive material from the Three Mile Island Unit 2 (TMI-2) reactor core damaged by the March 28, 1979, reactor accident, including the remains of 177 Babcox [Babcock] and Wilcox 15x15 fuel assemblies with a maximum of 2.98% U-235 isotope, 61 control rod assemblies, and miscellaneous irradiated core and core basket material.*
  - *Radioactive material related to receipt, storage, and transfer of the above radioactive material, including 267 fuel canisters, 12 knockout canisters, and 62 filter canisters used to confine the above TMI-2 core debris in the absence of intact fuel assembly cladding.*

Background – TMI-2 ISFSI License (cont.)

- ***Chemical and/or Physical Form***
  - *As debris consisting of significantly damaged fuel and control assemblies and non-fuel reactor components in the form of partially intact assemblies, conglomerate core material, previously molten materials, rubble, and fines.*
- ***Maximum Amount Licensee May Possess at Any One Time Under this License***
  - *82,985.9 kg U initially contained in the fuel assemblies of the damaged TMI-2 reactor core, contained in roughly 139,293 kg of material removed from the TMI-2 reactor vessel.*
- ***Delegation Order 10CFR72.512.1***
  - *The Secretary of Energy has delegated (Delegation Order No. 10CFR72.512.1) the Manager, Department of Energy, Idaho Operations Office, as the Secretary's authorized representative in all matters regarding this license and future amendments thereto and informed the Commission of this delegation in writing on October 31, 1996.*

Background – TMI-2 ISFSI License (cont.)

- ***Exemptions pursuant to 10 CFR 72.7***
  - *Requirements of 10 CFR 72.102(f)(1) related to the specified seismic design criteria of 10 CFR Part 100, Appendix A.*
  - *Requirements of 10 CFR 20.1501(c) to use NVLAP accredited dosimetry and instead is authorized to use DOELAP dosimetry.*
  - *Requirement of 10 CFR 72.124(b) that the design of the ISFSI shall provide for positive means to verify the continued efficacy of solid neutron absorbing materials.*
  - *Requirements of 10 CFR 72.82(e) that a report of the preoperational test acceptance criteria and test results be submitted at least 30 days prior to loading the ISFSI. [May request removal.]*

Background – TMI-2 ISFSI License (cont.)

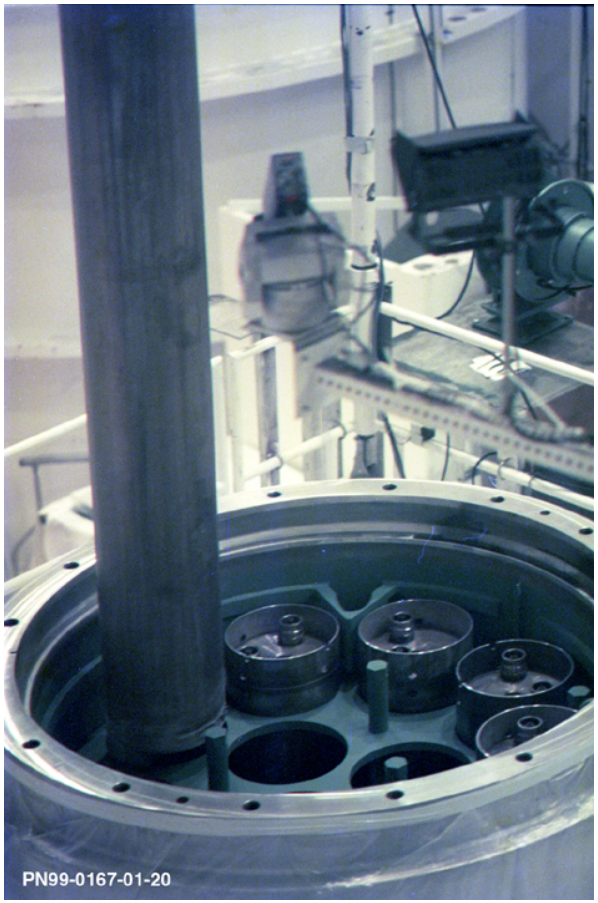
- ***Technical Specifications are incorporated into the license.***
- ***For the duration of the license, the licensee shall inform the Director, NMSS, at least 90 days in advance, of the replacement of the entity contracted by DOE-ID to perform the management and operation (the DOE contractor) of the TMI-2 ISFSI.***
- ***Within 180 days after the replacement of the DOE contractor, the licensee shall assess the performance of the DOE contractor and provide a statement to the NRC verifying that the replacement of the DOE contractor has had no effect on the execution of licensed responsibilities for the TMI-2 ISFSI.***
- ***DOE-ID [via DOE Chief Financial Officer and the President's Budget request to Congress] shall be responsible for requesting necessary funds from Congress to ensure compliance of TMI-2 ISFSI operations and decommissioning under this license. DOE-ID will notify the Nuclear Regulatory Commission, in writing, of any anticipated or forecasted budget shortfalls, as soon as they are known, along with a plan detailing the specific measures that will be taken by DOE-ID to obtain the required funding and/or prevent adverse impacts on ISFSI operations.***

