**Beyond Nuclear**

**Citizens Environmental Alliance of Southwestern Ontario**

**Don't Waste Michigan**

**Green Party of Ohio**

December 27, 2010

Annette Viette-Cook, Secretary
Office of the Secretary
United States Nuclear Regulatory Commission
Washington, DC 20555-0001
[Electronically filed by NRC Digital Certificate]

**Request for a Public Hearing and Petition for Leave to Intervene in the Matter of FirstEnergy's Application to Relicense the Davis-Besse Nuclear Power Plant (Facility Operating License No-NFP-003, Docket No. 50-346, NRC-2010-0299) for 20 Additional Years of Extended Operation**

Ms. Viette-Cook:

As noticed by Federal Register of October 25, 2010 [Vol. 75, No. 205, Pages 65528 to 65531], *"Notice of Acceptance for Docketing of the Application, Notice of Opportunity for Hearing for Facility Operating License No. NPF–003 for an Additional 20-Year Period; Firstenergy Nuclear Operating Company, Davis-Besse Nuclear Power Station, Unit 1,"* we are providing the agency with the following submission.

Please find attached the Request for Public Hearing and Petition for Leave to Intervene as filed by Beyond Nuclear, Citizens Environmental Alliance of Southwestern Ontario, Don't Waste Michigan, and the Green Party of Ohio, in the matter of FirstEnergy's license renewal application for the Davis-Besse nuclear power plant located near Oak Harbor, Ohio.

Sincerely,

/Signed by Kevin Kamps/

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December 27, 2010

UNITED STATES OF AMERICA
BEFORE THE NUCLEAR REGULATORY COMMISSION
OFFICE OF THE SECRETARY

| | |
|---|---|
| In the Matter of | ) |
| | ) |
| FIRSTENERGY NUCLEAR OPERATING COMPANY | ) |
| | ) DOCKET NO. 50-346 LRA |
| DAVIS-BESSE NUCLEAR POWER STATION, UNIT 1 | ) NRC-2010-0298 |
| | ) |
| Regarding the Renewal of Facility Operating License NPF-003 for a 20-Year Period | ) |
| | ) |

BEYOND NUCLEAR,
CITIZENS ENVIRONMENT ALLIANCE OF SOUTHWESTERN ONTARIO,
DON'T WASTE MICHIGAN,
AND THE GREEN PARTY OF OHIO
REQUEST FOR PUBLIC HEARING AND
PETITION FOR LEAVE TO INTERVENE

Now comes Beyond Nuclear, Citizens Environment Alliance of Southwestern Ontario, Don't Waste Michigan, and the Green Party of Ohio, hereafter referred to as the "Petitioners," and hereby make their REQUEST FOR PUBLIC HEARING AND PETITION FOR LEAVE TO INTERVENE in the above captioned matter, pursuant to the Federal Register of October 25, 2010 [Vol. 75, No. 205, Pages 65528 to 65531], *"Notice of Acceptance for Docketing of the Application, Notice of Opportunity for Hearing for Facility Operating License No. NPF–003 for an Additional 20-Year Period; Firstenergy Nuclear Operating Company, Davis-Besse Nuclear Power Station, Unit 1,"* and in accordance with the provisions of 10 CFR § 2.174 and §2.309. As indicated in the Federal

Register Notice, and in recognition of the official federal holiday for Christmas, the intervention deadline is, under NRC regulations, thus the next business day, that is, December 27, 2010.

In support of the Request for Hearing and Petition to Intervene, said Petitioners as Intervenors further state as follows:

1. Beyond Nuclear is a not-for-profit organization based in Takoma Park, Maryland with over 6,000 members of whom a number reside, work and recreate within the fifty (50) mile Emergency Planning Zone for the Davis-Besse Nuclear Power Station, Unit 1 (hereinafter referred to as "Davis-Besse"). Beyond Nuclear is providing the declaration of one of its members, Phyllis Oster, who lives within a 50-mile radius of Davis-Besse nuclear power plant. Beyond Nuclear seeks to intervene to protect the interests of Phyllis Oster. The central office of Beyond Nuclear is located at 6930 Carroll Avenue, Suite 400, Takoma Park, Maryland, 20912, Tel. (301) 270-2209, www.beyondnuclear.org. In addition, Paul Gunter and Kevin Kamps seek to represent Beyond Nuclear in this proceeding.
2. The Citizens Environment Alliance (CEA) of Southwestern Ontario is a non-profit, grass-roots, international, education and research organization, based in the southwestern portion of the Province of Ontario, Canada, committed to an ecosystem approach to environmental planning and management. A focus of CEA's work for decades has been the questions of toxins in the Great Lakes, as well as air quality throughout the transboundary area, and raising citizen awareness of various issues related to preservation of the Great Lakes and favoring the increased deployment of environmentally benign energy sources. CEA has around 50 members, some of whom reside, work, and/or

recreate within the fifty (50) mile Emergency Planning Zone for Davis-Besse. CEA has designated Derek and Richard Coronado, its coordinators, as members on behalf of which the organization seeks to intervene. Derek and Richard Coronado live within a 50-mile radius of the Davis-Besse nuclear power plant. The central office of CEA is located at 1950 Ottawa Street, Windsor, Ontario, Canada N8Y 197, Tel. (519) 973-1116, www.citizensenvironmentalliance.org/index.html. In addition, Derek Coronado seeks to represent CEA in this proceeding.

3. Don't Waste Michigan is a federation of environmental organizations with a board of directors and a membership of around 50 researchers, educators, concerned citizens, and organizational representatives, founded in 1987 to oppose the designation of the state of Michigan as a repository for what was misleadingly termed "low-level" radioactive waste from eight states. Don't Waste Michigan's work was ultimately successful and the state of Michigan was eliminated from consideration as a repository for the wastes. Don't Waste Michigan, with the Lake Michigan Federation (now the Alliance for the Great Lakes) and support from numerous local grassroots organizations, along with Michigan Attorney General Frank Kelly, brought suit in federal court in 1993 to prevent the loading of high-level nuclear waste in casks on the shore of Lake Michigan at the Palisades plant. Don't Waste Michigan has a number of members who reside, work, and/or recreate within the fifty (50) mile Emergency Planning Zone for Davis-Besse. Don't Waste Michigan seeks to intervene on behalf of its member, Michael J. Keegan, who lives within a 50-mile radius of Davis-Besse. Don't Waste Michigan's website is http://dwmi.homestead.com/. In addition, Michael J. Keegan seeks to represent Don't Waste Michigan in this proceeding.
4. The Green Party of Ohio is composed of grassroots activists, environmentalists, advocates for social justice, nonviolent resisters, and regular citizens who've had

enough of corporate-dominated politics. Its goal is to be the electoral wing of the nation-wide movements against war and corporate power. Greens provide real solutions for real problems, because its members are locally based activists. Whether the issue is universal health care, corporate globalization, alternative energy, election reform, or decent, living wages for workers, Greens have the courage and independence necessary to take on the powerful corporate interests. The Green Party of Ohio Don't has many members who reside, work, and/or recreate within the fifty (50) mile Emergency Planning Zone for Davis-Besse. The Green Party of Ohio can be contacted via its Co-Chair, Anita Rios, at 2626 Robinwood Avenue, Toledo, OH 43610, Tel. (419) 243-8772. Its website is http://ohiogreens.org/. Joseph R. DeMare, Sean Nestor, and Anita Rio seek individual standing in this proceeding. In addition, Anita Rios seeks to represent the Green Party of Ohio in this proceeding.

5. The aforementioned individuals live within a 50-mile radius of the Davis-Besse nuclear power plant. Phyllis Oster, Derek and Richard Coronado, Michael J. Keegan, and Joseph R. DeMare, Anita Rios, and Sean Nestor have designated Beyond Nuclear (represented by Kevin Kamps and Paul Gunter), Citizens Environment Alliance of Southwestern Ontario (represented by Derek Coronado), Don't Waste Michigan (represented by Michael J. Keegan), and the Green Party of Ohio (represented by Anita Rios) to represent them as intervenors.

