UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of:	)	Docket No. 50-346-L
FirstEnergy Nuclear Operating Company Davis-Besse Nuclear Power Station, Unit 1	)	September 2, 2014
	)	
	)	

INTERVENORS' MOTION FOR ADMISSION OF CONTENTION NO. 7 ON WORSENING SHIELD BUILDING CRACKING AND INADEQUATE AMPS IN SHIELD BUILDING MONITORING PROGRAM

Now come Beyond Nuclear, Citizens Environment Alliance of Southwestern Ontario (CEA), Don't Waste Michigan, and the Green Party of Ohio (collectively, Intervenors), by and through counsel, and move for the admission of a new Contention No. 7 concerning recent FirstEnergy Nuclear Operating Company ("FENOC") modifications to its Aging Management Plans ("AMPs") within its Shield Building Monitoring Program associated with worsening cracking in the reactor Shield Building at the Davis-Besse Nuclear Power Station, Unit 1 ("Davis-Besse"). Intervenors further move for inclusion of appropriate severe accident mitigation candidates in the Supplemental Environmental Impact Statement being prepared by the NRC Staff for this License Renewal proceeding.

/s/ Terry J. Lodge
Terry J. Lodge (Ohio Bar #0029271)
316 N. Michigan St., Ste. 520
Toledo, OH 43604-5627
Phone/fax (419) 255-7552
tjlodge50@yahoo.com
Counsel for Intervenors

MEMORANDUM

A. Procedural Background

This Motion addresses the belated emergence and admission by FirstEnergy Nuclear Operating Company ("FENOC"), which owns and operates the Davis-Besse Nuclear Power Station, that there is an uncontained, continuing, and possibly spreading problem of various forms of concrete cracking throughout portions of the walls of the Shield Building which houses the reactor at the plant site.

In February 2014, during hydro-demolition activities for creation of a construction opening in the shield building to support a scheduled steam generator replacement outage, FENOC learned that at least 26 sections of steel reinforcement (rebar) had been broken and/or cracked in the 2011 (and 2014) construction opening area, each break or crack apparently located close to the mechanical splice coupling used to reconnect the rebar during the reactor head replacement outage in 2011. Intervenors argue, in support of their proposed Contention 6 in April 2014, that FENOC may be incapable of managing Davis-Besse safely and successfully through the proposed license extension period of 2017-2037 because of the repeated problems with voids in the concrete, and a seemingly open-ended problem with the spreading of laminar and other cracks throughout the Shield Building. Intervenors sought then, and seek now, to litigate the adequacy of FENOC's anticipated modifications to Davis-Besse's Shield Building Monitoring Program and the Structures Monitoring Program Aging Management Plans ("AMPs") in light of their recent dramatic change of position, wherein the company admits the aging-related nature of the cracking phenomena - a position advocated by Intervenors since the cracks were first publicized by the company in 2011.

B. History of Cracking at Davis-Besse

The Davis-Besse Reactor Shield Building has a troubling history of multiple laminar and other concrete cracks. Intervenors in 2012 proffered multiple filings following the observation of cracking in the shield building concrete in 2011 during a reactor head replacement project at Davis-Besse. Intervenors documented concerns that the proliferation of different types of cracks may have commenced in the 1970's before the plant had even opened, and that their spreading and frequency of occurrence may be increasing with the passage of time. *See, generally*, "Intervenors' Motion for Admission of Contention No. 5 on Shield Building Cracking," and successive amendments and supplements: "Intervenors' Motion to Amend 'Motion for Admission of Contention No. 5'" (Feb. 27, 2012) ([hereinafter First Motion to Amend); "Intervenors' Motion to Amend and Supplement Proposed Contention No. 5 (Shield Building Cracking)" (June 4, 2012) (hereinafter Second Motion to Amend); "Intervenors' Third Motion to Amend and/or Supplement Proposed Contention No. 5 (Shield Building Cracking)" (July 16, 2012) (hereinafter Third Motion to Amend); "Intervenors' Motion to Amend and Supplement Proposed Contention No. 5 (Shield Building Cracking)" (July 23, 2012) (hereinafter Fourth Motion to Amend); "Intervenors' Fifth Motion To Amend and/or Supplement Proposed Contention No. 5 (Shield Building Cracking)" (Aug. 16, 2012) (hereinafter Fifth Motion to Amend). Intervenors incorporate these filings and their accompanying exhibits fully herein as though rewritten.

The ASLB flatly rejected Intervenors' Contention No. 5. "Memorandum and Order (Denying Motions to Admit, to Amend, and to Supplement Proposed Contention 5)," LBP-12-27 (December 28, 2012). But in September 2013, additional concrete cracking which had not

hitherto been identified was discovered in the shield building. On September 20, 2013, a Preliminary Notification of Event appeared in the NRC's ADAMS cache which stated as follows:

> On August 26, 2013, the licensee was performing examinations of core bores in the shield building in accordance with the commitments First Energy Nuclear Operating Company (FENOC) made to the NRC. The commitment is for long term monitoring of the shield building which was documented in the NRC's Confirmatory Action Letter dated December 2, 2011 (ADAMS ML11336A355). The examinations performed in 2011 and 2012 showed no additional cracks. *This year, using new instrumentation with enhanced capabilities, plant workers identified a crack that had not been seen before. To date, the core bore examinations revealed seven previously unidentified cracks*. FENOC has taken steps to reevaluate 43 core bores and will be looking at the remaining 39 going forward.

(Emphasis supplied). PNO, Exhibit 6.

In a formal Request for Additional Information ("RAI") dated April 15, 2014 (ADAMS No. ML14097A454), the NRC Staff said that "during a subsequent routine baseline inspection in August/September 2013, FENOC discovered several (about 15) cracks on the Davis-Besse shield building that were not identified previously." The Staff continued:

> Further, the NRC staff understands that in the ongoing February 2014 refueling outage, during hydro-demolition activities for creation of a construction opening in the Davis-Besse shield building to support the scheduled steam generator replacement, FENOC learned that several (at least 26) sections of steel reinforcement (rebar) had been broken and/or cracked in the construction opening area. Each section was apparently broken very close to the mechanical splice coupling used to splice the rebar during the head replacement outage in 2011.

In this striking understatement, the NRC Staff admitted that when the shield building was sealed shut following reactor head replacement in 2011, a stretch of the shield building wall which was 26-rebar-sections in length was not anchored to the rest of the rebar skeleton. The splices which joined the iron rebar rods together in the area of the shield building where the skeletal structure of the building was patched shut were cracked or broken at the time the concrete was poured to

complete the re-closure. After the 2011 resealing of the shield building, Davis-Besse operated at full power for over two years. While the information on the concrete voids is sparse and a bit unclear so far, it is legitimate to wonder if there is any relationship between the void, which apparently was located along the top of the 2011 construction opening, and the cracked and broken rebar, also located inside the perimeter of the 2011 construction opening.

According to the April 2014 RAI, FENOC has taken additional core samples of shield building concrete and is performing evaluations and testing to determine the root cause of the cracks and their apparent progression. A root cause analysis was performed in February 2012; a second, revised analysis was completed in April 2012. The 2014 analysis is the third root cause analysis.

Intervenors alleged in 2012 when they initially filed Contention 5 over cracking that FENOC must describe how it will manage the shield building cracking during the license renewal term, while the NRC Staff must consider the implications of the shield building cracking in its Draft Supplemental Environmental Impact Statement (DSEIS). Intervenors moved into evidence considerable documentation, such as the internal NRC calculations of two engineers who had determined that a minor earthquake or reactor thermal event could cause the collapse of very significant portions of the shield building walls, up to 90%. But it all came to naught; the contention was summarily rejected.

In 2012, FENOC argued (noted by the ASLB at p. 20, fn 99 of LBP-12-27) that Intervenors' insistence that the shield building cracking must be addressed in the then-anticipated Draft Supplemental Environmental Impact Statement (DSEIS) did not cure the claimed untimeliness of Intervenors' Contention 5 motion. The 2014 DSEIS contains zero mention of the

shield cracking phenomena at all, even as a subject for Severe Accident Mitigation Analysis ("SAMA"). Despite the NRC Staff's DSEIS explanation that the "purpose of [SAMA analysis] is to ensure that plant changes (*i.e.*, hardware, procedures, and training) with the potential for improving severe accident safety performance are identified and evaluated" (DSEIS p. 5-3), there is no mention of the changes in the Davis-Besse shield building, although it is surely a "hardware" structure within the sweep of SAMA review.[1] Given the latest (belated) admissions by FENOC that the cracking phenomena are aging-related, the Final Supplemental Environmental Impact Statement must itself be supplemented to include thorough SAMA recognition and analysis of the cracking damage to the Shield Building. It is ongoing; the stated root cause ("Blizzard of '78" moisture penetration and freezing) no longer holds, well, water. FirstEnergy has enunciated a new theory of "ice wedging" even as it admits that painting the Shield Building in 2012 seems not to have stemmed the presence of water within the concrete of the structure, nor its consequent damaging effects.

