The following is provided as public comment on the NRC draft EIS re: Davis-Besse’s proposed 20 year license extension

I have previously submitted comments regarding our environmental coalition’s contention, dated Jan. 10, 2012, seeking a hearing, on Shield Building cracking at Davis-Besse, submitted to the NRC ASLB.

The following comments stem from our coalition’s five supplements to that contention, submitted between Feb. and August of 2012.

INTERVENORS’ [FIRST] MOTION TO AMEND ‘MOTION FOR ADMISSION OF CONTENTION NO. 5’
(FEBRUARY 27, 2012)

Posted online at:
http://www.beyondnuclear.org/storage/Coalition%20filing%20contention%20amdt%202%2027%202012.pdf

At page 2/102, we quoted U.S. Representative Kucinich (D-OH), who stated:

“…The reports showed conclusively that the cracking was not in “architectural” or “decorative” elements of the wall, as FirstEnergy publicly claimed, but ran throughout the line of the main outer rebar.

In fact, the cracking is so extensive that the NRC required FirstEnergy to assume, in its calculations of the strength of the wall, that the vertical outer rebar mat did not even exist.

When FirstEnergy made its presentation at the January 5 public hearing, its Site Vice-President, Mr. Barry Allen, admitted for the first time that the cracking was located along the line of the main outer rebar. But, Mr. Allen, did not mention FirstEnergy’s previous misrepresentations or explain the significance of the new description. When I asked him about this discrepancy, his response was that FirstEnergy’s investigation of the cracking had been ongoing, and that FirstEnergy had revealed all new information as it was discovered.

That would be a very appropriate response, if it were true. But, it is not true.

FirstEnergy knew in early October that the cracking was in the area of the main outer rebar. That is shown in the very first photo released by the NRC. Most of the tests that showed that cracking in the line of the main outer rebar were performed before FirstEnergy issued a statement to its shareholders on October 31, 2011 that repeated their misrepresentations. And, even as late as December 29, 2011, the NRC was still repeating this misleading description from FirstEnergy—“Cracking has been identified primarily in the architectural regions....” (“Q-and-As for Davis-Besse Shield Building Issues,”
At page 3/102, we went on to state:

“A January 31, 2012 inspection report, ML12032A119, shows that FENOC discovered on October 31, 2011 that there were other areas of cracking, but also:

On October 31, 2011, the licensee identified additional indications of concrete cracking during IR testing towards the top of the SB wall, approximately between the 780 ft and 800 ft elevations. This area of indications was yet another one different from the laminar cracking initially identified adjacent to the RRVCH opening. The licensee entered this extent-of-condition issue for the SB cracking into their CAP as CR 2011-04648, informed the NRC via the Resident Inspectors’ Office on site, and continued to investigate further to determine if any additional adverse conditions existed.

P. 48 of report (p. 52 of .pdf).”

The public is indebted to Congressman Kucinich for clearly showing the severity of the cracking in Davis-Besse’s Shield Building, which FENOC and even NRC had downplayed up to that point. The seriousness of the matter is all the more clear now, since the August/September 2013 revelation of worsening old cracks, and discovery of new ones.

Re: the Jan. 31, 2012 NRC Inspection Report confirmation of cracking in the top 20 feet of the Shield Building wall, near the dome, it is still unclear, at this late date, whether the originally formulated cracking AMP, or any update to it, is comprehensive enough to account for the status of cracking damage at the upper reaches of the Shield Building.

That Jan. 31, 2012 NRC Inspection Report, cited in the contention supplement, also reported on NRC intercepting sub-standard rebar, which FENOC was about to install in the access opening repair in late 2011. Although NRC Staff claimed to have prevented that mistake from being made, what’s to explain the rebar damage done by the hydro-demolition to open the 2014 access opening? Did sub-standard rebar get installed in 2011 after all?

At p. 8/16, we stated:
“FENOC is developing a comprehensive engineering plan to re-establish the design and licensing basis conformance of the Shield Building. The plan is scheduled to be completed and issued by December 1, 2012. The plan will include a detailed structural analysis of the Shield Building and consider applicable effects.”

As also stated further below, in regards to our FOURTH MOTION TO AMEND AND/OR SUPPLEMENT (July 23, 2012):

It’s fair to say, at this late date (April 2014), that FENOC’s supposed re-establishment of licensing basis design conformance is shaky at best. In fact, NRC has granted FENOC till mid-2014 to re-figure the root cause of Shield Building cracking, after the August/September 2013 revelation of worsening old cracks, and initiation of previously unseen new cracking.

