

Davis-BesseNPEm Resource

From: Harris, Brian
Sent: Monday, January 31, 2011 6:55 AM
To: Travers, Allison; Harris, Brian; Cooper, Paula; Parillo, John
Cc: Monteith, Emily; Wright, Megan
Attachments: Joint Petitioners Combined Reply January 28 2011.pdf

All,

Please find the Petitioners reply to the Applicant's answer and our answer, attached. Please take an opportunity to review the filing so that we can set up a meeting either later this week or at the beginning of next week to discuss.

Best regards,
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Hearing Identifier: Davis_BesseLicenseRenewal_Saf_NonPublic
Email Number: 624

Mail Envelope Properties (65FB43187ED87C46B3F00CB97D081E601458AF8604)

Subject:
Sent Date: 1/31/2011 6:55:04 AM
Received Date: 1/31/2011 6:56:08 AM
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Post Office: HQCLSTR01.nrc.gov

Files	Size	Date & Time
MESSAGE	528	1/31/2011 6:56:08 AM
Joint Petitioners Combined Reply January 28 2011.pdf		2544460

Options

Priority: Standard
Return Notification: No
Reply Requested: No
Sensitivity: Normal
Expiration Date:
Recipients Received:

January 28, 2011

**UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION
Office of the Secretary**

In the Matter of:) Docket No. 50-346
FirstEnergy Nuclear Operating Company)
Davis-Besse Nuclear Power Station, Unit 1)
(Regarding the Renewal of Facility)
Operating License NPF-003 for a 20-Year)
Period))
)

**JOINT INTERVENORS' COMBINED REPLY IN SUPPORT
OF PETITION FOR LEAVE TO INTERVENE**

Now come Beyond Nuclear, Citizens Environment Alliance of Southwestern Ontario, Don't Waste Michigan, and the Green Party of Ohio, hereafter "Petitioners") and hereby reply in support of their Petition for Leave to Intervene submitted on December 27, 2010 in this proceeding.

REPLY TO FENOC ASSERTION OF PETITIONERS' UNTIMELY SUBMISSION

At pages 11-13 of its Answer, FENOC accuses Petitioners of not timely filing their Petition for Leave to Intervene. Significantly, FENOC makes no credible argument of prejudice to its interest as a result of the shortly before, and shortly after midnight submission by Petitioners on December 27-28, 2010. Moreover, the NRC staff does not challenge the

timeliness of Petitioners' filing.

As detailed in the attached "Declaration of Kevin Kamps," Petitioners experienced major difficulties with NRC's Electronic Information Exchange system on the night of the December 27, 2010, despite their good faith efforts to attain compatible computational status, and having earlier obtained assurances from the EIE Help Desk that everything was in good order. Joint petitioners' *pro se* point person for this proceeding is Kevin Kamps of Beyond Nuclear. He contacted the EIE Help Desk a week in advance of the December 27, 2010 filing deadline, and spent an extended period of time on the phone and his computer with the EIE Help Desk obtaining his EIE digital certificate for the Davis-Besse proceeding, making sure that it was in good order.

On the evening of December 27, 2010, Kevin Kamps again contacted the EIE Help Desk at 7:00 p.m., ahead of its closure at 8:00 p.m., to make sure that his digital certificate was in good order and that everything would function smoothly for the filing due before midnight. He spoke with Debra at the EIE Help Desk, who assured him that the certificate was fine and that the filing should proceed smoothly.

Once Kamps had the petition and request in final form, and all exhibits in order and ready to submit, he began the process of submission at 11:00 p.m. It quickly became apparent that the EIE system was not working properly. Kamps was only able to get up to the signature page of the EIE system, but was unable to get beyond it, no matter how he tried to.

As an emergency contingency, Kamps contacted his co-worker Paul Gunter, who also had a digital certificate for the Davis-Besse proceeding. Fortunately, Gunter was able to submit Petitioners' documents into the system after racing to the Beyond Nuclear office (on Christmas

holiday; Beyond Nuclear takes the Christmas to New Year's time window as holiday) after 11 p.m. in order to do so. Kamps transmitted the complete filing, including all exhibits, to Gunter via email, then called the NRC Secretary's office and the EIE Help Desk to leave timely messages about the problems he experienced in filing. Gunter handled the filing through the NRC EIE as quickly as he was able.

It should also be noted that all of the exhibits, as well as Dr. Al Compaan's curriculum vitae and declaration, were embedded as links in the Microsoft Word version of the "Request for Hearing and Petition for Leave to Intervene," which FENOC itself admits (FENOC Answer p. 11) was submitted *before* the midnight deadline.¹ Thus, all exhibits, as well as Dr. Compaan's supporting documents, were available to FENOC in a timely fashion.

Kamps spent hours the next day, as delineated in his Declaration, working with EIE Help Desk staff, who verbalized their own frustrations with the system and who questioned whether there was a software problem that had corrupted Kamps' electronic certificate. After noon on December 28, Kamps submitted two exhibits that the EIE system had earlier rejected, after the Help Desk staff identified the filing problem.

Notably, shortly after 8:00 a.m. on December 28, Kamps spoke to NRC staffer Rebecca Gitter, who apologized to him for the difficulties with the EIE system, saying, "This is something others have experienced." She added that this is "a common problem others have had at the submission stage." Kamps Declaration, p. 2.

Obviously, the EIE Help Desk's assurances to Kevin Kamps on December 21 and 27,

¹"The text of the Petition itself, the standing declarations, and eight exhibits (Exhibits 1, 2, 5-7, and 9-11) were submitted by the requisite deadline on December 27, 2010."

2010 that his digital certificate was in good order and he would be able to submit documents to the EIE system were incorrect. Kamps made good faith attempts to file before the midnight deadline, followed by Paul Gunter's successful filing of several key documents ahead of midnight and Gunter's submission of 73 items in all, one at a time, into the EIE's Davis-Besse docket. Kamps immediately followed up the next day at the commencement of NRC business hours to straighten out the glitch and filed the remaining two exhibits as soon as the problems were identified and solved by the Help Desk. Kamps Decl. pp. 2-3.

Petitioners submit that they have demonstrated "good cause" to have their Petition deemed timely submitted and filed. The first factor of those specified in 10 C.F.R. § 2.309 (c)(1), the timeliness rule, is whether there exists "good cause, if any, for the failure to file on time." *Cincinnati Gas and Electric Co. (William H. Zimmer Nuclear Power Station)*, ALAB-595, 11 NRC 860, 862 (1980). In considering the "good cause" factor, a strong excuse for lateness will attenuate the showing necessary on the other factors of 10 C.F.R. § 2.309 (c). *Puget Sound Power & Light Co. (Skagit Nuclear Power Project, Units 1 and 2)*, ALAB-523, 9 NRC 58, 63 (1979). *See also Florida Power and Light Co. (St. Lucie Nuclear Power Plant, Unit No. 2)*, ALAB-420, 6 NRC 8, 22 (1977), *affirmed*, CLI-78-12, 7 NRC 939 (1978). While a satisfactory explanation for failure to file on time does not automatically warrant the acceptance of a late-filed intervention petition, because those additional factors specified under 10 C.F.R. § 2.309(c) must also be considered, it remains that where a late filing of an intervention petition has been satisfactorily explained, a much smaller demonstration with regard to the other factors of 10 C.F.R. § 2.309 (c) is necessary than would otherwise be the case. *Wisconsin Public Service Corporation (Kewaunee Nuclear Power Plant)*, LBP-78-24, 8 NRC 78, 83 (1978).

Finally, petitioners proceeding *pro se* will be shown greater leeway on the question of whether they have demonstrated good cause for lateness than petitioners represented by counsel. *Maine Yankee Atomic Power Co.* (Maine Yankee Atomic Power Station), LBP-03-23, 58 NRC 372, 378 (2003). That principle should be applied to the facts here.

Against Petitioners' account of what went wrong with the filing - most of which can be verified through NRC Help Desk records and the Secretary's phone log - FENOC can make no credible showing of prejudice. Unless, that is, FENOC's legal staff awaited the filing at 12:01 a.m. December 2010 in order to immediately begin work on their response to the Petition for Leave to Intervene. FENOC's objection is frivolous, hypertechnical, and rote. There is no issue as to the genuine efforts by Petitioners to timely file through an inexperienced, *pro se* coordinator in his first adjudicatory filing situation. This is a non-issue, and Petitioners pray the ASLB ignore the Applicant's pointless objection.

***REPLY TO CLAIMED LACK OF STANDING OF
CITIZENS ENVIRONMENT ALLIANCE OF SOUTHWESTERN ONTARIO***

In an argument which disrespects the workload facing the ASLB, both FENOC and the NRC Staff contrive to object to the standing of Citizens Environment Alliance of Southwestern Ontario, a Windsor, Ontario organization. They claim (FENOC Answer p. 9; Staff Answer p. 6), that CEA's the two declarants, Rick Coronado and Derek Coronado, live at a Windsor address that according to respondents' measurement is 300 feet outside of the 50-mile radius (that is, 50.024 miles) , hence outside the radius of proximity which is customarily presumed to establish standing to petition the NRC in license extension cases.

FENOC claims to have measured (FirstEnergy's Answer p. 9 fn. 31) from an aerial map of the Davis-Besse site "by first locating the Davis-Besse site address . . . and then manually

moving the location marker to the containment building, which is clearly visible using the ‘Hybrid’ . . . viewer.” FENOC does not state whether it measured from the precise center of the containment building. And FENOC makes no demonstration that the 50-mile proximity presumption is not, in fact, measured from the boundary fence at Davis-Besse. Nor do the Staff or FENOC address the issue of whether being inside a 50 mile radius from the Davis-Besse water outflow pipe, which easily extends several hundred feet into Lake Erie and which in some accident scenarios could dump prodigious amounts of highly-radioactive water into the Lake which would evaporate into the air, would not confer standing on CEA under the proximity presumption.

The hairsplitting implicit in the respondents’ global positioning overkill postulates an reading of the proximity presumption to which the Commission does not subscribe. In *Calvert Cliffs 3 Nuclear Project, LLC and Unistar Nuclear Operating Services, LLC* (Combined License Application for Calvert Cliffs, Unit 3), CLI-09-20, the Commission stated:

In practice, we have found standing based on this ‘proximity presumption’ if a petitioner (or a representative of a petitioner organization) resides **within approximately 50 miles** of the facility in question. (Emphasis supplied)

Id. at 5.

Pertinent emergency preparedness documents on which the proximity presumption is based refer to the 50-mile radius as “approximate.” See “Davis-Besse Nuclear Power Station Emergency Plan Implementing Procedure, RA-EP-02245, Protective Action Guidelines, Revision 01 (2003),” ADAMS #ML030220458, p. 4, “Definitions:”

3.5 EMERGENCY PLANNING ZONE(S) -The two zones that are established around a nuclear power station in which predetermined protective actions plans are needed.

3.5.1 The first zone has an approximate radius of 10 miles for the plume

exposure pathway.

3.5.2 The second zone has an ***approximate radius of 50 miles*** for the ingestion exposure pathway. (Emphasis supplied)

See also December 21, 1979 letter, NRC to licensees (ADAMS #ML073521046):

Briefly, the proposed rule would . . . (3) Require extending emergency planning considerations to the emergency planning zones (i.e., within the ***approximate*** 10 and 50 mile radii around the plant). (Emphasis supplied)

It bears noting that the CEA office in Windsor is located at 1950 Ottawa Street,² and using the same calculator as FENOC did, when the Coronados are at work or meeting in that office, they are 49.751 miles of the containment building at Davis-Besse. The proximity presumption applies if the petitioner lives within, or otherwise has frequent contacts with, the zone of possible harm from the nuclear reactor. *Pa'ina Hawaii, LLC*, LBP-06-4, 63 NRC 99, 105 (2006), (citing *Fla. Power & Light Co.* (Turkey Point Nuclear Generating Plant, Units 3 and 4), LBP-01-6, 53 NRC 138, 146 (2001), *aff'd on other grounds*, CLI-01-17, 54 NRC 3 (2001).

Indeed, the NRC has entertained a proximity presumption of greater than 50 miles. *Philadelphia Electric Co.* (Limerick Generating Station, Units 1 and 2), LBP-82-43A, 15 NRC 1423, 1447 (1982) (residence more than 75 miles from a plant will not alone establish an interest sufficient for standing as a matter of right), citing *Dairyland Power Cooperative* (LaCrosse Boiling Water Reactor), ALAB-497, 8 NRC 312, 313 (1978); *Public Service Co. of Oklahoma* (Black Fox Units 1 and 2), ALAB-397, 5 NRC 1143, 1150 (1977).

Rick and Derek Coronado have produced sufficient evidence to warrant their being allowed to intervene on behalf of Citizens Environment Alliance of Southwestern Ontario.

REPLY AS TO CLAIMED LACK OF GERMANENESS OF DON'T WASTE MICHIGAN

²http://www.citizensenvironmentalliance.org/about_cea.html

FENOC maintains (Answer p. 10) that Don't Waste Michigan fails to demonstrate that the interests it seeks to protect are "germane" to its purpose, arguing that "Don't Waste Michigan does not explain how seeking to intervene in this license renewal proceeding for a facility located outside of Michigan falls within its organizational interests or purpose."

FENOC is wrong. The complete corporate purpose statement of Don't Waste Michigan, as stated in its articles of incorporation, is as follows:

A statewide coalition of concerned individuals, citizens groups, and environmental organizations dedicated to educating the public about the dangers nuclear contamination poses to human health and the environment.

Taking these broad goals of DWM together with the proximity presumption that hundreds of thousands of Michigan residents live within 50 miles of Davis-Besse, it is indisputable that DWM claims a valid stake on behalf of its members for purposes of this relicensing case.

Where a showing of germaneness needs to be made, as a requirement, it is "undemanding." The germaneness requirement mandates "mere pertinence between litigation subject and organizational purpose." *Humane Society of the United States v. Hodel*, 840 F.2d 45, 58-59, 268 U.S.App.D.C. 165 (D.C. Cir. 1988). Other courts agree: showing germaneness is "undemanding." *See, e.g., National Constructors Association v. National Electrical Contractors Association*, 498 F.Supp. 510, 521 (D.Md.1980) (germaneness standard allows suits by groups whose purposes are "pertinent or relevant to" claim at issue); *American Insurance Association v. Selby*, 624 F.Supp. 267, 271 (D.D.C.1985) (stating that "an association's litigation interests must be truly unrelated to its organizational interests before a court will declare that those interests are not germane"); *Medical Association of Alabama v. Schweiker*, 554 F.Supp. 955, 965 (M.D. Ala.1983) (germaneness test requires that "the injury to [an association's] members has some

reasonable connection with the reason the members joined the organization and with the objectives of the organization").

Petitioners have demonstrated the requisite “mere pertinence between litigation subject and organizational purpose” enunciated in *Hodel*. Don’t Waste Michigan clearly deserves to be accorded standing to participate as one of the Joint Petitioners.

REPLY IN SUPPORT OF CONTENTIONS ONE, TWO AND THREE

A. Dinosaur Denial

Both FENOC and NRC Staff assert that neither Wind nor Solar provide “baseload power” and that neither Wind nor Solar comprise a “single, discrete electric generating source.”

It gainsays FENOC and the Staff nothing to assert that the future of Wind and Solar is “remote” and “speculative” when their data dates from 1986 (wind-power classification of Class 3 or higher necessary for production,, ER p. 221-2); 1996 (GEIS says 214 square miles of land needed to replace 910 MW ; 12,740 acres of photovoltaic solar collectors to replace 910 MW); and 2009. The ER neither notes nor discusses active plans for deployment of Solar and Wind in the near Great Lakes demonstrated by Joint Petitioners in their initial filing. When FENOC trivializes the “current status” of alternatives as “emerging” and “under development,” it is well to understand that the utility critiques technologies which have experienced a double-digit explosion of deployment in the same decade of a “nuclear revival” that has produced zero new nuclear power plant capacity additions. According to the U.S. Department of Energy (DOE), the U.S. has gone from 2,472 MW of wind-generated electricity in 1999 to 36.698 MW in 2009.³

³http://www.windpoweringamerica.gov/wind_installed_capacity.asp

In the present baseload generation market, Wind and Solar are competing head-on with nuclear and beating it badly in the cost per installed kilowatt. FENOC's and the Staff's dinosaur denial of the onslaught of Wind and Solar is studiously misleading, and that misdirection violates NEPA straightaway.

NRC regulations at 10 C.F.R. § 51.92(a)(2) obligate the NRC staff to supplement a final environmental impact statement where "[t]here are new and significant circumstances or information relevant to environmental concerns and bearing on the proposed action or its impacts." Reliance on inaccurate data, coupled with word play aimed at minimizing and trivializing these highly-competitive alternatives threatens to "defeat the purpose of an EIS by 'impairing the agency's consideration of the adverse environmental effects' and by 'skewing the public's evaluation' of the proposed agency action." *Hughes River Watershed Conservancy v. Glickman*, 81 F.3d 437, 446-48 (4th Cir. 1996).

B. The 'Baseload' Mislead

FENOC and the NRC Staff consider Davis-Besse to be a "baseload" power source. The concept of baseload power implies continuously-available power to the grid, but the actual facts of the record of power delivery from both Davis-Besse and Perry (FENOC's other Ohio nuclear plant), show otherwise. Data from the U.S. Energy Information Agency⁴ (EIA) for the twenty years from 1989 through 2008 show that the capacity factor for the combination of the two plants is only 75%. In 2010, the Union of Concerned Scientists published a report, "Walking a Nuclear Tightrope: The Unlearned Lessons of Year-Plus Reactor Outages," in which Davis-Besse was

⁴http://www.eia.doe.gov/cneaf/nuclear/state_profiles/ohio/oh.html

accorded attention for some of the longest outages in the domestic industry's history.⁵

Thus, "baseload power," at least as FirstEnergy uses the term, certainly does not mean 100% availability. As between Perry and Davis-Besse, the latter has the notably worse record of performance over 30 years, with many major outages lasting more than 12 months, including more than one summer during which time the demand for electricity reached its maximum. During these long outages, FirstEnergy has had to bring alternative generating sources online or to purchase power.

Contemporary energy storage schemes, such as pumped hydro or compressed air energy storage (CAES) do not have the storage capacity to replace the long-duration outages that are common with nuclear power. Even under the best of conditions, a nuclear refueling event will exhaust these energy storage resources. Hence even "baseload" nuclear power is, itself, not always available as baseload, indeed, is unavailable fully one-quarter of the time. The capacity factor of Solar is about 20%, while Wind is about 30%. The comparison between the 75% capacity of nuclear and 30% for wind or 20% for solar is a much lower hurdle than the myth of baseload productivity for nuclear posed by FENOC and the NRC Staff.

. Considered together, or even discretely, Solar and Wind could provide a credible and reliable electric power baseload. The nature of Solar and Wind in the territory of FirstEnergy is such that complete outages will never occur, especially during the peak demand summer months. This critical insight, which is missing from the Environmental Report, contains great significance. Petitioners do not claim 100% availability for solar or wind power; but the

⁵http://www.ucsusa.org/nuclear_power/nuclear_power_risk/safety/walking-a-nuclear-tight-rope.html, pp. 22-23, 26, 32, 34, 36.

distinction between Solar or Wind discretely or in combination vs. Nuclear is quantitative, not dispositive. It does not legitimately support dismissal of the alternatives contentions.

C. Nuclear Is Not ‘Discrete’

Contrary to the implication of FENOC’s and the NRC Staff’s Answers, nuclear is not truly a “single, discrete electric generating source.” Petitioners have noted above that 25% of the time, according to the historical record, Davis-Besse has required back-up power. In this sense, it cannot truly be considered a single, discrete electric generating source. But beyond this obvious difficulty due to refueling, unexpected “events” and “hole in the head” crises, nuclear power is coupled with energy storage. A good example of this is the operation of the Ludington Pumped Storage Plant, operated jointly by DTE Energy and Consumers Energy. [brochure 62-5117, 15607 5M 12/06]. This hydro plant uses excess power from nighttime baseload generators when the demand is low, and produces power during the day when the demand is high. Some of this power is drawn from large nuclear and coal plants as far away as Monroe, about 200 miles away from Ludington, MI. Consequently, even large nuclear power stations cannot truly be considered as “single” and “discrete” sources of power.

Just as nuclear power can be coupled with energy storage such as pumped hydro, Petitioners have proposed the coupling of energy storage with Solar or Wind to compose a viable alternative to a twenty-year license extension of Davis-Besse. Again, the distinction is quantitative and not dispositive. Recently, Milligan, *et al.* [Michael Milligan, Kevin Porter, Edgar DeMeo, Paul Denholm, Hannele Holttinen, Brendan Kirby, Nicholas Miller, Andrew Mills, Mark O’Malley, Matthew Schuerger, and Lennart Soder, “Wind power myths debunked,”

IEEE Power & Energy Magazine, Nov-Dec 2009 pp. 89-99⁶] discussed the fact that storage has been widely used in the electrical grid network, even before wind or solar became widely used.

They state:

Storage is nearly always beneficial to the grid, but this benefit must be weighed against its cost. With more than 26 GW of wind power currently operating in the United States and more than 65 GW of wind energy operating in Europe (as of the date of this writing), no additional storage has been added to the systems to balance wind. Storage has value in a system without wind, which is the reason why about 20 GW of pumped hydro storage was built in the United States and 100 GW was built worldwide, decades before wind and solar energy were considered as viable electricity generating technologies. Additional wind could increase the value of energy storage in the grid as a whole, but storage would continue to provide its services to the grid - storing energy from a mix of sources and responding to variations in the net demand, not just wind.

Nuclear power and other conventional sources of power use energy storage to facilitate smooth grid operation. There is considerable expense and instability caused to the grid if a large so-called “baseload” coal or nuclear plant departs it suddenly.

Petitioners contend that the combined resource of Solar and storage or Wind and storage, or both together + storage, will form a viable alternative to Davis-Besse. The particular example chosen by Petitioners in their initial filing to illustrate this contention was the proposed Norton Energy Storage Project for underground CAES announced by First Energy. According to a FE press release, the Norton facility could easily handle power production equal to or greater than the 900 MW of Davis-Besse. In contrast with the use of the Ludington energy storage by DTE for power plants, including nuclear, near Detroit, 200 miles distant, the Norton facility is only 85 miles from the Davis Besse site. Shorter transmission lines contribute to greater economy of operation of the combined resource. In fact either the Solar or the Wind resource (or the

⁶<http://www.ieee-pes.org/images/pdf/open-access-milligan.pdf>

combination) would be distributed somewhat across Northern Ohio and/or other parts of the FE distribution territory, much of which is even closer to the Norton storage location.

Nuclear power is “in-discrete” in yet an additional aspect. A long, complex uranium fuel chain is required for Davis-Besse to operate and generate electricity. This includes such far-flung front-end activities as: uranium mining, milling, processing, conversion, enrichment, and fuel fabrication, with all the transportation in between. And it requires such far-flung back end activities as: on-site irradiated nuclear fuel storage in the waste storage pool and dry casks, perhaps followed by: off-site irradiated nuclear fuel storage in dry casks in "centralized interim storage facilities" -- surface parking lots often targeted at Native American communities, an environmental justice violation; dirty, dangerous, and expensive reprocessing, as at Department of Energy facilities; and ultimate disposal of irradiated nuclear fuel at a permanent geologic repository. Also included in back-end nuclear fuel chain activities are various forms of so-called "low-level" (but not low-risk) radioactive waste "management" activities, from deconversion of depleted uranium at enrichment facilities, to disposal in shallow dirt trenches, to incineration, to so-called "recycling" in common use products, an issue that will grow much worse when Davis-Besse is decommissioned, its radioactive facilities dismantled and its radioactively contaminated soil, groundwaters, and Lake Erie sediments "cleaned up" (if that's even possible) someday, a task that will grow more daunting the longer Davis-Besse operates. Without this far-flung nuclear fuel chain complex, with its radiological, toxic chemical, and even greenhouse gas emissions at each step, Davis-Besse could not operate to generate electricity. Davis-Besse is cannot in any respect be considered “discrete.”

The misconception that neither Wind nor Solar represent single, discrete electric

generating sources, while nuclear power does, projects a *faux* apples-and-oranges comparison. Petitioners legitimately seek an apples-to-apples comparison between their postulated alternatives and Davis-Besse to see who holds the lemon.

D. The Replacement Power of Wind and Solar

The NRC Staff states (Answer pp. 15-16) that “Joint Petitioners have not provided sufficient information to show a genuine dispute with the ER’s conclusions that solar power and wind power cannot replace Davis-Besse as a source of 910 MWe of baseload power by the commencement of the relicensing period, 2017.” The Staff suggests that neither solar nor wind can be implemented by 2017.

1. Wind

If there is no massive installation of wind across the near Great Lakes between now and 2017, it will be anomalous. On December 1, 2010, the National Wildlife Federation issued a report on Eastern seaboard wind power potential offshore entitled “Offshore Wind in the Atlantic: Growing Momentum for Jobs, Energy Independence, Clean Air, and Wildlife Protection.”⁷ The rates of dispersion of commercial-grade wind generators, present and projected, is accelerating. Altogether, 908 MW of dependable wind could be installed in time; it’s not a technical impossibility, but it requires the political will to get it done.

