

**UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION
Before the Atomic Safety and Licensing Board**

In the Matter of)	Docket No. 50-346-LR
<i>First Energy Nuclear Operating Company</i>)	
(Davis-Besse Nuclear Power Station, Unit 1)	August 16, 2012
)	
*		*

**INTERVENORS' FIFTH MOTION TO AMEND AND/OR SUPPLEMENT PROPOSED
CONTENTION NO. 5 (SHIELD BUILDING CRACKING)**

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 the Board for leave to further supplement and amend their proposed Contention No. 5, which addresses the shield building cracking phenomena at the Davis-Besse Nuclear Power Station ("Davis-Besse"). This supplementation focuses on a new collection of information recently provided to Intervenors on the Davis-Besse shield building cracking via the U.S. Nuclear Regulatory Commission's ("NRC" or "Staff") response (FOIA/PA-2012-0121) to Intervenors' January 26, 2012 request made under the Freedom of Information Act (FOIA).

A. Background

On January 10, 2012, Intervenors moved for admission of a new Contention No. 5, which states:

Intervenors contend that FirstEnergy's recently-discovered, extensive cracking of unknown origin in the Davis-Besse shield building/secondary reactor radiological containment structure is an aging-related feature of the plant, the condition of which precludes safe operation of the atomic reactor

beyond 2017 for any period of time, let alone the proposed 20-year license period.

NRC has proposed alternative wording which would transform the contention into a contention of omission. FirstEnergy Nuclear Operating Company ("FENOC") and the Staff timely responded to the original contention motion.

Intervenor's first "MOTION TO AMEND 'MOTION FOR ADMISSION OF CONTENTION NO. 5'" was filed on February 27, 2012. It is posted online at: <http://www.beyondnuclear.org/storage/Coalition%20filing%20contention%20amdt%202%2027%202012.pdf>. It was based on revelations of the significance of the cracking first made public by U.S. Representative Dennis Kucinich (D-OH) on February 8, 2012. Rep. Kucinich's revelations are posted online at <http://kucinich.house.gov/news/documentsingle.aspx?DocumentID=278784>.

On February 28, 2012, FENOC furnished the NRC with its "Root Cause Analysis Report" ("Root Cause Analysis" or "RCA"), ML120600056. Then, on April 5, 2012, FENOC promulgated an "aging management plan", or AMP (ML12097A216), the purpose of which is to specify arrangements prospectively to oversee and deal with the shield building's historic cracking phenomena.

On June 4, 2012, Intervenor's timely submitted their second "INTERVENORS' MOTION TO AMEND AND SUPPLEMENT PROPOSED CONTENTION NO. 5 (SHIELD BUILDING CRACKING)," in response to FENOC's AMP. This filing is posted online at <http://www.beyondnuclear.org/storage/June%204%202012%20Motn%20to%20Amend%20Supp%20Contn%205%20COMPLETE-1.pdf>.

Intervenors moved on July 16, 2012 to supplement (their Third Supplement) their cracking contention for the purpose of exposing discrepancies between FENOC's May 16, 2012 Revised "Root Cause Analysis Report" ("RRCA"), and other analyses of the shield building problems. This third supplement is posted online at <http://www.beyondnuclear.org/storage/3rd%20%20Motion%20COMPLET%20supp%20cracked%20concrete%20containment%20contention%20July%2016%202012.pdf>.

Intervenors moved on July 23, 2012, to supplement (their Fourth Supplement) their cracking contention, based on previously undisclosed information contained in FENOC contractor Performance Improvement International's (PII) report, "Root Cause Assessment: Davis-Besse Shield Building Laminar Cracking, Vol. 1." This PII report was added to the NRC's ADAMS system on May 24, 2012 as ML12138A037, which is one of multiple volumes of PII analysis added to ADAMS that day. Intervenors' July 23, 2012 motion demonstrated inconsistencies between FENOC's February 2012 Root Cause Analysis and the findings of FENOC's consultant, PII. This fourth motion is posted online at <http://www.beyondnuclear.org/storage/4th%20Motion%20PII%20COMPLET.pdf>; its supportive exhibits are posted online at <http://www.beyondnuclear.org/storage/4th%20Motion%20PII%20CompleT%20FOIA%20attachments.pdf>.

Intervenors are now moving to itemize the divergences and issues of fact between the proposed license action and the true status of the Davis-Besse shield

building, in light of the NRC's response to Intervenor's January 26, 2012 FOIA request regarding Davis-Besse shield building cracking (FOIA/PA-2012-0121).

NRC's FOIA Response Number 1 is dated June 12, 2012, is postmarked June 14, 2012, mailed via U.S. Postal Service PRIORITY MAIL (a form of First Class mail), and received some days later by Intervenor.

Intervenor is timely acting to itemize these divergences and issues of fact between the proposed license action and the true status of the Davis-Besse shield building by making this filing within the 60-day period set forth in the Initial Scheduling Order in this case, as complemented by the additional 3 days provided by NRC's licensing proceeding regulations regarding "Computation of time," 10 CFR 2.306(b), subpart (1).¹

Intervenor maintains that there is serious incongruity between the cracking problems as defined by FENOC, and the proposed remedy, exemplified by the AMP. The scope of the admitted cracking is far narrower than the identified cracking, and the potential for further aging-related concrete and rebar problems in the Davis-

¹ From p. 12 of Initial Scheduling Order, ASLBP No. 11-907-01-LR-BD01 (June 15, 2011): "The Board directs that a motion and proposed new contention shall be deemed timely under 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 to the moving party through service, publication, or any other means. If filed thereafter, the motion and proposed contention shall be deemed nontimely under 10 C.F.R. §2.309(c). If the movant is uncertain, it may file pursuant to both sections." 10CFR2.306(b), subpart (1), reads: "(1) If a notice or document is served upon a participant, by first-class mail only, three (3) calendar days will be added to the prescribed period for all the participants in the proceeding."

Besse shield building may include the loss of up to 90% of the shield building walls with the collapse of outer layers of concrete and rebar, or in other words, the shield building could fall, according to NRC documents revealed to Intervenor by FOIA/PA-2012-0121, Response Number 1.

**B. Issues of Fact And Inconsistencies Between Proposed
License Action And Revelations Documented
In NRC FOIA Response Number 1, Appendix B**

1. Timeliness

Intervenor hereby supplement their Davis-Besse concrete shield building cracking contention with the following points from NRC's initial, partial response (Response Number 1, dated June 12, 2012; postmarked June 14, 2012; sent via U.S. Postal Service Priority Mail, a category of First Class Mail; and received some days later by Intervenor) to Intervenor's FOIA request (FOIA/PA-2012-0121) dated January 26, 2012. Intervenor note that NRC's FOIA Response Number 1, Appendix B, mentions many additional documents which have not yet been provided to them. Although it should not be necessary, Intervenor will explicitly request from NRC's FOIA office those named documents, in a follow on FOIA request, if they are not provided in the near future. NRC's withholding of documents, potentially significant to Intervenor's cracked concrete containment contention, puts Intervenor at a distinct disadvantage in this proceeding, in contravention of applicable laws and regulations.

This contention supplement does not include issues raised in FOIA Response Number 1, Appendix A, "Agency records subject to the request that are...already

available for public inspection...". Appendix A documents were more than 60 days old, and, according to NRC's FOIA officer, had been previously made available to the public, via the NRC Public Document Room and ADAMS system.

Likewise, this contention supplement does not include issues raised in NRC FOIA Response Number 2 (date stamped July 12, 2012), Appendix C, "Agency records subject to the request that are...already available for public inspection...". Appendix C documents were more than 60 days old, and, according to NRC's FOIA officer, had been previously made available to the public, via the NRC Public Document Room and ADAMS system.

This fifth supplement also does not include supplementation associated with NRC FOIA Response Number 3 (date stamped July 27, 2012; postmarked August 1, 2012; sent via U.S. Postal Service First Class Mail; received some days later by Intervenor), Appendix D. Although Appendix D does contain documents previously not made available to the public, Intervenor has not yet been able to analyze their contents for relevance and applicability to their concrete containment cracking contention. Intervenor reserves the right to submit a contention supplement based on relevant revelations in Appendix D, by the 60-day deadline, complemented by 10 CFR 2.306 provisions.

Yet again, as with the previous appendixes, Appendix D indicates that, as of July 27, 2012, NRC is "... continuing to process your request." As the FOIA response is incomplete, Intervenor also reserves the right to further supplement their contention, based on applicable revelations contained in future appendixes provided by NRC regarding FOIA/PA 2012-0121.

Such additional new information, contained in Appendix D/Response Number 3, and Appendixes/Response Numbers beyond that, could well derive from the additional relevant documents mentioned in NRC's FOIA Response Number 1/Appendix B, but not yet provided to Intervenor in Appendix B.

Rather, this contention supplement focuses exclusively on Appendix B, "Agency records subject to the request that are ... being made available" for the first time. As newly available information, Appendix B revelations afford Intervenor 60 days in which to supplement their contention, per the ASLB's Initial Scheduling Order, as complemented by 10 CFR 2.306 provisions. Thus, Intervenor's fifth contention supplement is timely, as it is submitted within the 60 days allowed for by the ASLB's Initial Scheduling Order, considering the time period required for the mailed FOIA Response Number 1 documents to reach Intervenor via the U.S. Postal Service PRIORITY MAIL, a form of First Class Mail. The 60 days allowed by the Initial Scheduling Order in this proceeding is complemented by 10 CFR 2.306(b), subpart (1), which allows an additional three calendar days.

2. Issues of Fact and Inconsistencies

Per the NRC FOIA officer's format, Intervenor refers to NRC's Appendix B FOIA Response Number 1 documents as B/1, B/2, etc. In addition, Intervenor restates the DATE and DESCRIPTION/(PAGE COUNT), as provided by the NRC FOIA officer on the cover sheet/table of contents for APPENDIX B, RECORDS BEING RELEASED IN THEIR ENTIRETY, as provided to Intervenor.

Document B/1 [undated; Davis-Besse Nuclear Power Plant, Unit Licensing Basis Seismic Ground Motion Concern. (3 pages)]:

Although undated, this document is almost certainly from October 10, 2011 or thereafter, as that was the date range of Intervenor's FOIA request (October 10, 2011 to January 26, 2012).

In its section titled "Concern," NRC states:

During original review prior to operation, ACRS Committee believed 0.20g bedrock ground acceleration was more appropriate for Davis-Besse (DB) site than 0.15g used for design of structures, systems, and components.

Paragraph 2C.3.4 of DB USAR [Revision 28] indicates Maximum Possible Earthquake (SSE [Safe Shutdown Earthquake]) design accelerograms (*sic*) were derived using 0.15g maximum ground acceleration. DB USAR specifies seismic design based on 0.15g not 0.20g for SSE. OBE seismic response spectra derived from SSE spectra using 0.08g/0.15g ratio.

In its section titled "Discussion," NRC states:

During review to determine current design and licensing bases for DB shield building, Supplement No. 1 to NUREG-0136 documented ACRS Committee concern that 0.20g ground acceleration was more appropriate than 0.15g used in design.

The Committee recommended that the staff review in detail the plant systems needed to accomplish safe shutdown of the reactor and continued heat removal for a safe shutdown earthquake acceleration of 0.2g and that Regulatory Guide 1.60, "Design response Spectra for Seismic Design of Nuclear Power Plants," should be applied at the foundation level of the facility.

Staff agreed with Committee and conditioned the license to require that analysis and evaluation be completed prior to startup following the first regularly scheduled refueling outage.

Of note, the licensee documented the position that 0.15g was appropriate – see above references. However, these letters predate the removal to the license condition and the NRR Safety Evaluation.

In its section entitled "Concern," NRC states:

What is the appropriate licensing basis maximum ground acceleration (SSE) at bedrock, 0.20g per ACRS Committee and licensing condition or 0.15g per Paragraph 2C.3.4 of DB USAR?

Non-conservative design scenario:

- Licensee modifies one of the reanalyzed systems or components
- Licensee uses Regulatory Guide 1.61 higher damping values
- Using seismic loading based on 0.15g ground motion would not be in accordance with ACRS Committee or prior licensing condition

Of note, recent functionality evaluations for shield building laminar (sic) indicated additional margin could be captured using higher SSE damping 7% damping (sic) for reinforced concrete permitted by current revision of Regulatory Guide 1.61.

- The functionality evaluation based on 0.15 not 0.20 maximum ground acceleration – shield building is anchored to bedrock.
- Will licensee use 7% damping for revised design

Document B/1 reveals that both ACRS and NRC Staff were concerned about seismic risks at Davis-Besse long before the revelation of shield building cracking in October 2011. In fact, these concerns date back to the mid-1970s, prior to Davis-Besse's operations. However, as revealed by the passage "Staff agreed with [ACRS] Committee and conditioned the license to require the analysis and evaluation be completed **prior to startup following the first regularly scheduled refueling outage**" (emphasis added), despite these seismic risk concerns, NRC allowed Davis-Besse to commence operations before addressing them. In that way, NRC allowed for "facts on the ground" (Davis-Besse's operational status) to preclude fundamental seismic safety upgrades, as impossible or un-economic, especially considering irradiation of plant systems, structures, and components. After all, Davis-Besse was

already constructed, operational, and radioactive. But even then, NRC agrees that FENOC's *post hoc* pencil whipping and paper fixes are "non-conservative."

NRC FOIA Response Number 1's inclusion of Document B/1 shows that 36 years after ACRS and NRC Staff first expressed seismic risk concerns at Davis-Besse, these concerns still haunt the facility – now, frighteningly, in the context of a severely cracked shield building.

Document B/2 [10/14/11; Email from P. Hernandez, NRR to J. Zimmerman, NRR RE: 2011-10-13, POP – Davis-Besse Containment Shield Building. (1 page)]:

NRC's Pete Hernandez initially downplayed the risk of Davis-Besse shield building cracking revealed just days earlier:

...After discussion it was decided that if no structural cracks were found through the chipping process, then we would be satisfied. If they were found, then we have to reevaluate. No one expects any cracks to be found...The expectation right now is that there will be no structural cracks found and this will be a non-issue...

However, as U.S. Rep. Dennis Kucinich (D-OH) not only revealed to the public, but also clearly explained (as opposed to NRC and FENOC) on February 8, 2012 (as cited above), the Davis-Besse shield building cracks *are structural*. In fact, *the outer rebar layer of the shield building is assumed to be dysfunctional*.

Document B/3 [10/18/11; Email from J. Zimmerman, NRR to P. Hernandez, NRR Re: FYI – Davis Besse Shield Building issue update. (1 page)]:

Intervenors note the significance of this 10/18/11 NRC internal Staff discussion of PN [Public Notification] about the shield building cracking. The cracking was first discovered on 10/10/11, and yet more than a week later, NRC had still not done public notification. Thus, not only were Intervenors still being left in the dark about this safety significant aging issue, but so was the general public.

Document B/4 [10/18/11; Email from S. CuardadoDeJesus (sic), NRR to R. Auluck, NRR et al. on Davis-Besse Shield Building Issue Summary. (2 pages)]:

In this one- page summary, NRC reported:

...Per their [“industry experts from Sargent and Lundy, and Bechtel”] expert opinion the indications found in the concrete were a product of the hydro-blasting operations and not a pre-existing condition...The NRC inspectors concur with the actions taken to date by the licensee and continue to evaluate the licensee’s preliminary conclusions that the indications are related to the hydro-demolition and do not appear to be preexisting flaws in the concrete shield building.

Of course, this directly contradicts FENOC’s Blizzard of 1978 root cause explanation. It’s significant that Bechtel admitted the “hydro-demolition” or “hydro-blasting” operations caused the cracking, as they were the very contractor carrying out the hydro-blasting. If Bechtel could have avoided blame for the cracking, it stands to reason that it would not have pointed to its own hydro-blasting operations as the root cause.

NRC Staff’s, FENOC’s, Bechtel’s, and Sargent and Lundy’s initial conclusion, that hydro-blasting had caused the sub-surface laminar cracking first discovered on 10/10/11, is solid evidence and strong support for a hearing on the merits of a significant license extension aging issue. FENOC plans a 2014 hydro-blasting demolition of the shield building, in order to replace Davis-Besse’s already age-degraded steam generators. As NRC, FENOC, Bechtel, and Sargent and Lundy each admitted was not only possible, but even probable, in the referenced “Davis-Besse Shield Building Potential Cracking Issue” summary included in Document B/4, this planned 2014 hydro-blasting breach of the shield building could well exacerbate the shield building cracking.

FENOC has stated that it “voluntarily” replaced its second reactor lid with a third one “early,” ahead of its original 2014 time schedule for doing so. But FENOC’s “voluntary” action was necessitated by the fact that the second lid had already suffered premature, significant degradation (due to primary coolant boric acid leakage, similar to the 2002 Davis-Besse Hole-in-the-Head Fiasco), and thus lasted only from 2004 to 2011, rather than to the planned 2014. Thus, it appears that FENOC had planned to breach the shield building just once – in 2014 – in order to replace both the second reactor lid with a third one, as well as to replace the original, degraded steam generators with a new, second set. But now, given the 2011 breach to swap out reactor lids, FENOC will have to breach the shield building not once, but twice, in 2011 and 2014. This added breach by hydro-blasting in 2014 risks inflicting yet more damage on the shield building. This is an aging-related safety issue that could very well increase the safety and environmental risks of the proposed license extension operations from 2017 to 2037.

Document B/9 [11/04/11, Email from P. Hernandez, NRR to E. Sanchez Santiago, RIII on Questions about Davis Besse Shield Building Report from DORL. (2 pages)]:

In this email, written a month after the sub-surface laminar cracks were first announced, NRC’s Pete Hernandez asks significant questions and makes important observations regarding calculation C-CSS-099.20.054:

This description makes me think that they are looking at a single crack going in a circle. From what I understood **the crack is pervasive along the entire surface, spidering in all directions, similar to a pane of tempered glass breaking.** The description in Attachment B addresses only the crack at the opening and assumes that the crack is right along the rebar line. **The core bores have shown that the cracks are at different depths so this doesn’t seem to capture the current situation.** Throughout the calculation, the

word Crack, singular, is used. They also mention that the extent of the crack is only 10'-12'. **This seems to greatly downplay the issue.**

At this point core bores of only the shoulders have been taken. So the only crack widths we are aware of are those in the shoulders, which are not being addressed. **How can an analysis be done on the structurally credited concrete if no data from that area, in the form of core bores, has been taken? Shouldn't the structural integrity of the shoulders be calculated as well?**

This seems to say that they are just doing calculations for the new concrete that is and **ignores the rest of the building altogether.** Is that right?