At p.12/16, we also stated:

“Moreover, Davis-Besse has other water problems inside the shield building. In RAI responses dated May 24, 2011 (ML11151A90), the NRC staff had noted a “history of ground water infiltration into the annular space between the concrete shield building and steel containment.” During a 2011 AMP audit, NRC staff also reviewed documentation that: [I]ndicated the presence of standing water in the annulus sand pocket region. The standing water appears to be a recurring issue of ground water leakage and areas of corrosion were observed on the containment vessel. In addition, during the audit the staff reviewed photographs that indicate peeling of clear coat on the containment vessel annulus area, and degradation of the moisture barrier, concrete grout, and sealant in the annulus area that were installed in 2002-2003.” (emphasis added)

It has since come to light that there were more problems with the access opening patch job in August/September 2002. Specifically, just as occurred in late 2011, the patch job in 2002 left air spaces or gaps in the resealed Shield Building wall. This growing, worsening accumulation of problems with both the Inner Steel Containment Vessel, as well as the Shield Building, are aging-related concerns with the Davis-Besse containment system, structures, and components (SSCs), that Intervenors’ sought to address in the ASLB license extension proceeding, but thus far have been denied.

INTERVENORS’ THIRD MOTION TO AMEND AND/OR SUPPLEMENT PROPOSED CONTENTION NO. 5 (SHIELD BUILDING CRACKING) (July 16, 2012)

Posted online at: http://www.beyondnuclear.org/storage/3rd%20%20Motion%20COMPLETE%20supp%20cracked%20concrete%20containment%20contention%20July%2016%202012.pdf
At section #1 (p. 3), our “Micro-cracking Present in Core-Bore Samples” challenge to FENOC should have been taken seriously, instead of denied. CTL had detected and reported micro-cracking to FENOC. FENOC essentially ignored the findings.

FENOC went on to claim that the cracking did not grow worse in 2011 and 2012. However, in August/September 2013, FENOC was forced to admit the old cracking had grown worse, and new cracking had initiated. However, FENOC has attempted to blur the issue, by claiming its 2013 testing techniques are more sensitive, implying the cracking “discovered” in 2013 were likely there all along in 2011 and 2012, but just couldn’t be detected (yet).

Intervenors urged that micro-cracking in core bore tests be taken more seriously in July 2012, a full year before FENOC began to do so in 2013. However, FENOC continues to downplay the significance of the micro-cracks it “discovered” in 2013. If its April 15, 2014 RAIs are any indication, however, NRC Staff seems to understand the 2013 micro-cracking “discovery” has serious implications for the 2017-2037 Shield Building cracking AMP.

In section #2, entitled “Radial Cracking” (pages 5-6), we cited NRC Staff criticism that FENOC had also ignored evidence of radial cracking in core bore samples. We concluded that “In effect, FENOC admits to multiple forms of cracking from multiple root causes.”

Grudgingly admits to them, we should add, for, no matter how many times we have raised concerns about multiple forms of cracking, likely of various root causes, and requiring a diversity of corrective actions, as well as aging management plans, FENOC has downplayed the significance, remaining focused on sub-surface laminar cracking, but has taken inadequate corrective action, and devised inadequate aging management plans, even on that.

At section #3 on p. 6, entitled “Deletion of Need for Further Investigation of Reinforcing Steel,” we challenged NRC’s suggestion that FENOC do less testing on reb. We urged that more testing on rebar, across the Shield Building, was needed. This is all the more clear now, that the 2014 hydro-demolition damaged rebar at the access opening.

But of course, revelations of outer rebar mat dysfunction due to the severe cracking (brought to light not by FENOC nor NRC transparency, openness, and accountability, but rather despite their obscurantism and secretiveness, thanks to Congressman Kucinich’s assertive devotion to public service), and exposed rebar on the exterior Shield Building surface, have long made it clear that the Davis-Besse Shield Building’s steel reinforcement structural integrity needs to be taken much more seriously by both FENOC and NRC.

After all, as revealed by Intervenors’ 2012 FOIA intervention, NRC Staffer Abdul Shiekh warned that a small addition stress could fail the Shield Building to the 90% level.
However, the Shield Building’s Inner Face exposure to the elements, for several long years in the 1970s, before the dome was put in place, and before the Initial Construction Opening was closed, calls into question the structural integrity of the Inner Face rebar mat, as well. Was Abdul Sheikh’s dire prediction too optimistic? As a part of Intervenors’ years-long call for more frequent testing, in more locations, using diverse testing methodologies, we extend our call for comprehensive testing of the Shield Building’s Inner Face.

As pointed out in our section #4, “Laminar Cracking in Main Steam Line Room” (pages 6-7), “The NRC Staff pointed out (RRCA at 6) that ‘The root cause report has insufficient Impulse Response documentation to conclude that laminar cracking initiated in the shoulder regions and propagated to areas of high density reinforcement, specifically in the areas of the Main Steam Line Penetrations.’”

As mentioned immediately above, we too have called for more Impulse Response testing across the Shield Building, especially at strategic locations, such as those of high-density rebar, the Inner Face, and the access openings subjected to multiple rounds of piercing. The status of the Inner Face rebar mat, as mentioned above, is of high significance to the structural integrity of the entire Shield Building wall, given the degradation of the Outer Face rebar mat functionality due to severe concrete cracking. As mentioned, the Inner Face rebar mat’s exposure to the elements for years on end calls its structural integrity into question.

