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From:
Theodore Robinson

TACs:
ME3056 ME3057

To:
Eric Leeds

***** YELLOW *****

For Signature of:

Routing:
Leeds
Grobe
Boger
NRR Mailroom

Description:
Citizen Power questions regarding FENOC inspection program to identify corrosion of the containment liner at Beaver Valley.

Assigned To:
DLR

Contact:
HOLIAN, BRIAN, E

Special Instructions:

EDATS: NRR-2010-0016

1/14 Reassigned to DLR from DORL

CITIZEN POWER

Public Policy Research Education and Advocacy

December 31, 2009

Eric J. Leeds
Director, Office of Nuclear Reactor Regulation
United States Nuclear Regulatory Commission
Washington, DC 20555-0001

Dear Mr. Leeds:

Thank you for your October 24th response to our July 1st, July 7th, and August 25th letters concerning the adequacy of the inspection regime proposed by FirstEnergy Nuclear Operating Company (FENOC) to detect containment liner corrosion originating on the outside surface of the containment liner. We would also like to express our appreciation for the responses provided by the Nuclear Regulatory Commission (NRC) Staff to our concerns as stated in our August 25th letter. Finally, we believe that the decision to include the containment liner volumetric inspection as a license condition, as outlined in Section (2)(I) of the renewed facility operating license, was a proper and necessary response to the history of liner corrosion at Beaver Valley Unit 2.

However, we believe that many of our concerns about the proposed inspection regime, as raised in our August 25th letter, are still valid and we urge the NRC to require that the proposed inspections be modified in order to assure a 95% confidence that 95% of the unexamined accessible containment liner is not degraded. In addition, we strongly suggest that the NRC should require immediate inspection of the containment liner based upon our concerns that the liner may not be able to perform its intended function as a leak-tight barrier in the case of a plant emergency. Specifically, Citizen Power believes that FENOC does not know the current condition of the steel containment liner. The importance of a properly functioning liner has been highlighted recently by the failure of the concrete shell at Crystal River.

Citizen Power still has questions regarding the ability of the IWE inspection program to identify corrosion of the containment liner when that corrosion has originated from the outside of the liner, as outlined in our August 25th letter. Our specific concerns, as stated in that letter, can be summarized as:

1. The IWE visual inspection cannot detect significant amounts of corrosion originating on the outside of the liner until it has gone through-wall and the April 23, 2009 hole found at Beaver Valley should not be used to predict the size of possible future penetrations of the liner.

2. The Integrated Leak Rate Test (ILRT) cannot detect significant amounts of corrosion originating on the outside of the liner and it is unclear whether the

ILRT alone should be used to determine whether the liner satisfies the 10 CFR 100 requirements.

3. The random sampling methodology proposed (based on EPRI TR-107514) is not applicable because the sampling methodology incorporates a null hypothesis that there is no degradation of the containment liner. In addition, random sample frames must be determined for all age related degradation mechanisms (ARDMs).

4. If the EPRI TR-107514 sampling methodology is used as proposed by FENOC, it will not provide a 95% confidence that 95% of the liner is not degraded.

5. The 8 non-random sample locations should be selected upon possible corrosion mechanisms.

6. FENOC currently does not know the actual condition of the containment liner.

7. The inspection schedules stretch out too long and may imperil public safety.

The responses by the NRC staff did clarify a couple of the issues. Specifically, that the 10 CFR 100 and 10 CFR 50.67 leakage rate requirements are for the whole containment system and that additional statistical methodologies may be employed to augment the container liner inspection program. However, we believe that the inspection program, as proposed by FENOC, is still not sufficient to guarantee public safety.

In the response to our first issue, an Oak Ridge National Laboratory National study of containments was referenced as evidence that "visual examination of the liner plate is effective for gross defect detection and identification of areas to be included for more detailed examination."[1] This appears to reference the statement "[Visual inspection] is beneficial for performing gross defect detection and in identifying areas for more detailed examination" found in the publication *Final Report Inspection of Aged/Degraded Containments Program*.[2] We believe that the reference to visual examination as being useful in detecting gross defect detection is not relevant to the issue of detecting corrosion that originates on the outside of a containment liner. It is clear that the paper's authors themselves do not think that visual examination is appropriate for detecting corrosion originating on the outside of a containment liner. "Inspection of inaccessible portions of metal pressure boundary components of nuclear power plant containments (e.g., fully embedded or inaccessible containment shell or liner portions, the sand pocket region in Mark I and II drywells, and portions of the shell obscured by obstacles such as platforms or floors) requires special attention."[3] Possible inspection techniques listed by the authors for embedded portions of pressure boundaries include "ultrasonic inspection,

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[1] Response to Citizen Power Issues, Adams No. ML092930500, 10-24-09, pg.2.
[2] Naus, D.J., Oland, C.B., and Ellingwood, B.R., "Final Report Inspection of Aged/Degraded Containments Program," September 2005, pg. 55.
[3] Id at 60.

electromagnetic acoustic transducers, half-cell potential measurements, high frequency acoustic imaging, magnetostrictive sensor technology, and guided plate waves."[4] In comparison, visual inspections can only detect external corrosion when it already has gone through-wall, or after the failure of the containment liner. Therefore, visual inspections are unsuited to detect corrosion that originates on the exterior of the containment liner.