This says to me, that they are ignoring the shoulders, **if they are ignoring all that concrete, it seems to be the opposite of conservative for evaluating the mechanical loads. (emphasis added)**

Regarding calculation C-CSS-099.20.055, it is written: "The purpose of this calculation is to demonstrate that during a seismic event, with the development of the crack in the architectural flute shoulder, the capacity of the rebar(s) can still provide adequate anchorage thus *prevent cracked concrete piece from falling*, and therefore Seismic II/I condition can be maintained." (emphasis added)

NRC's Pete Hernandez responded, alarmingly:

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 cracking in the credited concrete, **do they have a basis to say that the structural concrete will maintain a Seismic II/I condition?"**

This use of singular terminology also discounts this calculation because it seems that they are looking at only 1 crack and 1 shoulder or 1 flute. **Because cracks have been found through multiple core bores, shouldn't the appropriate calculations account for the combined effects of cracks in all the shoulders** and not just one by opening and not just individually?

From what I understand, **IR [Impulse Response] mapping is only an indicator, but must be validated by core bores.** Does basing all

the calculations on a length of a 12 foot crack discount the calculations altogether, because we have indications of cracks at distances greater than 12 feet. This also seems to assume that there is only 1 crack and not many as the core bores seem to prove. **Isn't IR mapping only useful at a limited depth too, so that using it to evaluate a 48" thick piece of concrete is not realistic? (emphasis added)**

Hernandez' questions echo concerns of Intervenors, such as the need for a comprehensive understanding of the cause(s), location(s), and the structural, safety, and environmental significance of cracking across the entire shield building, not just arbitrarily narrow, supposedly non-structural parts of the shield building. His questions also point to the need for empirical data, not just qualitative arguments, as Intervenors have also asserted in previous filings pertaining to this contention.

Hernandez also questions the limitations of Impulse Response mapping, emphasizing the need for complementary core bore sampling. Intervenors assert that such in depth testing needs to happen at not just an arbitrarily small number of locations, on an inadequately infrequent basis, but across the shield building on a regular basis, given the risk significance, as captured in his own words: **"the greater concern is will the SB stay standing"?**

Document B/10 [11/07/11; Davis Besse Shield Building Issue NRC Technical Reviewer Focus Questions. (1 page)]:

NRC's question, "Is extent of condition adequately understood, given limited data points?" echoes Intervenors' questions along the same lines. It is noteworthy that not only this question, but also those below, remain unanswered—at least in terms of the documents provided by NRC in Response Number 1/Appendix B, to Intervenors' FOIA request.

NRC then asked:

Does the licensee's analysis provide reasonable assurance that the shield building will perform its design function? Why or why not?

- a. If yes, does the shield building remain in conformance with all licensing and design basis requirements including required Codes and required safety margins? **Note that if the shield building is functional but nonconforming, then the licensee would be able to restart the plant, but would be expected to have a plan in place to restore conformance (additional analysis, repairs, or license amendment) at the next reasonable opportunity. (emphasis added)**

NRC's generous allowance to FENOC until "the next reasonable opportunity" to have a plan for restoring conformance is akin to the mid-1970s permissiveness (see Document B/1) which allowed Davis-Besse to commence operations, despite significant lingering questions about seismic risks. It makes a mockery of NRC's regulations, which should strictly require Davis-Besse to operate at all times under its original licensing and design bases.

Finally, NRC asked:

3. Has the licensee provided reasonable assurance that the shield building will remain capable of performing its design function **in the near and distant future (i.e. the condition will not worsen)?** Why or why not? If not, are we comfortable until the next refuel outage (May 2012) and why, and **what additional actions from the licensee, if any, do we think are necessary going forward? (emphasis added)**

On their face, NRC's questions show that these matters are aging related and unresolved, bolstering Intervenor's contention as worthy of a hearing on the merits.

Document B/13 [11/09/11; Email from P. Hernandez, NRR to R. Auluck, NRR et al. Re: Davis Besse Shield Building teleconference. (1 page)]:

In a classic example of the tail wagging the dog, NRC's Pete Hernandez wrote: "Though the licensee wants to button up this issue and plans to go to Mode 4 on Nov. 18th, please review the evaluations as thoroughly as possible."

This email's revelation that FENOC desired to begin to restart Davis-Besse on November 18, 2011 is significant. As reflected in Intervenor's original contention (January 10, 2012), about this very same time, NRC Region 3's tone in media coverage changed significantly – and inexplicably, at least to Intervenor and the public -- from one of questioning the root cause, extent of condition, and corrective actions necessary, to one that yielded to FENOC's right to decide when it wanted to restart Davis-Besse. In fact, just two weeks later, NRC approved Davis-Besse's restart, via the December 2, 2011 Confirmatory Action Letter.

Document B/15 [11/11/11; Email from J. Zimmerman, NRR to M. Evans, NRR re: DB shield building. (1 page)]:

This document reveals “alignment” at NRC Region 3 on the Davis-Besse shield building cracking issue, as well as a sense of urgency, as indicated by overtime work by NRC staff on the weekend (“We authorized them to work OT [overtime] (Saturday) to listen into that call.”). Based on the revelation in Document B/13 above, that FENOC desired commencing restart by 11/18/11, Intervenor is most concerned that a “tail wagging the dog” dynamic effectively pressured NRC to sign off on a hasty “rush to restart,” despite significant lingering safety questions and concerns not only related to current operations, but also aging management during the proposed license extension. Many of these questions and concerns have still not been resolved.

Document B/16 [11/12/11; Discussion points relayed to the licensee after our internal technical discussion (1 page)]:

The sense of urgency created by FENOC's desired rush to restart clearly pressured NRC Staff, as shown by NRC's and FENOC's conference call, unusually held on a weekend, Sunday, November 13, 2012.

NRC's significant, lingering concerns, its questioning of FENOC's illogical arguments, as well as its need to push back against FENOC's pressure to rush restart approval, are exemplified by NRC's statements "Current 12/12/11 (sic, 11/12/11?) completion as part of CR-2011-3346 is **not acceptable for justification for earlier restart,**" and "NRC needs this clear and concise report ["Compilation of calculations, testing, etc."] with sufficient time for review **prior to startup.**" **[emphasis added]** It is remarkable that NRC had to explicitly demand sufficient time for safety review prior to restart, begging the question, who had actual, ultimate restart authority, NRC or FENOC? Shouldn't that authority reside with the federal government's regulatory agency, charged with protecting public health and safety against nuclear risks? This bodes ill for NRC's safety and environmental enforcement vis a vis the proposed 20-year license extension, bolstering the worthiness of Intervenor's contention for a hearing on the merits.

NRC's "Technical concern," that "ACI [American Concrete Institute] 349.3R [is] not applicable to laminar cracking," confirms Intervenor's fear that Davis-Besse's cracking problem is unprecedented and unique. This uncharted territory is deserving of the most rigorous aging management program possible, especially given the proposal for a 20-year license extension. FENOC's efforts thus far fall far short of what is needed to ensure ongoing functionality of the shield building, especially under accident or disaster conditions.

NRC's "technical concerns" continued:

- b. 360° degree laminar crack does not address Prof. Darwin's concern that circumferential steel be located outside crack region to support the conclusion that "no mode change or operating restrictions" are required.
 - i. Were the professors aware of the 360° postulated laminar cracking in upper shield building?
 - ii. Appear Prof. Darwin stipulates cracking to be outside spliced region.

Given that cracking, and other shield building degradation and flaws, have been documented in areas of spliced rebar, NRC's expressed concerns are most significant.

Such concerns are elaborated further in NRC's "Technical Notes":

- a. Top of shield building – 360° around 20' down from the top
 - i. Challenges Prof. Darwin concern that rebar splices be outside cracked region
 - ii. No ACI standard for evaluation and no licensee structural evaluation
- b. Concern that sampling did not eliminate I.F. cracking at top of SB **(different undefined failure mechanism Then [sic] in the shoulder)**
- c. Outside shoulder area at top, what is the technical explanation of why the cracking is limited to the outer rebar mat and does not extend through the rebar mat thickness.
- d. Any splice in cracked regions require further evaluation – Prof. Darwin
 - i. Design calc – fully effective rebar, **unverified assumption (ACI 349.3R not applicable to laminar cracking) [emphasis added]**

As alleged by Intervenors in previous contention supplements, NRC has here confirmed that the cracking at the top of the shield building represents a "**different undefined failure mechanism [than] in the shoulder.**" This challenges FENOC's overly simplistic Blizzard of 1978 root cause explanation for the different kinds of cracking found across the shield building. In fact, if "I.F." stands for "Inner Face" of

rebar, that would deepen Intervenor's concerns. After all, the "Outer Face" of rebar has already been declared structurally dysfunctional by NRC and FENOC – although it took Rep. Kucinich's persistence to clearly communicate this basic, most safety- and environmentally-significant fact to the public.

Significantly, cracking at the "Top of shield building – 360° around 20' down from the top ... Challenges Prof. Darwin concern that rebar splices be outside cracked region," and there is "No ACI standard for evaluation and no licensee structural evaluation." The cracking is indeed most safety- and environmentally-significant, unique, and unprecedented, all reasons to hold a hearing on these matters.

Document B/18 [11/15/11; Email from P. Hernandez, NRR to J. Zimmerman, NRR on Draft email. (1 page)]

This document states "The licensee requested a delay of the public meeting to give them more time to finish the splice evaluation. The NRC accepted so that we would have time to review the documents before the meeting."

This coordination between FENOC and NRC regarding the timing of a public meeting on the shield building cracking is evidence of collusion that is disconcerting to Intervenor's. Neither Intervenor's, nor the public, had even been informed in any way that a public meeting would be held on the issue, and yet NRC agreed to FENOC's request to delay the yet-to-be-announced public meeting. Instead, Intervenor's were left to scramble for information about the cracking, in the 60-day time window allotted for contention submission based upon new information.

Intervenor's remain thankful to U.S. Representative Dennis Kucinich (D-OH), who on November 21, 2011 [see

<http://kucinich.house.gov/news/documentsingle.aspx?DocumentID=270017>

requested of then NRC Chairman Jaczko a public meeting in northern Ohio about the shield building cracking prior to Davis-Besse's restart. In the end, however, NRC suddenly, and inexplicably, approved restart with the issuance of its Confirmatory Action Letter (CAL) on December 2, 2011, despite unresolved questions of root cause, extent, safety significance, and corrective actions associated with the shield building cracking. FENOC then began restarting Davis-Besse immediately. The long-delayed public meeting was not held until January 5, 2012 – a month *after* Davis-Besse's restart. Intervenors incorporated revelations from the January 5th meeting into its cracking contention, and submitted it five short days later, on January 10, 2012.

Document B/19 [11/15/11; Email from P. Hernandez, NRR to M. Evans, NRR et al. RE: Updated Davis-Besse Containment Shield Building POP. (1 page)]

This document sheds more light on this lack of public accountability and transparency, and the collusion between NRC and FENOC. On November 15th, NRC's Michele Evans informed NRC's Pete Hernandez *et al.* that "a public meeting will be held tomorrow afternoon from 2pm – 6pm (eastern) in Region 3" regarding the "Updated Davis-Besse Containment Shield Building POP."

But then later that same day, Hernandez informed Evans *et al.* that the "public meeting" had been "postponed until Thursday [Nov. 17] ... so that the licensee has more time to finish their calculations of the rebar splices and so that we can review them beforehand. It was at the licensee's request that it was changed."

This begs the question, how "public" was this "public meeting"? Isn't NRC supposed to announce "public meetings" 10 days in advance, so that the public has

the opportunity to hear about it, and make preparations for attending? In this case, at most a mere one or two day's notice could have been given: after all, the meeting, apparently originally scheduled for Nov. 16th, was postponed on Nov. 15th till Nov. 17th, at FENOC's request. To the best of Intervenors' knowledge, absolutely no public notice of the meeting was given in advance.

Suffice it to say, no members of the public – including Intervenors, who are parties to the Davis-Besse license extension proceeding, and who have filed environmental as well as safety contentions unrelated to the issue of shield building cracking – even knew about the “public meeting” until long after it was over. It is telling to compare and contrast FENOC's ability to pressure NRC for “public meeting” postponements on short notice, as well as NRC's lack of public notice about such “public meetings,” with the very “strict by design” deadlines faced by Intervenors in this very proceeding. As NRC hurriedly checked a box on this “public meeting” in its rush to approve Davis-Besse's restart (a mere two weeks after this un-announced “public meeting”), Intervenors and the public were left in the dark; any pretense of openness and transparency were steamrolled. Especially considering the economic – NRC is a federal agency with a billion dollar annual budget and 4,000 staff persons; FENOC is a multi-billion dollar corporation, with thousands of executives, managers, employees, and contractors -- this is beyond unfair. It is unjust. In the end, Intervenors had to learn about a November 17, 2011 “public meeting” 8 months after it took place, through a FOIA request.

Document B/21 [11/16/11; Email from P. Hernandez, NRR to R. Auluck, NRR et al., on Davis Besse conf call. (1 page)]

This document reflects the complexity of the shield building cracking problem, as NRC staff reserved a conference room “for the rest of the day” in order to conduct a 7-hour-long conference call, from 10am to 5pm on November 16, 2011. This is significant, given Document B/15’s revelation that FENOC desired to commence restart as early as November 18, 2011. This day-long NRC Staff meeting took place just one day before the unannounced “public meeting” mentioned immediately above, and a mere two days before FENOC desired to commence restart operations.

Document B/22 [11/17/11; Email from P. Hernandez, NRR to E. Sanchez Santiago, RIII on Davis Besse Operability question. (1 page)] and Document B/24 [11/17/11; Email from P. Hernandez, NRR to M. Evans, NRR et al., on Davis Besse Operability question. (2 pages)]

This document provides important insight into NRC Staff members’ struggle to understand the regulatory and legal basis (or lack thereof) for allowing Davis-Besse to continue operating, given its severely cracked shield building. (Comparing Document B/24 [11/17/11; Email from P. Hernandez, NRR to M. Evans, NRR et al., on Davis Besse Operability question. (2 pages)] to B/22, it appears to Intervenor that the former was the final version, while the latter was a draft.)

NRC’s Pete Hernandez wrote:

I understand that the question of Operability vs design basis was posed and that if the SB issue is in operations space, are qualitative evaluations the extent of review required by the licensee?

To answer that, the distinction between Operability and Functionality needs to be understood. The most clear way I’ve had it explained is that the determination of Operability is tied to the Tech Specs for the specific plant. If the Tech Specs are met, then it is operable. (An operability determination is usually prompted by degraded conditions, nonconforming conditions or the discovery of an

unanalyzed condition.) Functionality is tied to the design bases documented in the FSAR [Final Safety Analysis Report] and thereby tied to the Current Licensing Basis.

From IMC9900

“If an SSC [System, Structure, or Component] described in the TSs [Tech Specs] is determined to be operable even though a degraded or nonconforming condition is present, the SSC is considered “operable but degraded or nonconforming.” An SSC that is determined to be operable but degraded or nonconforming is considered to be in compliance with its TS LCO [Limiting Condition for Operation, defined at NRC’s website Glossary as “The section of Technical Specifications that identifies the lowest functional capability or performance level of equipment required for safe operation of the facility.”] and the operability determination is the basis for continued operation. **The basis for continued operation should be frequently and regularly reviewed until corrective actions are successfully completed.**” (emphasis added)

The licensee decided to not enter into an Operable but Degraded or Nonconforming determination and that the cracking issue is a design basis question hence functionality. [this section was denoted by a hand written bracket by someone at NRC]

Speculating: The cracks in the building qualify as an unanalyzed condition so for the licensee to Operate with a degraded or nonconforming condition, they would have to develop a plan to fix the issue through their CA [Corrective Action] process. However, the licensee has stated that the SB is Operable as is, so there is nothing to fix. This still leaves the issue of the cracks unresolved so they are trying to prove that the cracks do not affect the functionality of the building. This led them to the design basis evaluations.

It is evident from NRC’s internal wrestling match that not only FENOC, but also the regulatory agency itself, were walking a regulatory tightrope, or threading the needle, in their efforts to justify a rushed restart at Davis-Besse. But rush the restart they did: NRC granted its approval via a Confirmatory Action Letter (CAL) just two weeks after this email was written, and FENOC began restarting Davis-Besse immediately.

However, playing fast and loose with “operable” versus “functional,” or “operability” versus “design basis,” nonetheless leaves the shield building at risk of not working when required, especially with age-related worsening of cracking over the proposed 20 year license extension.

As NRC’s Hernandez said, **“The basis for continued operation should be frequently and regularly reviewed until corrective actions are successfully completed.”** Of course, few if any corrective actions were “successfully completed” between this November 17, 2011 email, and Davis-Besse’s restart. But the corrective action schedule leading up to, and during, the proposed 2017-2037 license extension period also leaves a lot to be desired. FENOC’s Aging Management Plan for shield building cracking includes only infrequent and irregular reviews of the basis for continued operation. In fact, apart from than applying weather sealant 40 years late, there are no corrective actions planned by FENOC. Impulse Response monitoring tests and bore hole sampling are very few and far between under the proposed FENOC AMP.

NRC’s woefully inadequate requirements for quantitative support for FENOC’s largely qualitative arguments fall far short of what should be required, given the safety significance of the shield building cracking.

Most likely, FENOC’s assertion that the shield building is “operational and conforming” was made in order to avoid not only the stigma, but also the added regulatory burden, of admitting it was “operable but *nonconforming*.” This would have required, in Hernandez’ words, FENOC “to have in place a plan to restore

conformance at the next reasonable opportunity,” although NRC would hurriedly bless operating the reactor in the meantime.