The European Union is projected to have 40,000 MW of wind power installed by 2020, 9 years from now; China is projected to have 30,000 MW of wind power installed by 2020, 9 years

⁷ www.nwf.org/News-and-Magazines/Media-Center/News-by-Topic/Global-Warming/2010/12-01-10-Offshore-Atlantic-Wind-is-Next-Clean-Energy-Wave.aspx. Petitioners submitted this report as Exhibit 12 along with their December 27, 2010 petition .

from now (in 2007, China had 1.5 MW, which increased to 102 MW by 2010). *Id.*, p. 19. Even DOE projects that the US can and will have 10,000 MW of wind power installed by 2020, 9 years from now. *Id.* If China can grow wind that fast, why can't 2,700 MW be installed in FENOC's service area to completely replace D-B in the next 6 years? 2,700 MW. Even assuming a 30% capacity factor, such an aggregation of windmills would still generate 900 MWe, replacing Davis-Besse.

Europe has experienced remarkable growth in wind as well: 2,300 MW in 2010; 40,000 to 55,000 MW by 2020; 150,000 MW by 2030. *Id.* p. 20.

Approximately 6 GW of offshore wind projects have been proposed along the US Atlantic Coast and many are advancing (2.84 - 3.25 GW proposed, another 2.47 - 3.22 GW advancing, for a total of 5.32 - 6.47 GW proposed and advancing. This total is 6,000 MW, versus David-Besse's 908 MW. *Id.* p. 20. Maine proposes 5,000 MW of offshore wind by 2030. 5,000 MW in 19 years averages to 263 MWe per year. If OH matched that rate of growth of offshore wind power, as in Lake Erie, it could install 1,578 MWe of offshore wind power capacity by 2017. Even at 30% capacity factor, that would still be 473.4 MWe, replacing over half of D-B's output. Combined with onshore wind in OH, and solar PV, D-B would be replaced by 2017. Similarly, at p. 36, the report documents that Massachusetts established a goal in 2009 to go from zero to 2,000 MW of onshore and offshore wind power by 2020. 2,000 MW in 11 years averages to 181.8 MW per year. So, if Ohio were to match that rate of growth, from 2011 to 2017, Ohio would see installation of 1,090 MW of wind power. Even at a 30% capacity rate, this would replace one-third (1/3) of Davis-Besse's output -- the other two-thirds (2/3) could be replaced by solar PV.

In MA, the Cape Wind project alone will be 468 MWe of offshore wind, installed between now and 2013. Even accounting for a 30% capacity factor, in two years, a dependable 140 MWe of electricity will be generated by Cape Wind in the next two years. Even tiny Rhode Island plans to install 384 MWe of offshore wind by 2014. And at a 30% capacity factor, that will be over 100 MWe of dependable wind power. Ohio has much more potential than that, if it chooses to tap it!

2. Solar

One of the world's largest photovoltaics manufacturers has a plant located in the FE service area. In calendar year 2009, First Solar was the world's largest manufacturer, producing 1,200 MW of solar panels. It is disingenuous to argue that appropriate PV installations could not be accomplished in the next six years. Paula Mints of Navigant Consulting⁸ reported in August 2010 that the manufacturing capacity of PV modules in 2010 was 35,000 MW. Even with a capacity factor of 20% this would represent 7 MW of continuous power in one year's production of solar panels at the 2010 capacity. Mints also demonstrates that the historical growth rate of module production over the past 35 years has been 42%. Preliminary figures by Mints for 2010 indicate that the growth over 2009 was 100%!⁹ But even at a pessimistic 30% growth rate, production will have expanded by another factor of 4.8 in six years to a capacity of 168,000 MW. The adequacy of supply of state-of-the-art photovoltaic collectors for the installation of 900 MW equivalent of PV power by 2017 simply cannot be used to dismiss this contention.

⁸http://www.electroiQ.com/ElectroIQ/en-us/index/display/Photovoltaics_Article_Tools_Template.articles.Photovoltaics-World.industry-news.2010.august.strong-demand_in_2009.html

⁹http://www.electroiQ.com/index/display/photovoltaics-article- display/3067170607/articles/Photovoltaics-World/industry-news/2011/1/the-12-step_solar.html

E. Solar's Is the Lesser Carbon Footprint

At p. 23 of its Answer, NRC Staff maintains that “Joint Petitioners also argue that solar power has a much smaller footprint than nuclear power, and that use of solar energy would meet Ohio’s mandates for renewable energies.” Petitioners made no such claim. Solar power has a *carbon* (CO₂) footprint that is much smaller than the full fuel chain of nuclear. The *carbon* footprint refers to CO₂ emissions to the atmosphere per unit of power generated over the life of a power plant.

As to the *physical* footprint of solar, the Staff is also incorrect where it argues (Answer p. 25) that “Since buildings sit on land, Joint Petitioners have not demonstrated that rooftop installations can reduce the amount of land needed for 910 MWe baseload power generation by 2017.” It is true that large land areas are necessary for solar power to be a viable alternative to Davis-Besse’s license renewal. But the notion of required land area for a power facility relates to reassignment of land use such that it cannot be used for other purposes. When PV is placed on rooftops, it certainly does not prevent normal usage of the land beneath the installation. This argument may be quickly disregarded.

Petitioners offer the following illustrative consideration. The Davis-Besse facility occupies 954 acres. The Norton underground storage facility occupies an additional 92 surface acres. The combined area is 4,233,000 square meters. If this land area were covered by solar panels the power production would be 550 MW, assuming a modest 13% efficiency from the panels. This is already a significant fraction of the Davis-Besse generation capacity. When one considers PV installations on rooftop spaces, the supposed problem of permanently tying up land for solar disappears. Maya Chaudhari, Lisa Frantzis, Dr. Tom E. Hoff have analyzed the

availability of rooftop space across the U.S. suitable for PV.¹⁰ Their analysis concludes that there is easily sufficient rooftop space for solar to provide a very large fraction of the U.S. electricity generation (in addition, there is a large amount of land that is unavailable for other uses such as landfill covers, roadside and railroad right-of-ways, *etc.*):

The state-by-state analysis, the first of its kind, concludes that the potential U.S. market for grid-connected solar rooftop PV could reach 2,900 MW per year by 2010, assuming that the solar industry can achieve a “breakthrough” price of \$2.00-\$2.50 per installed watt.... Rooftop space is not a constraining factor for solar development. *Residential and commercial rooftop space in the U.S. could accommodate up to 710,000 MW of solar electric power* (if all rooftops were fully utilized, taking into account proper orientation of buildings, shading from trees, HVAC equipment, and other solar access factors). For comparison, total electricity-generating capacity in the U.S. today is about 950,000 MW. (Emphasis supplied)

Even limiting the rooftop space converted for solar only to commercial rooftops that are suitable for PV, Paul Denholm and Robert Margolis of NREL have written:¹¹

For commercial buildings, we used the CBECS database to estimate the distribution between flat and pitched roofs (DOE 2003). The CBECS data indicates that about 37% of commercial buildings (corresponding to about 31% of roof area) use shingles, wood, or slate; and it assumed that these roof materials are used on pitched roofs, with the remainder flat. For the orientations of pitched roofs, we assume a uniform distribution. Total roof area was then translated into usable area using an availability factor, which accounts for shading, rooftop obstructions, and other constraints.

Applying the data of Denholm and Margolis, including these constraints of shading and orientation, *etc.*, for the flat commercial rooftops in the Cleveland-Akron-Youngstown-Toledo metro areas - all FE territory - to obtain the solar generation potential, the commercial roof space can reasonably be estimated to yield 4,400 MW of solar electricity. Considering a capacity

¹⁰“PV Grid Connected Market Potential in 2010 Under a Cost Breakthrough Scenario,” September 2004. <http://www.ef.org/documents/EF-Final-Final2.pdf>.

¹¹“Supply Curves for Rooftop Solar PV-Generated Electricity for the United States,” Technical Report, NREL/TP-6A0-44073, November 2008, p. 4, <http://www.nrel.gov/docs/fy09osti/44073.pdf> .

factor of about 20% for solar, these two sources, commercial rooftops and the Davis-Besse plus Norton land area, would yield 990 MW of baseload generating capacity. This demonstrates that the generating capacity of solar, together with the storage capacity of Norton, can readily provide a very viable alternative to Davis-Besse, without impacting any additional land area.

F. FENOC Surrounded by Nonspeculative Solar Ferrets

FENOC asserts (Answer p. 25) that “An environmental review need not ‘ferret out every possible alternative, regardless of how uncommon or unknown that alternative may have been at the time the project was approved.’ Rather, ‘NEPA only requires consideration of reasonable alternatives, (*i.e.*, those that are feasible and nonspeculative).” FENOC maintains that Petitioners have not met four criteria. Taking these criteria, however, as supported by the foregoing observations in this Reply, Petitioners have conclusively met them:

a) That the solar generation option (which includes an integrated storage unit, not unlike the storage regularly used by conventional power sources such as nuclear and coal) will accomplish the purpose of the proposed project (908 MWe of grid power);.

b) That the solar option is both technically feasible now; and

c) commercially deliverable today from an industry which has grown annually at a rate of 40% per year for the past 30 years. And the largest manufacturer of PV modules in the world in 2009 had its only U.S. manufacturing facilities located in the FE service area ((Perrysburg, OH);

d) That this power is supplied from a single source, solar panels that could be located if desired in the Ohio region of the FE service territory, with no impact on land usage. This source would utilize storage to provide continuous supply in conceptually the same way that storage, whether pumped hydro or compressed air or other storage, is used to smooth out the day/night

load variations on large conventional power plants such as nuclear and coal.

And a nearly-identical profile could be depicted for Wind.

G. CAES: It's More Than a Concept

FENOC claims (Answer, p. 38) that compressed air energy storage (CAES) is only a concept. But the Electric Power Research Institute (EPRI) has identified pumped hydro and compressed air energy storage as the two best choices for energy storage.¹² FE acknowledges this wisdom, as signified by its purchase of the Norton underground CAES facility. Compressed air storage is not just a concept. Large CAES systems have been in operation since 1978 in Bremen, Germany (Huntorf), where there is a 290 MW plant,¹³ and since 1991 in Alabama (McIntosh plant), a 110 MW facility.¹⁴

H. NRC Finally Takes NEPA's Alternatives Requirements Seriously

Even as Solar and Wind have become very serious market competitors with which the nuclear industry has to contend, when combined with storage or supportive conventional power sources, they are receiving increasingly serious scrutiny as alternatives during the NEPA phase of power plant licensing.

In *Environmental Law & Policy Center v. NRC*, 470 F.3d 676 (7th Cir. 2006), the NRC was considering an early site permit for a new nuclear plant. Environmentalist intervenors asserted that the applicant utility failed to adequately consider energy efficiency or combinations of wind or solar power with fossil fueled plants. *Id.* at 680. The ASLB Board acknowledged the

¹² <http://www.greentechmedia.com/articles/read/epri-on-renewable-energy-compressed-air-energy-storage>

¹³ <http://coen.boisestate.edu/WindEnergy/resources/ER-07-001.pdf>

¹⁴ <http://www.caes.net/mcintosh.html>

environmental groups' contention that Exelon had failed to consider combining wind or solar power with fossil fueled facilities and had used potentially flawed and outdated information regarding wind and solar power generation methods. After the ASLB admitted the contention, the utility, Exelon, provided a report evaluating facilities that combined wind or solar power with fossil fuel which concluded that coal-fired facilities, gas-fired facilities, or facilities using a combination of these alternatives were not environmentally preferable to the proposed nuclear facility, because the combination would produce environmental impacts greater than or equal to a new nuclear facility. *Id.* at 680. The Staff issued a draft Environmental Impact Statement (DEIS), concluding that individual wind and solar facilities were not sufficient on their own to generate baseload power and that, from an environmental standpoint, the nuclear facility would be preferable or equivalent to a combination facility using wind or solar power and fossil fuel. The utility moved successfully for summary disposition on the issue and the environmental groups appealed. *Id.* at 680.

On appeal, the Seventh Circuit affirmed that the NRC had taken the requisite “hard look” under NEPA, and ducked. Noting that the “need for power” issue might be premature since the early site permit opened a window for Exelon to apply for permit to construct a nuclear plant anytime during a 40-year window, the Court of Appeals opined that “The need for power could vary considerably over that time period, so any analysis at this stage is speculative at best.” *Id.* at 684. From *Environmental Law & Policy Center*, it is evident that consideration of wind and solar alternatives in combination with other forms of energy has a history dating back at least to 2005. In the six (6) years since then, they have only become more formidable competitors with nuclear power.

Far more recently, the NRC considered the adequacy of a utility's discussion of alternatives to a new nuclear plant at Calvert Cliffs and found the summary rejection of wind and solar disconcerting. *Calvert Cliffs 3 Nuclear Project, LLC and Unistar Nuclear Operating Services, LLC* (COLA for Calvert Cliffs Unit 3), LBP-10-24, Docket No. 52-016-COL (December 28, 2010). In *Calvert Cliffs*, the intervenors sought admission of Contention 10C, which stated: "The DEIS Discussion of a Combination of Alternatives is Inadequate and Faulty." The intervenors asserted that the NRC Staff grossly underestimated the contribution from all wind power sources, that additional wind power which would be produced off the nearby coasts of Delaware and New Jersey was not mentioned in the DEIS; that the NRC staff did not consider a DOE assessment of offshore wind potential in Maryland; and that the DEIS significantly underestimated the potential contribution of wind power to a combined alternative of wind and solar photovoltaic-generated electricity. The intervenors contended that a feasible combination of alternatives might well include a considerably smaller natural gas plant than contemplated in the DEIS, along with a much larger contribution from renewable sources of power and demand-side programs to produce reliable baseload power with lower environmental consequence and possibly reduced economic cost. *Id.* p. 48.

The ASLB agreed, holding:

Intervenors have provided sufficient information to show that there is a genuine dispute concerning the appropriate composition of the combined alternative described in the DEIS and its environmental consequences. This dispute is material to the licensing decision. In order to issue the license, the NRC Staff must prepare an EIS that complies with NEPA. As we have explained, the alternatives analysis is the most critical part of an EIS. Intervenors maintain that the comparison in the DEIS between a new nuclear power plant and the combined alternative violates NEPA because it is inaccurate and incomplete. They have identified information indicating that the NRC Staff might have significantly underestimated the potential contribution of wind power and solar power to the combined alternative. If Intervenors are correct, then the DEIS's comparison of

alternatives might well be incomplete or inaccurate because, by underestimating the contribution of power sources that produce little or no air emissions, it overestimates the air emissions the combined alternative would produce. The estimated level of air emissions influenced the DEIS's comparison of the combined alternative to the construction of a new nuclear power plant.

Id. pp. 48-49. Respecting the matter of whether, having identified serious factual flaws in the DEIS, what the duty of the NRC Staff under NEPA was, the Board further ruled as follows:

If Intervenors' contention is upheld on the merits, they will have shown that the DEIS violates NEPA even if they have not shown precisely how the DEIS should be revised or what ultimate conclusion it should reach. Federal courts have held that inaccurate, incomplete, or misleading information in an EIS concerning the comparison of alternatives is itself sufficient to render the EIS unlawful and to compel its revision. As the court of appeals explained in *Animal Defense Council v. Hodel*,

The Council alleges that the EIS was so filled with misinformation and incorrect cost figures that the Bureau must revise its EIS to adequately provide the public with an informed comparison of alternatives. Where the information in the initial EIS was so incomplete or misleading that the decisionmaker and the public could not make an informed comparison of the alternatives, revision of an EIS may be necessary to provide 'a reasonable, good faith, and objective presentation of the subjects required by NEPA.' *Johnston v. Davis*, 698 F.2d 1088, 1095 (10th Cir. 1983) (revision of EIS necessary where use of artificially low discount rate resulted in unreasonable comparison of alternatives to proposed project); *see also National Wildlife Federation v. Andrus*, 440 F.Supp. 1245, 1254 (D.D.C. 1977) (EIS deficient where several alternatives were not treated in the EIS and the EIS did not set forth reasons why these alternatives were rejected).

Thus, if the DEIS's analysis of the combined alternative significantly underestimates the potential contribution of wind and solar power, as Intervenors maintain, then the EIS fails in one of its essential functions - to provide the public and the decision maker with accurate information comparing the proposed action and its alternatives - and, as such, it cannot support an agency decision to issue the license. (Emphasis supplied)

Id. p. 50.

Conceding that *Calvert Cliffs* involves a COLA for a new power plant, Petitioners urge, nevertheless, that NEPA applies as fully to the consideration of alternatives in a supplemental EIS - the NEPA document to be produced for these license extension proceedings. Even when

the 1996 GEIS has resolved a Category 1 issue generically, the applicant must still provide additional analysis in its Environmental Report if new significant information may bear on the applicability of the Category 1 finding at the particular plant. Intervenor may seek a waiver to a rule if they possess information that may show that a generic rule would not serve its purpose at the specific plant; or they may use the SEIS notice and comment process to request that the NRC forgo use of the suspect generic finding and suspend license renewal proceedings, pending a new rulemaking or update of the GEIS. *Entergy Nuclear Generation Co. And Entergy Nuclear Operations, Inc.* (Pilgrim Nuclear Power Station), LBP-06-24, 64 NRC 257, 294-95 (2006). An applicant is required to address new and significant information for either Category 1 or Category 2 issues in its ER for an LRA. *Entergy Nuclear Operations, Inc.* (Indian Point, Units 2 and 3), LBP-08-13, 68 NRC 43, 189 (2008).

Accordingly, the NRC's own interpretations of its obligation to consider alternatives under NEPA requires a greatly-expanded scrutiny of Solar and Wind power as a possible baseload replacement of Davis-Besse in this license extension proceeding. "The existence of a viable, but unexamined alternative renders an environmental impact statement inadequate." *Idaho Conservation League v. Mumma*, 956 F.2d 1508, 1519-20 (9th Cir. 1992). Agencies must "study. . . significant alternatives suggested by other agencies or the public. . ." *DuBois v. U.S. Dept. of Agric.*, 102 F.3d 1273, 1286 (1st Cir. 1996), *cert. denied*, 117 S.Ct. 1567 (1997). Even an alternative which would only partially satisfy the need and purpose of the proposed project must be considered by the agency if it is "reasonable," *Natural Resources Defense Council v. Callaway*, 524 F.2d 79, (2nd Cir. 1975), because it might convince the decision-maker to meet part of the goal with less impact, *North Buckhead Civic Ass'n v. Skinner*, 903 F.2d 1533, 1542

(11th Cir. 1990).

I. Conclusion: Contentions One, Two and Three Should Be Admitted

FENOC claims (Answer p. 27) that the evaluation of the relicensing application must not be "based on speculation about alternatives that may be technically feasible or commercially viable sometime in the future." If that is the case, then the relicensing application itself must be immediately denied. By applying for relicensing so many years before the current operating license expires, FENOC is speculating that large, discreet power sources such as Davis-Besse will still be commercially viable.

There are many plausible scenarios under which this speculation could be false. A large scale accident could lead to the banning of nuclear power. The regulatory response to the current status of tritium leaks could be additional regulation or remediation mandates that make nuclear power too expensive to be commercially viable. FENOC may argue that these postulates are not "feasible and reasonable," but it cannot be denied that the relicensing application itself is the result of speculation on market, environmental, and technological conditions six years into the future. FENOC is also speculating that the wind, solar, and combined wind and solar technologies advocated as alternatives by the Petitioners will not be commercially viable or technologically feasible in the future, knowing full well that the real-world evidence, today, reveals otherwise. Wind, solar, and combined wind and solar are technically feasible and commercially viable in their current status. FENOC's claim that wind, solar, and combined wind and solar can not provide baseload generation are belied by the fact that they are currently doing so in many European countries. The petitioner's contentions are backed, not by speculation, but by data collected from currently functioning electrical grids in other countries.

The NRC's NEPA regulation found at 40 C.F.R. § 1502.14(a) obligates the NRC to "[r]igorously explore and objectively evaluate all reasonable alternatives," FENOC cannot credibly argue that reliance on the 1996 factual conclusions of the GEIS, and to not mention 2010 Wind and Solar market analyses, nor to assess serious contemporaneous plans to commercialize Wind and Solar comprises "rigor." Wind power has experienced a surge in technological development over the past fifteen years. Wind turbines are more economical, larger, and technologically feasible than they were when the boilerplate language FENOC used was written.

The reasons for elimination of an alternative must, themselves, be reasonable. To simply claim repeatedly that wind, solar, and combined wind and solar can not provide baseload power is unreasonable in light of the fact that they are doing so in many countries including Germany, Denmark, Spain, and China. FirstEnergy's Environment Report has so briefly discussed the wind and solar energy alternatives, relying upon significantly dated information compounded by its own omission of significant expert and expert agency documents for its distribution jurisdiction as to leave its discussion of the alternative significantly incomplete, uninforming, inaccurate and misleading for the purpose of preparing the Environmental Impact Statement. Wind and Solar, either as baseload or in some combination, constitute "reasonable" alternatives, the more so when other far less attainable alternatives, such as geothermal, were identified and considered in the Environmental Report.

The ASLB must take pains to avoid the "losing proposition" of "blindly adopting the applicant's goals", because it does not allow for the full consideration of alternatives required by NEPA. *Simmons v. Corps of Engineers*, 20 F.3d 664, 669 (7 Cir. 1997). NEPA requires than

agency to "exercise a degree of skepticism in dealing with self-serving statements from a prime beneficiary of the project" and to look at the general goal of the project rather than only those alternatives by which a particular applicant can reach its own specific goals." *Id.*

The Environmental Report is plainly inadequate on Solar, Wind, and a combination of Solar and Wind as alternatives which would obviate the need for a 20-year license extension.

Our combined reply regarding CONTENTION FOUR: SEVERE ACCIDENT COST UNDERESTIMATED

In Contention Four of their December 27, 2010 Petition and Request (Page 100), Joint Petitioners assert that:

The Environmental Report (ER) is Inadequate Because It Underestimates the True Cost of a Severe Accident at Davis-Besse in Violation of 10 C.F.R. 51.53 (C)(3)(II)(L) and Further Analysis by the Applicant, FENOC, Is Called For.

INTRODUCTION

FENOC acknowledges, under E.1.2 REQUIREMENTS at page E-15 of its Environmental Report, that NRC regulations state and require:

10 CFR 51, Subpart A, Appendix B, Table B-1, Issue 76 (Severe Accidents)

... The probability weighted consequences of atmospheric releases, fallout onto open bodies of water, releases to ground water, and societal and economic impacts from severe accidents are small for all plants. However, alternatives to mitigate severe accidents must be considered for all plants that have not considered such alternatives....

As context for considering "Severe Accidents" and their mitigation at Davis-Besse, it should be borne in mind that Davis-Besse has had numerous near-misses with severe accidents. Joint Petitioner Beyond Nuclear has summarized these numerous close-calls in a November 2010 backgrounder (corrected December 2010) entitled "Davis-Besse Atomic Reactor: 20 MORE Years of Radioactive Russian Roulette on the Great Lakes Shore?!" This backgrounder has been submitted along with this Combined Reply to the NRC EIE Hearing Docket for this proceeding, and is also viewable online at

http://www.beyondnuclear.org/storage/Davis_Besse_Backgrounder.pdf. As Davis-Besse has had so many brushes with severe accidents, it is remarkable that FENOC has identified no severe accident mitigation alternatives that it considers cost-beneficial at its problem-plagued reactor.

FENOC and NRC staff's objections to Joint Petitioners' CONTENTION FOUR: SEVERE ACCIDENT COST UNDERESTIMATED are similar. Thus, Joint Petitioners' comments regarding FENOC's objections may be applied to NRC staff's objections, as appropriate.

FENOC and NRC staff seem to have forgotten at least three basic principles.

First, a proceeding, including before this ASLB, has at least three distinct phases: Pleading, Summary Disposition, and Hearing.

The issue at the Pleading stage is whether, taking all of the facts pleaded as true, Joint Petitioners' contentions provide sufficient alleged factual or legal bases; or, as said in the Federal Rules of Civil Procedure, state a claim upon which relief can be granted. "Intervenors are not asked to prove their case at the contention stage, or to provide an exhaustive list of possible bases, but simply to provide sufficient alleged factual or legal bases to support the contention, and to do so at the outset." (NRC staff Practice and Procedure Digest ("NRC Digest"), Prehearing Matters, page 16). "Commission Rules of Practice" make no provision for motions for orders of dismissal for failing to state a legal claim. However, the Federal Rules of Civil Procedure do in Rule 12(b)(6), and ASLBs occasionally look to federal cases interpreting that rule for guidance. In the consideration of such dismissal motions, which are not generally

viewed favorably by the courts, all factual allegations of the complaint are to be considered true and to be read in a light most favorable to the nonmoving party.

Sequoyah Fuels Corp. and General Atomics (Gore, Oklahoma Site Decontamination and Decommissioning Funding), LBP-94-17, 39 NRC 359, 365 (1994)” (NRC Digest, Hearings, 80)

Similarly, the issue at this stage is not whether summary disposition should be granted. There are plainly material facts in dispute, and summary disposition is proper only after giving Joint Petitioners the opportunity to present all pertinent material. Further, even after discovery is completed, the material facts must be undisputed. “If there is any possibility that a litigable issue of fact exists or any doubt as to whether the parties should have been permitted or required to proceed further, the motion must be denied.” (NRC Digest, Hearings 64, 65, underlining added; see also, 10 C.F.R. § 2.710(d)(2)).