Section #5 (p. 7-8) documents “Shield Building Dome Parapet Cracking” dating back to August 15, 1976. However, FENOC, and its predecessor Toledo Edison Co., kept this secret from the public until May, 2012 – for over 35 years! Of course, 1976 predates 1978, so this cracking can’t possibly have the Blizzard of 1978 as its root cause. The August/September 2013 discovery of worsening cracking has sent FENOC back to the drawing board, for yet another revision to its already revised Root Cause Report. Unless and until FENOC understands the likely multiple root causes for multiple forms of cracking, it cannot determine the likely multiple corrective actions, and aging management plans, needed to address the worsening problem.

At section #6, “AMP Omits to Inspection of 2002 Shield Building Opening for Cracking.” (p. 8). we called for Impulse Response tests on the 2011 access opening repair area of the Shield Building wall.

If this had been done, the huge air space or gap would have shown up clearly, instantly. Any acoustic test of that area of the Shield Building wall, even very basic ones, would have readily revealed the gap.

Yet, rather than require or perform even the most basic acoustic test, NRC Staff and FENOC both fought our contention and its supplements at every turn, throughout summer and autumn of 2012. At the end of the year, the ASLB simply rejected our contention and supplements, including this one.
If our warning had been heeded, another year or more (July 2012 to Feb. 2014) of full power operations with a Shield Building wall with a significantly reduced margin of safety (the gap, not to mention the cracking) could have been avoided.

Isn’t a gap in the Shield Building wall a prima facie reduction in safety margin? And yet FENOC came out on day one saying it was not so. NRC has not contradict nor corrected FENOC, yet, on this assertion, two full months later.

Our charge, in section #7, “No Examination of Admitted Cracking of SB Dome Or Below-Grade Shield Building” (pages 8-9), that “the AMP is unduly narrow in scope, which provides a means of avoiding issues of aging management of the whole shield building and as well, other safety-related structures at Davis-Besse,” is all the more relevant and compelling now, in light of the August/September 2013 admission of worsening cracking.

Re: section #8, “Use of Other Safety-Related Structures as Comparables Instead of as Inspection Targets” (pages 9-10), given the visual discovery of an “invisible” safety-related problem that has lurked unseen during many years of full power operations (the gaps in the Shield Building wall access opening area, not only from 2011 to 2014, but even from 2004 to 2011), we again call on more extensive, frequent, and diverse testing to check for both the “invisible” (sub-surface cracks and gaps) and the visible (as through visual examination not blocked by metal plates left in place, for no good reason, in the access opening from 2011 to 2014 – blocking visual identification of a large gap in the Shield Building wall).

Re: section #9, “Ettringite Penetration Beyond Outer Rebar Layer” (pages 10-11), the discovery of worsening cracking in August/September 2013, the discovery of repeated Shield Building wall gaps during many years of full power operations (2004-2011, and 2011-2014), as well as damage inflicted on the rebar by the hydro-demolition process in 2014, underscores the need for a clear and comprehensive status report of reinforcing steel across the structure, to ensure its ongoing integrity, and design functionality, from 2017 to 2037.

Re: section #10 (page 11), “Insufficiently-Detailed Extent of Condition Corrective Action #1,” we point out that while Impulse Response as well as core bore testing can still – and should still – be conducted across the Shield Building’s exterior face, the white wash of 2012 now precludes the visual examination of surface defects, such as surface cracking. A comprehensive visual examination of the Shield Building exterior should have been conducted prior to the white washing of 2012, but was not. Now, ongoing visual examination is impossible, as the evidence has been covered up. Thus, the importance of core bore and Impulse Response, as well as other testing methods, increases.

Re: section #11, “Slip-Form Friction Fiction” (pages 11-13), the 2014 damage to the access opening rebar from hydro-demolition, the recurring wall gaps (2002-2011; 2011-2014), and the severe, worsening cracking (1978-2014, although FENOC admitted in May 2012 that dome cracking had been documented in 1976) make clear that cumulative stresses on the Shield Building (including the slip-form friction dating back to earliest
construction, in the early 1970s) are a very serious and growing concern, demanding comprehensive root causes analyses, continuously updated monitoring of the status of the extent of conditions over the full structure and over time, and multiple corrective actions, as well as multiple aging management plans, to address multiple root causes and multiple worsening conditions.

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INTERVENORS’ FOURTH MOTION TO AMEND AND/OR SUPPLEMENT PROPOSED CONTENTION NO. 5 (SHIELD BUILDING CRACKING) (July 23, 2012)

Posted online at: http://www.beyondnuclear.org/storage/4th%20Motion%20PII%20COMPLETE.pdf

Re: p.3-5/56, re: NRC’s first line of inquiry, given the Aug./Sept. 2013 revelations of worsening cracking, chemical analyses to guard against carbonation, chloride, sulfate, and other chemical attack should be significantly strengthened.