Background – TMI-2 ISFSI General Arrangement

Background – TMI-2 ISFSI General Arrangement (cont.)

E M Environmental Management

Background – TMI-2 ISFSI General Arrangement (cont.)



Background – TMI-2 ISFSI General Arrangement (cont.)

License Renewal Approach

- ***10 CFR 72.42(a): Each license issued under this part must be for a fixed period of time to be specified in the license.***
  - *The license term for an ISFSI must not exceed 40 years from the date of issuance.*
  - *Licenses may be renewed by the Commission at the expiration of the license term upon application by the licensee for a period not to exceed 40 years and under the requirements of this rule.*
- ***10 CFR 72.7: The Commission may, upon application by any interested person or upon its own initiative, grant such exemptions from the requirements of the regulations in this part as it determines are authorized by law and will not endanger life or property or the common defense and security and are otherwise in the public interest.***

License Renewal Approach (cont.)

- ***DOE-ID will apply for a 20-year extended license term to accommodate:***
  - An October 16, 1995 Settlement Agreement between the State of Idaho, Department of the Navy, and the Department of Energy requiring that all SNF at the TMI-2 ISFSI be shipped out of Idaho no later than January 1, 2035
  - Allowance for adequate time for subsequent decontamination and decommissioning of the ISFSI required for license termination.
- ***DOE-ID will submit the License Renewal Application for the TMI-2 ISFSI under the delegated authority.***
- ***DOE-ID has reviewed and will base its application on NUREG-1927 guidance.***

License Renewal Approach (cont.)

- ***DOE-ID staff has or will review the following from the aspects of both precedent and lessons learned:***
  - *Virginia Electric and Power Company, Surry Independent Spent Fuel Storage Installation (ISFSI), License Renewal Application, Docket No. 72-2, License No. SNM-2501, April 29, 2002*
  - *H. B. Robinson Steam Electric Plant, Unit No. 2 Independent Spent Fuel Storage Installation, Docket No. 72-3, License No. SNM-2502, Request for Renewal of Independent Spent Fuel Storage Installation, February 27, 2004*
  - *Duke Energy LLC, Oconee Nuclear Station, License Renewal Application for the Site-Specific Independent Spent Fuel Storage Installation, January 30, 2008*
  - *Department of Energy, Idaho Operations Office, Submittal of Application for the Renewal, with No Revision of License Conditions, of 10 CFR Part 72 Materials License No. SNM-2504 for the Fort St. Vrain Independent Spent Fuel Storage Installation, Docket 72-0009 (EM-FMDP-09-075), November 10, 2009*
  - *Calvert Cliffs Nuclear Power Plant, LLC, Site-Specific Independent Spent Fuel Storage Installation License Renewal Application, Material License No. SNM-2505, Docket No. 72-8, September 17, 2010*
  - *Transnuclear, Inc. progress with renewal of Certificate of Compliance No. 1004, Package Identification No. USA/72-1004, Standardized NUHOMS Horizontal Modular Storage System for Irradiated Nuclear Fuel, Expiration Date January 23, 2015*

Schedule

- ***Pre-Submittal Activities: Ongoing through 2016***
  - *Scoping evaluation of Structures, Systems, and Components (SSCs) Important to Safety that are to be evaluated in an aging management review process (Complete)*
  - *Aging management review of the SSCs (Ongoing through 2014)*
  - *Time-limited aging analyses (2014)*
  - *Aging effects management program for the SSCs (Ongoing, started with HSM concrete crack mitigation and monitoring)*
  - *License basis document changes (2015)*
  - *Development of a license renewal application (2016)*
  - *Interface meetings with NRC as appropriate and necessary (2011 through 2016)*
- ***Submittal to NRC: No later than March 2017***
  - *Required Submittal Date: March 19, 2017*

Scoping Results (EDF-9959)

