Compilation of Recent CEP Communications
3/11/16 to 5/2/16

1 - Stress Corrosion Cracking

From: Tom Palmisano
Sent: Friday, April 08, 2016 9:42 AM
To: Bill Horn; Carlos Olvera; Dan Stetson ; David Victor; Donna Boston; Garry Brown; Glenn Pascall; Jim Leach; Jerry Kern; Jim Alpay; Lisa Bartlett; Lisa Bartlett; Lindsay Stigall; Marisol Eaton ; MRose ; Paul Walters ; Pam Patterson ; Rich Haydon ; Richard McPherson; Steve Carlson ; Tanya Flink ; Ted Quinn ;Tim Brown; Tom Caughlan; Victor Cao ; Val Macedo; William Parker ;
Cc: Manuel Camargo ; Liese Mosher ; Maureen Brown ; Tom Palmisano ; Julia Martinez ; Esther Soto
Subject: Follow up on Sandia Study

Dear Community Engagement Panel members,

I write to provide you some information related to a comment made during our recent CEP meeting. An interested member of the public made a comment based on a 2015 Sandia National Labs report on stress corrosion cracking research. The comment was based on a lack of understanding of the nature of the work summarized in the report. We have discussed the report with the author as well as the NRC, and I want to provide you the additional information.

I have attached three documents. The first is a note summarizing what we have learned from our discussions with the report author and the NRC. The second document is an email from the NRC responding to a similar question about the report which they received. The third document is the Sandia National Labs report.

I welcome any questions you may have.

Sincerely,

Tom

Attachments

1 - CEP Ltr Dry Storage Final 4.7.2016

2 - Sandia Study 2015

3 - Sandianrc Email 4.7.2016

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From: David G. Victor
Sent: Wednesday, April 06, 2016 8:29 AM
To: Nikolewski, Rob, SD Union Tribune; Teri Sforza, OC Register
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Cc: Manuel Camargo ; Tom Palmisano
Subject: (External):follow up on cask cracking issues...

Dear Rob and Teri

both of you have asked me questions over the last few weeks about the ongoing claims by a few members of the community that the Holtec casks (and all such stainless steel canister systems) are dangerous. As you know, I have spent a lot of time on this issue and repeatedly examined each new wave of claims—finding each to be baseless. Moreover, the alternative proposals that these folks have made—in favor of an unlicensed German design—are reckless and would degrade the safety of spent fuel storage in our community. Much of what I and several other members of the CEP have learned is summarized in the white paper from December 9th, 2014.

at the last CEP meeting a new round of claims was made—pointing in part to a "new" Sandia report. As I suspected, those claims were based on taking key elements of the report out of context. this is not the first time it is happened, and for reasons that are hard for me to understand folks willfully take experimental results that, by design, produce failures and assume that those experiments are designed to emulate real world conditions. IN fact, nearly all experiments in this area are designed in a way to maximize the appearance of corrosion and cracking because if scientists designed experiments under real world conditions they would have to wait centuries to see any effect. This issue with experimental design is familiar to anyone who is well versed with the scientific method—the same issues arise with drug toxicity trials, testing of concrete for earthquake resistance, and lots of other phenomena that are relatively rarely observed under real world conditions.

Below is a note from NRC earlier today that sets the record straight. there is a similar note that will be coming from Edison to the CEP shortly, and I can forward that to you when it is available. But given the manufactured dramas over this topic recently I thought you'd want to see this exchange asap.

all best

david

From: "Lombard, Mark"
Date: Wednesday, April 6, 2016 at 4:55 AM
To: Donna Gilmore , "Csontos, Aladar" >
Cc: CHAIRMAN Resource , "Shane, Raeann" , "Sampson, Michele" , "Brown, Christopher" , "Powers, Dana">, "Lai, John" , Michal Freedhoff , Arnie Gundersen , David Lochbaum - Union of Concerned Scientists , Ed Lyman , "Robert \"Bob\" Einziger" , Susan Corbett , Ken Alex , Kevin Barker - CEC , Joseph Street , David Peffer , Lori Donchak - City Council , Toni Iseman , Rita Conn , Tom Palmisano , Robert Alvarez , Gordon Thompson , "Frank N. von Hipple" , "Conley, Maureen" , William Boyle , "Robert \"Bob\" Einziger"
Subject: (External):RE: Sandia labs chart shows hotter spent fuel canister crack growth rate failure in less than 5 years after crack initiation NUREG 1927 issue

Ms. Gilmore,

We appreciate your question and I apologize for the delay in responding to it. We wanted to make sure our reply was complete. Our response is provided below. Please let us know if you have further questions.

The short answer to your question is yes, the NRC staff already evaluated the results cited in this study for the development of NUREG-1927R1. The response below includes a summary of the NRC staff position based on more than 10 years of study on the potential for Chloride-Induced Stress Corrosion Cracking (CISCC) followed by a detailed technical discussion.

Summary

The NRC staff is aware of, and previously reviewed all of the data and papers cited in, Figure E-5 of Sandia Report SAND2015-2175R. Some additional points with respect to Sandia Report SAND2015-2175R and NUREG-1927, Revision 1 (NRC's revised guidance document for spent fuel storage renewals) follow:

- The NRC staff held detailed technical discussions and provided some of the data to the authors of Sandia Report SAND2015-2175R, who, based on their feedback, concur with the conclusions of our analysis and response.
- The purpose of the Sandia report was to provide a rationale for mitigating stress corrosion cracking concerns on a new, standardized storage canister. It concluded that through-penetration by stress corrosion cracking may be possible *within 150 years*, the proposed regulatory lifetime of the new canister made by the authors; the report does not indicate or suggest that corrosion could occur in very short time intervals.
- NUREG-1927, Revision 1, Appendix B already includes references to the papers published by Kosaki (2008) and Hayashibara et al., (2008) which are two of the data sources cited in Figure E-5 of Sandia Report SAND2015-2175R
- The NRC staff held detailed technical discussions with several of the authors referenced in the Sandia Report
- The studies summarized in Figure 3-5 of the Sandia report carried out testing under "accelerated conditions" to establish the relationship between crack growth rate and temperature. To actually stimulate crack growth, testing conditions that are impossible to achieve in the natural environment were required.
- *Without exception*, the elevated-temperature data in Figure E-5 of Sandia Report SAND2015-2175R were obtained under conditions that are unrealistic for a natural environment.
- The NRC staff analyses and conclusions are based on CISCC growth rates calculated using available test data and consideration of the range of realistic environmental including the effects of elevated temperature

The NRC staff continues to be engaged with domestic and international technical experts from DOE, academia, international research organizations, and domestic industry groups such as EPRI on the potential for CISCC of welded stainless steel dry storage canisters.

Discussion

The use of unnatural ("accelerated") environmental conditions for corrosion testing (including SCC) is a common method employed by researchers to obtain test results in a short period of time and to assess the variability of individual environmental or metallurgical parameters on the corrosion or crack growth

rates. Many ASTM standard corrosion test methods rely on the use of accelerated test methods using conservative or unrealistic environmental conditions to rank susceptibility parameters.

As an example, Figure E-5 of Sandia Report SAND2015-2175R includes CISCC growth rate data obtained at temperatures of 60 °C [140 °F] and above. These CISCC tests were conducted in environmental chambers under conditions that are not observed in natural environments. In some cases, testing under unnatural conditions was conducted to determine the relative CISCC susceptibility of several stainless steel alloys and/or obtain information on the effects of temperature on crack growth rates.

Table 1 contains the summary testing environments at temperatures of 60 °C [140 °F] and above for the data cited in Figure E-5 in Sandia Report SAND2015-2175R. The testing temperatures and relative humidity values were reported by the researchers. To demonstrate that the testing conditions are not relevant to any plausible natural exposure conditions, Table 1 also contains the calculated absolute humidity, dew point and heat index for each test condition which can then be compared to actual extreme weather conditions. The absolute humidity and dew points were calculated from the reported testing conditions using the National Oceanic and Atmospheric Administration (NOAA) Air Resources Laboratory (ARL) online calculator: https://www.ready.noaa.gov/READYmoistcal.php. Heat index values were calculated using the reported testing conditions with the NOAA National Weather Service (NWS) Weather Prediction Center (WPC) online calculator: http://www.wpc.ncep.noaa.gov/html/heatindex.shtml.