Re: p.5-6/56, re: NRC’s second line of inquiry, FENOC contractor PII’s admission of no “reliable information about the rate of crack propagation” is now, clearly, all the more significant, given the revelations of Aug./Sept. 2013. Beginning on Feb. 27, 2012, with the publication of its Root Cause Report, blaming the Blizzard of 1978 as the culprit, and continuing through its Revised Root Cause Report of mid-May 2012, FENOC attempted to maintain the position that Shield Building cracking was frozen in time – that the damage was done over a few days in January 1978, but had not worsened since. This could no longer be maintained after revelations of worsening old cracking, and initiation of new cracking, in Aug./Sept. 2013. Thus, a much larger number of Shield Building locations must be tested, at a greater frequency, given this fundamental, and safety-significant, blind spot regarding “rate of crack propagation.”

Re: NRC’s third line of inquiry (p.7/56), “PII and FENOC need to develop better testing methods” for carbonation – now more than ever, given the Aug./Sept. 2013 revelations. They indicate that the root cause(s) are insufficiently understood, and hence the corrective actions, and aging management plans, needed. In addition, such revelations as a mere one inch of concrete covering the outer rebar mat are exacerbated by additional rebar damage – as occurred due to the access opening hydro-demolition in Feb. 2014. The Shield Building concrete cracking, and rebar degradation/damage, are cumulative, aging-related risks, as Intervenors have repeatedly warned in their intervention.

Re: NRC’s fourth line of inquiry (p.7-8/56), the contradiction between FENOC contractors CTL and PII re: micro-cracking is all the more significant in light of the Aug./Sept. 2013 revelations. PII’s attempted elimination of “a fatigue/progressive failure mechanism” is not defensible, given the discovery of worsening old cracking, and
initiation of new cracking – revealed, reportedly, due to a new testing method, better able to detect micro-cracking (which PII earlier attempted to deny was present or possible).

Re: NRC’s fifth line of inquiry (p.8-10/56), the Aug./Sept. 2013 revelations of aging-related cracking, combined with the added risks of recurrent Shield Building wall gaps (2002-2011, 2011-2014), and even hydro-demolition damage to rebar, demand that top-notch, careful, and comprehensive analyses, such as sensitivity studies, be carried out on all aspects of Shield Building cracking and rebar degradation. This is all the more important, given the doubts and concerns still swirling around conformance to design and licensing bases.

At p. 9/56, we stated:

“FENOC – which admitted in its February 2012 RCA [Root Cause Analysis] that the shield building cracking has left the shield building “non-conforming to the current design and licensing bases” - has also wrestled with this challenge. Perhaps seeking its own “path of least resistance” (not unlike a propagating crack in the Davis-Besse shield building), the nuclear utility chose the approach that allowed immediate return to full power operations, while kicking the can down the road on “re-establishing” licensing basis design conformance. The NRC Staff did not object to this, even as it struggled to understand the legal and regulatory justification for such a move. In fact, the Staff generously granted FENOC a grace period until December 2012, during which time FENOC will attempt to complete a design basis conformance re-evaluation, in order to address significant licensing non-conformances created by the severe shield building cracking.”

It’s fair to say, at this late date (April 2014), that FENOC’s supposed re-establishment of licensing basis design conformance is shaky at best. In fact, NRC has granted FENOC till mid-2014 to re-figure the root cause of Shield Building cracking, after the August/September 2013 revelation of worsening old cracks, and initiation of previously unseen new cracking.

Re: NRC’s seventh line of inquiry, we would simply like to repeat, verbatim, our concluding observations and assertions, in light of the Aug./Sept. 2013 revelations of worsening, age-related cracking:

“…could not the various cracking and other degradation at diverse locations on the shield building be attributable to not only the Blizzard of 1978’s wind-driven precipitation into the exterior side walls, but also to a top-down dynamic, if not other causes to boot? Without a comprehensive root cause analysis, PII and FENOC cannot guarantee that age-related degradation of the shield building is comprehended, and that appropriate protections are in place to defend against it.

Intervenors also challenge the acceptability of FENOC performing only three full depth core bores. Three core bores across the entire surface of the huge shield building is not acceptable, is much too small a sample size. It provides a mere snap shot, frozen in time,
of mere cubic inches (and mere square inches of surface concrete), versus the thousands or tens of thousands or hundreds of thousands of cubic feet of shield building structures, which very well may be suffering worsening cracking over time.”

On Feb. 14, 2014, in Toledo Blade coverage of the revealed Shield Building gap, a FENOC spokeswoman claimed that the gap had not diminished any safety margins. This claim was repeated several days later, in the NRC event notification. However, as a member of the public asked on the Feb. 20, 2014 NRC Webinar re: steam generator replacement at Davis-Besse, how could the gap not have decreased safety margins? It appears on its face that safety margins must have been decreased. The questioner also pointed out to NRC that it had previously pledged to correct FENOC publicly when the utility made indefensible safety claims – but it has yet to do so regarding the Shield Building gap.