Even more clearly, the issue now before the Board is not whether, after both discovery and hearing, all of those disputed facts should be decided in favor of the Applicant and the NRC. And it is FENOC, not the Joint Petitioners, that has the burden of proving that it is entitled to a 20 year license extension. (See NRC Digest, Hearings, pages 82-83)

Second, NRC “practice” is not a law or rule, and is open to challenge on numerous grounds: e.g., it does not provide the required protection to the public, it is not “reasonable,” and that it is not supported by proved facts applicable -- not in the past -- but rather to whether, in the here and now, Davis-Besse should be granted a license extension. Similarly, NRC NUREGs and Regulatory Guidance documents are routine

policy pronouncements that do not carry the binding effect of regulations. *International Uranium (USA) Corp.*, CLI-00-1,51 NRC 9,19 (2000); *Southern Nuclear Operating Co.* (Early Site Permit for Vogtle ESP Site), LBP-07-3,65 NRC 237,254(2007). PHM 105. “Adjudicatory decisions must be supported by evidence properly in the record.” *Pacific Gas & Electric Co.* (Diablo Canyon Nuclear Power Plant, Units 1 & 2), ALAB-580, 11 NRC 227, 230 (1980); *Philadelphia Electric Co.* (Limerick Generating Station, Units 1 and 2), ALAB-836, 23 NRC 479, 499 n.33 (1986).

Third, the decisions in the prior proceedings to which FENOC and NRC staff refer are essentially irrelevant. Those decisions were dependent on exactly what the intervenor(s) there did, or did not, plead or prove. A decision that an issue was not part of an intervenor’s contention, for example, that Pilgrim Watch’s original contention (Pilgrim nuclear power plant license extension proceeding) did not specifically include health or clean-up costs, or that Riverkeeper’s contention (Indian Point license extension proceeding) did not raise whether the choice of source term was proper, has nothing to do with whether the issues that are raised by the Joint Petitioners here must be considered. A prior decision that an intervenor did not prove an admitted contention similarly has nothing to do with whether a contention should be admitted here.

The NRC Commission has long said (Fed. Register, Vol. 63, No. 150, August 5, 1998, repeated in the 2010 Edition of the NRC Digest) that:

“the Commission's objectives are to provide a fair hearing process...and to produce an informed adjudicatory record that supports agency decision making on matters related to the NRC's responsibilities for protecting public health and safety, the common defense and security, and the environment,”

and that “the opportunity for hearing should be a meaningful one that focuses on genuine issues and real disputes...”.

The most recent edition of the NRC Digest says that “Public participation through intervention is a positive factor in the licensing process and Intervenors perform a valuable function and are to be complimented and encouraged.” (Prehearing Matters, 11)

Joint Petitioners trust that the NRC means what it has said, and that the Petitioners here will be permitted to perform their indisputably “valuable function,” and help insure that the NRC will fulfill its “responsibilities for protecting public health and safety, the common defense and security, and the environment,” or, as NRC’s website homepage (<http://www.nrc.gov/>) so elegantly puts it, “Protecting People and the Environment.”

FENOC’S ADMISSIBILITY ARGUMENT

FENOC first incorrectly argues that Contention 4 is inadmissible for three fundamental reasons, and then attempts to challenge each material dispute raised by the Joint Petitioners in six subparts, the Petition and Request designated as:

- (1) FENOC’S USE OF PROBABILISTIC MODELING UNDERESTIMATED THE TRUE CONSEQUENCES OF A SEVERE ACCIDENT (Joint Petitioners’ Petition and Request, December 27, 2010, beginning on Page 104);
- (2) THE SAMA ANALYSIS FOR DAVIS-BESSE MINIMIZES THE POTENTIAL AMOUNT OF RADIOACTIVE RELEASE IN A SEVERE ACCIDENT (Page 108);
- (3) THE SAMA ANALYSIS FOR DAVIS-BESSE USES AN OUTDATED AND INACCURATE PROXY TO PERFORM ITS SAMA ANALYSIS, THE MACCS2 COMPUTER PROGRAM (Page 115);

- (4) USE OF AN INAPPROPRIATE AIR DISPERSION MODEL, THE STRAIGHT-LINE GAUSSIAN PLUME, AND METEOROLOGICAL DATA INPUTS THAT DID NOT ACCURATELY PREDICT THE GEOGRAPHIC DISPERSION AND DEPOSITION OF RADIONUCLIDES AT DAVIS-BESSE'S GREAT LAKES SHORELINE LOCATION (Page 116);
- (5) USE OF INPUTS THAT MINIMIZED AND INACCURATELY REFLECTED THE ECONOMIC CONSEQUENCES OF A SEVERE ACCIDENT, INCLUDING DECONTAMINATION COSTS, CLEANUP COSTS AND HEALTH COSTS, AND THAT EITHER MINIMIZED OR IGNORED A HOST OF OTHER COSTS (Page 135);
- (6) USE OF INAPPROPRIATE STATISTICAL ANALYSIS OF THE DATA, SPECIFICALLY THE APPLICANT CHOSE TO FOLLOW NRC PRACTICE, NOT NRC REGULATION, REGARDING SAMA ANALYSES BY USING MEAN CONSEQUENCE VALUES INSTEAD OF, FOR EXAMPLE, 95TH PERCENTILE VALUES (Page 149).

FENOC's "*Summary of FirstEnergy Response to Contention 4*" (FENOC Answer, Page 80) alleges that "Contention 4 suffers from several pervasive flaws that render all of its six subparts, and therefore the contention in its entirety, inadmissible under 10 C.F.R. § 2.309(f)(1)." FENOC's three fundamental objections are: (1) "numerous issues that plainly are beyond the proper scope of this license renewal proceeding"; (2) lack of "adequate support in the form of alleged facts or expert opinion"; and (3) failure "to demonstrate that any of its SAMA contentions raises a genuine, material dispute with the Applicant".

FENOC concludes its summary by stating "For these reasons, and as explained more fully below, none of the six subparts of Contention 4, whether viewed independently or cumulatively in combination with other subparts of the contention, is admissible. Thus, Contention 4 should be rejected in its entirety for failing to meet the requirements of 10 C.F.R. § 2.309(f)(1)(iii)-(vi)." (FENOC Answer, Page 83)

FENOC assertions that Contention 4 is inadmissible are incorrect, and their arguments fundamentally flawed, including that Joint Petitioners have ignored NEPA's rule of reason, and failed to present a genuine dispute by not proving issues raised with facts supported by expert testimony. In so doing, FENOC has repeatedly attempted to support its mistaken arguments by citing opinions and decisions made at other license extension adjudicatory proceedings -- out of context and not applicable here.

NEPA'S RULE OF REASON

Both FENOC (pages 24, 71, and 76) and NRC staff (page 37 and 84) bring forward the "the rule of reason" in their arguments so that the discussion below applies to both, as appropriate.

FENOC's (pages 82, 112, and 115) and NRC staff's (pages 69) arguments are seriously flawed. Joint Petitioners did not argue that there were "plainly better" methods to determine offsite consequences; instead we correctly stated that FENOC's methods were plainly outdated, inappropriate for Davis-Besse's location, and significantly flawed. FENOC's choice of methods served to severely underestimate consequences so that offsite costs appeared to not justify mitigations to reduce risk and better protect the health and safety of the public.

Joint Petitioners, unlike FENOC, fully understands the rule of reason. NEPA does not allow, or find reasonable, the Applicant's decision to use outdated methodologies and assumptions in their analyses. Joint Petitioners' alternative methods are available, in use by other federal agencies, industries and parties, and are both reliable and applicable to Davis-Besse's SAMA cost-benefit analyses.

One example involves issues surrounding the meteorological plume model. FENOC labels its treatment of the meteorological plume model issue as referring to Joint Petitioners' "*Contention 4d: Use of the Gaussian Plume Model in the ATMOS Module of MACCS2*" (FENOC Answer, Pages 105-115). Joint s Petitioners designated this contention as USE OF AN INAPPROPRIATE AIR DISPERSION MODEL, THE STRAIGHT-LINE GAUSSIAN PLUME, AND METEOROLOGICAL DATA INPUTS THAT DID NOT ACCURATELY PREDICT THE GEOGRAPHIC DISPERSION AND DEPOSITION OF RADIONUCLIDES AT DAVIS-BESSE'S GREAT LAKES SHORELINE LOCATION (Petition and Request, December 27, 2010, beginning at Page 116). FENOC (at its Answer, page 23) and (NRC staff, and its Answer, page 38) state that an environmental impact statement is not intended to be "a research document." We do not necessarily disagree. However, the statement is not applicable to the issue at hand.

The plume modeling that Joint Petitioners present as appropriate for Davis-Besse's SAMA analysis, instead of FENOC's decision to use the straight-line Gaussian plume model, are not techniques that require research. They are, in fact, established methods that are publically available, routinely used, and appropriate for quantifying atmospheric dispersion of contaminants. Although an effort may be required to adapt them for SAMA analyses, this would be very straightforward – research would not be required.

Appropriate meteorological data or modeling methodology is available. There is no shortage of appropriate meteorological data for a licensing model application.

Alternative modeling methods that would use more extensive meteorological data are also available.

FENOC chose to use only one year of onsite data collected at the Davis-Besse site. Meteorological data is also available from the nearby Toledo Express commercial airport (FENOC's Environmental Report at Section 2.10, Meteorology and Air Quality, and Table 2.10-1, Summary of Local Climatology Data (Toledo), cites meteorological data from the Toledo Express Airport, but does not utilize it in its SAMA analyses) and, importantly, processed data on a gridded basis can be obtained from NOAA (the U.S. federal National Oceanographic and Atmospheric Administration) to augment Davis-Besse's limited onsite meteorological data relied upon for the SAMA analyses that have been provided by FENOC. Also there are several publically available meteorological modeling methods that can simulate variable trajectory transport and dispersion phenomena. MM5 is one which is routinely used nationally and internationally. There are other options as well. The present state of the art for an appropriate meteorological model would use multi-station meteorological measurement data as input to the meteorological model. The numerical computations, based upon numerical weather prediction techniques, would compute wind fields appropriate for modeling dispersion over a much larger geographic area than the a single measurement site at Davis-Besse itself can appropriately provide for.

A second reasonableness criterion is that the modeling method must be reliable. The outputs from such meteorological models that are used to produce inputs for the dispersion models are well accepted and form the basis for weather predictions provided by NOAA's National Weather Service (or NWS, cited by Joint Petitioners at

pages 117, 120, 121 of their December 27, 2010 Petition and Request as experts on the phenomenon of Great Lakes “sea breeze effect”), as well as analyses of air pollution impacts of concern to regulatory agencies. These techniques have been proven to be reliable and acceptable for air quality permitting and policy applications in complex terrain – such as that surrounding Davis-Besse -- and over long distances for the U.S. Environmental Protection Agency (EPA), the U.S. National Park Service (NPS), as well as internationally. Joint Petitioners argued with sufficient particularity in their Petition and Request that for complex meteorological situations such as exist at the Davis-Besse site and its surrounding region, these techniques would be more reliable than using the straight-line Gaussian plume model.

The third reasonableness criterion is that the modeling methods be applicable to SAMA analyses. The methods Joint Petitioners recommended are applicable because with straightforward modifications to incorporate nuclear radioisotope decay rates, they can produce the fields of concentration values and deposition rates needed for radiation dosage calculations.

The fourth reasonableness criterion is that the modeling methodology be adaptable for evaluating SAMA analysis cost-benefit conclusions. There is nothing inherent in variable trajectory models that would prohibit the output concentration and deposition fields from being applied to SAMA analyses.

None of the criteria cited would make the use of alternative models unreasonable to apply to FENOC’s Davis-Besse SAMA analyses.

Further, there is no basis to the argument that there may be no way to assess through mathematical or precise model-to-model comparisons, how alternative meteorological models would change the SAMA analysis results. Some assessments may necessarily be qualitative, based simply upon expert opinion. But this argument seems to undercut the very value of mathematical simulation models in general as a method to assess the impacts of atomic reactor radioactivity emissions.

It is worth noting that any notion that the use of advanced models would be computationally too expensive and/or burdensome to use is not justified by the actual run time shown in Joint Petitioners' review of MACCS2 output files. With modern computers, the use of inappropriate models on the basis of differences of computational costs is indefensible.

Invoking the "rule of reason" to the present disagreement about the most appropriate modeling methodology for application to FENOC's Davis-Besse SAMA analyses is blatantly dismissive of the concept that the present methods are inappropriate and outdated and that there are indeed alternative modeling methods that would be quite reasonable to use.

Another example involves issues surrounding the Modular Accident Analysis Program, or MAAP code. This contention is discussed by FENOC in its Answer to "Contention 4b: FirstEnergy's SAMA Analysis Minimizes the Potential Amount of Radioactive Release in a Severe Accident," pages 92 to 98; by NRC staff in its Answer at "*i. Joint Petitioners' Claim that MAAP is Inappropriate Does Not Raise a Material Issue,*" beginning at its Answer on page 79; and by Joint Petitioners under the

designation THE SAMA ANALYSIS FOR DAVIS-BESSE MINIMIZES THE POTENTIAL AMOUNT OF RADIOACTIVE RELEASE IN A SEVERE ACCIDENT (Petition and Request, Page 108).

Joint Petitioners explained that the source terms used by FENOC to estimate the consequences of severe accidents (radionuclide release fractions generated by the Modular Accident Analysis Progression, MAAP) are consistently smaller for key radionuclides than the release fractions specified in NUREG-1465 and its recent revision for high-burnup fuel.

The radioactivity source term used results in lower consequences than would be obtained from NUREG-1465 release fractions and release durations. New research is not required. Joint Petitioners' alternative model is reliable. Instead, independent studies and a study by the Brookhaven National Laboratory, cited in Joint Petitioners' contention, showed use of the MAAP code is unreliable due to significantly underestimating collective dose. (J. Lehner et al., "Benefit Cost Analysis of Enhancing Combustible Gas Control Availability at Ice Condenser and Mark III Containment Plants," Final Letter Report, Brookhaven National Laboratory, Upton, NY, December 23, 2002, p. 17. ADAMS Accession Number ML031700011, cited on page 113 of Joint Petitioners' December 27, 2010 Petition and Request)

We would demonstrate this at the hearing. Joint Petitioners' alternative model is applicable to SAMA analyses and adaptable for evaluating the SAMA analysis cost-benefit conclusions. The effect of alternative source codes for evaluating SAMA analysis cost-benefit conclusions has been demonstrated at other sites. As an example, Dr. Edwin Lyman, Senior Scientist at the Union of Concerned Scientists (UCS), has

performed such an alternative analysis for Entergy's Indian Point nuclear power plant (Units 2 and 3) near New York City, which has also the subject of an ongoing license extension proceeding before an NRC ASLB since April 30, 2007.

Yet another example involves issues surrounding the MELCOR Accident Consequence Code System, or MACCS2 risk consequence code. This contention is discussed by FENOC at "*Contention 4c: The MACCS2 Code Used in FirstEnergy's SAMA Analysis Is 'Outdated and Inaccurate,'*" pages 98 to 105 of FENOC's Answer; by NRC staff between pages 58 to 79, including issues of the MACCS2 code being outdated or obsolete from page 58 to 61; and by Joint Petitioners under the designation THE SAMA ANALYSIS FOR DAVIS-BESSE USES AN OUTDATED AND INACCURATE PROXY TO PERFORM ITS SAMA ANALYSIS, THE MACCS2 COMPUTER PROGRAM (Page 115).

The Applicant's SAMA analysis uses MELCOR Accident Consequence Code System (MACCS2) computer program. Joint Petitioners stated the plain fact that there is no NRC regulation *requiring* the use of that code, or any other particular code. It was FENOC's choice. There are other consequence computer codes in use for nuclear accidents around the world. Again, research is not necessary.

Further, Joint Petitioners explained that it is reasonable to require FENOC to update the code if, as we shall demonstrate, it provides the "wrong" answer by significantly underestimating offsite consequence costs.

The user (FENOC is this instance) controls what is put into the consequence code – the meteorological data, decay chain data, the dose conversion factor file data,

the population input file data, and the data that go into the COMIDA 2 model. The MACCS2 code's OUTPUT file does the averaging and ranks the data into a cumulative distribution function (CDF) – the mean, 50th quartile, 90th quartile, 95th quartile, peak consequence, peak probability, and peak trial. FENOC chose to take the mean value; and, there is no NRC rule requiring the mean. The mean is the wrong choice, as it underestimates consequences. A mean divides the sum by the number of entries. There are thousands of individual data entries so that dividing the sum by so many entries unreasonably dilutes the results. Further, FENOC multiplied the mean by its estimate of the probability of the accident scenario.

The point is that FENOC's choices – inputs and choice of averaging and probability – resulted in significantly underestimating costs. It is not unreasonable to require further analysis using different data and parameters.

Lastly, it is obvious that FENOC has time to do a proper analysis; Davis Besse's license does not expire for over six more years, so they clearly have time to do so.

MOTIONS TO INTERVENE – REQUIREMENTS

Joint Petitioners largely covered this issue in the foregoing Introduction to this section of its Combined Reply regarding CONTENTION FOUR: SEVERE ACCIDENT COST UNDERESTIMATED.

However we shall take this opportunity to address points raised by FENOC. FENOC argues that "Contention 4 lacks adequate support in the form of alleged facts or expert opinion, in contravention of 10 C.F.R. [Part] 2.309(f)(1)(v)." (FENOC Answer, Page 80)

Joint Petitioners quite clearly met this standard. Joint Petitioners provided genuine disputes and did not rest upon mere allegations or denials; rather disputes raised were supported by ample references to experts, government documents and site specific studies.

Expert testimony is not required at this stage in the proceeding. If it were so, most members of the public, non-profit public interest groups, and local governments would be unable to file due to lack of resources. The very limited resources of these groups necessarily must be preserved for expert witnesses required at the summary disposition and hearing stage of these proceedings. Surely it is not the intent of the NRC Commission to restrict initial participation only to insiders with deep pockets?

What FENOC forgets is that we are at the initial stage of the proceeding (not the summary disposition or hearing stage) and are following requirements to introduce with sufficient particularity areas that the Applicant must defend against.

UNCERTAINTY

An example of FENOC's attack on Contention Four for "[lack of] adequate support in the form of alleged facts or expert opinion, in contravention of 10 C.F.R. [Part] 2.309(f)(1)(v)" is its allegation that "*Contention 4f Lacks Adequate Factual or Expert Support*" (FENOC Answer, Page 131). FENOC makes this claim against Joint Petitioners' challenge to its treatment of uncertainty in its SAMA analyses.

In defense of its treatment of uncertainty, FENOC argues that it performed a number of sensitivity analyses to account for uncertainty. At FENOC's Answer, Page 132, Footnote 567, it states:

With regard to the cost-benefit evaluation, seven sensitivity cases were investigated. These cases examined: (1) the impacts of assuming damaged plant equipment is repaired and refurbished following an accident, (2) a lower discount rate, (3) a higher discount rate, (4) higher on-site dose estimates, (5) higher total on-site cleanup costs, (6) higher costs for replacement power, and (7) a higher non-internals event hazard groups' multiplier. Further details on the sensitivity cases are provided ER Appendix E, Section E.8.

However, Joint Petitioners have clearly refuted the value of these studies, as they relied on the exact same flawed methodology. Repeating the same mistakes over and over does not provide the correct answer or, in this case, demonstrate that they properly accounted for uncertainty.

Joint Petitioners fully appreciate that there is uncertainty. For example, source term, meteorological conditions and evacuation (protective action measures cannot be definitively predicted to be occurring at any given time and must be addressed probabilistically in SAMA analyses). But NEPA requires an honest probabilistic analysis based on available, reliable and up-to-date models. FENOC failed to do so, the dispute that forms the very heart of this contention.

Further, there is no basis to the argument that there may be no way to assess through mathematical or precise model-to-model comparisons, how alternative models would change the SAMA analysis results. Some assessments may necessarily be qualitative, based simply upon expert opinion. But this argument seems to undercut the very value of mathematical simulation models in general as a method to assess the impacts of nuclear reactor radioactivity emissions offsite in a severe accident. Surely the ASLB does not believe this.

Finally, FENOC questions (at its Answer, Page 131) why Joint Petitioners cited Dr. Edwin Lyman's testimony in the Indian Point (Units 2 and 3) license extension proceeding, and how it applies to this Davis-Besse license extension proceeding. Joint Petitioners cited Dr. Lyman's testimony to emphasize the important of scientific conservatism, as embodied in 95th percentile confidence levels as opposed to mean values. Joint petitioners insist that such confidence levels are necessary to adequately "protect people and the environment" against the hazards of radioactivity, to successfully mitigate against severe accidents. In the aftermath of Davis-Besse's 2002 hole-in-the-head fiasco, NRC's Office of Inspector General reported in December, 2002, that not only FENOC, but also the NRC itself, had prioritized the company's profits over public safety, risking a major radiological disaster. FENOC's committing to 95th percentile confidence levels in its SAMA analyses would be a small but important step in the right direction towards redressing its past "profit of safety" excesses, one of many it should undertake.

SECTION-BY-SECTION REBUTTAL

FENOC and NRC staff make similar arguments; therefore Joint Petitioners reply to NRC staff's Answer would be applicable here below, as appropriate.

FENOC's Arguments Against "Contention 4a: Use of Probabilistic Risk Assessment Techniques," (Pages 83 to 92 of FENOC's Answer); Joint Petitioners' "FENOC'S USE OF PROBABILISTIC MODELING UNDERESTIMATED THE TRUE CONSEQUENCES OF A SEVERE ACCIDENT" (Joint Petitioners' Petition and Request, December 27, 2010, beginning on Page 104)

In this contention, Joint Petitioners assert that FENOC's use of probabilistic modeling underestimated the deaths, injuries, and economic impact likely from a severe

accident by multiplying consequence values, irrespective of their amount, with very low probability numbers, making the consequence figures appear minimal. FENOC's claim that this contention is inadmissible is incorrect.

At Page 89 of its Answer, FENOC states:

Petitioners' citation to a 1985 decision involving Indian Point also is inapposite. Specifically, Petitioners note that the Board stated that "the Commission should not ignore the potential consequences of severe-consequence accidents by always multiplying those consequences by low probability values." But the Board's statement is taken out of context. In that decision (which pre-dates the SAMA analysis requirement in Part 51 by more than a decade), the Board noted that, due to the high population density near Indian Point, "a low probability accident at Indian Point may result in greater consequences than the same accident at another site." The Board did *not* hold that it is inappropriate to consider the probability of a severe accident in assessing the associated risk. In fact, in that proceeding, the Commission instructed the Board to consider serious accidents with "equal attention" to both probabilities and consequences. This is consistent with the definition of risk articulated by the Commission and used in numerous nuclear regulatory contexts, including SAMA analysis. [FENOC's reference to footnotes removed by Joint Petitioners]

Joint Petitioners take issue with several aspects of FENOC's argument. First is its apparent attempt to downplay population density risks at Davis-Besse. Davis-Besse's neighbors include: Detroit, Michigan; Toledo and Cleveland, Ohio; and Windsor, Ontario. These major metropolitan areas are all located within 50 miles of Davis-Besse. Given such population density, a severe accident at Davis-Besse, certainly one involving a radiological release, would likely result in large, not small, consequences.

In addition to population density, Davis-Besse's Lake Erie shoreline location raises additional risks. Lake Erie serves as the headwaters for the drinking water supply for many millions of people downstream, not only in the U.S. and Canada, but also in numerous Native American and First Nations. Toronto, Ontario and Montreal, Quebec –

two of the largest metropolitan areas in all of Canada, are downstream of Davis-Besse on the Great Lakes and St. Lawrence River. A severe accident at Davis-Besse, especially one involving a radiological release, would result not in small, but rather large, consequences of an international scope to downstream drinking water supplies. Such large consequences of international scope to downstream drinking water – and also agricultural irrigation water -- supplies would also extend, of course, to the northern shore of Lake Erie itself.

Due to such risks of an “international incident” involving a catastrophic radiological release into the Great Lakes (drinking water supply for 40 million people altogether in both countries, engine for one of the biggest regional economies on the entire planet, and heart of one of the world’s largest trading partnerships between the U.S. and Canada), FENOC and NRC itself must much more seriously address the risks of an intentional terrorist attack at Davis-Besse, as opposed to the flippant bureaucratic dismissal embodied by FENOC’s response to “Alleged Need to Consider Intentional Acts” at its Answer, Page 86. To do otherwise is to risk unimaginable peril. FENOC argument, and NRC’s policy position, effectively assumes that the risk of a terrorist attack at Davis-Besse is zero. As shown by the events of September 11, 2001, such a risk calculation is dead wrong. As alluded to by the title of Dr. Edwin Lyman’s report, *Chernobyl on the Hudson? The Health and Economic Impacts of a Terrorist Attack at the Indian Point Nuclear Plant*, (Union of Concerned Scientists, September 2004, available at http://www.ucsusa.org/nuclear_power/nuclear_power_risk/sabotage_and_attacks_on_reactors/impacts-of-a-terrorist-attack.html), Joint Petitioners are determined to do

prevent a Chernobyl on the Great Lakes – as by intervening in this proceeding, and demanding that accurate SAMA analyses be carried out by FENOC in order to prevent a severe accident – or attack – from ever taking place at Davis-Besse. And of course, an element of Joint Petitioners’ Contentions One (Wind), Two (Solar), and Three (Solar and Wind Combined) is that those renewable energy alternatives to Davis-Besse would not incur the risks of severe accidents or attacks unleashing catastrophic amounts of radioactivity into the Great Lakes Basin to blow with the wind and flow with the water to fallout downstream and downwind over vast areas.

Joint Petitioners do not disagree with the reasoning behind the cited Commission instruction to the ASLB in the 1980s Indian Point proceeding cited above, that regarding serious accident risk, “equal attention” should be paid “to both probabilities and consequences.” In fact, that is the very definition of risk itself.

