## UNITED STATES OF AMERICA **NUCLEAR REGULATORY COMMISSION**

## **Atomic Safety and Licensing Board**

## **Before Administrative Judges:**

ASLBP BOARD 09-892-HLW-CAB04 Thomas S. Moore, Chairman Paul S. Ryerson Richard E. Wardwell

| In the Matter of              | ) |                       |
|-------------------------------|---|-----------------------|
|                               | ) |                       |
| U.S. DEPARTMENT OF ENERGY     | ) | Docket No. 63-001-HLW |
|                               | ) |                       |
| (High Level Waste Repository) | ) | September 25, 2009    |

## REPLY OF THE STATE OF NEVADA TO DOE'S ANSWER OPPOSING NEVADA'S MOTION FOR LEAVE TO FILE A NEW CORROSION CONTENTION

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### I. INTRODUCTION

On August 24, 2009, the State of Nevada ("Nevada") filed a Motion for Leave to File

New Contention Based on Newly Available Information ("Nevada's Motion"); attached as

Exhibit A to Nevada's Motion was proposed NEV-SAFETY-206. The focus of NEV-SAFETY
206 was that, as revealed by two DOE Condition Reports ("CRs") first made available July 31,

2009 (LSN# DEN001614752 and DEN001614731), contamination in DOE's experimental

facility undercut the validity of the weight loss measurement DOE relied upon to estimate

generalized corrosion of Alloy-22. On September 18, 2009, the Department of Energy ("DOE")

filed an Answer ("Answer") objecting to Nevada's Motion, contending it was not timely because

it was based on information previously available. For the reasons given below, DOE's

objections are unfounded. Nevada's Motion should be granted, and NEV-SAFETY-206 should

be admitted.

### II. BACKGROUND

On June 3, 2008, DOE tendered its Yucca Mountain Repository License Application ("LA") to the Nuclear Regulatory Commission ("NRC"), seeking authorization to construct a geologic repository at Yucca Mountain, Nevada. After the NRC Staff docketed the DOE LA in September 2008, the Commission issued a Notice of Hearing and Opportunity to Petition for Leave to Intervene, in response to which Nevada filed a timely intervention Petition and was named one of the parties admitted to this proceeding (*see* CAB Order May 11, 2009). On June 19, 2009, the Chief Administrative Judge established Construction Authorization Board ("CAB") 04 to, among other things, preside over matters concerning new or amended contentions.

On August 24, 2009, Nevada filed the instant Motion, requesting leave to file the contention (NEV-SAFETY-206) which it appended to its Motion. DOE and NRC Staff both

filed timely Answers to the Motion, and Nevada timely files this Reply within seven days of DOE's Answer.

The standards governing the timeliness of Nevada's Motion are set out in 10 C.F.R. 2.309(f)(2) and the Board's Case Management Order #1 dated January 29, 2009 (at 3-4): A Petitioner may submit a new contention if:

- i. the information upon which the amended or new contention is based was not previously available;
- ii. the information upon which the amended or new contention is based is materially different than information previously available; and
- iii. the amended or new contention has been submitted in a timely fashion based on the availability of the subsequent information.

10 C.F.R. 2.309(f)(2)(i) - (iii).

CAB Case Management Order #1 (at 3-4) provides that: "Notwithstanding the time period specified in 10 C.F.R. § 2.323(a), such motion and proposed contention shall be deemed timely under 10 C.F.R. § 2.309(f)(2) if filed within 30 days of the date when the new and material information on which it is based first became available." As acknowledged by DOE in its Answer (at 2), "If a new contention meets these requirements, then it is considered 'timely' and the intervenor is not required to satisfy the additional requirements of 10 C.F.R. § 2.309(c)(1) for 'non-timely' filings." Because DOE contends that Nevada's Motion and contention are based on previously available information, it asserts that Nevada should satisfy the eight-factor balancing test for non-timely filings set out in 10 C.F.R. § 2.309(c)(1). However, Nevada need not meet such standard, because its Motion and contention are entirely timely in relation to the newly available information on which they are based. As explained below, the Motion and contention are based, as stated by Nevada in its Motion, on two new documents (LSN# DEN001614752 and DEN001614731) which were first made available on

July 31, 2009, less than 30 days prior to Nevada's timely filing of its Motion and contention, and the Motion and contention could not have been filed before these two DOE documents became available.