In LBP-12-27 (December 28, 2012), the Atomic Safety and Licensing Board refused to consider widespread cracking of the Shield Building as an aging-related problem which would fall within the permissible parameters of this license renewal proceeding:

---

[1]The Davis-Besse reactor shield building constitutes a "system [or] structure . . . as delineated in [10 C.F.R.] §54.4. . . subject to an aging management review" because it "perform[s] an intended function . . . without moving parts . . . [and includes] the containment [and] containment liner. . . ." 10 C.F.R. §54.21(a)(1). The shield building and the steel liner within it are among those "[p]lant systems, structures, and components" which are "[s]afety-related systems [and] structures . . . which are . . . relied upon to remain functional during and following design-basis events (as defined in 10 CFR 50.49 (b)(1)) to ensure the following functions - (I) The integrity of the reactor coolant pressure boundary; (ii) The capability to shut down the reactor and maintain it in a safe shutdown condition; or (iii) The capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures comparable to those referred to in §50.34(a)(1), §50.67(b) (2), or §100.11 of this chapter, as applicable." 10 C.F.R. §54.4(a)(1).

> . . . Intervenors must point to the specific ways in which the Shield Building Monitoring AMP is wrong or inadequate to raise a genuine dispute with FENOC's LRA. This they have failed to do. ***Intervenors have provided no support for their argument that the cracking (1) is aging-related,*** and (2) prevents safe operation of the plant. These claims amount to bare assertions, which the Commission has made clear "are insufficient to support a contention." We do not intend to imply that Intervenors must prove their case at this stage, as the Commission has made clear that petitioners bear no such burden. However, a petitioner "'must present sufficient information to show a genuine dispute' and reasonably 'indicating that a further inquiry is appropriate.'"

(Emphasis added). *Id*., LBP-12-27 at 30 (32 of .pdf). The ASLB then castigated Intervenors for "speculating" about the incipient and growing problem of cracking of the Shield Building:

> . . . Contention 5 is based, in large part, on ***pure speculation***. For example, Intervenors state that "there is a likelihood that the risks presented by the current cracks will only increase in the next few years." Intervenors note that Davis-Besse will undergo a steam generator replacement in 2014, and argue that this fact supports their claim regarding increased risk. Intervenors provide no support for their argument that the 2014 steam generator replacement will increase the risk of cracking, and as such, their argument is ***mere speculation***. In addition, Intervenors state that "it is conceivable that FENOC very well may need to replace its steam generators yet again after 2014 . . . risking further contributions to the cracking." Whether FENOC will need to perform another steam generator replacement after 2014 is ***mere speculation, on top of the mere speculation*** that such a procedure might contribute to the cracking.

LBP-12-27 at pp. 34-35 (36-36 of .pdf).

But alas, history has caught up with Davis-Besse. After Contention 5 was unceremoniously dismissed, FENOC acknowledged in September 2013, as stated in the introductory section of this Motion, that there is worsening shield building cracking. And on July 3, 2014, FirstEnergy Nuclear Operating Company formally admitted to the NRC that the cracking problems in Davis-Besse's Shield Building persist, and are worsening. Nearly at the end of this LRA adjudicatory proceeding, FENOC has finally admitted, quietly, what has become quite clear to Intervenors since 2011: the calculations of NRC staff engineers predicting the Shield Building to be permeated by cracking which threatens the continued usefulness and stability of the

structure itself, and the burgeoning evidence of increasing cracking, call into serious question the basis for giving Davis-Besse a new lease on its operating life.

LEGAL STANDARDS

On July 25, 2014, the Atomic Safety and Licensing Board ("ASLB") panel overseeing this proceeding wrote:

> To the extent that Intervenors have proffered Contention 6 in advance of future modifications to the relevant AMPs that they assume will occur as a result of the recently identified structural problems, it is premature. The Board notes that the modifications to Davis-Besse's Shield Building Monitoring Program, anticipated by the Intervenors, were provided on July 3, 2014 in Amendment No. 51 to the Davis-Besse LRA. Specific intervenor concerns regarding specific portions of LRA Amendment No. 51 may be submitted to the Board in a timely manner for its consideration as specified by our Initial Scheduling Order.[2]

The July 3, 2014 "modifications to Davis-Besse's Shield Building Monitoring Program" to which the ASLB referred are contained in FENOC's "Reply to Request for Additional Information for the Review of the Davis-Besse Nuclear Power Station, Unit No. 1, License Renewal Application (TAC No. ME4640) and License Renewal Application Amendment No. 51" sent by FENOC to the attention of the Document Control Desk at the Commission on July 3, 2014 and labeled L-14-224, per 10 C.F.R. Part 54.[3]

Under the ASLB panel's Initial Scheduling Order ("ISO") in this proceeding, a new contention must meet the requirements of the former (that is, pre-August 2012) 10 C.F.R. § 2.309(f)(2)(I) through (iii), which provided that Intervenors may submit a new contention only

---

[2]MEMORANDUM AND ORDER (Denying Intervenors' Motion for Admission of Contention No. 6 on Shield Building Concrete Void, Cracking and Broken Rebar Problems), *FirstEnergy Nuclear Operating Company* (Davis-Besse Nuclear Power Station, Unit 1), Docket No. 50-346-LR, ASLBP No. 11-907-01-LR-BD01, July 25, 2014, Page 16, internal citations omitted.

[3]NRC ADAMS Accession No. ML14184B184.

with leave of the presiding officer upon a showing that:

(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;

(iii) The amended or new contention has been submitted in a timely fashion based on the availability of the subsequent information.[4]

The ISO provides that "a motion and proposed new contention shall be deemed timely under [the pre-August 2012] 10 C.F.R. § 2.309(f)(2)(iii) if it is filed within sixty (60) days of the date when the material information on which it is based first becomes available."[5]

Intervenors address each timeliness requirement in turn.

1) Information not previously available

The information upon which Intervenors' new contention is based was not available before July 3. As the ASLB panel itself pointed out, above, FENOC's "modifications to Davis-Besse's Shield Building Monitoring Program … were provided on July 3, 2014 in Amendment No. 51 to the Davis-Besse LRA." (*See also* fn. 1, *infra*).

Just as Intervenors could not file cracking contentions by the initial intervention and contention filing deadline of December 27, 2010, since the cracking was not revealed until late 2011, Intervenors could not file this contention regarding "modifications to Davis-Besse's Shield

[4] Licensing Board Order (Initial Scheduling Order) at 12 (June 15, 2011) (unpublished) [hereinafter ISO].

[5] *Id.*

Building Monitoring Program" until they were published, less than sixty (60) days ago. FENOC made the "modifications" to its Aging Management Programs (AMP) in its Shield Building Monitoring Program based on revelations of previously undetected cracking, and "propagating" - worsening - of the cracking, which was not detected until August-September, 2013.[6]

2) Materially different information

The information upon which this new contention is based is materially different than information previously available. The ASLB panel itself indicated as much in its own July 25, 2014 ruling, as mentioned above, by pointing out this opportunity for Intervenors to file a new contention.

Additionally, with the July 3, 2014 "modifications to Davis-Besse's Shield Building Monitoring Program," FENOC saw it as necessary to modify its monitoring program due to the discovery in August-September, 2013 of previously undetected cracking, and worsening cracking. FENOC's cracking-related AMP modifications to its monitoring program represent significant, new, material information.