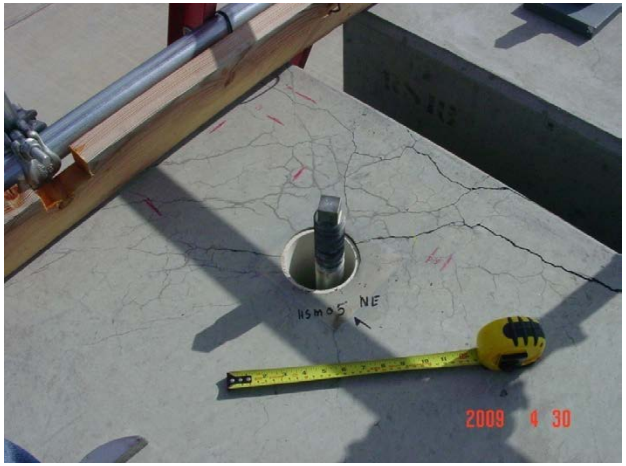
*Component**	*Classification*	*Intended Functions*
Dry Shielded Canisters	*Important to Safety*	*RS, CC, PB, SS*
Horizontal Storage Modules		*HT, RS, SS*
End Module Shield Walls		*RS*
DSC Basket Assembly	*Not Important to Safety*	*SS*
TMI-2 Defueling Canisters		*RS, SS*
TMI-2 Core Debris		*None*

** Subcomponents inclusive.*

Aging Management Program

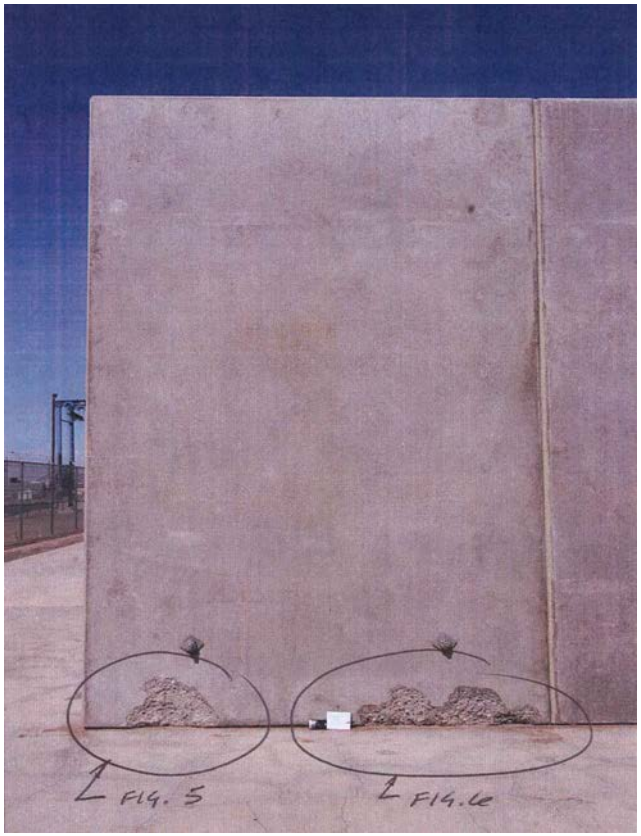
- ***Concrete Cracking Mitigation***
  - ***HSMs***
    - ***Roof Bolt Hole Polyurethane Foam (2009)***
    - ***Roof Bolt Hole Protective Covers (2011)***
    - ***Resin Injection in Roof/Wall Cracks (2011)***
    - ***Weatherproof Coating (2011)***
  - ***End Shield Walls***
    - ***Coil Insert Hole Sealing (2012)***
- ***Annual Concrete Surface Monitoring***

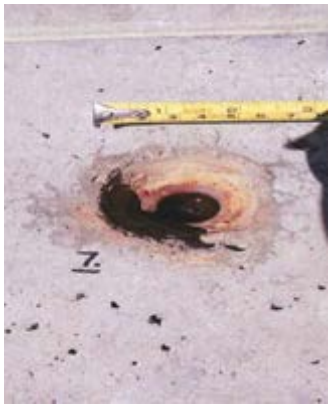
HSM Roof Bolt Holes



HSM Roof Corner

End Shield Wall





Remote Visual Inspection

- ***HSM 15***
  - ***Contains empty DSC Overpack and Overpack Support Structure***
- ***HSM 16***
  - ***First HSM loaded with a partially loaded DSC***
  - ***Lowest radiation environment***
  - ***Components/subcomponents representative of all other loaded HSMs***

Remote Visual Inspection (cont.)