It is appropriate to pinpoint what is, and is not, at issue with respect to Nevada's Motion, DOE's Answer, and this Reply. DOE does not contest the fact that Nevada's proffered contention NEV-SAFETY-206 is complete and compliant with the six component requirements for contention filing set out in 10 C.F.R. § 2.309(f)(1). Likewise, NRC Staff, which filed its Answer to Nevada's Motion on September 11, 2009, concluded affirmatively "the proposed contention appears to satisfy the contention admissibility requirements in 10 C.F.R. § 2.309(f)(1)." NRC Staff Answer at 4.

Second, DOE and Nevada agree that Nevada has not argued the applicability of the eightpart balancing test for "non-timely" contentions set out in 10 C.F.R. § 2.309(c)(1). Nevada
asserts that it need not do so, because its August 24, 2009 Motion and appended contention are
not "non-timely." For its part, DOE concedes that, if Nevada's new contention meets the
requirements for a timely contention prescribed by 10 C.F.R. § 2.309(f)(2)(i) - (iii), then it is
indeed considered timely, and "the intervenor is not required to satisfy the additional
requirements of 10 C.F.R. § 2.309(c)(1) for 'non-timely' filings." DOE Answer at 2.

Accordingly, the sole issues for consideration by the Board are that of the timeliness of Nevada's
Motion and contention and the material difference between the information Nevada relies on
therein from prior available information. The NRC Staff likewise takes no issue with Nevada in
this respect, concluding "the contention appears to be based upon previously unavailable and
materially different information." NRC Staff Answer at 4. Indeed, Staff concluded its Answer

with the statement: "the Staff does not oppose Nevada's Motion for Leave to File Proposed Contention NEV-SAFETY-206, and does not object to admission of the proposed contention."

#### III. NEV-SAFETY-206 WAS TIMELY FILED AND SHOULD BE ADMITTED

Nevada's new contention is timely because the older documents cited by DOE in its Answer contain information which is not materially similar to the information contained in the two new DOE documents which Nevada cites and relies on in its contention (LSN# DEN001614752 and DEN001614731). In particular, Nevada will show that:

- The information which was previously available to it did not and could not have formed the basis of NEV-SAFETY-206; and
- The information upon which Nevada does predicate its new contention is materially different from that which was previously available.

# A. Information Previously Available Is Not and Could Not Be the Basis of NEV-SAFETY-206

None of the eight documents cited by DOE in its Answer focus on the issue addressed in NEV-SAFETY-206. DOE vaguely suggests that various "information related to contamination" was available in these documents (DOE Answer at 4). In particular, DOE contends that information relating to the contamination of corrosion test solutions was available. Nevada emphasizes that this information was non-specific as to the nature of the contamination and did not specify that it was relevant to samples used for estimating long-term **general corrosion** rates ("general corrosion" in the context of this contention refers to a specific term of art used in the metals industry to distinguish this type of corrosion from others, such as crevice corrosion or stress corrosion). Thus, the information previously available had no relationship to information included in the License Application. Only the two recent documents that form the basis of the contention (LSN# DEN001614752 and DEN001614731) make this relationship to the arguments

presented in the License Application clear. It is important to keep in mind that NEV-SAFETY-206 does not address contamination in the Long-Term Corrosion Test Facility (LTCTF) in a general, non-specific way; rather it focuses on the lack of validity of the DOE weight-loss measurements used in evaluation of general corrosion properties of Alloy-22 as invoked in the License Application and used in the TSPA-LA.

Although DN2002213451 cited by DOE did raise the issue of contamination in the long-term test facility, <sup>1</sup> it did so in the context of samples in test cells that were used to study the passive film, <sup>2</sup> not the extent of general corrosion that would result when the film is lost or degraded. In this context, it should be noted that the samples and test cells used to study the properties of the passive film could not be assumed to be the same as those used to study long-term corrosion rates. Indeed, it would be a reasonable experimental protocol to study these issues in separate, parallel experiments. There is no reason to believe from DOE data presented in DN2002213451 that any other samples were affected by poor experimental procedures as discussed in NEV-SAFETY-206. The actual numbers and kinds of specimens loaded in the LTCTF test cells, and the aqueous composition of the liquids in the cells, are not discussed in DN2002213451. There is no specific information to tie these data or this older DOE report to experiments performed or interpreted to assess general or localized corrosion of Alloy-22.