The NRC Staff did not respond to our second contention that the ILRT is not a suitable method for the detection of containment liner corrosion originating on the outside of the liner. Our position is consistent with the discussion during the 564th ACRS Meeting on July 8, 2009 (ADAMS Accession No. ML092290693) concerning the inability of an ILRT to detect a through-wall hole when intact concrete is backing the steel containment.[5]

However, the NRC Staff did clarify their position that "[t]he leakage rate requirements in 10 CFR 100 and 10 CFR 50.67 are for the whole containment system and not specific to the liner plate."[6] We are concerned that the significance of through wall corrosion is being downplayed based on the assumption that the concrete layer will provide a degree of containment during a design basis accident sufficient to provide close to a leak tight barrier. Any new holes through the steel containment are not guaranteed to conform to the size of the hole discovered on April 23, 2009. The sample size of through-wall holes in containment liners is too small to make predictions about future hole sizes. In addition, given the recent discovery of a significant crack in the concrete containment at Crystal River, it should not be taken as a given that the concrete backing a potential hole is completely intact. In fact, an inspection of the containment structure for Beaver Valley Unit 1 in 1992 found cracks in the exterior concrete surface.[7] Finally, since foreign objects have been found at the locations of through-wall holes in the containment liner, it is possible that there may be a correlation between non-intact concrete and through-wall holes in the liner. This correlation may make assumptions regarding the degree of protection that concrete would provide during a design basis accident incorrect. The dangers are clear. According to FENOC, if the concrete is not accounted for, the leak rate associated with the April 23, 2009 hole would have been increased by a factor of 100.[8]

Citizen Power believes that public safety mandates an inspection technique that detects corrosion on the exterior of the containment liner before it goes through-wall. Visual inspections and ILRTs are insufficient to detect exterior liner corrosion until it is too late. Different types of inspection techniques, such as volumetric examinations, are necessary to get an accurate picture of the condition of the exterior of a containment liner. During the period of extended operation for both units, the proposed inspection regime

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[4] Id.
[5] Transcript of 564th ACRS Meeting on July 8, 2009, pg 37.
[6] Response to Citizen Power Issues, Adams No. ML092930500, 10-24-09, pg.2.
[7] H. Ashar and G. Bagchi, Assessment of Inservice Conditions of Safety-Related Nuclear Plant Structures. NUREG 1522, June 1995, Adams No. ML062510407, pgs. A-48 and A-51.
[8] Transcript of 565th ACRS Meeting on September 11, 2009, pg. 27.

will be unable to assess the condition of the exterior side of the containment liner plate. The absence of volumetric examinations during extended operation is especially problematic if the proposed random sampling methodology indicates that there may be some corrosion issues and the root cause is endemic or unidentified.

In the response to our third issue, the NRC Staff defended the use of EPRI TR-107514 based on the theory that "foreign objects are the root cause of the localized, through-wall corrosion at BVPS, Unit 1..." and that it is reasonable for FENOC to assume "that there is no other corrosion at the liner-concrete interface."[9] The Staff also noted that the use of TR-107514 was consistent with current practice in the nuclear industry and even provided the example of it being used to inspect snubbers even when previous degradation had been observed. However, the use of TR-107514 was rejected in the North Anna/Surry SER because "this technical report has not been reviewed or approved by the staff."[10] The Staff also noted "FENOC will evaluate applicable statistical methodologies to characterize the general state of the containment liner plate." Finally, the Staff clarified that Surry Unit 2 had not experienced significant corrosion on its containment liner.

Citizen Power believes that EPRI TR-107514 should only be used when there has been a determination that the characteristic being sampled for (in the present case a certain amount of corrosion) is not probable and this determination is reasonable based upon the facts. FENOC has made an assumption that there is no other corrosion on the exterior of the containment liner. However, Citizen Power believes that this assumption is not based on the facts for two reasons: (1) during replacement of a steam generator in 2006, three locations of corrosion were detected in a section of containment liner twenty-one feet by seventeen feet. Based on this discovery alone, it should be incumbent upon FENOC to show why these three corrosion locations are an anomaly. Their explanation for the corrosion has changed over time from "the probable cause was identified as corrosion of the liner that occurred during construction where the liner was exposed to oxygen and water" in the license renewal application on page 3.5-47 to a statement by Cliff Custer in the September ACRS meeting "...the exact material could not be identified and found, but it is quite apparent to me that it was due to foreign material."[11] (2) a through-wall hole has been found at both Beaver Valley Unit 1 and North Anna Unit 2, possibly suggesting that sub-atmospheric containments may promote certain types of corrosion.

