SAN ONOFRE COMMUNITY ENGAGEMENT PANEL

Community Engagement Panel Educational Seminar

SONGS Spent Fuel:
Onsite Storage and Initiative to Relocate Offsite

Thursday, October 16, 2025

5:30 – 8:30 pm PT via Microsoft Teams

Link available on the CEP meeting webpage at songscommunity.com

THIS MEETING IS BEING RECORDED

SAN ONOFRE COMMUNITY ENGAGEMENT PANEL

Agenda

Topic	Presenter	Timing
Introduction	Dan Stetson, CEP Chair	5:30 – 5:40 pm
Purpose and 3rd Party Expert	Fred Bailly, SCE VP of Generation and Chief Nuclear Officer	5:40 – 5:50 pm
Initiative to Clear San Onofre of Spent Fuel	Manuel Camargo, SCE Strategic Planning Mgr.	5:50 – 5:55 pm
Spent Fuel Storage Methodology, Inspection Results and Remediation	Jerry Stephenson, SCE Engineering Manager	5:55 – 6:20 pm
Review of Chloride Induced Stress Corrosion Cracking (CISCC) Mechanisms, Sensitivities & Management Approaches for Multi-Purpose Canisters (MPCs)	Dr. James Burns, Professor, University of Virginia	6:20 – 6:50 pm
Review of Inspection Images	Jerry Stephenson	6:50 – 7:15 pm
Break		7:15 – 7:25 pm
Public Comment/Q&A	Victor Cabral and Martha McNicholas	7:25 – 8:25 pm
Closing Comments	Dan Stetson and Fred Bailly	8:25 – 8:30 pm
Read-Only Appendix: Background on initiative to clear San Onofre of spent fuel, SONGS spent fuel canister near-term inspection schedule and Acronyms		

Public Comment

Dan Stetson

SAN ONOFRE COMMUNITY ENGAGEMENT PANEL

Directions for the public comment period:

To submit comments and questions in writing:

- Use the CEP Comment Form, if online
- Use the CEP Question/Comment Card available at the entrance

To sign up to speak:

- Use the CEP Comment Form, if online
- Use the CEP Question/Comment Card available at the entrance

We will begin our public comments with the people in the room and move on to our online guests

Comments and questions will be addressed in the order received Victor Cabral will facilitate

Purpose and 3rd Party Expert

Fred Bailly
SCE VP of Generation and Chief Nuclear Officer

Seminar purpose

- Address interest in images from spent fuel canister inspections
- Results from canister inspections discussed periodically since 2018
- 2024 inspection results discussed at CEP meetings in March and June 2025
- Third-party expert invited to challenge or confirm our findings
- Today is a deep-dive

Independent review of images by third-party expert

- Dr. James T. Burns, a materials scientist with University of Virginia
- Broad experience in infrastructure, aerospace, marine, oil/gas, medical, automotive, and nuclear
- Expertise exploring mechanistic underpinnings of CISCC challenges for dry cask storage systems like that at SONGS
- Research characterizing CISCC kinetics in austenitic stainless steels in atmospheric environments
- Dr. Burns reviewed all images from inspections at SONGS

Dr. James T. Burns
Professor
Center for Electrochemical Science and Engineering
Department of Materials Science and Engineering

Initiative to clear San Onofre of spent fuel

Manuel Camargo
SCE Principal Manager, Strategic Planning

Federal Government's Responsibility

- US Department of Energy (DOE) legally and contractually required to start taking possession of spent nuclear fuel (SNF) from commercial power reactors 27 years ago
- Nuclear utility customers pre-paid approximately $50 billion for disposal
- DOE's partial breach of contract costs taxpayers another $2 million per day/$10 billion+ to date to cover costs for onsite storage
- Communities around nuclear plants never agreed to perpetual storage
- Need to solve this challenge rather than pass it on to the next generation

Advocacy for offsite storage and disposal

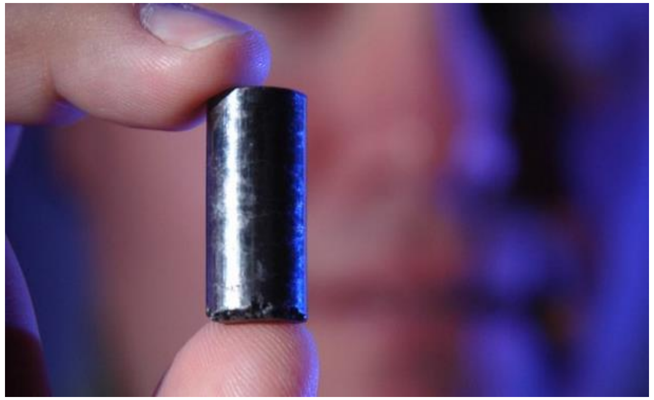
- SCE is not satisfied with the status quo with spent fuel stranded onsite
- In 2021, SCE released the *Strategic Plan for the Relocation of SONGS Spent Nuclear Fuel to an Offsite Storage Facility or a Repository*
- Strategic Plan stated SCE alone cannot control outcomes, but it can catalyze actions
- SCE teamed with county governments to form Spent Fuel Solutions coalition
- SFS and SCE pursuing 3 key workstreams:
  - Creating awareness for the spent fuel problem
  - Supporting DOE's work on collaboration-based siting for consolidated storage
  - Legislative reform to provide for a more durable federal spent fuel management program

About spent fuel and how we got here

Jerry Stephenson
SCE Engineering Manager

Spent Nuclear Fuel is in a stable, solid-state form

- Ceramic uranium dioxide fuel pellets
  - Require 5,000 degrees F to melt (details HERE)
  - SONGS SNF cooling 13-plus years
  - Decay heat of hottest fuel assembly comparable to a single 1500W hair dryer
  - Pellets/radioactive material cannot escape via through-wall crack in canister



Reduced risk of offsite release at ISFSI

- There are no credible accidents that result in an offsite release
- Operating plants have much more heat in the fuel which must be cooled to prevent a release due to an accident.
- This requires a lot of safety equipment, redundant electrical systems, pumps, cooling water sources, and flowpaths.
- For ISFSI, cooling is by naturally circulated air, there are no moving parts and no electricity used for cooling.
- The top 2 emergency levels (Site Area Emergency and General Emergency), no longer apply to the spent fuel stored at the ISFSI.

Why onsite storage?

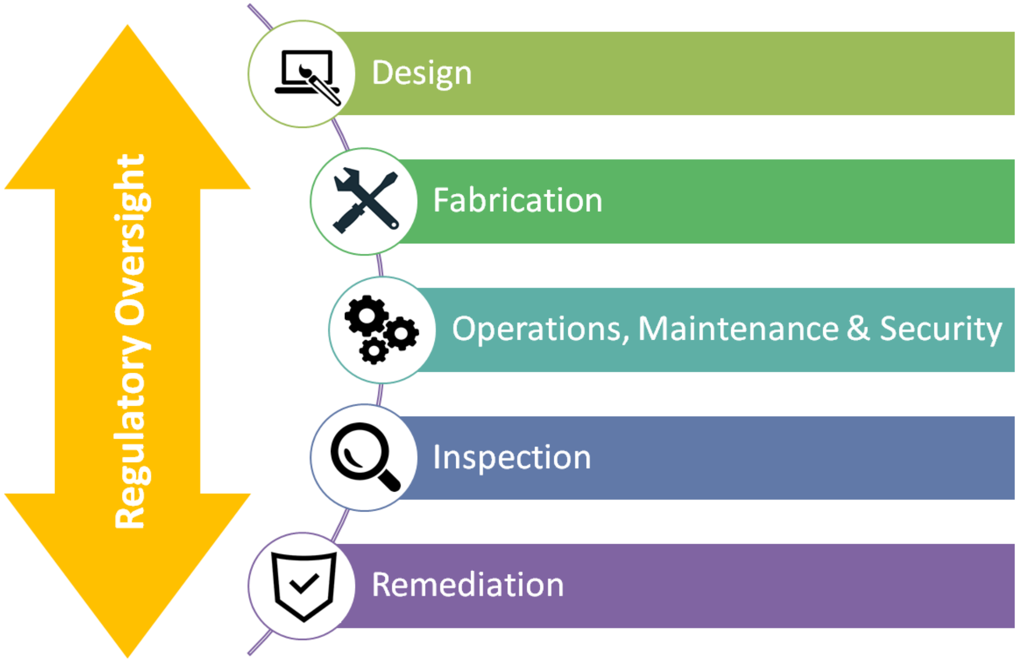
- Without a Federal interim storage or disposal site available, the industry developed onsite storage which is used by SCE and every other nuclear utility
- Onsite storage is safe and closely regulated by US Nuclear Regulatory Commission (NRC)
- Per NRC, canisters are good for 100 years plus with Aging Management Program (AMP)
- SONGS storage system is designed to withstand marine environment
  - Special low-carbon 316L stainless steel
  - Wall thickness 25% thicker than NRC requirement for extra margin
- Canisters are inspected per regulatory guidance
  - SONGS canisters in storage 20+ years have nothing more than dust
  - No canister requires repair or mitigation

Note: See our webpage and video for more information on spent fuel dry cask storage: https://www.songscommunity.com/used-nuclear-fuel/continued-safe-storage-of-used-nuclear-fuel/dry-cask-storage

SONGS Independent Spent Fuel Storage Installation Systems

Defense-in-depth strategy

- Safety strategy relies on multiple layers of protection to prevent and mitigate issues
- For SNF storage, defense-in-depth means:
  - **Design**: Specified corrosion-resistant 316L stainless steel vs carbon steel, a 1/8-inch thicker shell, and capable of withstanding submersion by water
  - **Fabrication**: Over-rolled UMAX (system closest to the ocean) canister shells and relaxed to put stainless steel into compression to make them more corrosion resistant
  - **Operations**: Monitor vents to ensure passive air flow; security force protects SNF 24/7
  - **Inspections**: Focus on oldest and coldest canisters in line with industry guidance
  - **Remediation**: Demonstrated metallic overlay repair method is “on the shelf” and available if ever needed

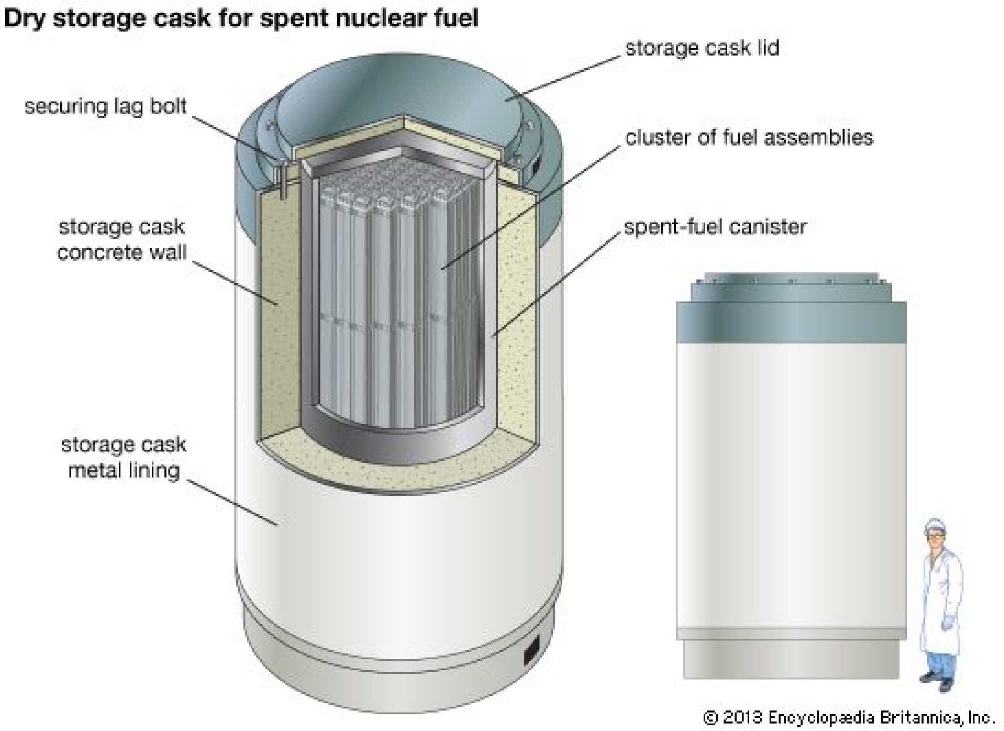


Casks and Canisters

US system (left) uses a canister surrounded by a thick cask which provides shielding and protection from weather and trauma. At SONGS, the cask is integrated into the structure and is 2' to 10' thick.

European system (right) does not use a separate canister but only a thick cask which has a bolted lid to allow easier removal for reprocessing.

Both provide robust shielding and missile protection. Both are over 1 foot thick.