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<sup>&</sup>lt;sup>1</sup> DN2002213451 at 23: "Sample DUA114 was immersed for 5+ years in the LTCTF in 90°C SCW.... The surface has a 50-150nm thick "wavy" carbon film at the metal interface. The sample held in SDW at 90°C for over 5 years (DUA140) looks similar to the sample held in SCW, although the carbon deposit is somewhat thicker (Figures 17-18). In both cases, it is likely that the carbon deposits are due to the partial dissolution of the tank linings in these basic solutions."

<sup>&</sup>lt;sup>2</sup> DN2002213451: "The objective of this study was to characterize the passive oxide composition and thickness after aging in solution. However, all of the immersed samples had unintentional 100-5000nm deposits on their surfaces that came from carbon that leached from the walls of the tanks and/or iron that leached from other metals in the tanks. This oxygen containing contaminant layer severely limited the characterization of the passive oxide film." at 20: "The purpose of this report is to characterize the oxide layer obtained from Alloy 22 over a range of environmental conditions and to demonstrate that the oxide shows passive behavior. . . . Section 4 evaluates the oxide obtained from Alloy 22 samples aged for time periods extending from one month to over five years." DN2002213451 at 1.

Sufficient clarity regarding these issues was only provided by the appearance of the two Condition Reports relied upon in NEV-SAFETY-206 ("Condition Report Record Report for Unexpected Test Results – Residue on Subset of Alloy-22 Coupons," CR12868 (06/01/2009), LSN# DEN001614752; and "Condition Report Record Report for Unexpected Test Results – Heterogeneous Alloy-22 Oxide Thickness," CR12799 (06/26/2009), LSN# DEN001614731) that focused on the details of the contamination with respect to general corrosion issues in the LTCTF. However, it was unknown, based upon the limited documentation provided in all of the various reports, what the relationships were between the samples used for passive oxide study, long-term (five-year) general corrosion and for longer-term general corrosion. Indeed, no information was provided on the notation used to characterize the specific reaction cells, or even how many cells there are, before the release of the CRs. Further, from DEN001614752 (at 12), one of those CRs, there is reason to believe that the pH for the SCW (simulated concentrated water) may be in question because it may not have been held to a pH of 10.8. The important point to note here is that this concern over the adequacy of the experimental protocol in terms of pH monitoring or changing of bath cell racks could not be identified as an issue until DEN001614752 queried whether the pH had been held at the specified value of 10.8.

In another report (LSN# NRC000029382 [A review of the Long-Term Persistence of the Passive Film on Alloy 22 in Potential Yucca Mountain Repository Environments, H. Jung, et al., 10/31/2007, CNWRA]) cited by DOE, it is stated that contamination was observed in passive oxide film experiments (referencing "The Passive Film on Alloy-22" (09/12/2005), LSN# DN2002213451). While it is true that some of the LTCTF experiments that focus on study of passive oxide film were contaminated (e.g., at 3-7, 3-8 of LSN# NRC00029382), nothing in NRC00029382 suggests that the long-term general corrosion samples were contaminated. As

mentioned above, it could not be assumed that the same samples or even the same test cells were used for studies of passive film characteristics and general corrosion rates.

In the "Management Review Committee (MRC) Meeting Minutes, December 10, 2008" (12/22/2008), LSN# DEN001609312 (cited by DOE), CR12868 is classified as: "Unexpected Test Results – Residue on Subset of Alloy 22 Coupons." Neither the title, the outline issue (as defined by DOE) nor the discussion indicate the relationship(s) of the organic contamination to general corrosion testing, the subset of Alloy 22 samples in question, or the relationship(s) between this potential oil-leak contamination (CR12868) and the observations reported for passive oxide sample studies. The information in this document (LSN# DEN001609312) provides no information dealing with the determination of the general corrosion rate. In a similar DOE management review committee document ("Management Review Committee (MRC) Meeting Minutes, March 25, 2009" (04/03/2009), LSN# DEN001611920 at 8-9), evidence is provided that an organic substance (a long-chained molecule) was introduced from the stirring motors over the tanks. However, the number of tanks associated with this contamination, the contents of those tanks and the question of how those specimens related to the characterization of materials important to Yucca Mountain performance were not addressed. Again, there is no discussion of the general corrosion rate provided in that document.