Table 1. Chloride induced stress corrosion cracking (CISCC) test conditions and calculations of absolute humidity, dew point, and heat index.

Researcher	Test Temperature, °C[°F]	Test Relative Humidity, %	Absolute Humidity, g/m^3 (calculated)	Dew Point, °C [°F] (calculated)	Heat Index, °C [°F] (calculated)
Tani, 2009	80 °C [176 °F]	35 %	100.6	56 °C [133 °F]	233 °C [450 °F]
Cook, 2011	80 °C [176 °F]	32 %	92.0	54 °C [129 °F]	214 °C [418 °F]
Kosaki, 2008	60 °C [140 °F]	95 %	121.7	59 °C [138 °F]	318 °C [604 °F]
Hayashibara, 2008	60 °C [140 °F]	35 %	44.8	39 °C [102 °F]	115 °C [238 °F]
	70 °C [158 °F]	35 %	68.1	47 °C [117 °F]	168 °C [333 °F]
	80 °C [176°F]	35 %	100.6	56 °C [133 °F]	233 °C [450 °F]
	70 °C [158 °F]	55 %	107.0	57 °C [134 °F]	257 °C [494 °F]
	80 °C [176 °F]	55 %	158.2	66 °C [151 °F]	362 °C [684 °F]
Shirai, 2011	80 °C [176 °F]	35 %	100.6	56 °C [133 °F]	233 °C [450 °F]

Note that heat index safety information and warnings are available from the NWS NOAA web site: http://www.nws.noaa.gov/om/heat/heat_index.shtml. Heat index values of 40 °C [104 °F] to 52 °C [126 °F] are considered to be dangerous. Heat index values greater than 52 °C [126 °F] are considered to be extremely dangerous.

In the US, the dew points above 30 °C [86 °F] are rare but a few events have been recorded. Areas of the US that reach dew points above 30 °C [86 °F] tend to be the coastal locations along the Gulf of Mexico, the Atlantic Coast of Florida, and parts of the Midwest where evaporation and transpiration from corn fields can result in locally high humidity values. The Persian Gulf also is known to have weather conditions that result in high humidity and heat index values. A summary of extreme weather conditions in the US and the Persian Gulf are summarized in Table 2.

Comparing the absolute humidity, dew point and heat index values calculated from the testing conditions listed in Table 1 to the absolute humidity, dew point and heat index values recorded from extreme weather conditions in the US and the Persian Gulf in Table 2, it is apparent that the accelerated testing conditions used by the researchers cited in Figure E-5 of Sandia Report SAND2015-2175R were conducted under conditions that greatly exceed any known naturally occurring weather conditions. While the information on crack growth rates under the testing conditions listed in Table 1 may be useful for comparing the relative resistance of alloys to CISCC or gaining an understanding the effects of temperature on crack growth rates, the environmental conditions and the crack growth rates obtained are not applicable to actual storage conditions Although the heatwaves that produce the extreme weather conditions listed in Table 2 may persist in a given area for several days, high dew points typically occur in the afternoon for a period of a few hours and as previously stated, these extreme conditions are rare and occur infrequently. Because the duration of these events are short and infrequent, the effect of such extreme conditions on CISCC of welded stainless steel components is small. Canister corrosion may occur at temperatures somewhat above ambient; however, under storage conditions, elevated canister surface temperatures result in low relative humidities on the canister surface, stifling corrosion. With increasing temperature, greater and greater absolute humidities are required. This greatly limits the fraction of time, over a year that stress corrosion crack growth can occur. Other features or processes (for instance, light salt surface loads) may also limit crack growth.

Table 2. Summary of extreme weather conditions in the US and Persian Gulf that resulted in high values of relative humidity, dew point, and heat index.

City, State, Country	Date and Time	Air Temperature, °C [°F]	Relative Humidity, %	Absolute Humidity, g/m^3	Dew Point, °C [°F]	Heat Index, °C [°F]
Melbourne, FL, USA	July 12, 1987, 2:00 PM	34.4 °C [93.9 °F]	88	33.4 g/m^3	32.1 °C [90.0 °F]	59 °C [138 °F]

New Orleans, LA (Naval Air Station), USA	July 30, 1987, 4:00 PM	32.8 °C [91.0 °F]	97	33.9 g/m^3	32.2 °C [90.0 °F]	57 °C [134 °F]
Appleton/ Greenville, WI, USA	July 13, 1995, 5:00 PM	38.3 °C [100.9 °F]	71	32.9 g/m^3	32.0 °C [89.6 °F]	65 °C [148 °F]
Moorhead, MN, USA	July 19, 2011, 6:14 PM	35.0 °C [95.0 °F]	80	31.4 g/m^3	31.0 °C [87.8 °F]	57 °C [134 °F]
Dhahran, Saudi Arabia	July 8, 2003, 1:00 PM	42.0 °C [107.6 °F]	68	38.0 g/m^3	34.7 °C [94.5 °F]	80 °C [176 °F]
Dhahran, Saudi Arabia	July 8, 2003, 4:00 PM	41.0 °C [105.8 °F]	72	38.3 g/m^3	34.9 °C [94.8 °F]	79 °C [174 °F]
Bandar Mahshahr, Iran	July 31, 2015, 4:30 PM	46.1°C [115.0 °F]	47	32.0 g/m^3	31.9 °C [89.4 °F]	74 °C [165 °F]

From: Donna Gilmore
Sent: Thursday, March 24, 2016 9:42 AM
To: Lombard, Mark ; Csontos, Aladar
Cc: CHAIRMAN Resource ; Shane, Raeann ; Sampson, Michele ; Brown, Christopher ; Powers, Dana ; Lai, John ; Michal Freedhoff ; Arnie Gundersen ; David Lochbaum - Union of Concerned Scientists ; Ed Lyman ; Robert "Bob" Einziger ; Susan Corbett ; Ken Alex; Kevin Barker - CEC ; Joseph Street ; David Peffer ; Lori Donchak - City Council ; Toni Iseman ; Rita Conn ; Tom Palmisano ; Robert Alvarez ; Gordon Thompson ; Frank N. von Hipple ; William Boyle ; Robert "Bob" Einziger
Subject: [External_Sender] Sandia labs chart shows hotter spent fuel canister crack growth rate failure in less than 5 years after crack initiation NUREG 1927 issue

Has this faster crack growth rate of failure in less than 5 years been considered in NUREG-1927 Aging Management draft and dry storage and ISFSI dry storage license renewals? The Koeberg nuclear plant had a similar component leak in 17 years and was only at ambient temperature. Our canisters are much hotter. This report indicates the Diablo Canyon and other canisters have higher temperatures and also have conditions for crack initiation. This is of critical importance to California communities as well as all other U.S. locations storing thin spent fuel canisters.
I live 5 miles from San Onofre.