(At NRC’s special public meeting on Davis-Besse’s shield building cracking held in Oak Harbor High School in Oak Harbor, Ohio on August 9, 2012, under pointed questioning by Intervenors, an NRC Staff member admitted that merely a “plan for a plan” is being required of FENOC to restore conformance to Davis-Besse’s design and licensing bases, given the shield building’s severe cracking. The deadline is a generous December 2012. Intervenors should be allowed to scrutinize the safety and environmental implications of this “plan for a plan” for Davis-Besse’s 2017 to 2037 extended operations, in a hearing on the merits of this contention.)

Hernandez’ concluding paragraph on page 1 of Document B/24 shows how NRC is allowing FENOC to show either “functionality” or “operability,” whichever is easier, for the applicant for a 20 year license extension at the problem-plagued Davis-Besse atomic reactor:

Currently they’ve given us a qualitative analysis to support their position that the shield building is functional and fully conforming. For NRC to accept and agree, which would mean no additional actions would be necessary to restore conformance, the licensee must provide reasonable assurance to show **operability or functionality** and provide a logical, supported basis that allows our technical reviewers to reasonably reach the same conclusion. In this case, **the qualitative arguments did not provide the logical, supported basis for our technical reviewers to reach the operability conclusion. So we asked them if they could provide additional assurance by in some way quantifying their analysis based upon good engineering principles. (emphasis added)**

As Intervenors asserted in a recent contention supplement, FENOC must be alternately coddled and/or pressured to address the significant safety risks of shield building cracking. And the teacher (NRC) helps the student (FENOC), over and over

again, to pass the test. Again, at the August 9, 2012 Oak Harbor High School public meeting cited above, NRC Staff bragged about how closely it had worked with FENOC to address the shield building cracking problem. In fact, this collaboration may be inappropriately close – NRC is repeatedly helping a nuclear utility licensee meet its standards. This raises the specter that unless NRC is constantly looking over FENOC’s shoulder, safety and environmental regulations will be violated.

FENOC tried to get off easy, but NRC’s questioning unraveled the utility’s illogical arguments. Even FENOC’s own academic expert “informed the licensee that with the assumptions they are making, no credit for the rebar impacted by the cracks is warranted. In light of this, the licensee has started to do more mapping and core bores to better analyze the SB.” Although this loss of outer rebar layer function was clearly articulated in this November 17, 2011 internal NRC email, it was not until U.S. Rep. Kucinich issued a press release on February 8, 2012 that the significance of the loss of function of the outer rebar layer due to the shield building cracking was clearly explained to Intervenor, and the general public at risk. Intervenor utilized Rep. Kucinich’s revelation to submit a contention supplement on February 27, 2012.

Despite these admissions by NRC and FENOC, that the outer rebar layer is dysfunctional, FENOC executives inexplicably expressed “confidence” in it at Davis-Besse in the August 9, 2012 Oak Harbor High School public meeting. So FENOC persists in spinning the cracking as non-structural, over six months after that lie was publicly exposed. Amazingly, NRC Staff did not contradict or challenge FENOC’s

renewed expressions of “confidence” in Davis-Besse’s outer rebar layer, although Rep. Kucinich was in attendance, and set the record straight, yet again.

Document B/23 [11/17/11; Davis-Besse Containment System Primary Steel Containment and Shield Building. (1 page)]

This document reveals numerous internal NRC contradictions. For example, Document B/23 lists Davis-Besse’s steel containment vessel as 2.5 inches thick. But Document B/4 reports the thickness as 1.5 inches, which appears to be the correct figure, given the countless times NRC, and even FENOC, cite it. Given the significant risks of shield building cracking for radiological containment, and the late date of this document (over five weeks after sub-surface laminar cracking was first announced; just a couple weeks prior to NRC CAL approval and FENOC restart), it is disconcerting that such a significant error could occur in a decision-making document.

Document B/23 contains another significant discrepancy. It reports a 4.5’ annulus between the inner steel containment vessel and the outer shield building. But Document B/4 lists a 4’ wide annulus. Such a discrepancy introduces confusion, at best, to safety decision-making, and such license extension significant issues as SAMA calculations, given the role of the severely cracked shield building “to ensure that anything [radioactivity] leaking, post-accident, from the steel vessel, is swept and filtered prior to release to the environment.” Davis-Besse’s radiological containment (which includes both the inner steel containment vessel and the outer shield building) must also withstand the internal buildup of heat, steam, and pressure under accident conditions. Use of the correct figure for annulus width (and hence volume) is critical to these safety significant calculations and analyses.

This document also claims “The shield building was designed to withstand forces generated by design bases seismic events,” but this assertion is challenged, if not outright undermined, by Document B/1’s revelations.

Intervenors cite NRC’s admission, “The existing as-found condition of cracking in the concrete of the shield building has raised questions on the ability of the structure to maintain its ability to perform its design functions under conditions that would introduce active forces (such as a seismic event or potentially rapid changes in the environmental conditions),” as supportive of its call for a hearing on the merits of these issues.

Document B/25 [11/21/11 (date barely visible on actual document, due to it being printed on top of NRC’s letterhead); Davis-Besse Nuclear Power Station Containment Shield Building Issue. (8 pages)]:

On page 1 of this document, at footnote 1, NRC states “The steel containment is a separate structure approximately 5 feet inside the SB...”. But the shield building annulus is actually 4.5 feet wide, as reported in Document B/23 (and many other places, such as NRC Region 3’s press release on December 2, 2011, announcing the CAL reactor restart approval, so presumably 4.5 feet is the correct figure). But Document B/4 reports the annulus as 4 feet wide. In addition to the confusion created by variously listing the shield building annulus as 4, 4.5, and 5 feet wide, Intervenors point out that claiming a 5 foot width when reality it is merely 4.5 feet wide significantly exaggerates the shield building’s ostensible strength by increasing the volume for withstanding buildup of heat and pressure as from a reactor disaster combined with a steel containment vessel breach.

Document B/25 is described as “Davis-Besse Nuclear Power Station Containment Shield Building Issue, To inform NRR senior management of situation at Davis-Besse with the Containment Shield Building cracks identified, and licensee response.” Reporting to senior decisionmakers a 6-inch overestimate of the actual value for the annulus width is a significant non-conservatism, *vis-a-vis* the shield building’s ability to withstand heat and pressure build up during an accident, for example. Given the safety-significance of the cracking, such an overly optimistic inaccuracy is unacceptable.

NRC admitted, under “Background”:

(#1) Extensive cracking in the shoulder region, **(#2) Cracking in the structural region** outside the flute shoulder region near the main steam piping penetrations, **(#3) Cracking indications via Impact [sic, Impulse] Response (IR) mapping in the cylindrical portion of the building near the top of the building at the interface between the domed roof and the cylindrical wall.** Items 2 and 3 are being evaluated separately. IR mapping and core boring continues as the licensee evaluates the top 20’ of the building.”

As U.S. Rep. Kucinich has repeatedly made clear for many months now, the cracking at Davis-Besse is **structural**, despite FENOC’s and NRC’s downplaying to the contrary, utilizing various “non-structural” euphemisms (such as “architectural” or “decorative”).

Despite NRC’s assertion, it does not seem that #2 and #3, above, have actually been dealt with separately by FENOC. It seems #1, #2, and #3 have all been lumped together, and supposedly explained by the Blizzard of 1978 root cause theory, even though NRC has posed serious questions about that, as revealed in the revised Performance Improvement International (PII) root cause assessment report. There, the NRC listed 27 areas of questioning which formed the basis of Intervenor’s

fourth contention supplement, submitted on July 23, 2012. As NRC itself has asked, how could the Blizzard of 1978 explain three significantly different forms of cracking, located at widely different areas of the shield building? In addition, as raised by Intervenors in a previous contention supplement, shield building cracking at the dome parapet was documented (although concealed from the public for 36 more years) in 1976 – before the Blizzard of 1978!

Under “NRC Questions,” the agency Staff asks:

Has the licensee provided reasonable assurance that the SB will remain capable of performing its design function in the near and distant future (i.e. the condition will not worsen)? Why or why not?

As acknowledged by NRC itself, these matters are aging related, and deserve to be addressed in a hearing on the merits.

NRC concludes: “They have submitted a plan, but we have raised the question of whether or not we need to approve the plan.” Disconcertingly, the agency charged with protecting public health and safety and the environment against radiological risks at Davis-Besse is not even clear about whether or not it needs to approve FENOC’s plan for aging management of the critical safety and environmental functions of the shield building. This underscores the need to convene a hearing on the merits, because NRC responsibilities are evidently being assumed by the NRC.

On page 2 of Document B/25, NRC Staff again mistakenly reports to NRR senior management that the steel containment vessel is 2.5 inches thick on the sides.

Also regarding the steel containment vessel, NRC assures it would “limit the release of radionuclides that might exist outside the reactor system after an accident to a very small percentage of the total volume of the steel vessel.” But “a very small percentage” of such a catastrophic quantity of hazardous radioactivity would still represent a disastrous radioactivity release within the shield building. If the shield building were to fail due to its cracking, this catastrophic radioactivity release could escape into the environment, to cause widespread harm downwind, downstream, up the food chain, and down the generations.

Confusing matters, on page 2, a 4.5 foot wide annulus (presumably the correct figure) is mentioned – contradicted just one page earlier, where a 5 foot wide annulus is reported in footnote 1. Did NRR senior management not notice the contradiction? Why was the mistake not corrected?

NRC reports that the shield building is supposed to contain radioactivity, so that it can be “swept and filtered” before release to the environment. But there is legitimate concern that the cracks in the shield building might allow direct leakage to the environment before “sweeping and filtering” can be carried out. FENOC’s February 28, 2012 root cause report documents cracking that penetrates the shield building nearly one-half of its thickness (depending on whether the crack is located at a thicker shoulder, or on the main body of the side wall) through its wall thickness (in some cases, nearly 16 inches deep). If the shield building fails, as questioned by NRC’s Pete Hernandez above, and NRC’s Abdul Sheikh below, it appears to be an open question how much hazardous radioactivity might escape into the environment.

In this sense, the shield building cracking is also SAMA-related, for FENOC's Severe Accident Mitigation Alternatives analyses undoubtedly assumed an intact and functional shield building, not the severely cracked one of doubtful functionality that exists in reality. In fact, NRC concludes page 2 by acknowledging this:

The existing as-found condition of cracking in the concrete of the shield building has raised questions on the ability of the structure to maintain its ability to perform its design functions under conditions that would introduce active forces in the structure (such as a seismic event or potentially rapid changes in environmental conditions).

On page 3 of B/25, NRC accepts, at face value, FENOC's presentation of Drs. Darwin and Sozen's judgments. But Darwin and Sozen are working as experts for FENOC (and presumably being paid for their service). In addition, NRC itself, not just FENOC, opposes Intervenor's cracking contention. In these circumstances, the noticeable lack of truly independent, unbiased peer review of Darwin's and Sozen's testimony as well as the rest of FENOC's revised root cause analysis report, and their conclusions about extent of cracking, its safety and environmental significance, and the corrective actions that may be needed, emphasizes material disputes with the license application.

Dr. Darwin is quoted: "Thus, if the splices in the circumferential steel are located outside of the crack region, I agree with and support the conclusion..." But NRC itself (as in Document B/16, above) confirmed rebar splices are located *inside* the crack region: cracking at the "Top of shield building – 360° around 20' down from the top ... Challenges Prof. Darwin concern that rebar splices be outside cracked region."

Dr. Darwin is also quoted: “they [the lap splices in the laminar crack region] are currently carrying the normal environmental loading (such as seasonal thermal gradient) and have since the structure was constructed.” In other words, since the building is still standing, it must be strong enough to handle relatively normal circumstances. But given the severe cracking, can the shield building withstand added stresses, such as due to natural disasters (earthquakes, tornadoes, tornado missiles, etc.) or a reactor accident?

From page 4 to page 5 of B/25, FENOC responded to NRC questioning, that “Although Drs. Darwin and Sozen both indicated that the capacity of reinforcement steel after it is cracked is still in the range of 20 to 30 percent, **since it is not quantifiable based on current industry knowledge, we conservatively assume it can carry no load under design basis conditions.**” As previously mentioned, although NRC NRR senior management was provided this clear understanding on 11/21/11, that outer rebar layer function had been lost due to the cracking, the public and Intervenors were not so informed until U.S. Rep. Kucinich’s press announcement on February 8, 2012. FENOC’s response also indicates that much is still not understood about the shield building cracking.

In Paragraph 2 on page 5, FENOC responds to NRC questioning:

Lap splices entirely within the crack zone are conservatively assumed to give way and fail to transfer load. In a large concrete structure the reinforcement steel and concrete act in a membrane fashion. If a local lap splice is ineffective the load will transfer to the adjacent load carrying members. Local structural failures would only exist if a large number of lap splices were to line up in the same crack area. The horizontal reinforcement bars in the shield building were well staggered to preclude this very issue.

This is an entirely qualitative argument – and a very optimistic one at that -- not backed up by empirical data. Intervenors seek a more rigorous, conservative analysis, such as might occur via a hearing on the merits.

Page 5, paragraph 3 carries forth in the same qualitative manner. No empirical data is provided to ensure that cracks will not line up in a catastrophic way. Although FENOC and its experts assure us that the risk is low, no probability figure is actually given for the risk of a shield building failure with potentially catastrophic consequences.

Page 5, paragraph 4 of FENOC's response states:

Since the reinforcement steel development specified staggered bar splices and the reinforcement steel is lightly loaded, Dr. Darwin suggested that the development could be evaluated on a percentage basis. That is, if the loading in the section is one third of the allowable, then at least one third of the section must contain solid (uncracked) regions to fully utilize the reinforcement steel.

To Intervenors, such an overly simplistic analysis, based on unsupported assumptions, is a very risky basis for reasonable assurance of shield building function for the next quarter century (2012 to 2037).

FENOC goes on to state in the fifth paragraph on page 5, "Conservative assumptions have been made to limit the extremely difficult data collection efforts." Intervenors are concerned that, due to the expense and time required to undertake such "extremely difficult data collection efforts," FENOC's assumptions are not conservative, and its data collection efforts (IR testing, core bore sampling) are too few and far between, both spatially across the shield building structure, but also temporally (testing is much too infrequent under FENOC's AMP) over months, years, and even decades.

Under “3)” on page 5, NRC asks: “How will your extent of Shield Building mapping demonstrate that you have sufficient uncracked concrete if the entire area is not mapped? If the entire shield building is not mapped what is the justification to extrapolate to other areas of the building?”

FENOC responded “Dr. Darwin ... stated that we needed to estimate the percent of cover and that there was no need to inspect every square inch of concrete.” Intervenors assert that assumptions, estimates, and educated guesses are a poor basis for ensuring shield building function from now till 2037, and expense, time, and difficulty are poor excuses for not collecting sufficient empirical data, given the potentially catastrophic consequences of shield building failure.

On page 6 of B/25, NRC quotes FENOC as stating “There is no evidence to support that the cracking is present generally in the remainder of the shield building shell regions.” But it appears that FENOC did not explore beyond “the shoulder regions, the small areas at the end of the shoulders near the blockouts for the Main Steam Lines, and near the spring line of the building”, and the NRC has not required such an investigation. FENOC asserts “Additional exploration is being performed to determine the extent of the cracking near the spring line of the building. Accessible areas are being IR tested and confirmed with core bores.” The results, if any, have not been communicated to Intervenors or the public. The same is true of inaccessible areas. It is curious that the NRC did not require investigation of less-accessible areas, as well as whole sections of the shield building that FENOC simply assumes are not cracked, given the safety and environmental risks.

On page 6 at “4)”, even though NRC requests that FENOC “Confirm that both vertical and horizontal rebar if located in a crack region are not considered in the strength evaluation,” FENOC nonetheless responds by assuming that half of the outside hoop reinforcement is effective, even though it has not investigated to make sure that cracking in those areas has not rendered outside hoop reinforcement completely ineffective.

In the second paragraph under “4)”, FENOC explicitly states that the only places on the shield building where zero credit is taken for vertical reinforcement credit is at the flute shoulders and main steam penetrations. But this does not account for the cracked upper 20 feet of the shield building and the large uninvestigated portions of the remainder of it. Under the circumstances, FENOC should be made to empirically verify that the portions of the shield building being counted on to maintain safety margins are, in reality, still solid.

FENOC’s statement, “Note that the vertical and hoop reinforcement is actually present and sufficiently bonded and will provide the necessary serviceability requirements such as crack control as it has under normal operating conditions since the structure was built,” appears to assume, inappropriately, that the cracks will not grow worse over time. That question and concern, and the risks it raises, are at the very heart of Intervenor’s contention, as supplemented. Not only does the “It-Must-Still-Be-Functional-Because-It-Hasn’t-Failed-Yet” approach fail to account for worsening cracking over time from 2012 to 2037, but it also fails to address the impact of added stresses on the severely cracked shield building, such as natural disasters, reactor accident conditions, daily/seasonal/annual thermal

cycles, and freeze/thaw cycles. These are aging-related concerns and disputes with the application.

On page 7, under “5)”, NRC requests that FENOC “Ensure that the required rebar bond strength will carry the entire design load (18.5 ksi) plus adjacent load from adjacent rebar in cracked area. FENOC responds that 12.4 ksi loads due to normal circumstances have been supported since the shield building was constructed, so the shield building is proven capable of withstanding at least that much stress. But:

...The Table also shows that a maximum stress of 21.7 ksi is expected in this reinforcement under combined dead, seismic and thermal load and 13.7 ksi for dead, wind and normal thermal load. 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 to be 12.4 ksi), **the reinforcement is assumed to detach itself from the outer section of the shell.** Because there is no restraint provided by the reinforcement, the accident thermal gradient will tend to self relieve, albeit trying to cause an increase in the crack width until the section finds a new balance. (emphasis added)

Such an admission, that additional stress could “increase ... the crack width,” is an admission of age-related degradation potential. It is also evidence that a strong enough stress could even “fail” the shield building, at least to the extent that the rebar will detach from the outer section of the concrete shell. The risk of such a failure would grow more likely, even under small additional stresses, if cracking worsens over time, such as during the license extension.

FENOC attempts to explain why a crack could not go through-wall: “Because of the rigidity of the shell and compression on the inside face due to a moment gradient, it is impossible to develop a through thickness crack in a localized region.”