The QA surveillance report ("Quality Assurance Surveillance Report for Report for Waste Package Barrier Material Testing and Analysis, Dates: 01/14/2009-01/15/2009" (01/28/2009), LSN# DEN001609264 at 2) (cited by DOE) refers to "visually observable residue on sample surfaces" on a subset of the 9.5-year LTCTF. That is all there is. There is no information concerning the samples or even the nature of the residue. This document does not provide information concerning these samples and their relation to the determination of the rate

of general corrosion of C-22, and again, did not provide new information sufficient to form the basis of a new contention.

The cited DOE audit report ("Quality Assurance Internal Audit IA-09-02 Checklist" (05/21/2009), LSN# DEN001614123) listed four possible causes for the "unexpected residue on the subset of Alloy 22 coupons that were in storage" (at 5, and as cited by DOE). The lessons learned by DOE with respect to the causes of the organic contamination do not in themselves resolve the issues of contamination, nor do they speak to the issues raised in NEV-SAFETY-206. This document does not provide evidence of previously available information that addresses the relationship between general corrosion rates and LTCTF contamination, which is the focus of NEV-SAFETY-206.

LSN# DEN001611086, the "Long-Term Corrosion Testing Plan" (02/01/2009), reported "an unexpected organic residue found on samples from the LTCTF" (at 128). Again, this document does not provide information concerning general corrosion rates in relation to contamination, which is the actual subject of NEV-SAFETY-206.

The final document cited by DOE, as evidence of information previously available is DOE's Response to RAI, Volume 3, Chapter 2.2.1.3.1 Second Set, Number 3; RAI: 3.2.2.1.3.1-2-003 (Response Tracking Number: 00196-00-00). This document does not address organic contamination; rather it relates to "experimental artifacts" of "(a matrix of Fe and O with particles rich in Si and O distributed throughout them) on some of the as-received crevice specimens" (ML091100634 at 1-2). This contamination discussion does not address the inorganic contamination described in NEV-SAFETY-206, which is of an entirely different chemical composition. It therefore only underlines the issue that DOE has lost control of its LTCTF experiments. This RAI is discussed further in the next section.

In summary, it is not disputed that various older documents touch upon various issues related to contamination of corrosion experiments with organic and inorganic materials. In any complex experimental program, there will be some experiments that are inadequately designed. Experimental research is a learning process in which failures are used to refine the equipment and protocols used. The issue in NEV-SAFETY-206 is not the failure to adequately monitor or control some experimental studies, but the subsequent reliance on such studies to estimate **general corrosion** rates for use in support of the License Application. It is not the existence of flawed data, but the use of those flawed data in a specifically identified safety-related context that is of concern.

# B. The Documents Relied on in NEV-SAFETY-206 Provide New and Materially Different Information From That Which was Previously Available

The focus of NEV-SAFETY-206 is stated as: "To derive estimates for general corrosion of Alloy-22, DOE utilizes Alloy-22 coupon bath tests employing SDW, SCW, and SAW test solutions for which there is now strong evidence of contamination in relation to the 5-year and 9.5-year tests (LSN# DEN001614752 and DEN001614731)." As detailed above, DOE did not document the degree and significance of this contamination to general corrosion until these two condition reports were made available. These reports provide the following new information:

- 1. The relationship between the 5-year and 9.5-year LTCTF Alloy-22 coupons and u-bends with respect to organic and inorganic contamination is related to general corrosion (LSN# DEN001614731 at 6; LSN# DEN001614752 at 1).
- 2. The issue of Alloy C-22 general corrosion rate and measurement uncertainties as a function of the organic contamination [DEN001614752 at 1].
- 3. Non-organic contamination (chlorine, magnesium, silicon) effects on both 5-year and 9-year test samples used for general corrosion analysis.