**Standing**

**Declarations in Support of Standing from Beyond Nuclear, Citizens Environment Coalition of Southwestern Ontario, Don't Waste Michigan and Green Party of Ohio and Individual Organization Members are embedded here.**

6. Pursuant to 10 CFR § 2.309, a request for hearing or petition for leave to intervene must address (1) the nature of the petitioner's right under the Atomic Energy Act to be made a party to the proceeding, (2) the nature and extent of the petitioner's property, financial, or other interest in the proceeding, and (3) the possible effect of any order that may be entered in the proceeding on the petitioner's interest. In determining whether a petitioner has sufficient interest to intervene in a proceeding, the Commission has traditionally applied judicial concepts of standing. *See Metropolitan Edison Co.* (Three Mile Island Nuclear station, Unit 1), CLI-83-25, 18 NRC 327, 332 (1983) (citing *Portland General Electric Co.* (Pebble Springs Nuclear Plant, Units 1 and 2), CLI-76-27, 4 NRC 610 (1976)). Contemporaneous judicial standards for standing require a petitioner to demonstrate that (1) it has suffered or will suffer a distinct and palpable harm that constitutes injury-in-fact within the zone of interests arguably protected by the governing statutes (e.g., the Atomic Energy Act of 1954 (AEA), the National Environmental Policy Act of 1969 (NEPA)); (2) the injury can be fairly traced to the challenged action; and (3) the injury is likely to be redressed by a favorable decision. *See Carolina Power & Light Co.* (Shearon Harris Nuclear Power Plants), LBP-99-25, 50 NRC 25, 29 (1999). An organization that wishes to intervene in a proceeding may do so either in its own right by demonstrating harm to its organizational interests, or in a representational capacity by demonstrating harm to its members. *See Hydro Resources, Inc.* (2929 Coors Road, Suite 101, Albuquerque, NM 87120), LBP-98-9, 47 NRC 261, 271 (1998). To intervene in a representational capacity, an organization must show not only that at least one of its members would fulfill the standing requirements, but also that he or

she has authorized the organization to represent his or her interests. *See Private Fuel Storage, L.L.C.* (Independent Fuel Storage Installation), LBP-98-7, 47 NRC 142, 168, *aff'd on other grounds*, CLI-98-13, 48 NRC 26 (1998). *Pacific Gas & Electric Co.* (Diablo Canyon Power Plant Independent Spent Fuel Storage Installation), LBP-02-23, 56 NRC 413, 426 (2002). Standing to participate in this proceeding is demonstrated by the declarations of the organizations and individuals provided with this Petition. All of the individual Petitioners live within 50 miles of the Davis-Besse site who have authorized some or all of the organizational Petitioners to represent their interests in this proceeding.

7. Because they live near the Davis-Besse site, *i.e.*, within 50 miles, the individually-named Petitioners have presumptive standing by virtue of their proximity to the Davis-Besse nuclear power plant. *Diablo Canyon, supra*, 56 NRC at 426-427, citing *Florida Power & Light Co.* (Turkey Point Nuclear Generating Plant, Units 3 and 4), LBP-01-6, 53 NRC 138, 146, *aff'd*, CLI-01-17, 54 NRC 3 (2001). In *Diablo Canyon*, the Licensing Board noted that petitioners who live within 50 miles of a proposed nuclear power plant are presumed to have standing in reactor construction permit and operating license cases, because there is an "obvious potential for offsite consequences" within that distance. *Id.* Here, FENOC seeks an operating license extension for Davis-Besse nuclear reactor, near Oak Harbor, Ohio. Thus, the same standing concepts apply.
8. The Petitioners' members seek to protect their lives and health by opposing the license extension at Davis-Besse. Petitioners seek to ensure that no license extension

is issued by the U.S. Nuclear Regulatory Commission unless FENOC demonstrates full compliance with the Atomic Energy Act and NEPA.

9. Further, *locus standi* is based on three requirements: injury, causation and redressability. Petitioners hereby request to be made a party to the proceeding because (1) Continued operation of the nuclear reactor at Davis-Besse continues to present a tangible and particular harm to the health and well-being of members living within 50 miles of the site, (2) the NRC has initiated proceedings for a license extension, the granting of which would directly affect the named members and other individuals, and (3) the Commission is the sole agency with the power to approve, to deny or to modify a license to operate a commercial nuclear power plant.

10. Contentions: A license extension is authorization from the NRC to continue operation of a nuclear power plant at a specific site. Before issuing the license extension the NRC staff must complete safety and environmental reviews of the application. The license extension must comply with provisions of the Atomic Energy Act, the National Environmental Policy Act, NRC regulations and all applicable laws. Petitioners present their sundry contentions as attachments to this Petition. They incorporate the same fully by reference into this Petition as though rewritten, and pray the Commission admit them for full and further adjudication.

11. The Petitioners, as intervenors seeking representational standing, believe that their members' interests will not be adequately represented without this course of action and intervention, and without the opportunity to participate as full parties in this proceeding. If the Davis-Besse license is extended by twenty (20) years without first resolving the Petitioners' concerns, this nuclear power generating station may operate

unsafely and pose an undue and unacceptable risk to the environment and jeopardize the health, safety and welfare of the Petitioners' members who live, recreate and conduct their business in the vicinity of the nuclear power plant.

12. Representational standing of the Petitioners is provided through the attached declarations for Beyond Nuclear, Citizens Environmental Alliance of Southwestern Ontario, Don't Waste Michigan, and the Green Party of Ohio by their respective members all of whom reside within the Davis-Besse Emergency Planning Zone.

**Contentions**

**CONTENTION ONE: WIND POWER**

13. Contention One: Wind Power. The FirstEnergy Nuclear Operating Company (hereinafter,FENOC) Environmental Report fails to adequately evaluate the full potential for renewable energy sources, such as wind power, to offset the loss of energy production from Davis-Besse, and to make the requested license renewal action from 2017 to 2037 unnecessary. In violation of the requirements of 10 C.F.R. §51.53(c)(3)(iii) and of the GEIS § 8.1, the FENOC Environmental Report (§ 7.2) treats all of the alternatives to license renewal except for natural gas and coal plants as unreasonable and does not provide a substantial analysis of the potential for significant alternatives, such as wind power, in the Region of Interest for the requested relicensing period of 2017 to 2037. The scope of the SEIS is improperly narrow, and the issue of the need for Davis-Besse as a means of satisfying demand forecasts for the relicensing period must be revisited due to dramatically-changing circumstances in the regional energy mix that are currently underway already during

this decade of Davis-Besse's remaining operating license (2010 to 2017), and can especially be expected to accelerate and materialize over two decades to come covering FENOC's requested license extension period (2017 to 2037).

**Basis**

14. The National Environmental Policy Act (NEPA) requires honesty and completeness in disclosure of environmental impact assumptions and the basis for agency decisions. The purpose of NEPA is to protect the environment. *See, e.g.*, *Weinberger v. Catholic Action of Hawaii/Peace Educ. Project*, 454 U.S. 139, 143 (1981) (NEPA's "twin aims" are "to inject environmental considerations into the agency's decision-making process" and "to inform the public that the agency has considered environmental concerns").
15. As part of the NEPA review for all major federal actions, FirstEnergy Nuclear Operating Company (hereafter, FENOC) must prepare an Environmental Report (hereafter ER) that includes a sufficiently complete evaluation of the alternatives to the requested action. The U.S. Nuclear Regulatory Commission (hereafter NRC) later prepares a Supplemental Environmental Impact Statement (hereafter SEIS) based in part on FENOC's ER.
16. While it is established that the courts must not "*substitute their judgment of the environmental impact for the judgment of the agency, once the agency has adequately studied the issue,*" *Crounse Corp. v. Interstate Commerce Comm'n*, 781 F.2d 1176 (6th Cir. 1986), Petitioners contend that the pivotal words are "*adequately studied*." The harm NEPA seeks to prevent is complete when the agency makes a decision

without sufficiently considering information NEPA requires be placed before the decision-maker and public. *Sierra Club v. Marsh*, 872 F.2d 497, 500 (1st Cir. 1989). "The injury of an increased risk of harm due to an agency's uninformed decision is precisely the type of injury {NEPA} was designed to prevent." *Comm. to Save the Rio Hondo v. Lucero,* 102 F.3d 445, 448-49 (10th Cir. 1996).