3) Timeliness of the amended or new contention

This new contention has been submitted in a timely fashion, within sixty (60) days of the

[6]See Intervenors' MOTION FOR ADMISSION OF CONTENTION NO. 6 ON SHIELD BUILDING CONCRETE VOID, CRACKING AND BROKEN REBAR PROBLEMS, *FirstEnergy Nuclear Operating Company*, Davis-Besse Nuclear Power Station, Unit 1, Docket No. 50-346-LR, April 21, 2014, Page 6, Exhibits 6 and 7 (ML14112A007). Exhibit 6 is Preliminary Notice of Event or Occurrence, PNO-III-13-007, DAVIS-BESSE SHIELD BUILDING LAMINAR CRACKS, September 20, 2013, ADAMS Accession No. ML13263A410. Exhibit 7 is REQUEST FOR ADDITIONAL INFORMATION FOR THE REVIEW OF THE DAVIS-BESSE NUCLEAR POWER STATION LICENSE RENEWAL APPLICATION (TAC NO. ME4640), Juan Uribe, Project Manager, Projects Branch 1, Division of License Renewal, Office of Nuclear Reactor Regulation, NRC, to Mr. Raymond A. Lieb, Vice-President, Davis-Besse Nuclear Power Station, FirstEnergy Nuclear Operating Company, April 15, 2014 (ML14112A008).

availability of the subsequent information, namely, the July 3, 2014 "modifications to Davis-Besse's Shield Building Monitoring Program."[7] It therefore complies with the ISO's timeliness requirements because it is being submitted in a timely fashion under the pre-August 2012 version of 10 C.F.R. § 2.309(f)(2)(iii).

ADMISSIBILITY CRITERIA

Contentions must meet the admissibility criteria set forth in 10 C.F.R. § 2.309(f)(1), which requires each contention to: (1) provide a specific statement of the issue of law or fact to be raised; (2) provide a brief explanation of the basis for the contention; (3) demonstrate that the issue raised in the contention is within the scope of the proceeding; (4) demonstrate that the issue raised in the contention is material to the findings the NRC must make to support the licensing action; (5) provide a concise statement of the alleged facts or expert opinions in support of the petitioner's position on the issue and on which the petitioner intends to rely at hearing; and (6) provide sufficient information to show that a genuine dispute exists with the applicant/licensee on a material issue of law or fact, with reference to specific disputed portions of the application. A failure to meet any of these criteria renders the contention inadmissible.[8] 10 C.F.R. § 2.309(f)(1)(I)-(vi). These admissibility criteria are addressed in turn below.

1) Specific statement of the issue of law or fact to be raised

FENOC's revisions to the AMPs in its Shield Building Monitoring Program, dated July 3,

[7] Because Monday, September 1, 2014 is Labor Day, Intervenors' filing deadline is Tuesday, September 2, 2014.

[8] Internal citations omitted, referenced by the ASLB panel.

2014,[9] acknowledge not only the risk, but the reality, of aging-related cracking propagation[10] -- that is, worsening – in the already severely cracked Shield Building, an admission which brings the issue within the scope of this License Renewal Application proceeding. FENOC's proposed modifications to its Shield Building Monitoring Program AMPs, regarding the scope (areas of the Shield Building to be examined), sample size (number of tests to be performed), and the frequency of its surveillance activities, are woefully inadequate. Significantly more core bores, as well as a broader diversity of complementary testing methods should be required, and at a much greater frequency than FENOC has proposed. The cracking phenomena must be identified, analyzed and addressed within the Final Supplemental Environmental Impact Statement for the license renewal.

2) Provide a brief explanation of the basis for the contention

In light of the revelation in August-September, 2013 of previously undetected cracks and the conclusion that they were worsening (propagating), Intervenors challenge the adequacy of FENOC's Shield Building Monitoring Program AMPs proposed for the 2017-2037 license extension period. Specifically, FENOC's testing frequency is inadequate, and risks becoming

---

[9]See FENOC's "Reply to Request for Additional Information for the Review of the Davis-Besse Nuclear Power Station, Unit No. 1, License Renewal Application (TAC No. ME4640) and License Renewal Application Amendment No. 51," Davis-Besse Nuclear Power Station, Unit No. 1, Docket No. 50-346, License Number NPF-3, sent by FENOC to the attention of the Document Control Desk at the U.S. Nuclear Regulatory Commission on July 3, 2014, per 10 CFR 54, Enclosure: Davis-Besse Nuclear Power Station, Unit No. 1 (Davis-Besse), Letter L-14-224, Amendment No. 51 to the Davis-Besse License Renewal Application (8 pages), p. 1 of 8. ADAMS No. ML14184B184 (hereinafter referenced as "FENOC's RAI Letter July 3, 2014").

[10]Two of numerous examples: "**The cracking propagation** was determined to be a result of ice-wedging (freezing water at a pre-existing crack leading edge)," and "**The rate of cracking propagation** is estimated at 0.4 to 0.7 inches per freezing cycle based on laboratory simulation." *Id.,* Page 7 of 8 (13 of 14 on pdf counter). (emphases added).

less adequate over time (via relaxed, less frequent testing). Annual inspections, at a minimum, should be required, not two- or even four-year inspection cycles, as FENOC has proposed.

In addition, the number of core bores to be examined should be significantly increased over the meager number proposed by FENOC. Vast areas of the Shield Building surface area, and volume, would fall outside of FENOC's Monitoring Program AMPs, as currently construed, and so the scope of the testing should also be significantly expanded.

Given the importance of the Shield Building to radiological containment, such as the proper functioning of the Emergency Ventilation System,[11] as well as a biological shield, and a tornado and missile shield,[12] and thus to public health, safety, and environmental protection, and in consideration of the already severe, and worsening, cracking of the Shield Building, these inadequacies in the Monitoring Program AMPs are unacceptable, and must be rectified.

---

[11] Davis-Besse Nuclear Power Station/License Renewal Application/Technical Information, section 2.3.3.13 Emergency Ventilation System. Page 2.3-88 [184/1,810 on pdf counter]. This document, dated August 30, 2010, appears to have not been posted at ADAMS nor assigned an ML number. However, it is posted at the following link on NRC's website: http://www.nrc.gov/reactors/operating/licensing/renewal/applications/davis-besse/davis-besse-lra.pdf.

[12] At section 2.4.1 CONTAINMENT (INCLUDING CONTAINMENT VESSEL, SHIELD BUILDING, AND CONTAINMENT INTERNAL STRUCTURES)–SEISMIC CLASS I, of the Davis-Besse Nuclear Power Station/License Renewal Application/Technical Information, FENOC states: "The Shield Building is a concrete structure surrounding the Containment Vessel. It is designed to provide biological shielding during normal operation and from hypothetical accident conditions. The building provides a means for collection and filtration of fission product leakage from the Containment Vessel following a hypothetical accident through the Emergency Ventilation System, an engineered safety feature designed for that purpose. In addition, the building provides environmental protection for the Containment Vessel from adverse atmospheric conditions and external missiles." Page 2.4-3 [263 of 1,810 on PDF counter] This Davis-Besse NPS/LRA/Tech. Info. document, dated August 2010, is posted at http://www.nrc.gov/reactors/operating/licensing/renewal/applications/davis-besse/davis-besse-lra.pdf.

3) Demonstration that the issue raised in the contention is within the scope of the proceeding

As explained by FENOC:

> The Enclosure identifies the **change to the License Renewal Application (LRA)** by Affected LRA Section, LRA Page No., and Affected Paragraph and Sentence. The count for the affected paragraph, sentence, bullet, etc. starts at the beginning of the affected Section or at the top of the affected page, as appropriate. Below each section the reason for the change is identified, and **the sentence affected is printed in *italics* with deleted text *{lined out}*[13] and added text *underlined.***[14] [Emphasis added]

Thus, *italicized and underlined text* is "affected," and "added." Intervenors assert that various sections of the *italicized and underlined text*, identified below, contain significant new material information and that FENOC's July 3, 2014 revisions to its Shield Building Monitoring Program AMPs finally acknowledge what should have been evident (and admitted) before now, the aging-related risk of cracking propagation. This issue is within-scope of this LRA proceeding, and worthy of a hearing, as will be shown.

4. Demonstration that the issue raised is material to the findings the NRC must make to support the licensing action

The NRC is mandated by the Atomic Energy Act and National Environmental Policy Act to provide reasonable assurance of public health and safety, and environmental protection, during the proposed 20-year license extension at Davis-Besse, and to take a "hard look" at environmental impacts, as by making predictive safety findings and conducting an environmental analysis regarding the safety and environmental impacts of the 20-year license extension.

The Shield Building at Davis-Besse is critical to radiological containment during reactor

---

[13] Intervenors are not able to indicate deleted text by striking it out, or lining it through as it appears in FENOC's original, and so indicate this with {parentheses}.