Given repeated Shield Building gaps (2002-2011, 2011-2014), worsening age-related cracking revealed in Aug./Sept. 2013, rebar damage from hydro-demolition in 2014, etc., the Shield Building risks at Davis-Besse are numerous and growing. Combine that with the lack of a sound root cause analysis (already clearly evident in 2012, as revealed in our contention supplement assertions cited here, but made all the more clear by the Aug./Sept. 2013 discoveries, and the need for FENOC to prepare yet another revised root cause analysis report by mid-2014), it’s clear that Intervenors’ contentions are worthy of hearing.

Also, NRC’s questions about the structural integrity of the Inner Face of the Shield Building’s concrete and rebar mat are similarly all the more significant now, that worsening cracking has been documented, as well as recurrent gaps, and still mysterious root cause(s). As revealed by Intervenors’ FOIA request in 2012, NRC Staffer Abdul Shiekh warned about the risk of a 90% failure of the Shield Building, under the stress of even small additional loading. Intervenors cited this warning repeatedly in contention supplements in 2012. But now it must be asked, isn’t 100% failure possible, given concerns about Inner Face concrete and rebar, including questions asked by NRC in 2012, which have never been answered or adequately addressed by FENOC since? As in 2012, Intervenors are still calling for comprehensive, and ongoing, testing of the Shield Building, including on its Inner Face – something entirely lacking from FENOC’s AMP.

Re: NRC’s eighth line of inquiry (p.16/56), NRC Staff question the very basis for FENOC’s Blizzard of 1978 root cause explanation – whether or not moisture penetrating and freezing in concrete can account for the cracking. Given the fact that worsening crack was discovered in Aug./Sept. 2013, this does call into question the Blizzard of 1978 hypothesis. In fact, FENOC has currently undertaken a revision to its revised root cause analysis, due out by mid-2014.

NRC’s ninth line of inquiry (p.16-18/56) asks:

“It appears if ice forms within this joint it would create radial stress on the parapet and top of SB [shield building] wall, at roof (and tensile loads on inside SB wall near roof).
Were any examinations (other than visual) performed on the roof or parapet? If not, why not. Were any type of examinations conducted at the inside surface of the SB wall just below the parapet to identify cracking? If not, why not? What actions proposed preclude this scenario from causing further cracking (e.g. is top surface sealing identified)?

Intervenors have previously expressed concerns about this potential top-down moisture intrusion potential, caused by cracking in the dome/parapet area dating as far as back as 1976, before the Blizzard of 1978. Intervenors have also urged that a diverse array of testing methodologies (including visual and Impulse Response, but others beyond these as well) be used to ascertain the structural integrity of the Shield Building across its surface area and cross section, including on its Inner Face. Thus far, Intervenors’ calls have fallen on deaf ears.

Re: NRC’s tenth line of inquiry (p.18-19/56), given evidence of micro-cracking, as well as multiple directions of potential moisture penetration of the Shield Building wall (outside-in, inside-out, and top-down), much more rigorous and extensive testing of the Inner Face, thickness, and Outer Face of the Shield Building than FENOC’s AMP plans is called for. This is all the more necessary, after the Aug./Sept. 2013 revelations of worsening cracking of still unexplained origin.

Re: NRC’s eleventh line of inquiry (p.19-20/56), FENOC contractor PII admitted that its conclusion, that the Blizzard of 1978 – but not the similar Blizzard of 1977 – is the singular root cause of Shield Building cracking “is based on engineering judgement. There was no sensitivity analysis performed.”

Intervenors surmised that:

“NRC’s questions point out compellingly that there is not a single root cause to shield building cracking, but potentially multiple root causes. Despite this, PII and FENOC cling to their ultimate root cause theory, that the Blizzard of 1978 was the only explanation for shield building cracking. But given the presence of multiple kinds of cracking, located at diverse places across the huge shield building, NRC’s questions raise the specter that PII and FENOC have not adequately explained the origin of all cracking. This would leave the shield building vulnerable to yet unidentified cracking initiation and propagation dynamics.”

The discovery, in Aug./Sept. 2013, of worsening cracking, deepens the doubts about the Blizzard of 1978 root cause explanation’s accuracy. In fact, FENOC is currently re-evaluating its root cause hypothesis, with a new final report due out by mid-2014. Thus, currently, without a compelling understanding of the root cause(s) of Shield Building cracking and rebar dysfunction, there can be no confidence that merely weather sealing the Shield Building’s exterior some 40 years late will prevent further cracking. In fact, the findings of Aug./Sept. 2013 – one year after weather sealant was applied – show the opposite.
NRC’s twelfth line of inquiry (p.20-24/56) was very significant, for it questioned the practice of FENOC and its contractors of using non-conservative figures and assumptions in its Shield Building cracking analyses. Intervenors showed the unacceptability of using such unjustifiable figures and assumptions, quoting NRC Staff such as Pete Hernandez and Abdul Shiekh, from communications obtained via FOIA. The two NRC Staff warned about downplaying the cracking’s significance, not doing enough core bore testing to validate Impulse Response testing of limited usefulness, not adequately establishing the Shield Building’s structural integrity, and not accounting for all stresses already endured by the Shield Building. They warned that small additional stresses could fail the Shield Building through 90% of its depth, with the reinforcing steel at the Outer Face detaching itself from the Shield Building structural concrete. They questioned whether or not the Shield Building will “stay standing.”