However, FENOC misconstrues Joint Petitioners’ challenge. Joint Petitioners are not “enemies” of probability determinations. But Joint Petitioners are “enemies” of FENOC’s systemic underestimation of risk probabilities due to its flawed models and methodologies. FENOC has consistently underestimated risk in its SAMA calculations by inappropriately and improperly underestimating probability values, as Joint Petitioners have shown in Contention Four. FENOC has then multiplied consequences by improperly and inappropriately low probability values to arrive at seemingly low overall risk values. In fact, FENOC determined that not a single one of the Severe Accident Mitigation Alternatives it had considered in its ER SAMA analysis proved to be cost-beneficial. We again point to the December 2002 NRC Office of Inspector General report, documenting that both FENOC and NRC itself prioritized “profit over safety” at

Davis-Besse, resulting in the close brush with a major disaster best known as the hole-in-the-head fiasco – the reactor lid corrosion incident first publicly revealed in early 2002.

Revealingly, at FENOC's ER on Page E-21 is the following passage:

Deleted reactor vessel rupture event AV. A frequency for this event was not published in NUREG/CR-5750 (Reference 6), so this event lacks a justifiable frequency. Based on the large LOCA frequencies in NUREG/CR-5750, this event should be a negligible contributor to the total CDF. (Note this was put back in the SAMA analysis model.)

What this passage reveals is a "lesson learned" in the nuclear power establishment – a hard lesson learned at Davis-Besse itself. How probable was it that an atomic reactor's reactor pressure vessel lid would corrode to such an extent that a breach could result in a loss of coolant accident to the nuclear core? At one time, not only the NRC, but even its contractor which performed NUREG/CR-5750, believed that a reactor vessel rupture event was so improbable that it need not even be considered in analyzing large Loss of Coolant Accident risks, including in SAMA analyses by nuclear utilities seeking 20 year license extensions.

However, Davis-Besse's hole-in-the-head revealed that accident scenarios long thought impossibly remote actually do happen in the real world, due to such factors as nuclear utility greed and disregard for public safety, combined with NRC complicity at the highest levels of the agency (putting profit over safety, in the words of NRC's OIG, December 2002). Interestingly, FENOC saw fit, in the aftermath of its near-disastrous, scandalous, and even criminal lid corrosion incident, to "put back" the reactor vessel rupture accident scenario it had previously deleted. What had previously been considered an accident scenario so fleetingly improbable so as to not merit any further

consideration, nearly became a 100% severe accident probability on the Great Lakes shoreline, 20 miles east of Toledo in early 2002. All it took was for FENOC to neglect and cover up its reactor's boric acid leak for a long enough period of time, and for NRC to look the other way and allow them to get away with it.

What Joint Petitioners' fear is that FENOC has already begun to forget such hard won "lessons learned," by improperly downplaying risks due to inappropriately underestimating accident probabilities. But the 2002 hole-in-the-head was not Davis-Besse's only close brush with a "low probability" disaster.

As documented in Beyond Nuclear's November/December 2010 backgrounder, "Davis-Besse Atomic Reactor: 20 *MORE* Years of Radioactive Russian Roulette on the Great Lakes Shore?!", Davis-Besse's September 24, 1977 "TMI precursor incident" had a 7% "core damage probability" (CDP), according to NRC Commission Document SECY-05-0192, Attachment 2, "Results, Trends, and Insights from the Accident Sequence Precursor (ASP) Program," Table 11, "Significant accident sequence precursors during the 1969-2005 period." (Pages 20-26; Joint Petitioners accessed this document online at <http://www.nrc.gov/reading-rm/doc-collections/commission/secys/2005/secy2005-0192/attachment2.pdf>.) Fortunately, this "asp" did not unleash its full venom on Davis-Besse, as a nearly identical accident sequence precursor did at the Three Mile Island (TMI) Unit 2 on March 28, 1979, leading to a 50% meltdown of the core, the worst atomic reactor accident in U.S. history thus far, with untold radioactivity releases to the environment, causing countless human health consequences to this day.

What was the probability that a “stuck-open PORV” (Pilot-Operated Relief Valve) could lead to a core meltdown considered to be, before it almost happened at Davis-Besse in 1977, and before it actually did happen at TMI in 1979? Tragically, NRC Region III inspector James Creswell’s courageous refusal to “shut up” about the lessons that *should have been learned* from the Davis-Besse near-miss went unheeded by his superiors at NRC, and certainly by the nuclear power industry itself, until it was too late.

Davis-Besse’s 1977 TMI precursor incident has been determined by NRC to be the fourth most serious accident sequence precursor during the 1969 to 2005 time period. It was only surpassed in severity by the 1979 TMI meltdown itself (with a 100% CDP, by definition), the 1975 Browns Ferry, Alabama fire (assigned a 20% CDP), and the 1978 Rancho Seco, California steam generator dryout (assigned a 10% CDP).

By the way, prior to it actually happening at Browns Ferry in 1975, what was the probability considered to be of a severe accident being caused by a nuclear power plant inspector checking for drafts in insulation with a lit candle, causing a fire that would lead to complete loss of control over the atomic reactor? Joint Petitioners’ point here is that accident scenarios considered to be of very low probability or even unthinkable have been inappropriately and improperly underestimated by the nuclear power industry time and time again in the past. FENOC’s SAMA methodologies and models are repeating that serious mistake in this present 20 year license extension application proceeding. This must not be allowed. The potential consequences – the radiological risks -- to the public and the environment are too great. These are the very risks that FENOC’s SAMA analyses are supposed to guard against. But due to its disregard for all severe accident scenarios considered as having too low a probability of actually occurring, not a single

SAMA was determined by FENOC to be cost-beneficial. Joint Petitioners challenge this disregard for accident risks based on improperly low probability determinations.

Davis-Besse's 1977 TMI precursor accident was not unlike the Space Shuttle Challenger disaster of 1986. Before Space Shuttle Challenger exploded on lift off, the probability of such an accident occurring was considered to be 1 in 100,000, largely determined through "expert judgment." After the disaster actually occurred, "expert judgment," coupled with a real world "data point," re-calculated the risk to be 1 in 25. Warnings by junior level safety engineers at NASA and its subcontractors went unheeded by senior management, which put an overriding priority on meeting the launch schedule. Tragically, given the faulty O-rings, this gave "deadline" a deadly meaning for the astronauts on board, as the nation watched in horror on live television. Strikingly, a very similar dynamic played out with the Space Shuttle Columbia disaster in 2003. Junior safety officials warned about the damage done to the shuttle's heat shielding tiles due to falling debris on lift off, but these warning went unheeded senior level decision makers preoccupied with operational details, until things went fatally wrong. Yet again, a vanishingly small probability risk, it was thought anyway, shocked the country with its deadly consequences.

FENOC (including its forerunner Toledo Edison) already has a long history of underestimating risk probabilities at Davis-Besse in the past. This must not be allowed to be repeated in the license extension SAMA analyses. As retired NRC Region III safety inspector Dr. Ross Landsman has warned (in the context of serious quality assurance violations with the design, fabrication, and use of dry cask storage containers for highly radioactive irradiated nuclear fuel – a problem that Davis-Besse itself also has

on-site), such nuclear power industry and NRC short cuts on safety are not unlike what caused Space Shuttles to crash to the ground. Risk probabilities are ignored, dismissed, or downplayed at catastrophic peril, especially when atomic reactors are involved.

Not to be outdone by the 1978 Rancho Seco steam generator dryout, Davis-Besse suffered a loss of cooling to the reactor core for 12 minutes on June 9, 1985. This accident also involved drying out of steam generators. Like a scene straight out of an Indiana Jones movie, Davis-Besse plant personnel were sent racing down darkened corridors with bolt cutters, not knowing if they had the proper keys or access cards to open locked security doors, in order to cut through chains securing valves, so that they could manually open them to restore cooling water flow to steam generators, in order to cool the reactor core, with each passing minute increasing the risk of a loss-of-coolant-accident, nuclear fuel damage, a meltdown, and even a catastrophic radioactivity release to the environment. David Lochbaum of Union of Concerned Scientists has explained that “an operator raced through the plant taking five manual actions in four different locations (including re-installing the fuses)” in a dangerously substandard, previously intentionally disabled motor-driven startup feedwater pump, in order to restore cooling to vital reactor systems. Lochbaum concluded that Davis-Besse came within 37 minutes of partially uncovering the core of its cooling water supply, and 41 minutes of completely uncovering the core; as he has pointed out, TMI’s core was never fully uncovered, but it was uncovered enough to half melt down.

Before it actually happened that day at Davis-Besse, what was the probability considered to be that “While at 90-percent power, the reactor [would trip] with main feedwater (MFW) pump ‘1’ tripped and MFW pump ‘2’ unavailable?” And before it

actually happened that day, what was the probability considered to be that, in addition to the above reactor “trip,” and feedwater pump “trip” and “unavailability,” Davis-Besse “operators [would make] an error in initiating the steam and feedwater rupture control system and [would isolate] EFW [emergency feedwater] to both steam generators”?

And to make matters even worse, and before it actually happened that day, what was the probability considered to be that, in addition to all of the above, “the PORV [would actuate] three times” and then “not reseal at the proper RCS [reactor coolant system] pressure”? All of those low probability events aligned on June 9, 1985 at Davis-Besse, causing what “the Nuclear Regulatory Commission referred to...as the worst [accident] since Three Mile Island in 1979,” reported Tom Henry of the *Toledo Blade*. NRC calculated the accident had represented a 1% CDP risk.

But the accident should not have come as a surprise to the nuclear utility and the NRC. A report prepared for the U.S. House of Representatives Subcommittee on Energy Conservation and Power just days after the accident suggested that the coolant-water episode at Davis-Besse was foreshadowed by no less than 48 problems concerning the auxiliary feed-water system just since July, 1979. And, as Lochbaum dubbed it, “decades of decadence” at Davis-Besse were the root cause: had *any* of the numerous equipment problems been addressed in a timely manner, rather than multiple simultaneous shortcuts on safety taken and maintenance jobs long deferred, the entire accident could have been avoided. In retrospect, the nuclear utility’s unrepentant neglect of Davis-Besse, and the NRC’s chronic complicity, that led up to the 1985 accident were forerunners of the “profit over safety” attitude, and lack of “safety culture,” that ultimately resulted in the 2002 hole-in-the-head, which the U.S. Government

Accountability Office would call “the most serious safety issue confronting the nation’s commercial nuclear power industry since Three Mile Island in 1979,” a conclusion echoed by U.S. Representative Dennis Kucinich of Cleveland, who declared that “NRC was ill equipped, ill informed and far too slow to react,” and that “NRC’s reaction to Davis-Besse was inadequate, irresponsible and left the public at grave risk.”

Significantly, Congressman Kucinich, then Chairman, and now still ranking Democrat on the U.S. House Oversight and Government Reform Committee’s subcommittee on domestic policy, with oversight on NRC, delivered a strong statement of opposition to Davis-Besse’s 20 year license extension at NRC’s environmental scoping meeting at Camp Perry, Ohio late last year. (Beyond Nuclear, “Davis-Besse Atomic Reactor: 20 *MORE* Years of Radioactive Russian Roulette on the Great Lakes Shore?!”, November/December 2010.)

Joint Petitioners’ deep concern over FENOC’s woefully inadequate SAMA analysis – and their motivation for intervening against the 20 year license extension -- stem in large part from the fact that Davis-Besse is one of the most problem-plagued atomic reactors in the entire country. NRC acknowledges that Davis-Besse has suffered six (out of a total of 34 incidents so designated nationwide) “significant accident sequence precursors” between 1969 and 2005. Incredibly, this is three times worse than any other American nuclear power plant. The 34 year long history of dismissing severe accident risks at Davis-Besse, until it was almost too late to prevent catastrophe, cannot and must not be allowed to be repeated in this license extension proceeding. The risks are too significant, and will only be more so after Davis-Besse surpasses the forty-year mark of age-related degradation.

In refuting Joint Petitioners' dispute regarding probabilistic modeling, FENOC cites from the *Pilgrim* license extension proceeding. That ASLB deemed such a challenge inadmissible because the "use of probabilistic risk assessment and modeling is obviously accepted and standard practice in SAMA analyses." (FENOC Answer, Page 85, Emphasis added) However, this is Davis-Besse's license extension proceeding, not Pilgrim's. Further, we underscore the key word "practice." It is a practice, not a rule.

Joint Petitioners agree that probability must be taken into consideration, but with due caution. That is why we referenced Kamiar Jamali's (DOE Project Manager for Code Manual for MACCS2) Use of Risk Measures in Design and Licensing Future Reactors (an attachment to our Petition and Request). Jamali made clear that "PRA" (probabilistic risk assessment) uncertainties are so large and unknowable that it is a huge mistake to use a single number coming from them for any decision regarding adequate protection. "Examples of these uncertainties include probabilistic quantification of single and common-cause hardware or software failures, occurrence of certain physical phenomena, human errors of omission and commission, magnitudes of source terms, radionuclide release and transport, atmospheric dispersion, biological effects of radiation, dose calculations, and many others." (Jamali, Page 935, Emphasis added)

Also, human error is not considered in PRAs. PRAs project into the future and come up with some very small number that an accident scenario only is likely to occur in so many hundreds-to-thousands of years. But no U.S. commercial reactor has operated for more than 42 years (Oyster Creek, 1969 to 2011), so actual experience is absent

from which to base predictions. Uncertainty must be respected by making certain that appropriate and up-to-date methods and assumptions are used in the analysis. FENOC has not done so.

FENOC's argument misinterprets the GEIS. FENOC argues that "This challenge to NRC regulations is impermissible under 10 C.F.R. [Part] 2.335, as the NRC has determined "As a general matter...[in Part 51]...that 'the *probability weighted* consequences of atmospheric releases fallout onto open bodies of water, releases to ground water, and societal and economic impacts from severe accidents are small for all plants,' but that alternatives to mitigate severe accidents must be considered for all plants that have not considered such alternatives." (FENOC, Answer, Page 84, citing 10 C.F.R. Part 51, Subpart A, App. B, Table B-1, emphasis added by FENOC). FENOC surmises that "Any contention asserting that this supplemental site-specific mitigation analysis must ignore risk and focus only on accident consequences necessarily implies that the NRC's underlying codified impact analysis improperly considered risk." (FENOC, Answer, Page 84)

However, FENOC's conclusion is wrong. FENOC misinterprets what the GEIS says. The GEIS says not that accident consequences are small, but after going through the "probability weighted consequences," that they then appear small. Therefore, we conclude that the GEIS supports our dispute regarding FENOC's choice to multiply the "mean" by the "weighted probability" in the MACCS2 OUTPUT file.

Finally, FENOC argues that Joint Petitioners' claim that the use of probabilistic modeling is improper for considering intentional malevolent acts (such as terrorist attacks) because "the Commission concluded that NEPA 'imposes no legal duty on the

NRC to consider intentional malevolent acts...in conjunction with commercial power reactor license renewal applications.” (FENOC, Answer, Page 87, citing *Oyster Creek* and *Pilgrim*). And, further, that the GEIS concluded that “the core damage and radiological release from such acts would be no worse than the damage and release expected from internally initiated events.” (FENOC, Answer, Page 87, citing *Oyster Creek*) However, that argument fails in that the consequences of an accident scenario must be analyzed, to determine the potential severity; nothing excludes severe “accidents” that happen to result from a terrorist attack, or other malevolent intentional act. Absent a site specific PRA at Davis-Besse to determine its specific vulnerabilities and potential accident consequences, the actual risk at Davis-Besse is unknown.

FENOC’s Arguments Against “Contention 4b: FirstEnergy’s SAMA Analysis Minimizes the Potential Amount of Radioactive Release in a Severe Accident” (FENOC Answer, Page 92 to 98), Joint Petitioners’ THE SAMA ANALYSIS FOR DAVIS-BESSE MINIMIZES THE POTENTIAL AMOUNT OF RADIOACTIVE RELEASE IN A SEVERE ACCIDENT (beginning on Petition and Request, December 27, 2010, Page 108)

In this contention, Joint Petitioners assert that FENOC’s SAMA analysis for Davis-Besse minimizes the potential amount of radioactive release in a severe accident. FENOC’s claims – that “This contention also is inadmissible because it raises issues beyond the scope of this proceeding, lacks adequate factual or legal support, and fails to raise a genuine dispute on a material issue of fact or law, in contravention of 10 C.F.R. [Part] 2.309(f)(1)(iii)-(iv) (FENOC Answer, Page 92) – is incorrect.

Irradiated Nuclear Fuel Pool Accidents

FENOC (Page 92) argues that no mitigation analysis is required for irradiated nuclear fuel pool accidents, an argument similar to its one above regarding terrorist attacks/malevolent acts. Joint Petitioners have clearly established the dispute.

We noted specifically that although 10 C.F.R. [Part] 51.53(c)(3)(ii)(L) does not provide a definition of severe accidents, the GEIS, which provides the factual background for the SAMA requirement in the regulations, does define a “severe accident.” According to Section 5.2.1 of NUREG 1437 “General Characteristics of Accidents,” the “term ‘accident’ refers to any unintentional event outside the normal plant operational envelope that results in a release or the potential for release of radioactive materials into the environment” and “ ‘severe’...[includes] those involving multiple failures of equipment or function and, therefore, whose likelihood is generally lower than design basis accidents but where consequences may be higher...”

(Emphasis added). This section recognizes the potential for a severe accident in which there are “releases substantially in excess of permissible limits for normal operation.”

The term “accident” refers to any unintentional event outside the normal plant operational envelope that results in a release or the potential for release of radioactive materials into the environment. Generally, the U.S. Nuclear Regulatory Commission (NRC) categorizes accidents as “design basis” (i.e., the plant is designed specifically to accommodate these) or “severe” (i.e., those involving multiple failures of equipment or function and, therefore, whose likelihood is generally lower than design-basis accidents but where consequences may be higher), for which plants are analyzed to determine their response. *The predominant focus in environmental assessments is on events that can lead to releases substantially in excess of permissible limits for normal operation. Normal release limits are specified in the NRC’s regulations (10 C.F.R. Part 20 and 10 C.F.R. Part 50, Appendix A). GEIS, 5.2.1, Italics added by Joint Petitioners.*

Section 5 focuses on potential *consequences* to determine whether or not a potential accident is severe – and thus within the scope of a Severe Accident Mitigation

Analysis. The question is not whether the source of the Severe Accident is the first or second largest inventory of radioactive materials. Perhaps FENOC confused Section 6 of the GEIS with Section 5. Section 6 deals with *normal operations* (see, for example, Section 6.1, “Accidental releases...could conceivably result in releases that would cause moderate or large radiological impacts. Such conditions are beyond the scope of regulations controlling normal operations...” (Emphasis added)

Section 5, not Section 6, deals with severe accidents. Nothing in Section 5 excludes severe accidents involving what is, at Davis-Besse, the largest inventory of radioactive materials – the irradiated nuclear fuel storage pool. Due to 40 years of operations by 2017, the “inventory of radioactive materials” in Davis-Besse’s irradiated nuclear fuel storage pool will be many times that contained in its reactor core. FENOC dismisses the fact that interactions between the irradiated nuclear fuel storage pool and the reactor need to be studied in the context of severe accidents. Its argument is foolish on its face. FENOC says, at Answer Page 93, that “Petitioners’ reference to a study prepared by Dr. Gordon Thompson [“Risks of Pool Sabotage of Spent Fuel at Pilgrim Nuclear Power Station and Vermont Yankee, A Report for the Massachusetts Attorney General,” by IRSS, at 12, 16, May 2006, available at ADAMS Accession No. ML061630088] and the *Shearon Harris* license amendment proceeding lend no support to their contention that FirstEnergy must examine interactions between the reactor and the spent fuel pool in its SAMA analysis.” First, it is not the Joint Petitioners’ responsibility to demonstrate proof at this state of the proceeding; and second, the interactions between the reactor and the pool apply at Davis-Besse – one does not need to have a nuclear engineering degree to figure that out. FENOC has raised the

issue of a “single, discrete electric generation source” time and time again in its Answer to challenge Joint Petitioners’ contentions that renewable sources of electricity such as solar PV and wind power – especially in combination together, and interconnected, as well as connected to storage devices (Joint Petitioners’ Contentions One, Two, and Three). However, if Davis-Besse nuclear power plant itself is to be considered “a single, discrete electric generation source,” must not the irradiated nuclear fuel storage pool be included in that definition? The reactor could not operate without somewhere to discharge its thermally hot and radioactively lethal irradiated nuclear fuel every 18 to 24 months, so that it can thermally cool and radioactively decay for at least five years. Thus, interactions between the reactor and the pool must be addressed, including in FENOC’s SAMA analysis.

FENOC also states “Petitioners also argue, without any factual or expert support, that ‘the offsite cost risk of a pool fire is substantially higher than the offsite cost of a release from a core damage accident.’” FENOC must be familiar with such studies as Robert Alvarez, Jan Beyea, Klaus Janberg, Jungmin Kang, Ed Lyman, Allison Macfarlane, Gordon Thompson, Frank N. von Hippel, “Reducing the Hazards from Stored Spent Power-Reactor Fuel in the United States,” *Science and Global Security*, 11:1–51, [January] 2003; *Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants* (NRC, NUREG-1738, 2001); and many others. To put this dispute in some context, around 200 tons of nuclear fuel in the Chernobyl Unit 4 core exploded on April 26, 1986, and then – along with its graphite moderator – burned for ten days. But there were already 557 tons of irradiated nuclear fuel stored at Davis-Besse by spring 2010, according to the U.S. Department of Energy’s February

2002 Final Environmental Impact Statement for the Yucca Mountain, Nevada dumpsite. DOE's FEIS went on to project that if Davis-Besse operates for a total of 50 years (that is, till 2027), it will generate over 900 tons of irradiated nuclear fuel. But of course, FENOC has applied to NRC for permission to operate not 50 years, but 60. Given that Davis-Besse generates from 20 to 30 metric tons of irradiated nuclear fuel every year it operates, another decade of operations would add yet another 200 to 300 metric tons of irradiated nuclear fuel stored on-site. Altogether, well over 1,000 tons of irradiated nuclear fuel could accumulate at the Davis-Besse site over the course of 60 years of operations. Despite the presence of a growing number of dry storage casks (which have their own problems), Davis-Besse's pool remains filled to capacity (well beyond the original design capacity, due to multiple re-rackings) with many hundreds of tons of irradiated nuclear fuel. Given that irradiated nuclear fuel discharged from Davis-Besse's core every 18 to 24 months during refueling outages must be stored in the pool for a minimum of five years, accident and attack risks involving Davis-Besse's pool will continue to be a significant safety and security issue for as long as Davis-Besse operates, and in fact longer – until the pool is emptied of its ultra-hazardous contents (at which time the risks will shift over to problematic dry casks, risky transport by road, rail, or waterway, etc.) The Chernobyl nuclear catastrophe that began nearly 25 years ago, but will continue to unfold for centuries and millennia due to the radioactive contamination of vast regions, has shown how much damage 200 tons of nuclear fuel exploding and burning for ten days can do. Thus, an even greater quantity of irradiated nuclear fuel stored in Davis-Besse's pool cannot be dismissed as having zero risk whatsoever, or even as having less risk than Davis-Besse's operating reactor core,

containing as it does less nuclear fuel than the pool (albeit significantly higher in many “shorter-lived” hazardous radioisotopes that have yet to radioactively decay).

MAAP Code

FENOC incorrectly found inadmissible Petitioners’ dispute regarding its use of the MAAP code to generate source terms. NextEra improperly and incorrectly alleges that “Petitioners have provided no facts or expert opinion to establish that FirstEnergy has used the MAAP code improperly, or that the use of alternative source terms would have resulted in the identification of additional potentially cost-beneficial SAMAs for Davis-Besse.” (FENOC Answer, Page 97)

Joint Petitioners are not required to prove our case at this juncture – this is not summary disposition.

Joint Petitioners referenced multiple sources in their contention. Examples included NRC, Brookhaven National Laboratory, and J. Schaperow.

FENOC’s objection that “Petitioners’ failure to meet their burden in this regard is particularly glaring given the widespread use and acceptance of MAAP code in the nuclear industry.” (FENOC Answer, Page 98) But two wrongs don’t make a right. “Strength in numbers” is not a valid defense of a flawed code. Groupthink, a word coined in the early 1950s, was modeled after Orwell’s “doublethink” from his novel *1984*. Groupthink is defined by the *World English Dictionary* as meaning “a tendency within organizations or society to promote or establish the view of the predominant group.” Just because MAAP is broadly used does not necessarily mean that it is free from the flaws we allege. In fact, being closed-mindedness is not a healthy attitude to criticism, especially in realms as significant to public safety as the nuclear power industry.

c. NRC staff’s Answer (at Page 80) agrees with Joint Petitioners’ position that the MAAP code has not been formally reviewed and approved by NRC. NRC staff says:

The Staff recognizes that Joint Petitioners have provided some support for the argument that MAAP may lead to lower consequences when compared to source terms generated by NRC Staff. *Id.* at 114. Specifically, the studies Joint Petitioners reference indicate that MAAP may lead to lower consequences when compared to the source terms in NUREG-1465. *Id.* Joint Petitioners also note that “[i]t has been previously observed that MAAP generates lower release fractions than those derived and used by NRC in studies such as NUREG-1150,” *id.* At 113, which uses “the Source Term Code Package [NRC’s state-of the art methodology for source term analysis at the time of NUREG-1150] and MELCOR.” *Id.* at 113 (quoting a Brookhaven National Laboratory study that independently analyzed the costs and benefits of one SAMA in the Catawba and McGuire license renewal proceeding).