[14] FENOC's RAI Letter, July 3, 2014, p. 1 of 8.

emergencies, such as meltdowns or other radioactive releases. It can filter radioactivity to a certain extent before it is expelled to the external atmosphere, and it is also essential to defending the Inner Steel Containment Vessel, and Reactor Pressure Vessel against external threats, such as tornadoes or missiles. The Shield Building further provides biological shielding during normal operations. (See fns. 11 and 12 *infra*).

The severe, and finally-admitted "propagation" cracking of the Shield Building threatens to fail the Shield Building from performing its vital design safety and environmental functions. Intervenors challenge the adequacy of FENOC's Shield Building Monitoring Program AMPs to guarantee the Shield Building fulfills its vital safety functions, as required by applicable laws and regulations. Therefore the issues raised by this contention are material to a license extension decision for Davis-Besse.

5. Concise statement of the alleged facts or expert opinions in support of the petitioner's position and on which the petitioner intends to rely at hearing

Intervenors incorporate herein by reference the "Bases for Contention" section below as their listing of the facts showing that FENOC's Shield Building Monitoring Program AMPs are inadequate to provide reasonable assurance that the Shield Building can provide adequate protection to public health and safety and the environment during the 2017 to 2037 license extension period.

6. Showing of a genuine dispute between the licensee on a material issue of law or fact, with reference to specific disputed portions of the application

Intervenors incorporate herein by reference the "Bases for Contention" section below in support of this criterion. Intervenors provide information which demonstrates that a genuine dispute exists with FENOC on a material issue of law and fact regarding the adequacy of

FENOC's Shield Building Monitoring Program AMPs to supply AEA and NEPA-required reasonable assurances of adequate protection of public health, safety, and the environment, as well as the required "hard look" at the environmental impacts, of a 20-year license extension at Davis-Besse, given the severe, and worsening, cracking of the Shield Building.

BASES FOR CONTENTION

1. A new wrinkle in time: admitted cracking propagation

FENOC states:[15]

> The locations *{of the core bores} for the inspections are* chosen from the core bores that have been installed in the subcomponents of the Shield Building Wall, *including new core bores installed as required to identify changes in the limits of cracking in areas with previously identified crack propagation.* The representative sample size includes *{20} a minimum of 23* core bore inspection locations in the subcomponent population *(defined as Shield Building Wall subcomponents having the same material, environment, and aging effect combination)*. The *{20} 23* core bore location *[sic]* distribution has been chosen to include core bore inspections in 8 of the 10 flute shoulders with a high prevalence of event-driven laminar *cracking…In addition, past evidence of crack propagation is considered in choosing future inspection locations*.[16]

There is other evidence cracking is growing worse with time, the phenomenon to which FENOC refers as "crack propagation."

Intervenors assert that FENOC is unduly and improperly vague in its assertion that,

> The locations *{of the core bores} for the inspections are* chosen from the core bores that have been installed in the subcomponents of the Shield Building Wall,

---

[15] As previously stated, deleted text is reproduced in Intervenors' memorandum using {parentheses}.

[16] FENOC's "Reply to Request for Additional Information for the Review of the Davis-Besse Nuclear Power Station, Unit No. 1, License Renewal Application (TAC No. ME4640) and License Renewal Application Amendment No. 51," the July 3, 2014 letter, ADAMS Accession No. ML14184B184, LRA Sections Affected: A.1.43; B.2.43, Affected LRA Section: A.1.43, LRA Page No.: Page A-25, Affected Paragraph and Sentence: 4th Paragraph, p. 2/8 (p. 8/14 on pdf counter).

including new core bores installed as required to identify changes in the limits of cracking in areas with previously identified crack propagation.

This is so ambiguous that it hardly comprises an aging management plan. No commitments are clearly expressed; it amounts to deferring a serious scientific or engineering commitment to monitoring, and given the three-year history since discovery of the cracking, is grossly inadequate. The scope – that is, the areas of the Shield Building to be monitored – is too narrow. FENOC mentions only "*areas with previously identified crack propagation.*" This excludes vast areas of the massive Shield Building, which could also be suffering cracking initiation and propagation.

Additionally, an increase by 3 of core bore locations is insufficient, given the significance of worsening cracking revealed in August-September, 2013, and the vital safety, health, and environmental protection roles the Shield Building is intended to fill.

In the extended section entitled "Detection of Aging Effects" (pp. 3-4/8 [pp. 9-10/14 on pdf counter]) FENOC has made the following modifications:

> The Shield Building Monitoring Program provides for detection of aging effects prior to the loss of Shield Building intended functions. *The inspections, testing and analyses of the Shield Building concrete and rebar that was done to support the root cause evaluation report, "Concrete Crack within Shield Building Temporary Access Opening", and the follow-up report, "Shield Building Laminar Crack Propagation," {will} provide a baseline for future Shield Building Monitoring Program activities.*
>
> Periodic visual inspections will be performed in accordance with an implementing procedure by inspectors qualified as described in Chapter 7 of ACI Report 349.3R. The visual inspections will be performed on a representative sample of Shield Building Wall structural subcomponents by inspection of the internal surfaces of core bores. *The locations of the {core bores have been} inspections will be chosen from the core bores that have been installed in the subcomponents of the Shield Building Wall, including new core bores installed as required to identify changes in the limits of cracking in areas with previously identified crack propagation. The representative sample size includes {20} 23 core bore inspection* locations in the subcomponent population (defined as Shield Building Wall subcomponents having the same material, environment, and aging

effect combination). *A minimum of 10 of the core bores at inspection locations are currently uncracked; however, they are adjacent to areas of known cracking. This strategic location. and selection of core bores provides FENOC with the ability to monitor for crack propagation. The {20} 23 core bore location distribution has been chosen to include core bore inspections in 8 of the 10 flute shoulders with a high prevalence of event-driven laminar cracking.* This distribution also covers shell sections above elevation 780 feet with 4 core bores (2 pairs), and each Main Steam Line penetration area with one core bore. *In addition, past evidence of crack propagation will be considered in choosing future inspection locations.* Visual inspections will be supplemented by other established nondestructive examination (NDE) techniques and testing, as appropriate.

The initial frequency of visual inspection of core bores and core bore samples will be based on the results of inspections conducted before the period of extended operation. *{If no aging effects were identified by these visual inspections, then visual inspections will continue to be conducted at least once every two years during the period of extended operation.} The first inspection conducted during the period of extended operation is scheduled for 2017 and the next inspection is scheduled for {2019} 2018. If no aging effects are identified by the {two-year} one-year interval visual inspections (defined as no discernable change in crack width or the confirmation that no visible cracks have developed in core bores that previously had no visible cracks), then the frequency of visual inspections may be changed to at least once every {five} two years through 2026. If no aging effects are identified by the two-year interval visual inspections, then the frequency of visual inspections may be changed to at least once every four years.* Any evidence of degradation will be documented and evaluated through the FENOC Corrective Action Program. *The evaluation will include a determination of the need for any required change to the inspection schedule or parameters that need to be inspected*…[17]

2. Better the devil you know: risks of known/unknown cracking propagation

Respecting FENOC's statement "including new core bores installed as required to identify changes in the limits of cracking in areas with previously identified crack propagation" (p. 3/8 [9/14 on pdf counter]), in August-September, 2013, FENOC discovered cracks where they had previously not been identified, and also discovered worsening cracking where none had been

[17] *Id.*, License Renewal Application Sections Affected: A.1.43; B.2.43, Affected LRA Section: A.1.43, LRA Page No.: Page A-25, Affected Paragraph and Sentence: 4th Paragraph, pp. 3-4/8 (pp. 9-10/14 on pdf counter).

previously identified, nor expected. Thus, limiting new core bores to "areas with previously identified crack propagation" is not sufficient, because new cracks, or worsening crack propagation, could develop in areas not under careful aging management surveillance by FENOC, and thereby go undetected for long periods of time.

This inattention has happened before at Davis-Besse, with serious implications. In FENOC's own Blizzard of 1978 root cause conclusion, endorsed by the NRC Staff, the sub-laminar cracking discovered in October 2011 had been there since 1978, for 33 years, undetected because it was not visible on the surface, and FENOC's aging management of the Shield Building was limited to visual inspections of the surface. Failing to investigate into large portions for evidence of the initiation or worsening of cracks in the Shield Building which FENOC does not expect is unacceptable as an AMP during the 20-year license extension period. For this reason, Intervenors call for additional testing methods, besides core bores, to be invoked.