This appears to be a very optimistic assumption which, in fact, is presented as a solely qualitative argument, with little to no empirical data provided for support, especially considering the admission in the February 28, 2012 root cause report that cracking already extends nearly halfway to a third of the way through the shield building wall in certain locations (15 inches deep or more), as documented by core bore sampling. A through-wall breach of the shield building would defeat its vital safety and environmental function of containing radioactivity, so that it can be “swept and filtered,” before release to the environment during reactor accident conditions and steel containment vessel failure.

At the bottom of page 6/top of page 7, FENOC admits: “However, one region [of cracking] has been identified which is longer than the reinforcement steel. The following is offered to support the soundness of using percentages in development even in significantly cracked areas.” But what actually follows is, yet again, mostly qualitative argument, with only the most basic quantitative support, and little actual data. FENOC’s conclusion on page 8, that “there is significant margin ... to carry this additional load to keep the cracks tight and provide the required shielding and allow the shield building to perform its intended safety function” appears based on overly-optimistic assumptions, the removal of any one of which could bring the entire house of cards tumbling down, both literally and figuratively. FENOC appears to be *hoping* cracks will not widen over time, even to the point of breaching the shield building through-wall. But overly optimistic assumptions and mere hope are poor foundations upon which to base a 20-year license extension at a historically

problem-plagued atomic reactor with this unprecedented and unique problem of a severely cracked shield building.

Document B/26 [11/22/11; Email from A. Sheikh, NRR to E. Sanchez Santiago, RIII on Questions for the Conference Call. (1 page)]:

This document calls the very structural integrity of the shield building into question. As this email was written just two weeks before Davis-Besse was actually restarted, it seems that most or all of these serious questions were not answered before restart. But most of these questions remain unanswered even now, and are of significant concern related to the proposed 20-year license extension.

NRC's Abdul Sheikh asks at "1.", "What is the actual condition of the concrete 20 feet below the spring line based on field verification"? It's incredible that a clear understanding of "the actual condition" of an area of the shield building, admitted by FENOC to be severely cracked, was still lacking this late in the decision making process prior to restart, and bolsters Intervenor's call for comprehensive testing of the entire shield building.

At "2.", Sheikh wrote:

...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. (emphasis added)**

Intervenors are most concerned that, despite an NRC NRR inspector warning that "only 3-4 inches of the concrete on the inside face can be used in the structural

analysis,” and “I am concerned that the concrete will fail in this region due to bending in this region even under small loads,” Davis-Besse was allowed to restart with so many questions unanswered (in fact, as will be shown below, Abdul Sheikh himself was still deployed on-site at Davis-Besse, reviewing safety-related calculations and presumably checking out those very field conditions he asked about above, when the December 2, 2011 CAL was issued, approving rushed reactor restart). However, the concerns identified by Sheikh certainly also extend to the 2017- 2037 license extension period. If instead of a 2.5 foot thick concrete shield building, all that can be counted on in terms of structural integrity is the inner rebar layer, and a mere 3 to 4 inches of concrete on the inside face of the structure, will the resulting “shield” be thick enough to withstand environmental threats, such as tornados, tornado missiles, or earthquakes? Is it enough to withstand the forces of a reactor accident which get past the inner steel containment vessel? How small a load is nonetheless big enough to “fail” the concrete “due to bending” a full 90% (27 of 30 inches) through the shield building side wall, as Sheikh warns?

At “3.”, Sheikh seems to identify problems with FENOC’s work regarding the “lap splice issue.” This is most significant, for FENOC’s own expert, Dr. Darwin, emphasized the importance of lap splice regions, pointing out that his endorsement of FENOC’s hypotheses only holds so long as the cracking does not exist in lap splice regions. At “4.”, Sheikh identifies a related disconnect, stating: “If this is the assumption, stress used for lap splice calculation should account for 100% increase in the stress.”

At “5.”, Sheikh wrote: “The licensee justification for ignoring the dead (DL) and normal (To) in calculation of rebars splice does not appear to be justified. The stresses due to dead load and thermal loads will be locked in the rebars and cannot be ignored.” Given that Sheikh had already warned of his concern that even “small loads” could cause concrete failure “due to bending,” and Dr. Darwin’s warning on the significance of lap splice regions, Intervenors are most concerned about FENOC unjustifiably ignoring *any* stresses on the shield building in its analyses and calculations.

Similar concerns are elaborated in Sheikh’s point “6.”: “The licensee considers the allowable stress in the rebar to be 60 ksi and ignores a phi factor (0.9) in his evaluation for lap splice. In addition, the licensee has not accounted for any additional uncertainty due the field conditions.” Per Sheikh’s concerns, it is imperative that there be a full account of all such phi factors and uncertainties due to the field conditions.

Sheikh’s point “7.” identifies yet another FENOC disconnect: “I am not aware of any pull tests carried out with a crack in the plane of the rebar. Can the licensee provide any documentation for this statement.” Intervenors are not aware of an answer yet to this question.

And Sheikh’s point “8.” states: “The licensee is using numerous assumptions in his summary report and calculations that are not described in the UFSAR and ACI 318-63, and still calls it a design basis calculation. Can the licensee provide justification for this approach.” Intervenors share Mr. Sheikh’s concern that FENOC’s

analysis is incomplete at best, and believe that they deserve answers to these questions at hearing.

Documents B/27 [11/23/11; Email from A. Howe, NRR to S. West, RIII et al. on Where do we stand on Davis Besse? (1 page)] and B/28 [11/23/11; Email from A. Howe, NRR to M. Evans, NRR et al., on Call with Steve West on Davis Besse. (1 page)]

Documents B/27 and B/28 show the increasing pressure on NRC to rush the approval of FENOC's restart of Davis-Besse, despite the deepening complexity of the questions and concerns swirling around the shield building cracking. Wednesday, November 23, 2011 was the day before Thanksgiving, a federal holiday. It was also just nine calendar days (including the holiday, and the holiday weekend) before NRC issued its December 2nd Confirmatory Action Letter blessing Davis-Besse's restart, which FENOC began immediately, and completed just four days later, on December 6th.

B/27, an email marked "Importance: High," was sent just before 1 p.m. on November 23. It revealed that the Office of the Executive Director of Operations Staff had "stopped by and asked ... Where do we stand on Davis Besse?"

B/28, written at 7:31 p.m. that evening, gives the requested update, stating that "RIII [NRC Region 3] senior management is engaged and has had several interactions with OEDO [Office of the Executive Director of Operations]." "1." reveals that NRC had to make certain that FENOC understood that NRC's review of the shield building cracking was ongoing, that review would take time given the deepening complexity of the cracking, and that NRC had not yet approved restart. It is disconcerting that – "tail wag the dog" style -- FENOC had to be reminded that

NRC must approve restart approval, and that such approval requires review, which takes time.

The second point reveals: “The technical review by NRC staff in RIII and NRR continues. Over the course of the past several days the licensee has changed its approach for evaluating/analyzing the observed cracking in the shield building. The changes are driven by **identification of additional cracking, challenges/feed-back from NRC staff, and from ongoing engineering assessments by the licensee (sic, licensee) and its consultants. The changing nature of the licensee’s approach has added time and complexity to the review.**” (emphasis added).

Intervenors note that their previous three supplements to this contention are based on revelations of new information contained in FENOC’s April 4 AMP, FENOC’s revised root cause analysis report (May 16), as well as PII’s revised root cause assessment report (docketed at ADAMS on May 24). The publication of each of these was directly related to “identification of additional cracking, challenges/feed-back from NRC staff, and from ongoing engineering assessments by the [licensee] and its consultants.” It is only now, thanks to FOIA Response Number 1/Appendix B, that Intervenors can begin to unravel the chronology of the decision-making process, carried out behind closed doors by NRC and FENOC, regarding the shield building cracking investigation of root cause, extent of condition, safety and environmental significance, and corrective actions; the rushed reactor restart; and prospective plans addressing the cracking in the 2017-2037 timeframe. Given “the changing nature of the licensee’s approach,” and the “complexity” of the analytical

review, Intervenors seek a hearing to best illuminate matters in the context of the license extension.

At “3.” and “4.”, it is revealed that “Technical staff has several questions related to the current information we have on the structural calculations,” and “Staff from RIII and NRR will conduct a conference call on Friday [Nov. 25] to discuss the status of the technical review. RIII (Steve West) will lead the call with the focus on identifying the appropriate issues/questions/conclusions to facilitate passing them on to the licensee.” This important conference call, a day after Thanksgiving, amidst a long holiday weekend, highlights the rush to reactor restart approval.

“5.” is NRC’s first mention of the draft CAL known to Intervenors. It was suddenly finalized and issued, much to the surprise and consternation of Intervenors and the public, on December 2nd. Intervenors note that this was the same time period during which NRC Region 3’s Office of Public Affairs spokespeople changed their messaging regarding Davis-Besse’s shield building cracking. Before, they had assured the media and public that NRC’s questions about root cause, extent of condition, safety and environmental significance, and corrective actions must be answered before reactor restart would be authorized. But shortly before Thanksgiving, NRC Region 3’s message changed to one of restart timing being FENOC’s decision to make. NRC’s shift in attitude has yet to be explained.

Under “6.”, NRC is already aware that Davis-Besse’s restart would likely occur prior to a public meeting on the shield building cracking requested by U.S. Rep. Kucinich. However, Rep. Kucinich had requested that the public meeting take place *prior* to restart.

Document B/29 [11/23/11; Email from J. Zimmerman, NRR to D. Hills, RIII on NSLAOrdersCommPlan.wpd. (5 pages)]:

Document B/29 is most puzzling. It is a “Communications Plan” regarding “Notice of Significant Licensing Action (NSLA) and Orders for Licensees associated with Bulletin 2001-01, Circumferential Cracking of Reactor Pressure Vessel Head Penetration Nozzles, dated August 3, 2001.” It is noteworthy that Jacob Zimmerman of NRR, who sent this email and its attachment to David Hills at RIII, is identified in the “Communications Plan” as NRR, Bulletin 2001-01 Lead Project Manager for the project that occurred over a decade earlier. That project also involved cracking - the cracking that allowed the boric acid to leak out of the reactor core and corrode through nearly seven inches of carbon steel on the Davis-Besse reactor lid, a near-disaster not revealed to the world until nearly seven months after this “Communications Plan” was published. Often dubbed the Hole-in-the-Head Fiasco, this fiasco at Davis-Besse was the most serious nuclear incident since the Three Mile Island meltdown of 1979, resulted in the largest fine in NRC history (\$33.5 million, levied against FENOC), as well as \$600 million in repairs (including a reactor lid replacement which necessitated a breach of the shield building) and replacement power expenses associated with the two-year safety shutdown.

Intervenors assume that B/29 tends to show that Davis-Besse’s 2011 shield building cracking discovery is the most significant safety and environmental scandal to beset FENOC since the 2002 Hole-in-the-Head Fiasco, hence NRC’s refresher on the earlier “Communications Plan.” Such a significant issue, which will extend into,

and may grow worse during, the 2017-2037 extended operations license period, is deserving of a hearing on the safety and environmental risks.

Document B/30 [11/27/11; Email from J. Zimmerman, NRR to M. Evans, NRR Re: Davis-Besse Draft CAL. (2 pages)]

This document again reveals the pressure of the rushed reactor restart approval. B/30 reveals not only that emails and individual phone calls were actively exchanged between NRC Staff on the Saturday and Sunday of Thanksgiving weekend (including during evening hours), but also that NRC Region 3 inspectors were sent to Davis-Besse to review calculations and analyses, and that a NRC internal conference call attended by multiple staff persons took place, as well as a conference call between Region 3 and FENOC management.

NRC's Jacob Zimmerman wrote: "FENOC has relied significantly on engineering judgment throughout much of the issue. This has been appropriately challenged by NRC staff to ensure FENOC's assumptions are reasonable and include an appropriate basis to support them. In several cases this has caused FENOC to rethink their approach and provide additional documentation with sufficient detail to support their engineering judgment." This admission bolsters Intervenor's previous assertions that FENOC's arguments are largely qualitative, lacking empirical support. If such support exists, Intervenor has yet to obtain it, perhaps due to the long delay in receiving a complete FOIA response from NRC.

Zimmerman continued: "... more work remains for FENOC. Most notably, FENOC needs to provide updates to two calculations previously submitted to NRC for review. The current schedule would have the calcs submitted to NRC this Wed.-Thurs." Intervenor notes that those dates are Nov. 30-Dec. 1 – that is, as little as one

day before NRC issued the CAL allowing restart. In fact, much of this internal NRC communication during the holiday weekend following Thanksgiving involved rushed coordination to finalize the CAL, despite the lingering, unanswered, complex, safety- and environmentally-significant questions and concerns related to the shield building cracking.

Document B/31 [11/28/11; Email from B. Lehman, NRR to S. CuadradoDeJesus, NRR RE: Shield building discussion with Melanie next week. (1 page)]

This email exchange reveals that NRC Office of General Counsel (OGC) attorney Brian Harris, who has led OGC's opposition to our intervention and contentions in this proceeding, requested to participate in a conference call involving NRC Staff from NRR (Division of Nuclear Reactor Regulation), DLR (Division of License Renewal, a sub-division of NRR), and perhaps other NRC staff subdivisions.

Bryce Lehman of NRR asked Samuel Cuadrado de Jesus of DLR if this was even appropriate: "please discuss with Dennis, Stacie or Melanie to *make sure it is ok if OGC is on the phone*. Melanie may prefer if this initial brief is internal to the division." (emphasis added)

Not only NRC NRR Staff, but also Intervenors, wonder why NRC counsel was so interested in this issue on November 28, 2011, in light of the collusory appearance of the restart. Intervenors by that time were tracking the shield building cracking issue closely. It took Intervenors filing a FOIA request – after the Acting Region 3 Administrator refused to provide decision-making documents at the January 5, 2012 Camp Perry meeting – to even learn the facts of the rush to restart. Then, it took NRC over six months to provide even the first FOIA response (Response

Number 1), including Document B/31. In fact, NRC's FOIA response is still, to this day, acknowledged as only partial ("We are continuing to process your request").

Document B/32 [12/01/11; Email from R. Haskell, NRR on New OpE Forum Posting (sic): Davis Besse – Cracks Discovered in Shield Building During Reactor Vessel Head Replacement. (1 page)]:

This email, written by Russell Haskell of NRC NRR, clearly labeled "not intended for distribution outside the agency," was sent to numerous NRC "communities." It reports that "Davis Besse remains shutdown in MODE 5. Agency technical reviewers continue to evaluate licensee's structural calculations." But Intervenor note that NRC issued its CAL *one day later*, on December 2nd, authorizing reactor restart. Full power operations at Davis-Besse were achieved just four days later, on December 6th.

No explanation is given by this NRC FOIA response as to how the deepening complexity of questions and concerns about Davis-Besse's shield building cracking could be resolved so quickly, in mere days or even hours, allowing NRC to confidently assure safety and authorize restart so quickly. As shown by NRC's allowing FENOC until February 28, 2012 to submit its root cause report, only to allow it to amend the root cause report in mid-May because the original was so badly flawed and incomplete, it is now retrospectively clear that NRC's questions and concerns were not resolved by the time the CAL was issued on December 2, 2011. Not just FENOC's, but even NRC's behavior, harkens back to the 2002 Hole-in-the-Head Fiasco, about which the NRC Office of Inspector General concluded that not only FENOC, but also NRC itself, was guilty of prioritizing FENOC profits over public safety (NRC OIG, "Event Inquiry Regarding NRC's Regulation of Davis-Besse

Regarding Damage to the Reactor Vessel Head,” OIG-02-03S, 12/30/2002, <http://www.nrc.gov/reading-rm/doc-collections/insp-gen/2003/02-03s.pdf>).

Intervenors fear this NRC attitude of “reactor operations approval at any cost,” so clearly exemplified by the rushed December 2, 2011 CAL authorizing rushed restart, will affirm the supposed legitimacy of the politicized decision-making culture during the proposed 2017-2037 period, as well. That decision-making culture will be fleshing out the Davis-Besse AMP for cracking. A hearing is warranted to assure that politicization of aging management is as unlikely as possible.

The author of Document B/32 found this issue of atomic reactor operating experience so significant that he shared it with the following Staff divisions at NRC: “All Communications, Containment (leakage, **degradation**, cooling system performance), Emergency Preparedness, Flood Protection & Missiles, Inspection Programs, Materials/**Aging**, Natural Phenomena, New Reactors, Power Uprate, **Structural**.” (emphasis added) As indicated by the inclusion of “[containment] degradation ... Aging [and] Structural” communities at NRC, this subject matter is entirely relevant for an aging-related license extension proceeding such as this.

Document B/33 [12/01/11; Email from B. Lehman, NRR to A. Sheikh, NRR et al., on Davis-Besse Shield Building. (1 page)]:

This document shows the disconcerting missteps and disconnects that occurred within NRC as it raced to approve Davis-Besse’s restart, even as questions and concerns about the shield building cracking deepened and grew more complex.

At 4:45 p.m. on the day before NRC issued its CAL restart approval, NRC’s Bryce Lehman admits that the “NRC’s Concerns” slide had not been updated since November 18. It needed to be updated by Monday, December 5 in order to be ready

for a “brief with Melanie” on Tuesday, December 6th. So key decision makers in the Davis-Besse restart approval had not updated their analysis or understanding in over two weeks, despite significant changes in FENOC’s very approach to explaining the cracking’s root cause, extent of condition, safety- and environmental-significance, and corrective actions. There were also, of course, alterations of the NRC Staff’s deepening concerns, judging by their questions as revealed for the first time in FOIA Response Number 1. NRC’s CAL must have been very near finalization -- it was issued the very next day, after all, yet key NRC Staff involved in the restart decision making had not even updated their briefing materials and, alarmingly, their list of concerns, despite two weeks of very significant changes and deepening insights (or lack thereof, and thus deepening questions and concerns) regarding the shield building cracking.

Intervenors’ interest in seeking a hearing is to ensure that NRC Staff and decision makers will not approve the 20-year license extension at Davis-Besse in the absence of a clear understanding and mastery of safety- and environmentally-significant issues, such as happened in the accelerated December 2nd CAL reactor restart approval.