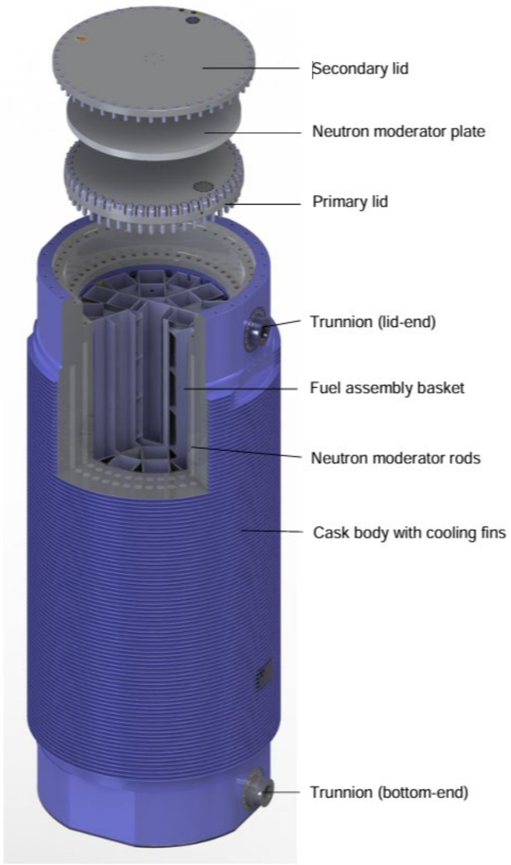


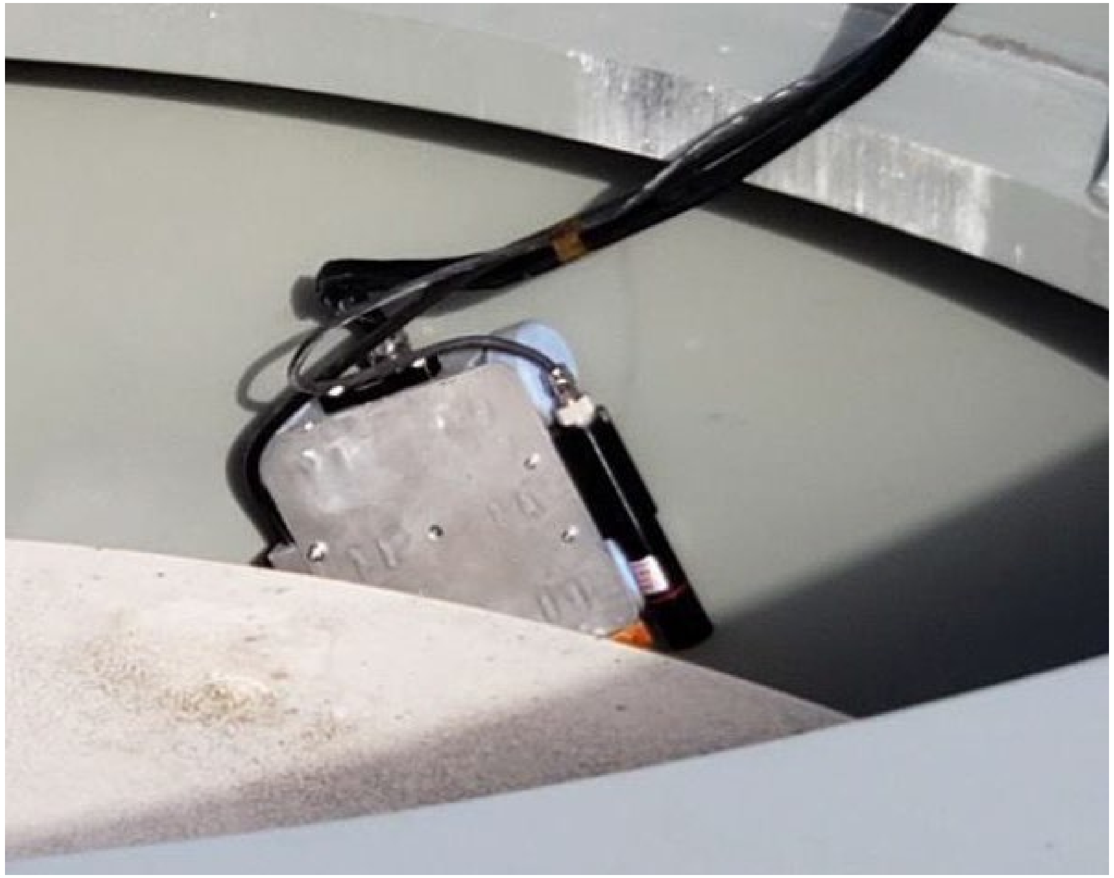
Figure 1: Design Features of the CASTOR® V/19

Inspection Methodology

- NRC-mandated AMP required after first 20 years of service (NUHOMS only)
- California Coastal Commission (CCC)-mandated Inspection and Maintenance Program (IMP) as part of Coastal Development Permits (NUHOMS and UMAX) require inspection after 5 years
- Both programs use same methodology: inspect oldest and coldest with one canister every time for trending and a rotating second canister
- 2 canisters inspected in NUHOMS system and 10 in UMAX – total of 12

Inspection technology and images

- Specialization of robots and cameras (developed at SONGS) now allow for in-situ inspection of ~100% shell
- High-resolution cameras can identify and measure depth to accuracy of +/-1/1000th of an inch



What is chloride-induced stress corrosion cracking?

- Chloride-induced stress corrosion cracking (CISCC) is limiting factor for storage canisters
- Requirements for CISCC to initiate:
  - Susceptible material
  - Tensile stress
  - Sea salt brine
- Most of canister shell not susceptible

  (only the welds and heat affected zones)

Example of CISCC

Glossary of Inspection Observations, Terminology & Descriptions

1. Buffing & fabrication marks – created during manufacturing process

NOTE: FABRICATION MARK

MPC 064-0028

NOTE: FABRICATION MARK

MPC 067-0017

Glossary of Inspection Observations, Terminology and Descriptions

2. Dust/Debris - collects on canisters during storage

NOTE: DUST/DEBRIS

DSC 003-0017

NOTE: DUST/DEBRIS

DSC 003-0034

Glossary of Inspection Observations, Terminology & Descriptions

3. Free iron transfer (stains) – caused by degraded epoxy in the transfer cask, which allows the transfer of free iron onto the canisters (UMAX) only

4. Rub marks – caused by contact with the shield ring during downloading process

NOTE: FREE IRON TRANSFER

MPC 061-0009

NOTE: RUB FROM SHIELD RING

MPC 055-0003

Glossary of Inspection Observations, Terminology & Descriptions

5. Scratches – caused by seismic restraints for Holtec Multi-Purpose Canisters (MPC) or the Advanced Horizontal Storage Module rails/transfer cask for NUHOMS dry storage canisters (DSC). Example of a surface profile image used to measure the depth of a scratch is also shown below.

MPC 055-0085

MPC 055-0158

Glossary of Inspection Observations, Terminology & Descriptions

6. Streaking – Dried water streaks in dust caused by wind driven rain. New outlet vent covers shown below are designed to reduce water intrusion.

NOTE: WATER INTRUSION

MPC 063-0005

New outlet vent covers

Old outlet vent covers

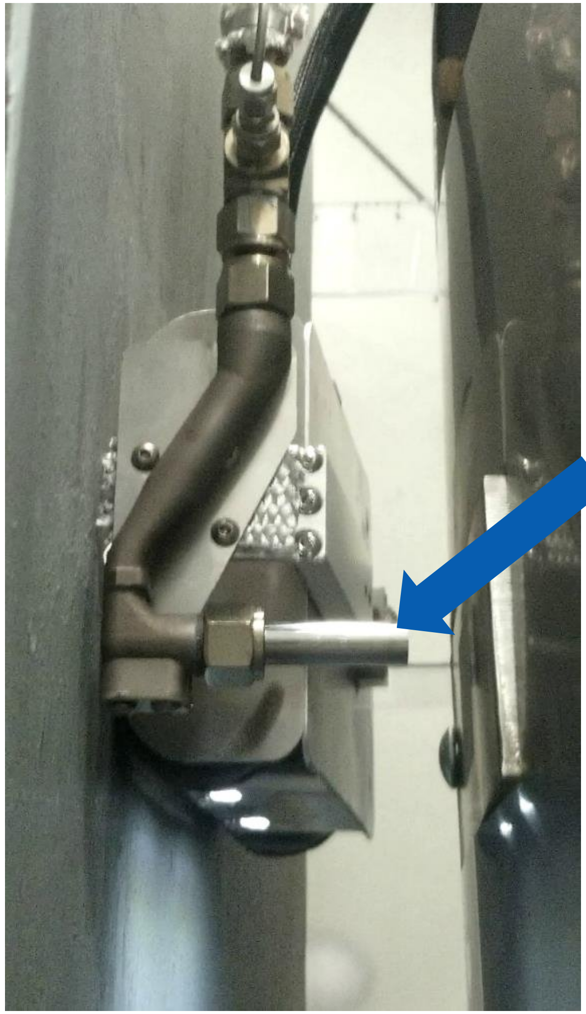
Glossary of Inspection Observations, Terminology & Descriptions

7. Radiographic Testing (RT) Mark – created when radiographic testing was performed during fabrication

MPC 064-0158

Remediation

- As part of the design code, a defect may require remediation if it is >0.0625 inches deep (10% of wall thickness)
- Deepest scratch discovered at SONGS is 0.016 inches deep
- For stains from free iron transfer, we looked for change between inspections; none found
- Streaks from rainwater not an issue as rainwater promptly dries on warm canister
- Cold spray (metallic overlay) developed at SONGS is the industry accepted mitigation and repair method and is ready for use
  - Independently reviewed as part of California Coastal Commission permitting process



Cold spray nozzle attached to robot applying coating on canister mock-up at vendor facility

Review of Cl-SCC Mechanisms, Sensitivities, and Management Approaches for Multi-Purpose Canisters (MPCs)

James T. Burns
32Burns Consulting, LLC
Professor
Center for Electrochemical Science and Engineering
Department of Materials Science and Engineering
University of Virginia

32Burns Consulting, LLC
James T. Burns
3125 Rock Cress Ln.
Sandy Hook, VA 23153
434-806-6167

CEP Educational Seminar
Oct 2025

Objectives:

- *Outline the fundamentals of the Chloride Induced-Stress Corrosion Cracking (CI-SCC) damage mode*
- *Discuss the origin of the contributing factors for the MPC application*
- *Overview of the relevant management guidelines*
- *Commentary on how the above informs the proper evaluation of inspection results*

Objectives:

- ***Outline the fundamentals of the Chloride Induced-Stress Corrosion Cracking (CI-SCC) damage mode***

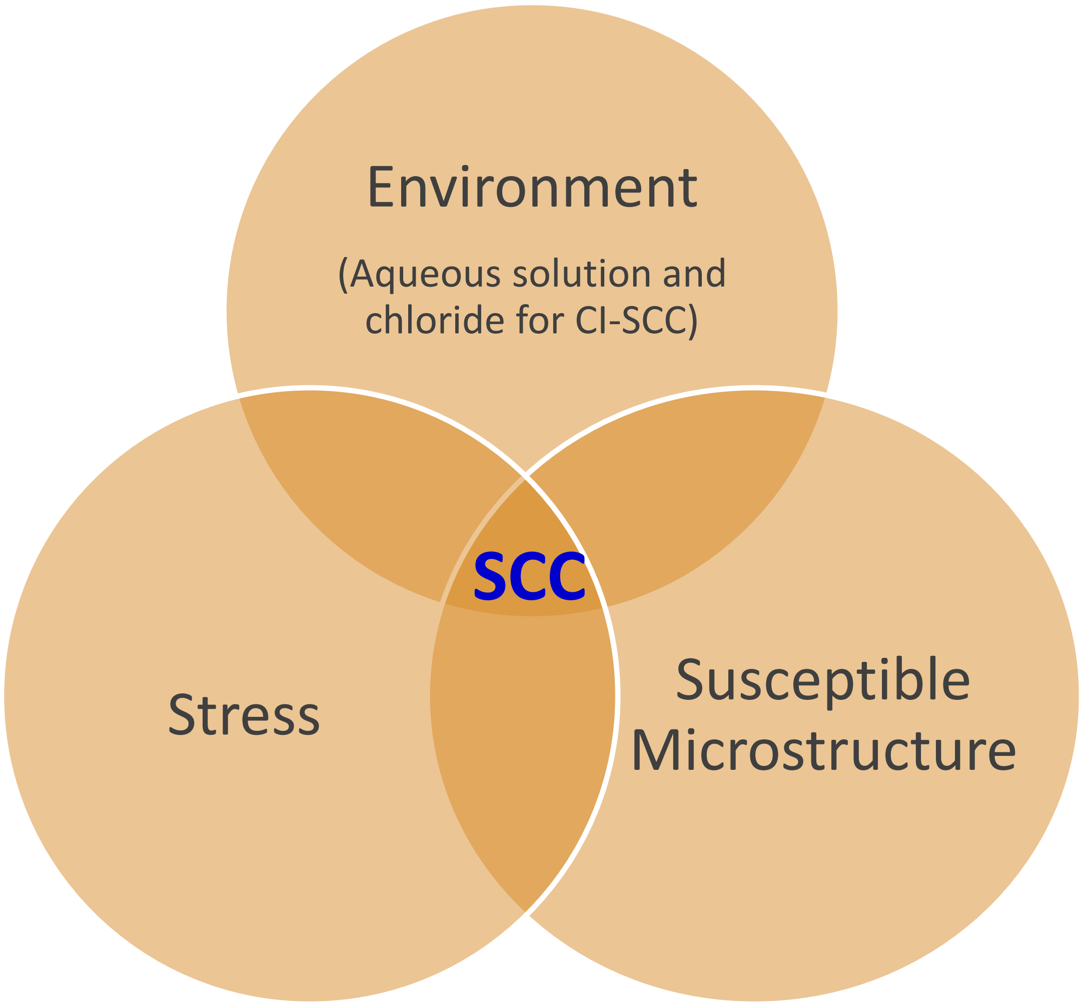
- ***Discuss the origin of the contributing factors for the MPC application***
  - ***Take-Away 1:*** *CI-SCC requires sufficiently severe: Microstructure, Stress, and Environment*
  - ***Take-Away 2:*** *Only inspection indications in the weld-regions are relevant to CI-SCC*
  - ***Take-Away 3:*** *There is a decades long window before an environment that would support CI-SCC should form*

- ***Overview of the relevant management guidelines***
  - ***Take-Away:*** *There is a mature and rigorous Aging Management program to ensure safety*

- ***Commentary on how the above informs the proper evaluation of inspection results***

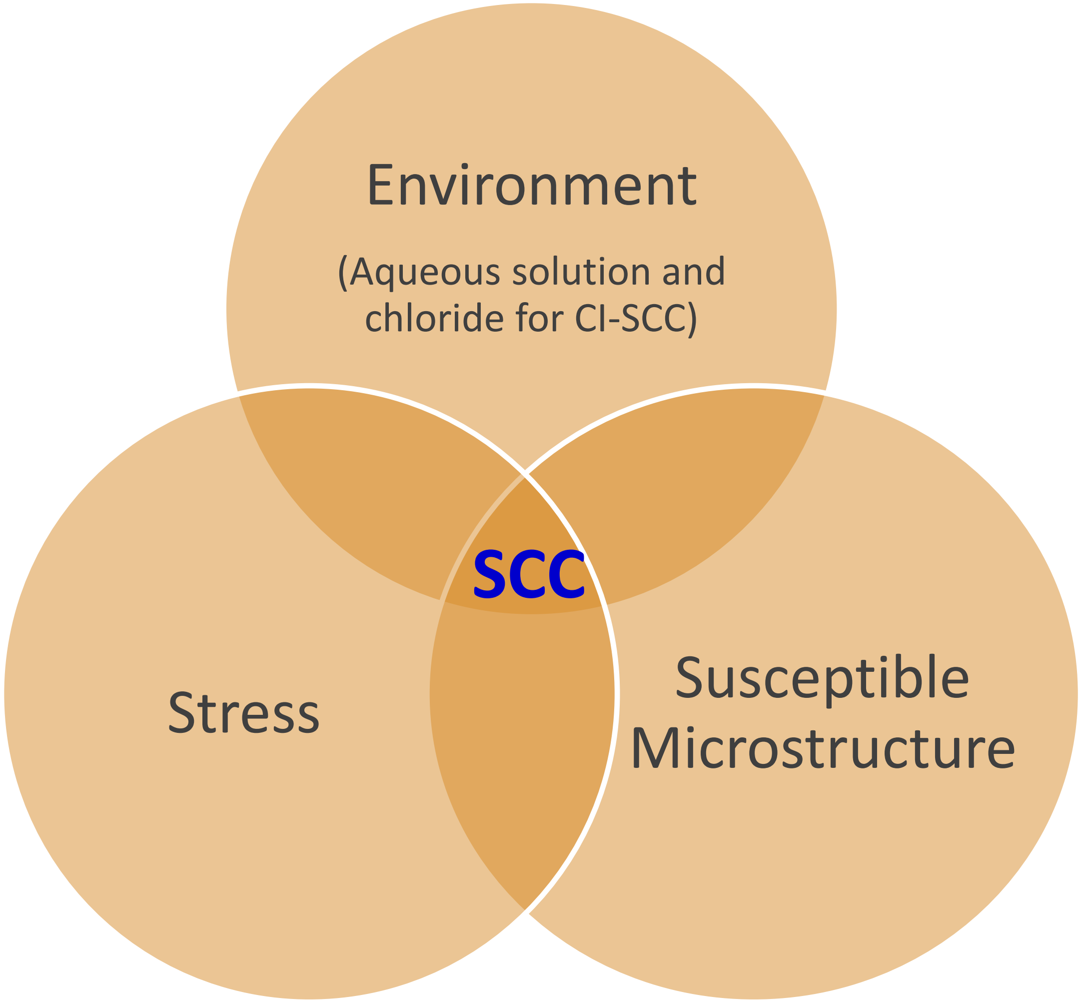
What is Stress Corrosion Cracking??