Extensive and comprehensive complementary testing methods should be deployed to compensate for the limitations of FENOC's small number of proposed core bore tests. These can and should include: electronic testing; impact response mapping or impulse response testing (IRT, a testing technique used to locate laminar cracking inside a concrete wall); creep testing; pull tests; ultrasonic testing; lab testing (such as chemical testing, for the presence of Ettringite, which would indicate moisture exposure, or testing for sulfates, or other chemicals known to have a deleterious effect on concrete, in order to determine if they are present in significant quantities in contact with the concrete containment structure), strength tests, and tensile tests. Given the vital safety and environmental role that the Davis-Besse Shield Building must perform from 2017 to 2037, such tests should be required to provide a comprehensive understanding of

the status of the Shield Building, and to guarantee its capability to perform its design functions. FENOC's incuriosity is not acceptable.

Regarding FENOC's statement "*A minimum of 10 of the core bores at inspection locations are currently uncracked; however, they are adjacent to areas of known cracking. This strategic location and selection of core bores provides FENOC with the ability to monitor for crack propagation*"(p. 3/8 [9/14 on pdf counter]) given the significance of the unexpected, newly detected cracks, and worsening of previously identified cracks, revealed in August-September 2013. "A minimum of 10 of the core bores at inspection locations [that] are currently uncracked" is a woefully inadequate sampling size across the vast, severely cracked -- and deteriorating – safety and environmentally significant Shield Building. While FENOC should be on guard against propagation of known cracking, it must also be vigilant to root out unknown cracking, and guard against its advance. After all, FENOC was unaware of the sub-laminar cracking it claims was caused by the Blizzard of 1978 until October 2011, that is, for nearly 34 years. To be unaware of such a threat against the Shield Building's performance of intended safety and environmentally significant design functions for such a long period of time, cannot be allowed to happen again.

3. Cracking's significance demands statistical significance

As to FENOC's statement that *"The {20} 23 core bore location distribution has been chosen to include core bore inspections in 8 of the 10 flute shoulders with a high prevalence of event-driven laminar cracking,*" (p. 3/8 [9/14 on pdf counter]) a mere increase of 3 core bores is insufficient, given the significance of the new cracking and advancing cracking revealed in August-September, 2013. (see f n. 5 above) The number of core bores must be significantly

increased. This is especially the case, given that FENOC has arbitrarily excluded large sections of the Shield Building from further examination under its proposed AMPs, such as two of the ten flute shoulders.

FENOC further intends to use past cracking evidence to choose future inspection locations: "*In addition, past evidence of crack propagation will be considered in choosing future inspection locations.*" Since FENOC had previously missed "*past evidence"* of cracking from 1978 to 2011, according to its self-report, it appears that "past evidence" is inadequate to choose "future inspection locations," for it could easily miss unknown cracking across stretches of the Shield Building. Similarly, an unknown air void or gap, extending most of the way through the Shield Building side wall, was present during over two years of full-power operations (late 2011 to early 2014) simply because it was not visible at the surface. Even *known* cracking has failed to prompt action at Davis-Besse. FENOC and its predecessors actually were aware of cracking on the dome parapet as early as 1976, but did not reveal this information to the public until 2012, 36 years later.[18]

4. Time flies when your Shield Building is cracking: inspection frequency increase needed

Thus, "*choosing future inspection locations*," based solely on considerations of *"past*

[18]"*On August 15, 1976 the Toledo Edison Company construction superintendent documented an examination of the shield building dome parapet that found a cracked and broken architectural flute shoulder at approximately 292 degree azimuth. There were also other hairline shrinkage cracks in the dome parapet at both corners of each architectural flute shoulder, at mid-width of each flute, and vertical around the periphery of the parapet*," cited in INTERVENORS' THIRD MOTION TO AMEND AND/OR SUPPLEMENT PROPOSED CONTENTION NO. 5 (SHIELD BUILDING CRACKING), In the Matter of First Energy Nuclear Operating Company (Davis-Besse Nuclear Power Station, Unit 1), Docket No. 50-346-LR, July 16, 2012, section 5, Shield Building Dome Parapet Cracking, Page 7. (italics in original FENOC document, its Revised Root Cause Analysis, RRCA, May 16, 2012, Page 34 of 131 on PDF counter, ADAMS Accession Number ML12142A053.)

evidence of crack propagation"(p. 4/8 [10/14 on pdf counter]) is not only unacceptably vague, it is also not acceptable in terms of reasonable assurance of adequate protection of public health, safety, and environment over the proposed 2017-2037 license extension.

FENOC's statement setting huge time intervals between investigatory inspections is troublesome:

> *The first inspection conducted during the period of extended operation is scheduled for 2017 and the next inspection is scheduled for {2019} 2018. If no aging effects are identified by the {two-year} one-year interval visual inspections (defined as no discernable change in crack width or the confirmation that no visible cracks have developed in core bores that previously had no visible cracks), then the frequency of visual inspections may be changed to at least once every {five} two years through 2026. If no aging effects are identified by the two-year interval visual inspections, then the frequency of visual inspections may be changed to at least once every four years*.

(p. 4/8 [10/14 on pdf counter]).

The unexpected August-September 2013 new cracking and crack propagation discovery was detected only because of an annual FENOC inspection. (See fn. 5 *infra*). Intervals of two or four years as proposed means that new or deteriorating cracking would be missed for years. The crucial role the Shield Building plays in containment, health, safety, and environmental protection makes it unacceptable for FENOC to relax inspections to less than annually. FENOC's weak commitment to document and evaluate evidence of degradation of the Shield Building through the company's Corrective Action Program and to "include a determination of the need for any required change to the inspection schedule or parameters that need to be inspected," is largely meaningless with two or four-year testing intervals. A determined inspection schedule and clear requirements of parameters that need to be inspected must be made into license conditions for the license extension now. Intervenors urge NRC to require expanded sampling size across diverse areas of the Shield Building and increased frequency of inspections, as

compared to FENOC's present proposal, given the risks of Shield Building failure.

5. Sins of Omission: Corrective Actions Speak Louder than Inadequate Inspections

Notably, FENOC mentions no action, such as repairs to the Shield Building, to be undertaken under its Corrective Action Program. The only corrective action FENOC has taken in response to the cracking phenomena was to whitewash the exterior of the Shield Building in August 2012, 40 years too late. And Intervenors have previously pointed out the inadequacy of the use of whitewash to seal the concrete.

Concerning "Monitoring and Trending" (pp. 4-5/8 [10-11/14 on pdf counter]) FENOC's modifications include:

> The Shield Building Monitoring Program will include a baseline inspection, followed by periodic inspections. Visual inspections will be performed in accordance with the implementing procedure by personnel qualified as described in Chapter 7 of ACI Report 349.3R. *The representative sample size includes {20} a minimum of 23 core bore inspection locations in the Shield Building Wall subcomponent population having the same material, environment, and aging effect combination. A minimum of 10 of the core bores at inspection locations are currently uncracked; however, they are adjacent to areas of known cracking. This strategic location, and selection of core bores provides FENOC with the ability to monitor for crack propagation. The {20} 23 core bore location distribution has been chosen to include core bore inspections in 8 of the 10 flute shoulders with a high prevalence of event-driven laminar cracking.* This distribution also covers shell sections above elevation 780 feet with 4 core bores (2 pairs), and each Main Steam Line penetration area with one core bore. *In addition, past evidence of crack propagation will be considered in choosing inspection locations.* Inspection findings will be documented and evaluated by assigned engineering personnel such that the results can be trended. Inspection findings that do not meet acceptance criteria will be evaluated and tracked using the FENOC Corrective Action Program.[19]

6. Few and far between: sample size much too small, scope much too narrow

FENOC's sample size is troubling: "*The representative sample size includes {20} a*

[19]FENOC's RAI Letter, July 3, 2014, Sections Affected: A.1.43; B.2.43, Affected LRA Section: A.1.43, LRA Page No.: Page A-25, Affected Paragraph and Sentence: 4th Paragraph, pp. 4-5/8 (pp. 10-11/14 on pdf counter).

minimum of 23 core bore inspection locations in the Shield Building Wall subcomponent population having the same material, environment, and aging effect combination" (p. 4/8 [10/14 on pdf counter]) as mentioned above, 23 core bore inspection locations are too few across the vast surface area and volumetric depth of the Shield Building structure. Intervenors call for a significant increase in both the sample size (numbers of tests), scope of monitoring (locations to be monitored), as well as frequency of testing. Intervenors have previously argued before the ASLB panel in this proceeding that there are multiple kinds of cracking, located at diverse places across the huge Shield Building (exhibiting different "*material, environment, and aging effect combination[s]")* (p. 4/8 [10/14 on pdf counter]), including sub-surface laminar cracking, surface cracking, dome cracking, micro-cracking, and radial cracking. And as of August-September, 2013, FENOC has been forced to admit that these cracks are propagating over time, which means that they are aging-related.