NRC staff also expresses agreement that “Joint Petitioners are correct that the MAAP code has not been formally reviewed and approved by the NRC,” (Answer, Page 80) thus, that its use is not required.

FENOC’s Arguments Against “Contention 4c: The MACCS2 Code Used in FirstEnergy’s SAMA Analysis Is “Outdated and Inaccurate” (FENOC’s Answer, Pages 98 to 105), Joint Petitioners’ contention designated “THE SAMA ANALYSIS FOR DAVIS-BESSE USES AN OUTDATED AND INACCURATE PROXY TO PERFORM ITS SAMA ANALYSIS, THE MACCS2 COMPUTER PROGRAM” (Joint Petitioners’ Petition and Request, December 27, 2010, beginning at Page 115)

Petitioners assert that the SAMA analysis FENOC uses for Davis-Besse utilizes an outdated and inaccurate proxy, the MACCS2 computer program.

FENOC incorrectly argues that this contention is inadmissible because it “lacks an adequate factual basis,” and that “Petitioners fall short of establishing the materiality of their claims or a genuine dispute with FirstEnergy on a material issue of law or fact.” (Answer, Page 98) It is clear that FENOC, like NRC staff, forgets that this is the preliminary pleading stage of these proceedings and that we are neither in the summary disposition nor hearing stage, as explained above.

For example, one material dispute of law or fact that we clearly establish is that “The cost formula and assumptions contained in the MACCS2 underestimates the costs likely to be incurred as a result of a severe accident, explained in greater detail further

below.” (Petition and Requet, Page 116) And, most certainly, we fulfilled out pledge to provide greater in the Petition further below.

For example, in the following section of our Petition and Request, we dispute the straight-line Gaussian plume model that is embedded in the ATMOS module of the code. This model calculates air and ground concentrations, plume size, and timing information for all plume segments as a function of downwind distance. FENOC acknowledges (Answer, Page 108) that the straight-line Gaussian plume is inextricably embedded in the MACCS2 model when it states: “the straight-line Gaussian ATMOS model cannot be replaced with replacing the MACCS2 code itself.” In that particular section of our SAMA related contention, we dispute the assumptions regarding cleanup and health costs embedded in the code. In yet another section of our SAMA related contention, we dispute the averaging performed in the MACCS2 output file.

Joint Petitioners devoted separate sections to these subparts because each subpart contributes to the whole or fundamental dispute that FENOC’s Environmental Report is inadequate because it underestimates the true cost of a severe accident at Davis-Besse in violation of 10 C.F.R.51.53 (C)(3)(II)(L) and further, and more accurate, analysis by FENOC is called for.

It is telling that even FENOC admits that “...there is no specific legal requirement that an applicant use the MACCS2 code in its SAMA analysis...” (Answer, Page 99)

FENOC argues, opposing Joint Petitioners’ assertion that the MACCS2 code is not quality assured and was developed for research purposes and *not* licensing purposes, “also lacks a sound factual basis.” (Answer, Page 100) However, Joint Petitioners’ key and relevant factual dispute was provided by an article written by David I. Chanin. Mr. Chanin wrote the FORTRAN for the MACCS and MACCS2 codes. He specifically wrote the referenced paper because, as described in an endnote:

The QA distinctions between an NQA-1 "licensing code" and a "research code" like MACCS2 have been emphasized in light of the fact that MACCS2 calculations are being used to support the Severe Accident Mitigation Alternatives (SAMA) analyses required for the license renewal of commercial nuclear power plants. It seems to me that the code's QA shortcomings and the lack of input justifications are again being ignored, just as they were prior to DNFSB TECH-25 and the veritable firestorm that soon followed. D.C.]

FENOC's criticism of Petitioners' statement that "there is no explanation of exactly how [MACCS2] works" – that the contention "is spurious and reflects Petitioners' failure to meet their pleading obligation," (Answer, Page 101) is incorrect. They argue that the *MACCS2 User's Guide* explains how it works and that Joint Petitioners must have known that because they reference the *User's Guide*. However, what Joint Petitioners know is what is and what is not in the *Guide* – information, and lack thereof, that FENOC apparently has missed.

FENOC's Arguments Against "Contention 4d: Use of the Gaussian Plume Model in the ATMOS Module of MACCS2" (Answer, Page 105 to 115), Joint Petitioners' Contention Designated "USE OF AN INAPPROPRIATE AIR DISPERSION MODEL, THE STRAIGHT-LINE GAUSSIAN PLUME, AND METEOROLOGICAL DATA INPUTS THAT DID NOT ACCURATELY PREDICT THE GEOGRAPHIC DISPERSION AND DEPOSITION OF RADIONUCLIDES AT DAVIS-BESSE'S GREAT LAKES SHORELINE LOCATION" (beginning on Page 116 of Petition and Request, December 27, 2010)

In this Contention, Joint Petitioners challenge the use of an inappropriate air dispersion model, the straight-line Gaussian plume, and meteorological data inputs that did not accurately predict the geographic dispersion and deposition of hazardous radionuclides at Davis-Besse's Great Lakes shoreline location.

FENOC properly acknowledges that Joint Petitioners pled a number of disputes that include: the straight-line Gaussian plume model; sea breeze; plumes remaining concentrated over water resulting in "hot spots;" terrain effects; input data restricted to one year; and input data from one source, the onsite meteorological tower. FENOC does not take issue with Joint Petitioners' dispute that the meteorological input data

came solely from the onsite meteorological tower. Therefore, we can conclude that they agree with Joint Petitioners that disputes on these various issues exist.

FENOC, like NRC staff, forgets that requirements for a Petition to Intervene and Request for a Hearing are very different from those at summary disposition or a hearing. It is clear that these issues have been pled and that FENOC has been properly forewarned of what to expect at hearing. Examples abound.

FENOC incorrectly states, at Answer Page 106, that “Petitioners scattershot references to the technical literature—wholly unsubstantiated by any expert opinion—do not constitute adequate factual support for the contention.” Not true. Joint Petitioners provided more than adequate support for a pleading, including a plethora of citations to government studies, site specific studies, and more general but applicable research published in prestigious journal articles.

FENOC argues that “Petitioners again provide no factual or expert support for their assertion as to why data collected at the Davis-Besse site meteorological tower would not reflect any ‘sea breeze’ present in the site vicinity.” (Answer, Page 114) FENOC likewise argues that “Petitioners’ argument that the MACCS2 code is inappropriate because it fails to account for the behavior of plumes over water similarly falters for lack of adequate support.” (Answer, Page 110) In addition, FENOC argues (Answer, Page 111) that our dispute that the straight line model is inappropriate and cannot account for changes in terrain simply referred to an EPA Guidance that “does not address radiological modeling for a severe reactor accident,” but “Instead, it addresses modeling of air pollution dispersion under the Clean Air Act.” Are we to believe that gaseous and particulate radionuclides are not hazardous air pollutants? A common thread to FENOC’s various arguments above is that they forget the central issue at this stage of the proceeding – what is and what is not required at the pleading stage.

FENOC in its arguments makes repeated reference to commentary and decisions in prior proceedings, especially to the on-going SAMA adjudicatory contentions in the license extension proceeding at Pilgrim Nuclear Power Station in

Massachusetts (Answer, Pages 107-112, and 115). However these references are irrelevant. Those decisions were dependent on exactly what the intervenor(s) there did or did not plead or prove, and have nothing to do with whether a contention should be admitted here.

For example, at its Answer Page 112, FENOC cites the Commission as noting “the relevant inquiry ‘is not whether there are ‘plainly better’ atmospheric dispersion models,’ but rather, whether the ‘SAMA analysis resulted in erroneous conclusions on the SAMAs found cost-beneficial to implement...’” (*Pilgrim*, CLI-10-11, slip op. at 37) But the above reference refers to the Commission’s Remand of the SAMA contention back to the ASLB on March 26, 2010. That Petitioner’s (Pilgrim Watch’s) Motion to Intervene was filed in May 2006, and was admitted by the ASLB in October 2006. It should have been clear to FENOC that pleading requirements are far less than at the remanded hearing stage.

Next, regarding FENOC’s allegation that “the document that Petitioners’ (sic) cite to support their ‘terrain effects’ claim actually shows that the straight-line modeling limitation serves to *increase* conservatism,” (FENOC Answer, Page 113, Emphasis in original) we find it telling that FENOC, in its repeated citations from the *Pilgrim* license extension proceeding, chose only to very selectively quote from intervenor Pilgrim Watch’s SAMA filings; but avoided, for example, Pilgrim Watch’s Brief in Response to CLI-09-11, at 11, that responded to the Commission’s request for briefing on whether the straight-line Gaussian plume model was conservative. It is unnecessary to respond here. Suffice it to say, we will provide evidence at the required stage here and, like at *Pilgrim*, present factual evidence that indeed the straight-line Gaussian plume is NOT conservative.

The core issue in Joint Petitioners’ contention is the FENOC did not choose a reasonable methodology, and there are models that are appropriate, up-to-date, reliable, and suitable to Davis-Besse’s site that would be reasonable – examples were provided.

At (5) on Page 113 of its Answer under “Meteorological Monitoring Data,” FENOC refutes our dispute that one year of meteorological data from a single collection point is insufficient. FENOC argues “Petitioners again provide no factual or expert support for their assertion as to why data collected at the Davis-Besse site meteorological tower would not reflect any ‘sea breeze’ present at the site vicinity.” (Answer, Page 114) Petitioners are not required to defend or prove our case here. However we will provide a short response for the benefit of the ASLB – an appetizer. Seasonal wind distributions can vary greatly from one year to the next. The simple fact is that measurements from a single anemometer will not provide sufficient information to project how an accidental release of a hazardous material would travel. For example, a “sea breeze” (or “lake breeze” given Davis-Besse’s Lake Erie shoreline location) effect will not be identified by a single onsite meteorological tower in cases when the sea breeze is just developing and for cases when the onshore component winds do not reach entirely from the ground to the anemometer height; instead, the anemometer would likely indicate an offshore wind indication. Further, in MACCS2 Guidance Report June 2004 Final Report page 3-8:3.2 Phenomenological Regimes of Applicability, it says that basing wind direction on the single on-site meteorological tower data ignores “shifting wind patterns away from the site including temporary stagnations, recirculations, and wind flow reversals that produce a different plume trajectory.

FENOC’s Arguments Against “Contention 4e: Assessment of the Economic Consequences of a Severe Accident, Including Decontamination, Cleanup, and Health Costs” (Answer, Pages 115 to 130), Joint Petitioners’ contention designated USE OF INPUTS THAT MINIMIZED AND INACCURATELY REFLECTED THE ECONOMIC CONSEQUENCES OF A SEVERE ACCIDENT, INCLUDING DECONTAMINATION COSTS, CLEANUP COSTS AND HEALTH COSTS, AND THAT EITHER MINIMIZED OR IGNORED A HOST OF OTHER COSTS (beginning on Page 135 of the Petition and Request, December 27, 2010)

In this contention, Joint Petitioners challenge the use of inputs that minimized and inaccurately reflected the economic consequences of a severe accident, including decontamination costs, cleanup costs and health costs, and that either minimized or ignored a host of other costs.

FENOC, like NRC staff, mistakenly believes that we are at the Summary Disposition stage of this process. Not so. Please refer again to the initial discussion of what is required, above.

FENOC argues that “Contention 4e” is inadmissible. They could not be more mistaken.

Decontamination and Cleanup Costs:

It is apparent that FENOC does not want to touch this issue any more than NRC, EPA or DHS want to take responsibility for cleanup, or industry to admit advertise that Price-Anderson does not cover cleanup costs, only damages. It is the big “Elephant in the Room.” These revelations came to public light for the first times thanks to reporter Doug Guarino at *Inside EPA*, who uncovered the truth in November 2010 via the Freedom of Information Act.

However FENOC’s arguments are ludicrous and disjointed on their face. Again we were not required to prove our case at this contention stage, or to provide an exhaustive list of possible bases, but simply to provide sufficient alleged factual or legal bases to support the contention and do so at the outset. We did – ample references, for example, were provided to government documents and the FENOC license extension application’s ER SAMA section.

Inexplicably, FENOC believes that we are at summary disposition says (at 91) that, “Petitioners’ arguments lack sufficient specificity, lack adequate factual or legal support, and do not establish a genuine material dispute.” (Answer, Page 116)

It is clear that FENOC either does not want to understand the issue or that they understand it only too well and base their argument upon misrepresentations of Joint Petitioner’s motion. For example:

FENOC spends considerable time muddying the waters about the differences between plutonium dispersal from weapons versus reactor accident. FENOC states at Page 117:

The *Site Restoration Study* indicates only that certain decontamination data may not be applicable to a *plutonium dispersal* accident. For example, it states that “[a]lmost all of the prior work in the U.S. and abroad on methods and effectiveness of radiological decontamination has been focused on fission products, and on time frames and conditions that have *limited applicability to decontamination after a plutonium-dispersal accident.*” That document makes no such assertion with respect to a reactor accident. (Emphasis by FENOC)

It is clear that we did not ask for FENOC to base its analyses on plutonium dispersal in a nuclear weapons accident; instead, we made plain that a large problem with the MACCS2’s code was that it, like its predecessor WASH-1400, assumes that the same methodology used to clean-up weapons events will be used after a severe nuclear reactor accident. The methods in MACCS2 (fire hosing and plowing under fields) are modeled assuming that they will be used to clean-up nuclear reactor accidents. Joint Petitioners explained why this is not acceptable for Davis Besse’s site. Radionuclides from reactor accidents differ from those released by a nuclear bomb explosion; therefore, they could not be cleaned up in the same manner, as quickly, or cheaply. Further, because plowing under fields and fire hosing does not cleanup the radionuclides, but simply moves them into the groundwater or deeper into the soil to once again reappear (as in food crops and drinking water) and contaminate the area and its living beings, this method will not be acceptable to local officials and the public.

FENOC has a most interesting definition of “conservatism.” They claim, at Page 118, that moving contamination from one place to another in the same geographical, contaminated area adds conservatism to the MACCS2 code and justifies its use, disputing Petitioner’s.

FENOC misinterprets Petitioner's reference to SAND-96-0957 (beginning at Answer, Page 116). They imply that we were advocating basing cleanup on a plutonium event. To the contrary, Joint Petitioners properly referenced the DOE document simply to point out that there were alternative models for cleanup and that DOE had moved far beyond NRC to improve methodology.

FENOC (Answer, Pages 123-125) misconstrues decontamination issues. They avoid the point by failing to say what they put into the MACCS2 code. Did FENOC take the *Users Guide's* suggestion; and did FENOC use the sample problem data? These are questions to answer as we go forward in this proceeding.

FENOC apparently chooses to misunderstand Joint Petitioners' references to Luna and Reichmuth's referenced RDD studies for the US Department of Homeland Security.

They were provided in the Petition and Request as a yardstick to indicate that if cleanup were properly assessed by FENOC in their SAMA, as required, that costs would be considerably higher, adding additional SAMAs as cost-beneficial. The studies provided likely costs per kilometer in urban to rural areas. Joint Petitioners thus logically concluded that "a severe accident at Davis-Besse is likely to result in huge costs; costs not accounted for by FENOC, because of the type and magnitude of radionuclides released in comparison with a RDD type device." (Petition and Request, Page 140, December 27, 2010)

Health Costs:

Joint Petitioners dispute health costs used in the analysis – they were underestimated. The population dose conversion factor of \$2,000/person-rem used by FENOC to estimate the cost of the health effects generated by radiation exposure is based on a deeply flawed analysis and seriously underestimates the cost of the health consequences of severe accidents. Joint Petitioners supported its dispute with reference to government documents, the National Academies of Sciences, and

independent research reported in respected technical journals. We fully satisfied requirements at this pleading stage.

Petitioners argue that FENOC's "evacuation time input data into the code were unrealistically low and unsubstantiated; and that if correct evacuation times and assumptions had been used, the analysis would show far fewer numbers in the affected population will evacuate in a timely manner, increasing health-related costs." Petition and Request at Page 147. FENOC's claim that our dispute is inadmissible does not stand up.

FENOC refers to a sensitivity study on Page 124 of its Answer. However, their sensitivity studies, actually referred to throughout their Answer in addition to this Contention 4e relevant instance, simply entered different inputs into the same flawed model. To paraphrase Einstein, repeating the same mistake many times does not give a reliable answer. We supported our dispute as required at this stage and thereby satisfied our pleading. We are not required to prove our case at this time. Joint Petitioners note that once more FENOC referenced Pilgrim findings at Answer, Page 125. We remind the ASLB that a prior decision, that an Intervenor did not prove a contention at another reactor in another license extension adjudication process, has nothing to do whether a contention should be admitted here.

FENOC dismisses the relevance of the CRAC-2 study cited by Joint Petitioners, stating (at Answer, Page 128): "Petitioners also do not explain the relevance of this almost 30-year old study—which used 1970 census data and the CRAC2 computer code..." It is certainly not Joint Petitioners' fault that NRC has not published an update to CRAC-2 since 1982. Significantly, NRC attempted to keep the information in CRAC-2 from the public – it took Congressman Ed Markey of Massachusetts to force NRC to make the report public in the first place. We must also hasten to add that we have tremendous concerns that the update NRC is undertaking, State of the Art Reactor Consequence Calculations, so-called, raises serious concerns, yet again, that flawed

modeling will lead to serious underestimates of radiological risks to the public. Joint Petitioners cited CRAC-2 to emphasize the very serious consequences that could result in Detroit/Windsor, Toledo, or Cleveland – depending on which way the wind happened to be blowing when the catastrophic radiological release at Davis-Besse takes place – and hence the importance of preventing such a release in the first place, as through doing accurate SAMA analyses and taking the appropriate cost-beneficial actions in response, as FENOC is supposed to do.

Myriad Other Economic Costs

Joint Petitioners allege that FENOC failed to include a myriad of other economic costs including “the business value of property;” loss and/or damage to infrastructure; costs of job training, unemployment costs, and litigation; and underestimated the value of farm land, for example, by not considering the value of the farm property for development purposes as opposed to agricultural, and farm land assessments are intentionally very low to encourage farming and open space. Contrary to FENOC, the issue is properly pled, and provides sufficient notice to them that this is a dispute to prepare for further down the road in this proceeding.

FENOC’s Arguments Against “Contention 4f: Statistical Analysis of Data” (Answer Page 130 to 134), Joint Petitioners’ contention designated as USE OF INAPPROPRIATE STATISTICAL ANALYSIS OF THE DATA, SPECIFICALLY THE APPLICANT CHOSE TO FOLLOW NRC PRACTICE, NOT NRC REGULATION, REGARDING SAMA ANALYSES BY USING MEAN CONSEQUENCE VALUES INSTEAD OF, FOR EXAMPLE, 95TH PERCENTILE VALUES (beginning on Page 149 of Petition and Request,. December 27, 2010).

In this contention, Joint Petitioners challenge the use of inappropriate statistical analysis of the data - specifically the Applicant chose to follow NRC practice, not NRC regulation, regarding SAMA analyses by using mean consequence values instead of,

for example, 95th percentile values. Thereby this important dispute is raised at the outset.

As Joint Petitioners have previously explained, the MACCS2 code's OUTPUT file does the averaging and ranks the data into a cumulative distribution function (CDF, not to be confused with Core Damage Frequency) – 50th quartile, mean, 90th quartile, 95th quartile, etc. FENOC chose to take the mean value; and, there is no NRC rule requiring the mean. The mean is the wrong choice, for it underestimates consequences. A mean divides the sum by the number of entries. There are thousands of individual data entries so that dividing the sum by so many entries unreasonably dilutes the results. Further FENOC multiplied the mean by their estimate of the probability of the accident scenario. The point is that FENOC's choices – inputs and choice of averaging and probability – resulted in significantly underestimating costs.

In summary, Joint Petitioners satisfied pleading requirements for Contention 4 and we look forward to proving our case at the appropriate stages in the process ahead.

Final Miscellaneous Points

FENOC more than once raised the issue that Joint Petitioners had copied their Contention Four from work done by other intervenors in earlier license extension proceedings. But this was certainly no secret – Joint Petitioners announced this at the very beginning of Contention Four, thanking New England Coalition and Friends of the Coast for their groundbreaking work at the Seabrook proceeding. Joint Petitioners were remiss in not thanking Pilgrim Watch and Riverkeeper for their even earlier groundbreaking work at *Pilgrim* and *Indian Point*, for it too was cited by Joint Petitioners.

At Page 82, FENOC charges that Joint Petitioners “may not fully understand” their own contention, portraying it thus as “frivolous.” What FENOC needs to “fully understand” is that Joint Petitioners, and area residents they represent, will not silently accept the serious radiological risks that the aging and deteriorating Davis-Besse atomic reactor inflicts on the region. Hence our Petition and Request.

At Page 85, Footnote 357, FENOC obfuscates the meanings of “risk” and “consequence.” If a severe accident in fact does happen, that is, probability of risk equals 100%, then the consequences of course will not be “small.” The definition of risk is probability multiplied by consequence. 100% probability times consequence equals risk.

At Page 87, FENOC cites NRC’s GEIS conclusion that “the core damage and radiological release from such [intentional] acts would be no worse than the damage and release expected from internally initiated [accidental] events.” FENOC adds that the U.S. Court of Appeals for the Third Circuit affirmed this conclusion. But Joint Petitioners must agree with Dr. Ed Lyman of UCS, whose report “Chernobyl on the Hudson?” we cited. Intentional acts of terrorism targeted at a nuclear power plant would be designed to maximize radiological releases. Equating this with accidents seems to us a fallacious assumption.

At Page 90, FENOC argues that New York City’s dense population raises different risk considerations at Indian Point than the population density surrounding Davis-Besse. However, Joint Petitioners insist that the dense populations represented by Detroit/Windsor, Toledo, Cleveland, etc. require that the utmost precautions be taken to prevent radiological releases at Davis-Besse, whether do to accidents or attacks, as by accurate SAMA analyses and appropriate cost-beneficial actions in response.

FENOC accuses Joint Petitioners of copying, “nearly verbatim,” from intervenor Riverkeeper in the Indian Point proceeding. Joint Petitioners freely admitted, as already mentioned, at the very beginning of their Contention Four, that New England Coalition and Friends of the Coast’s Petition at Seabrook formed the model for its SAMA contention at Davis-Besse.

At Page 98, FENOC states “Petitioners’ failure to meet their burden in this regard is particularly glaring given the widespread use and acceptance of the MAAP code in the nuclear industry.” Joint Petitioners must point out that “widespread use and acceptance” does not necessarily mean it is correct, conservative, or protective of safety and environment. Joint Petitioners have mentioned the risks of “groupthink” above. The “widespread use and acceptance” of flammable “fire barriers” across the nuclear power industry does not make that practice right or acceptable or safe. Likewise, the deployment of irradiated nuclear fuel dry casks across the industry that violate basis quality assurance principles does not make that practice right, safe, or acceptable. Also, “widespread use and acceptance” of the illusion that Yucca Mountain would “solve” the 54 year old problem of what to do with forever deadly commercial irradiated nuclear fuel did not make it so, as the project’s recent cancellation has revealed. These are but three of countless examples from the nuclear power industry that could be mentioned, including flaws with the MAAP code, as Joint Petitioners have here contended.

This same reasoning applies to FENOC’s citation, on Page 107, of a recent Commission ruling that “the straight-line Gaussian plume model used in the ATMOS module of MACCS2 has been an accepted analytical approach for plume dispersion analyses in the nuclear industry for several decades.” Again, long-time, widespread acceptance does not necessarily make something right. Hence Joint Petitioners’ contention. By the way, FENOC’s reference to “the Commission recently confirmed that MACCS2—not AERMOD or CALPUFF—is ‘the most current, established code for NRC

SAMA analysis” is troubling to Petitioners. A several-decade-old, flawed code being “the most current, established code for NRC SAMA analysis” is troubling.

Similarly, FENOC’s dismissal of Joint Petitioners’ concerns about lack of quality assurance on the MAACS2 code is reflective of a dangerous attitude apparent across the nuclear establishment regarding the safety significance of QA. QA problems, as mentioned just above, have been identified with dry cask storage, as by industry whistleblower Oscar Shirani, and NRC inspector Ross Landsman. But they have also been identified repeatedly at DOE’s Yucca Mountain Project, by the GAO. Beyond Nuclear, Citizens Environment Alliance of Southwestern Ontario, and Don’t Waste Michigan – Petitioners in this proceeding – have contended serious QA problems with the Fermi 3 new reactor proposal 30 miles northeast of Davis-Besse at Detroit Edison’s Fermi nuclear power plant site, an issue that will now be heard by the ASLB. FENOC’s dismissal of QA’s significance – as by its implication at Page 100 that NRC can do a lesser job of QA than DOE (that a SAMA analysis is to be held to a lesser standard than a DOE Documented Safety Analysis – is reflective of a troubling trend apparent across the nuclear power industry and its regulatory agency. The fact that FENOC identified not one single SAMA that proved cost-beneficial seems to echo this trend, as well as NRC OIG’s very serious finding in the aftermath of the Davis-Besse hole in the head fiasco of 2002 that profit had been prioritized over safety.

FENOC’s assertion at Page 101 that “A SAMA analysis is not safety-related” perplexes and troubles Joint Petitioners. It seems to indicate a perilous disregard by FENOC of the safety significance of SAMA analyses, and may explain why and how FENOC found not a single SAMA to be cost-effective. Of course the public bears the

ultimate risk of such decisions by FENOC, while FENOC saves money at the expense of public risk.