Definition of SCC: Crack formation and stable growth below the fracture toughness (K_{IC}) caused by time-dependent damage involving the conjoint interaction of…..



What is Stress Corrosion Cracking??

<u>Definition of SCC</u>: Crack formation and stable growth below the fracture toughness (K_{IC}) caused by time-dependent damage involving the conjoint interaction of…..

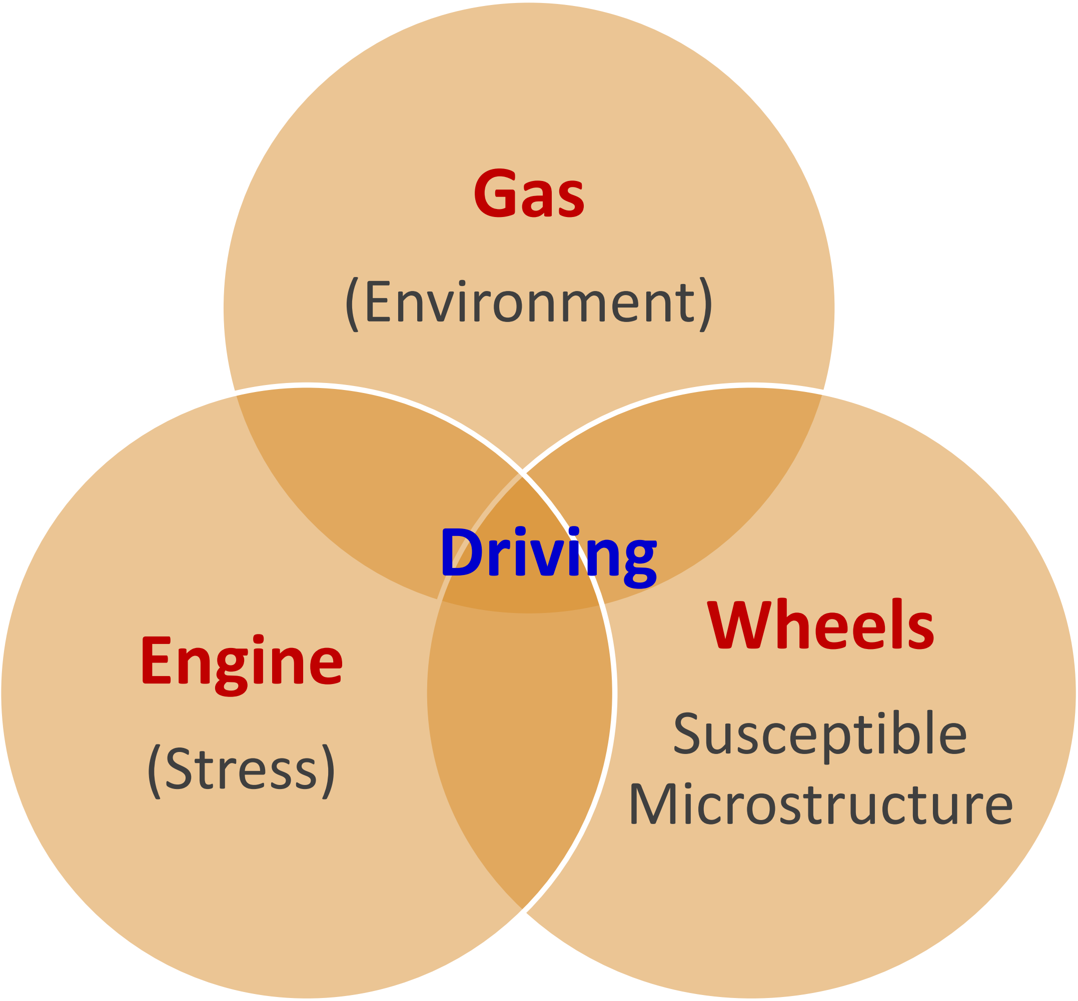


Note:

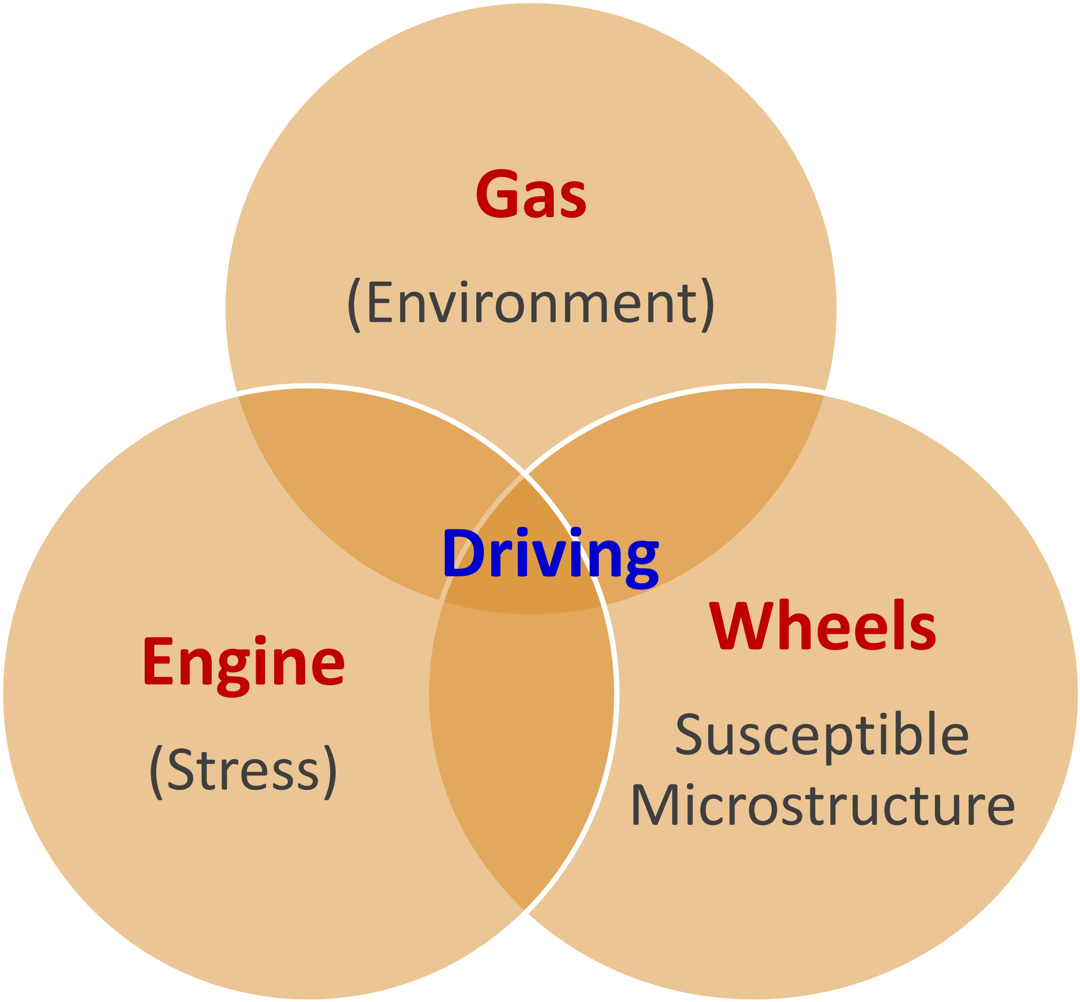
The presence of each are necessary but NOT SUFFICIENT to get cracking…

Each must be above a certain severity level for SCC to occur

Stress Corrosion Cracking Analogy: Driving a Car

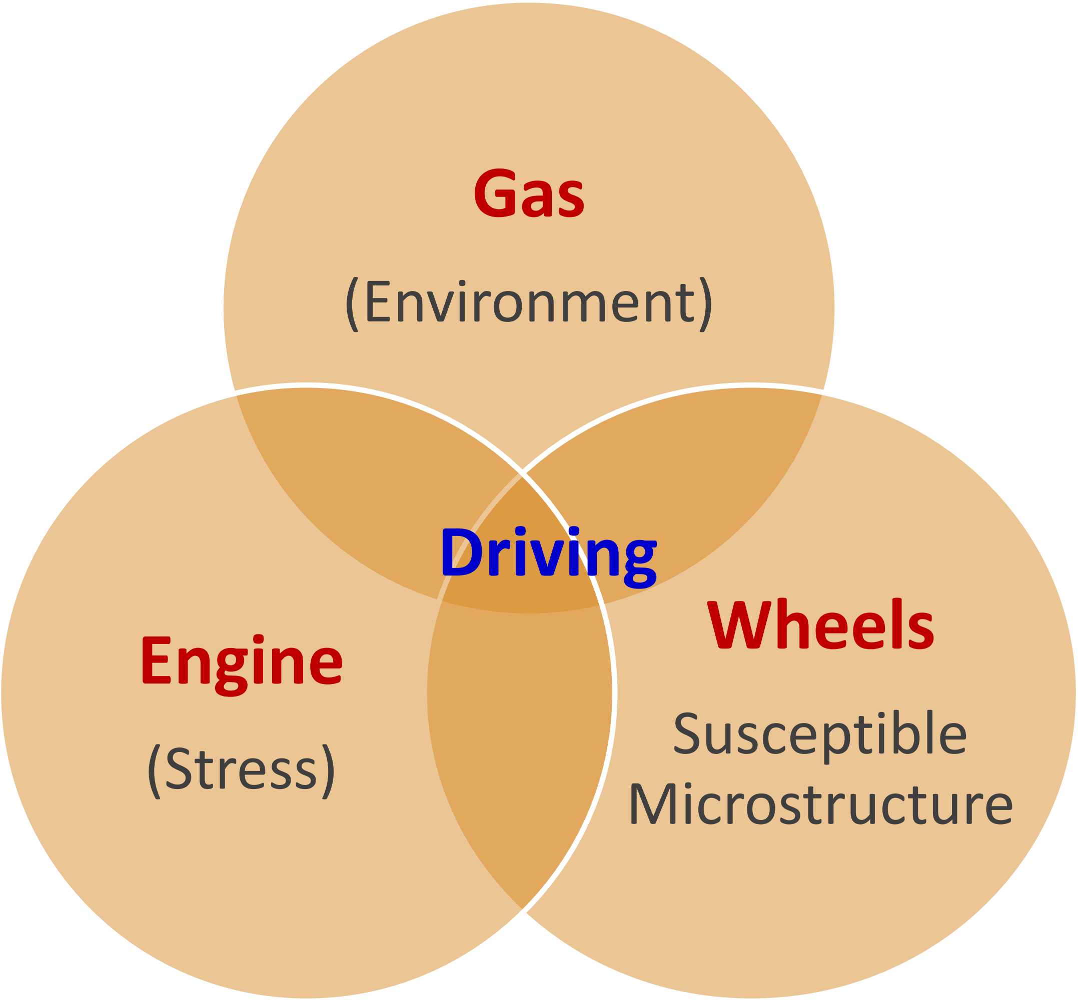


Stress Corrosion Cracking Analogy: Driving a Car



Point 1: *Engine, Gas and Wheels are* ***NECESSARY*** *to drive a car.*

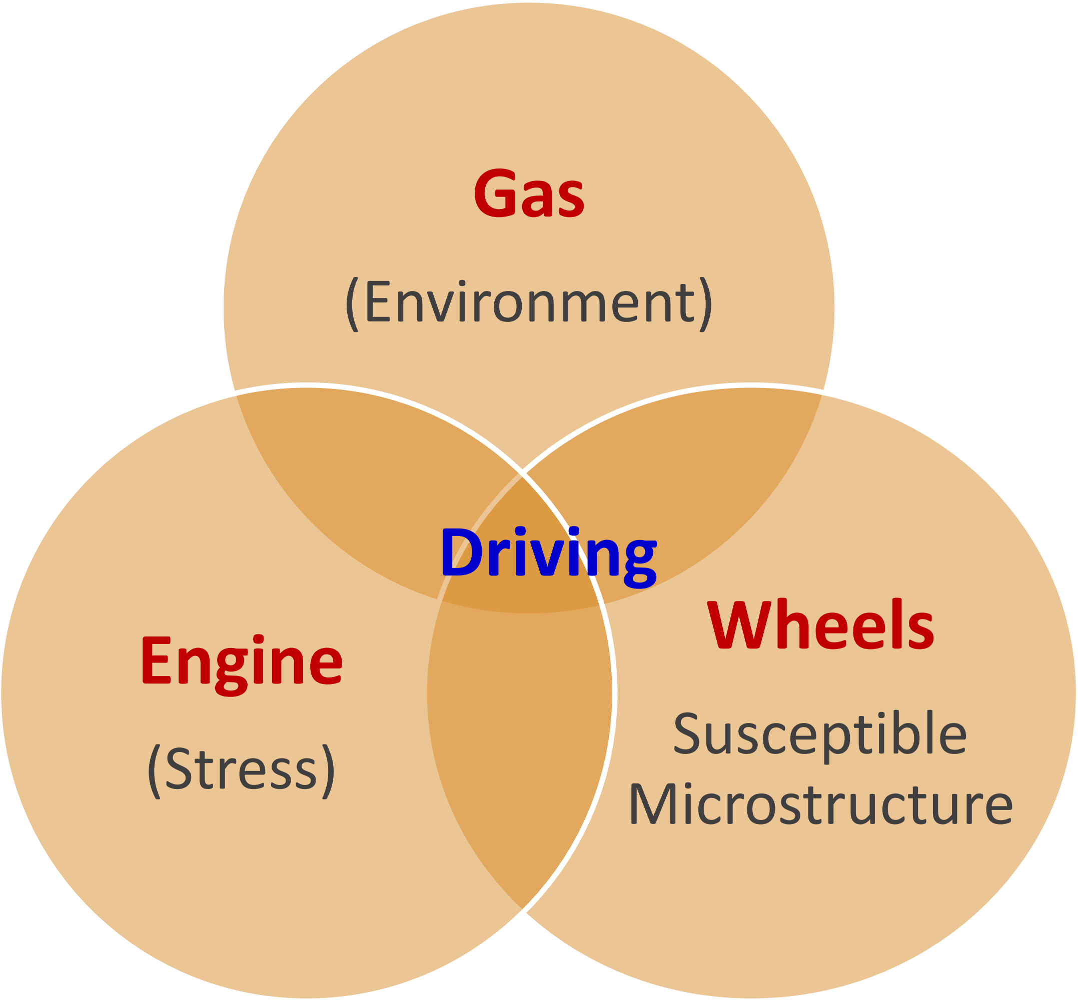
Stress Corrosion Cracking Analogy: Driving a Car