7. Timing (relatedness) is everything: contention within LRA scope

FENOC's acknowledgment of an "aging effect" associated with the Shield Building cracking finally establishes what the ASLB has denied previously to the Intervenors: this contention is indeed within scope, and worthy of a hearing, given the aging-related risks of the Shield Building cracking and its propagation.

FENOC's statement that "*[a] minimum of 10 of the core bores at inspection locations are currently uncracked; however, they are adjacent to areas of known cracking"* is grossly inadequate for sampling purposes, given the significance of the unexpected, newly detected cracks, and worsening of previously identified cracks, revealed in 2013.

8. Loss of conformance: acrobatic 'aligning' on regulatory tightrope

FENOC also has modified its "Acceptance Criteria" as follows:

> For core bore inspections, unacceptable inspection findings will include any indication of new cracking or a "discernable change" in previously identified cracks. Any indication of new cracking is defined as a visual inspection finding that visible cracks have developed in core bores that previously had no visible cracks. A discernable change in a previously identified crack is defined as a visual inspection finding that there has been a discernable change in general appearance or in crack width as identified by crack comparator measurement. *Conditions to be evaluated following each inspection cycle for determination of "acceptable results" include conformance with the plant design and licensing basis, as well as with previously determined crack propagation rates. Comparison with previously determined propagation rates will be to identify any potential changes in the driving force of the condition.*[20]

These again are bare minimum requirements, and should be substantially strengthened. *"[C]onformance with the plant design and licensing basis*" should be a basic requirement, and must be strictly enforced at all times. But as appears to be the problem in dealing with the Shield Building cracking trend, the NRC Staff has been too willing to ignore licensing and design basis violations.[21]

Such regulatory violations, and the absence of an agency interested in demanding compliance with them, cannot be allowed in the critical decision to grant a license extension. Short cuts on safety, allowed by regulator-industry collusion, were officially determined by the Japanese Diet (Parliament) to have been the root cause of the Fukushima Daiichi nuclear

---

[20] FENOC's RAI Letter, July 3, 2014, LRA Sections Affected: A.1.43; B.2.43, Affected LRA Section: A.1.43, LRA Page No.: Page A-25, Affected Paragraph and Sentence: 4th Paragraph, pp. 5/8 (p. 11/14 on pdf counter).

[21] *See* "NRC acrobatic 'aligning' on a regulatory tightrope," and associated footnotes (#81 and following), citing documents obtained from NRC via FOIA, in *What Humpty Dumpty doesn't want you to know: Davis-Besse's Cracked Containment Snow Job*, Beyond Nuclear Fact Sheet, August 8, 2012, pp. 8-10 (posted online at: http://www.beyondnuclear.org/storage/Snow%20Job%20Recent%20Revelations%208%208%20 2012.pdf.

catastrophe.[22] The NRC has acknowledged the need to learn lessons from Fukushima.[23] Avoiding a potential nuclear catastrophe should be the aim.

9. The roots of the problem: cracking acceleration, with multiple drivers

FENOC's reference, "*[c]omparison with previously determined [crack] propagation rates…to identify any potential changes in the driving force of the condition*"(p. 5/8 [11/14 on pdf counter]), is an overt admission by FENOC that the cracking is aging-related. Ironically, FENOC, and NRC staff for that matter, have previously argued before this ASLB panel that Intervenors' Shield Building containment cracking-related contentions are not proper for adjudication because of FENOC's determination that the root cause of the cracking was the Blizzard of 1978, and so the cracking is not aging-related. But now, FENOC acknowledges that cracking could well grow worse with time (that is, "propagate"), due to "*potential changes in the driving force of the condition*." Even as FENOC and the NRC staff stand by the dubious Blizzard of 1978 root cause conclusion, FENOC now seems willing to admit another "*driving force of the condition*"(p. 5/8 [11/14 on pdf counter]) – that is, another root cause – is likely at work initiating new cracks and worsening previously detected ones, perhaps even accelerating their spread over time. FENOC's admission is conclusive that Davis-Besse's Shield Building cracking is aging-related, making Intervenors' contention within scope, and worthy of a hearing on the merits.

10. Shaky shell games demand concrete AMP solutions

FENOC's Shield Building Monitoring Program modifications concerning age-related

---

[22]National Diet [Parliament] of Japan, Official Report of the Fukushima Nuclear Accident Independent Investigation Commission, Executive Summary, posted online at http://warp.da.ndl.go.jp/info:ndljp/pid/3856371/naiic.go.jp/en/report/.

[23] http://www.nrc.gov/reactors/operating/ops-experience/japan-dashboard.html

degradation of rebar, while outside the 60-day period to become part of a contention, nonetheless relates to the need for reconsideration of the news that the Shield Building cracking is aging-related:

> The acceptance criteria for rebar corrosion found during visual inspections will be that there is no evidence of corrosion indicated by loose, flaky rust or reinforcement section loss. Given the inherent variability of reinforcement cross section, and the encompassing concrete, **no measurement technique is employed.** (Emphasis added).[24]

Despite their being unable to challenge this aspect of FENOC's AMPs, Intervenors emphasize that their other points on this new Contention 7 should be the more compelling and urgent, given the utter lack of adequate aging-management on the critical rebar reinforcement in the Shield Building.[25] Mere visual inspection, and an utter lack of any measurement technique represents an astounding deficiency in aging management during the 2017-2037 license extension. If FENOC refuses to improve its aging management of the rebar, then the aging management of the severely cracked concrete, becomes all the more important – especially given the August-September 2013 revelation of new crack initiation, and worsening cracking. In particular, this conclusion in the July 3 letter is suspect:

> *The Shield Building laminar cracking condition has been evaluated with respect to the design basis functions of the Shield Building. The condition is documented in FENOC calculation C-CSS-099.20-063, as supported by Bechtel report "Effect of Laminar Cracks on Splice Capacity of No. 11 Bars based on Testing Conducted at Purdue University and University of Kansas for Davis-Besse Shield Building," that the*

---

[24]FENOC's RAI Letter, July 3, 2014, License Renewal Application Sections Affected: A.1.43; B.2.43, Affected LRA Section: A.1.43, LRA Page No.: Page A-25, Affected Paragraph and Sentence: 4th Paragraph pp. 5-6/8 (pp. 11-12/14 on pdf counter).

[25]Intervenors' Contention No. 6, opposed by FENOC and NRC staff, and rejected by this ASLB panel, also raised concerns about significant damage FENOC has inflicted on the rebar of the Shield Building, such as during the early 2014 steam generator replacement project. See fns. 1, 5, *infra*.

Shield Building "…meets all design requirements specified in USAR and will perform its USAR described design functions." This analysis bounds the identified changes in the laminar cracking condition from the conditions identified in 2011.[26]

As Intervenors have mentioned above, Davis-Besse's compliance with licensing and design bases, due to the severe and worsening Shield Building cracking, is dubious at best.

11. Diverse testing techniques needed to avoid blind spots

FENOC's "Operating Experience"-related modifications in light of changed laminar cracks are inadequate. In the "Operating Experience" section of the July 3 letter, the company states:

> *Inspections of 12 core bores were completed in 2013 under the "Design Guidelines for Maintenance Rule Evaluation of Structures" Procedure EN-DP-01511. During that cycle of inspections, a crack was observed in one of the core bores. This finding, upon a review of the records was determined to be a pre-existing crack given that the extracted concrete core was cracked at the location identified. Given this finding, the inspection population was increased, eventually leading to inspection of all available core bores. This re-inspection identified a total of 7 core bores with similar conditions that were determined to be pre-existing.* ***This re-inspection also identified 8 conditions where the laminar cracking conditions were determined to have undergone a discernable change***.[27] (emphasis added).