Document B/34 [12/01/11; Email D. Morey, NRR to S. CuadradoDeJesus, NRR Re: Davis-Besse Shield Building. (1 page)]:

This document shows that NRC staff concerns about Davis-Besse shield building cracking persisted up to the final moments before NRC’s rushed CAL authorized reactor restart.

NRC’s Dennis Morey and Samuel Cuadrado De Jesus agree that “We need to take a close look at this,” although it is pointed out that a key NRC staff member,

Abdul Sheikh was busy *at Davis-Besse* and might not be available to help. But nearly three hours after close of business (7:42 PM), Dennis Morey bluntly writes “Actually, Bryce needs our comments,” whether or not Abdul Sheikh was available to help. Of course, it is clear in retrospect what the urgency was about – somehow, someone(s) at NRC had decided that restart would be approved the very next day, via the issuance of the CAL, despite the fact that many questions not only remained unanswered, but were growing more complicated, many concerns were still unresolved, and NRC inspectors (namely, Abdul Sheikh) were still deployed to Davis-Besse trying to get to the bottom of things.

Document B/35 [12/02/11; Email from D. Morey, NRR to B. Lehman, NRR et al RE: Davis-Besse Shield Building. (1 page)]

This document epitomizes NRC’s disjointed, self-contradictory rush to approve Davis-Besse’s restart.

Dennis Morey emailed Bryce Lehman at 9:16 AM on Friday, December 2, 2011 – the very day NRC Region 3 issued the CAL approving Davis-Besse restart, despite so many unanswered questions and unresolved concerns, including significant implications for the proposed 20 year license extension.

Morey wrote:

The issue with the D-B crack is that the location and direction of the crack are not clear from the diagrams.

Next, I think we should say that operability is still being discussed. **If D-B is allowed to start up, there needs to be a slide describing why it is OK.**

Finally, I think **the LR [License Renewal] impact needs to be clearer** (on the final slide):

☐ Degraded concrete is a Part 50 issue affecting license renewal

☐ DLR [Division of License Renewal] needs to understand if the degradation is age-related and progressive etc. and how the effect will be managed

☐ DLR has prepared a draft RAI asking the applicant to explain **how the unique OE [Operating Experience] will be addressed by its AMPs [Aging Management Plans]**

☐ Currently holding the RAI until more information is known in the Part 50 arena (root cause, proposed solutions, etc.)

☐ This will be tracked as an Open Item in SER [Safety Evaluation Report]

Despite the reality that the basic facts about the cracking were not even clear, NRC was pushing to okay restart, while wrestling with how to justify this under regulations, even though “operability [was] still being discussed.”

The relevance of the shield building cracking issue to this license extension proceeding is laid out very clearly, and repeatedly, above. The numerous unanswered questions and unresolved concerns – “the LR impact needs to be clearer”; “Degraded concrete is a Part 50 issue affecting license renewal”; “DLR needs to understand if the degradation is age-related and progressive etc. and how the effect will be managed”; a DLR RAI “asking the applicant to explain how the unique OE will be addressed by its AMPs”; “This will be tracked as an Open Item in SER” – clearly confirms the merits of Intervenors’ request for a hearing.

Document B/36 [12/02/11; Email from B. Lehman, NRR to S. Sakai, NRR et al. FW: Davis Besse POP. (2 pages)]:

If there were any remaining questions or concerns among NRC Staff, they were effectively silenced by this email.

Pete Hernandez wrote to Michele Evans *et al.* that:

Tech staff unanimously concurred on the decision that the licensee provided reasonable assurance for (sic) the Shield Building will perform its safety function. There are no further questions from the NRC to be answered before startup can commence.

The grammatical error, given the significance of this final decision announcement, may be a reflection of the speed at which the restart approval was granted, and all outstanding questions and concerns silenced. Claiming “here are no further questions from the NRC to be answered before startup can commence” is contradicted by Dennis Morey’s questions and concerns from just 7 hours earlier in the day, and by the fact that Abdul Sheikh was still physically deployed to Davis-Besse to inspect safety related calculations and analyses, and presumably, the field conditions about which he expressed such serious concerns in Document B/26.

Hernandez stated on: “A CAL was issued addressing completed and planned actions for the licensee to provide continued long-term confidence of the SB safety functions.” It is those planned actions and that long-term SB safety function in which Intervenors have no confidence for the 2017-2037 period.

Hernandez ended his email: “The licensee expects to enter Mode 4 today December 2, 2011 at 1800 and continue progressing with plant startup.” As Hernandez’ email is time-stamped 3:47 p.m., FENOC was going to begin restart operations a mere two hours later. After the long hours, weekends, and holidays worked by NRC Staff in the rush to the restart, it appears that no overtime would be worked after the issuance of the CAL late on this Friday afternoon.

The second page of B/36 is entitled “Davis-Besse Nuclear Power Station, Containment Building Issue, 12/2/2011, Purpose/Expected Outcomes/Process,” or POP for short.

Although the POP refers to an “interested Congressman” in the singular (probably Rep. Kucinich), the NRC author seems to have been unaware that a second senior Democrat in the U.S. House had expressed alarm at the revelation of the Davis-Besse cracks. On October 14, 2011, Rep. Ed Markey (D-MA) wrote a four-page letter to NRC Chairman Jaczko expressing his concerns (ML11292A005).

The following classification is prominently displayed on the POP: “This document is for NRR Internal information only.” The public has only now gained access to this document thanks to Intervenor’s FOIA request, made necessary by NRC’s withholding of its decision-making documents surrounding the Davis-Besse shield building cracking scandal.

The POP goes on: “After clarification of NRC questions, final calculations were provided to NRC technical staff on Thursday, December 1, 2012 (sic).” Despite asking FENOC repeatedly for adequate time to review documents, calculations, analyses, etc., prior to restart, NRC Staff nonetheless rushed to finalize the CAL on Dec. 2, even though FENOC did not provide final calculations to NRC technical staff until December 1st.

The POP continues: “NRC Technical staff on site at Davis Besse and at headquarters reviewed the final calculations on Thursday and Friday, December 1 and December 2, 2011.” This shows how quickly the restart was not only approved, but also actually begun – with review of final calculations occurring just hours, or less, before it. The POP related the “Decision” that: “The conclusion was made that the licensee had provided reasonable assurance that with the current condition, the SB will perform its safety function. All technical staff from the region and

headquarters concurred with this conclusion.” The POP then claimed “There are no further questions from the NRC to be answered before startup can commence.” To the contrary, Dennis Morey still had significant questions and concerns as of 9:16am that morning. Abdul Sheihk was still on-site at Davis-Besse, performing inspections of calculations, analyses, and field conditions.

Yet by 3:47pm, NRC’s POP claims all questions were answered and concerns resolved. So much for the “close look” Dennis Morey felt needed to happen just the day before. This gives a whole new meaning to the NRC and industry catch-phrase “effective and efficient regulation;” effective and efficient *regulatory retreat*, perhaps.

Intervenors wonder whatever happened to the Davis-Besse shield building cracking briefing set for December 6, 2011, and its slide #10 on “NRC’s Concerns” mentioned in Document B/33. Evidently it was all eclipsed by Davis-Besse’s full power operations that commenced that very day.

NRC’s POP concludes with an “NRC Question,” which is odd, as the POP had just said a few lines above that: **“There are no further questions** from the NRC to be answered before startup can commence.” (emphasis added) NRC’s “question” is more of a *concern*, stating: “The licensee still has unresolved questions to answer regarding the design basis of the plant. ***Basically, when the SB was built the requirements and codes it was built under were for an uncracked building. Because the building is now cracked, the question of whether the SB still meets the requirements as stated in the FSAR [Final Safety Analysis Report] and licensing basis needs to be evaluated.***” (Emphasis supplied).

This is unquestionably an age-related concern which exposes a dispute with the license application.

Document B/37 [12/03/11; Email from J. Zimmerman, NRR to M. Evans, NRR et al. Fw: Press Release has been issued. Attachment is publicly available at (3 pages)]:

In this document, NRC's Jacob Zimmerman gloats about Region 3's "press release associated with our conclusion on the safety of the shield building and the Confirmatory Action Letter" that: "I think they did a nice job crafting it. I especially like that they addressed fully documenting the decision." (He concludes his email, most ironically, at least from the perspective of those concerned with Davis-Besse's safety and environmental risks, "Have a great weekend!", since NRC's overtime work during evenings, weekends, and holidays would cease, now that its rushed restart approval had been granted.)

Intervenors, like most members of the public living downwind and downstream of Davis-Besse, would prefer "truthful" to "crafty" in an NRC press release. But Zimmerman was the NRR Bulletin 2001-01 Lead Project Manager regarding Circumferential Cracking of Reactor Pressure Vessel Head Penetration Nozzles 11 years ago (as documented in B/29), in the lead up to the infamous Hole-in-the-Head Fiasco first publicly revealed in early 2002 at Davis-Besse.

But Intervenors, like most members of the public living near Davis-Besse, would also prefer *accurate* to "crafty" in an NRC press release. In its haste -- very late on a Friday afternoon, after close of business hours -- to announce the rushed reactor restart approval, the NRC Region 3 Office of Public Affairs staff made errors, large and small, in its press release. The release was dated "December, 2 2011". Faintly ironic was Region 3 OPA's claim to the media that "The plant is located in

Oak Harbor, Ohio about 40 miles southeast of Toledo.” The NRC website’s own entry for “Davis-Besse Nuclear Power Station, Unit 1” [<http://www.nrc.gov/info-finder/reactor/davi.html>] reports “Location: Oak Harbor, OH (*21 miles ESE of Toledo, OH*).” (emphasis added). Such a gross error in estimating the distance from an atomic reactor to a population center carries numerous implications, from radiological doses suffered downwind, to emergency preparedness, SAMA analyses, etc. This makes NRC’s opposition to Intervenor’s SAMA contention, for example, all the more absurd..

In the press release, the foremost FENOC commitment is listed as “Determine and provide the root cause of the cracks in the shield building, corrective actions, and develop a long-term monitoring program.” But NRC Region 3 staff had repeatedly assured the media and public that such issues would be resolved *prior to* restart. For example, the *Cleveland Plain Dealer* reported on October 12, 2011, two days after the shield building cracks had supposedly first been discovered:

The significance of the crack is not clear at this point, NRC spokeswoman Viktoria Mytling said. “We will review what the company and its engineers find, and we are doing our own independent assessment,” she said. “*We will have to resolve this issue before they re-start the reactor.*” (emphasis added)

Of course, NRC allowed FENOC to re-start the reactor long before any resolution of the issue. So much for “fully documenting the decision.” The press release’s own admission that “...the NRC will continue to inspect whether the shield building in its current conditions meets all design requirements in the plant’s license” shows that questions remain unanswered and concerns unresolved.

Document B/38 [12/05/11; Email from V. Mitlyng (sic), RIII to T. Briley, RIII et al. on Davis-Besse coverage (3 pages)]:

This document compiles media coverage garnered by NRC Region 3's press release. In *Power Engineering Magazine's* December 2, 2011 article entitled "Nuclear Power Plant Safe to Restart, NRC Determines," a figure of 913 Megawatts-electric is given for the Davis-Besse nuclear power plant. When Intervenors then checked the NRC website's own entry for "Davis-Besse Nuclear Power Station, Unit 1" [<http://www.nrc.gov/info-finder/reactor/davi.html>] on August 3, 2012, it too listed the "Electrical Output" as "913 MWe." This figure is of concern because throughout this proceeding, Intervenors have cited FENOC's own figure of *908 MWe*, from the ER. In their renewable alternatives contentions, Intervenors tried to demonstrate how wind power, solar power, or a combination of the two, integrated with compressed air energy storage, could readily replace Davis-Besse's output. Intervenors wonder if a power uprate was granted, accounting for the 5 MWe increase. If there has been an electrical output increase at Davis-Besse since late 2010, when this proceeding began, this increases safety and environmental risks, due to the reactor's increased thermal output. Davis-Besse was already the hottest operating reactor in the U.S., before any such thermal power/electrical power output uprate. In fact, its high operating temperature is theorized to be associated with the boric acid leakage, and consequent lid corrosion, that has necessitated Davis-Besse's not one, but two, lid replacements in a single decade (2002-2011). An increase in thermal output holds potential environmental and safety implications for both Intervenors' SAMA and cracked concrete containment contentions.

Document B/39 [12/05/11; Email from B. Lehman, NRR to S. Sakai, NRR et al., on Davis-Besse Shield Building Brief – Lehman.pptx. (1 page)]:

This document partially answers Intervenors' question above: the previously -scheduled 12/06/11 Davis-Besse shield building cracking issue briefing appears to have gone ahead, even though NRC's CAL had already granted restart approval four days earlier. This email, from Bryce Lehman to Stacie Sakai *et al.*, states: "I have made some changes to reflect recent developments and Abdul's insight. The major changes occurred on the last two slides. Please review and provide feedback by noon tomorrow if you want changes made in time for the brief."

Amazingly, NRC staff was still making major changes to its briefing slides, three days *after* restart approval had been granted by the agency, three days *after* FENOC had actually begun the restart, and just one day *before* actual full power operations were underway at Davis-Besse. It appears that NRC Staff were now working hard to try to rationalize, explain, and justify why the restart had been okay to approve, under regulations, as Dennis Morey had said was necessary on December 2nd (Document B/35).

Of course, major "recent developments" would have to include NRC's restart approval, and FENOC's actual restart operations. Intervenors are curious if "Abdul's insight," un-explained further, involved a major safety and/or environmental risk, which also needed to be worked around or explained away. The answer should be the subject of a hearing inquest into the lack of serious aging management of the cracked shield building.

Document B/40 [12/06/11; Email from B. Lehman, NRR to S. CuadradoDeJesus, NRR on Shield Building RAI. (1 page)]:

This document involves a draft NRC Request for Additional Information on Davis-Besse shield building cracking, despite the sweeping December 2 NRC POP

(Document B/36) declaration that “There are no further questions from the NRC to be answered before startup can commence.” Bryce Lehman announced the need to “finalize it based on recent developments” – such developments as NRC approval for FENOC to restart full power operations, which commenced that very day, perhaps?

Document B/41 [12/06/11; Presentation Slides on Davis-Besse Shield Building Crack. (6 pages)]:

This document comprises the *post hoc* rationalization-justification-explanation for NRC’s December 2, 2011 CAL restart approval – presented just as Davis-Besse achieved full power operations. Slide #2’s note “Impact on License Renewal” would seem to indicate that Intervenor’s contention has merit. Page 3’s “Slide #6” indicates that core bores were only taken on 12 shoulders and not all 16. Intervenor submit that all 16 shoulders should be core bored, to determine the severity of the cracking throughout. It must be remembered that core bores were not taken anywhere else on the building, beyond the few areas FENOC selected, such as the shoulders.

Page 4’s “Slide #7” states “One flute area did have a vertical crack, but determined to be isolated condition”. Intervenor assert that this represents yet another additional form of cracking, in addition to those FENOC has chosen to focus so exclusively upon in just a few select areas (flute shoulders, main steam line penetrations, the top 20 feet of the shield building).

These numerous different types/areas of cracking challenge FENOC’s “Blizzard of 1978” theory. Just as NRC’s own questioning, documented in the PII revised root cause assessment report, indicated, FENOC’s theory cannot account for all this. So many different forms of cracking, in widely different areas of the shield

building, likely involve multiple root causes, which FENOC has not identified nor accounted for. Nor has NRC required FENOC to do so. Intervenor's fear that such unaccounted-for root causes, as well as incomplete accounting of the extent of the cracking and safety/environmental risk significance, and consequently inadequate corrective actions, will lead to worsening of known cracks, not to mention initiation and worsening of unknown cracks. This, of course, would increase the risks.

Page 4's "Slide #8" admits: "Cracking exists at the top 20' of Shield Building wall outside shoulder region (**investigation ongoing**)". (emphasis added) This once again contradicts NRC's POP statement [Document B/36] that "There are no further questions from the NRC to be answered before startup can commence."

"Slide #8" also states "Cracks are...located near the outer reinforcing mat". But this statement, about cracking 3 inches deep into the shield building wall, does not account for admissions, in FENOC's February 28, 2012 root cause analysis report, of cracks as deep as 15 inches or more, a full third of the way, or even halfway, through the shield building wall.

On page 5, on "Slide #9," the "Licensee's Position" is stated as: "Believe sampling method of IR testing and core bores has characterized the extent of cracking in the structure". "Believe" is a strange and disconcerting word choice in such a scientific/technical/engineering endeavor involving such significant safety and environmental risks. How can FENOC be so confident that it has completely "characterized the extent of cracking in the structure," when it has not checked the entire structure? Even NRC's Pete Hernandez asked similar questions (Document B/9: "... At this point core bores of only the shoulders have been taken. So the only

crack widths we are aware of are those in the shoulders, which are not being addressed. How can an analysis be done on the structurally credited concrete if no data from that area, in the form of core bores, has been taken? Shouldn't the structural integrity of the shoulders be calculated as well? ... This says to me, that they are ignoring the shoulders, if they are ignoring all that concrete, it seems to be the opposite of conservative for evaluating the mechanical loads" ... "Because the licensee has not performed core bores to see if there is cracking in the credited concrete, do they have a basis to say that the structural concrete will maintain a Seismic II/I condition? *Etc.*)". Intervenors are concerned that FENOC's response, based on Dr. Darwin's advice, is inadequate – that merely broad *strokes* of understanding are good enough, that not "every square inch" of the building need be checked. Intervenors assert that neglecting to perform confirmatory tests on vast areas of the shield building could miss large areas of severe cracking, which have rendered the shield building unfit for safety or environmental duty, and will cause this to only worsen over time, due to age-related degradation worsening both known, and currently unknown, cracking.

NRC also states that the "Licensee's Position" is that "Primary concern is ability of outside rebar to perform its intended function. Observations of construction opening and testing indicate concrete is firmly attached to rebar mat". But this flies in the face of the admission, by both NRC and FENOC, that the outer rebar layer is dysfunctional. In fact, at Document B/9, NRC's Pete Hernandez states "I think the greater concern is will the SB stay standing and not whether or not the decorative concrete will fall off." Similarly, in Document B/26, NRC's Abdul Sheikh quotes

FENOC itself as saying “because the bond strength of reinforcement with laminar cracking next to it cannot be quantified, outside face hoop reinforcement in these regions is treated as ineffective --- for ultimate strength calculations” and goes on to add himself “If this assumption is correct only 3-4 inches of the concrete on the inside face can be used in the structural analysis.” Sheikh goes on to conclude: “I am concerned that the concrete will fail in this region due to bending in this region even under small loads.” Such NRC Staff questioning contradicts FENOC’s claim that “concrete is firmly attached to rebar mat”.