Beginning on Page 108, FENOC's dismissal of experts cited by Joint Petitioners regarding the Great Lakes sea breeze effect is unacceptable. Joint Petitioners re-affirm that the NOAA NWS and Dr. Heidorn should be recognized as the experts that they are on this significant Great Lakes meteorological dynamic. It should also be emphasized that, whereas New England Coalition and Friends of the Coast at Seabrook, as well as Pilgrim Watch at Pilgrim, identified the significance of sea breeze effect for the dense population of metro Boston, in this proceeding, Joint Petitioners point to the significance of Great Lakes sea breeze dynamics for the dense populations in metro area such as Detroit/Windsor, Toledo, and Cleveland.

At Page 112, FENOC complains that Joint Petitioners did "not include as an exhibit or provide with a reference link" DOE's *MACCS2 Guidance*. But NRC and DOE were at one time the same agency (AEC), and are still closely affiliated, so we assumed that NRC had instant access to this document, and thus so does FENOC, which must work with its regulator NRC on an ongoing basis to fulfill NRC regulations.

Regarding Footnote 512 on Page 117 of FENOC's Answer, about 1% of irradiated nuclear fuel is comprised of plutonium that has built up during the course of the nuclear chain reaction in Davis-Besse's reactor core. Likewise, even reactor fuel in the core undergoing fissioning will contain some quantity of plutonium, which builds up over time to that 1% level. Any plutonium is significant because its various isotopes are ultra-hazardous. As Joint Petitioners have mentioned earlier, Davis-Besse had 557 metric tons of irradiated nuclear fuel stored on-site, in both the pool and dry casks, as of

spring 2010. If Davis-Besse operates for a total of 50 years, that amount will grow to over 900 metric tons. And if operated a decade beyond that, as FENOC has applied to NRC for permission to do, the amount of irradiated fuel at Davis-Besse could grow to more than 1,000 metric tons. 1% of 1,000 metric tons is 10 metric tons of plutonium, or 10,000 kilograms of plutonium. Typical nuclear weapons contain “only” several kilograms of plutonium, at most. Thus, the amount of plutonium at Davis-Besse would represent thousands of nuclear weapons’ worth. It would be available for release to the environment in the event of a severe accident. This establishes clearly the significance of a potential plutonium release from Davis-Besse in the event of a severe accident. However, it must be kept in mind that plutonium isotopes represent just a handful of the hundreds of hazardous radioactive isotopes that would be released by Davis-Besse in the event of a severe accident, isotopes that are not even present in undetonated nuclear weapons.

FENOC at Page 120 of its Answer cites a Commission statement claiming that “acknowledged difficulties of the Chernobyl clean-up may largely have been due to poor training, lack of equipment, and a nearly complete break-down in leadership.” Petitioners would point to the U.S. experience in the aftermath of Hurricane Katrina as an example of how such difficulties could be experienced right here at home in the aftermath of a nuclear power plant disaster as well. *Inside EPA’s* November 2010 revelations about ongoing disputes between NRC, EPA, and FEMA over which agency would lead a post accident clean up, and where funding would come from to do the clean up, show that authority in this country is indeterminate. And if FENOC and NRC assume that the U.S. military could be called upon to take part in dealing with a severe

nuclear accident at Davis-Besse and its aftermath, it should be kept in mind that, as with the USSR in 1986, the U.S. military is stretched thin due to its current war in Afghanistan, not to mention its additional current war in Iraq.

At Page 122-123 of its Answer, FENOC charges that “Petitioners here do not furnish *any* alleged facts, documentary support, or expert opinion – i.e., anything beyond pure assertion – for their “loss of economic activity” argument.” Petitioners are surprised by FENOC’s ignorance of economic activity in northwest Ohio where Davis-Besse is based. This includes not only the recreation and tourism associated with the Lake Erie Islands, the abundant fisheries to be found in Lake Erie, but also the industrial base represented by the combined Detroit/Windsor, Toledo, and Cleveland metro areas, including, as mentioned elsewhere in this filing, the largest factory for solar PV panel production in the world, FirstSolar in Perrysburg, Ohio. In fact, the Great Lakes region, of which northwest Ohio is a part, is one of the biggest regional economies on the planet. The “loss of economic activity” at risk if Davis-Besse suffers a severe accident is self-evident.

In response to FENOC repeated complaints that Joint Petitioners merely copied, or cut and paste, their Contention Four from other intervenors in other proceedings, we must respond that those living in glass houses should not throw stones. The NRC OIG in 2007 reported that, in the context of reactor license extensions, NRC staff had copied, at times nearly verbatim, from nuclear utility ERs, in preparation of NRC environmental documents presented as independent analyses. Later, NRC OIG also documented that NRC staff had destroyed working documents that led up to, and supposedly justified, their decisions to grant license extensions. It should be kept in

mind that NRC is a federal agency, with a billion dollar plus annual budget, and over 4,000 staff at its disposal. Joint Petitioners, on the other hand, are small non-profit organizations, whose total *annual* budgets, if added together, represent much less than what FENOC makes in a single day, in net profit, at Davis-Besse. Therefore, yes, groups like ours do work with similar groups across the country to pool resources and not “recreate the wheel” unnecessarily, such as we did on our SAMA contention.

We are also surprised at FENOC’s complaint at Page 128 of its Answer, in regards to Joint Petitioners’ citation of CRAC-2, that “This document is not attached to the Petition as an Exhibit, and counsel has been unable to locate a document with this title, author, and date that is readily available in the public domain. Nor do Petitioners identify the relevant pages of this document. Petitioners’ failure in this regard deprives the Board and other participants of the ability to readily evaluate the accuracy (or inaccuracy) of Petitioners’ characterization of the referenced document.” CRAC-2 is a well known report within the nuclear power establishment. It is an NRC document. Its findings are clearly identifiable within the report.

Respectfully submitted,

/s/ Kevin Kamps & submitted by Digital Certificate *pro se* on behalf of Petitioners

Kevin Kamps

Radioactive Waste Watchdog

Beyond Nuclear

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Takoma Park, MD 20912

Tel. 301.270.2209 ext. 1

Email: kevin@beyondnuclear.org

Website: www.beyondnuclear.org

January 28, 2011

January 28, 2011

**UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION
Office of the Secretary**

In the Matter of:) Docket No. 50-346
FirstEnergy Nuclear Operating Company)
Davis-Besse Nuclear Power Station, Unit 1)
(Regarding the Renewal of Facility)
Operating License NPF-003 for a 20-Year)
Period))
)

CERTIFICATION OF SERVICE OF JOINT INTERVENORS' COMBINED REPLY IN
SUPPORT OF PETITION FOR LEAVE TO INTERVENE

I hereby certify that a copy of the foregoing Joint Intervenor's Combined Reply in Support of Petition for Leave to Intervene" was sent by me to the following persons via electronic deposit filing with the Commission's EIE system this 28th day of January, 2011:

Administrative Judge
William J. Froehlich, Chair
Atomic Safety and Licensing Board Panel
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Washington, DC 20555-0001
E-mail: wjfl@nrc.gov

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

Administrative Judge
Dr. William E. Kastenberg
Atomic Safety and Licensing Board Panel
U.S. Nuclear Regulatory Commission
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Office of the General Counsel
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E-mail: sburdick@morganlewis.com

Respectfully submitted,

/s/ Kevin Kamps & submitted by Digital Certificate *pro se* on behalf of Petitioners

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Radioactive Waste Watchdog
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(Regarding the Renewal of Facility)
Operating License NPF-003 for a 20-Year)
Period))
)

**JOINT INTERVENORS' COMBINED REPLY IN
SUPPORT OF PETITION FOR LEAVE TO INTERVENE
(ATTACHMENTS AND EXHIBITS SUPPLEMENT)**

Attached are:

Declaration of Kevin Kamps

Articles of Incorporation of Don't Waste Michigan

NRC Notification Letter, December 1979

Davis-Besse Emergency Implementing Procedures (2003)

Pamphlet from Beyond Nuclear: Davis-Besse Atomic Reactor:
20 MORE Years of Radioactive Russian Roulette on
the Great Lakes shore?!

/s/ Kevin Kamps & submitted by Digital Certificate *pro se* on behalf of Petitioners
Kevin Kamps
Radioactive Waste Watchdog
Beyond Nuclear

6930 Carroll Avenue, Suite 400
Takoma Park, MD 20912
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Email: kevin@beyondnuclear.org
Website: www.beyondnuclear.org

January 28, 2011

January 28, 2011

**UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION
Office of the Secretary**

In the Matter of:) Docket No. 50-346
FirstEnergy Nuclear Operating)
Company)
Davis-Besse Nuclear Power)
Station, Unit 1)
Regarding the Renewal of)
Facility Operating License)
NPF-003 for a 20-Year Period)

**DECLARATION OF KEVIN KAMPS
ON TIMELY FILING OF PETITION TO INTERVENE**

Now comes Kevin Kamps, Declarant herein, who hereby declares as follows under penalty of perjury:

1. I am the Joint Petitioners' point person in the captioned proceeding. I am not a lawyer and this intervention is being conducted *pro se* by nonlawyer parties. I am employed by Beyond Nuclear, which has previously participated in NRC proceedings. I have never filed a Petition for Leave to Intervene in an adjudicatory hearing prior to this license extension proceeding.

2. When I filed the Petition for Leave to Intervene in this proceeding shortly after 11:00 p.m. on December 27, 2010, I did so as a first-time electronic filer in the NRC's system, as I had received my first digital certificate about a week earlier following a conference with the EIE Help Desk to align my computer with the NRC's system.

3. About 7:00 p.m. on the evening of December 27, I contacted the EIE Help Desk, ahead of its closing hour of 8:00 p.m., to make sure that my digital certificate was in good order, and that everything would function smoothly for the petition filing. I spoke with Debra at the EIE Help Desk, who assured me that my digital certificate was in good order, and the filing should proceed smoothly.

4. Once I had the petition and associated exhibits and items in final form, and all exhibits in order and ready to submit, I began the process of submission at 11:00 p.m. December 27, 2010. It quickly became apparent that the EIE system was not responding properly. I was able to get to the signature page of the EIE system, but was unable to get beyond it.

5. As an emergency contingency, I contacted a co-worker, Paul Gunter, who also has a digital certificate for the Davis-Besse proceeding. Fortunately, Mr. Gunter was able to submit Petitioners' documents into the system after racing to the Beyond Nuclear office (on Christmas holiday, it should be noted - Beyond Nuclear takes the Christmas - New Year's time window as holiday) after 11:00 p.m. in order to do so. I transmitted the complete filing, including all exhibits, to Paul Gunter as quickly as possible via email. Paul Gunter then submitted those items into the NRC EIE as quickly as possible.

6. All of the exhibits, including Dr. Al Compaan's *curriculum vitae* and declaration, were embedded as links in the Microsoft Word version of the REQUEST FOR HEARING AND PETITION FOR LEAVE TO INTERVENE. FENOC admits that these items were submitted before the midnight deadline. Some exhibits were submitted before, and some shortly after, midnight December 27, 2010 and were thus available to all parties in a timely fashion.

7. Paul Gunter continued submitting the exhibits as separate .pdf format files into the EIE system as quickly as possible after midnight, although two exhibits were rejected by the system. In all, Mr. Gunter was able to submit 73 items into the EIE system under the Davis-Besse docket, completing that effort by roughly 3:30 a.m. on December 28, 2010.

8. Moments after midnight, I phoned the NRC Secretary's office, as well as the EIE Help Desk and reported the difficulties I was having via voicemail.

9. At 8:00 a.m. on December 28, 2010, I phoned both the EIE Help Desk, as well as the NRC Secretary's office. No one answered at the EIE Help Desk, but after a several minute hold, I was able to leave another message there.

10. A receptionist did pick up at the NRC Secretary's office at 8:07 a.m., and transferred me to Rebecca Gitter, who apologized to me for the difficulties with the EIE system and stated "This is something others have experienced." She added that this is "a common problem others have had at the submission stage," and indicated that she would have the EIE Help Desk contact me.

11. At 8:17 a.m. on December 28, Debra from the EIE Help Desk contacted me. She and other staff spent most of the entire time period from then until 12:20 p.m. - over four hours - on the phone with me, each of us at our respective computer, working together to try to get my computer and the EIE system to communicate so that I could submit the final two exhibits which the EIE system rejected when Paul Gunter had attempted to submit them, even though the EIE system had accepted 73 other items from Paul Gunter.

12. At times while she assisted me, Debra also spoke with her co-worker Ivan at the EIE Help Desk, commenting on the perplexing technical complications, hindrances, and problems we were experiencing trying to activate my NRC EIE digital certificate. At 9:32 a.m., Debra said to Ivan "I don't know what's going on. I've had him do every-thing." Ivan suggested in response that Debra should shepard me

through Mozilla instead of Internet Explorer in an attempt to get my digital certificate in order, and my EIE submission ability functional, saying "That's the only thing I can think of, till we figure out I.E."

13. Debra then commented that my digital certificate appeared to be corrupted and not working properly. She admitted that "maybe the certificate is no good."

14. At 9:35 a.m., Ivan said to Debra "I had one like that last week."

15. At that point, Debra's attempts to help me hit a brick wall, with Debra exclaiming "Oh man, come on!" Over an hour and a half into our working together, Debra instructed me to shut down my computer, in order that she could begin the entire process over again with me.

16. At 10:00 a.m., I was still encountering the same roadblock that prevented me from submitting to the EIE the previous night: a "No Signature" error message at the Send Button on the EIE submission signature screen.

17. At 10:09 a.m., Debra asked "Ivan, do you think he needs a new certificate?" Ivan responded "You've got to be kidding." Debra replied "Trust me, I'm not kidding." Ivan responded "I've seen that before too. Disable, try Mozilla. It doesn't hurt to try."

18. Over the course of the next hour, Debra had Kevin restart his computer three times, each time running through the entire EIE submission process, all to no avail. At Step 4, Signature Information, the EIE error message to Kevin read "No Signature."

19. At 11:55 a.m., Debra requested Kevin email her his NRC digital certificate. She informed him that she thought "it might be corrupt." Having received it, and looking it over, at 11:59 a.m., Debra exclaimed "Whoa. Whoa! Interesting...."

20. At 12:03 p.m., four hours after beginning this telephonic help session, Debra said to me, "Whew! I see what the problem is." At 12:19 p.m., Debra said to me, "Finally!"

21. I greatly appreciated Debra's professionalism and patient assistance over the course of more than four hours during the early morning, and then afternoon, of December 28, 2010. Debra noticed that one of the two problematic exhibits - which the EIE system would not allow Paul Gunter to submit earlier, despite his successfully submitting 73 other items - contained a dollar symbol in its title (it was a news article with a dollar symbol in its title) - and believed that the presence of that character may have been the problem. She advised me to remove it, which I did. I quickly submitted the final two exhibits, and with my now-functional digital certificate, the submissions entered the EIE system smoothly.

22. It remains that the EIE Help Desk's assurances to me on December 21 and December 27, 2010 that my digital certificate was in good order and that I would be able to submit documents to the EIE

system were incorrect. In light of the technical problems which were not attributable to any failing on my part, taken with my and Paul Gunter's good faith attempts to get the petition and associated items timely filed (succeeding with all but 2 of 75 total items by about 3:30 a.m. on December 28), and the discovery of technical problems at the EIE end of the filing continuum, I respectfully submit that good cause exists for the (partially) belated filing. The two remaining rejected items were filed in EIE about 12 hours after the deadline.

23. Further Declarant saith naught.

January 28, 2011
Date

Kevin Kamps
Kevin Kamps



MICHIGAN DEPARTMENT OF COMMERCE — CORPORATION AND SECURITIES BUREAU	
(FOR BUREAU USE ONLY) <div style="text-align: center; font-size: 2em; font-weight: bold; margin: 10px 0;">FILED</div> <div style="text-align: center; font-weight: bold; margin: 10px 0;">SEP 12 1991</div> <div style="text-align: center; font-size: 0.8em;"> Administrator MICHIGAN DEPARTMENT OF COMMERCE Corporation & Securities Bureau </div>	Date Received <div style="text-align: center; font-weight: bold; font-size: 1.2em;">SEP 10 1991</div>
CORPORATION IDENTIFICATION NUMBER	7 6 1 - 4 1 9

ARTICLES OF INCORPORATION

For use by Domestic Nonprofit Corporations

(Please read information and instructions on last page)

Pursuant to the provisions of Act 162, Public Acts of 1982, the undersigned corporation executes the following Articles:

ARTICLE I

The name of the corporation is:

DON'T WASTE MICHIGAN, STATE ORGANIZATION

ARTICLE II

The purpose or purposes for which the corporation is organized are:

a state wide coalition of concerned individuals, citizens groups, and environmental organizations dedicated to educating the public about the dangers nuclear contamination poses to human health and the environment.

ARTICLE III

The corporation is organized upon a nonstock basis.
(stock or nonstock)

- If organized on a stock basis, the total number of shares which the corporation has authority to issue is _____ . If the shares are, or are to be, divided into classes, the designation of each class, the number of shares in each class, and the relative rights, preferences and limitations of the shares of each class are as follows:

SK

Use space below for additional Articles or for continuation of previous Articles. Please identify any Article being continued or added. Attach additional pages if needed.

I (We), the incorporator(s) sign my (our) name(s) this 30th day of JULY, 19 91.

Sanda L Andrews

DOCUMENT WILL BE RETURNED TO NAME AND MAILING ADDRESS INDICATED IN THE BOX BELOW.

SANDA L. ANDREWS

DON'T WASTE MICHIGAN
SANDA L. ANDREWS
7229 RIGA HWY.
RIGA, MI 49276

SANDA L. ANDREWS
419 248-3384

MEMORANDUM AND INSTRUCTIONS

Faint, mostly illegible text in the lower half of the page, likely containing instructions or a memorandum. The text is too light to transcribe accurately but appears to be a standard form with several paragraphs.

50-390

Watts Bar



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

December 21, 1979

ALL POWER REACTOR LICENSEES
ALL CONSTRUCTION PERMIT HOLDERS AND APPLICANTS

Gentlemen:

The U. S. Nuclear Regulatory Commission (NRC) is proposing a change to the current regulation on radiological emergency response plans for nuclear production and utilization facilities. During the comment period on the proposed rule, the NRC staff intends to meet regionally with appropriate State and local officials and utility representatives to discuss the feasibility of the proposed rule, its impact and the procedures proposed for complying with its provisions.

Briefly, the proposed rule would:

- (1) Require an NRC licensee to shut down a nuclear power reactor if appropriate State and local emergency response plans have not received NRC concurrence or do not warrant continued NRC concurrence.
- (2) Require that State and local emergency response plans be concurred in by the NRC as a condition of operating license issuance.
- (3) Require extending emergency planning considerations to the emergency planning zones (i.e., within the approximate 10 and 50 mile radii around the plant).
- (4) Require that detailed emergency planning implementing procedures be submitted to NRC for review.
- (5) Require informing the public and improving support for local emergency response personnel.

NRC will be holding its workshop for States in your region in accordance with the enclosed schedule. I invite you to designate one individual to represent your views during discussions among State, local, utility, NRC and FEMA participants.

566 50-3
FOR ENCL

800 204 0007

MAY

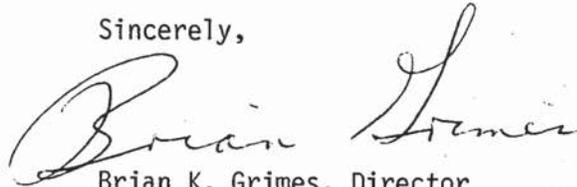
December 21, 1979

Since we are working in a short time frame, I ask that by December 31, you notify Mr. Allan Morrongiello, Office of Standards Development, (301) 443-5966 and give the name of your representative, his or her position, address and telephone number.

It is our view that this proposed rule is a significant step to providing needed protection in the event of an accident at a nuclear facility. I look forward to your participation in this important meeting.

For your information, I am enclosing the Federal Register notice of the proposed rule and the agenda for the January workshops.

Sincerely,



Brian K. Grimes, Director
Emergency Preparedness Task Group
Office of Nuclear Reactor Regulation

Enclosures:

1. Federal Register Notice
2. Agenda
3. Schedule

PLANTS UNDER OL REVIEW

1. Farley 2	50-364
2. Byron 1/2	50-454, 455
3. Braidwood 1/2	50-456/457
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19. Comanche Peak 1/2	50-445, 446
20. North Anna 2	50-339
21. WPPSS-2	50-397
22. Fermi 2	50-341
23. Zimmer 1	50-358

Davis Besse Power Station
Transmittal / Receipt Acknowledgement

Control Copy Number: 1665
Transmittal Number: 0301-20415
Transmittal Date: 01-10-2003

To: DOC. CONTROL DESK

Mail Stop / Address: USNRC DIVISION OF EMERGENCY PREPAREDNESS WASHINGTON, D.C. 20555

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Davis Besse Power Station
Transmittal / Receipt Acknowledgement

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Transmittal Date: 01-10-2003

		Document					
TOC 1	TOC 2	Type	Number	Shr/Sec	Changes	Rev	Status
old	EPIB	PROC	RA-EP-02245		C97-2719	0000	APPROVED
new	EPIB	PROC	RA-EP-02245			0001	APPROVED

Davis-Besse Nuclear Power Station

EMERGENCY PLAN IMPLEMENTING PROCEDURE

RA-EP-02245

Protective Action Guidelines

REVISION 01

Prepared by: Paul F. Timmerman

Procedure Owner: Manager - Security

Effective Date: JAN 10 2003

Procedure Classification:

- Safety Related
- Quality Related
- Non-Quality Related

LEVEL OF USE:
IN-FIELD REFERENCE

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1.0 PURPOSE

- 1.1 This procedure defines specific guidelines for determining protective action recommendations for emergencies involving abnormal releases of radioactivity at the Davis-Besse Nuclear Power Station (DBNPS).

2.0 REFERENCES

2.1 Developmental

- 2.1.1 U.S. Food and Drug Administration, Federal Register, Vol. 47, No 205, Oct 22, 1982
- 2.1.2 NRC IE Information Notice No. 83-28: Criteria for Protective Action Recommendations for General Emergencies, dated May 4, 1983.
- 2.1.3 EPA-400-R-92-001, May 1992, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents
- 2.1.4 Anno, George, Dore, and Michael: The Effectiveness of Sheltering as a Protective Action Against Nuclear Accidents Involving Gaseous Releases, EPA 520/1-78- 001A, April 1978.
- 2.1.5 SAND 77-1725, Public Protection Strategies for Potential Nuclear Reactor Accidents – Sheltering Concepts with Existing Public and Private Structures.
- 2.1.6 Davis-Besse Nuclear Power Station Emergency Plan.
- 2.1.7 KLD Associates, Inc., "Development of Evacuation Time Estimates for Davis-Besse Nuclear Power Station", Revision 4, November 1991.

2.2 Implementation

- 2.2.1 RA-EP-02110, Emergency Notification
- 2.2.2 RA-EP-02240, Offsite Dose Assessment
- 2.2.3 RA-EP-02520, Assembly and Accountability
- 2.2.4 RA-EP-02530, Evacuation
- 2.2.5 RA-EP-02620, Emergency Dose Control and Potassium Iodide Distribution

3 0 DEFINITIONS

- 3.1 ALARA – As Low As Reasonably Achievable, means making every reasonable effort to maintain exposures to radiation as far below the dose limits in 10CFR20 as is practical and consistent with the purpose for which the licensed activity is undertaken.
- 3.2 COMMITTED DOSE EQUIVALENT (CDE) – The dose equivalent to organs or tissues that will be received from an intake of radioactive material by an individual during the 50-year period following the intake.
- 3.3 CORE MELT SEQUENCE – A situation in which the core could be uncovered and there is no means for restoring cooling to the core. Without cooling, overheating and melting of the fuel will occur.
- 3.4 DADS – The Data Acquisition and Display System is a computerized system which provides plant parameters, meteorology data, dose calculations, and other related programs.
- 3.5 EMERGENCY PLANNING ZONE(S) – The two zones that are established around a nuclear power station in which predetermined protective actions plans are needed.
- 3.5.1 The first zone has an approximate radius of 10 miles for the plume exposure pathway.
- 3.5.2 The second zone has an approximate radius of 50 miles for the ingestion exposure pathway.
- 3.6 EVACUATION DOSE – The dose that a potential evacuee would receive if he or she were openly exposed during the evacuation.
- 3.7 EVACUATION EXPOSURE PERIOD – The period during which those people being evacuated are exposed to the radioactive plume.
- 3.8 EXPOSURE TIME – That period of time during which the offsite population will be exposed to radiation as a result of an airborne radioactive release.
- 3.9 LAKE BREEZE – A meteorological condition that may occur on clear, sunny days. During a lake breeze, a radioactive release can travel inland, rise, reverse course in an overhead return flow, and then return to land in a convoluted path.
- 3.10 MINIMUM PROTECTIVE ACTION RECOMMENDATIONS (PAR) – The minimum PAR is evacuate Subarea 1, Subarea 12, and affected downwind subareas within five miles.
- 3.11 OFFSITE – Any area outside the Owner Controlled Area surrounding Davis-Besse Nuclear Power Station.
- 3.12 SAFETY PARAMETER DISPLAY SYSTEM (SPDS) – The SPDS is a group of graphic displays developed to assist with monitoring plant operations.
- 3.13 SECTOR – One of the 16 areas bounded by radii 22½ degrees apart into which the 10-mile EPZ is divided. Sectors are designated by the Letters A through P, excluding I and O. Sector A is north, E is East, J is south, and N is west.
- 3.14 TOTAL EFFECTIVE DOSE EQUIVALENT (TEDE) – The sum of the deep-dose equivalent (for external exposure) and the Committed Effective Dose Equivalent (for internal exposure).