**Environmental Review and Scoping**

17. The scope of the environmental review is defined by 10 C.F.R. Part 51, the NRC's "Generic Environmental Impact Statement [GEIS] for License Renewal of Nuclear Plants" (NUREG 1437 (May 1996)), and the initial hearing notice and order. *See, e.g., Vermont Yankee*, 2006 NRC Lexis 201 (ASLB 9/22/2006). Some environmental issues that might otherwise be germane in a license renewal proceeding have been resolved generically for all plants and are normally, therefore, "beyond the scope of a license renewal hearing." *Matter of Florida Power & Light Co.* (Turkey Point Nuclear Power Plant), CLI-01-17, 54 NRC 3, 15 (7/19/2001); *see* 10 C.F.R. § 51.53(c)(3)(i).

18. These "Category 1" issues are classified in 10 C.F.R. Part 51, Subpart A, Appendix B. Category 1 issues may be raised when a petitioner (1) demonstrates that there is new and significant information subsequent to the preparation of the GEIS regarding the environmental impacts of license renewal; (2) files a petition for a rulemaking with the NRC; or (3) seeks a waiver pursuant to 10 C.F.R. § 2.335. *See Turkey Point*, 54 NRC at 10-12; *see also* 10 C.F.R. § 51.53(c)(3)(iv) (new and significant information).

**New and Significant Information Prompts Revision of ER**

19. The National Environmental Policy Act (NEPA), 42 U.S.C. §§ 4321-37, requires all federal agencies to examine environmental impacts that could be caused by their discretionary actions. NEPA's twin aims are (1) obligating a federal agency to consider every significant aspect of the environmental impact of a proposed action and (2) ensuring that the federal agency will inform the public that it has indeed considered environmental concerns in its decision-making process. *Baltimore Gas & Elec. Co. v. Natural Resources Defense Council*, 462 U.S. 87, 97 (1983); *see also* 42 U.S.C. § 4332(2)(c) (identifying requirements of an EIS).

20. As a federal agency, the NRC must comply with NEPA. *Calvert Cliffs Coordinating Comm. v. AEC*, 449 F.2d 1109 (D.C. Cir. 1971) (NEPA applies to NRC's predecessor). Moreover, NEPA imposes continuing obligations on the NRC following completion of an environmental analysis. An agency that receives new and significant information casting doubt upon a previous environmental analysis must reevaluate the prior analysis. *Marsh v. Oregon Natural Resources Council*, 490 U.S. 360, 374 (1989). This requirement is codified in NRC regulations at 10 C.F.R. § 51.92(a).

21. The NRC's license renewal application regulations repeat this obligation. 10 C.F.R. § 51.53(c)(3)(iv) provides that an Environmental Report (ER) must contain "any new and significant information regarding the environmental impacts of license renewal of which the applicant is aware." The Nuclear Regulatory Commission (Commission) has concluded this applicant obligation extends to new and significant information

even when such information pertains to a Category 1 issue. *See Duke Energy Corp.* (McGuire Nuclear Station, Units 1 and 2; Catawba Nuclear Station, Units 1 and 2), CLI-02-14, 55 NRC 278, 290 (2002). In *Vermont Yankee*, 50-271-LR (9/22/2006) at 17-27, the Commission recognized "... that even generic findings sometimes need revisiting in particular contexts. Our rules thus provide a number of opportunities for individuals to alert the Commission to new and significant information that might render a generic finding invalid, either with respect to all nuclear power plants or for one plant in particular. In the hearing process, for example, petitioners with new information showing that a generic rule would not serve its purpose at a particular plant may seek a waiver of the rule. See 10 C.F.R. § 2.758; see also note 3, supra, and accompanying text. Petitioners with evidence that a generic finding is incorrect for all plants may petition the Commission to initiate a fresh rulemaking. See 10 C.F.R. § 2.802. Such petitioners may also use the Supplemental Environmental Impact Study (SEIS) notice-and-comment process to ask the NRC to forgo use of the suspect generic finding and to suspend license renewal proceedings, pending a rulemaking or updating of the GEIS. See 61 Fed. Reg. at 28,470; GEIS at 1-10 to 1-11."

22. So the Commission foreclosed no options but has identified some of the several options available. A waiver of the generic rule is not a prerequisite, nor is such a conclusion obvious or necessary in light of the plain language of the regulation.

23. To the extent that Petitioners articulate significant or new information, it is aimed at rebutting statements made, and conclusions drawn by the Applicant, and to evidence some of the errors and omissions in the Environmental Report.

24. With respect to the remaining issues in Appendix B, "Category 2" issues, (1) the applicant must make a plant-specific analysis of environmental impacts in its Environmental Report, 10 C.F.R. § 51.53(c)(3)(ii), and (2) NRC Staff must prepare a Supplemental Environmental Impact Statement (SEIS), id. § 51.95(c). Contentions implicating Category 2 issues ordinarily are deemed to be within the scope of license renewal proceedings. *See Turkey Point,* 54 NRC at 11-13; *Matter of Amergen Energy Co.* (Oyster Creek), 50-0219-LP, 2006 NRC Lexis 195 (Feb. 27, 2006).

25. Similarly, the environmental review mandated by NEPA is subject to a rule of reason. While it need not include all theoretically possible environmental effects arising out of an action, it draws direct support from the judicial interpretation of the statutory command that the NRC is obliged to make reasonable forecasts of the future. *Northern States Power Co.* (Prairie Island Nuclear Generating Plant, Units 1 & 2), ALAB-455, 7 NRC 41, 48, 49 (1978); Hydro Res., Inc., LBP-04-23, 60 NRC 441, 447 (2004), *review declined*, CLI-04-39, 60 NRC 657 (2004).

26. In the context of the required NEPA review to include a reasonable forecast for less harmful alternatives to the proposed federal license extension of Davis-Besse for the requested renewal period of 2017 to 2037, renewable energy alternatives such as wind power are demonstrated to be unique, significant, and compelling when compared to the proposed Davis-Besse relicensing activity because such alternatives can be demonstrated to have significantly less adverse human environmental impacts. In large part, this unique quality is due to the fact that energy alternatives like wind (as well as efficiency and solar, as discussed in separate contentions below) are

abundantly available and do not have a carbon producing fuel cycle such as is the case with uranium (the major carbon producing aspects of the uranium fuel chain occur at the stages of mining, milling, processing, and enrichment, although the various transport legs also contribute, as does the very long term management of radioactive wastes; in addition, carbon releases from operating nuclear power plants, and especially radioactive waste reprocessing facilities, include radioactive Carbon-14 releases, a very significant biological hazard with a hazardous persistence lasting more than 50,000 years) as it pertains to the requested relicensing action. Such alternatives also do not have the radiological impacts and risks of the uranium fuel chain, which is, of course, an inevitable part and parcel of the environmental impacts associated with a 20 year license extension at Davis-Besse.