Regarding “NRC’s Position,” on Page 5/”Slide #10”, NRC states: “Licensee developed a model with reasonable assumptions which demonstrated adequate margin for *operability*”. (*emphasis in original*) It is quite telling that NRC italicized “*operability*,” for NRC has acknowledged that Davis-Besse’s currently severely cracked shield building does not conform to the plant’s original design or licensing bases: “Staff continues to evaluate whether the shield building conforms to the design code requirements in the CLB [Current Licensing Basis].” Again, this belies NRC’s claim in its December 2, 2011 POP [Document B/36] that “There are no further questions from the NRC to be answered before startup can commence.” When will this evaluation be done? Intervenors intend to show the safety implications of Davis-Besse’s failure to fulfill its design and licensing bases in the hearing.

NRC mentions the need for FENOC to “Determine root cause and develop a long-term monitoring program (due 2/28/12)”. FENOC failed on both scores. Although FENOC did submit a root cause report by 2/28/12, NRC identified so many

holes in it that FENOC was forced to submit a revised root cause analysis report in mid-May. David Lochbaum, Director of the Nuclear Safety Project at the Union of Concerned Scientists, pointed out to NRC Region 3 Administrator, Chuck Casto, in late May that this was a prima facie violation of 10CFR50.9 requirements that FENOC submit complete and accurate information by the February 28, 2012 deadline. But NRC has done nothing to enforce this regulation, nor hold FENOC accountable for its violation. In addition, FENOC did not publish its “long-term monitoring program” (its AMP) till April 4, 2012 -- over a month late. Even then, FENOC’s AMP was woefully inadequate, and remains so to this day.

NRC also mentions requiring FENOC to “Select multiple un-cracked areas to investigate to verify the cracking is not spreading (due 90 days)”. But the only un-cracked areas to be examined are located right next to already known cracks. A shield building-wide look is not being required, so severe cracking in large areas of the shield building could be occurring, that FENOC has simply *assumed* is not there.

Page 6, “Slide #11” is entitled “License Renewal Impact”. It includes the following admissions by NRC:

The degraded shield building is a Part 50 issue affecting license renewal

DLR needs to understand if the degradation is age-related, and if so how it will be managed

DLR has prepared a draft RAI asking the applicant to explain how the unique OE will be addressed by its AMPs

Currently finalizing RAI based on last week’s developments and will be prepared to issue shortly

This will be tracked as an Open Item in the SER

Each of these admissions by NRC bolsters the case for our contention's admittance for hearing, on both safety and environmental grounds.

Document B/42 [12/08/11; Email from M. Murphy, NRR to W. Jessup, NRR et al., FW: ET Significant Topic: Containment Delamination. (2 pages)]

This document further confirms that the shield building cracking at Davis-Besse is a license extension/aging management issue, worthy of a hearing.

The exchange of emails relates to a December 22, 2011 "ET Significant Topic: Containment Delamination" presentation. Stacie Sakai wrote to Martin Murphy "I am acting for Rajender Auluck, Chief of the Aging Management of Structures, Electrical, and Systems Branch...There is an ET significant topic brief ... Based on the LT SharePoint site, the title of the brief is Containment Delamination and the objective of the meeting is to discuss containment delamination at Crystal River and Davis Besse." Sakai later confirmed to Murphy that "DLR [Division of License Renewal] has the lead on putting the presentation together." That DLR and the Chief of the Aging Management of Structures, and his staff, led an NRC briefing on Davis-Besse's concrete containment cracking is solid proof these issues are aging related during the license extension, bolstering our hearing request.

Document B/43 [12/13/11; Email from M. Murphy, NRR to C. Roquecruz, NRR RE: G20110823 – Cracks in the Concrete Wall of the Shield Building of the Davis-Besse Power Plant (1 page)]:

This document shows that even 11 days after NRC hastily green-lighted FENOC's restart of Davis-Besse with its CAL, there was still confusion at NRC over which division (Region 3? Executive Director of Operations?) was actually in charge of further mop up operations to attempt to justify the restart under regulations, despite the severe cracking of the shield building, still of undetermined root cause,

extent, safety significance, and with corrective actions yet to be identified, as well as Davis-Besse's documented nonconformance with its design and licensing bases.

Document B/44 [12/13/11; Email from M. Galloway, NRR to A. Sheikh, NRR et al., RE: Davis-Besse Shield Building. (1 page)]:

This document contains some astonishing and very disconcerting admissions. Abdul Sheikh admits "**Davis Bessee [sic] shield building has not been designed for containment accident pressure and temperature.**" (emphasis added). If the Davis-Besse concrete, steel reinforced shield building was not even designed for the levels of pressure and temperature that would result from a steel containment accidental breach, then it stands to reason that a severely cracked shield building would be even more vulnerable to catastrophic failure than an uncracked shield building. In fact, Abdul Sheikh himself, in Document B/26, stated "**I am concerned that the concrete will fail in this region due to bending in this region even under small loads.**" (emphasis added) As Sheikh indicates above, a breach of the steel containment vessel at Davis-Besse would subject the severely cracked shield building not to "small loads," but to accident pressures and temperatures that it was never designed to withstand, even when brand new and uncracked!

How likely is it, then, that Davis-Besse's steel containment vessel will fail, subjecting its severely cracked concrete shield building to catastrophic failure? Davis-Besse's steel containment vessel was a mere 1.5 inches thick when brand new. Besides its exposure to Davis-Besse's intense operating conditions for 35 years now (including the hottest running reactor in the U.S.), we also know from 2011 NRC RAIs, and FENOC responses thereto, that the steel containment vessel itself is

corroded. At its base, in the sand bed region, it has been exposed to standing water, “aggressive” groundwater containing dissolved chemicals that make it a high risk for corrosion, which in fact has been observed in that portion of the steel containment. But other areas of the steel containment have also exhibited corrosion, as towards the top, due to a corrosive boric acid leak from the refueling channel associated with the reactor cavity. A leak from the refueling channel would also likely contain tritium, itself highly corrosive to steel. This steel containment documented degradation makes its failure during an accident more likely.

As explained to Intervenors by nuclear engineer Arnie Gundersen at Fairewinds Associates in Vermont, “Boric acid dripping inside lined containments has also called the containment liners to be breached, which of course would then release radiation in the event of an accident. I can think of two reactors that had the boric acid eat through their liners ... Turkey Point and Salem, but there may be more...”. Gundersen cited the following documents as references: Turkey Point Event Notification Report, CONTAINMENT LINER CORROSION DEGRADATION, Event Number: 46362, Notification Date: 10/25/2010; and NRC NRR, NRC INFORMATION NOTICE 2010-12: CONTAINMENT LINER CORROSION, June 18, 2010. These two documents are attached to this filing. While Davis-Besse may not be considered a “lined containment,” the point is that boric acid leakage can cause corrosion of carbon steel. Davis-Besse is the most infamous boric acid leaking atomic reactor in the U.S. How much corrosion damage has Davis-Besse’s chronic boric acid leakage caused to its inner steel containment vessel already? How much

more such corrosion will occur in the future? Enough to fail the steel containment vessel under core accident temperatures and pressures?

What would be the consequences if both Davis-Besse's steel containment vessel, and its severely cracked concrete shield building, were to fail during a reactor accident? The shield building would fail to contain the radioactivity escaping from not only the reactor pressure vessel, but also the steel containment. The shield building would not "sweep and filter" the radioactivity before discharging it through a venting system, into the environment. Rather, the radioactivity releases could escape directly, unfiltered, into the outside air, to blow downwind and fallout over vast areas.

How bad would the casualties and property damage be? The NRC commissioned, Sandia National Lab-conducted "Calculation of Reactor Accident Consequences" (CRAC-2) report sheds terrifying light on this question. NRC actually tried to bury the report, but Congressman Markey forced CRAC-2's publication via his congressional hearing powers in 1982. The consequences that could result from a catastrophic radioactivity release at Davis-Besse are shocking. CRAC-2 lists the following casualty and property damage figures: 1,400 Peak Early Fatalities; 73,000 Peak Early Injuries; 10,000 Peak Cancer Deaths; \$84 billion in property damage. But CRAC-2 was based on 1970 U.S. Census data; as reported by the Associated Press's Jeff Donn in his June 2011 series "Aging Nukes" (<http://www.ap.org/company/awards/part-iii-aging-nukes>), populations around Davis-Besse have grown significantly in the past 42 years, meaning that those casualty figures would now be much worse. And when adjusted for inflation from

1982 dollar figures, property damage would today surmount \$187 billion in 2010 dollar figures (as calculated by The Inflation Calculator, www.westegg.com/inflation/).

Sheikh also wrote “Davis Bessee [sic] shield building cracking is about 2-3 inches from outside face concrete.” This has been the standard line of FENOC and NRC since the very beginning of this sub-surface, laminar cracking scandal in October 2011. But why did he not also mention the shield building cracking of up to 15 inches or more in depth, which FENOC admitted to in its February 28, 2012 root cause report? That is halfway through the shield building wall at most locations, or still nearly a third of the way through the shield building wall at locations of added thickness, such as the flute shoulders. Intervenors are not only concerned about the sub-surface laminar cracking, which has rendered the outer rebar layer dysfunctional, but also about all the cracking (surface, dome, micro-, radial, shrinkage, etc.), across the entire shield building, and the overall, cumulative risk this represents. That is why we are seeking a hearing.

Document B/45 [12/13/11; Email from A. Sheikh, NRR to B. Lehman, NRR et al RE: Davis-Besse Shield Building RAI. (2 pages)]:

Intervenors are curious as to whether or not the “Davis-Besse Hearing File Resource” referenced in Samuel Cuadrado de Jesus’s email to Bryce Lehman, refers to *this* hearing proceeding, that is, Intervenors’ challenge to the license extension, and specifically to the cracked concrete containment contention?

The admission, “With all the [holiday] parties and frequent interruptions I almost forgot to get in touch with you on the issue with the shield building RAI...”, is revealing about NRC’s priorities. Eleven (11) days after NRC blessed Davis-Besse’s

hurried restart, with countless unanswered questions and unresolved concerns still in the air, NRC's holiday parties were getting in the way of getting to the bottom of the safety risks at Davis-Besse.

Abdul Sheikh responded: "I have added request for some specific information on the attached file. Some of the information I have requested is the gray area of part 50/54. However, I feel it is better to ask it since such information has not been formally requested previously by the NRC." Clearly, NRC's key technical Staff were groping through uncharted territory, the unique and unprecedented safety and environmental risks posed by Davis-Besse's shield building cracking under both Part 50 regulations (domestic licensing) and Part 54 regulations (license extension).

Sheikh's draft RAI (labeled RAI B.2.39-X) exemplifies how central aging management during the license extension is to the risks posed by Davis-Besse's severely cracked shield building, and how worthy Intervention contention is for a hearing:

Issue:

Extensive cracking in the shield building could affect the structural integrity of the shield building and may impact its ability to perform its intended function during the period of extended operation...

Request:

...2. Explain how the recent plant-specific operating experience impacts the Shield Building's ability to perform its intended functions during the period of extended operation. Include a list of any additional aging effects that may require management based on this operating experience.

3. Explain how the recent plant-specific operating experience will be incorporated into the Structures Monitoring Program AMP, and if the current program will be adequate to manage aging of the shield building during the period of extended operation, based on this operating experience. Specifically address the following:

- i. Details of tests planned to determine the long term effect of the concrete cracks on the ability of the rebars to carry design loads.
 - ii. Plans, if any, to repair the crack or reinforce the shield building concrete
 - iii. Detailed plans to monitor the extent and thickness of cracks, and corrosion of the rebars over the long term
 - iv. Plans, if any, to perform detailed structural analysis, with explicit modeling of rebars, cracks, and concrete, to demonstrate that the shield building will perform its intended design function over the long term. This analysis should also consider the effect of shrinkage and environment on the concrete and rebar during the period of extended operation.
4. Identify and explain any changes to the license renewal application based on the recent plant specific operating experience.

Intervenors are most keenly interested in the answers to these questions, and many more, as well.

Document B/46 [12/14/11; Email from P. Hernandez, NRR to E. Sanchez Santiago, RIII et al., FW: ET/LT Brief 12-22-11 – Containment Delamination Davis-Besse/ CR-3. (1 page)]:

This exchange of emails discusses a Division of License Renewal presentation to the “ET/LT team” on Dec. 22nd regarding Davis-Besse’s shield building cracking.

Bryce Lehman wrote to Michael Mahoney et al. “I need help filling out slides 11 & 12, especially explaining why the CAL did not address questions regarding code compliance.” Intervenors agree that that is a very good question! 11 days after the CAL was issued, key NRC technical Staff were still collectively scratching their heads, brainstorming ways to justify Davis-Besse’s restart as “safe,” and compliant with regulations, even though design and licensing bases were being violated.

Lehman concludes his email, “I want to make sure we present accurate information and that the staff is in alignment.” One would hope that information

relating to nuclear safety is accurate, that goes without saying. But it is revealing that Lehman seeks Staff alignment, given the many unanswered questions and unresolved concerns, generated by NRC Staff itself, with their potentially enormous implications for the adequacy of aging management of the shield building's safety and environmental risks during the 2017-2037 license extension.

Document B/48 [12/15/11; Email from P. Hernandez, NRR to A. Erickson, NRR, FW: ET/LT Brief 12-22-11 – Containment Delamination Davis-Besse/ CR-3. (5 pages)]:

On page 2 of the presentation, at "Condition Assessment," Slide #8, NRC wrote: "Spring line area appears to have little or no cracking (top 5')." But Intervenor question the contradiction with FENOC's May 16, 2012 revised root cause analysis report, where FENOC admits for the first time that cracking had been documented on the dome all the way back in 1976?

In Slide #9, "Condition Assessment Summary," is the text "[delete (investigation ongoing)]". Intervenor are most concerned that the ongoing investigation regarding "Cracking exist[ing] at top 20' of Shield Building wall outside shoulder region" appears to have been stopped, and would pursue that issue in a hearing.

Slide #11, "NRC's Position," states "Staff continues to evaluate whether the shield building conforms to the design code requirements in the CLB [Current Licensing Basis]." This email, and its attached draft of the presentation, was written on December 15th, 13 days post-restart approval; they are working on polishing a draft document for presentation on Dec. 22nd, a full 20 days post re-start approval – and yet, they are still wrestling to come up with an explanation for why it was justified to approve restart, given the violation of design and licensing bases. And it is now over 9 months since restart approval, and such an evaluation is still

incomplete. In fact, NRC has given FENOC until December 2012, a full year after restart approval, to merely come up with a “plan for a plan” to restore conformance of license and design bases violated by the shield building cracking.

Regarding Davis-Besse’s violation of design and licensing bases, NRC reports “This requires a 50.59 review and is currently being addressed by Region III in inspection space.” 10 CFR 50.59 relates to “Changes, tests, and experiments” under NRC’s “Domestic Licensing of Production and Utilization Facilities.” While testing is appropriate at Davis-Besse, and much more is needed, operation of the reactor -- with such a severely cracked shield building, of yet unexplained origin, extent, and safety significance, with yet to be determined corrective actions, if any are even possible – is not appropriate, especially during a period of extended operation. It is, in a very real sense, a risky “nuclear experiment” on the Great Lakes shoreline. NRC’s open-ended handling of this safety and environmentally significant matter “in inspection space” is not appropriate, as it allows violations of basic NRC safety and environmental regulations to continue indefinitely, perhaps even into the period of extended operation, as no firm due date for final resolution has been given. In fact, the NRC authors even ask in their draft presentation, “IS THERE A DUE DATE OR TIME LIMIT ON THIS?” Apparently not, to Intervenor’s knowledge. The draft further reveals “The ongoing inspection is continuing and the focus has shifted to resolving the question regarding compliance with the design and licensing basis. Region III is developing a plan/timeline for resolution and issuance of the inspection report.”

Does NRC’s follow on question, “WHAT IS DRIVING THIS REVIEW?” suggests that the authors would like to see this review ended.

It is unclear to Intervenor which inspection report NRC is referring to which supposedly will finalize closure on this significant issue: NRC's January 31, 2012 inspection report? Its June 21, 2012 inspection report? Some later one(s)?

Slide #12, the second "NRC's Position" slide, again confirms that the shield building cracking issue is of aging-related license extension relevance: NRC's CAL "included commitments to ... develop a long-term monitoring program ... investigate to verify the cracking is not spreading ... verify the cracks are not growing."

It also states "Decision was made to leave code compliance questions out of the CAL and to focus on confirming assumptions made in the operability calculations." Intervenor would like to know *who* made that decision, and why? How and when was it arrived at? By what regulatory justification? Judging by the ongoing internal wrestling with the question, it seems NRC does not have clear answers to those questions. Intervenor would pursue them in a hearing, and seek to shed light on their license extension safety and environmental relevance.

NRC added these points: "Focus on continued operability going forward" and "Address design through ongoing inspection." This open-ended, path of least resistance approach to guaranteeing Davis-Besse's ongoing operations and profit making (as opposed to public health and safety, as well as environmental protection) is frighteningly and disturbingly reminiscent of the 2002 Hole-in-the-Head Fiasco and the official conclusion NRC had put FENOC's profits ahead of public safety, by lowering safety standards and not enforcing regulations (citation above). Even joy rides can seem to be going well, till that first curve gets missed.

The “License Renewal Impact,” slide #13 on page 3, yet again confirms the license extension relevance of Davis-Besse’s shield building cracking, as also documented at B/41 above.