Point 1: *Engine, Gas and Wheels are* ***NECESSARY*** *to drive a car.*

Point 2: *Each must be* ***SUFFICIENT*** *to drive…*
Can't drive if you only have 3 wheels, a lawn-mower engine, or if your gas is 50% water

Stress Corrosion Cracking Analogy: Driving a Car



Point 1: *Engine, Gas and Wheels are* ***NECESSARY*** *to drive a car.*

Point 2: *Each must be* ***SUFFICIENT*** *to drive…*
Can't drive if you only have 3 wheels, a lawn-mower engine, or if your gas is 50% water

Point 3: *The car will go faster with a bigger engine or premium gasoline*

Chloride Induced SCC (Cl-SCC) has been identified as a possible damage mode relevant to Multi-purpose Canisters (MPC)

UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR MATERIAL SAFETY AND SAFEGUARDS
WASHINGTON, DC 20555-0001

November 14, 2012

NRC INFORMATION NOTICE 2012-20: POTENTIAL CHLORIDE-INDUCED STRESS CORROSION CRACKING OF AUSTENITIC STAINLESS STEEL AND MAINTENANCE OF DRY CASK STORAGE SYSTEM CANISTERS

U.S. NUCLEAR WASTE TECHNICAL REVIEW BOARD

CHLORIDE-INDUCED STRESS CORROSION CRACKING POTENTIAL IN DRY-STORAGE CANISTERS FOR SPENT NUCLEAR FUEL

SUMMARY

Chloride-induced stress corrosion cracking (CISCC) is a type of degradation that leads to cracks in certain stainless steel materials. While known to be common in submerged water environments,

USED FUEL DISPOSITION CAMPAIGN

Gap Analysis to Support Extended Storage of Used Nuclear Fuel

Rev. 0

Fuel Cycle Research & Development

Prepared for
U.S. Department of Energy
Used Fuel Disposition Campaign

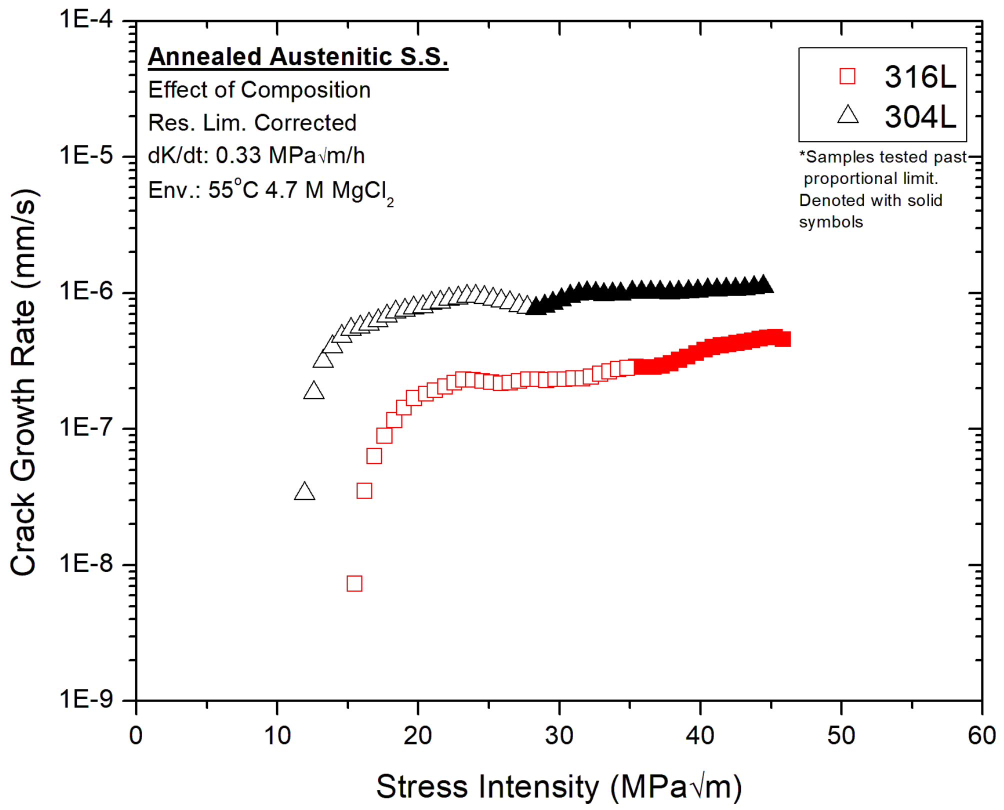
Brady Hanson (PNNL)
Halim Alsaed (INL)
Christine Stockman (SNL)
David Enos (SNL)
Ryan Meyer (PNNL)
Ken Sorenson (SNL)
January 31, 2012
FCRD-USED-2011-000136 Rev. 0
PNNL-20509

For the MPC conditions what are the sources of the 3 factors?

Susceptible Material, Stress, Environment

For the MPC conditions what are the sources of the 3 factors?
Susceptible Material, Stress, Environment

- *Austenitic stainless steels are used in the MPC (304, 304L, 316, 316L) and have been reported to exhibit Cl-SCC*



For the MPC conditions what are the sources of the 3 factors?
Susceptible Material, Stress, Environment

- *Austenitic stainless steels are used in the MPC (304, 304L, 316, 316L) and have been reported to exhibit Cl-SCC*
- ***For this low-temperature Cl-SCC mode the crack morphology is often transgranular with significant branching***

For the MPC conditions what are the sources of the 3 factors?
Susceptible Material, Stress, Environment

- *Austenitic stainless steels are used in the MPC (304, 304L, 316, 316L) and have been reported to exhibit Cl-SCC*
- *For this low-temperature Cl-SCC mode the crack morphology is often transgranular with significant branching*
- ***The susceptibility will depend on material details:***
  - *Alloy composition, degree of cold-work, weld-microstructure, sensitization, microstructural orientation*

For the MPC conditions what are the sources of the 3 factors?
Susceptible Material, Stress, Environment

- *Austenitic stainless steels are used in the MPC (304, 304L, 316, 316L) and have been reported to exhibit Cl-SCC*
- *For this low-temperature Cl-SCC mode the crack morphology is often transgranular with significant branching*
- ***The susceptibility will depend on material details:***
    - *Alloy composition, degree of cold-work, weld-microstructure, sensitization, microstructural orientation*

Take-Away:
The austenitic stainless steels used for MPCs can be susceptible to Cl-SCC…
But **ONLY** if there is a sufficiently severe stress and environment

For the MPC conditions what are the sources of the 3 factors?

Susceptible Material, **Stress**, Environment

For the MPC conditions what are the sources of the 3 factors?

Susceptible Material, **Stress**, Environment

- *Modeling and experimental studies determined that weld-residual stresses are the only source of stress sufficient to potentially drive Cl-SCC in MPCs*

Final Report: Characterization of Canister Mockup Weld Residual Stresses

Fuel Cycle Research & Development

Prepared for
U.S. Department of Energy
Used Fuel Disposition Program
D.G. Enos and C.R. Bryan
Sandia National Laboratories
November 22, 2016
FCRD-UFD-2016-000064
SAND2016-12375 R

Finite Element Analysis of Weld Residual Stresses in Austenitic Stainless Steel Dry Cask Storage System Canisters

Technical Letter Report

Joshua Kusnick[1], Michael Benson[1], and Sara Lyons[2]

U.S. Nuclear Regulatory Commission
[1]Office of Nuclear Regulatory Research
[2]Office of Nuclear Reactor Regulation

December 2013

For the MPC conditions what are the sources of the 3 factors?

Susceptible Material, **Stress**, Environment

- *Modeling and experimental studies determined that weld-residual stresses are the only source of stress sufficient to potentially drive Cl-SCC in MPCs*
- *Weld residual stresses arise due to thermal gradients during the weld process (steps can be taken to minimize)*

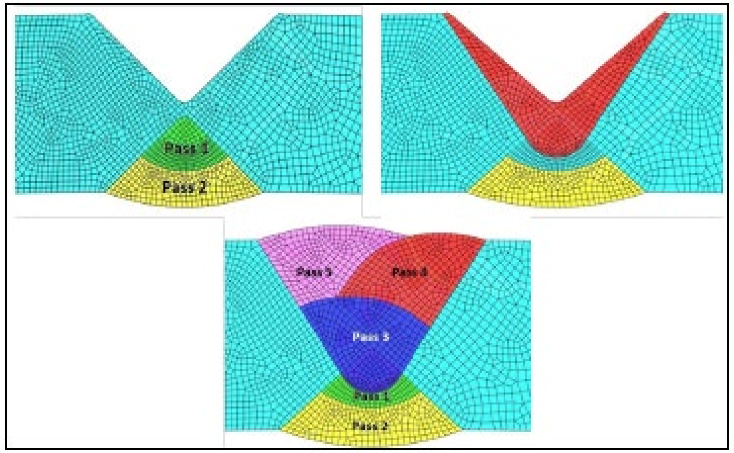
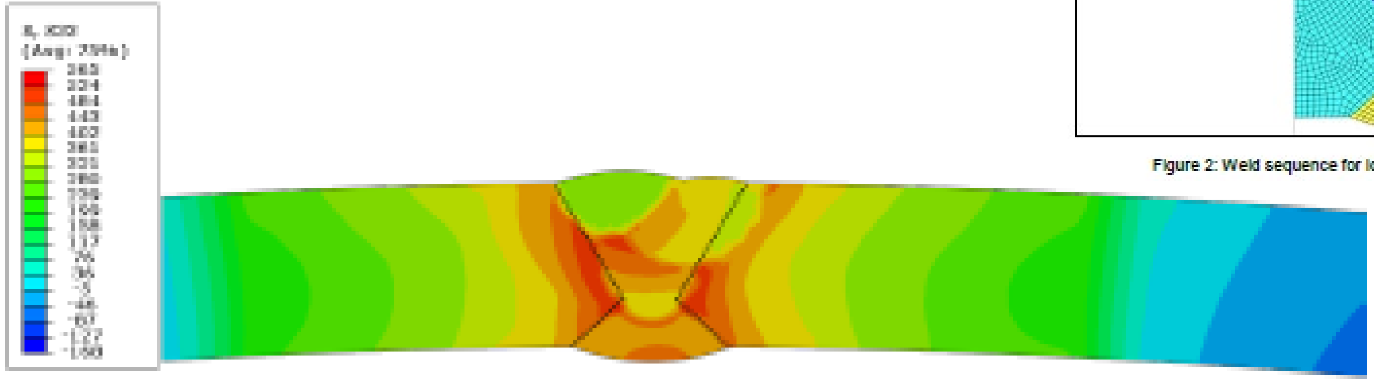
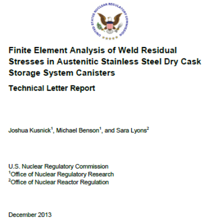


Figure 2: Weld sequence for longitudinal and circumferential canister welds




Finite Element Analysis of Weld Residual Stresses in Austenitic Stainless Steel Dry Cask Storage System Canisters

Technical Letter Report

Joshua Kusnick[1], Michael Benson[1], and Sara Lyons[2]

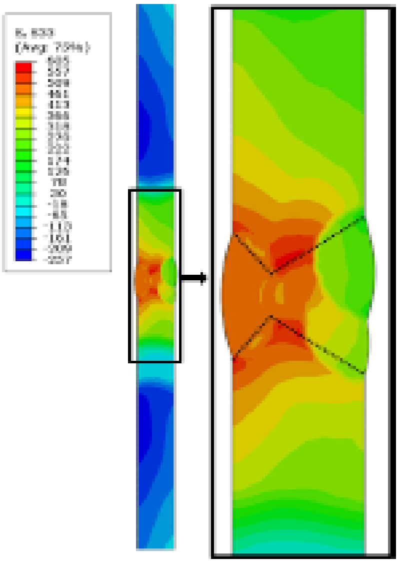
U.S. Nuclear Regulatory Commission
[1]Office of Nuclear Regulatory Research
[2]Office of Nuclear Reactor Regulation

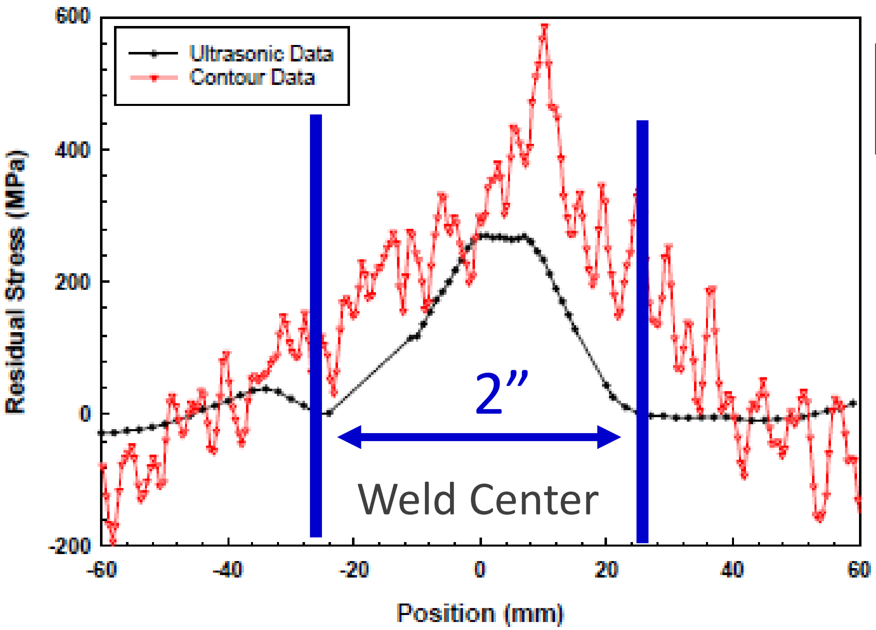
December 2013

For the MPC conditions what are the sources of the 3 factors?