**Supporting Evidence**

27. A significantly beneficial environmental feature of wind generated power over the extension of the operation of Davis-Besse is that scientific studies show that wind has a significantly smaller carbon footprint (as well as no radiological footprint). Petitioners submit that wind power generation releases 9 grams of carbon dioxide per kilowatt-hour, as compared to both nuclear power generation at a mean value of 66 grams of carbon dioxide released per kilowatt-hour and coal power generation at mean value of 960 grams of carbon dioxide released per kilowatt-hour. Davis-Besse therefore has on average an excess of seven (7) times more carbon dioxide emissions than wind power. [**Petitioners' Exhibit #1**, "Valuing the greenhouse gas emissions from nuclear power: A critical survey," Benjamin Sovacool, Energy Policy, Elsevier, February 2008, Table 8, page 2950]

28. Thus, greater reliance upon renewable energy in the future, particularly in wind energy development, would provide a significantly greater reduction in adverse human environmental consequences as compared to the proposed nuclear power relicensing action at Davis-Besse, by fact that renewable energy generators such as wind turbines also do not require radiological emergency planning zones, constantly vigilant security perimeters, use-of-lethal-force security exclusion zones, and the creation of national sacrifice areas to contain radioactive wastes, as is the case with the uranium fuel chain, beginning with the uranium mines and mills, and ultimately leading to the still-unresolved issue of long-term nuclear waste management and disposal.
29. The Petitioners contend that without fulfilling the NEPA standards, the NRC cannot effectively make decisions as to the wisdom and merit of the requested federal relicensing action in light of reasonable energy alternatives that are demonstrably less harmful to the human environment – such as wind power -- as required by NEPA in comparison with the requested relicensing action beginning in 2017 and ending in 2037.
30. The Petitioners contend that the Applicant's Environmental Report as currently written is significantly and unacceptably deficient and does not meet the requirements of NEPA to rigorously discuss and provide a sufficiently complete evaluation of those alternatives with significantly less adverse human environmental consequence to the requested federal relicensing action for the period of 2017 through 2037.
31. Therefore, the Petitioners contend that the NRC cannot accept the Applicant's Environmental Report as accurate and sufficiently complete for purpose of preparing

and completing the NEPA required Environmental Impact Statement (EIS) in the requested federal action for the following reasons regarding the Applicant's treatment of the renewable energy alternatives, including the wind energy alternative, projected for the region of interest.

32. The Petitioners contend that the Applicant's Environmental Report fails to provide the requisite "reasonable forecast" with sufficiently "high quality" and "accurate scientific analysis," nor does it sufficiently include "expert agency comments" necessary for rigorously and objectively discussing a very reasonable alternative, wind energy, for the Region of Interest in the requested relicensing period of 2017 to 2037. The Petitioners contend that the Applicant's lack of attention to detail and failure to meet the requirements of NEPA as applied to its evaluation of the wind energy alternative more broadly apply to its dismissive treatment of all the individual renewable energy alternatives as projected for the Davis-Besse license renewal period of 2017 to 2037 including solar power, as well as energy efficiency.

33. Petitioners assert that the proffered contention challenges the Applicant's Environmental Report, which Petitioners assert does not adequately provide the agency with sufficient information that can be reasonably characterized as containing "high quality" and "accurate scientific analysis," nor with sufficient "expert agency comments" so as to meet NEPA standards for the consideration of alternatives, the mitigation of environmental effects, and the provision to the NRC and the public with enough quality information that the agency can fulfill its obligation to take the required "hard look" in an Environmental Impact Statement.

34. In fact, the Applicant's Environmental Report offers only vague and superficial arguments on the alternatives such as wind power, and even those arguments are significantly dated, incomplete and inaccurate. The Applicant has further failed or neglected to undertake a vigorous and substantially complete discussion of the alternative energy resources, such as wind power, specific to the region of interest, for the requested relicensing of Davis-Besse, as NEPA requires for the Environmental Report.

35. The Applicant's Environmental Report proffers in its evaluation of alternatives to the requested federal relicense action at Section 7 [7.0 ALTERNATIVES TO THE PROPOSED ACTION] the statement : "…As provided in 10 CFR 51.53(c)(2), FENOC does not consider the need for power from Davis-Besse in this analysis, but does consider the potential impact of alternatives for replacing this power. Replacement options considered include building new base-load generating capacity, purchasing power, delaying retirement of non-nuclear assets, and reducing power requirements through demand reduction, as discussed in Section 7.2." [FENOC ER, 7.1.2 REPLACEMENT CAPACITY, Page 7.1-3]

36. Regarding its proposed 2017 to 2037 Davis-Besse license extension, FENOC's ER continues: "While many methods are available to generate electricity, the GEIS indicates that a "reasonable set of alternatives should be limited to analysis of single, discrete electric generation sources and only electric generation sources that are technically feasible and commercially viable" (**NRC 1996**, Section 8.1). Considering that Davis-Besse serves as a large base-load generator, FENOC considers reasonable alternatives to be those that would also be able to generate base-load power. FENOC

believes that any alternative would be unreasonable if it did not consider replacement of the energy resource." [FENOC ER, 7.2 ALTERNATIVES THAT MEET SYSTEM GENERATING NEEDS, page 7.2-1]

37. FENOC sets forth that the states of Ohio, Pennsylvania, and New Jersey comprise the area in which it "serves load" to the electric grid. [FENOC ER, 7.2.2.1 Alternatives Not Requiring New Generating Capacity, Page 7.2-6]

38. But then FENOC's ER indicates that not only Ohio and Pennsylvania are states of interest for the generation of wind power, but so is West Virginia, while failing to mention New Jersey at all: "Areas suitable for wind energy applications must be wind-power Class 3 or higher (**NREL 1986**, Chapter 1). Coastal regions along Lake Erie in northwestern Ohio have an estimated wind power of Class 3, increasing to Class 5 over offshore areas (**NREL 1986**, Chapter 3) and some Class 6 areas mid-lake (**USDOE 2009a**). The rest of the state, however, is devoid of Class 3 or higher wind-power areas. Pennsylvania is mostly a wind power Class 1 region, although some areas, particularly along ridgelines, may provide wind classes ranging from 4 to 6. West Virginia is also mostly a wind power Class 1 region, with Class 2 and higher resources along highlands and ridges in the east-central part of the state. The total wind generation capacity for the three-state region in 2008 was 698 MWe. (**USDOE 2009a**)**…**Thus, wind power in coastal Ohio along Lake Erie and along ridgelines in Pennsylvania and West Virginia is a feasible alternative to Davis-Besse license renewal in theory…However, wind power by itself is not suitable for large base-load capacity. As discussed in the GEIS, wind has a high degree of intermittency and average annual capacity factors for wind plants are relatively low, less than 30

percent (**NRC 1996**, Section 8.3.1). Wind power in conjunction with energy storage mechanisms might serve as a means of providing base-load power. But current energy storage technologies are too expensive for wind power to serve as a large base-load generator. (**NRC 2009b**, Section 8.2.5.2)" [FENOC ER, 7.2.2 ALTERNATIVES CONSIDERED AS NOT REASONABLE, 7.2.2.2 Alternatives Requiring New Generating Capacity, Wind Power, Page 7.2-9] FENOC gives no explanation as to why it does not mention New Jersey in the context of wind power generation potential, despite listing it as a state in which the utility "serves load" to the electric grid.