Given the added stress on the Shield Building created by a large wall gap, from 2011 to 2014, recently revealed in Feb. 2014, it is all the more important that these faulty and questionable assumptions by FENOC and its contractors be comprehensively re-examined, as in a hearing on the merits of this contention.

A thirteenth area of NRC inquiry (p.24-26/56) involved out-of-level friction forces during construction, which have been little analyzed by FENOC, its contractors, or their predecessors. We quoted PII’s admission: “We do not have information regarding the method of correcting the problem and whether it caused excessive friction forces.” To the “growing list of stresses borne by the Davis-Besse shield building (which, during construction alone, included the following: “Noteworthy deviations during construction of the shield building walls were issues such as concrete with the wrong water to cement ratio, concrete with smaller coarse aggregate size, concrete with the wrong type of cement, exceeding shield building wall tolerance for plumb, installation of reinforcing steel, embeds, or reglets, and omission of blockouts. The shield building construction deviations are described in attachment 8.),” must now be added Shield Building wall gaps (2002-2011, 2011-2014), as revealed in Feb. 2014.

NRC’s fourteenth area of inquiry (p.26-27/56) questions how evidence of varying depths of cracking comports with the Blizzard of 1978 root cause conclusion. This underscores a strong suspicion that another root cause, or multiple root causes, are to blame for the cracking. This suspicion was deepened considerably when worsening old cracking, and the initiation of new cracking, were discovered/admitted in Aug./Sept. 2013. In fact, FENOC has embarked on yet another round of revising its root cause explanation, a report due out later this year.

Thus, various kinds of cracking and other Shield Building degradation, caused by multiple root causes and growing worse over time, are added to the risks created by recurring Shield Building wall gaps (2002-2011, 2011-2014).

Similarly, NRC’s fifteenth area of inquiry (p.27-28/56), concerning dense rebar, adds yet another element of risk to the long list mentioned just above. To this now must be added the rebar damaged by hydro-demolition to create the access opening in Feb. 2014, which
may be related to sub-standard rebar, documented in the Jan. 31, 2012 NRC Inspection Report, potentially installed to repair the 2011 access opening. As mentioned above, we cited this as INTERVENORS’ [FIRST] MOTION TO AMEND ‘MOTION FOR ADMISSION OF CONTENTION NO. 5’ (February 27, 2012).

Along similar lines, NRC’s sixteenth area of inquiry raised questions of sub-standard concrete, vulnerable to excessive thermal diffusivity (conductivity, specific heat) allowing deep penetration of not only moisture infiltration (for lack of exterior weather sealant for over four decades) but also heat flow, leading to severe cracking. Such questions have still not been addressed, and must be, given the latest developments (worsening cracking in Aug./Sept. 2013, Shield Building wall gap revealed in Feb. 2014), and the increased risks associated with them.

NRC’s seventeenth line of inquiry (p.30-31/56) questioned FENOC’s and its contractors’ tendency to take non-conservative approaches, such as neglecting to account for the “abnormally” and “uniquely high thermal conductivity” measurements of the Davis-Besse Shield Building concrete in stress analyses. Such non-conservative approaches are even less defensible, given the 2013 revelations of worsening cracking, and the 2014 revelation of a large wall gap.

Re: NRC’s eighteenth line of inquiry (p.31-32/56), PII’s admission that “the [tensile and compressive] strengths of concrete can decrease over time due to aging-related mechanisms such as freeze-thaw cycles and chemical attacks” bolsters Intervenors’ arguments that the cracked concrete containment contention is aging-related, and points to the obligation of a full hearing on the merits, as we stated in our 2012 motion to supplement. The worsening cracking revealed in 2013, combined with added risks such as the Shield Building wall gap revealed in Feb. 2014, add yet more weight to Intervenors’ arguments of 2012.

NRC’s nineteenth line of inquiry (p.32-34/56), concerned the build up of water and snow/ice on the Shield Building dome area due to poor to no drainage. NRC raised questions about the added stress from the weight of off-center loading, as from snow and ice. FENOC’s contractor PII admitted pent up water would be just as bad. Combined with cracks in the Shield Building dome, as well as flaws with the weather sealant on the dome, both documented as early as 1976, pent up water, or melting snow or ice, was acknowledged by FENOC, PII, and even NRC as the second most likely root cause for the sub-laminar cracking. Despite this, it has been even been mentioned in the Feb. 27, 2012 Root Cause Report, nor the mid-May 2012 Revised Root Cause Report. Perhaps it will be mentioned in the mid-2014 revision to the Revised Root Cause Report? After all, cracking was documented as worsening in Aug./Sept. 2013, and questions linger about the weather sealant functionality at the dome/parapet intersection.