Spent fuel canisters at higher temperatures will have faster crack growth rate. Sandia Chart below shows higher temperatures can cause canisters to penetrate the wall in less than 5 years. This chart assumes canister wall is 0.625" (5/8") thick. The majority of the U.S. canisters are only 0.50" (1/2") thick. It is

unknown when a crack will start, but these canisters are subject to corrosion and cracking from environment conditions such as ocean salts (chlorides). air pollution (e.g., vehicle exhaust sulfides), pitting, and microscopic scratches.
Draft Geologic Disposal Requirements Basis for STAD Specification, A. Ilgen, C. Bryan, and E. Hardin, Sandia National Laboratories, March 25, 2015, FCRD-NFST-2013-000723 SAND2015-2175R, page 46
http://prod.sandia.gov/techlib/access-control.cgi/2015/152175r.pdf
https://sanonofresafety.files.wordpress.com/2013/06/sccpropatationratessandiastad2015-03-25.jpg?w=640

Donna Gilmore
SanOnofreSafety.org

34 Draft Geologic Disposal Requirements Basis for STAD Specification
March 25, 2015

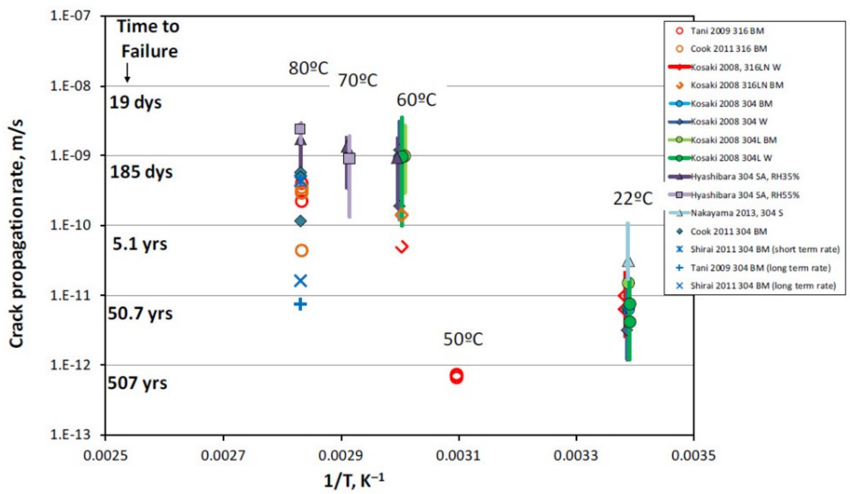

Figure E-5. SCC propagation rates for atmospheric corrosion of 304SS and 316SS. BM –base metal; W–weld sample; SA–solution annealed; S–sensitized. Bars represent reported ranges (if more than one), while symbols represent average values. Time to failure corresponds to the time required to penetrate a 0.625" thick canister wall.

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2 - Consolidated Interim Storage (CIS)

-----Original Message-----
From: Manuel Camargo
Sent: Monday, May 02, 2016 10:18 AM
To: David G. Victor
Cc: Dan Stetson ; Tim Brown ; Tom Palmisano ; Esther Soto
Subject: RE: (External):FW: Sacramento DOE Meeting

David,
We will include Dan's DOE remarks in the next circular as well as the pre-read for the June 22 CEP meeting.
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Thanks,
Manuel

Manuel C. Camargo Jr.
Southern California Edison

-----Original Message-----
From: David G. Victor
Sent: Monday, May 02, 2016 7:56 AM
To: Manuel Camargo
Cc: Dan Stetson ; Tim Brown ; Tom Palmisano
Subject: (External):FW: Sacramento DOE Meeting

Dear Manuel
as we put together the pre-read for the June 22 meeting can you please be sure that a readout from the DOE ^{3}consent^{2} meeting is part of our update.
And can you put Dan^{1}s remarks at that meeting into the pre-read.

thanks

david

On 4/29/16, 1:48 PM, "Dan Stetson (NE)"

>David
>Thanks for your support!
>Dan
>>

Attachment

4 - D Stetson_Sacramento DOE Mtg Remarks 4-26-2016

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-----Original Message-----
From: David G. Victor
Sent: Tuesday, April 12, 2016 8:32 AM
To: Jerry Kern
Cc: Manuel Camargo
Subject: (External):Re: SJR 23 - Interim Consolidated Storage Act

Dear Manuel

would you please include this email with our next circular to CEP members-ideally as part of the message that goes out reporting on outcomes from the last meeting. Let^{1}s also put this as an update item for the agenda of our June 22 meeting since this is directly on point.
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@Jerry: does Pat need some letters from local towns and such, as well as CEP leadership, or should we sit tight for now?

thanks

david

-----Original Message-----
From: Jerry Kern
Sent: Monday, April 11, 2016 8:35 PM
To: David G. Victor
Cc: Manuel Camargo
Subject: (External):FW: SJR 23 - Interim Consolidated Storage Act

David,

This may be of interest to other CEP members.

http://www.leginfo.ca.gov/pub/15-16/bill/sen/sb_0001-0050/sjr_23_bill_20160328_introduced.pdf

Jerome M Kern
Council Member
City of Oceanside

_____
From: Khan, Alexander [Alexander.Khan@sen.ca.gov]
Sent: Monday, April 11, 2016 3:25 PM
To: Jerry Kern
Subject: SJR 23 - Interim Consolidated Storage Act

Councilman Kern,

The Senate Energy, Utilities and Communications Committee will hear SJR 23 on Tuesday, April 19th. Support letters should be sent to addressed to Senator Ben Hueso and sent to Jay.Dickenson and cc'd to me at Alexander Khan.
Thank you so much for your help. Please be in touch if you need anything further.

Thanks,
Alex A. Khan
Senate Fellow
Office of Senator Patricia C. Bates

Connect with Senator Bates:
Website<http://district36.cssrc.us/>/Facebook<https://www.facebook.com/senatorpatbates>/Twitter<https://twitter.com/senatorpatbates>
[Description: Senate Seal Icon]<http://district36.cssrc.us/> [Description: "f" Logo] <https://www.facebook.com/senatorpatbates> [Description: https://g.twimg.com/Twitter_logo_blue.png] <https://twitter.com/senatorpatbates>

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From: "David G. Victor"
Date: April 12, 2016 at 8:04:12 PM PDT
To: Tom Palmisano
Cc: Manuel Camargo
Subject: (External):Re: Article on nuclear waste disposal at WIPP in New Mexico

Dear Manuel

can we include this article in the next email circular.

thanks

david

From: Tom Palmisano
Date: Tuesday, April 12, 2016 at 9:52 AM
To: David Victor , Tim Brown , Dan Stetson , Manuel Camargo
Cc: Tom Palmisano
Subject: Article on nuclear waste disposal at WIPP in New Mexico

All,

Attached is an article discussing the Waste Isolation Pilot Plant (WIPP) in New Mexico. The purpose of the article is to discuss the potential disposal of plutonium from the weapons programs at WIPP. Although the article is not specifically about commercial nuclear waste disposal, it does talk about New Mexico's willingness to accept nuclear waste and makes brief mention of their support the the Holtec Eddy Lea alliance project. The article also makes some brief mention of funding support and emergency training for local responders.

Provided for your information.

Tom

Attachment

5 - Changing nuclear landscape alters WIPP's role – The Santa Fe New Mexican Local News

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From: Tom Palmisano
Sent: Wednesday, April 13, 2016 9:41 AM
To: David Victor ; Tim Brown ; Dan Stetson (NE) ; Manuel Camargo ; Maureen Brown
Cc: Julie C Holt ; Tom Palmisano
Subject: DOE consent based siting meeting Atlanta

All,

Attached is a news report on the DOE consent based siting meeting held in Atlanta this week. We will provide this to the full CEP in a future mailing.

Tom

Attachment

6 - Georgia meeting ask how to choose nuclear waste site - The Augusta Chronicle

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From: Tom Palmisano
Sent: Friday, April 29, 2016 11:44 AM
To: David Victor ; Dan Stetson (NE) ; Tim Brown ; Manuel Camargo ; Liese Mosher ; JAMES MADIGAN
Cc: Tom Palmisano
Subject: Waste Control Specialists article

All,

Waste Control Specialists have file their NRC license application for a consolidated interim storage site in Texas for used nuclear fuel. This is a major milestone for them and the industry.

Provided for your information.

Manuel, let's provide this to the full CEP in the next mailing.

Tom

Attachment

7 – Waste Control Specialist Files License App with NRC to Operate a CIS Facility for Used Nuclear Fuel

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Additional Attachments

8 - NRC License Application Submitted for Spent Nuclear Fuel Interim Storage Facility – Power Mag article

9 - Company proposes new nuclear waste storage site in New Mexico – The Associated Press 4-13-16

3 - Aging Management

From: David G. Victor
Sent: Thursday, March 24, 2016 5:19 AM
To: Ted Quinn
Cc: Manuel Camargo
Subject: (External):Re: EPRI Journal Magazine, Mar-Apr 2016

Ted

many thanks.