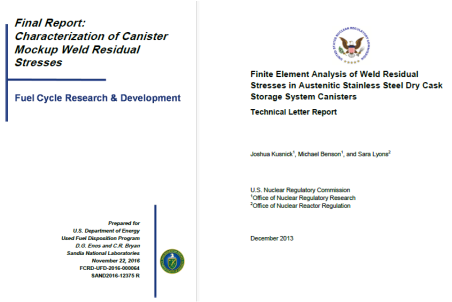
Susceptible Material, **Stress**, Environment

- *Modeling and experimental studies determined that weld-residual stresses are the only source of stress sufficient to potentially drive CI-SCC in MPCs*
- *Weld residual stresses arise due to thermal gradients during the weld process*
- ***Critical to note that the weld-residual stresses will be highly localized to the welds***





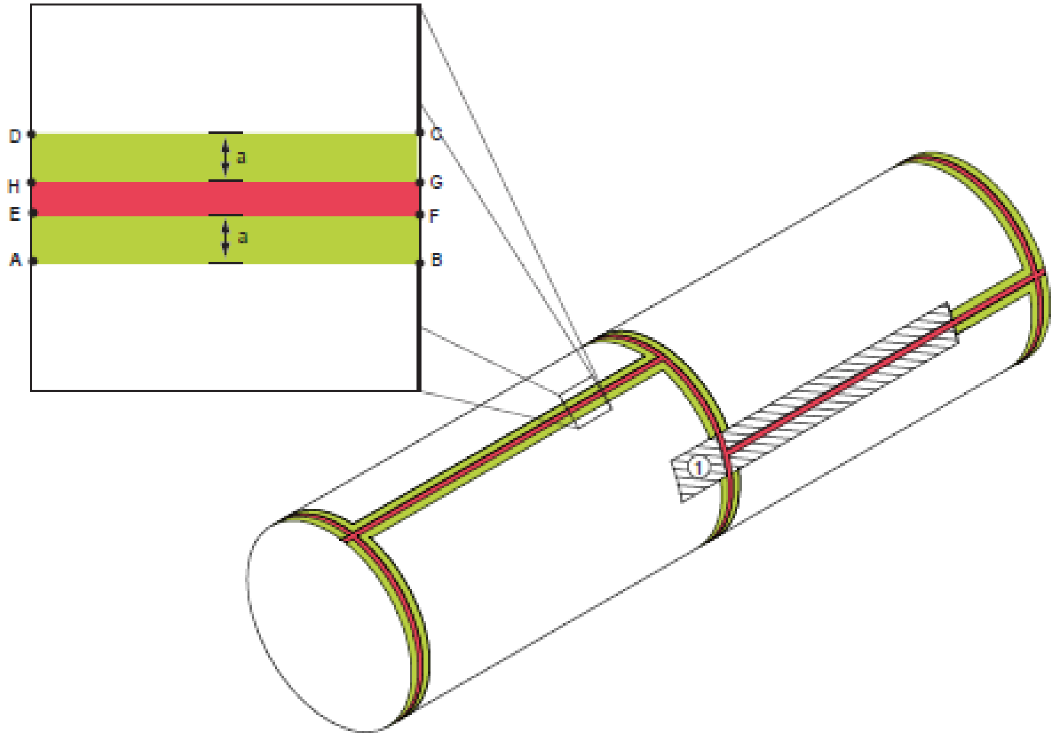
So What?



For the MPC conditions what are the sources of the 3 factors?

Susceptible Material, **Stress**, Environment

- ***The ONLY place where there is a driving force for this damage mode is adjacent to the welds,*** *this is an extremely low percentage of the surface area*



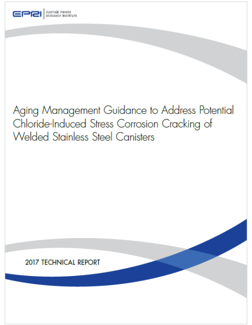
LEGEND:

a = 50 mm (2 inch)

A-B-C-D = Extent of the examination surface

E-F-G-H = Visually determined extent of weld

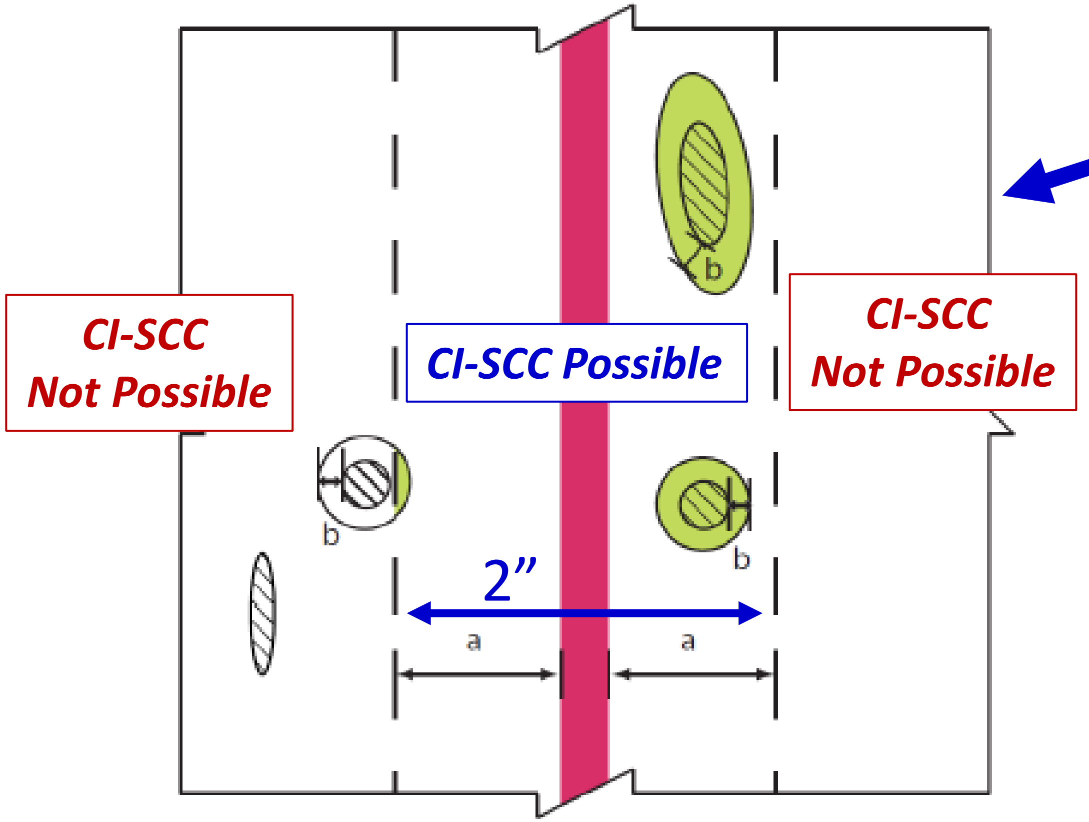
1 = Example inaccessible areas; the examination surface does not include inaccessible areas

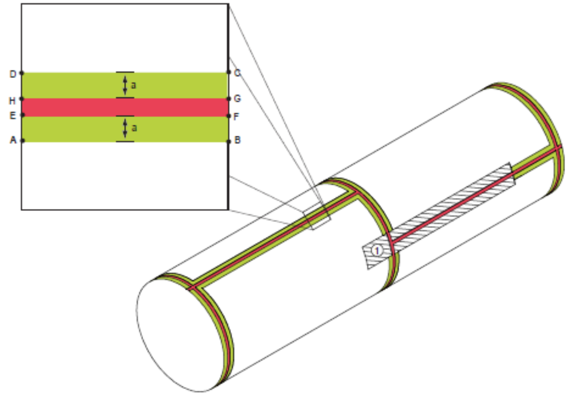


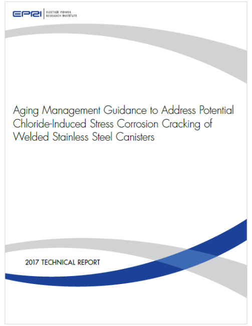
For the MPC conditions what are the sources of the 3 factors?

Susceptible Material, **Stress**, Environment

- *The ONLY place where there is a driving force for this damage mode is adjacent to the welds, this is an extremely low percentage of the surface area*
- ***Important to recognize this when interpreting relevance of inspection findings***







For the MPC conditions what are the sources of the 3 factors?

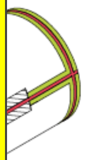
Susceptible Material, **Stress**, Environment

- *The ONLY place where there is a driving force for this damage mode is adjacent to the welds, this is an extremely low percentage of the surface area*
- ***Important to recognize this when interpreting relevance of inspection findings***

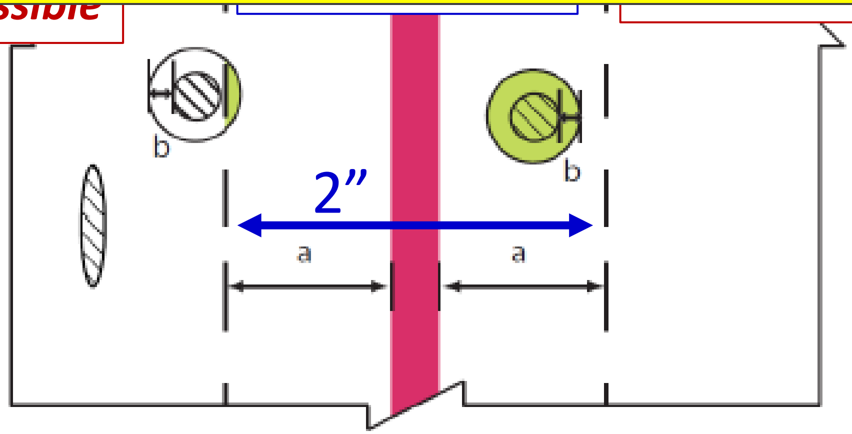
Take-Away:

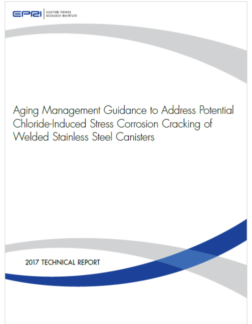
Weld residual stress provides a potential driving force for CI-SCC…

But only in a very few locations and not all stresses are sufficient to cause CI-SCC



Not Possible





For the MPC conditions what are the sources of the 3 factors?

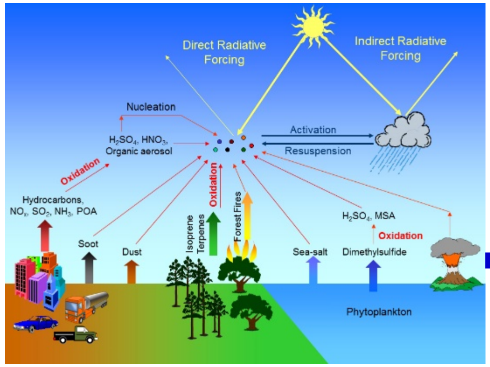
Susceptible Material, Stress, **Environment**

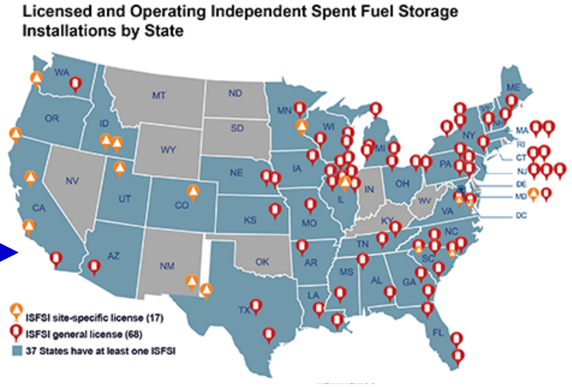
For the MPC conditions what are the sources of the 3 factors?

Susceptible Material, Stress, **Environment**

- *These canisters are not underwater, so where does the electrolyte come from?*

Variety of ways for aerosols to be generated





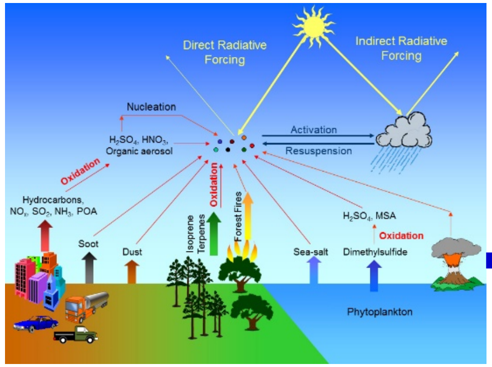
Generation of aerosols will vary with ISFSI location

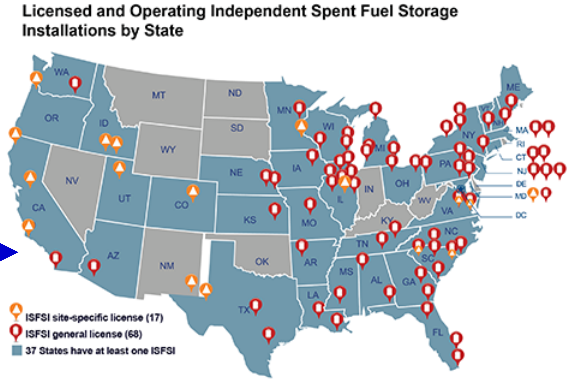
For the MPC conditions what are the sources of the 3 factors?

Susceptible Material, Stress, **Environment**

- *These canisters are not underwater, so where does the electrolyte come from?*

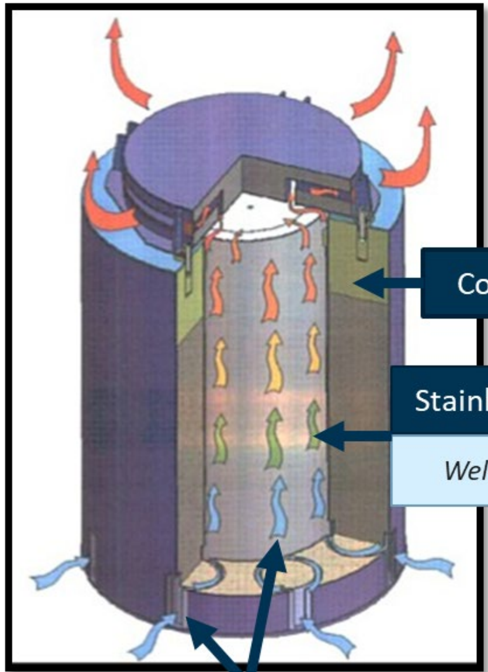
Variety of ways for aerosols to be generated