HSM 15

HSM 2 - floor_walls_roof_general
07 Jun 12
11:27

HSM 2 - floor_walls_roof_general
07 Jun 12
14:23

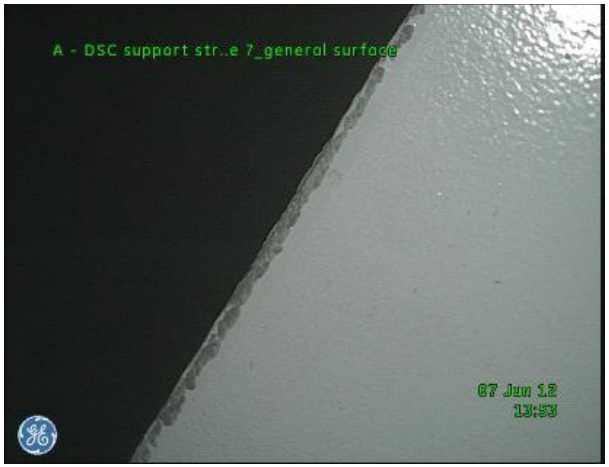
HSM 1 - roof to wall corners
07 Jun 12
15:10

A - DSC support structure E_cross beam
07 Jun 12
13:42

HSM 15 (cont.)

A - DSC support str..ront mounting plate
07 Jun 12
11:36

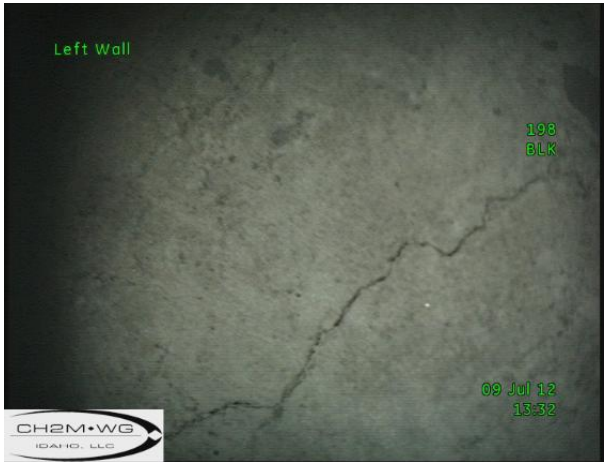
A - DSC support str..ront mounting plate
07 Jun 12
13:35


A - DSC support str..e 7_general surface
07 Jun 12
13:53

A - DSC support str..e 7_general surface
07 Jun 12
14:20

HSM 16

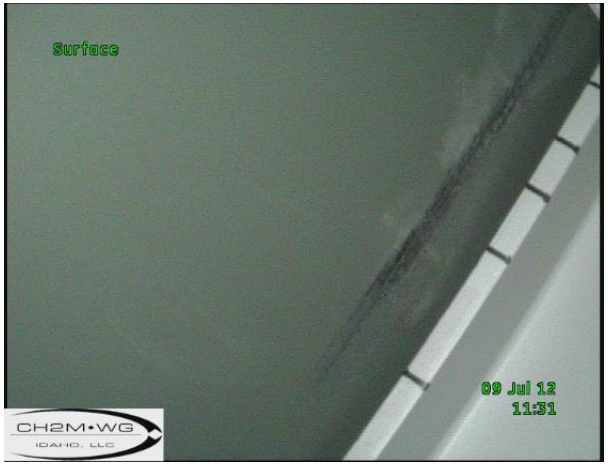
Front Wall
09 Jul 12
11:36
CH2M•WG
IDAHO, LLC


Left Wall
198
BLK
09 Jul 12
13:32
CH2M•WG
IDAHO, LLC

Roof Front Right Corner
09 Jul 12
15:21
CH2M•WG
IDAHO, LLC

Roof Front Left Corner
09 Jul 12
15:22
CH2M•WG
IDAHO, LLC

HSM 16 (cont.)