Manuel: with the next email circular to the CEP can you please include a copy of the EPRI article "Keeping Spent Nuclear Fuel Safe".

all best

david

From: Ted Quinn
Date: Wednesday, March 23, 2016 at 10:37 PM
To: David Victor
Cc: Tom Palmisano , Dan Stetson , Tim Brown , 'Manuel Camargo' , 'Ted Quinn' >
Subject: RE: EPRI Journal Magazine, Mar-Apr 2016

Hi David:

Sorry for the delay in responding --- I did look at this and have worked with Margaret Ryan in a number of projects. She is very good technically and at writing. I am sure EPRI approved the issue of this. I recommend the isolated article for distribution.

Best regards,

Ted Quinn

ANS Past President

From: David G. Victor
Sent: Thursday, March 17, 2016 8:21 PM
To: Quinn, Ted
Cc: Tom Palmisano ; Dan Stetson Dan Stetson ; Tim Brown ; Manuel Camargo
Subject: FW: EPRI Journal Magazine, Mar-Apr 2016

Guys

Attached/below is the latest EPRI journal with an article on their cask aging management program. Ted: could you take a look at this and advise on whether this is something useful to share with the CEP?

Thx

David

From: EPRI Journal Magazine
Reply-To:
Date: Thursday, March 17, 2016 at 10:35 AM
To: "David G. Victor"
Subject: EPRI Journal Magazine, Mar-Apr 2016

Attachment

10 - Keeping Spent Nuclear Fuel Safe – EPRI Journal MarApr 2016

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4 - Security

From: Tom Palmisano
Sent: Thursday, April 14, 2016 6:15 AM
To: David Victor; Dan Stetson (NE) ; Manuel Camargo ; Tim Brown
Subject: Article by former NRC Chairman MacFarlane on nuclear plant security

All,

Attached is a good article by former NRC Chairman MacFarlane on nuclear plant security. The focus of the article is the need for security improvements at foreign nuclear plants. She points out that the US commercial nuclear plants can be used a model to improve security, she specifically makes the following statement:

> "U.S. nuclear power plants now are some of the most well-guarded facilities in the world."

This is provided for your information. If you think it is appropriate, we can include this in a future CEP mailing. Tom

Attachment

11 - How to Protect Nuclear Power Plants from Terrorist by former NRC Chairman Allison MacFarlane

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5 - Communications with the Public

From: David G. Victor
Sent: Monday, April 11, 2016 3:36 PM
To: Manuel Camargo
Subject: (External):Fwd: Future & possible reuse of the San Onofre Nuclear Generating Station.

Please include this in the next circular email to the CEP. Thanks

Sent from limited typing device

Begin forwarded message:

From: Cindi Andersen
Date: April 11, 2016 at 2:40:46 PM PDT
To: "David G. Victor"
Subject: Re: Future & possible reuse of the San Onofre Nuclear Generating Station.
Reply-To: Cindi Andersen

Thank you for helping me with my enquiry, Professor Victor, Sir -
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Yes, you absolutely can share my e-mail with the public. Since the area where the power plant is located has been used for electrical generation purposes since construction of the facility began circa~1964, why not continue to utilize it for that same basic designation? The unimaginably expensive infrastructure which was built from 1964-1985 consists of concrete-and-steel structures, substructures and a seawall which is already in place and would cost millions more to remove. Why not continue to have them earn money, create jobs & provide electricity which benefits everyone in Southern California, civilian & military alike?

What possible purpose would the Navy and/or Marine Corps be using the site for -- to simulate assaults on a hardened nuclear facility? The military can always make arrangements to share the SONGS facility with the civilian interests; why not have one's cake and eat it too? There is no reason why SONGS cannot become a win-win situation for everyone in the area. The U.S.M.C. (2011) has already thrown Harry Singh and all other agricultural operations off Camp Pendleton -- people who have worked to grow food ever since before the military took over the land from Rancho Santa Margarita y Las Flores back in 1942. The O'Neill and Baumgartner families who owned the land were expecting that the property would be returned at the end of the Second World War, as the government had implied. Of course, we all know what happened.

A little-known fact is that at the time WWII broke out, Mr. Jerome Baumgartner (an O'Neill family heir who had worked in the hospitality business up in San Francisco) was planning for a fine, full-service hotel to be built at San Onofre, midway between San Diego & Los Angeles on U.S. Highway 101. Perhaps his hotel idea could also eventually be brought to fruition on the SONGS property, along with a natural gas-fired electrical generating station, business park & small harbor.

Very sincerely,

Cindi Andersen

From: David G. Victor
To: Cindi Andersen
Cc: David G. Victor
Sent: Sunday, April 10, 2016 8:23 PM
Subject: Re: Future & possible reuse of the San Onofre Nuclear Generating Station.

Dear Cindi (if I may)

with your permission, I would like to share our email exchange with the full Community Engagement Panel (and thus the public).

The CEP is not a decision-making body, and thus I can't speak authoritatively on all the options for all the issues that you raise. What I have heard, repeatedly, is that the Navy is keen to get its land back—and thus options that would involve a large ongoing footprint at the site would be difficult to fathom. There will be continued use of the "switchyard" (the place where all the power lines come together) to help manage power flow between San Diego and Orange County. Indeed, there are some upgrades to the switchyard (new capacitors and such) that will expand those capabilities. When SONGS was in operation

it provided important benefits in terms of grid stability because it injected large amounts of power into the grid while also connecting large spinning turbines to the grid where it did.

As far as I know, all of the forseeable extra needs for power supply from closure of SONGS have been met.

I was intrigued to learn about the options for harbors and such. And if I may share your note with the CEP some members may want to follow up with you on that and other matters.

all best

David

David Victor

Chairman, SONGS CEP

From: Cindi Andersen
Reply-To: Cindi Andersen
Date: Saturday, April 9, 2016 at 3:06 PM
To: David Victo
Subject: Future & possible reuse of the San Onofre Nuclear Generating Station.

Good afternoon, Dr. Victor,

I would please like to ask about the future of the San Onofre Nuclear Generating Station (SONGS), which is located on Navy-owned land at Camp Pendleton. Since the lease runs for many more years, is there any chance for the electrical switchgear and transformers at SONGS to be re-purposed for use with a natural gas-powered electrical plant on the property? I wouldn't think that the U.S. Navy would object to having electrical energy produced from natural gas rather than nuclear power, especially when Camp Pendleton itself would benefit and Southern California Edison would continue to pay the Navy rent on the property. Since the SONGS has its own Santa Fe Railway spur, underutilized portions of the land could generate extra rental income for SCE & the Navy as a civilian/military business park with light industry.

Also, local civilian harbors such as the ones at Dana Point & Oceanside lack vacancies for boats over 33' in length and have a severe shortage of room for dry-boat storage. As SONGS possesses a large seawall along the ocean-facing side of the plant, perhaps a small auxiliary harbor could be constructed along it. There was a very interesting 1949 design for a small harbor at San Clemente that was never built -- maybe the basic plan could be added to SONGS, along with an extension of the existing rail spur so as to accommodate the loading and unloading of cargoes. Security for SONGS would be enhanced through the presence of a small U.S. Coast Guard station at the harbor (per the 1949 design) and of course, any or all of these options would help to raise money for both SCE and the Navy through leases.

Small 1949 San Clemente Harbor Design -
http://www.habig.com/remember_harbor.html

Southern California needs the electricity and jobs produced by SONGS and it seems like such a waste of infrastructure for a perfectly-good facility to be scrapped just because the nuclear aspect is no longer on

the table. As things stand, even while a natural gas plant operates on SONGS, the closed nuclear portion of the facility might be able to be gradually converted for use as a Thorium-based reactor in the future, if Thorium is indeed as promising as it is claimed to be.

Thorium Reactor Advantages -
http://www.extremetech.com/extreme/160131-thorium-nuclear-reactor-trial-begins-could-provide-cleaner-safer-almost-waste-free-energy

Respectfully,
Cindi Andersen

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From: David G. Victor
Sent: Monday, April 11, 2016 5:15 AM
To: Bill Hawkins
Cc: Manuel Camargo
Subject: (External):Re: Draft Evaluation of the Technical Basis for Extended Dry Storage and Transportation of Used Nuclear Fuel - Summarized for the benefit of SCE, Ratepayers & NRC Region IV Staff - AVP ARORA International- A 501(c)3 Public Charity for Nuclea...

thank you for your note, and this helpful information.