4.0 RESPONSIBILITIES

- 4.1 The Emergency Director is responsible for directing protective actions for Station personnel and recommending protective actions to offsite officials for the Plume Exposure Pathway (10-mile EPZ).
- 4.2 The Dose Assessment Coordinator is responsible for collecting and analyzing offsite dose assessment data used to provide the basis for protective action recommendations.

5.0 INITIATING CONDITIONS

Initiate this procedure when a declared emergency has the potential for an abnormal release of radioactivity.

6.0 PROCEDURE6.1 Onsite Protective Actions

- 6.1.1 The Emergency Director shall initiate the necessary actions to protect DBNPS personnel.
- _____ a. Evacuate personnel in accordance with RA-EP-02530, Evacuation
 - _____ b. Account for personnel in accordance with RA-EP-02520, Assembly and Accountability.
 - _____ c. Distribute potassium iodide in accordance with RA-EP-02620, Emergency Dose Control and Potassium Iodide Distribution
- 6.1.2 All supervisors shall ensure that appropriate safety and ALARA precautions are implemented

NOTE 6.2

- Any condition that justifies issuing an offsite Protective Action requires a General Emergency declaration.
- Offsite Protection Action Recommendations shall be made with initial notification of a General Emergency.

6.2 Offsite Protective Actions

- _____ 6.2.1 Verify a General Emergency has been declared.
- _____ 6.2.2 IF the reactor is in a CORE MELT SEQUENCE, GO TO Attachment 1, Flowchart For Determining Protective Action Recommendations During Core Melt Sequence, otherwise N/A this step.
- _____ 6.2.3 IF no radioactive release is in progress or imminent THEN recommend the minimum PAR (evacuate subarea 1, subarea, 12, and affected downwind subareas to 5 miles) as determined from Attachment 3, Affected Subareas By Wind Directory, otherwise N/A this step.
- _____ 6.2.4 IF the Safety Parameter Display System (SPDS) is available, Refer To RA-EP-02240, Offsite Dose Calculations, for dose calculations and Protective Action Recommendations (PARs), otherwise N/A this step.
- _____ 6.2.5 IF SPDS is not available, GO TO Attachment 2, Protective Action Recommendations (PARs) By Affected Subareas, otherwise N/A this step
- _____ 6.2.6 Notify offsite agencies and the NRC of the PARs and the affected subareas using RA-EP-02110, Emergency Notification, and Initial Notification Form. If a lake breeze is occurring, the wind direction is unknown, or the wind direction is from between 162° and 277°, inform the NRC that the release may enter Canadian territory

6.2.7 As Radiation Monitoring Team (RMT) data becomes available, compare it to dose projections and verify that Protective Action Recommendations are adequate.

6.3 Continue to monitor radiological and meteorological conditions, and repeat Steps 6.1 and 6.2 as conditions change.

7.0 FINAL CONDITIONS

Terminate this procedure when the Emergency Director, and offsite agencies determine that dose assessment and protective actions are no longer necessary.

8.0 RECORDS

8.1 The following quality assurance records are completed by this procedure and shall be listed on the Nuclear Records List, captured, and submitted to Nuclear Records Management in accordance with NG-NA-00106:

8.1.1 None

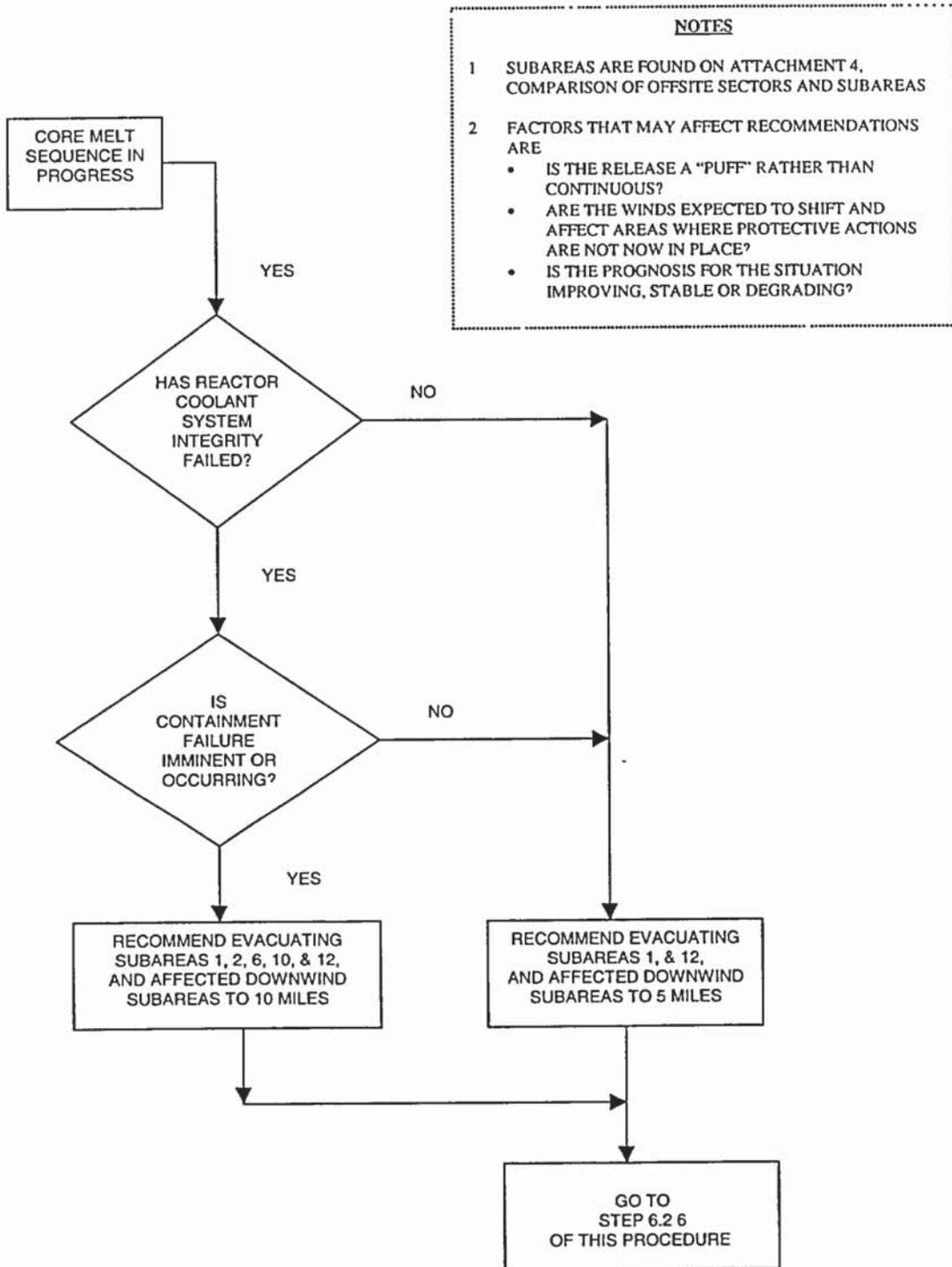
8.2 The following non-quality assurance records are completed by this procedure and may be captured and submitted to Nuclear Records Management, in accordance with NG-NA-00106:

8.2.1 None

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ATTACHMENT 1: FLOWCHART FOR DETERMINING PROTECTIVE ACTION
RECOMMENDATIONS DURING CORE MELT SEQUENCE

Page 1 of 1





ATTACHMENT 2:
PROTECTIVE ACTION RECOMMENDATIONS (PARs) BY AFFECTED SUBAREA
Page 1 of 2

NOTE: Step 1

A nomogram will only provide a TEDE value

- _____ 1 Calculate the TEDE and CDE dose rates at 0.75, 2, 5, and 10 miles using RA-EP-02240, and insert value in Column B of Table 1, IF TEDE value is < 1 Rem AND the CDE value is < 5 Rem, GO TO Step 6.
- _____ 2. In Column A of Table 1, circle subareas 1 and 12, and all of the two-mile and five-mile affected subareas determined from Attachment 3, Affected Subareas By Wind Direction.
- _____ 3. Insert the expect release duration (in hours) in Column C of Table 1, IF unknown, use 2 hours
- _____ 4 Calculate the dose rate 0.75, 2, and 5 miles by multiplying the value in Column B by the value in Column C and enter dose rate in Column D of Table 1.
- _____ 5 For the affected subarea(s) with TEDE value \geq 1 Rem and/or the CDE value \geq 5 Rem, THEN circle "YES" in Column F and recommend evacuation for all affected subareas circled in Column A, AND verify a General Emergency has been declared, OTHERWISE, circle "NO".
- _____ 6. IF the affected subarea(s) TEDE value is < 1 REM, AND the CDE value is < 5 Rem AND a General Emergency has been declared, THEN recommend the evacuation of subarea 1 and subarea 12 and all affected downwind subareas within 5 miles as determined from Attachment 3, OTHERWISE, N/A.
- _____ 7. Make appropriate notifications in accordance with Step 6.2.6.

ATTACHMENT 2:
PROTECTIVE ACTION RECOMMENDATIONS BY AFFECTED SUBAREA

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TABLE 1: PROTECTIVE ACTIONS AND AFFECTED SUBAREAS

Distance From Plant	A Affected Subareas		B Doserate (REM/hr)	C Release Duration (hr)	D Dose (REM)	E Limit (REM)	F Protective Action Recommendation
.75 to 2 miles	1 12	TEDE				≥ 1	Yes Evacuate
							No: No Action (Evacuate if in General Emergency)
	Thyroid CDE (I ₂) **				≥ 5	Yes: Evacuate	
						No: No Action (Evacuate if in General Emergency)	
2-5 miles	2 6 10	TEDE				≥ 1	Yes: Evacuate
							No No Action (Evacuate if in General Emergency)
	Thyroid CDE (I ₂) **				≥ 5	Yes: Evacuate	
						No: No Action (Evacuate if in General Emergency)	
5-10 miles	3 4 5	TEDE				≥ 1	Yes: Evacuate
							No: No Protective Action
	Thyroid CDE (I ₂) **				≥ 5	Yes. Evacuate	
						No: No Protective Action	

**N/A CDE row if nomogram is used to determine dose rate.

Performed by:

Signature

Date

ATTACHMENT 3 AFFECTED SUBAREAS BY WIND DIRECTION

Page 1 of 1

NOTE

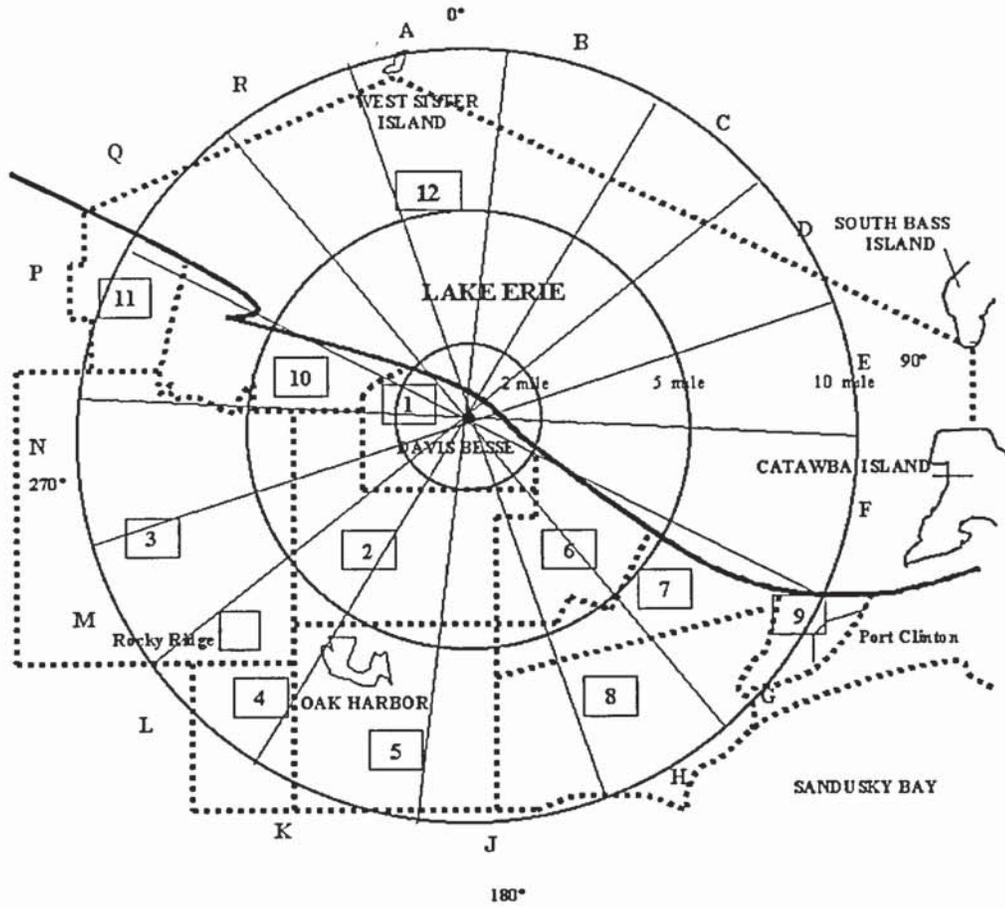
This table was based on the inclusion of 22 ½° segments on either side of the plume centerline.

- 1 IF a lake breeze is occurring or the wind direction is unknown, THEN select "Unknown" subareas. OTHERWISE, record the wind direction (if known) _____°, and identify affected subareas for distances of 2-5 miles and 5-10 miles from the plant.

Wind Direction (from) _____°

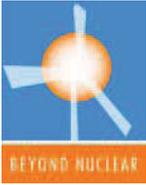
Wind Direction From	0 - 2 Miles	2 - 5 Miles	5 - 10 Miles
141° to 278°	1, 12	(None)	(None)
279° to 286°	1, 12	6	7, 9
287° to 293°	1, 12	6	7, 8, 9
294° to 330°	1, 12	2, 6	7, 8, 9
331° to 005°	1, 12	2, 6	5, 7, 8
006° to 013°	1, 12	2, 6	4, 5, 7, 8
014° to 020°	1, 12	2	4, 5
021° to 065°	1, 12	2	3, 4, 5
066° to 072°	1, 12	2	3, 4
073° to 078°	1, 12	2, 10	3
079° to 117°	1, 12	2, 10	3, 11
118° to 122°	1, 12	10	3, 11
123° to 140°	1, 12	10	11
Unknown or Lakebreeze	1, 12	2, 6, 10	3, 4, 5, 7, 8, 9, 11

ATTACHMENT 4: COMPARISON OF OFFSITE SECTORS AND SUBAREAS
Page 1 of 1



COMMITMENTS

<u>Step Number</u>	<u>Reference</u>	<u>Comments</u>
Attachment 4	TERMS O 13602	Depiction of both 22 5° sectors and evacuation subareas
Attachments 1, 2	TERMS O 13523	Combination of subareas 1 and 12 for protective action recommendations
Attachment 2	TERMS O 13592	Release duration considered in projected dose calculations
Attachments 1, 2, 4	TERMS O 13645	Automatic recommendation to evacuate "keyhole"
Attachments 1, 2, 3, 4	TERMS O 13920	Combine Subareas 1, 8, and 11 of Evacuation Sector Map
Attachment 3	TERMS O 13684	Large scale EPZ map same as this attachment
Attachment 2	TERMS O 14992	Protective Action decisions during Lake Breeze
Attachment 2	TERMS O 13584	Provide sufficient guidance to make appropriate Protective Action Recommendations
Entire Procedure	TERMS Q 00780	Procedure for determining protective measures during an emergency



Davis-Besse Atomic Reactor: 20 MORE Years of Radioactive Russian Roulette on the Great Lakes shore?!

INTRODUCTION

FirstEnergy has applied to the U.S. Nuclear Regulatory Commission (NRC) for a 20 year operating license extension at its nearly 34-year-old Davis-Besse nuclear power plant near Oak Harbor, Ohio, just over 20 miles east of Toledo.¹ If approved, Davis-Besse would be permitted to operate for 60 years, until 2037 (its original license, granted in 1977, is currently set to expire at the end of 40 years of operations, in 2017). Beginning a decade ago, NRC has rubberstamped 59 of 59 license “renewals” sought by industry,² including at the oldest operating reactors in the U.S., despite some of them having very serious, documented safety risks due to age-related degradation. The NRC Office of Inspector General, however, has reported serious problems with NRC’s license extension program: NRC staff have “cut and paste” the nuclear utility’s own work, sometimes word for word, falsely presenting it as independent safety analysis, then once license extensions are rubberstamped, destroyed the working documents that formed the basis for “renewal” approvals.³

But Davis-Besse is one of the most problem-plagued atomic reactors in the entire country. For example, NRC acknowledges that Davis-Besse has suffered six (out of a total of 34 incidents so designated nationwide) “significant accident sequence precursors” between 1969 and 2005, three times more than any other American nuclear plant. This includes the September 24, 1977 “stuck-open pressurizer PORV” (Pilot-Operated Relief Valve) at Davis-Besse, an almost identical accident precursor that unfortunately did lead to a 50% core meltdown at Three Mile Island (TMI), Pennsylvania just a year and a half later. NRC has calculated that this 1977 accident precursor at Davis-Besse had a 7% “core damage probability” (CDP), making it the fourth most serious accident in the entire industry during the time period in question, surpassed only by the 1979 TMI meltdown, 1975 Browns Ferry, AL fire (assigned a 20% CDP), and the 1978 Rancho Seco, CA steam generator dryout (assigned a 10% CDP).⁴ (However, it deserves mentioning that the Fermi 1 plutonium breeder reactor located in Monroe, Michigan – 30 miles across Lake Erie, and visible with the naked eye, from Davis-Besse – also suffered a partial core meltdown just a few years earlier than NRC’s timeframe above, in 1966.⁵) But the 9/24/77 TMI precursor accident was but the first of numerous times “We Almost Lost Toledo,” but one of many skeletons in Davis-Besse’s closet.

Three Mile Island meltdown precursor incident, September 24, 1977

Very fortunately for Toledo and points downstream and downwind, including Cleveland, the fledgling, six-month-old Davis-Besse reactor was only operating at 9% power⁶ when “a spurious half-trip of the steam and feedwater rupture control system initiated closure of the startup feedwater valve. This resulted in reduced water level in SG [steam generator] “2.” The pressurizer PORV lifted nine times and then stuck open because of rapid cycling.”⁷ Obscured by such NRC techno-engineering “Nukespeak”⁸ is that this unforeseen “break-in phase” accident created instant chaos in the Davis-Besse control room, bewildering the highly trained operators, leaving them in “complete confusion” for over 20 minutes as they tried to stabilize the suddenly and inexplicably out-of-control reactor. Over three hundred bells and flashing lights were simultaneously signaling alarm as a water column displaced the steam bubble “shock absorber” and filled the pressurizer on the very top of the reactor, risking any sudden jolt fracturing safety-significant pipes, and as the Number 2 Steam Generator risked boiling dry, which could cause dangerous overheating and even a “loss-of-coolant-accident” in the hellishly hot reactor core. Operators “grasped at straws,” rashly deciding to chuck emergency manual procedures that only seemed to be making matters worse in this unprecedented accident situation. Luckily for the unsuspecting cities just to the east and west, an operator spotted a gauge reading that resolved the perplexing puzzle, and corrective action was taken at the 26th minute of the crisis that brought the situation under control.⁹

Despite such a wild roller coaster ride, almost no one within the industry, including at reactor design firm Babcock and Wilcox, grasped the gravity of this accident. Most NRC officials were of the mindset that Davis-Besse personnel had acted appropriately, that the situation had been satisfactorily resolved, and that there were no more lessons to learn from the incident. However, an NRC regional inspector, James Creswell, from the Chicago office refused to “shut up.” After first exhausting normal channels by working, in vain, within the system, Creswell – at great personal risk to his career and livelihood – bypassed his nay-saying chain of command and

directly communicated the significance of the accident, and his unresolved concerns, to the attention of NRC Commissioners Bradford and Ahearne, as well as their technical staff, on March 22, 1979. Tragically, it was too late -- the TMI meltdown occurred just six days later, following an almost identical accident sequence as had begun to unfold at Davis-Besse 18 months earlier. Creswell was later honored by NRC for his efforts, as the agency tried to clean up its ruined image after the TMI disaster.¹⁰

Later in 1977, Davis-Besse experienced another “significant accident sequence precursor,” when Emergency Feedwater (EFW) pumps became inoperable during a test. NRC reported “During EFW pump testing, operators found that control over both pumps was lost because of mechanical binding in the governor of one pump and blown control power supply fuses for the speed changer motor on the other pump.” NRC calculated that this incident had a core damage probability of 1/200, or 0.5%.¹¹ But Davis-Besse’s very bad *first* year of operations was just the beginning.

“The Worst Accident Since TMI” -- Loss of cooling to reactor core for 12 minutes, June 9, 1985

Due to a convoluted combination of equipment malfunction and unavailability resulting from deferred maintenance, inexplicable “spurious actuation” in safety critical systems, operator error, and even overzealous security precautions that interfered with emergency actions, on June 9, 1985 at Davis-Besse, “several steps had been taken along the pathway to meltdown, but fortunately that journey was halted in time.”¹² Even NRC admits that Davis-Besse faced a 1% “core damage probability” when, despite the reactor being scrammed,¹³ there was a complete loss of feedwater to steam generators essential for core cooling. NRC’s summary of the incident states: “While at 90-percent power, the reactor tripped with main feedwater (MFW) pump “1” tripped and MFW pump “2” unavailable. Operators made an error in initiating the steam and feedwater rupture control system and isolated EFW [emergency feedwater] to both steam generators (SGs). The PORV actuated three times and did not reseal at the proper RCS [reactor coolant system] pressure. Operators closed the PORV block valves, recovered EFW locally, and used HPI [high pressure injection] pump “1” to reduce RCS pressure.”¹⁴ Such technical language obscures the fact that plant personnel had to sprint through darkened corridors with bolt cutters, not knowing if they had the proper keys or access cards to open locked security doors, in order to cut through chains securing valves, so they could manually open them to restore water flow to steam generators in order to cool the reactor core, with each passing minute increasing the risk of a loss-of-coolant-accident, nuclear fuel damage, and even a meltdown.¹⁵

As Dave Lochbaum at Union of Concerned Scientists clearly relates, Davis-Besse came within 37 minutes of partially uncovering the core of its cooling water supply, and 41 minutes of completely uncovering the core; as he points out, TMI’s core was never fully uncovered, but it was uncovered enough to half melt down.¹⁶ As if describing a tense scene from an Indiana Jones movie, Lochbaum also recounts how “Now that the main feedwater pumps and the backup auxiliary feedwater pumps had all crapped out, workers turned to [a dangerously substandard, previously] intentionally disabled motor-driven startup feedwater pump. An operator raced through the plant taking five manual actions in four different locations (including re-installing the fuses).”¹⁷

As summarized by Tom Henry in the *Toledo Blade*, “Davis-Besse experienced a 12-minute interruption in the feedwater flow to steam generators...The potentially catastrophic event idled the plant for more than a year.”¹⁸ Henry added “...**the Nuclear Regulatory Commission referred to the 1985 accident as the worst since Three Mile Island in 1979**...A report prepared for the U.S. House Subcommittee on Energy Conservation and Power just days after the June 9, 1985, event suggested that the coolant-water episode at Davis-Besse should not have surprised the NRC. The report said 48 problems concerning Davis-Besse’s auxiliary feed-water system had been reported by [FirstEnergy forerunner] Toledo Edison since July, 1979. The plant unexpectedly shut down 40 times between 1980 and 1985 - at least half of those times because of hardware problems and at least nine times because of human error.”¹⁹ (emphasis added) Dubbing it “decades of decadence” at Davis-Besse, Lochbaum has emphasized that had *any* of the numerous equipment problems been addressed in a timely manner, rather than multiple simultaneous shortcuts on safety taken and maintenance jobs long deferred, the entire accident could have been avoided.²⁰

In fact, two of the incidents in the early 1980s mentioned by Henry also rose to the level of “significant accident precursors,” according to NRC. On April 19, 1980, Davis-Besse lost two essential busses, causing a 1/1000 core damage probability; NRC reported “When the reactor was in cold shutdown, two essential busses were lost due to breaker ground fault relay actuation during an electrical lineup. Decay heat drop line valve was shut, and air was drawn into the suction of the decay heat removal pumps, resulting in loss of a decay heat removal path.”²¹ And on June 24, 1981, Davis-Besse lost a vital bus, coupled with the failure of an EFW pump, as

well as a main steam safety valve lifting and failing to reseal. NRC reported “With the plant at 74-percent power, the loss of bus “E2” occurred due to a maintenance error during CRDM [control rod drive mechanism] breaker logic testing. A reactor trip occurred, due to loss of CRDM power (bus “E2”), and instrumentation power was also lost (bus “E2” and a defective logic card on the alternate source). During the recovery, EFW pump “2” failed to start due to a maladjusted governor slip clutch and bent low speed stop pin. A main steam safety valve lifted, and failed to reseal (valve was then gagged).” This resulted in a 1/500, or 0.2%, core damage probability.²²

In addition, then-owner Toledo Edison was fined for an odd incident not unrelated to the 1985 close call. In a misguided, botched attempt to appease anti-nuclear watchdogs after the loss of coolant accident, a former U.S. Nuclear Navy submarine commander was brought onboard as plant manager, supposedly in order to make Davis-Besse “ship shape.” However, his “command and control” approach left a bit to be desired with the public and even his fellow employees, and he left after just a couple of years. The final straw came during the holidays in the mid to late 1980s, when the plant manager entered the Davis-Besse control room visibly drunk, cursing the busy reactor operators, and having to be physically restrained and dragged out by plant security when he tried to pick a fight.²³

Again, the major fiascos of Davis-Besse’s first decade of operations would be followed by more.