In response to our fourth issue, the NRC Staff indicated that the sampling methodology proposed by FENOC is acceptable and implied that inaccessible areas are not a significant problem because they are less then five percent of the containment liner surface. In addition, the NRC Staff restated FENOC's willingness "to evaluat[e] statistical methodologies to gain insights to augment the containment liner inspection

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[9] Response to Citizen Power Issues, Adams No. ML092930500, 10-24-09, pg.4.
[10] NUREG-1766 [2:3] Page 2-151- Page 3-130, Safety Evaluation Report, Related to License Renewal of North Anna Power Station, Units 1 & 2, & Surry Power Station, Units 1 & 2, pg. 3-77. ML030160825
[11] 9-11-09 ACRS Transcript, pg. 71.

program based on visual, non-random, and randomly selected volumetric examinations of the accessible area."[12]

Citizen Power believes that if the TR-107514 approach is used, that the methodology should be modified to adjust for the inaccessible areas in the liner in order to rule out any correlation bias. In addition, since the sampling is being taken over a period of time, the earlier results should be adjusted to account for the probability that additional corrosion will occur over time. This is especially relevant for the Unit 2 random samples, which may not be completed until 2027. We also think that it would be appropriate to set X to a positive number in the sampling program equation in order to reflect the corrosion of the liner that has already been identified. Citizen Power welcomes the openness of FENOC to use additional statistical methodologies in order to gain a better picture of the condition of the containment liner and believes that they should adopt these suggestions.

We are also concerned about what constitutes a positive finding of degradation in both the random and non-random sampling. Specifically, we would like to clarify what degradation would be "attributable to fabrication/erection practices", since any areas with this type of degradation would not count as a mechanism of interest and would not trigger an increase in the sample size. Furthermore, we would like to point out that if degradation is found that has a fabrication/erection type of root cause, under the TR-107514 approach, this may indicate that a separate statistical analysis of this distinct mechanism/component pair may be necessary.

In addition, Citizen Power would like to stress that the current proposed statistical methodology of increasing the sample size if the attribute of corrosion is detected within the sample should only be applied in conjunction with the TR-107514 approach. The 95/95 sampling plans used in NUREG 1475 make it clear that these sampling plans cannot be used as part of a multiple-sampling plan strategy because they will reduce the assurance below 95%.[13] If one example of corrosion is detected, the equation from TR-107514 must be used. It would be inappropriate to switch to the NUREG 1475 methodology and only increase the sample size to 93.

In response to our fifth issue, the NRC Staff referred to their answers to our first through fourth issues. In those answers it was clear that the areas chosen for the non-random samples were based upon operating experience, though not necessarily upon specific corrosion mechanisms. The areas identified seem reasonably calculated to find corrosion locations and may help determine any corrosion mechanisms.

In response to our sixth issue, the NRC Staff stated that through-wall corrosion is a slow process based on industry experience, that the non-random volumetric inspections will occur only eighteen months after the last visual inspection, and that there will be volumetric examination of random locations during the next three outages.

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[12] Id, pg. 5.

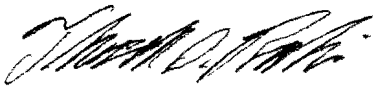
[13] D. Lurie and R.H. Moore, Applying Statistics, NUREG 1475, February 1994. A very clear illustrative example can be found on pages 21-14 through 21-18.

Citizen Power still maintains that FENOC cannot know the actual condition of the exterior of the containment liner. Both visual inspections and ILRTs do not identify even significant amounts of corrosion until they have gone through-wall. When a seventeen by twenty-one foot section of the panel was removed in 2006, three separate areas of corrosion were discovered. We do agree that once the volumetric examinations are completed, we will have a much better picture of the condition of the containment liner. However, the non-random samples, though very important to the overall inspection, are too few in number to give an adequate representation of the overall liner. On the other hand, the random volumetric examinations will not be complete until 2016 for Unit 1 and 2027 for Unit 2. A better, though not sufficient, view of the condition of the liner will be obtained once 25 samples have been examined. Although Citizen Power does believe that in order to protect the safety of the public an immediate UT examination of the containment liner of both units is necessary, we urge the NRC to encourage FENOC to examine at least 25 samples during the next outage of both Units 1 and 2.

In response to our seventh issue, the NRC Staff outlined the timing of the entire inspection regime for both Units 1 and 2. Citizen Power still maintains that the inspection schedule spans too great a timeframe.

In conclusion, our opinion is that the current inspection plans are inadequate to protect the public safety. We believe that the TR-107514 sampling methodology should be modified to account for previous degradation, inaccessible areas, and the long timeline during which random sampling will be conducted. In addition, we believe that in order to adequately protect public safety, UT testing of Unit 1 should commence immediately. If you have any questions, please contact me at robinson@citizenpower.com or at 412-421-7029.

Sincerely,



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cc: Alan L. Hiser
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