While page 4’s Slide #20, “Comparison of Davis-Besse & CR-3,” admits “Similar crack geometry” and “Laminar cracking around circumference of building” about the two troubled reactors, it hastily adds “Similarities end there.” In fact, since the very beginning of the Davis-Besse shield building cracking scandal, NRC has worked hard to differentiate it from the cracking of Crystal River’s containment, which has kept that nuclear power plant shut down for several years now, and may very well lead to its permanent closure. As evidenced by the rush to restart Davis-Besse, culminated by the NRC CAL on December 2, 2011, all efforts were made by both NRC and FENOC to maintain the appearance that the October to December shutdown for lid replacement was a regularly scheduled, routine maintenance outage. Of course, there is nothing “regular” about having to install a third lid on an atomic reactor in a single decade (2002-2011) -- other than its most irregular regularity -- nor is there anything routine about the severe shield building cracking first revealed to the public in mid-October, 2011.

The next slide, #21, is entirely devoted to “Differences Between Davis-Besse and CR-3.” Revealingly, under “Root cause still under investigation,” NRC wrote:

Potential causes: thermal loading and structural discontinuities

OK for examples of likely causes if NRC internal presentation. Licensee likely will investigate other potential causes in their root cause evaluation.

So it seems that NRC is comfortable saying one thing to itself behind closed doors, but saying another thing – or nothing at all -- to the public and media. Meanwhile, FENOC fished around for the most convenient root cause it could conjure up, and settled on the Blizzard of 1978, inappropriately and inexplicably excluding other potential, and even likely, root cause explanations, as spelled out in NRC's 27 questions documented in the May, 2012 PII revised root cause assessment report. The convenience, to FENOC and NRC, of the Blizzard of 1978 root cause theory, is that other potential causes, such as thermal loading and structural discontinuities, as identified by NRC itself above, are ongoing, and potentially aging-related, undermining FENOC's coveted 20 year license extension.

In its "Summary", Slide #22, NRC wrote "The Regions and Headquarters will continue to work together to ensure continued functionality (Part 50) and to ensure aging is properly managed (Part 54)." Given Intervenor's lack of confidence in NRC to protect public health and safety and the environment, the latter point yet again confirms this contention is ripe for a hearing, vis a vis the proposed license extension.

Document B/49 [12/22/11; Presentation Slides on Shield Building/Containment Delamination. (11 pages)]:

This document appears to be the final draft used in the long awaited presentation. On page 6, at Slide #11, "NRC's Position," the word "operability" is no longer italicized, as it was in the draft (Document B#48). Intervenor's wonder what is the legal, regulatory, and even "public relations" significance of this seemingly subtle change?

On page 11, at Slide #21, “Differences Between Davis-Besse and CR-3,” the sub-points listed under “Root cause still under investigation” on the draft (B/48) have simply been dropped in this final version – no examples of “potential causes” are given, not even for NRC eyes only. Intervenors wonder why the draft’s insights were kept from the NRC audience on December 22, 2011?

Document B/50 [01/12/12; Email from D. Morey, NRR to M. Galloway, NRR et al., FW: Summary of meeting with OGC to discuss Davis Besse-s (sic) new contention on the shield building crack. (2 pages)]:

This document, written just one week after the NRC’s January 5, 2012 public meeting at Camp Perry in response to U.S. Rep. Kucinich’s request, and just two days after Intervenors originally filed their Davis-Besse shield building cracking contention on January 10, 2012, directly bolsters Intervenors’ request for a hearing on this contention, and is reproduced in its entirety below (within quotation marks):

“From: Morey, Dennis
Sent: Thursday, January 12, 2012 4:51 PM
To: Galloway, Melanie; Delligatti, Mark
Cc: Auluck, Rajender; CuadradoDeJesus, Samuel; Sheikh, Abdul; **Davis-BesseHearingFile Resource; Harris, Brian; Subin, Llyod; Kanatas, Catherine**
Subject: FW: Summary of meeting with OGC to discuss Davis Besse’s new contention on the shield building crack
Attachments: Davis-Besse Sheild (sic) Building Contention.pdf
Importance: High

Melanie and Mark,

Sam Cuadrado, Abdul Sheikh and I met with OGC today to discuss the new Davis-Besse contention on the shield building cracks. **Since DLR [Division of License Renewal] has a documented concern with the cracks, OGC does not want to oppose the contention but will instead propose a revised contention that focuses on the license renewal safety issue: the adequacy of the AMP to address age-related cracking in the shield building. We agreed and will support developing a revised contention.**

Thanks,

Dennis Morey”

“From: CuadradoDeJesus, Samuel
Sent: Thursday, January 12, 2012 4:34 PM
To: Morey, Dennis
Cc: Sheikh, Abdul; Davis-BesseHearingFile Resource
Subject: Summary of meeting with OGC to discuss Davis Besse’s new contention on the shield building crack
Importance: High

Dennis,

Summary of Meeting with OGC to discuss Davis Besse’s New Contention No. 5 on the Shield Building Crack

On January 10, 2012, a “Motion for Admission of Contention No. 5 on Shield Building Cracking” for Davis-Besse was submitted before the Atomic Safety and Licensing Board (ASLB). The new Contention No. 5 reads as follows:

Contention 5: Cracked Shield Building/Secondary Reactor Radiological Containment Structure

Intervenors contend that FirstEnergy’s recently discovered, extensive cracking of unknown origin in the Davis-Besse shield building/secondary reactor radiological containment structure is an aging-related feature of the plant, the condition of which precludes safe operation of the atomic reactor beyond 2017 for any period of time, let alone the proposed 20-year license period.

Per request of Brian Harris (OGC lawyer) a meeting was scheduled to discuss with the technical staff the merits of the contention. The meeting was held on January 12, 2012, and the participants were the following:

Brian Harris (OGC)
Lloyd Subin (OGC)
Catherine Kanatas (OGC)
Abdul Sheikh
Dennis Morey
Samuel Cuadrado

During the meeting Abdul Sheikh presented and explained to OGC (1) the sequence of events since the discovery of the cracks on October 2011 and (2) the technical concerns within the scope of license renewal associated with the shield building cracks. The staff also pointed out that an RAI was issued on December 2011 (RAI B.2.39-13) requesting the applicant to provide the shield building cracks root cause and to explain whether the Structures Monitoring Program AMP, will be adequate to manage aging of the shield building during the period of extended operation. The

staff also stated that the applicant will provide information on the root cause by the end of February 2012. The staff further stated that an assessment on the adequacy of an AMP won't be possible until we receive the applicant's determination of the root cause and proposed AMP.

Given the information provided by the staff, OGC does not want to oppose Contention No. 5 but will propose rewording it. **OGC will prepare a revised contention that reflects a concern with the adequacy of the Structures Monitoring Program AMP to address the shield building cracks. OGC will provide the staff with a draft revised contention in order to receive comments and feedback before submitting the February 6 ASLB response.** The DLR PM [Division of License Renewal Plant Manager] will contact Region III inspectors and related LR supporting staff to keep them up to date with the discussions associated with OGC and Contention No. 5.

Thanks,

Samuel Cuadrado de Jesus
Project Manager
Projects Branch 1
Division of License Renewal
U.S. Nuclear Regulatory Commission
Phone: 301-415-2946
Samuel.CuadradoDeJesus@nrc.gov

Although NRC OGC has since moved to oppose Contention 5 in its entirety, there was initial support for it, albeit as metamorphosed into a contention of omission

Document B/51 [01/19/12; Davis-Besse Root Cause Review – Status Call 1/19/2012. (3 pages)]:

This document reveals that the Davis-Besse Finite Element Model was “developed and applied to Crystal River containment cracking issue,” but “Updated to reflect DB Shield building including specific mechanical properties of DB SB materials (concrete/rebar).” But previously (as at B/49, Slide #20), NRC has stated emphatically that Crystal River and Davis-Besse’s cracking issues are wholly dissimilar.

Intervenors are very concerned about the use of Crystal River's computer model at Davis-Besse. Recently, it has been revealed that the misapplication of an inappropriate computer model for the design of replacement steam generators is the root cause of premature failure of brand new steam generator tubes at San Onofre nuclear power plant. This problem is so serious, that both reactors at San Onofre have been shut down since January because of it, and may even remain shut down permanently. Misuse of Crystal River's computer model could end in disastrous results if inappropriately applied at Davis-Besse. Is the motivation to use the same computer model so that FENOC can save money, by not developing its own site specific computer modeling for the unprecedented and "unique operating experience" (NRC's words about the shield building cracking) at Davis-Besse?

This document also explains the purpose of the Purdue University concrete testing being funded by FENOC: "Result will be used to support use-as-is disposition for the existing concrete cracking configuration...". But doesn't this amount to predicting, or predetermining the outcome, of Purdue University's tests? Shouldn't they wait for the results before describing them as supporting use-as-is? Doesn't this amount to FENOC simply paying for test results or predetermined outcome that allow it to maintain its desired status quo, regardless of the risks? As stated by Michael Keegan of Don't Waste Michigan in Monroe, Michigan, an Intervenor in this proceeding, "The concept of 'Use As Is,' when it comes to operating a nuclear power plant, is a risky proposition." ("Davis-Besse allowed to restart operations," by David Patch, *Toledo Blade*, December 3, 2011).

NRC then asked “How was the location for harvesting the Three 2” dia core bores (sic) samples sent to Photometrics facility determined?”

FENOC responded “No specific logic, used 2” samples from cracked and uncracked locations for carbonation examinations.”

Intervenors are concerned that FENOC applied “no specific logic” in its shield building cracking investigation. Rep. Kucinich highlighted the significance of carbonation as a potential root cause of the cracking, based on an Oak Ridge Nuclear Lab study, as we cited in our January 10, 2012 contention submission. Here, FENOC admits applying “no specific logic” on a very limited number (3) of core bores. And even the locations for the core bore samples taken seem to have been arbitrary, with “no specific logic” in their choice. How can NRC be certain that FENOC did not consciously choose areas where they expected to find minimal to no cracking? Or that FENOC’s “no specific logic” approach missed areas of the shield building, intentionally or unintentionally, where significant cracking is taking place, and yet goes undetected?

NRC later asked “You indicated freeze thaw test not complete by need date to end RCR [Root Cause Report] due to equipment failure. What failed?”

FENOC responded “Lost power to test rig.”

So, this is another aborted test – in addition to the one in which high winds prevented certain core boring, which was then never completed. But why didn’t FENOC complete these tests once power was restored to the test rig, or once the high winds died down? What was the rush to issue the root cause report, when its incompleteness resulted in FENOC having to publish a revised root cause analysis

report two and a half months later, anyway? Intervenors find FENOC's excuses for aborting tests unacceptable, and wonder why NRC did not require the tests be completed. This is yet another example of the tail wagging the dog, and essential truth and facts about the shield building cracking being sacrificed to arbitrary schedules, lame excuses, and, apparently, corporate profitability. It begs the question of whether FENOC's investigation of the shield building cracking was a token exercise.

Intervenors note another attempt by FENOC to make excuses for not carrying out tests related to the shield building cracking:

NRC: "Is freeze/thaw still a viable potential cause?"

FENOC: "Yes."

NRC: "Why is this test information not needed by RCT [the Root Cause Team]?"

FENOC: "We have data from original construction freeze/thaw tests."

FENOC seems content to rely on a limited set of data from 40 years ago. Given the safety significance of the shield building cracking, why did NRC not demand that more empirical data be collected in the present day? After all, a large number of freeze/thaw cycles have occurred over the past four decades, and their cumulative stresses on the concrete shield building could be another root cause explanation for the cracking.

NRC then asked "Stated that freeze/thaw testing had been done on the first pour of the shield building. What testing was done and did this testing include both the type 1 and type 2 cement used in construction of the SB?"

FENOC responded “Freeze thaw done early on for only the type 2 cement because of time of year below grade portion of SB was poured (winter).”

According to ConcreteNetwork.com
[<http://www.concretenetwork.com/cement.html>], Type 1 Cement is defined as “Normal portland cement. Type 1 is a general use cement,” and Type 2 Cement is defined as “Is used for structures in water or soil containing moderate amounts of sulfate, or when heat build-up is a concern.”

So FENOC’s disinterest in collecting adequate data points extends back to the earliest days of its predecessor utility members, such as Toledo Edison, during the very construction of the Davis-Besse shield building in the first place. FENOC admits that freeze/thaw tests were not done on the Type 1 cement used in the construction of the shield building, and that only a limited data set was collected on freeze/thaw testing of the Type 2 cement used in the construction of the shield building, because the ground was frozen. This is a very weak foundation on which to rule out the annual, seasonal, and daily freeze/thaw cycles on the shoreline of the Great Lakes as contributing, at least in part, to the various forms and locations of cracking on the Davis-Besse shield building. Of course, freeze/thaw is ongoing and a form of age-related degradation, something FENOC would very much like to deny has anything to do with the severe cracking of its shield building, as it seeks to extend Davis-Besse’s operations by two decades of additional winters and their inevitable freeze/thaw cycles. Intervenors are not willing to let that go so easily.

NRC next asked: “How sensitive is your analytical model to obtaining accurate material properties in this area?”

FENOC admitted: “Don’t know yet if model can predict freeze thaw.”

So FENOC’s modeling is of uncertain accuracy, robustness, and value? This is unacceptable, given the likelihood that freeze/thaw has contributed, at least in part, to the cracking of the shield building, and the likelihood that it will continue to worsen the cracking in the future.

NRC then asked “Current Leading Potential Causes for Cracking?”.

FENOC responded: “At least 8 and could be combination of several.”

Intervenors wonder how a list of “at least 8” potential causes for cracking, several of which could have combined to form the root cause(s) of the cracking, got whittled down by FENOC to its singular purported root cause, the Blizzard of 1978? It appears to Intervenors that FENOC cherry-picked a single root cause that it could claim was not aging related, thereby minimizing needed corrective actions (simply weather sealing the shield building, albeit 40 years late), allowing it to deny the possibility that cracking could worsen over time, as it carries out full power operations for another quarter-century (2012-2037).

Lastly, NRC asked: “Do you still believe that a Root Cause for SB cracking can be identified?”.

FENOC admitted: “Yes, but verdict is still out since this is not straightforward.”

Intervenors actually agree with FENOC’s statement that its root cause analysis was not straightforward: the path to its Blizzard of 1978 theory, announced, just five weeks later, was most convoluted!

Document B/52 [01/19/12; Email from P. Hiland, NRR to M. Murphy, NRR RE: **Without the Root Cause.** (1 page)]:

This document was appropriately labeled in the subject line of this email exchange! (highlighted above, as well as below)

Martin Murphy wrote to Patrick Hiland et al., “See attached for reasoning why it was acceptable for startup **without the RCA** [Root Cause Analysis]. I think Dan and Kamal did a nice job of getting this to a level where the general public will comprehend the reasoning.”

Intervenors are incredulous and most concerned that, more than a month and a half after NRC issued its rushed CAL approving Davis-Besse restart, NRC technical Staff were *still* brainstorming ways to justify why that was acceptable under their regulations. This was simply an extension of NRC’s wrestling with explanations, justifications, and rationalizations, as documented at B/46 over a month earlier.

They seem to rely on “faith based regulation”:

Dan Hoang to Martin Murphy et al.: “Hope it hits the mark.”

Martin Murphy to Patrick Hiland: “Hope it will do.”

To add insult to injury, they congratulate themselves on a job well done:

Murphy to Hiland et al.: “I think Dan and Kamal did a nice job getting this to a level where the general public will comprehend the reasoning.”

Hiland to Murphy: “On target. Thanks.”

This echoes NRC’s self-congratulatory gloating on its press release, issued after business hours on Friday, December 2, 2011, announcing the issuance of its rushed CAL approving Davis-Besse’s restart (B/37).

Rather than being focused on enforcing its own safety regulations, NRC seems much more worried about justifying its own questionable actions – allowing Davis-Besse’s rushed restart – to a skeptical and concerned public. These communications on January 18-19, 2012 came nearly seven weeks after NRC CAL restart approval, and two weeks after NRC’s Camp Perry public meeting requested by Rep. Kucinich, and yet NRC was *still* wrestling internally to come up with explanations in an attempt to soothe public concern and skepticism. Intervenors do not find pencil-whipping, spin, and “hope” as acceptable regulatory approaches.

Document B/53 [01/26/12; Davis-Besse Root Cause Review – Status Call 1-26-2012 (3 pages)]:

This document deepens Intervenors’ concerns.

Under “Status of Testing Core Samples,” NRC asks “Any plans to salvage freeze/thaw test data?”

FENOC responds: “Not initially, since it will not be completed until after mid-February (too late for RC [Root Cause] schedule). There will be a correction action to evaluate results to determine if FE [Finite Element] model needs to be updated.”

So a very significant potential root cause’s testing won’t be carried out, because the results would not be ready in time for the arbitrary February 28, 2012 deadline? Never mind that the February 28 root cause report was so half-baked that NRC sent it back to the kitchen, only for FENOC to re-publish it with many revisions on May 16, 2012. What was really motivating NRC and FENOC in terms of the root cause investigation? Arbitrary deadlines? Finding a convenient (as opposed to accurate, comprehensive, or truthful) root cause explanation, such as the Blizzard of 1978, which sidesteps any relationship to age-related degradation, so that little to

no money will have to be spent to fix the problems? Ensuring expedited Davis-Besse return to operations, and profit-making, above all else? A decade ago, NRC's OIG warned against putting profit ahead of safety in the aftermath of the Davis-Besse Hole-in-the-Head Fiasco, chastising NRC for having done so -- but that hard won lesson learned seems to have been forgotten.

NRC then asked: "What testing was done on core samples to obtain measured data on the rebar/concrete bond strength for the shield building."

FENOC admitted: "None. Have core sample from SB at PII which "nicked" a portion of the rebar and photographs from construction of the access opening which will suffice to evaluate this issue."

This is an incredible admission by FENOC. Intervenors are not sure which is worse: FENOC's incurious nonchalance about the root cause investigation, or NRC's letting FENOC get away with it. FENOC seems content to collect the bare minimum of data points, sometimes even by accident, as by "nicking" a portion of rebar. How can a single "nicked" segment of rebar establish the bond strength of rebar/concrete across the entire shield building? Of course, it cannot. And yet FENOC confidently claimed (B/41) "Observations of construction opening and testing indicate concrete is firmly attached to rebar mat." How so? By eyeballing it? Given the fact that *no* testing has been carried out, as admitted above, how can FENOC make such claims?