By copy I ask Manuel Camargo to include our correspondence with the next circular to the CEP members.

all best

David

From: Bill Hawkins
Date: Monday, April 11, 2016 at 5:13 AM
To: David Victor
Subject: Re: Draft Evaluation of the Technical Basis for Extended Dry Storage and Transportation of Used Nuclear Fuel - Summarized for the benefit of SCE, Ratepayers & NRC Region IV Staff - AVP ARORA International- A 501(c)3 Public Charity for Nuclear Safety an...

Dear Dr.Victor,

That is the idea. Please kindly go forward. Thanks for your consideration. Please remember,previously I supported the spent fuel pool cooling system in consultation with a former Chief Engineer of Disney. I am a promoter of safe power and a previous Senior Engineer with Yucca Mountain Design Team.

On Sun, Apr 10, 2016 at 8:18 PM, David G. Victor wrote:

Dear Bill (if I may)

may I share your note with the full CEP?

thank you

david victor
~~~~~~

From: Bill Hawkins
Date: Sunday, April 10, 2016 at 9:07 AM
To: David Victor
Subject: Draft Evaluation of the Technical Basis for Extended Dry Storage and Transportation of Used Nuclear Fuel - Summarized for the benefit of SCE, Ratepayers & NRC Region IV Staff - AVP ARORA International- A 501(c)3 Public Charity for Nuclear Safety and a ...

Dear Dr. David G. Victor (University of California, San Diego)

Chairman, San Onofre Community Engagement Panel

It is Sunday Morning and a great time to read the following article as Chairman of the San Onofre Community Engagement Panel.

If San Onofre Senior Leadership Team, MHI and & NRC AIT would have listened to me, San Onofre Units 2 would be potentially operating today (if found safe by the public) after performing the required repairs, public hearings and securing a NRC License Amendment. Anyhow Ted Craver did not trust the SCE Unit 3 Root Cause prepared after spending 100s of millions of dollars and did not want SCE to go bankrupt in case of a tube leak from Unit 2 at reduced power. Therefore, after securing the framework of San Onofre Settlement in his back pocket and a phone call to Honorable Governor Jerry Brown, Ted Craver announced the retirement of San Onofre Units 2 & 3.

When criminal investigators with the California Attorney General's Office searched the home of a Michael Peevey early last year, they uncovered evidence that upended a story state officials and a major electric utility had been telling consumers about the deal to pay for the shutdown of the San Onofre Nuclear Generating Station. This was big. And Attorney General Kamala Harris, now a candidate for U.S. Senate, was hailed by consumer activists for her aggressive investigation.

The California Public Utilities Commission and Southern California Edison had claimed a settlement that left ratepayers with the $3.3 billion bill for the San Onofre Nuclear Generating Station's closure was the product of hard-fought negotiations between ratepayer advocates and the power But when Harris' investigators went through the La Cañada Flintridge home of former CPUC President Michael Peevey after obtaining a search warrant, a different story emerged.

Investigators found handwritten notes that showed Peevey had met secretly with an Edison executive in Poland after the nuclear power plant sprang a radioactive leak and had to be closed. There, they came up with a framework for a San Onofre settlement that closely resembled the final public deal.While her office's criminal probe launched with a punch when Peevey's home was searched, the investigation is now dragging on without result.Six months after Harris' investigators searched Peevey's house, the attorney general obtained more search warrants. This time they were for the centers of power in the San Onofre case — Edison and the offices of state regulators. But the attorney general's investigators

never went in, according to court documents. Instead, they served the search warrants to Edison and the CPUC and asked them to turn over all documents and communications related to the San Onofre settlement.

"You don't drop it off at the front door and say, 'Hey, gee, send me your records,'" said Aguirre, a former federal prosecutor and San Diego city attorney. "That's the whole point of a search warrant. ... You go in and you execute the search warrant and you seize the records, because you're concerned they're going to disappear." He said using the full power of the search warrant is essential if the public is ever to get the truth from state regulators and Edison over how the San Onofre settlement was reached.

The bottom line is California Public paid SCE for operating San Onofre Units 2 & 3 safely, reliably and economically. SCE failed on all three counts. California Public has already paid for the failed San Onofre Units 2 & 3 and their decommissioning. California Public and Ratepayers expect SCE, Holtec and NRC to ensure the safety of dry casks utilizing the best inspection methods, technology, materials, research, corrective actions, quality assurance and monitoring programs. That is unfortunately not occurring despite repeated, loud and meaningless safety assurances by SCE, Holtec and NRC. Let us explore, why?

NRC states in its website, "A democracy requires accountability, and accountability requires transparency. As Justice Louis Brandeis wrote, 'sunlight is said to be the best of disinfectants.' In our democracy, the Freedom of Information Act (FOIA), which encourages accountability through transparency, is the most prominent expression of a profound national commitment to ensuring an open Government. At the heart of that commitment is the idea that accountability is in the interest of the Government and the citizenry alike. The Government should not keep information confidential merely because public officials might be embarrassed by disclosure, because errors and failures might be revealed, or because of speculative or abstract fears. Nondisclosure should never be based on an effort to protect the personal interests of Government officials at the expense of those they are supposed to serve. In responding to requests under the FOIA, executive branch agencies (agencies) should act promptly and in a spirit of cooperation, recognizing that such agencies are servants of the public. The core value of a democracy is the right of citizens to know the actions of public officials."

United States Nuclear Waste Technical Review Board (December 2010) states, "The fuel-drying process is not perfect. After drying, residual water remains in unknown amounts that can affect subsequent internal degradation processes. The vacuum-drying heat cycles can change the nature of the hydrogen in the cladding and stress the fuel. According to the literature review, the fuel, the dry-storage system components (canister, cask, etc.), and the concrete foundation pad may all degrade during dry storage. Some degradation mechanisms may be active during the early years of dry storage, while different mechanisms may be active at the lower temperatures that would be expected during extended storage. The most significant potential degradation mechanisms affecting the fuel cladding during extended storage are expected to be those related to hydriding, creep, and stress corrosion cracking. These mechanisms and their interactions are not well understood. New research suggests that the effects of hydrogen absorption and migration, hydride precipitation and reorientation, and delayed hydride cracking may degrade the fuel cladding over long periods at low temperatures, affecting its ductility, strength, and fracture toughness. High-burnup fuels tend to swell and close the pellet-cladding gap,

which increases the cladding stresses and can lead to creep and stress corrosion cracking of cladding in extended storage. Fuel temperatures will decrease in extended storage, and cladding can become brittle at low temperatures. Only limited references were found on the inspection and characterization of fuel in dry storage, and they all were performed on low-burnup fuel after only 15 years or less of dry storage. Insufficient information is available on high-burnup fuels to allow reliable predictions of degradation processes during extended dry storage, and no information was found on inspections conducted on high-burnup fuels to confirm the predictions that have been made. The introduction of new cladding materials for use with high-burnup fuels has been studied primarily with respect to their reactor performance, and little information is available on the degradation of these materials that will occur during extended dry storage. Consequently, without any data for predicting how aging affects the fuel condition over longer storage periods, vendors model the condition of high-burnup used fuel in storage on the basis of a limited series of examinations of fuel that also form the basis for predicting the behavior of used fuel during extended dry storage and normal handling and transport of used fuel and in the event of transportation accidents.These mechanisms and their interactions are not well understood. New research suggests that the effects of hydrogen absorption and migration, hydride precipitation and reorientation, and delayed hydride cracking may degrade the fuel cladding over long periods at low temperatures, affecting its ductility, strength, and fracture toughness. High-burnup fuels tend to swell and close the pellet-cladding gap, which increases the cladding stresses and can lead to creep and stress corrosion cracking of cladding in extended storage. Fuel temperatures will decrease in extended storage, and cladding can become brittle at low temperatures. One of the main deterrents to corrosion of the fuel cladding and the canister or metal cask internals during extended dry storage is the presence of helium. If the helium leaks and air is allowed to enter the canister or cask, this, together with the moisture in the air, can result in corrosion of the fuel cladding, the canister, and the cask. However, although provision is made to monitor the pressure of the helium during extended storage in bolted canisters, there is currently no means of confirming the presence of helium in welded containers or casks, nor is there a requirement for periodically inspecting the integrity of the closure welds for defects. If these storage systems were inspected for weld defects and/or tested for helium periodically, this would allow welded containers and casks with leaks to be repaired and refilled with helium."