39. FENOC's ER then admits, however: "Environmentally, wind turbine generators produce no air emissions, consume no water for cooling, result in zero wastewater discharges, require no drilling, mining or transportation of fuel, and produce no hazardous or solid wastes other than used lubrication oil that can be recycled." [FENOC ER, 7.2.2 ALTERNATIVES CONSIDERED AS NOT REASONABLE, 7.2.2.2 Alternatives Requiring New Generating Capacity, Wind Power, Page 7.2-9]
40. But, FENOC's ER then goes on to assert: "However, the amount of land needed for operation can be significant. An estimated 214 square miles of land are needed to generate 910 MWe of power (**NRC 1996**, Section 8.3.1), although much of the land could be collocated with other resources (e.g., solar energy production, or agriculture). Noise produced by the rotor blades, visual impacts, and bird and bat fatalities are also of some concern (**EERE 2008**)." [FENOC ER, 7.2.2 ALTERNATIVES CONSIDERED AS NOT REASONABLE, 7.2.2.2 Alternatives Requiring New Generating Capacity, Wind Power, Page 7.2-9]

41. FENOC concludes its analysis of wind power as an alternative to Davis-Besse's 20 year license extension by stating: "Considering that wind conditions are variable, energy storage technologies do not currently allow supply to more closely match demand, and large land requirements and associated aesthetic impacts, FENOC does not consider a utility-scale commercial wind power project a reasonable alternative to Davis-Besse license renewal." [FENOC ER, 7.2.2 ALTERNATIVES CONSIDERED AS NOT REASONABLE, 7.2.2.2 Alternatives Requiring New Generating Capacity, Wind Power, Page 7.2-9]

42. The Petitioners dispute numerous Applicant assertions that downplay, belittle, and dismiss the potential for wind energy development in FENOC's region of interest. Firstly, FENOC's Environmental Report is factually in error as it regards the wind power potential of Ohio. FENOC's ER states:

"Wind Power

Areas suitable for wind energy applications must be wind-power Class 3 or higher (NREL 1986, Chapter 1). Coastal regions along Lake Erie in northwestern Ohio have an estimated wind power of Class 3, increasing to Class 5 over offshore areas (NREL 1986, Chapter 3) and some Class 6 areas mid-lake (USDOE 2009a). *The rest of the state [of Ohio], however, is devoid of Class 3 or higher wind-power areas.*" [7.2.2.2 Alternatives Requiring New Generating Capacity, Page 7.2-9, Appendix E, Applicant's Environmental Report, Operating License Renewal Stage, Davis-Besse Nuclear Power Station, August 2010; emphasis added by Petitioners]

FENOC thus strongly implies that "the rest of the state" of Ohio -- apart from "[c]oastal regions along Lake Erie in northwestern Ohio," (estimated wind power Class 3) "offshore areas," (estimated at increasing to wind power levels up to Class 5) and some "areas mid-lake [Erie]" (estimated at wind power levels up to Class 6) -- "is devoid" of any meaningful potential for wind power development.

43. But the U.S. Department of Energy's National Renewable Energy Laboratory's (hereinafter, NREL) own analysis contradict FENOC's assertion. At NREL's Energy Efficiency & Renewable Energy/Wind and Water Power Program/Wind Powering America/Ohio Wind Map and Resource Potential website [**Petitioners' Exhibit #2**, and also viewable online at http://www.windpoweringamerica.gov/wind_resource_maps.asp?stateab=oh], NREL states that "Areas with annual average wind speeds around 6.5 m/s [meters per second] and greater at 80-m [meter] height are generally considered to have suitable wind resource for wind development." NREL's "Ohio Wind Map" ("Ohio – Annual Average Wind Speed at 80 m") [**Petitioners' Exhibit #3**, and also viewable online at http://www.windpoweringamerica.gov/images/windmaps/oh_80m.jpg], clearly shows extensive areas of the northwestern ***quadrant*** of the State of Ohio (that is, well beyond the Lake Erie shoreline) with wind speeds of 6.5 meters per second at the 80 meter height level (depicted by orange colored shading on NREL's map) – that is, developable wind power potential, according to NREL.

44. Despite FENOC's false assertion, these areas encompass parts of Ohio well beyond the "coast," the shoreline of Lake Erie. They include areas in the following nineteen inland Ohio counties (that is, counties that do not border Lake Erie, and thus cannot

technically be considered "coastal regions," to use FENOC's terminology; in fact, many of these counties are located well over 100 miles from the Lake Erie shoreline), in alphabetical order: Allen (which includes the City of Lima), Auglaize, Clark (which includes the City of Springfield), Crawford, Greene, Hancock (which includes the City of Findlay), Henry, Huron, Madison, Miami, Morrow, Paulding, Preble, Putnam, Richland (which includes the City of Mansfield), Sandusky, Shelby, Wood (which includes the City of Bowling Green), and Van Wert. Additionally, the four Ohio counties of Darke, Hardin, Mercer, and Seneca each appear to have a majority of land area with developable wind power potential (that is, with wind speeds at 80 meters equal to or greater than 6.5 meters per second). And two more Ohio counties, Champaign and Logan, have areas of land where the wind speeds at 80 meters of height are even greater, equal to or greater than 7.0 meters per second (depicted by burnt orange-reddish shading on NREL's map).

45. Also, the ***northeastern*** quadrant of Ohio -- on or near the Lake Erie shoreline, specifically in the five Ohio counties of Ashtabula, Cuyahoga (which includes the City of Cleveland), Geauga, Lake, and Lorain -- contains areas of land with wind speeds at 80 meters of height equal to or greater than 6.5 meters per second – that is, developable wind power potential, according to NREL.

46. Thus, FENOC's claim that, outside of coastal *northwestern* Ohio or offshore in Lake Erie, the "rest of the state" is "devoid" of developable wind power potential is factually erroneous. NREL's "Ohio Wind Map" ("Ohio – Annual Average Wind Speed at 80 m") [**Petitioners' Exhibit #3**, and also viewable online at http://www.windpoweringamerica.gov/images/windmaps/oh_80m.jpg], clearly

shows that no less than 30 Ohio counties outside of northwestern Ohio (listed by name above) have developable wind power potential. This group of Ohio counties, inappropriately excluded from FENOC's Environmental Report for consideration as devoid of developable wind power potential, represents nearly a third of all counties in the State of Ohio.

47. In fact, certain of these counties, such as Wood (including the City of Bowling Green), have already begun to tap the wind power potential in their area, despite FENOC's failure to acknowledge such potential in its Environmental Report. For example, the dedication celebration for Ohio's first commercial, utility scale wind turbines, the AMP-Ohio/Green Mountain Energy Wind Farm, was held over seven years ago, on November 7, 2003. It has operated successfully since November 2004. It is owned and operated by the City of Bowling Green's municipally-owned electricity distribution utility. It is located near the Wood County landfill, off State Route 6, about six miles west of the City of Bowling Green. Initially, the installation's first two 1.8 MegaWatt turbines, produced nearly 6.9 million kilowatt-hours of electricity annually – the 257 foot tall turbines enough to power approximately 785 homes. The wind farm operated at 30% capacity, and 97% availability, during its first month of operation, according to the Bowling Green Municipal Utilities. [**Petitioners' Exhibit #4**, "Ohio's First Commercial Wind Farm"] An additional two 257 foot tall, 1.8 MegaWatt wind turbines have since been added to the farm, which can now generate up to 7.2 MegaWatts of electricity, enough to supply power for some 3,000 area residents. [**Petitioners' Exhibit #5**, "Wind Turbines—City of Bowling Green, Ohio"]

48. Similarly, the Cleveland Science Museum installed a functional wind turbine – the first in an urban setting in Ohio – in 2006. This, of course, is in ***northeastern*** Ohio, an area that FENOC's Environmental Report falsely declares devoid of developable wind power potential. [**Petitioners' Exhibit #6**, "Cleveland's Urban Wind Turbine"]

49. In February 2007, the Cuyahoga Regional Energy Development Task Force published "Building a New Energy Future: Recommendations for a Lake Erie Offshore Wind Energy Demonstration Project and Research Center." This document was released when Cuyahoga County, Ohio, issued a national request for qualifications seeking a Project Manager for the completion of a feasibility study for the planning, design, financing, construction and operation of a freshwater offshore wind research/development center, including a demonstration wind energy project of between 5 to 20 megawatts located upon Lake Erie in the vicinity of Downtown Cleveland. The study shows the very real potential for offshore wind in northeastern Ohio. [**Petitioners' Exhibit #7**, "Building a New Energy Future: Recommendations for a Lake Erie Offshore Wind Energy Demonstration Project and Research Center," Cuyahoga Regional Energy Development Task Force Report to the Board of Commissioners of Cuyahoga County, Ohio, February 8, 2007]

50. And of historical interest, a wind turbine was generating useful electricity well over *a century ago* in ***northeastern*** Ohio, which FENOC's Environmental Report has declared devoid of developable wind power potential. Invented and constructed in 1887 by Charles F. Brush of the Brush Electric Company, which was later absorbed into the General Electric Company, the wind turbine operated from 1888 to 1909. [**Petitioners' Exhibit #8**, Green Energy Ohio's "Charles F. Brush."] (Brush's other

pioneering accomplishments included supplying arc lights, by 1881, to such cities as New York, Boston, Philadelphia, Baltimore, Montreal, Buffalo, San Francisco, Cleveland and others, lighting public places well into the 20th century. Brush's San Francisco system represented the first instance of a utility (predecessor of today's PG&E) supplying electricity from a central plant to multiple customers via transmission lines. Brush's New York system was lighting Big Apple streets two years prior to Thomas Edison's. Brush also supplied the generating equipment for one of the first hydroelectric power plants in the U.S., in Minnesota in 1882.) [**Petitioners' Exhibit #9**, "Charles F. Brush" Wikipedia entry.]