In Document B/25 above, NRC asked: "How will your extent of Shield Building mapping demonstrate that you have sufficient uncracked concrete if the entire area is not mapped? If the entire shield building is not mapped what is the justification to extrapolate to other areas of the building?" FENOC responded "Dr.

Darwin ... stated that we needed to estimate the percent of cover and that there was no need to inspect every square inch of concrete.” But if vast areas of the shield building have not been inspected for cracking, and if FENOC has done no testing on rebar/concrete bond strength, how can the structural integrity of the shield building simply be *assumed*?

NRC then asked “Did your vendor request test samples to rule out bond/adhesion issues?”

FENOC admits “No.”

Not only FENOC, but also the contractors it has employed to carry out the detailed root cause investigative work, express little to no curiosity about an issue of deep safety and environmental significance: the rebar/concrete bonding and adhesion status. Intervenors are most concerned about FENOC and company’s studied disinterest, a sure sign of lack of “safety culture” at Davis-Besse, a root cause of the 2002 Hole-in-the-Head Fiasco. That is why we seek a hearing on the merits.

NRC then asked: “Any other core sample tests needed for root cause?”

FENOC simply answered “No.”

FENOC’s lack of interest in its own root cause investigation seems complete. It displays a flippant disregard for a potential major contributing root cause, as FENOC itself has admitted (NRC: “Is freeze/thaw still a viable potential cause?” FENOC: “Yes.” B/51), by collecting a bare minimum of data. And it shows the same flippant disregard for establishing the bond strength and adhesion between rebar and concrete in its shield building. NRC, which rushed to issue the CAL approving restart on December 2, 2011, then rubberstamped FENOC’s dubious Blizzard of

1978 root cause explanation in June 2012, does not press them on any of this, in the end.

Under “Status of Your Team/Contractor Work Products,” NRC asks “Any more information on Benchmarking ABAQUS software? (e.g. run ABAQUS against another software model to validate results)”.

FENOC responds: “Plan to run Davis-Besse model and compare with Crystal River containment model results but both are ABAQUS models. No other benchmarking plans and results of this comparison are expected to be documented by the vendor in the RCR.”

This exhibits an echo chamber effect. There is no third party validation of the models. Intervenors previously commented above (regarding B/51) on their concerns with using the same computer model for two supposedly very dissimilar cracking problems.

Under “Root Cause Report,” NRC asks:

It is our understanding that the results of the vendor shield building FE [Finite Element] modeling done in support of your root cause effort will not be used to validate or be referenced in support of site analysis/calculations that confirm the operability or functionality of the shield building (with cracks). Is our understanding correct?

FENOC responds “Yes. Because this FE model will not be considered or used in a design calculation **it does not need to be under an Appendix B QA program.**”
(emphasis added)

But shouldn’t a root cause determination, for an issue this safety significant, be quality assured? In addition, since NRC has repeatedly admitted that the design

and licensing bases have been violated and must be “restored,” won’t FENOC need to carry out such work using a robust QA program?

It is worth noting that on the second page of Document B/53, to Intervenors’ knowledge anyway, FENOC for the very first time floats the Blizzard of 1978, as a theory for a root cause of the shield building cracking. Just a month later, FENOC would present it as *the exclusive* root cause.

Of significance to this license extension proceeding, NRC next asked: “Will root cause report results be used to validate the adequacy of site programs for managing the aging effects of safety related structures?”

FENOC responded “Yes. The site did not develop the FE or root cause under Appendix B controls but intends to use the result to ensure that they have an adequate structures monitoring program for license renewal aging management.”

Intervenors object that FENOC has no plan, and NRC seems content to not require, that a robust Quality Assurance program be applied to the very foundations of “site programs for managing the aging effects of safety related structures.” In fact, this issue of lacking QA is most deserving of further inquiry in a hearing, for it completely undermines the safety and soundness of 20 year license extension decision making. Such decisions are made while “flying blind,” due to the lack of QA.

Under “Status of Purdue Univ Testing (not Used by RCT),” NRC asks “Is this testing going to be conducted under a vendor (Bechtel) or site QA approved Appendix B program?”

FENOC responds: “Undecided at this point.”

Intervenors are most concerned about FENOC's repeatedly dodging its QA responsibilities, and NRC's letting them get away with it. This is especially dire, in that FENOC previously stated it would utilize the Purdue testing results to justify its own use-as-is philosophy at the severely cracked Davis-Besse shield building.

NRC then asked: "Schedule for this testing?"

FENOC replied: "Not yet developed."

Did FENOC ever get around to developing that testing schedule? Did NRC think to press them on this? The one schedule that *did* seem to very much matter to FENOC was the reactor restart schedule. NRC, for its part, rushed its CAL on December 2, 2011, to make sure that FENOC could keep to its profit-making schedule, the risks and safety regulations be damned.

C. Legal Standards Regarding Admissibility Of Supplemental Information

1. The Contention Satisfies the NRC's Admissibility Requirements in 10 C.F.R. § 2.309(f)(1)

a. Brief Summary of the Basis for the Contention

The contention is based on the continuing technical information that has become public since October 2011 respecting cracking phenomena which were observed on the shield building at the Davis-Besse Nuclear Power Station. The early disclosures by FENOC concerning both the cause of the cracks, the extent of them, and their effects on the integrity of the shield building were minimal and inaccurate. The utility set as a priority the restart of commercial power production at Davis-Besse, which was approved by the NRC commencing on December 2, 2011.

b. The Contention is Within the Scope of the Proceeding

It is not disputed that maintenance of the structural stability of the shield building is within the scope of this licensing proceeding. On April 5, 2012, FENOC proposed an aging management plan (AMP) and the NRC Staff insists that any aging-related aspects of the shield building are ameliorated by that AMP. “[W]ith respect to license renewal, under the governing regulations in 10 CFR Part 54, the safety review of license renewal applications is limited to the plant systems, structures, and components (as delineated in 10 CFR § 54.4) that will require an aging management review for the period of extended operation or are subject to an evaluation of time-limited aging analyses.”

As to the shield building, FENOC “must demonstrate that the ‘effects of aging will be adequately managed so that the intended function(s) [as defined in § 54.4] will be maintained consistent with the CLB [current licensing basis] for the period of extended operation.’” *Nuclear Generation Co. and Entergy Nuclear Operations, Inc.* (Pilgrim Nuclear Power Station), CLI-10-14, 71 NRC __ (June 17, 2010) (slip op. at 8) (quoting 10 C.F.R. 54.21(a)(3)) (emphasis in original)). It is worth noting that NRC is currently only requiring FENOC to devise a “plan for a plan,” by December 2012, to restore licensing and design bases conformance at Davis-Besse, given the severely cracked shield building. This was confirmed by NRC Staff at the August 9, 2012 NRC public meeting regarding shield building cracking, held at Oak Harbor High School near Davis-Besse, which Intervenors attended. In fact, NRC Staffs’ admission of a year-belated “plan for a plan” for Davis-Besse licensing and design bases conformance came in response to direct questioning by Intervenors.

c. The Issues Raised Are Material to the Findings that the NRC Must Make to Support the Action that is Involved in this Proceeding

The issues raised in this contention are material to the findings the NRC must make to support the action that is involved in this proceeding, in that the NRC must render findings pursuant to the National Environmental Policy Act (NEPA) and to the Atomic Energy Act (AEA) covering all potentially significant environmental and safety impacts. License renewal review focuses on “those potential detrimental effects of aging that are not routinely addressed by ongoing regulatory oversight programs.” *Florida Power & Light Co.* (Turkey Point Nuclear Generating Plant, Units 3 & 4), CLI-01-17, 54 NRC 3, 7 (2001); *Entergy Nuclear Generation Co. and Entergy Nuclear Operations, Inc.* (Pilgrim Nuclear Power Station), LBP-06-24, 64 NRC 257, 275-76 (2006). It is again worth noting, as confirmed by NRC staff at the August 9, 2012 Oak Harbor High School NRC public meeting, that Davis-Besse’s current non-conformances with its licensing and design bases, due to shield building cracking, are being overseen by NRC in “operations space” (see NRC FOIA Document B/22 and B/24) or “inspection space” (see NRC FOIA Document B/48, Slide #11) -- that is, during the course of routine, regular, ongoing operational “inspections.”

Intervenors question the appropriateness of such a lax, open-ended time period during which FENOC has the opportunity to “restore conformance” with Davis-Besse licensing and design bases – all the while allowing FENOC’s operation of Davis-Besse at full power, despite being in violation of licensing and design bases, due to the severe shield building cracking. Even NRC Staff has questioned “Is there a due date or time limit on this?” (see NRC FOIA Document B/48, Slide #11).

Before the NRC will grant a license renewal application, the applicant must reassess safety reviews or analyses made during the original license period that were based upon a presumed service life not exceeding the original license term. *Florida Power & Light Co.* (Turkey Point Nuclear Generating Plant, Units 3 & 4), CLI-01-17, 54 NRC 3, 8 (2001). The reassessment must “(1) show that the earlier analysis will remain valid for the extended operation period; (2) modify and extend the analysis to apply to a longer term such as 60 years; or (3) otherwise demonstrate that the effects of aging will be adequately managed in the renewal term.” *Florida Power & Light Co.* (Turkey Point Nuclear Generating Plant, Units 3 & 4), CLI-01-17, 54 NRC 3, 8 (2001) (citations omitted).

**D. Concise Statement of Facts or Expert Opinion
That Support the Contention**

The shield building cracking was unforeseen in FENOC’s license renewal application, which presumed a structure surrounding the nuclear reactor which was fissure-free and not prone to failure in the form of up to 90% collapse of its rebar and concrete [see NRC FOIA Document B/26], raising such fundamental safety and environmental protection questions as “will the [Shield Building] stay standing”? [see NRC FOIA Document B/9]. Instead of the extremely limited, exclusive focus on laminar cracking identified in the February and May 2012 root cause analyses provided the NRC by FENOC, it appears that there is widespread micro-cracking in the shield structure, radial cracking, surface cracking, shrinkage cracking in the dome of the building as early as 1976, before the supposed “root cause” of the limited cracking admitted to exist (i.e., the Blizzard of 1978), and other shield

building degradation, such as spalling, bare rebar exposed to the elements, etc. The NRC Staff, relying on FENOC's representations and those of its engineering consultant, PII, has determined that there is a significant chance of collapse of the structure's walls which could leave only a 3" thick building to contain a radiological accident.

A Genuine Dispute Exists with the Applicant on a Material Issue of Law or Fact

The Intervenors have articulated a genuine dispute with the applicant, FENOC, and NRC, regarding physical adequacy of the shield building, which is a most critical structure at the Davis-Besse plant in terms of radiological containment, as well as shielding for the inner steel containment vessel against environmental hazards, such as tornadoes and tornado missiles. There is extensive information, much of which is from NRC's own Staff, and thus of an undisputed nature, suggesting the universal presence of cracking in the shield building from different origins (from the pouring and original drying of the concrete, the construction of the shield building significantly out of plumb, micro-cracking, moisture infiltration, carbonation and corrosion), of high safety and environmental risk significance. Until there is a thorough, global investigation of the nature, extent and causation, the muted warnings of the NRC Staff stand as creating a genuine dispute of fact.

2. The Contention Is Timely Pursuant to 10 C.F.R. § 2.309(f)(2)

The contention meets the timeliness requirements of 10 C.F.R. § 2.309(f)(2), which call for 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; and

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

*Id.*⁷

Intervenors satisfy all three prongs of this test. First, the information on which amendment or supplementation of the contention is sought is new and materially different from previously available information. A new contention may be filed after the deadline found in the notice of hearing 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; and (iii) The amended or new contention has been submitted in a timely fashion based on the availability of the subsequent information. 10 C.F.R. § 2.309(f)(2).

Intervenors respectfully submit that their amended/supplemental facts are timely submitted under the Commission's standard in 10 C.F.R. § 2.309(f)(2)(i)-(iii). As supplemented/amended, Contention 5 meets the NRC's three-part standard for a timely contention. The information on which the contention is based was not previously available. NRC's FOIA (FOIA/PA 2012-0121) Response Number 1 was date stamped June 12, 2012, PRIORITY MAILED (a form of First Class Mail) via U.S. Postal Service on postmark date June 14, 2012, and received by Intervenors a

number of days later. The information on which the contention is based is materially different than information previously available, see 10 C.F.R. § 2.309(f) (2)(ii), because it relates to findings and provides facts which did not exist when Intervenors moved for admission of Contention 5 in January 2012. This amendment/supplementation of Contention 5 is timely because it is filed within sixty (60) days of the NRC FOIA/PA 2012-0121 Response Number 1, and conforms with the ASLB's Initial Scheduling Order, as complemented by a 3 day allowance of time for U.S. Postal Service First Class Mail delivery (10CFR § 2.306(b)(1)). *Shaw Areva MOX Services, Inc.* (Mixed Oxide Fuel Fabrication Facility), LBP-08-10, 57 NRC 460, 493 (2008). Intervenors have acted in a manner which is timely according to 10 C.F.R. § 2.309(f)(2)(iii).

If a contention satisfies the timeliness requirement of 10 C.F.R. 2.309(f)(2)(iii), then, by definition, it is not subject to 10 C.F.R. 2.309(c), which specifically applies to nontimely filings. The three (f)(2) factors are not mere elaborations on the "good cause" factor of Section 2.309(c)(1)(i), since "good cause" to file a nontimely contention may have nothing to do with the factors set forth in (f)(2). *Entergy Nuclear Vermont Yankee, LLC, and Entergy Nuclear Operations, Inc.* (Vermont Yankee Nuclear Power Station), LBP-06-14, 63 NRC 568, 573 (2006).

F. Certificate of 10 C.F.R. § 2.323(b) Consultation

Counsel for Intervenors, along with Beyond Nuclear's designated representative, participated in a telephone conference concerning the prospective contents of the within Motion on August 10, 2012 with counsel for the NRC Staff and

counsel for FirstEnergy Nuclear Operating Corporation. Following that conference, FENOC's counsel stated "FENOC lacks sufficient information upon which to determine whether it will agree to or oppose the proposed supplement at this time." Similarly, the NRC Staff's counsel indicated "The Staff, as we discussed on Friday, lacks sufficient information to determine whether it would support or oppose the proposed supplement at this time."

G. Conclusion

Intervenors have met all preconditions to be granted leave for receipt of the within information into the record of this matter to amend and/or supplement their Motion for Admission of Contention 5. FENOC has offered up a very partial explanation to widespread shield building cracking, which ignores or downplays forms of structural degradation besides sub-surface, laminar cracking. Moreover, the NRC Staff suggests that the state of cracking of the shield building is such that even a mild to moderate earthquake event, or other "small loads," could "fail" the shield building in certain regions, or even cause loss of 90% of the wall mass, which would comprise a tremendous failure of the structure as a protective barrier between Davis-Besse's nuclear reactor and the outer atmosphere, land and water, as well as the public.

WHEREFORE, Intervenors pray the Licensing Board grant them leave to amend and/or supplement their proffered Contention 5 in the particulars stated.

/s/ Kevin Kamps

Kevin Kamps, *in pro per* ☐

Radioactive Waste Watchdog Beyond
Nuclear☐6930 Carroll Avenue, Suite 400 Takoma
Park, MD 20912☐Tel. 301.270.2209 ext.

1☐Email: kevin@beyondnuclear.org

Website: www.beyondnuclear.org

/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

**UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION
Before the Atomic Safety and Licensing Board**

In the Matter of)	Docket No. 50-346-LR
<i>First Energy Nuclear Operating Company</i>)	
(Davis-Besse Nuclear Power Station, Unit 1))	August 16, 2012
)	

* * * * *

CERTIFICATE OF SERVICE

We hereby certify that a copy of the "INTERVENORS' FOURTH MOTION TO AMEND AND/OR SUPPLEMENT PROPOSED CONTENTION NO. 5 (SHIELD BUILDING CRACKING)" and its associated exhibits, APPENDICES I THROUGH IX were sent by us to the following persons via electronic deposit filing with the Commission's EIE system on the 16th day of August, 2012:

Administrative Judge William J. Froehlich,
Chair Atomic Safety and Licensing Board Panel
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001
E-mail: wjf1@nrc.gov

Administrative Judge Dr. William E. Kastenbergh Atomic Safety and Licensing Board Panel U.S. Nuclear Regulatory Commission Washington, DC 20555-0001 E-mail: wek1@nrc.gov

Administrative Judge Nicholas G. Trikouros Atomic Safety and Licensing Board Panel U.S. Nuclear Regulatory Commission Washington, DC 20555-0001 E-mail: ngt@nrc.gov

Office of the Secretary
U.S. Nuclear Regulatory Commission
Rulemakings and Adjudications Staff
Washington, DC 20555-0001
E-mail: hearingdocket@nrc.gov

Office of the General Counsel
U.S. Nuclear Regulatory Commission
Mail Stop O-15D21 Washington, DC 20555-0001
Catherine Kanatas
catherine.kanatas@nrc.gov
Brian G. Harris
E-mail: Brian.Harris@nrc.gov
Lloyd B. Subin lloyd.subin@nrc.gov
Office of Commission Appellate Adjudication U.S. Nuclear Regulatory Commission Mail Stop: O-16C1 Washington, DC 20555-0001 E-mail: ocaamail@nrc.gov

Michael Keegan Don't Waste Michigan 811 Harrison Street Monroe, MI 48161 E-mail: mkeeganj@comcast.net

Stephen J. Burdick Morgan, Lewis & Bockius LLP 1111 Pennsylvania Avenue, N.W. Washington, D.C. 20004 Phone: 202-739-5059 Fax: 202-739-3001 E-mail: sburdick@morganlewis.com

Timothy Matthews, Esq.
Morgan, Lewis & Bockius LLP
1111 Pennsylvania Avenue, N.W.
Washington, DC 20004
Phone: (202) 739-5830
Fax: (202) 739-3001
E-mail: tmatthews@morganlewis.com

Respectfully submitted,

/s/ Kevin Kamps

Kevin Kamps, *in pro per*
Radioactive Waste Watchdog
Beyond Nuclear
6930 Carroll Avenue, Suite 400
Takoma Park, MD 20912
Tel. 301.270.2209 ext. 1
Email: kevin@beyondnuclear.org
Website: www.beyondnuclear.org

/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