Re: NRC’s twentieth line of inquiry (p.34-35/56), Intervenors re-affirm the need for FENOC to comprehensively age-manage the entire Shield Building, not cherry-picked areas thereof. This is all the more important now that aging-related cracking was documented in Aug./Sept. 2013, undermining FENOC’s NRC-blessed Blizzard of 1978
root cause conclusion. As but one example, if Impulse Response, or any other basic acoustic test, had been performed on the access opening after the 2011 repair, the air space or gap would have been readily detected. This would have prevented over two years of full power operations with a clearly compromised containment. Relying on sheer luck – that the compromised containment was not tested between Dec. 2011 and Feb. 2014 – is a very risky form of nuclear safety regulatory policy.

Re: cherry-picking areas of the Shield Building for analysis, NRC’s twenty-first line of inquiry prompted Intervenors to ask “what about a combination of adverse forces acting simultaneously on a severely compromised shielding building structure, not only at the 30’ crack location, but also at equally vulnerable, or even more vulnerable, locations?” The Feb. 2014 Shielding Building wall gap shows this question to be quite significant, for this was a severely compromised, very vulnerable structure. The recurring wall gaps (2002-2011, 2011-2014) shows that neither FENOC nor NRC knows how to avoid them. What is to guarantee that current access opening repairs won’t leave Shield Building wall gaps that will represent a serious decrease in containment safety margin for the period of extended operation (2017-2037)? What testing, to guard against further gaps within the various perimeters of past access openings, is NRC requiring of FENOC, if any? If no testing is being required, why not? Wouldn’t such testing have instantly revealed the gap introduced in 2011, and thus prevented over two years of full power operations with a severely compromised containment structure?

To NRC’s twenty-second area of inquiry (p.36-37/56), Intervenors responded:

“NRC’s questions ("Why wasn't a similar FE model developed to evaluate the potential for growth of the existing cracking? Why isn't a more refined FE model or other applicable analysis needed as part of the corrective actions to monitor crack growth to ensure monitoring plans are adequate?") show that Intervenors’ request for a hearing on these aging-related matters is reasonable as well. PII’s inadequate responses and FENOC’s AMP fail to answer or account for the NRC’s safety-significant, aging-related questions. The daily and seasonal thermal forces, as well as environmental stresses, could pose a challenge to the already multiply-challenged shield building over the 2017 to 2037 license extension period. PII and FENOC, have not adequately accounted for all the cumulative loads and stresses.”

The revelation of worsening cracking in Aug./Sept. 2013 underscores the importance of Intervenors’ demand that FENOC’s AMP be strengthened considerably. Intervenors also point out that such revelations as recurring Shield Building wall gaps (2002-2011, 2011-2014) must now be considered in light of other risk factors – such as increasing temperature extremes, including both summer highs, and winter lows, large temperature swings over short periods of time, and extreme weather, all attributable to human-caused climate change. Have FENOC and NRC, in both required safety and environmental reports, accounted for this “global weirding” weather wild card in their analyses of Shield Building functional integrity? In its Shield Building cracking root cause analyses and reports, FENOC, and its contractor PII, seem to have inappropriately assumed past weather norms, past daily and seasonal temperature fluctuations, as appropriate for
analyzing on-going Shield Building stresses, as has NRC in its analyses, such as the license extension EIS. As hinted at by the title of the Oscar-winning documentary “An Inconvenient Truth,” and as attested to by the on-going scientific work of the United Nations Intergovernmental Panel on Climate Change (which, along with the documentary’s filmmaker, Vice President Al Gore, were awarded the Nobel Peace Prize for their efforts to protect the climate), such assumptions are no longer conservative.

The NRC’s twenty-third line of inquiry (p.37-38/56) focuses on the importance of areas of the Shield Building incorporating a dense concentration of rebar. This issue is all the more significant now, given the Feb. 2014 admission of hydro-demolition damage to rebar, which itself raises doubts about rebar quality installed into the Shield Building access opening repair work in late 2011. The degradation and damage to structural reinforcing steel across the Shield Building must be considered in light of other damage and degradation, including worsening cracking, recurring Shield Building wall gaps, etc.

NRC’s twenty-fourth area of inquiry (p.38-40/56), regarding “crack initiation depth or growth rate,” prompted this response by Intervenors:

“Intervenors assert that a rigorous sensitivity study should have been, and still should be, performed. PII and FENOC should model growth rate, as this is essential for an adequate shield building aging management plan and monitoring program over time, including any 2017 to 2037 license extension period.”

After all, FENOC’s contractor PII, as evidenced by NRC’s line of questioning, admitted to very deep cracking of 14 inches in depth, about halfway through the 30 inch thick Shield Building wall.

Given the Aug./Sept. 2013 revelation of new crack initiation and old crack worsening, as well as no clear root cause(s) conclusion(s), extent(s) of condition(s), nor course(s) for corrective action(s) needed (all made clear by yet another revision to the root cause report, due out later this year), a clear and comprehensive understanding/determination of “crack initiation depth or growth rate” is all the more called for now. This could be provided by an ASLB hearing on the merits. This is all the more needed, given such added risks as recurring Shield Building wall gaps (2002-2011, 2011-2014), as revealed in Feb. 2014. Such recurring wall gaps demonstrate the inability of both FENOC and NRC to guarantee containment safety during the period of extended operations (2017-2037), an area that Intervenors continue to hope to address in an ASLB hearing on the merits.