During extended dry storage, degradation mechanisms also act on the outside of canisters, on storage casks (concrete or steel), and on modular concrete facilities as well as on the storage pads. The effect of these degradation mechanisms will depend on the environmental conditions at the specific location, on diurnal and seasonal temperature variations, and on the presence of corrosive agents and moisture in the air. The review identified references to general metal and concrete deterioration mechanisms and modeling, but none included the information necessary to predict the degradation of dry-storage canisters, casks, or concrete structures during extended storage.

Hydrogen in zirconium alloys may influence crucial material properties such as dimensions, mechanical, corrosion and creep performance of fuel claddings, spacer and fuel channels. It has been shown in the open literature that hydrides may decrease the Zircaloy ductility and impact toughness. There have also been a number of recent investigations showing that hydrides may accelerate the uniform corrosion rate. Also, hydrogen/hydrides will in some cases influence the material creep rate. Only copper canisters have been tested for the long-term radiation induced corrosion and stress corrosion cracking and shown to be relatively safe for the "San Onofre Corrosive Sea Environment" as shown below.

NRC states, "The NRC periodically inspects the design, manufacturing and use of dry casks. These inspections ensure licensees and vendors are following safety and security requirements and meeting the terms of their licenses and quality assurance programs (**My Emphasis, like NRC trusted SCE and MHI due to lack of staff and budget on the design of Destroyed San Onofre Replacement Steam Generators**). NRC inspectors also observe practice runs before utilities begin moving their spent fuel into dry casks (**My Emphasis, like NRC OIG stated about the NRC San Onofre Inspectors**). Since the first casks were loaded in 1986, dry storage has released no radiation that affected the public or contaminated the environment (**My Emphasis, NRC True Statement on Tube Ruptures**)." So, just for my understanding, the question is, what is the real safety role of NRC? To manage the mitigation of Nuclear Accidents like Fukushima, Chenobyl, after they occur by using FLEX?

NOTE: FLEX is a strategy developed by the nuclear energy industry to implement the Nuclear Regulatory Commission (NRC)'s Fukushima task force recommendations quickly and effectively. FLEX addresses the main safety challenges at Fukushima—the loss of cooling capability and electrical power resulting from a severe natural event—to make U.S. facilities even safer. The strategy is "flexible" in that it relies on portable equipment to protect against even the most unlikely events — events that go beyond the plant's design basis.

NRC said the same thing about San Onofre Replacement Steam Generators and SCE. The results are obvious to NRC. The projected $2 billion dollar savings for ratepayers from the replacement steam generator project assumed nothing would go wrong -- including a drop in the price of natural gas (which happened). And let alone, a drop in the price of renewable energy solutions (which also happened). And let alone, a bone-headed engineering SNAFU that could have been avoided if only SCE hadn't tried so hard to avoid regulatory (and public) oversight entirely.

AREVA states, "The NUHOMS® system's horizontal above-ground fortress-like structure enables easy access for inspections, monitoring, and maintenance that may be needed for aging management and life extension programs." Other systems, including underground systems, like Holtech's proposed San Onofre Underground Casks are difficult to access and inspect, and require more risky maneuvers to extract a compromised canister. It's not practical to repair a damaged canister, says Dr. Kris Singh, CEO, Holtec International. if that canister was to develop a leak, let's be realistic; you have to find it, that crack, where it might be, and then find the means to repair it. You will have, in the face of millions of curies of radioactivity coming out of canister; we think it's not a path forward …… A canister that develops a microscopic crack (all it takes is a microscopic crack to get the release), to precisely locate it… And then if you try to repair it (remotely by welding) … the problem with that is you create a rough surface which becomes a new creation site for corrosion down the road. ASME Sec 3. Class 1 has some very significant requirements for making repairs of Class 1 structures like the canisters, so I, as a pragmatic technical solution, I don't advocate repairing the canister." Instead Dr. Singh states…you can easily isolate that canister in a cask that keeps it cool and basically you have provided the next confinement boundary, you're not relying on the canister. So that is the practical way to deal with it and that's the way we advocate for our clients. However, there are many problems with Dr. Singh's solution of putting cracked and leaking canisters inside [transport] casks.

1. There are no NRC approved Holtec specifications that address Dr. Singh's solution of using the "Russian doll" approach of putting a cracked canister inside a [transport] cask.

2. NRC requirements for transport casks require the interior canister to be intact for transport. This NRC requirement provides some level of redundancy in case the outer cask fails. Does this mean this leaking canister can never safely be moved? Who will allow this to be transported through their communities? How stable is the fuel inside a cracked canister?

Copper and copper alloys are widely used in many environments and applications because of their excellent corrosion and stress cracking resistance especially in salt environments, which is coupled with combinations of other desirable properties, such as superior electrical and thermal conductivity, ease of fabricating and joining, wide range of attainable mechanical properties, and resistance to biofouling. Copper does not crack and corrodes at negligible rates in unpolluted air, water, and deaerated non-oxidizing acids. Copper alloy artifacts have been found in nearly pristine condition after having been buried in the earth for thousands of years, and copper roofing in rural atmospheres has been found to corrode at rates of less than 0.4 mm in 200 years. Copper alloys resist many saline solutions, alkaline solutions, and organic chemicals.

Sweden's radioactive-waste disposal organization has designed a cask covered with copper that is believed would not corrode through for a million years. The canisters are made of copper with inserts of nodular cast iron and each contains about 2 tons of waste.

SCE is making confusing material representation to the Public, NRC, Holtec and CPUC like improved replacement steam generators with in-plane FEI, San Onofre Units 2 & 3 operational data (SCE accuses NRC of falsifying data to make NRC look bad in eyes of the American Public), when it states, "NRC used assumptions to derive the results, and not operational data.") and illegal $3.7 billion dollar settlement/Hotel Bristol Notes. I do not believe that Dr. Kris Singh and NRC will agree with SCE's statement, when SCE states on behalf of Holtec, "Holtec's canister integrity monitoring program is designed to prevent, detect, monitor and address any cracking or corrosion." Tom Palmisano, chief nuclear officer at San Onofre, is making false material representation to the Public, NRC and CPUC, when he said, "The decision to go with the stainless steel casks had nothing to do with money." NRC knows by now, that for SCE. "every decision is profit and not safety based."

Holtec spent fuel canisters are only approved by NRC for 20 years, even though Holtec apparently claims they are good for much longer. The NRC fails to explain what happens if they don't get renewal after 20 years. This proposed system is underground. How will they get the casks out if it is not fit for relicensing? How will they make a determination of if they are not corroded, if they are underground? The Nuclear Regulatory Commission's Mark Lombard said canisters cannot be inspected. Holtec's canister vendor said they cannot be repaired. Southern California Edison's Coastal Permit required Special Conditions: canisters must be inspected, repaired, maintained, monitored and transportable—but only after 20 years!

AVP recommends that Holtec 0.5" thick stainless steel casks be encased with a five-centimeter (2") thick copper casing to protect against corrosion and stress cracking and for ultimate transportation with

the money for technology transfer and manufacturing allocated from Decommissioning Funds, so Ratepayers, Residents, NRC, Dr. Kris and CPUC can sleep peacefully at night. SCE should no longer be allowed to make profits after being paid $3.3 Billion Dollars for destroying San Onofre Units 2 & 3 by the Ratepayers and continue decommissioning preaching safety by ordering cheap and unsafe casks and endanger Ratepayers peace and life after $3.3 Billion Steam Generator Debacle.

The stainless steel encased copper casing casks should be protected by: (a) Horizontal or Vertical Storage Module with 4 foot thick steel reinforced concrete roof, (b) Earthquake: 1.5g horizontal / 1.0g vertical / 2.35g combined acceleration, (c) Tsunami/Flood: qualified for a flood height of 27', (d) Tornado: can withstand impact of tornado accelerated objects (e.g. 4,000 lbs. automobile traveling more than 195 mph), and (e) Airrcraft Impact: no release of radioactive material in case of aircraft impact and above ground system not susceptible to jet fuel fires.

Nuclear Energy Institute (NEI) on Casks