- 4. The fact that the organic contamination occurred across the board on Alloys G3. C4, C22, I825 and titanium. Thus, all of the bath samples in vessels 25, 26 and 30 have issues with contamination. The contaminated C-22 samples have been used for the determination of the general corrosion rate. This is of critical importance to NEV-SAFETY-206.
- 5. There is some question as to the pH of some of the baths that may have been kept at a pH of 10.8 or greater. A pH of 12 or above requires that the racks be changed. DEN001614752 at 12.

Although CR12868 (DEN001614752) acknowledged organic contamination, no compelling data were offered by DOE that could be used to correlate the massive organic contamination with **general corrosion**. The relationship of these observations to samples used in general corrosion testing remained unclear.

DOE cites only one document ML091100634 (supra) that does not deal with organic residue contamination. This document deals with iron, silica and oxygen particle contamination associated with crevice specimens.<sup>3</sup>

This RAI response is not relevant to NEV-SAFETY-206, as the argument that is presented in the contention is based upon chlorine, magnesium and silicon deposits formed under

ML091100634, 1.5 Summary at 18.

An analysis of the effect of the re-cleaning process on weight-loss and crevice control specimens (specimens that were never exposed to the test solutions) indicates that the mill-annealed oxide coating on the back side of the crevice specimens is at least partially removed by the cleaning process. Additionally, there is evidence of surface contamination (a matrix of Fe and O with particles rich in Si and O distributed throughout them) on some of the as-received crevice specimens, which could also be totally or partially removed during cleaning. This surface contamination was not present on the as-received weightloss specimens.

ML091100634, 1.1 Crevice Specimens at 2 (emphasis added).

As discussed above, experimental artifacts on the crevice specimens (e.g., mill-annealed oxides and surface contamination, which were not present on the weight-loss specimens). . .

the gravimetric crevice sample Teflon washers of the 5-year and 9.5-year test specimens that are at this point only provided by DEN001614731 (CR12799). This information was not previously available and is not supplied by the ML091100634 document as DOE contends. Further, the presence of chlorine, magnesium, and silicon deposits are critical to the argument presented in NEV-SAFETY-206, because these data suggest that these elements may be sequestered by the Alloy-22.4 DOE has attributed the nature of contamination under LTCTF conditions to the deposition of chlorine, magnesium and silicon.<sup>5</sup> These data among other information provided in ML09110634 suggests that Alloy-22 sequesters the elements present in the contaminant deposits. The coloration of the Alloy-22 surface is different depending upon the nature of the contamination deposit (DEN001614731 (CR12799), "Comparison of Oxide Thickness Between 5 and 9.5-Year Alloy-22 Gravimetric Samples," K.R. Zavadil & J.A. Ohlhausen (06/24/2009) at 1-8). This suggests that there is a hydrochemical relationship between the test specimen surface and the deposit. The role this deposit has with respect to general corrosion has not been addressed adequately by DOE, and combined with the organic contamination issues these data underpin a critical argument underlining Nevada's concern that these experiments lack critical control and are consequently flawed by the experimental procedures that DOE adopted. Thus, results from these experiments cannot be used to underpin safety arguments in the License Application.

<sup>&</sup>lt;sup>4</sup> For example, chlorine appears to be selectively concentrated at the crevice surface as a DOE designated contaminant deposit. Chlorine is present in the test bath solutions: SDW (min 5.83 x 101 mg/L to max 1.26 x 102 mg/L), SCW (min 5.42 x 103 mg/L to max 7.56 x 103 mg/L), and SAW (min 2.21 x 104 mg/L to max 2.77 x 104 mg/L) (as reported in DEN001614752 Attachment 2: Relevant LTCTF Test Solution Compositions). Magnesium and silicon are also present in the SCW, SDW and SAW test solutions.

<sup>&</sup>lt;sup>5</sup> The crevice formed under the Teflon washer was reported to have thicker deposits than the "boldly exposed surfaces" (DEN001614731 at 5) and the 9.5-year samples were said to have about twice the thickness as the 5-year samples. All of these data are evidence of deposition rather than corrosion of Alloy-22.