Surface
09 Jul 12
11:31
CH2M•WG
IDAHO, LLC

Surface
09 Jul 12
13:27
CH2M•WG
IDAHO, LLC

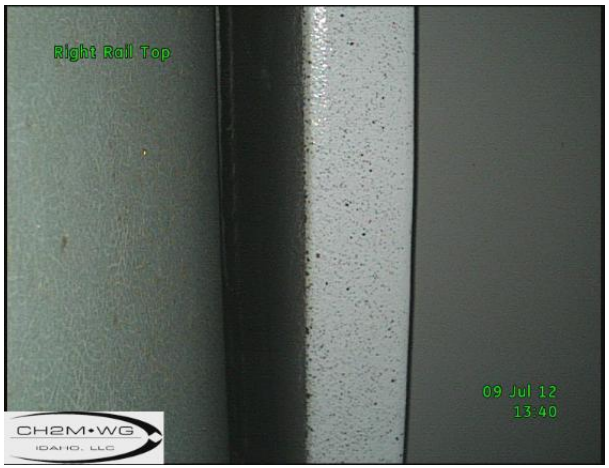
Circumferential Weld
09 Jul 12
11:30
CH2M•WG
IDAHO, LLC

Longitudinal Weld
09 Jul 12
15:06
CH2M•WG
IDAHO, LLC

HSM 16 (cont.)

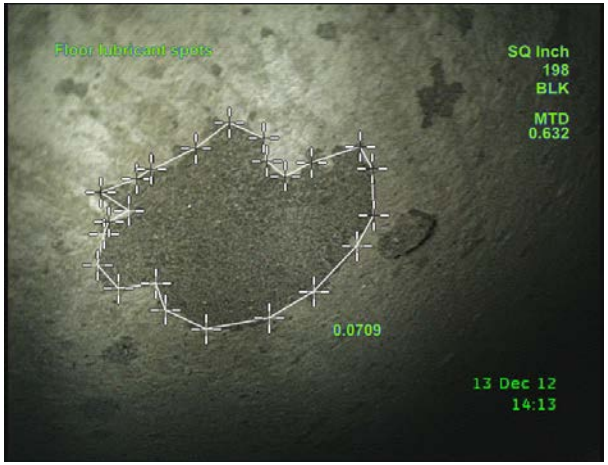
Front Right Mounting Plate
09 Jul 12
11:37
CH2M•WG
IDAHO, LLC

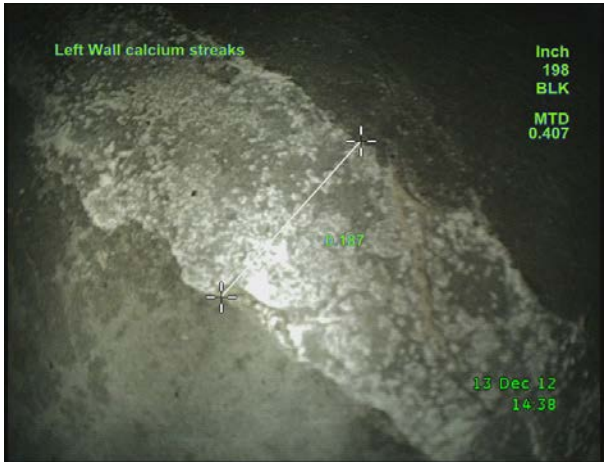
Rear Right Attach Assembly
09 Jul 12
11:55
CH2M•WG
IDAHO, LLC

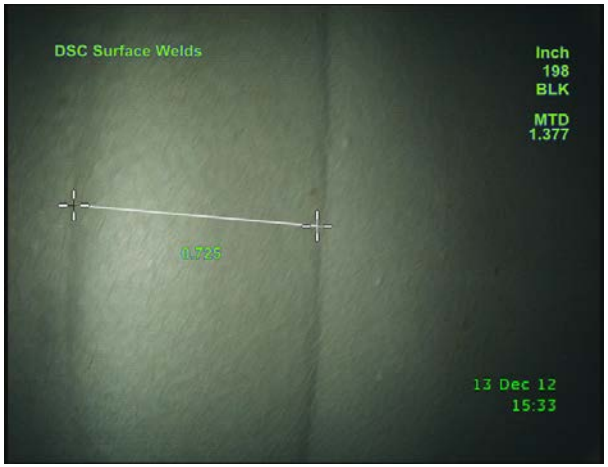

Right Rail Top
09 Jul 12
13:40
CH2M•WG
IDAHO, LLC

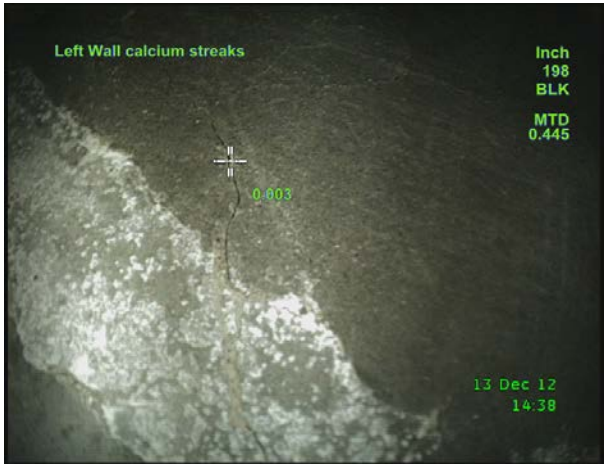
Right Rail Top
09 Jul 12
13:42
CH2M•WG
IDAHO, LLC

HSM 16 (cont.)