NEI 14-03 introduces “tollgates” into the Part 72 license and CoC renewal process. “Tollgate” is a new term created by the industry to address the fact that verification of the applicability of potential dry cask storage aging mechanisms may not be available at the time license and CoC renewal applications are submitted. This information will enhance the current understanding of the future state of the dry spent fuel and the canisters containing the fuel. Briefly put, tollgates are part of a learning, operations-based aging management program implemented by licensees via requirements in the renewed license or CoC, and associated FSAR. These requirements obligate the licensees to perform periodic assessments of the aggregate state of knowledge of aging-related operational experience, research, monitoring, and inspections to ascertain the ability of in-scope DCS structures, systems and components to continue performing their intended safety functions throughout the renewed period of operation.

Nuclear Energy Institute states, “Storing used fuel at reactor sites for long periods of time wasn’t originally planned. But given the history of delays in the federal program to remove used fuel from reactor sites, the question of whether the canisters will need to remain at Calvert Cliffs beyond that time is still an open one. There are now 63 independent on-site dry storage facilities at existing or former nuclear reactor sites—and still no federal program to begin removing used fuel from these sites any time soon. The U.S. Nuclear Regulatory Commission has just published its final “continued storage” rule. The rule confirms that spent fuel can be stored at reactor Independent Spent Fuel Storage Installations (ISFSI) safely and without significant environmental impact either indefinitely after the end of reactors’ licensed lifetimes or until it is removed to an off-site repository for final disposal.

As one of the earliest of these facilities, the Calvert Cliffs ISFSI has been storing used fuel since November 1993. Exelon’s application for a 40-year renewal of its original 20-year license is currently under NRC review—the agency is expected to complete its licensing activities on the application once the continued storage rule becomes effective on Oct. 20. (The NRC has a list of licensing actions that have been awaiting the final rule.) As part of its license renewal application, Calvert Cliffs is one of two ISFSIs—along with Xcel Energy’s Prairie Island facility in Minnesota—to pioneer a rigorous dry storage aging management program that will monitor the long-term performance of their dry cask storage systems. To this end, the Nuclear Energy Institute is developing industry guidance (NEI 14-03) that

proposes a “tollgate” approach to take advantage of advanced inspection technologies and industry operating experience as they become available in the future. In keeping with the industry’s defense-in-depth approach to safety, the aging management program will inspect various components of the dry cask storage system at intervals spanning five-to-ten year periods. These component investigations include, but are not limited to:

1. Surface condition of the steel dry shielded canister, including rigorous inspections for signs of metal pitting and chloride-induced stress corrosion cracking.

2. Calvert Cliffs, and Prairie Island, will make first use of the results of a collaborative program under the Energy Department and the Electric Power Research Institute to confirm the long-term behavior of storage casks loaded with high heat load, high-burnup spent fuel as evaluated by their safety analyses. This program relies on data from a cask that will be loaded at Dominion’s North Anna nuclear power plant in 2017 and monitored for several years.

3. Regular inspections of the concrete horizontal storage modules and ISFSI pad for signs of cracking or degradation. The program will include groundwater chemistry monitoring.

Fate of Yucca Mountain - Testimony of Kenny Guinn, Governor, State of Nevada, 2002

Honorable Mr. Chairman and members of the Committee, my name is Kenny C. Guinn and I am Governor of the State of Nevada. These written comments are submitted for inclusion in the hearing record. The state of Nevada compliments Chairman Bingaman for holding this important hearing and providing an opportunity for every member of the Senate to review in detail an issue of profound national importance - whether to proceed with the development of Yucca Mountain in Nevada as a site for a national nuclear waste repository. This is an issue that will tangibly affect tens of millions of Americans and it is hurtling toward finality in a manner that is premature, unnecessary and ill-conceived.

I would like to call the Committee's attention to a new document, a key document, which recently appeared from within the scientific community that excoriates the scientific work of DOE in connection with Yucca Mountain. Numerous independent scientific reviewers have now evaluated the project during the past year, and all have reached the same conclusion: There is nowhere near enough information to certify the suitability of the Yucca Mountain site for high-level nuclear waste disposal, and the information that is available suggests the site is woefully unsuitable geologically. This latest report, the aforementioned peer review report commissioned by DOE from the International Atomic Energy Agency and the Nuclear Energy Agency (IAEA) of the Organization for Economic Cooperation and Development (OECD), reaches shocking new conclusions. These agencies assembled some of the world's leading scientists to evaluate, over several months, the total system performance of Yucca Mountain as represented by DOE and its computer models. Among other things, these leading scientists concluded that DOE lacks sufficient information even to build a model to predict the suitability and hydro-geologic performance of the proposed repository. According to the peer review group, the water flow system at Yucca Mountain is "not sufficiently understood to propose a conceptual model for a realistic transport scenario." Moreover, according to the peer review group, DOE's level of understanding of the

hydrogeology of the site is "low, unclear, and insufficient to support an assessment of realistic performance." DOE's sensitivity studies in its computer models "do not give any clues to the important pathways for the water in the system." Perhaps most troubling of all, in DOE's performance model of Yucca Mountain, "increased ignorance leads to lower expected doses, which does not appear to be a sensible basis for decision-making." It is truly amazing to me, as an elected executive official, that DOE commissioned this peer review report many months ago, and then made a final "site suitability" determination to the President and the Congress in spite of its stunning conclusions. It shows once again, in my view, that politics has long prevailed over science when it comes to Yucca Mountain. This is another reason for Nevada to redouble its efforts to stop this project - government bureaucrats seem unable to pull the plug, even in the face of shocking independent evidence that the science is bad or nonexistent.

United States Nuclear Waste Technical Review Board - December 2010

Conclusions - The technical information currently available, together with the experience gained to date in the dry storage of used fuel, demonstrates that used fuel can be safely stored in short term and then transported for additional storage, processing or repository disposal, at least for low burnup fuel. However, additional information is required in order to demonstrate, with similarly high confidence, that high burnup fuel can be safely transported and any type of used fuel can be stored in dry storage facilities for extended periods without the fuel degrading to the extent that it may not perform satisfactorily during continued storage and subsequent transportation.

However, the Board recommends a number of research and development programs be implemented to demonstrate that used fuel can be stored safely in dry storage facilities for extended periods. However, research alone will not be sufficient. Because the experience base for extended dry storage of used fuel is short and the credible degradation phenomena are several and not robustly predictable in a quantitative sense, an in-service inspection and aging maintenance program appears to be necessary to support extended dry storage of used nuclear fuel. The technical details of such an in-service inspection program will depend on the desired safety objectives of extended dry storage. Consequently, a practical engineering approach that is based on the observational method and periodic assessments will likely be required to provide an adequate safety basis in addition to what can be learned from targeted scientific investigations.

The regulations concerning dry storage of used fuel do not currently address storage for extended periods. There is also some inconsistency between the regulations that apply to dry storage and those that apply to transportation and it is unclear how to meet both sets of regulations. It would be helpful in managing extended dry storage of used fuel if the regulations were to be revised as an integrated set and based on a risk assessment for safety significance and consequence. In addition, the Board considers that the regulatory requirements related to physical security and terrorist threats should also be reviewed on a risk-informed basis using potential consequence analysis and integrated with the storage and transportation regulations.

At this point, the nuclear waste management policy of the United States is unclear, with the result that used fuel will be stored at reactor sites for longer than originally foreseen. It is thus essential that the

appropriate research and development programs, and monitoring and inspection programs, are implemented as a matter of priority in order to demonstrate that used fuel can be safely stored for extended periods and then transported and handled as part of a future waste management program.

The Sweden & Finland Canister Laboratory's safe copper casks