So FENOC overlooked pre-existing cracks, only to find them later. This underscores the need, as mentioned above, for diverse testing methods, so that "blind spots" can be avoided, and existent cracks can be detected, instead of going unnoticed and being overlooked. FENOC's admission that "re-inspection also identified 8 conditions where the laminar cracking conditions were determined to have undergone a discernable change," and the AMP modifications this has led to,

---

[26]FENOC's RAI Letter, July 3, 2014, Enclosure L-14-224, p. 7/8 (p. 13/14 on pdf counter).

[27]*Id.*, License Renewal Application Sections Affected: A.1.43; B.2.43, Affected LRA Section: A.1.43, LRA Page No.: Page A-25, Affected Paragraph and Sentence: 4th Paragraph, pp. 6-7/8 (pp. 12-13/14 on pdf counter).

is new, significant, material information. "[A] discernable change" is indicative of an aging-related mechanism and brings it within the scope of this LRA proceeding. Now that even FENOC acknowledges what Intervenors have argued since January 2012 before this very ASLB panel – that the cracking is aging-related, and subject to worsening – Intervenors urge the ASLB panel to grant a hearing on their contention, in order to address Intervenors' material dispute with FENOC regarding the adequacy of its AMPs in the Shield Building Monitoring Program.

12. Clear as ice on the Great Lakes shore: Locking cracking propagation under belated whitewash

FENOC further admits that cracking propagation occurred for some four decades:

> *The cracking propagation was determined to be a result of ice-wedging (freezing water at a pre-existing crack leading edge). This condition requires water, freezing temperatures, and pre-existing cracks. Because the Shield Building has been coated it contains a finite amount of water. It is not practical to remove the water in an accelerated manner given the cumulative magnitude of leading crack edges and transportability of water. It is also not practical to remove the existing cracks or prevent freezing temperatures. The rate of cracking propagation is estimated at 0.4 to 0.7 inches per freezing cycle based on laboratory simulation. By application of the evaluation criteria hierarchy of ACI 349.3R, "Evaluation of Existing Nuclear Safety-Related Concrete Structures," Figure 5.1, the condition was acceptable through evaluation. The condition was not passive; however, it was bounded by design basis documentation. The Shield Building Monitoring Program was changed to ensure conformance with the design requirements and to maintain the USAR functions.*[28]

According to FENOC, "ice-wedging" went on from construction of the Shield Building in the 1970's until August 2012, when the company whitewashed the Shield Building exterior. The NRC Staff itself brought to light that Davis-Besse's Shield Building concrete was of inferior quality, allowing not only water saturation, but also freezing temperatures to penetrate well into

[28] *Id.*, License Renewal Application Sections Affected: A.1.43; B.2.43, Affected LRA Section: A.1.43, LRA Page No.: Page A-25, Affected Paragraph and Sentence: 4th Paragraph, p. 7/8 (13/14 on pdf counter).

the thick walls.[29]

Davis-Besse's August 2012 whitewash may prevent moisture from penetrating the Shield Building side wall. However, moisture could still be penetrating the Shield Building from other pathways. For example, the previously cited PII revised root cause analysis document brought to light a "top-down" moisture infiltration pathway.[30] There is even a "down-up" moisture

---

[29]FENOC subcontractor Performance Improvement International, or PII, brought this issue to Intervenors' attention in its revised root cause assessment report. PII documented one of many NRC Requests for Additional Information: '16. Item 56: Why was the thermal conductivity of the SB [Shield Building] concrete 50% higher than the highest range expected for concrete? Did this contribute to an increased depth of freezing such that the area susceptible to cracking was at the outer rebar mats?' FENOC-Davis-Besse Nuclear Power Station, Unit 1, Submittal of Contractor Root Cause Assessment Report [Revised Root Cause Assessment Report, or RRCAR]-Section 1, from B.S. Allen, FirstEnergy Nuclear Operating Company, to Cynthia D. Pedersen, NRC, NRC/RGN-III/ORA, L-12-196, May 24, 2012, see p. iii (19/257 on pdf counter), ADAMS Accession No. ML12138A037.

This led Intervenors to ask the following: "If Davis-Besse's shield building concrete conducts heat 50% faster than it is supposed to, this may have allowed or caused deeper cracking in the shield building. Did Davis-Besse use substandard concrete in the shield building construction? Is this another design and/or construction error in the Davis-Besse shield building? Is this also a non-conformance to licensing and design bases? Why, when FENOC has blamed the Blizzard of 1978 and lack of a weather sealant on the shield building exterior as root causes of the subsurface laminar cracking in the shield building wall, didn't the utility also mention this concrete thermal conductivity issue? What other negative properties does the substandard Davis-Besse shield building concrete have? What other natural or man-made assaults is it therefore vulnerable to? A hearing on the merits of Intervenors' cracked concrete containment contention, as supplemented, might illuminate answers to these important questions." No such illumination was allowed, however – the contention was rejected in its entirety. See *INTERVENORS' FOURTH MOTION TO AMEND AND/OR SUPPLEMENT PROPOSED CONTENTION NO. 5 (SHIELD BUILDING CRACKING), First Energy Nuclear Operating Company* (Davis-Besse Nuclear Power Station, Unit 1), Docket No. 50-346-LR, July 23, 2012, pp. 28-30, ADAMS No. ML12205A507.

[30]At p. 18 [38/257] of PII RRCAR, per fn. 28 immediately above, PII states: "The top-down moisture transport process assumes that the water comes from the top of the structure and slowly penetrates down within the concrete wall. During the construction of the Shield Building, the wall was built first and the dome was subsequently constructed two years and four months later. So, the jacking bars, dense rebar, and top of the concrete wall were all exposed to the environment. Moreover, initial defects may be generated by the jacking bars and dense rebar, together with the large aggregate used in the concrete. These factors resulted in the potential for high porosity concrete near the rebar and jacking bars allowing for water penetration. Due to the heterogeneous characteristics of concrete, the water comes down along random paths of least

infiltration pathway, given the "wicking" dynamic due to aggressive, standing groundwater saturating the base of the Shield Building wall, and a degraded moisture barrier.[31] It follows that any flaws or degradation in the whitewash on the Shield Building side wall during the 2017-2037 license extension would allow water to penetrate Davis-Besse's substandard concrete during precipitation events, which are common on the Lake Erie shoreline. This highlights the need for a comprehensive sealant AMP as well.

Also common on the Lake Erie shore are freeze/thaw cycles. As FENOC stated, "*It is also not practical to remove the existing cracks or prevent freezing temperatures*" (p. 7/8 [13/14 on pdf counter]). The impracticality of removing the existing cracks underscores a point made above by Intervenors: FENOC has done nothing to address the Shield Building cracking, other

---

resistance which may tend to explain the sporadically distributed cracks in the wall. This moisture transport mechanism is illustrated in Figure 4." (p. 14, citations omitted) And, as mentioned on p. 14, any failure of the dome's/parapet's waterproof sealant would allow water to percolate down into the SB wall below. This top-down water flow could worsen cracking over time – that is, cause age-related degradation – due to rains, melting of snow, etc., which are common occurrences on the shoreline of the Great Lakes. So, if "an uneven snow load" is as bad as "the entire roof filling up with water," this is of great concern to Intervenors, not only due to the weight of the snow/water, but to the potential for water to flow through roof/sealant flaws into the shield building wall, causing further damage below." (pp. 32-33). INTERVENORS' FOURTH MOTION TO AMEND AND/OR SUPPLEMENT, per fn. 28 *infra.*

[31] "Moreover, Davis-Besse has other water problems inside the shield building. In RAI responses dated May 24, 2011 (ML11151A90), the NRC staff had noted a 'history of ground water infiltration into the annular space between the concrete shield building and steel containment.' During a 2011 AMP audit, NRC staff also reviewed documentation that:

> [I]ndicated the presence of standing water in the annulus sand pocket region. The standing water appears to be a recurring issue of ground water leakage and areas of corrosion were observed on the containment vessel. In addition, during the audit the staff reviewed photographs that indicate peeling of clear coat on the containment vessel annulus area, and degradation of the moisture barrier, concrete grout, and sealant in the annulus area that were installed in 2002-2003." INTERVENORS' MOTION TO AMEND AND SUPPLEMENT PROPOSED CONTENTION NO. 5 (SHIELD BUILDING CRACKING), *First Energy Nuclear Operating Company* (Davis-Besse Nuclear Power Station, Unit 1), Docket No. 50-346-LR, June 4, 2012, p. 12 (internal citations omitted).

than the August 2012 whitewash (40 years late), and its inadequate attempts at AMPs. No other corrective actions, such as physical structure repairs have been done, nor are any planned. This does not provide reasonable assurance of adequate protection of health, safety, and the environment through the 2017-2037 license extension, given the Shield Building's questionable capability of fulfilling vital design functions. Even without flaws or degradation, however, FENOC has not established that the whitewash coating the exterior of the Shield Building actually insulates the side wall thickness against freezing and thawing temperatures. This is a problem, as apparently, there is enough water in the Shield Building side wall to continue to carry out freeze and thaw cycles, causing significant damage each time, in terms of cracking growth. Also, the whitewash has sealed off the wall, has now locked that water inside, so there is no getting it out. In addition to the trapped water continuing to inflict significant damage by propagating cracks, there are other potential water infiltration pathways, as well. Cracking propagation could simply accelerate and worsen over time.