51. Petitioners also dispute FENOC's assertion that wind power involves *negative* "aesthetic" and "visual" impacts, as described in points 14 and 15 above. For example, one observer describes the Cleveland Science Center's urban wind turbine in glowing terms: "The Science Center has done an excellent job of installing the [wind] turbine to maximize its aesthetic appearance and the unit provides a dramatic visual attraction on the city's harbor front skyline." [See once again **Petitioners' Exhibit #6**, "Cleveland's Urban Wind Turbine."] And Danish photographer Mads Eskesen, in his book of photos "The beauty in the wind," said "Big poetic expressions should be used in order to really describe the Middelgrunden offshore wind farm," in Copenhagen's harbor, which served as a monumental backdrop for the Copenhagen climate negotiations in December 2009. [Petitioners' Exhibit #10, "Mads Eskesen: The Beauty in the Wind."] And of course, wind mills have traditionally been included in art for centuries, as on hand painted fine chinaware and decorative tile [Petitioners' Exhibit #47, Bosman Delft Blauw Decorative Tile W/Stand (Delft Blue HandPainted Holland).] and in paintings from the Netherlands, where wind power has long

been recognized for its utilitarian *and aesthetic* purposes. [Petitioners' Exhibit #46, Van Gogh's "Windmill on Montmarte," 1867.]

52. Petitioners also dispute FENOC's assertion that storage remains a cost prohibitive impediment to wind power's widespread and large-scale development. As experts such as Dr. Arjun Makhijani, President of the Institute for Energy and Environmental Research, have long pointed out, such cost-effective storage mechanisms as compressed air storage have enabled wind power to surmount intermittency challenges, so much so that NREL now recognizes the existence of "baseload wind." Dr. Makhijani has made such points in his 2007 book *Carbon-Free and Nuclear-Free: A Roadmap for U.S. Energy Policy*, and his related public presentations and writings since then. [Petitioners' Exhibit #11, Arjun Makhijani, *Carbon-Free and Nuclear-Free: A Roadmap for U.S. Energy Policy*, 2007.] Although written in the context of storing solar power, a January 2008 *Scientific American* article by Zweibel, Mason, and Fthenakis shows the compressed air storage would also work for wind power, and at very large-scale [Petitioners' Exhibit #48, "By 2050, solar power could end U.S. dependence on foreign oil and slash greenhouse gas emissions."] In fact, FENOC recognizes the promise of compressed air storage, acquiring the Norton Energy Storage Project in Norton, Ohio just over a year ago. Anthony J. Alexander, president and chief executive officer of FirstEnergy, stated at the time: "The compressed-air technology envisioned at this site would essentially operate like a large battery, storing energy at night for use during the day when it is needed. Because many renewable energy sources – such as wind – are intermittent, they don't always produce power when electricity demand is high. The energy storage aspects of this project would provide a way to harness renewable energy to be used when customers need it, making this project a key component to our region's overall renewable energy strategy." FENOC's press

release about the Norton Energy Storage Project went on to quote Arshad Mansoor, vice president of Power Delivery and Utilization at the Electric Power Research Institute, who said: "A compressed-air energy storage project of this size has the potential to be a major step in advancing electricity storage and balancing load demand. This could be a key component in integrating large-scale intermittent renewables onto the nation's grid system." And it report that: "The company is evaluating its options related to the project, but has not yet committed to development scope or timing. However, an initial phase could involve installing two to four units capable of generating a minimum of 268 megawatts (MW) of electricity. With 9.6 million cubic meters of storage, the Norton Energy Storage Project has the potential to be expanded to up to 2,700 MW of capacity. Currently, there are two commercial-scale compressed air electric generating facilities: a 110 MW plant in McIntosh, Ala., operated by PowerSouth Cooperative that began service in 1991; and a 290 MW facility in Bremen, Germany, that has been in operation since 1978. While there are other compressed-air projects under development, none is expected to be comparable in size and scope to the Norton facility…The Norton Energy Storage Project is part of FirstEnergy's overall environmental strategy, which includes continued investment in renewable and low-emitting energy resources…" [Petitioners' Exhibit #49, FENOC press release, "FIRSTENERGY ACQUIRES RIGHTS TO NORTON ENERGY STORAGE PROJECT," November 23, 2009.] Given two decades of successful compressed air storage in Alabama, and over three decades of success in Germany, Petitioners urge FENOC to maximize the potential scale of the Norton Energy

Storage Project, and utilize it to begin integrating Ohio's vast wind power potential into the electricity grid.

53. Petitioners also dispute FENOC's assertion that wind power's impacts on birds and bats make its development an insurmountable environmental challenge. The National Wildlife Federation -- along with report co-sponsors such as Audubon, Environment America, and many others, all leading defenders of birds, bats, and other wildlife -- has endorsed a large-scale expansion of offshore wind in the U.S., showing that they are convinced impacts on wildlife can be mitigated. [Petitioners' Exhibit #12, National Wildlife Federation, *Offshore Wind in the Atlantic: Growing Momentum for Jobs, Energy Independence, Clean Air, and Wildlife Protection*, 2010.] Many wind power proponents take the wildlife impact issue very seriously, and are determined to fully understand and address it. The Great Lakes Wind Collaborative, for example, has posted numerous studies on the subject at its web site [Petitioners' Exhibit #13, Great Lakes Wind Collaborative, "Effects on Wildlife."] It should be noted that Davis-Besse, as with every operating atomic reactor, has inevitable negative impacts on wildlife, particularly aquatic organisms, as through thermal, toxic, and radiological discharges to Lake Erie, even during so-called "routine operations." [Petitioners Exhibit #17, Gunter, Gunter, Cullen, and Burton, *Licensed to Kill: How the Nuclear Power Industry Destroys Endangered Marine Wildlife and Ocean Habitat to Save Money*, NIRS/SECC/STAR, 2001.] And very significantly, given the fact that FENOC chose to build and operate Davis-Besse in an area of avian migration and bird refuges, it should be noted that the atomic reactor's "routine" and "permitted" radioactive discharges, as well as its "accidental" discharges and leaks of radioactivity, could well be having a harmful impact on area wildlife, including birds [Petitioners' Exhibit #18, New Scientist, "Chernobyl-based birds avoid radioactive nests," March, 2007]. Migratory and brightly colored song birds

appear most vulnerable to radioactivity. [Petitioners' Exhibit #19, Nature news, "Chernobyl birds are better off drab and lazy," July 2007.]

54. Petitioners also dispute FENOC's assertion that sound impacts could hinder wind power's development. Wind power proponents, such as the Great Lakes Wind Collaborative, are at work in good faith efforts to better understand the issue and address it. For example, at a Great Lakes Wind Collaborative Environmental Planning, Siting, and Permitting Workgroup meeting in June 2009, the workgroup listed sound impacts at the top of their list for development of best practices response. [Petitioners' Exhibit #14, Great Lakes Wind Collaborative, Environmental Planning, Siting, and Permitting Workgroup, June 11, 2009, Breakout Session Summary, page 4.] Likewise, a Great Lakes Wind Collaborative Draft Siting Principles and Policy Options for Wind Development on the Great Lakes of April 23, 2009 recognized the need to minimize sound impacts not only during operations, but during construction. [Petitioners' Exhibit #15, Great Lakes Wind Collaborative, Environmental Planning, Siting, and Permitting Workgroup, June 11, 2009, Breakout Session Summary, page 4.]