Generation of aerosols will vary with ISFSI location

Aerosols can deposit on the MPC surface during passive cooling



Concrete Overpack

Stainless-steel canister

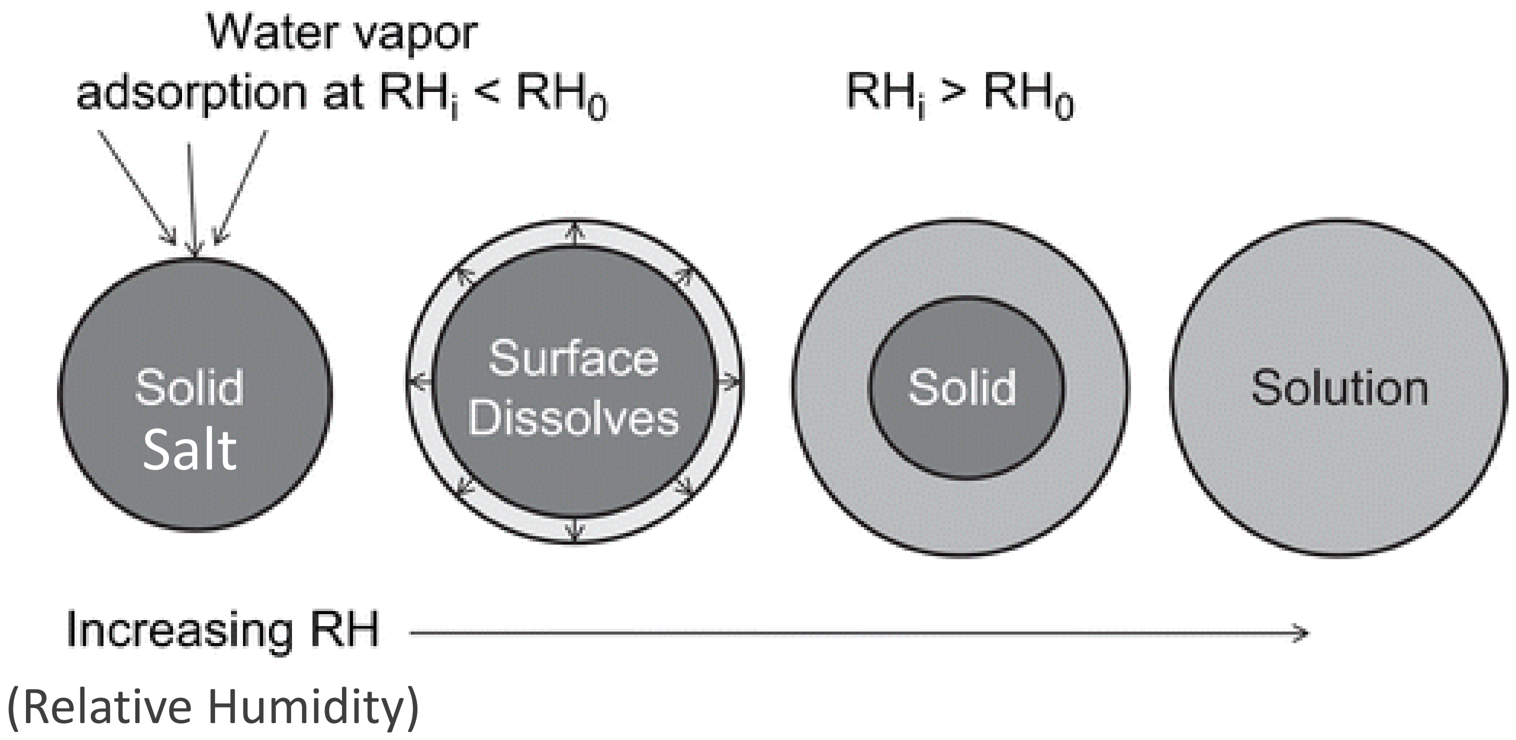
Welded austenitic S.S.

Passive ventilation cooling

Deposition of dust & salts

For the MPC conditions what are the sources of the 3 factors?
Susceptible Material, Stress, **Environment**

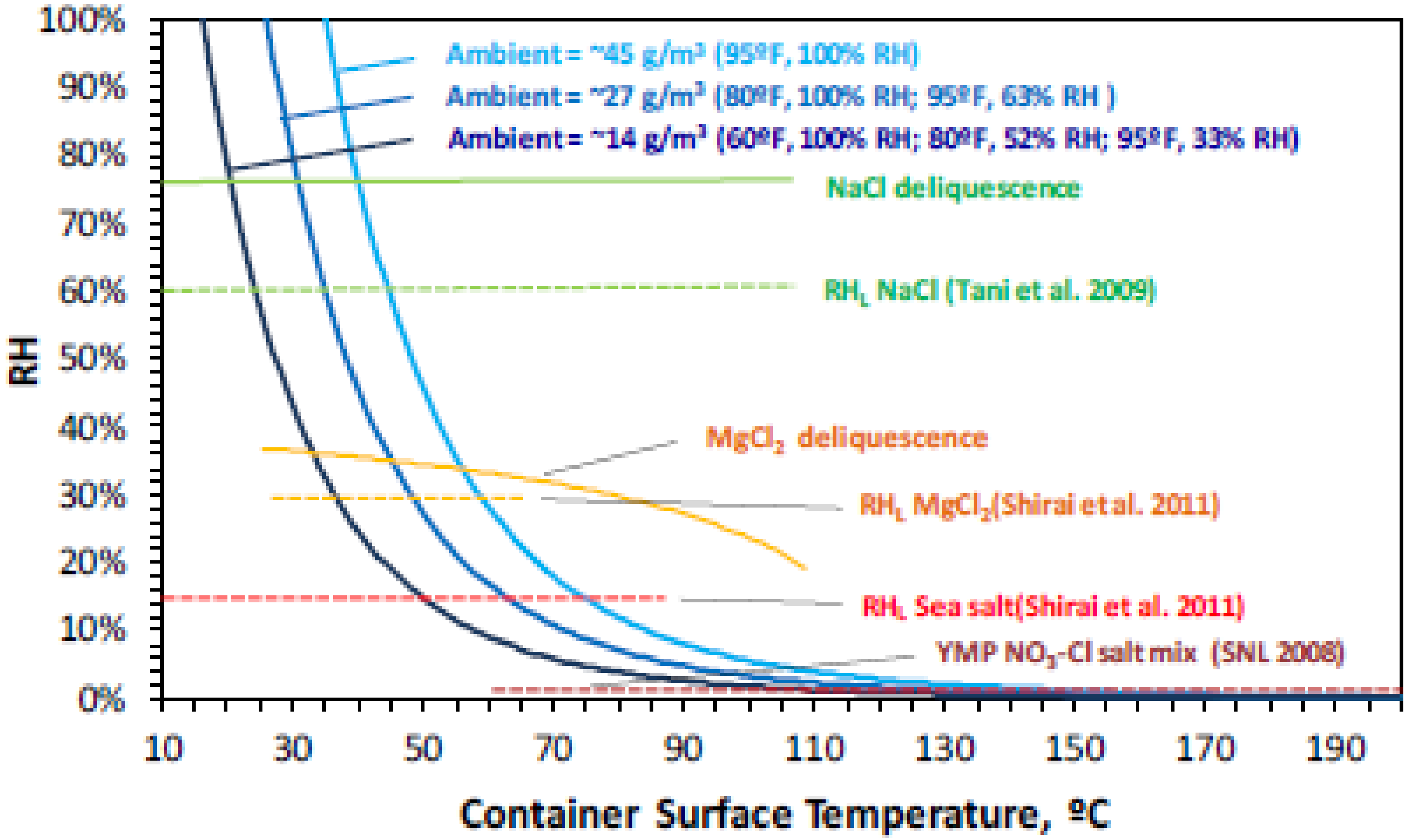
- ***Once salt is deposited on the surface, deliquescence can occur to form an electrolyte***



For the MPC conditions what are the sources of the 3 factors?

Susceptible Material, Stress, **Environment**

- ***Deliquescence will depend on: RH, salt type and temp***



Data Report on Corrosion Testing of Stainless Steel SNF Storage Canisters

Fuel Cycle Research & Development

Prepared for U.S. Department of Energy Used Fuel Disposition Campaign

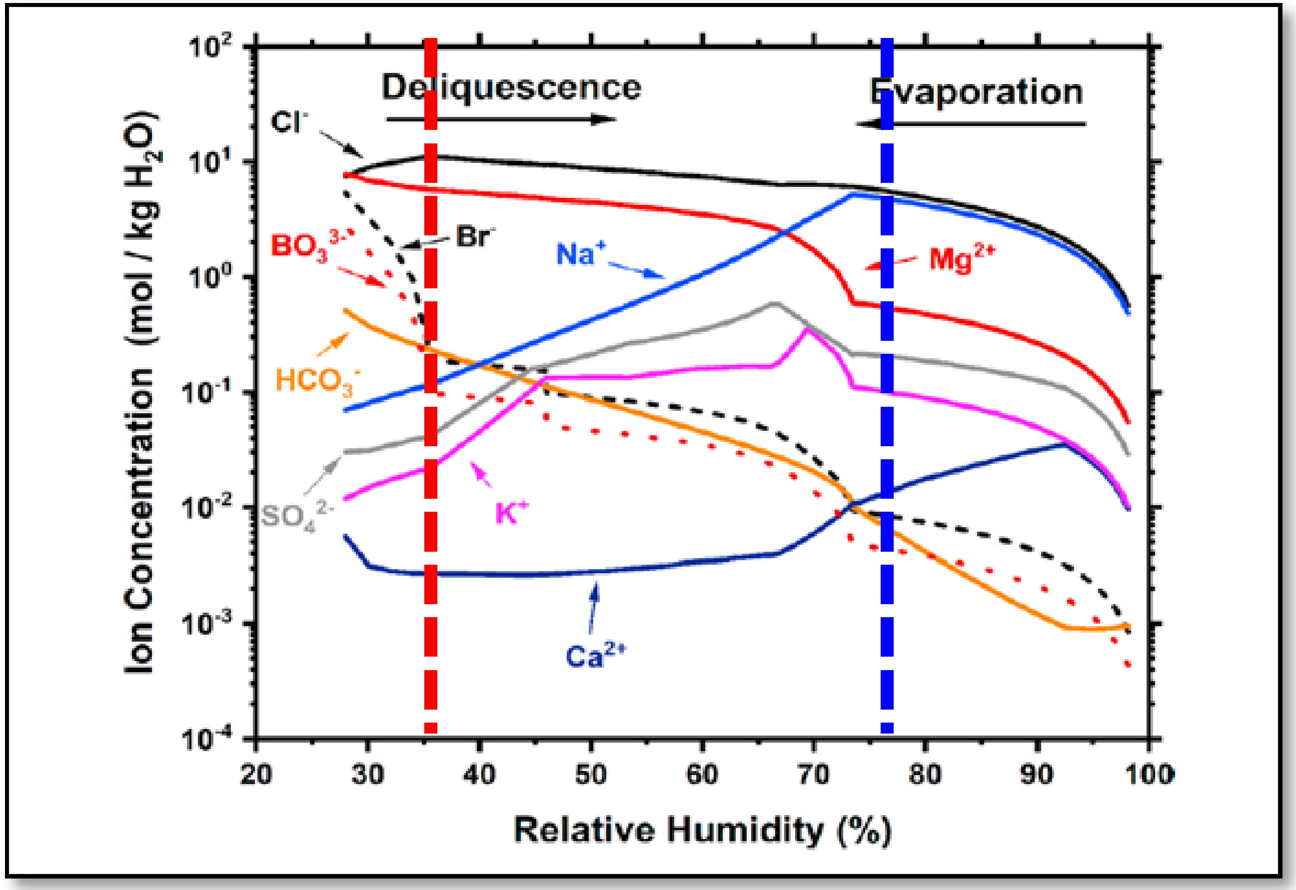
D.G. Enos, C.R. Bryan, and K. M. Norman
Sandia National Laboratories
September 30, 2013

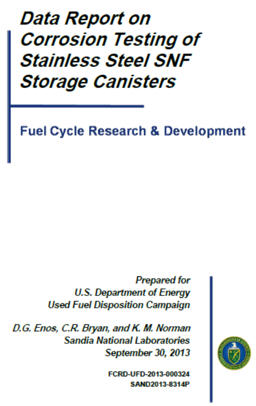
FCRD-UFD-2013-000324
SAND2013-8314P

For the MPC conditions what are the sources of the 3 factors?

Susceptible Material, Stress, **Environment**

- ***Deliquescence will depend on: RH, salt type and temp***
  - *Electrolyte volume and composition depend on the salt loading density and the RH*



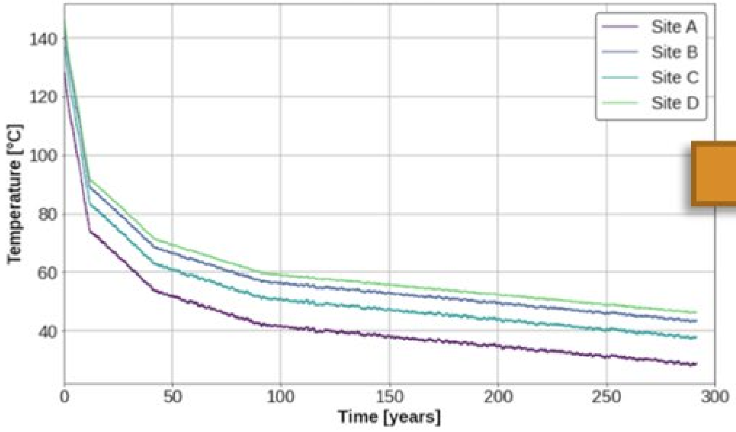


For the MPC conditions what are the sources of the 3 factors?

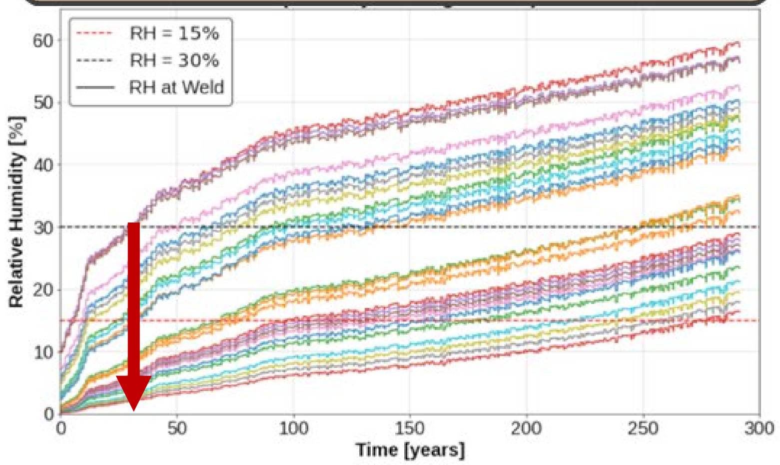
Susceptible Material, Stress, **Environment**

- ***Deliquescence will depend on: RH, salt type and temp***
  - *Electrolyte volume and composition depend on the salt loading density and the RH*
- ***Critically, due to elevated temperature (due to fuel), there is long window of time (decades) when deliquescence CANNOT occur***

Predicted Canister Surface Temperature



Predicted Canister Surface RH



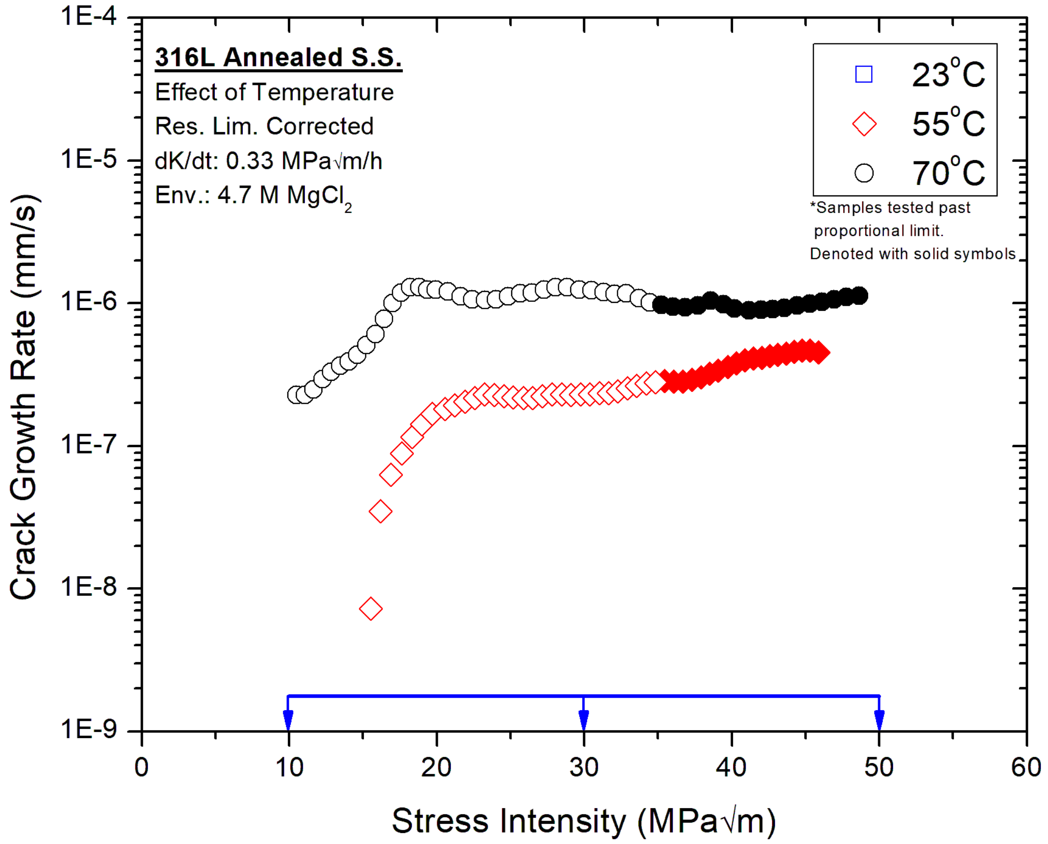
For worst case condition, no deliquescence for ≈30 years

Sandia National Lab Report: SAND2022-11358R (2022)

For the MPC conditions what are the sources of the 3 factors?