Direct hit by tornado, June 24, 1998

An F2 tornado, with wind speeds of 113 to 157 miles per hour, scored a direct hit on Davis-Besse, with the funnel cloud passing between the cooling tower and the containment building. The control room operators, running the reactor at 99% power, had little to no advance warning of the twister, until alerted by the guard shack, which had spotted it approaching the plant. Although the reactor was then immediately scrammed, a large amount of radioactive decay heat in the core would need to be actively cooled for many hours, even days. As a safety precaution, operators immediately attempted to initiate the plant’s two emergency diesel generators (EDGs). However, the first EDG initially failed to start, and was forced more than once over the course of the next day to be declared inoperable due to overheating of the room housing it. In addition, the second EDG was later declared inoperable “due to an apparent problem with the governor control.” This “uncertainty of the operability of the EDGs” was a very serious concern, as the tornado had caused extensive damage to Davis-Besse’s electrical switchyard, as well as to the region’s electrical transmission lines, leading to a complete loss of offsite power that lasted for nearly 27 hours. Thus, the EDGs were needed to cool the thermally hot core, as well as to cool the irradiated nuclear fuel storage pool, for over a day. Complete failure of both the offsite power supply, as well as the EDGs, could lead to core damage and even a meltdown in a short period of time, as well as boil off of the radioactive waste storage pool’s cooling water supply, which could cause spontaneous combustion of the irradiated nuclear fuel within a day or two. Such a reactor meltdown and/or pool fire could result in catastrophic radioactivity releases.²⁴ In addition to the dicey electricity supply to run vital safety and cooling systems, Davis-Besse’s emergency alert system and communications were largely destroyed or inoperable. For example, most of the emergency sirens across Ottawa County no longer worked after the electrical distribution system was so severely damaged. Ironically, when needed most, the emergency sirens did not work. Thus, the public would have been “in the dark” had there been radiological releases, and Davis-Besse could not even communicate with the State of Ohio or neighboring counties to coordinate emergency response.²⁵

3/16^{ths} of an inch from a meltdown?! The reactor with a hole in its head, March, 2002

The infamous 2002 “reactor hole-in-the-head” fiasco, due to Davis-Besse’s “multiple conditions coincident with reactor pressure vessel (RPV) head degradation” – namely, cracked control rod drive mechanism nozzles, a massive acid corrosion hole through the reactor lid, exacerbated by potential clogging of the emergency sump, as well as degradation of the high-pressure injection (HPI) pumps during core cooling water recirculation – is considered by the U.S. Government Accountability Office as **“the most serious safety issue confronting the nation’s commercial nuclear power industry since Three Mile Island in 1979.”**²⁶ (emphasis added) As recently summarized by Tom Henry in the *Toledo Blade*, “...in 2002, Davis-Besse’s old nuclear reactor head nearly burst. The lid was weakened by massive amounts of acid that had leaked from the reactor over several years. The acid induced heavy corrosion on top of the head. Radioactive steam would have formed in a U.S. nuclear containment vessel for the first time since the 1979 half-core meltdown of Three Mile Island Unit 2 in Pennsylvania if Davis-Besse’s lid had been breached. The only thing preventing that was a thin stainless steel liner that had started to crack and bulge, records show. Correcting the problem kept the Davis-Besse [reactor] idle

a record two years. Federal prosecutors later described the incident as **one of the biggest cover-ups in U.S. nuclear history**. Two former Davis-Besse engineers were convicted of withholding information and put on probation; the utility itself wound up paying a record \$33.5 million in civil and criminal fines”; this represents the **“largest single fine ever proposed by the NRC.”**²⁷ (emphasis added)

NRC’s own Office of Inspector General concluded that not only FirstEnergy, but also the NRC under the chairmanship of Richard Meserve, had prioritized the nuclear utility company’s profits over public safety.²⁸ U.S. Representative Dennis Kucinich (Democrat-Ohio), responding to the GAO report entitled “NRC Needs to More Aggressively and Comprehensively Resolve Issues Related to the Davis-Besse Nuclear Power Plant Shutdown”²⁹ – an investigation he had requested in the first place – said “The General Accounting Office (GAO) Report highlights shocking, serious and dangerous systemic problems at the Nuclear Regulatory Commission (NRC). Problems that call into question whether the agency can, as it is currently run, continue to perform its most fundamental functions-to protect public safety. This report reveals failures at almost every rung of the bureaucratic ladder at the NRC. **The crisis at Davis-Besse is the most serious safety issue to face a commercial nuclear power plant since Three Mile Island.** The GAO report shows that the NRC was ill equipped, ill informed and far too slow to react. The NRC’s reaction to Davis-Besse was inadequate, irresponsible and left the public at grave risk.”³⁰ (emphasis added)

The Northeast Blackout of 2003 – caused by FirstEnergy’s sagging money tree?!

The U.S.-Canada Power System Outage Task Force reported in its “Final Report on the August 14, 2003 Blackout in the United States and Canada: Causes and Recommendations”³¹ – regarding the second biggest power outage in history, affecting 55 million people in 8 U.S. states and Ontario – that the main cause involved FirstEnergy’s failure to trim trees in its Ohio service area, combined with extensive maintenance backlogs as well as computer and communications system breakdowns. Could it be that FirstEnergy, in the midst of paying over \$139,200,000 in costs³² (replacement power, repairs, etc.) associated with the hole-in-the-head fiasco (costs which would grow to over \$600 million altogether) at Davis-Besse due to the hole-in-the-head, and facing intense scrutiny by NRC and other government agencies such as the U.S. Department of Justice (which would eventually lead to civil and criminal charges and convictions), was experiencing “cash-flow challenges” and “other distractions” that contributed to these tree-trimming and maintenance backlogs? Ironically, the power outage forced the shutdown of dozens of atomic reactors in the U.S. and Canada – a safety pre-caution during such grid instability.

Two holes in your reactor’s head are better than one?! March 12, 2010

Tom Henry has also reported that “Davis-Besse resumed operation in 2004 but was unexpectedly sidelined again for several weeks earlier this year [2010] after a 25-year-old reactor head the utility had installed to replace the original one showed signs of premature aging. Officials said the device was made of an inferior alloy. Several of its metal nozzles became brittle and starting cracking.”³³ Lochbaum reports “In March 2010, workers at Davis-Besse discovered indications that two CRDM nozzles in the reactor vessel head purchased to replace the original head that CRDM nozzle leakage damaged beyond repair have through-wall cracks that leaked borated water onto the carbon steel reactor vessel head.”³⁴ In all, 24 of the 69 CRDM nozzles were found to have flaws, Henry reports. The new vessel head was supposed to last 15 years, but was failing after just 6 years. Apparently, an inferior metal alloy, now being phased out across the industry, was used in the lid’s manufacture, and Davis-Besse inspectors missed the problem when the lid was purchased from Consumers Energy’s built, but never operated, Midland nuclear power plant in Michigan.³⁵ Lochbaum points out that The CRDM nozzle leakage identified in 2002 clearly constituted “*significant conditions adverse to quality*” – the NRC imposed the majority of its \$5.45 million record fine for it. This federal regulation required the licensee to take corrective action to preclude recurrence. The 2010 recurrence demonstrates that Criterion XVI (Corrective Action) in Appendix B (Quality Assurance Criteria for Nuclear Power Plants and Fuel Preprocessing Plans) to 10 CFR [Code of Federal Regulations] Part 50 -- had been violated. In response to this latest regulatory violation, on April 5, 2010, Dave Lochbaum at UCS filed a petition with the NRC entitled “Request for Restoration and Maintenance of Adequate Protection of Public Health and Safety at the Davis-Besse Nuclear Plant,” citing NRC regulations and requirements that allow for “zero reactor coolant pressure boundary leakage during operation with the requirement to shut down the reactor within six hours if such leakage occurs.”³⁶ Despite this, NRC allowed Davis-Besse to return to service in early summer, 2010.

Radioactive Risks Piling Up on the Lake Erie Shoreline

The U.S. Department of Energy (DOE) estimates that Davis-Besse had, by the spring of 2010, generated about 557 tons of highly radioactive irradiated nuclear fuel.³⁷ DOE projects that if Davis-Besse operates for a total of 50 years (till 2027), it will generate over 900 tons of irradiated nuclear fuel.³⁸ If it operated a decade beyond that, as FirstEnergy has applied to do, the reactor would generate yet another 20 to 30 tons of irradiated nuclear fuel annually, or an additional 200 to 300 tons during that additional decade of operations.

Davis-Besse's indoor pool for storing high-level radioactive wastes was "packed to the gills" by the mid-1990s, at which point it proposed loading horizontal outdoor "bunkers" (unfortified) of concrete and steel – "dry" storage casks – to serve as "overflow parking." NRC identified serious problems with 3 of the "NUHOMS" dry storage casks, manufactured by Vectra Technologies (later taken over by Transnuclear, Inc., a subsidiary of the French government owned nuclear giant Cogema, now called Areva) fully loaded with irradiated nuclear fuel at Davis-Besse. The casks were discovered to have been built below technical specifications: the aggregate used to fabricate the casks' outer concrete walls – essential for radiation shielding -- was poor quality, and the steel alloy walls of the inner metallic canisters actually containing the irradiated nuclear fuel were ground too thin along the weld lines, in violation of technical specifications. The Toledo Coalition for Safe Energy challenged the safety and quality assurance of this proposal in 1994, but was overruled by NRC, which allowed loading of casks to begin in 1995. These faulty casks remain fully loaded with high-level radioactive waste onsite at Davis-Besse to this day, 15 years later.³⁹

The vast majority of Davis-Besse's irradiated nuclear fuel is still stored in its pool – vulnerable to cooling water drain downs or boil offs due to accident (such as heavy load drops), natural disaster (such as tornadoes), or intentional terrorist attacks. Without cooling water, wastes in the pool could catch fire within hours, resulting in 25,000 latent cancer deaths, due to large amounts of such hazardous radioactive isotopes as Cesium-137 escaping in the smoke and blowing downwind, depositing lethal fallout as far away as 500 miles.⁴⁰ However, as time goes on, more and more dry casks are being loaded with older irradiated nuclear fuel at Davis-Besse, in order to free up room in the storage pool for the hellishly hot and radioactive rods just removed from the operating reactor core during re-fueling outages.

Dry casks themselves are vulnerable to accidents, are not designed to withstand terrorist attacks, and will eventually degrade with exposure to the elements and need to be unloaded and replaced with new containers.⁴¹ NRC recently updated its "Nuclear Waste Confidence Findings and Rule," asserting that "the nation's spent nuclear fuel can be safely stored for at least 60 years beyond the licensed life of any reactor and that sufficient repository capacity will be available when necessary."⁴² NRC's "confidence" in the opening of a repository is suspect: President Obama has cancelled the proposed Yucca Mountain, Nevada repository, the only "deep geologic" dumpsite to be studied for high-level radioactive waste disposal in the U.S. for the past 23 years. NRC is thus perpetrating a "con game"⁴³ on the American people, and blocking any consideration of irradiated nuclear fuel generation risks in new reactor combined construction and operating license application proceedings, as well as in old reactor license extension proceedings, such as the one now underway at Davis-Besse.

Thus, NRC has already "blessed" high-level radioactive wastes remaining at Davis-Besse for a century, until 2077. If NRC rubberstamps a 20 year license extension, the irradiated nuclear fuel could remain onsite until 2097. However, the NRC Commissioners have also "directed the NRC staff to conduct additional analysis for [even] longer-term storage," ordering staff to submit a "plan to the Commission for the long-term rulemaking by the end of the calendar year [2010]."⁴⁴ Thus, NRC could soon approve irradiated nuclear fuel remaining at Davis-Besse – on the shoreline of the Great Lakes, 20% of the world's surface fresh water, and drinking supply for 40 million people -- for *centuries* into the future, despite the safety, security, health, and environmental risks.

High-level radioactive wastes are one of the most hazardous substances ever generated by humankind. While electricity is but a fleeting byproduct, irradiated nuclear fuel will remain deadly and need to be isolated from the living environment "forevermore."⁴⁵ Without radiation shielding, it can deliver a lethal dose of gamma radiation in seconds or minutes, even decades after removal from the reactor. Alpha particle emitters, however, such as Plutonium-239 -- a microscopic speck of which, if inhaled, could initiate lung cancer -- will remain hazardous for hundreds of thousands of years. Other radioactive isotopes will remain deadly far longer – Iodine-129, for example, has a 157 million year hazardous persistence.

Ongoing Problems

As shown, Davis-Besse's woes are not confined to the past. Radioactive leaks have occurred in recent years.

On July 31, 2006, FirstEnergy publicly admitted four "occurrences of inadvertent releases of radioactive liquids that had the potential to reach groundwater," adding Davis-Besse to the growing list of 102 reactors in the U.S. that have leaked radioactivity into the environment since the early 1960s (and as the reactor ages, such leaks will become more likely).⁴⁶ These four "inadvertent releases of radioactive liquids" were, specifically:

"[1] Following a primary to secondary leak, contaminated secondary resin was transferred to the South Settling Basin, where it remains. The Davis-Besse South Settling Basin was designed to accept spent resin from backwashed secondary polishing demineralizers. Spent resins from the secondary polishers are no longer directed to this basin. [2] Water from the Backwash Receiver Tank leaked into the ground from a break in a 3-inch line located between the Backwash Receiver Tank and the South Settling Basin. The line break was excavated and repaired, and 7 cubic yards of contaminated soil was sent to a disposal facility. [3] Primary grade water was spilled onto the ground near the Borated Water Storage Tank while draining the Hydrogen Addition System. Approximately 20 cubic yards of contaminated soil was excavated from the area and shipped to a disposal facility. [4] While pumping water from the North Settling Basin to the Collection Box, the discharge hose from the pump fell out of the Collection Box and spilled water containing **low-level** [sic, emphasis added] tritium (**4 E+04 pCi/L**) [that is 4 X 10,000 picoCuries per liter, twice the U.S. Environmental Protection Agency's permissible concentration level for tritium contamination under the Safe Drinking Water Act] onto the ground."⁴⁷

In October, 2008, Davis-Besse admitted an uncontrolled release of tritium – carcinogenic, mutagenic, and teratogenic⁴⁸ -- discovered by a fluke when workers checked fire protection systems.⁴⁹

Of course, Davis-Besse – as with every operating reactor in the U.S. -- has permission from NRC, EPA and other government agencies to release radioactivity into air, water, and soil on a "routine" basis,⁵⁰ despite the fact that every radiation exposure, no matter how small, carries a health risk, and those risks are cumulative.⁵¹

Then, on June 25, 2009, an explosion took place in Davis-Besse's electrical switchyard. Well over a year later, NRC is still investigating the accident, criticizing FirstEnergy's response as "too narrow in scope," including its failure to specify how it will prevent such explosions from happening again.⁵²

And in November, 2009, a Davis-Besse security guard inexplicably managed to shoot himself in the leg, calling into question the competence, and even safety risks, associated with the reactor's security force.⁵³

Conclusion

The litany of serious close calls listed above could have led to loss-of-coolant in the Davis-Besse atomic reactor's core, meltdown, and a catastrophic radioactivity release on the Great Lakes shoreline, between Toledo and Cleveland. How bad might that have been in terms of casualties and property damage? The 1982 NRC and Sandia National Lab report, "Calculation of Reactor Accident Consequences," or CRAC-2, found that a major radioactivity release from Davis-Besse could cause 1,400 "peak early fatalities," 73,000 "peak early injuries," and 10,000 "peak cancer deaths." An \$84 billion figure for property damage was given. However, population growth in the past 28 years must be accounted for, which would likely make such casualty numbers even worse today. And when adjusted for inflation to present day dollar values, property damages could now top \$185 billion. And it has recently been revealed that NRC, EPA, and the Federal Emergency Management Agency (FEMA) disagree about which agency would lead the longer term clean up after a major radioactivity release, and where the funding would come from, calling into question disaster planning and severe accident mitigation analysis upon which Davis-Besse's 20 year license extension approval by NRC would be based.⁵⁴

The TMI and Fermi 1 meltdowns, the Davis-Besse Sept. 24, 1977 incident, and the 1986 Chernobyl reactor explosion and fire represent "break-in phase" accidents – new reactors, at significantly elevated risk due to unrecognized design flaws, construction mistakes, or inexperienced operators "working the bugs out" the hard way. Even during "middle age," as shown by Davis-Besse's June 9, 1985 incident – even with more experienced staff and "broken in" systems -- risks still persist at atomic reactors. However, as reactors age and their systems, structures and components degrade and wear out, "break down phase" accident risks significantly increase. Such risks are made even worse as experienced plant personnel retire from the workforce. The year 2000 Indian Point,

NY steam generator tube rupture, as well as the 2002 Davis-Besse hole-in-the-head fiasco, are examples of such “old age” breakdowns.⁵⁵

If the first 34 years have been this troubled, what kind of unpleasant surprises does Davis-Besse have in store in the next several decades? Is an additional 20 years of operations at Davis-Besse, which has already repeatedly experienced more brushes with disaster than almost any other U.S. reactor, worth the risks? Incredibly, 60 years of risky reactor operations and radioactive waste generation at Davis-Besse may be just the beginning. The nuclear power industry, NRC, DOE, and national nuclear labs are now pushing for 80 years of operations at U.S. atomic reactors.⁵⁶ Will the radioactive Russian roulette at Davis-Besse end before it's too late? Davis-Besse should be shut down as soon as possible, and replaced with safe, secure, clean, reliable, and ever more cost competitive energy efficiency⁵⁷ and renewable alternatives⁵⁸ such as wind⁵⁹ and solar power.⁶⁰

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Endnotes

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² See NRC's Status of License Renewal Applications and Industry Activities at <http://www.nrc.gov/reactors/operating/licensing/renewal/applications.html>.

³ NRC OIG, AUDIT REPORT, Audit of NRC's License Renewal Program, OIG-07-A-15, September 6, 2007.

⁴ NRC Commission Document SECY-05-0192, Attachment 2, “Results, Trends, and Insights from the Accident Sequence Precursor (ASP) Program,” Table 11, “Significant accident sequence precursors during the 1969-2005 period,” pages 20-26, <http://www.nrc.gov/reading-rm/doc-collections/commission/secys/2005/secy2005-0192/attachment2.pdf>.

⁵ John G. Fuller, *We Almost Lost Detroit*, Reader's Digest Books, 1975, Berkley, 1984.

⁶ Mike Gray and Ira Rosen, *The Warning: Accident at Three Mile Island*, Chapter 2, “Toledo, September 24, 1977,” W.W. Norton and Company, New York, 1982, 2003, page 32.

⁷ NRC SECY-05-0192, *ibid*.

⁸ Hilgartner, S., Bell, R.C., O'Conner, R., *Nukespeak: The Selling of Nuclear Technology in America*, Sierra Club Books, 1982.

⁹ *The Warning*, *ibid*.

¹⁰ *The Warning*, *ibid*.

¹¹ NRC, *ibid.*, citing LER [Licensee Event Report] 346/77-110.

¹² David Lochbaum, “Davis-Besse: Back to the Future,” Issue Brief, Union of Concerned Scientists, http://www.ucsusa.org/assets/documents/nuclear_power/20050609-db-ucs-backgrounder-feedwater-event.pdf.

¹³ SCRAM originally referred to the “Safety Control Rod Axe Man” – literally, a man with an axe who would have chopped a rope to drop a control rod into the uranium pile in hopes of snuffing out an out of control chain reaction -- at the world's first atomic reactor, built by Enrico Fermi's team at the University of Chicago squash courts under the football stadium. Scram now refers to the automatic insertion of control rods to shut a reactor down due to off-normal conditions. Even after scrambling, reactors must be actively cooled for days due to hellishly high thermal heat from radioactive decay in the core's irradiated nuclear fuel.

¹⁴ NRC, *ibid.*, citing LER [Licensee Event Report] 346/85-013, entitled “Reactor Trip and Total Loss of Feedwater Event at Davis-Besse,” dated Dec. 18, 1985.

¹⁵ See, for example, NRC, Loss of Main and Auxiliary Feedwater Event at the Davis-Besse Plant on June 9, 1985, Report NUREG-1154, US Nuclear Regulatory Commission, Washington, DC, July 1985, as well as NRC's Oct. 15, 1985 INFORMATION NOTICE NO. 85-80: TIMELY DECLARATION OF AN EMERGENCY CLASS, IMPLEMENTATION OF AN EMERGENCY PLAN, AND EMERGENCY NOTIFICATIONS (<http://www.ornl.gov/ptp/PTP%20Library/library/NRC/Info/in85080.PDF>), and NRC's July 10, 1986

INFORMATION NOTICE NO. 86-55: DELAYED ACCESS TO SAFETY-RELATED AREAS AND EQUIPMENT DURING PLANT EMERGENCIES (<http://www.ora.gov/ptp/PTP%20Library/library/NRC/Info/in86055.pdf>)

¹⁶ Lochbaum, "Davis-Besse: Back to the Future," *ibid.*

¹⁷ Lochbaum, "Davis-Besse: Back to the Future," *ibid.*

¹⁸ Tom Henry, *Toledo Blade*, "Public asked for its input on license extension at Davis-Besse: Nuclear plant seeks OK for 20 more years," Nov. 1, 2010, <http://www.toledoblade.com/article/20101101/NEWS16/10310341>.

¹⁹ Tom Henry, *Toledo Blade*, "Davis-Besse Reactor Near to a Dismal Record," Aug. 31, 2003, <http://www.ohiocitizen.org/campaigns/electric/2003/dismal.htm>.

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²³ Personal communication with Toledo Safe Energy Coalition attorney Terry Lodge, November 7, 2010.

²⁴ See, for example, Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants (NRC, NUREG-1738, 2001), as well as the 1982 NRC/Sandia National Lab report, "Calculation of Reactor Accident Consequences" (CRAC-2).

²⁵ See: NRC news releases, both dated June 25, 1998, "NRC TEAM DISPATCHED TO DAVIS-BESSE NUCLEAR PLANT," (<http://permanent.access.gpo.gov/lps11598/www.nrc.gov/reading-rm/doc-collections/news/1998/98-40iii.html>), and "NRC INSPECTION TEAM MONITORING DAVIS-BESSE PLANT RESPONSE TO TORNADO DAMAGE AND LOSS OF OFFSITE POWER," (<http://permanent.access.gpo.gov/lps11598/www.nrc.gov/reading-rm/doc-collections/news/1998/98-40aiii.html>); see also LICENSEE EVENT REPORT (LER) 1998-006-00, "Tornado Damage to Switchyard Causing Loss of Offsite Power," EVENT DATE 6/24/98, REPORT DATE 08/21/1998.

²⁶ U.S. General Accounting Office, Report to Congressional Requestors, "NUCLEAR REGULATION: NRC Needs to More Aggressively and Comprehensively Resolve Issues Related to the Davis-Besse Nuclear Power Plant's Shutdown," GAO-04-415, May 2004.

²⁷ Tom Henry, *Toledo Blade*, "Public asked for its input on license extension at Davis-Besse: Nuclear plant seeks OK for 20 more years," Nov. 1, 2010, <http://www.toledoblade.com/article/20101101/NEWS16/10310341>. For more information on FirstEnergy's record-breaking fines and penalties, see NRC "NOTICE OF VIOLATION AND PROPOSED IMPOSITION OF CIVIL PENALTIES - \$5,450,000; (NRC OFFICE OF INVESTIGATIONS REPORT NO. 3-2002-006; NRC SPECIAL INSPECTION REPORT NO. 50-346/2002-08(DRS)); DAVIS-BESSE NUCLEAR POWER STATION," April 21, 2005, <http://www.nrc.gov/reading-rm/doc-collections/enforcement/actions/reactors/ea05071.html> as well as U.S. Dept. of Justice press release, "Firstenergy Nuclear Operating Company to Pay \$28 Million Relating to Operation of Davis-Besse Nuclear Power Station," Jan. 20, 2006, http://www.justice.gov/opa/pr/2006/January/06_enrd_029.html. For more information on this Davis-Besse near-disaster, and its aftermath, see the extensive coverage by Henry in the *Toledo Blade*, as well as by John Funk and John Mangels in the *Cleveland Plain Dealer*, beginning in early 2002 and continuing for months and even years after. Also search for Davis-Besse at www.ucsusa.org for numerous reports and backgrounders by Dave Lochbaum. For instance, Lochbaum's *Walking a Nuclear Tightrope: Unlearned Lessons of Year-plus Reactor Outages*, viewable at http://www.ucsusa.org/nuclear_power/nuclear_power_risk/safety/walking-a-nuclear-tightrope.html, provides a detailed chronicle of Davis-Besse's over two year shutdown.

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⁶⁰ Toledo area companies pioneering solar panel manufacture include Willard & Kelsey Solar Group LLC (<http://wksolargroup.com/>) in Perrysburg, Ohio, Xunlight Corp. in Toledo (<http://www.xunlight.com/>), and First Solar Inc. (<http://www.firstsolar.com/en/index.php>), which is based in Arizona but has its only North American factory in Perrysburg Township, Ohio.