55. While concluding that wind power is not a reasonable alternative to a 20 year license extension at Davis-Besse, FENOC's ER nonetheless admits "The total wind generation capacity for the three-state region in 2008 was 698 MWe. (USDOE 2009a)" But even that two year old data needs significant updating. DOE NREL's "United States – Current Installed Wind Power Capacity (MW)," citing American Wind Energy Association data extracted on December 14, 2010, reveals that, as of September 30, 2010, Ohio (with 10 MW), Pennsylvania (with 748 MW), and West

Virginia (431 MW), the three states included in FENOC's consideration, now have an installed wind power capacity of 1,189 MW. This increase of 491 MW of installed wind capacity in the three states represents a 70% increase in just two years, from 2008 to 2010. This shows how quickly wind power can be developed and connected to the electricity grid. If New Jersey's 8 MW of installed wind capacity is added, the grand total for the region of interest (New Jersey, Ohio, Pennsylvania, West Virginia) is 1,197 MW. FENOC lists New Jersey as a state where it feeds load to the grid. Given the tremendous potential for wind power that has yet to be tapped, even within just New Jersey, Ohio, Pennsylvania, and West Virginia, and accounting for capacity factors, Davis-Besse's replacement by quickly deployed wind power can be seen.

56. NREL, in its "Estimates of Windy Land Area and Wind Energy Potential by State for Areas Greater Than or Equal to 30% Capacity Factor at 80 m," shows that Ohio has a total of 17,189.9 square kilometers of windy land area with wind power capacity factors of 30% or greater at 80 meters height. NREL excluded areas of land unlikely to be developed for wind power (such as wilderness areas, parks, urban areas, and water features), amounting to 6,205.9 square kilometers in Ohio. Thus, this excluded from development 36.1% of windy land area, but still left 10,983.9 square kilometers of windy land area in Ohio – 10.28% of the state's surface area – available for wind power development. NREL calculates Ohio's wind energy potential as an installed capacity of 54,919.7 MW, amounting to an annual generation of 151,881 GigaWatt-hours (GWh). [Petitioners' Exhibit #16, NREL and AWS Truewind, "Estimates of Windy Land Area and Wind Energy Potential by State for Areas >= 30% Capacity Factor at 80m," February 4, 2010.] At a 30% capacity factor, 54,919.7 MW of

installed wind capacity still represents 16,475.9 MW of electrical generation, or over 18 times the amount of electricity generated by Davis-Besse.

57. NREL, in its "Estimates of Windy Land Area and Wind Energy Potential by State for Areas Greater Than or Equal to 30% Capacity Factor at 80 m," shows that Pennsylvania has a total of 2,123.5 square kilometers of windy land area with wind power capacity factors of 30% or greater at 80 meters height. NREL excluded areas of land unlikely to be developed for wind power (such as wilderness areas, parks, urban areas, and water features), amounting to 1462.1 square kilometers in Pennsylvania. Thus, this excluded from development 68.9% of the windy land area, but still left 661.4 square kilometers of windy land area in Pennsylvania – 0.56% of the state's surface area – available for wind power development. NREL calculates Pennsylvania's wind energy potential as an installed capacity of 3,307.2 MW, amounting to an annual generation of 9,673 GigaWatt-hours (GWh). [Petitioners' Exhibit #16, NREL and AWS Truewind, "Estimates of Windy Land Area and Wind Energy Potential by State for Areas >= 30% Capacity Factor at 80m," February 4, 2010.] At a 30% capacity factor, 3,307.2 MW of installed wind capacity still represents 992.2 MW of electrical generation, or significantly more than the amount of electricity generated by Davis-Besse.

58. NREL, in its "Estimates of Windy Land Area and Wind Energy Potential by State for Areas Greater Than or Equal to 30% Capacity Factor at 80 m," shows that West Virginia has a total of 1,495.2 square kilometers of windy land area with wind power capacity factors of 30% or greater at 80 meters height. NREL excluded areas of land unlikely to be developed for wind power (such as wilderness areas, parks, urban

areas, and water features), amounting to 1,118.6 square kilometers in West Virginia. Thus, this excluded from development 74.8% of the windy land area, but still left 376.6 square kilometers of windy land area in West Virginia – 0.60% of the state's surface area – available for wind power development. NREL calculates West Virginia's wind energy potential as an installed capacity of 1,883.2 MW, amounting to an annual generation of 5,820 GigaWatt-hours (GWh). [Petitioners' Exhibit #16, NREL and AWS Truewind, "Estimates of Windy Land Area and Wind Energy Potential by State for Areas >= 30% Capacity Factor at 80m," February 4, 2010.] At a 30% capacity factor, 1,883.2 MW of installed wind capacity still represents nearly 565 MW of electrical generation, or nearly two-thirds of the amount of electricity generated by Davis-Besse.

59. NREL, in its "Estimates of Windy Land Area and Wind Energy Potential by State for Areas Greater Than or Equal to 30% Capacity Factor at 80 m," shows that New Jersey has a total of 280.8 square kilometers of windy land area with wind power capacity factors of 30% or greater at 80 meters height. NREL excluded areas of land unlikely to be developed for wind power (such as wilderness areas, parks, urban areas, and water features), amounting to 254.5 square kilometers in New Jersey. Thus, this excluded from development 90.6% of the windy land area, but still left 26.4 square kilometers of windy land area in New Jersey – 0.14% of the state's surface area – available for wind power development. NREL calculates New Jersey's wind energy potential as an installed capacity of 131.8 MW, amounting to an annual generation of 373 GigaWatt-hours (GWh). [Petitioners' Exhibit #16, NREL and AWS Truewind, "Estimates of Windy Land Area and Wind Energy Potential by State for

Areas >= 30% Capacity Factor at 80m," February 4, 2010.] At a 30% capacity factor, 131.8 MW of installed wind capacity still represents 39.5 MW of electrical generation, or over 4% of the amount of electricity generated by Davis-Besse.

60. Thus, taken all together, even accounting for a capacity factor of 30%, the wind power potential in Ohio (16,475.9), Pennsylvania (992.2), West Virginia (565), and New Jersey (39.5) adds up to 18,072.6 MW. This is nearly 20 times the amount of electricity generated by Davis-Besse. It should be noted that NREL explicitly states that the wind power capacity factors cited above are 30% *or greater*. Thus, these figures are conservative. If wind power development proceeds in these windy areas of Ohio, Pennsylvania, West Virginia, and New Jersey, the actual capacity factors could well be greater than 30%, generating even more electricity than calculated here. It should also be noted that the NREL figures are for wind power potential on windy *lands*. The *offshore* wind power potential in various of these states – especially in Ohio (Lake Erie), Pennsylvania (Lake Erie), and New Jersey (Atlantic Ocean) – will add significantly to the amount of wind power that can be generated in this region of interest.

61. The very real possibility that improved technology may be developed during the 40-year life span of a reactor does not render consideration of environmental issues too speculative. NEPA's requirement for forecasting environmental consequences into the future implies the need for predictions based on existing technology and those developments which can be extrapolated from it. *NRDC v. NRC*, 547 F.2d 633 (1976).