In Sweden and Finland, before the spent nuclear fuel is deposited in the Spent Fuel Repository it will be encapsulated in cast iron and copper. SKB's Canister Laboratory, which is situated in Oskarshamn's port, is the center for the development of the technology that will be used for the encapsulation. The canisters are nearly five meters long and just over one meter in diameter. The shell consists of a bottom plate, a tube and a lid and forms a five-centimeter thick copper casing to protect against corrosion. Inside the canister is an insert of nodular cast iron to provide the structural integrity required. Tests are carried out at the Canister Laboratory to fine tune the technology for welding the bottom plates and the lids to the canisters. The methods we are going to use to inspect the components of the canister and the welded joints are also developed and demonstrated here.

Friction welding is the method that will be used to seal the canisters of spent nuclear fuel. The welding technique used is called friction welding, or more specifically friction stir welding. This was developed in the early 1990s by Britain's Welding Institute (TWI) which in partnership with SKB has adapted the method specifically for welding copper. The principle of friction welding is relatively straightforward. A rotating conical tool is inserted in the joint between the components that have to be welded. The material around the tool is heated by the friction to about 850 degrees C and softens. The tool is then shifted forwards in the direction of the joint. The metal in its wake is pressed inwards to form a homogenous welded joint. To make sure that the welds and the rest of the canister's components meet our high quality standards, they are inspected using several non-destructive techniques that have also been developed and tested at the Canister Laboratory. Ultra sound is the principal method for non-destructive testing of welding. This is supplemented by x-ray and inductive testing,

The Canister Laboratory is also where the staff who will be working with the canisters in the encapsulation plant will be trained. SKB collaborates closely with our Finnish counterpart, Posiva, when it comes to manufacturing canisters and sealing techniques. Sweden and Finland have more or less the same conditions for final disposal of spent nuclear fuel and in both countries the same method will be used. The most important mutual questions are testing the different manufacturing methods used by different suppliers and developing techniques for inspecting the components of the canisters and the welds.

Stress corrosion cracking of copper canisters - Conclusions

The possibility of stress corrosion cracking (SCC) of copper canisters in a deep geological repository in the Fennoscandian Shield has been assessed. Each of the four main mechanisms proposed for the

SCC of pure copper, film rupture (slip dissolution), tarnish rupture, film-induced cleavage, and surface mobility, have been reviewed. The required conditions for cracking for each mechanism have been

compared with the expected environmental and mechanical loading conditions within the repository. Other SCC mechanisms currently under development have also been considered.

Mechanisms that require a degree of oxidation or dissolution are only possible whilst oxidant is present in the repository and then only if other environmental and mechanical loading conditions are

satisfied. These constraints are found to limit the period during which the canisters could be susceptible to cracking via film rupture or tarnish rupture mechanisms to the first few years after deposition of the canisters. However, there will be insufficient SCC agent (ammonia, acetate, or nitrite) to support cracking during this period. During the anaerobic phase, the supply of sulphide ions to the free surface will be transport limited by diffusion through the highly compacted bentonite. Therefore, no HS- will enter the crack and cracking by either of these mechanisms in the long term is not feasible.

Cracking via the film-induced cleavage mechanism requires a surface film of specific properties, typically a nanoporous structure. Slow rates of dissolution characteristic of processes in the repository will tend to coarsen any nanoporous layer. Under some circumstances, a cuprous oxide film could support film-induced cleavage, but there is no evidence that this mechanism would operate during the long-term anaerobic period because copper sulphide films appear to be insufficiently adherent.

A critical review of the surface mobility model has been presented. The formulation of the crack growth law appears to be flawed and in its corrected form predicts crack growth rates of the order of 10-20 m/s. Therefore, even if cracking were to occur via this mechanism, the crack velocity would be too small to lead to canister failure, even over repository timescales.

Two other SCC mechanisms, the adsorption-induced dislocation emission and vacancy injection and embrittlement models, have also been discussed. Although these models are still in the development stage, it is considered unlikely that they could induce cracking during the long-term anaerobic phase. Therefore, it is concluded that the probability of SCC during the early aerobic period is low because of the absence of the necessary conditions for cracking and that there is no well-founded SCC mechanism that would result in cracking during the long-term anaerobic phase in the repository.

Radiation induced corrosion of copper for spent nuclear fuel

G -radiation causes significant corrosion effects on copper exposed to anoxic water. The concentration of dissolved copper increases continuously with radiation dose up to 100 kGy, corresponding to 100 years in deep repository. The corrosion effects are local and of different shapes and depths. After a total radiation dose of 100 kGy, corrosion effects with depth 0,5 mm are seen. The dominating oxide is Cu_2O, with average thickness around 100 nm after 100 kGy. Radiolysis of water can only account for a small fraction of the experimentally observed concentration of dissolved copper. At a given dose the concentration of dissolved copper increases with decreased dose rate.

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From: "David G. Victor"
Date: April 14, 2016 at 11:26:52 AM MST
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To: Marni Magda ; Julie C Holt; Tom Palmisano; Daniel Stetson ; Glenn Pascall ; Manuel Camargo
Subject: (External):Re: SCE Responses to Notes and questions on March 7th meeting

Manuel

Can you please add this email thread to the next CEP circular.

Thanks

David

From: Marni Magda
Date: Thursday, April 14, 2016 at 10:40 AM
To: Julie C Holt , Tom Palmisano , Daniel Stetson , "David G. Victor" , Glenn Pascall , Marni Magda
Subject: Re: UPDATE: SCE Responses to Notes and questions on March 7th meeting

Julie,

Thank you for this clear statement about Holtec canisters being ready for shipment in 2020 once the NRC approves the Holtec transportation cask. This is very important information as I travel to Sacramento to attend the DOE forum on consent based siting for spent nuclear fuel on April 26th.

I am copying others with this information on the CEP because of the last CEP meeting when we all were raising concerns and you set the June agenda to address Interim storage and transportation issues. But also to let all of you know the mistake I made that night in announcing support for HR 3643. Congressman Dana Rohrabacher is NOT backing HR 3643.

The misunderstanding occurred when I had a phone call from Constance Towers planning staff for him that the meeting Dan Stetson and I had scheduled with the Congressman on March 10 was cancelled because Congressman Rohrabacher was already on board to sponsor HR 3643. I asked to meet anyway to give him the latest information about interim storage and was told it wasn't necessary. I was aware of his stand on the issue a year before and was glad to hear he had changed his position. It was not until yesterday, April 13th that a staff member told me the Congressman is NOT sponsoring the bill. I have tried to contact his staff in D.C. who are supposed to send me his position on SNF, but no one is responding. I am sorry about the misinformation. I am seeking another in district meeting with the Congressman for Dan Stetson and me just as soon as it can be scheduled. I will be sure in the future to have such information in writing.

Thank you Tom and Julie for all of the clear information on San Onofre spent nuclear fuel storage issues.

Best Regards,

Marni Magda

On Thu, Apr 14, 2016 at 9:39 AM, Julie C Holt wrote:

Hi Marni, It was nice to see you at the CEP meeting two weeks ago. You had asked for a clarification for the response to Question 24:

24. **Question:** Can the canisters be moved as soon as they are filled? The radiation dose versus the temperature are two issues aren't they? Did SCE say the Holtec NPC 37 canisters can be moved to New Mexico in 2025 if the DOE has a place and a cask and railcar to take them?

Clarified Response: Based on the current Holtec transportation cask proposal to the NRC, if approved, the 73 Holtec canisters would be eligible to ship by 2020. The radiation dose and temperature of the SONGS 2 and 3 fuel will be such that they can be packed in a Holtec transportation cask and placed on a railcar to be taken to offsite.

Hope all is well with you.

Julie

Julie Chang Holt

From: Julie C Holt
Sent: Thursday, March 24, 2016 9:57 AM
To: Marni Magda
Cc: Dan Stetson
Subject: SCE Responses to Notes and questions on March 7th meeting

Good Morning Marni,

Attached are the responses to your questions and clarifications on your notes from our March 7 meeting. I took your notes and questions, and placed them in the left column and provided the responses in the right column – hope you don't mind. This was an effort to make sure we were able to address all of your questions. I will call you later this morning so that we can review each response – or feel free to call me at your convenience.

Tom wanted you to know that he agrees with the responses that have been provided.

Hope all is well with you. Will you be at the CEP meeting tonight? If so, I look forward to seeing you there!

All the best,

Julie

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