As FENOC states in the July 3 RAI Letter, "*It is not practical to remove the water in an accelerated manner given the cumulative magnitude of leading crack edges and transportability of water*" (p. 7/8 [13/14 on pdf counter]). However, impracticality cannot excuse FENOC under the Atomic Energy Act, from legal or regulatory compliance. FENOC chose to build Davis-Besse on the Great Lakes shoreline. It chose not to seal the Shield Building in the early 1970s, or afterwards, until August 2012, apparently in order to save money. FENOC is responsible for its actions, and inactions.

The *"ice-wedging (freezing water at a pre-existing crack leading edge)"*(p. 7/8 [13/14 on pdf counter]) represents a different root cause of the Shield Building cracking from the purported

Blizzard of 1978 root cause previously argued. As Intervenors contended in previous contention filings related to the Shield Building cracking problem, the root cause is likely multi-faceted and synergistic, as NRC staff's own RAI questions suggested, and as revealed in PII's RRCA. This "ice-wedging" cracking propagation will inflict damage in addition to the severe cracking already inflicted ostensibly by the Blizzard of 1978, and numerous other possible root causes.

13. Off to the ice races: startling cracking propagation rate

FENOC's admission that *"The rate of cracking propagation is estimated at 0.4 to 0.7 inches per freezing cycle based on laboratory simulation*" suggests a very high rate of cracking growth! It raises many questions, including: How long has it already been going on? Since the Blizzard of 1978? Earlier? Does the freeze-thaw cycle still penetrate the Shield Building side wall, due to the whitewash's inability to insulate? How long before circumferential cracking goes all the way around the diameter of the Shield Building? How long before through-wall cracking goes all the way through the Shield Building side wall, which is 30 inches thick? How soon before the severely cracked Shield Building simply collapses under its own weight, due to a tornado, missile, earthquake, or internal pressure build up, as NRC Staff conjectured in internal emails in 2011 which were brought to light by FOIA, and cited repeatedly by Intervenors in previous cracking-related contention filings in this case.[32]

[32] *See*, for example: "**If this assumption is correct only 3-4 inches of the concrete on the inside face can be used in the structural analysis.** In the response to the questions, the applicant stated that, 'Since we assume that outside reinforcement is to be treated ineffective in carrying any additional stress beyond 12.4 ksi, under accident thermal loads that may cause stresses in excess of what the rebar can carry (assumed 12.4 ksi), **the reinforcement is assumed to detach itself from the outer section of the shell.' These statements seems (sic) to be contradictory. In addition, I am concerned that the concrete will fail in this region due to bending in this region even under small loads."** NRC's engineer Pete Hernandez wrote "**I think the greater concern is will the SB stay standing and not whether or not the decorative concrete will fall off.** Because the licensee has not performed core bores to see if there is

FENOC's "Operating Experience" discussion contains a highly-suspect conclusion:

> *Referencing the Evaluation Criteria hierarchy of ACI 349.3R, Figure 5.1, the 2013 condition was determined to be acceptable through evaluation. The condition was not passive; however, it was bounded by design basis documentation. The condition will therefore be subjected to increased monitoring to ensure conformance with the design requirements and USAR functions.*[33]

Intervenors submit that the Shield Building's condition is **not** "bounded by design basis documentation." Internal NRC Staff emails obtained by Intervenors under FOIA show that design and licensing bases are very questionable at Davis-Besse, due to Shield Building damage, which Intervenors now understand, per FENOC admission, is likely significantly worsening with the passage of time. FENOC's vague commitment that "[t]he condition will therefore be subjected to increased monitoring to ensure conformance with the design requirements and USAR functions" is no commitment at all.

CONCLUSION

If FENOC cannot assure Davis-Besse's safety, then the plant must be permanently shut down, not granted a 20-year license extension. It has become increasingly clear that Davis-Besse fails the reasonable assurance of adequate protection test, given its Shield Building's aging-related degradation, its severe and worsening cracking, and its susceptibility to not properly perform vital design functions. FENOC cannot be allowed to endanger the public throughout its region by operating Davis-Besse for 20 additional years in such a degraded, and worsening, state.

---

cracking in the credited concrete, **do they have a basis to say that the structural concrete will maintain a Seismic II/I condition?"** (emphases added) See *INTERVENORS' FOURTH MOTION TO AMEND AND/OR SUPPLEMENT PROPOSED CONTENTION NO. 5 (SHIELD BUILDING CRACKING), First Energy Nuclear Operating Company* (Davis-Besse Nuclear Power Station, Unit 1), Docket No. 50-346-LR, July 23, 2012, pp. 22-23, ML12205A507.

[33]FENOC's RAI Letter, July 3, 2014, Enclosure L-14-224, p. 7/8 (p. 13/14 on pdf counter).

In late December 2002, the NRC OIG warned that FENOC had put profits ahead of safety at Davis-Besse. The OIG reported that also NRC was guilty of allowing this at the very highest levels of the agency. Certainly FENOC should not be allowed to again place its profits ahead of public safety, as by being allowed to operate Davis-Besse for 20 additional years with a Shield Building of dubious structural integrity and functionality.

WHEREFORE, Petitioners pray the Atomic Safety and Licensing Board panel admit Contention 7 for full adjudication.

Executed according to 10 C.F.R. § 2.304(d)

/s/ Terry J. Lodge
Terry J. Lodge (Ohio Bar #0029271)
316 N. Michigan St., Ste. 520
Toledo, OH 43604-5627
Phone/fax (419) 255-7552
tjlodge50@yahoo.com
Counsel for Intervenors

CONSULTATION PURSUANT TO 10 C.F.R. § 2.323(b)

Undersigned counsel hereby certifies that he made a sincere attempt to consult with opposing counsel for the Nuclear Regulatory Commission Staff and for FirstEnergy Nuclear Operating Company in an effort to resolve the concerns raised in the foregoing Motion. Counsel for FirstEnergy Nuclear Operating Company indicated during a meet-and-confer phone conference on September 2, 2014 that FENOC would oppose Intervenors' Motion. Counsel for the NRC Staff stated that the Staff did not oppose Intervenors' right to file this Motion, given the ASLB's mention of the possibility in its July 25, 2014 order, but reserved the right to oppose it upon review.

Executed in Accord with 10 C.F.R. § 2.304(d)

/s/ Terry J. Lodge
Terry J. Lodge
Counsel for Intervenors

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of:	)	Docket No. 50-346-L
FirstEnergy Nuclear Operating Company Davis-Besse Nuclear Power Station, Unit 1	)	September 2, 2014
	)	
	)	

CERTIFICATE OF SERVICE

I hereby certify that a copy of the foregoing INTERVENORS' MOTION FOR ADMISSION OF CONTENTION NO. 7 ON WORSENING SHIELD BUILDING CRACKING AND INADEQUATE AMPS IN SHIELD BUILDING MONITORING PROGRAM was deposited in the NRC's Electronic Information Exchange this 2nd day of September, 2014 and was served upon all parties of record.

Executed in Accord with 10 C.F.R. § 2.304(d)

/s/ Terry J. Lodge
Terry J. Lodge (Ohio Bar #0029271)
316 N. Michigan St., Ste. 520
Toledo, OH 43604-5627
Phone/fax (419) 255-7552
tjlodge50@yahoo.com
Counsel for Intervenors