Susceptible Material, Stress, **Environment**

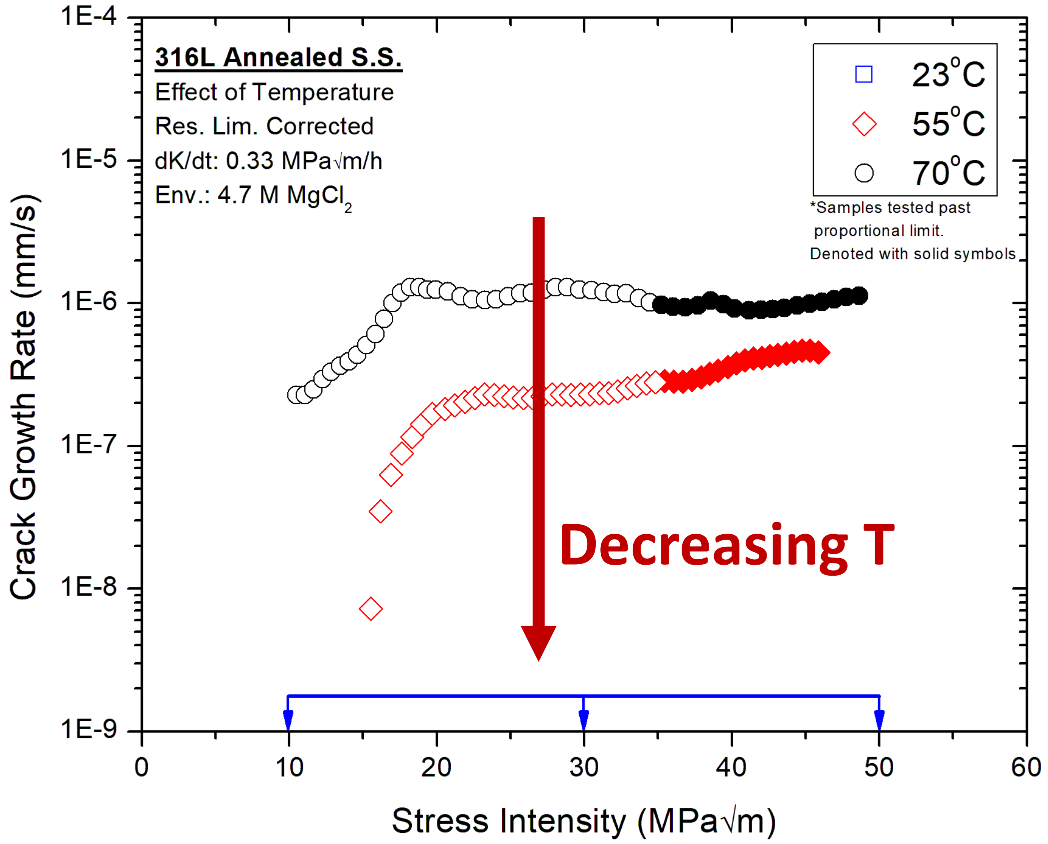
- ***If electrolyte does form, Cl-SCC behavior depends on:***
  - *Electrolyte composition, electrolyte volume, temperature and time of wetness*



For the MPC conditions what are the sources of the 3 factors?

Susceptible Material, Stress, **Environment**

- ***If electrolyte does form, Cl-SCC behavior depends on:***
  - *Electrolyte composition, electrolyte volume, **temperature** and time of wetness*
  - *Note: High temps no electrolyte, as temp falls growth rate decreases*



For the MPC conditions what are the sources of the 3 factors?

Susceptible Material, Stress, **Environment**

-

Take-Away:

- **Cl-SCC can only happen if there is an electrolyte**
- Aerosol/Salt deposition and deliquescence provides a means for electrolyte to form on MPCs
- Due to the elevated temperature (from the fuel) there is a long time window where electrolyte CANNOT form
- If electrolyte does form, then Cl-SCC severity depends on its volume, composition, and temperature
- Self-regulating dependence on temperature. (High T, no electrolyte; Low T, slow growth)

Stress Intensity (MPa√m)

What are the relevant guidelines that govern the management of CI-SCC??

NUREG-2214

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

NUREG–2214

Managing Aging Processes In Storage (MAPS) Report

Final Report

Manuscript Completed: March 2019
Date Published: July 2019

ASME Code Case N-860

ASME BPVC.CC.NC.S6-2019

CASE N-860

Approval Date: July 6, 2020

Code Cases will remain available for use until annulled by the applicable Standards Committee.

Case N-860
Inspection Requirements and Evaluation Standards for Spent Nuclear Fuel Storage and Transportation Containment Systems
Section XI, Division 1; Section XI, Division 2

(e) This Case applies to canisters subjected to outdoor ambient environmental conditions, including those considered sheltered, that is, the environment experienced by canisters inside a ventilated concrete shielding structure.

(f) SNF storage and transportation containment sys-

New Draft Reg Guide

U.S. NUCLEAR REGULATORY COMMISSION

DRAFT REGULATORY GUIDE DG-3058

Proposed new Regulatory Guide 3.78

Issue Date: July 2024
Technical Lead: Darrell Dunn

ACCEPTABLE ASME SECTION XI INSERVICE INSPECTION CODE CASES FOR 10 CFR PART 72

What are the relevant guidelines that govern the management of CI-SCC??

NUREG-2214

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

NUREG–2214

Managing Aging Processes In Storage (MAPS) Report

Final Report

Manuscript Completed: March 2019
Date Published: July 2019

ASME Code Case N-860

ASME BPVC.CC.NC.S6-2019

CASE
N-860

Approval Date: July 6, 2020

Code Cases will remain available for use until annulled by the applicable Standards Committee.

Case N-860
Inspection Requirements and Evaluation Standards for Spent Nuclear Fuel Storage and Transportation Containment Systems
Section XI, Division 1; Section XI, Division 2

(e) This Case applies to canisters subjected to outdoor ambient environmental conditions, including those considered sheltered, that is, the environment experienced by canisters inside a ventilated concrete shielding structure.

(f) SNF storage and transportation containment sys-

Note:

- *Aging Management Plans for SCC are common for various industries (aerospace, marine, oil/gas applications)*

New Draft Reg Guide

U.S. NUCLEAR REGULATORY COMMISSION
DRAFT REGULATORY GUIDE DG-3058

Proposed new Regulatory Guide 3.78

Issue Date: July 2024
Technical Lead: Darrell Dunn

ACCEPTABLE ASME SECTION XI INSERVICE INSPECTION CODE CASES FOR 10 CFR PART 72

These details provide context for interpretation of inspection results:

- ***Cl-SCC will only occur if there is sufficiently high:***
  - ***Material Susceptibility, Stress, and Chloride Containing Electrolyte***

- ***A feature MUST be in a region of residual stress in order for Cl-SCC to be possible***
  - *This is a necessary but not sufficient condition*

- ***Corrosion pits are of most interest due to the local stress concentration and chemistry development***

- ***Deliquescence of salt deposits can ONLY occur at a sufficiently high RH and sufficiently low temperature (details depend on salt)***
  - *The elevated temperature of the canister (due to the fuel) can preclude the formation of an electrolyte and can quickly dry any moisture from other sources (rain, etc.)*

These details provide context for interpretation of inspection results:

- ***A multi-level, conservative Aging Management protocol is in-place and guided by federal regulations***
    - *The approach is extensively documented and justified in industry, government, and academic literature*
    - *There are avenues for continuous improvement and responsiveness to inspection results*
    - *Structural management of SCC challenges occurs in many technical disciplines*

- ***If damage is found during the Aging Management inspections then there is are repair approaches available***

Review of Inspection Images

Jerry Stephenson
SCE Engineering Manager

Review of inspection images

- SCE is making all images captured during periodic inspections publicly available
- Even the most minor observations documented for analysis and trending
- All canisters inspected found in good condition
- No canister requires repair or mitigation

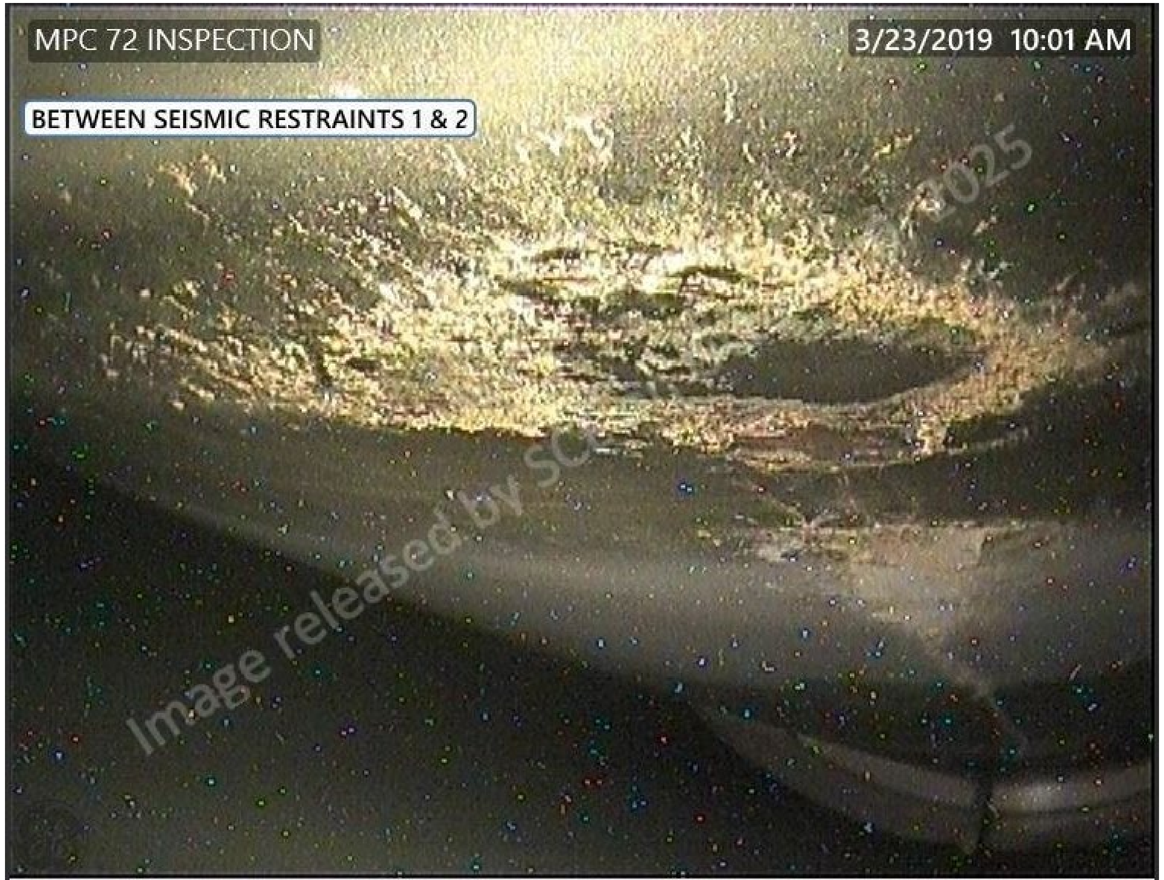
Robotic inspection in progress at SONGS

Inspection images and observations

UMAX Multi-Purpose Canister MPC072
Images best illustrating observations
Inspected 2019 and 2024

Inspection results – Holtec UMAX system

MPC072 Inspection 2019



NOTE: FREE IRON TRANSFER

MPC072 Inspection 2024

NOTE: FREE IRON TRANSFER AND WATER INTRUSION

Note: Comparison images requested by Gary Headrick

Inspection results – Holtec UMAX system

MPC072 Inspection 2019 (close-up)

NOTE: FREE IRON TRANSFER

MPC072 Inspection 2024 (close-up)

NOTE: FREE IRON TRANSFER

Inspection results – Holtec UMAX system

MPC072 Inspection 2019 (close-up)

NOTE: SCRATCH

MPC072 Inspection 2024 (close-up)