DOE has based its objection to NEV-SAFETY-206 on artificial assumptions suggesting that the information which forms the basis for the contention was previously available. This is incorrect. Not only was the information that underlies the contention newly provided, without that new information the contention could not have been formulated. The inorganic data that has only been supplied in the two new documents relied on in the Nevada contention provides the only compelling data that indicate inorganic deposit enrichments on the Alloy-22 samples. If these test samples are in fact sequestering these elements and forming deposits then the role of general corrosion **must** be affected by this coating. Further, this activity gives rise to aqueous reactions "unexpected" by DOE furthering the claim that DOE does not have control or understanding of its LTCTF experiments. The organic contamination certainly exacerbates the situation. In summary, only in the new documents cited in NEV-SAFETY-206 is the critical chemical composition of the inorganic deposits revealed, raising issues as to how general corrosion rates can be interpreted in circumstances in which organic contamination is interacting with corrosion processes leading to sequestration of inorganic materials at the metal surface. These recent documents make it clear that a complex chemical situation existed in the general corrosion experiments that did not correspond to the situation that DOE intended to study. This should have disqualified the data obtained in these experiments from safety related applications.

Because the "previously available" information identified by DOE did not address the specific issue raised by NEV-SAFETY-206 (i.e., the general corrosion of Alloy-22 and deficient experiments directed thereto), and because the information which Nevada **does** rely on in its new contention (focusing on the use of data from flawed experiments to estimate general corrosion rates) is materially different from that which was previously available, Nevada's Motion and

contention are timely: the Motion should be granted, and the contention should be admitted in its entirety.

## C. Potential Detriment to Contention Protocol Fostered by LSN System

While the LSN can no doubt be seen as a valuable tool for all the parties to the licensing proceeding, it is far from perfect. As has been observed by every party and every Board member who has attempted to use the LSN extensively, seemingly appropriate search terms often may yield anywhere from zero to tens of thousands of responsive "hits." A lesson from this is that it is unreasonable to attribute to any party an encyclopedic knowledge of the contents of every one of the millions of documents and tens of millions of pages of data which have been placed on the LSN. Ferreting out particular information on a defined subject may literally be compared to finding a needle in a haystack.

Nevada has, in this Reply, carefully differentiated the new information (which it **did** rely on in crafting NEV-SAFETY-206) from older data referenced by DOE (which was not and **could** not have been relied on in that contention, because it is materially different). But in view of the potential for future contentions being filed by intervenors, it is worth noting that DOE's Answer implicitly asks the Board to apply an unreasonable and unfair "encyclopedic LSN knowledge" standard, charging every party with immediate knowledge of the text and safety significance of every sentence in every page of the LSN's millions of documents. There is an additional important reason why such a standard for judging the timeliness of new contentions may be unreasonable and unfair. It is that the significance of technical information or raw data in an LSN document is often not clear until a later time when DOE uses it for a particular purpose. To give an example unrelated to NEV-SAFETY-206, assume that DOE places a document on the LSN which changes tritium detection thresholds. One cannot know at the time

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of such posting whether the document will be relevant or important, until such time as the

changed thresholds are actually used by DOE in an analysis of the tritium data. It is the

subsequent analysis rather than the original information which could be of significance.

Moreover, even when information in an early DOE document is picked up in a later one, it is

usually impossible for the parties to discern what DOE analyses (much less the raw data which

precedes them) are relevant subjects for potential contentions until DOE relies on them in an

amendment to the application, or response to a NRC Staff RAI.

IV. **CONCLUSION** 

Contrary to DOE's position argued in its Answer, Nevada's new contention NEV-

SAFETY-206 is timely and based upon new information which is materially different from that

which was earlier available. Accordingly, Nevada's Motion for Leave to File New Contention

Based on Newly Available Information should be granted, and its contention NEV-SAFETY-206

should be fully admitted in this proceeding.

Respectfully submitted,

(signed electronically)

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Dated: September 25, 2009

# UNITED STATES OF AMERICA NUCLEAR REGULATORY COMMISSION

## **Atomic Safety and Licensing Board**

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|                               | ) |                       |
| U.S. DEPARTMENT OF ENERGY     | ) | Docket No. 63-001-HLW |
|                               | ) |                       |
| (High Level Waste Repository) | ) | September 25, 2009    |

### **CERTIFICATE OF SERVICE**

I hereby certify that the foregoing Reply of the State of Nevada to DOE's Answer Opposing Nevada's Motion for Leave to File a New Corrosion Contention has been served upon the following persons by the Electronic Information Exchange:

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