To NRC’s twenty-fifth area of inquiry (p.40-42/56), PII responded:

“Damage in the flute shoulders is concentrated on the southwest side of the building, which coincides with the predominant wind direction. Other parts of the building will still get wet. Based on the IR mapping, the laminar cracks that are not on the southwest side of the building are limited to regions with weak planes of concrete (due to high density
rebar). Weak planes of concrete will require less force to initiate cracks. Therefore, the observed result is expected.”

But FENOC has never provided empirical evidence even establishing, with statistical significance, that the cracking on the southwest face of the Shield Building is in fact worse than the cracking on the other faces.

Intervenors responded to FENOC’s and PII’s arguments thus:

“…the entire shield building surface containing high density rebar should be carefully examined for cracking. Davis-Besse is located on the Lake Erie shoreline. It has been exposed to countless episodes of moisture drenching, followed by freezing temperatures. Combined with information on the substandard heat transfer characteristics of Davis-Besse’s shield building concrete, discussed above, allowing deep freezing of water into the thickness of the shield building, the admission that high wind was not even needed to cause extensive cracking must be addressed across the structure. Weather-sealing the shield building 40 years late does not reverse the damage already inflicted. Nor does it preclude the need for a comprehensive aging management plan and corrective actions for damaged areas of the shield building which by PII’s admission above extends to all areas of dense rebar, if not beyond.”

FENOC has not undertaken a robust testing regimen for the areas of the Shield Building with densely concentrated rebar, nor has NRC required it. Given the worsening old cracking, and newly initiated cracking, revealed in Aug./Sept. 2013, FENOC has undertaken yet another revision to its Revised Root Cause Report of mid-May 2012. Thus, neither root cause(s), extent(s) of condition(s), corrective action(s), nor aging management plan(s) can be said to be adequate. In addition, other forms of damage, degradation, and decreased safety margins – due to rebar damage from hydro-demolition, Shield Building wall gaps, etc. – increase the risks of containment failure, both now and during the license extension period (2017-2037).

Responding to NRC’s twenty-sixth line of inquiry (p.42-43/56), Intervenors stated:

“Intervenors are concerned that PII’s assumption of concrete strength values, which are over-optimistically high, would tend to underestimate cracking and other damage across the shield building structure. Such faulty assumptions and dangerous underestimates must be addressed in a hearing.”

Intervenors continue, two years later, to assert the need for a hearing on the merits regarding Shield Building cracking, damage, and decreasing safety margins. The recurring Shield Building wall gaps (2002-2011, 2011-2014) revealed in Feb. 2014 prompts this latest call, for there is clearly no guarantee that FENOC nor NRC will prevent another round of Shield Building wall gaps in current access opening repairs, which means such containment failure risks will remain into the license extension period. Combined with the added risk of rebar damage, as was inflicted by hydro-demolition activities and revealed in Feb. 2014, as well as the specter of worsening cracking.
(revealed in Aug./Sept. 2013), the overall stresses on the Shield Building merit close examination, before the 2017-2037 license extension approval is granted.

Re: NRC’s twenty-seventh area of inquiry (p.43-44/56), concerning ever more significant “shield building crack initiation, crack growth, and crack arrest,” Intervenors re-assert that:

“…PII not be allowed to cherry-pick select areas of the shield building to test, which fit its predetermined theory, but exclude testing other areas of the shield building structure that could also be cracked or otherwise damaged. NRC itself has questioned the logic of PII’s and FENOC’s Blizzard of 1978 root cause conclusion for sub-surface laminar cracking – given that areas not in the direction of wind driven rain are also cracked, inexplicably. But the Blizzard of 1978 cannot explain shield building dome cracking that was documented as early as 1976. Nor can applying weather sealant 40 years late reverse damage already inflicted, as through the top-down moisture penetration model, where cracks and weather sealant failures in the dome area have allowed moisture penetration via that route downwards – moisture that originated not only from the Blizzard of 1978, but other precipitation events on the Lake Erie shoreline over the course of years and perhaps even decades.

Intervenors urge that their cracked concrete containment and Severe Accident Mitigation Alternatives (SAMA) contentions are inextricably interlinked because FENOC assumes a functioning shield building in its SAMA analyses. Given the severe cracking and other degradation of the shield building, that assumption no longer holds water.”

Intervenors’ objections are still valid, further bolstered by the Feb. 2014 revelations of recurring Shield Building wall gaps (2002-2011, 2011-2014) and rebar damage from hydro-demolition. Intervenors had warned that repeated creation of access openings could damage the Shield Building, as the Feb. 2014 hydro-demolition has done. To Intervenors’ validated concerns must be added the growing risk revealed, in Aug./Sept. 2013, of worsening old cracks, and even the initiation of new ones.