Floor lubricant spots
SQ Inch
198
BLK
MTD
0.632
0.0709
13 Dec 12
14:13

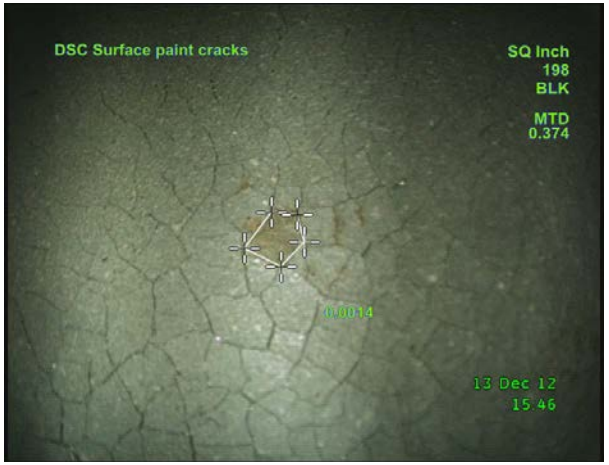

Left Wall calcium streaks
Inch
198
BLK
MTD
0.407
0.187
13 Dec 12
14:38

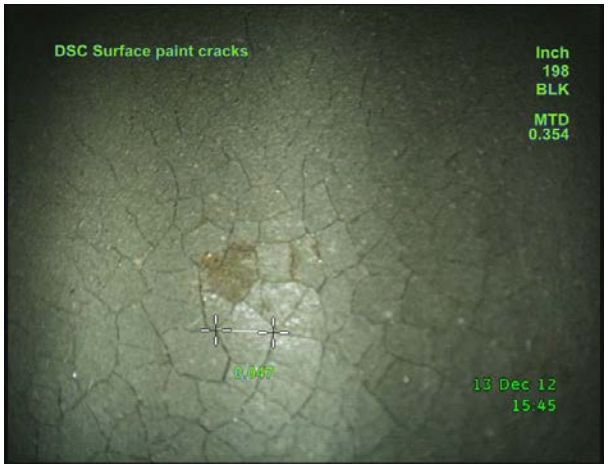

DSC Surface Welds
Inch
198
BLK
MTD
1.377
0.725
13 Dec 12
15:33

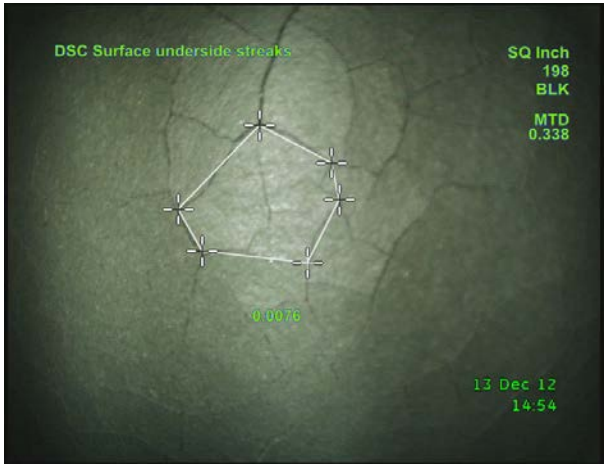

Left Wall calcium streaks
Inch
198
BLK
MTD
0.445
0.003
13 Dec 12
14:38

HSM 16 (cont.)

DSC Surface spotting
13 Dec 12
15:08


DSC Surface paint cracks
SQ Inch
198
BLK
MTD
0.374
0.0014
13 Dec 12
15:46


DSC Surface paint cracks
Inch
198
BLK
MTD
0.354
0.047
13 Dec 12
15:45


DSC Surface underside streaks
SQ Inch
198
BLK
MTD
0.338
0.0076
13 Dec 12
14:54

Summary

- ***DOE-ID must continue operation of the TMI-2 ISFSI.***
- ***DOE-ID will submit a 10 CFR Part 72 license renewal application no later than March 2017.***
- ***The License Renewal Application will incorporate NUREG-1927 guidance and lessons learned from previous LRA submittals.***