NOTE: SCRATCH

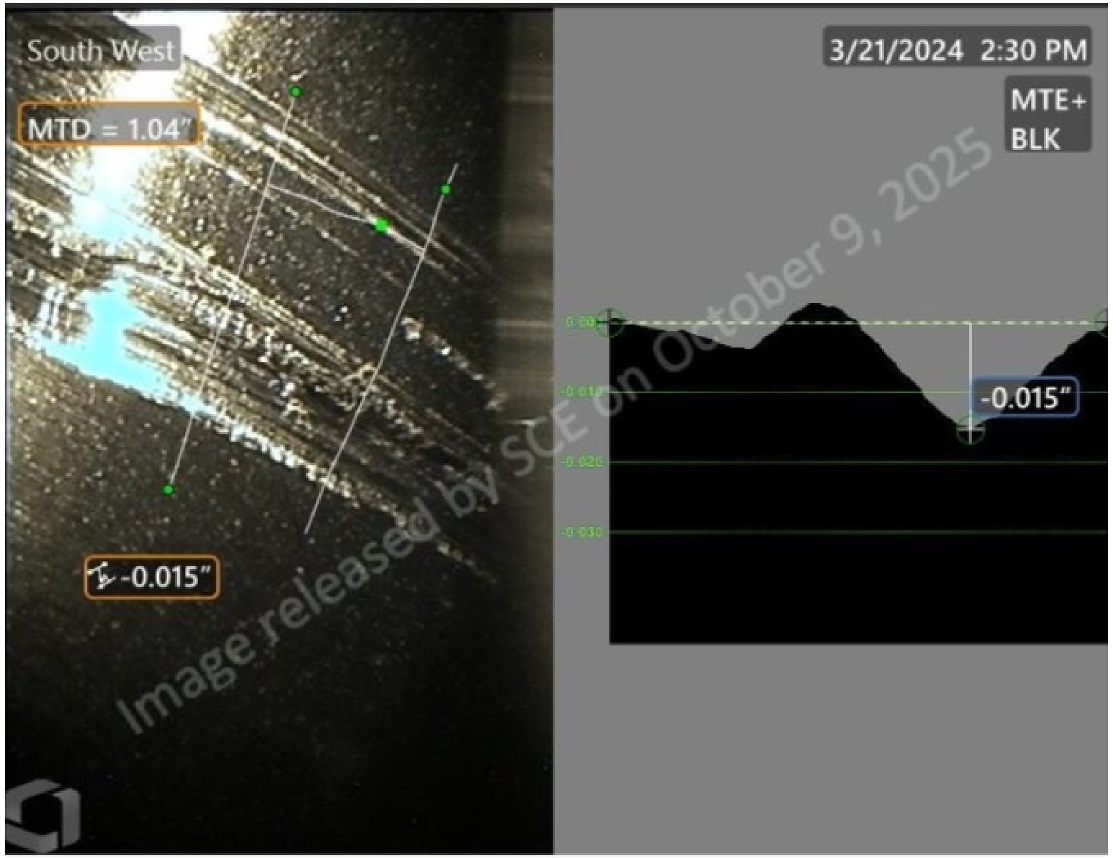
Note: Comparison images requested by Gary Headrick

Inspection results – Holtec UMAX system

MPC072 Inspection 2024 (close-up)

NOTE: SCRATCH

MPC072 Inspection 2024 (measurement)



NOTE: SCRATCH AND SURFACE PROFILE

Inspection results – Holtec UMAX system

MPC072 Inspection

NOTE: NO AREA OF INTEREST

Inspection results – Holtec UMAX system

MPC072 Inspection

NOTE: SURFACE BUILDUP AND SURFACE PROFILE (DUST ACCUMULATION, NOT CALCIUM)

SONGS spent fuel canister inspection images best illustrating observations of the NUHOMS dry storage canisters and Holtec UMAX multi-purpose canisters

Update10/16/25: To access CEP Educational Seminar Presentation Photos go to meeting webpage SONGS Spent Fuel: Onsite Storage and Initiative to Relocate Offsite | SONGS

NUHOMS canisters are identified as DSC003, DSC008

Holtec UMAX canisters are identified as MPC055, MPC061, MPC063, MPC064, MPC065, MPC067, MPC068, MPC072 and MPC094

Note: Inspection date and times are provided on all images.

View-only appendix
All images from canister inspections

Update 10/16/25: To access SONGS Spent Fuel Canister Inspection Photos go to meeting webpage SONGS Spent Fuel: Onsite Storage and Initiative to Relocate Offsite | SONGS

NUHOMS canisters are identified as DSC003, DSC008

Holtec UMAX canisters are identified as MPC055, MPC061, MPC063, MPC064, MPC065, MPC067, MPC068, MPC072 and MPC094

Note: Inspection date and times are provided on all images.

Public Comment

Dan Stetson

SAN ONOFRE COMMUNITY ENGAGEMENT PANEL

Directions for the public comment period:

To submit comments and questions in writing:

- Use the CEP Comment Form, if online
- Use the CEP Question/Comment Card available at the entrance

To sign up to speak:

- Use the CEP Comment Form, if online
- Use the CEP Question/Comment Card available at the entrance

We will begin our public comments with the people in the room and move on to our online guests

Comments and questions will be addressed in the order received Victor Cabral will facilitate

SAN ONOFRE COMMUNITY ENGAGEMENT PANEL

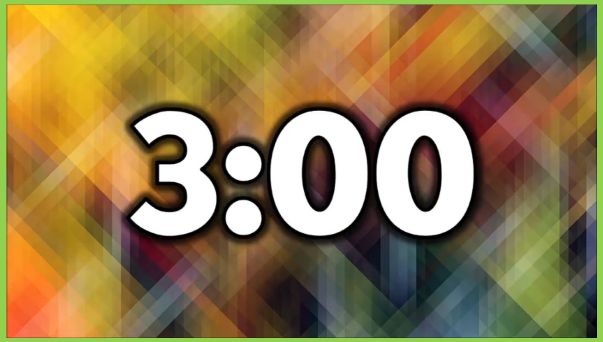
BREAK

Speaker Queue:

SAN ONOFRE
COMMUNITY
ENGAGEMENT
PANEL

General Public Comment

To sign up to speak online use the [CEP Comment Form]

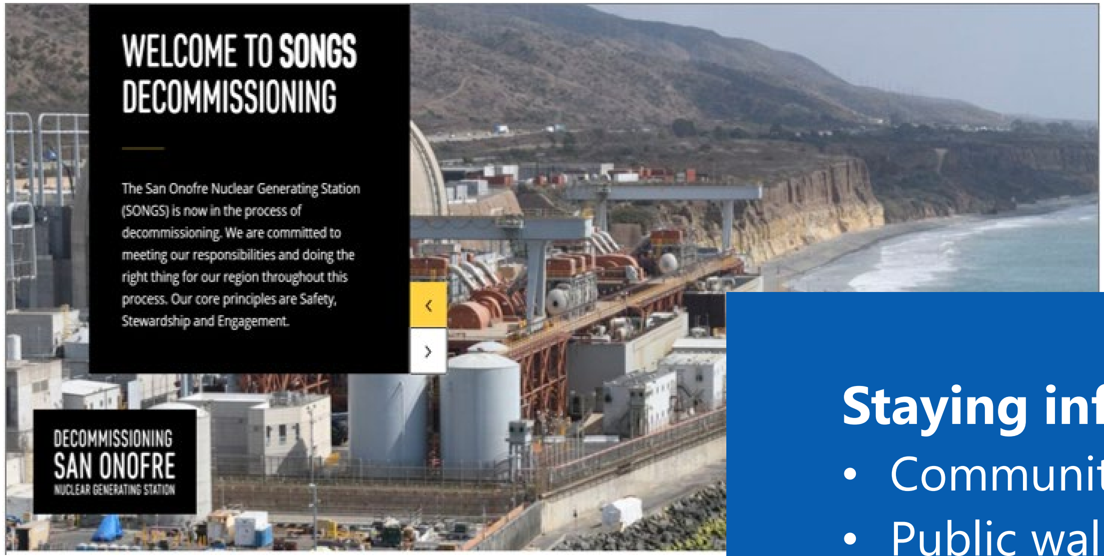


CLOSING COMMENTS

Fred Bailly

Resources

Learn about decommissioning
www.songscommunity.com



Staying informed

- Community Engagement Panel meeting dates
- Public walking tour dates and sign ups
- Decommissioning blog and news updates
- SONGS community update email
- Facebook, YouTube, and Instagram

KEY TAKEAWAYS

DAN STETSON

2025 CEP Meetings and Topics

(future topics subject to change)

Preliminary Focus Topics	Dates
1Q CEP Regular Meeting DOE/Pacific Northwest National Lab Site-Specific De-Inventory Report and SONGS Spent Fuel Dry Cask Storage Inspections	March 20
2Q CEP Regular Meeting SONGS Emergency Preparedness and Offsite Agency Support	June 12
3Q CEP Regular Meeting SONGS Dismantlement Update by San Onofre Decommissioning Solutions	August 28
CEP Educational Seminar SONGS Spent Fuel: Onsite Storage and Initiative to Relocate Offsite	October 16
4Q CEP Regular Meeting SONGS Dismantlement Update	November 13
CEP Member Consultation Meeting	December 15

SAN ONOFRE
COMMUNITY ENGAGEMENT PANEL

Thank you
Stay safe and healthy

Appendix:
Read-Only Topics and Reference Material

- Background on initiative to clear San Onofre of spent fuel
- SONGS Spent Fuel Canister Near-term Inspection Schedule
- Acronyms

Background on initiative to clear San Onofre of spent fuel

- Nuclear utility customers pre-paid for disposal and deserve solutions
- Ongoing delay costs all taxpayers $2 million per day
- Spent fuel challenge should not be left to future generations to solve
- Policy priorities are a durable federal spent fuel management program with near-term storage and long-term disposal
  - Taking program out of DOE and putting it into a single-purpose federal corporation
  - Reliable funding
  - Authorization to pursue siting for repository using a collaborative process
  - Revising linkage in Nuclear Waste Policy Act (NWPA) between storage and disposal to allow for near-term offsite storage
- Help make a difference by joining SFS at www.spentfuelsolutionsnow.com
- Strategic Plan is available HERE

SONGS Spent Fuel Canister Near-term inspection schedule

Dry Cask Storage System	UMAX	NUHOMS
Inspection Program	California Coastal Commission Inspection & Maintenance Program	Nuclear Regulatory Commission Aging Management Program
Periodicity	2 spent fuel canisters every 5 years, Heated test canister every 2.5 years	2 spent fuel canisters every 5 years, +/- 1 year
Timing	**2Q 2024** 2 spent fuel canisters, and test canister	
		4Q 2026 2 spent fuel canisters
	1Q 2027 Test canister	
	4Q 2029 2 spent fuel canisters, and test canister	

Acronyms

ACM	Asbestos Containing Material
AHSM	Advanced Horizontal Storage Module
ALARA	As Low As Reasonably Achievable
AMP	Aging Management Program
AREOR	Annual Radiological Environmental Operating Report
ASME	American Society of Mechanical Engineering
C&D	Cold & Dark
CAP	Corrective Action Program
CCC	California Coastal Commission
CBS	Core Barrel Support
CCR	Current Conditions Report
CDP	Coastal Development Permit
CDPH	California Department of Public Health
CEC	California Energy Commission; Cavity Enclosure Container
CEP	Community Engagement Panel
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CH&S	Corporate Health & Safety
CIS	Consolidated Interim Storage
CISCC	Chloride Induced Stress Corrosion Cracking
CNO	Chief Nuclear Officer
CPEN	Camp Pendleton
CPUC	California Public Utilities Commission
CSLC	California State Lands Commission
D&D	Decontamination & Dismantlement
DA	Decommissioning Agreement; Decommissioning Agent
DCE	Decommissioning Cost Estimate
DGC	Decommissioning General Contractor
DGCL	Derived Concentration Guideline Levels
DID	Defense-in-Depth
DOE	Department of Energy
DoN	Department of Navy

DOR	Division of Responsibility
DPH	Department of Public Health
DSAR	Defueled Safety Analysis Report (replaces FSAR)
DSC	Dry Storage Canister
D-SEIS	Draft Supplemental Environmental Impact Statement
D-SER	Draft Safety Evaluation Report
DSFM	Division of Spent Fuel Management (NRC)
DTF	Decommissioning Trust Fund
DTSC	Department of Toxic Substances Control
EAL	Emergency Action Level
EH&S	Environmental, Health & Safety
EIR	Environmental Impact Report (under CEQA)
EIS	Environmental Impact Study (under NEPA)
EP	Emergency Plan
EPA	Environmental Protection Agency
EPRI	Electric Power Research Institute
ERO	Emergency Response Organization
ET	Experts Team
FA	Fuel Assembly
FEIR	Final Environmental Impact Report
FERC	Federal Energy Regulatory Commission
FSAR	Final Safety Analysis Report
FSS	Final Status Surveys
FSSR	Final Status Survey Report
FTO	Fuel Transfer Operations; Field Training Officer
GTCC	Greater Than Class C (Waste)
HAZ	Heat Affected Zone
HI-TRAC	Holtec International Transfer Cask
Hi-PORT	Holtec International Transporter
HI-STORM	Holtec International Storage Module
HSM	Horizontal Storage Module

Acronyms

IOEP	ISFSI-Only Emergency Plan
IPC	Interjurisdictional Planning Committee
IRMS	ISFSI Radiation Monitoring System
ISA	Industrial Security Area
ISFSI	Independent Spent Fuel Storage Installation
LAR	License Amendment Request
LLRW	Low-Level Radioactive Waste
LOED	Large Organism Exclusion Device
LTP	License Termination Plan
MARSSIM	Multi-Agency Radiation Survey Site & Investigation Manual
MOU	Memorandum of Understanding
MPC	Multi-Purpose Canister
NDTF	Nuclear Decommissioning Trust Fund
NEI	Nuclear Energy Institute
NEPA	National Environmental Policy Act
NOP	Notice of Preparation
NOV/IO	Notice of Violation and Investigative Order
NPDES	National Pollutant Discharge Elimination System
NPP	Nuclear Power Plant
NRC	Nuclear Regulatory Commission
NTP	Notice to Proceed
NUREG	Nuclear Regulation
NUHOMS	Nutech Horizontal Modular Storage
NWPA	Nuclear Waste Policy Act
OC	Orange County
O&M	Operation & Maintenance
OE	Operating Experience
OSHA	Occupational Safety & Health Administration
PA	Protected Area
PDEP	Permanently Defueled Emergency Plan
PDTS	Permanently Defueled Technical Specifications
PPE	Personal Protective Equipment
PSDAR	Post-Shutdown Decommissioning Activities Report
Q&A	Questions and Answers

RECP	Radioactive Effluents Control Program
REIR	Request for Environmental Impact Review
REMP	Radiological Environmental Monitoring Program
RP	Radiological Protection
RPV	Reactor Pressure Vessel
RSI	Request for Supplemental Information
RV	Reactor Vessel
RVI	Reactor Vessel Internals
RWQCB	Regional Water Quality Control Board
SCE	Southern California Edison
SD	San Diego
SDDEH	San Diego Department of Environmental Health
SDS	San Onofre Decommissioning *Solutions*
SFP	Spent Fuel Pool; Support Foundation Pad (ISFSI)
SFPI	Spent Fuel Pool Island
SLC	State Lands Commission (CA)
SLR	Sea Level Rise
SNF	Spent Nuclear Fuel
SONGS	San Onofre Nuclear Generating Station
STP	Sewage Treatment Plant
SWPPP	Storm Water Pollution Prevention Plan
T&D	Transmission & Distribution
TBA	To Be Announced
TBD	To Be Determined
TEDE	Total Effective Dose Equivalent
UFSAR	Updated Final Safety Analysis Report
UT	Ultrasonic Testing
UU	Unrestricted Use
VCT	Vertical Canister Transporter
VLLW	Very Low-Level Waste
VRS	Volume Reduction Station
WNR	Wheeler North Reef (Marine Mitigation)
WHOI	Woods Hole Oceanographic Institution