62. Thus NEPA seeks to "force action" through a rigorous and objective discussion backed by expert document and expert agency comment. In this case, the Applicant's approach to completing an Environmental Report is more akin to avoidance of such documentation and expert comment than providing the requisite objective "hard look." While some element of speculation is implicit in NEPA, federal agencies such as the NRC may not be allowed "to shirk their responsibilities under NEPA by labeling any and all discussion of future environmental effects as 'crystal ball inquiry'." *Scientists' Institute for Public Information, Inc. v. AEC (SIPI),* 156 U.S.App.D.C. 395, 408, 481 F.2d 1079, 1092 (1973). Informed prediction is only possible after an agency has been provided with sufficient and qualified documentation to conduct a thorough inquiry into all aspects of the contemplated project and the area to be affected. While NEPA does not specify the quantum of information that must be in the hands of a decision-maker before that decision-maker may decide to proceed with a given project, it does intend "to ensure that decisions about federal actions would be made only after responsible decision-makers had fully adverted to the environmental consequences of the actions, and had decided that the public benefits flowing from the actions outweighed their environmental costs." *Alaska v. Andrus*, 11 ERC 1321, 188 U.S.App.D.C. 202, 8 Envtl. L. Rep. 20,237 (D.C. Cir. 1978)

63. Here, the Applicant has too readily dismissed the wind energy alternative, as when it stated that: outside of Ohio's northwest Lake Erie coastline, and offshore, the "rest of the state" is "devoid" of developable wind power; "wind power by itself is not suitable for large base-load capacity"; "wind has a high degree of intermittency and

average annual capacity factors for wind plants are relatively low, less than 30 percent"; "current energy storage technologies are too expensive for wind power to serve as a large base-load generator"; and "Noise produced by the rotor blades, visual impacts, and bird and bat fatalities are also of some concern (**EERE 2008**)…Considering that wind conditions are variable, energy storage technologies do not currently allow supply to more closely match demand, and large land requirements and associated aesthetic impacts, FENOC does not consider a utility-scale commercial wind power project a reasonable alternative to Davis-Besse license renewal." [FENOC ER, page 7.2-9, "Wind"] These various forms of dismissing wind power's potential were done without proffering a rigorous and objective discussion or "hard look," as if to say, there are no reasonable foreseeable solutions, demonstrations, and developments set forth in any expert documents or by expert agency comments that make the alternative "reasonably foreseeable" and that can be specifically projected upon the requested relicensing action for 2017-2037 for the region of interest. In fact, the Applicant's cursory treatment and dismissal is neither entirely honest nor does it provide a sufficiently complete evaluation as pertains to the requested relicensing action but appears to manifest FENOC's particular bias toward the requested relicensing outcome.

64. The Applicant's Environmental Report states "wind power by itself is not suitable for large base-load capacity. As discussed in the [NRC] GEIS, wind has a high degree of intermittency and average annual capacity factors for wind plants are relatively low, less than 30 percent (**NRC 1996**, Section 8.3.1). [FENOC ER, Page 7.2-9] But then FENOC concedes "Wind power in conjunction with energy storage mechanisms

might serve as a means of providing base-load power." [FENOC ER, Page 7.2-9] The Applicant then seeks to dismiss the entire alternative with the statement, "But current energy storage technologies are too expensive for wind power to serve as a large base-load generator." (**NRC 2009b**, Section 8.2.5.2) [FENOC ER, Page 7.2-9]

65. As such, the Applicant offers the very narrow argument in its Environmental Report that storage technologies are and will be the only solutions for addressing the alternative's baseload and intermittency issues.

66. However, contrary to the Applicant's assertion, the Petitioners have submitted Exhibits 11, 48, and 49 [in Paragraph 53, above], and submit the following additional expert documents, expert agency comments, current events and statements of fact discussing and illuminating the implementation of solutions to address intermittency and baseload as reasonably, scientifically and commercially projected as available for the requested relicensing action in the 2017 to 2037 time frame, specifically for the Applicant's region of interest (Ohio, Pennsylvania, West Virginia, New Jersey).

67. In fact, an expert agency, the Department of Energy's National Renewable Energy Laboratory (NREL), has looked at the issue of wind energy as a reasonable baseload power source through utilization of innovative storage technology in a more forward looking evaluation than what the Applicant would lead us to believe. The Petitioners submit that NREL has published "Creating Baseload Wind Power Systems Using Compressed Air Energy Storage Concepts," by which it is argued: "*Greatly expanded use of wind energy has been proposed to reduce dependence on fossil and nuclear fuels for electricity generation. The large-scale deployment of wind energy is ultimately limited by its intermittent output and the remote location of high-value wind resources, particularly in the*

*United States. Wind energy systems that combine wind turbine generation with energy storage and long-distance transmission may overcome these obstacles and provide a source of power that is functionally equivalent to a conventional baseload electric power plant. A 'baseload wind' system can produce a stable, reliable output that can replace a conventional fossil or nuclear baseload plant, instead of merely supplementing its output. This type of system could provide a large fraction of a region's electricity demand, far beyond the 10-20% often suggested as an economic upper limit for conventional wind generation deployed without storage."* [**Petitioners' Exhibit** #20, National Renewable Energy Laboratory, United States Department of Energy, "Creating Baseload Wind Power Systems," Background and Overview, October 3, 2006.]

68. The Petitioners proffer expert documentation and expert agency comment in support of its contention and in contrast to the Applicant's cursory dismissal of wind energy as an unreasonable energy alternative, without reasonably foreseeable applicability as a baseload alternative to the relicensing of Davis-Besse. The Applicant's portrayal grossly misrepresents what the Petitioners argue as a reasonable assessment of "state of the art and science" of wind power potential in the present day and near future. Largely by the process of omission, the Applicant has conjured up what is in fact an incomplete and misleading characterization of wind energy as isolated turbines and individualized, disconnected wind farms that are necessarily subject to the whim of localized variable weather patterns. Such a portrayal is in fact a misrepresentation of many expert assessments and evaluations of the relevance and importance of the wind power alternative's potential for the requested period of the proposed federal relicensing action.

69. The Petitioners submit expert documentation, published in Stanford University's Journal of Applied Meteorology and Climatology, entitled "Supplying Baseload Power and Reducing Transmission Requirements by Interconnected Wind Farms," which states: *"A solution to improve wind power reliability is interconnected wind power. In other words, by linking multiple wind farms together it is possible to improve substantially the overall performance of the interconnected system (i.e., array) when compared with that of any individual wind farm."* [**Petitioners' Exhibit #21**, "Supplying Baseload Power and Reducing Transmission Requirements by Interconnected Wind Farms," Journal of Applied Meteorology and Climatology, Manuscript, Stanford University, February 2007, p. 1702.] The scientific manuscript concludes, "*Contrary to common knowledge, an average of 33% and a maximum of 47% of yearly averaged wind power from interconnected farms can be used as reliable, baseload electric power. Equally significant, interconnecting multiple wind farms to a common point, and then connecting that point to a far-away city can allow the long-distance portion of transmission capacity to be reduced, for example, by 20% with only a 1.6% loss of energy."* [**Petitioners' Exhibit #21**, "Supplying Baseload Power and Reducing Transmission Requirements by Interconnected Wind Farms," Journal of Applied Meteorology and Climatology, Manuscript, Stanford University, February 2007, p. 1716.]

70. An increasing number of news accounts of current events reveal a building momentum for interconnecting renewable energy resources to address the issue of intermittency and baseload. In the United States, the Petitioners submit that Google corporation has announced the formation of a consortium to supply large scale baseload wind power through the advancement of a scalable platform for an offshore "backbone transmission project" to interconnect East Coast offshore wind farms to be completed by 2020, just three years after the proposed Davis-Besse federal

relicensing action. This is significant even in FENOC's region of interest, in that New Jersey will form the northern terminus of Google's "backbone" cable, which will extend all the way to Virginia. This will encourage and accelerate the development of offshore wind power near the New Jersey coast, dramatically increasing the quantity of wind power potential in the Garden State above what is available on land. *The Washington Post* reported "The transmission line would address the problem of wind's intermittent supply by tapping into a much broader swath of the coast to meet consumer demand." [**Petitioners' Exhibit #22**, "Google helps finance 'superhighway' for wind power," *Washington Post*, October 13, 2010]

71. The Petitioners proffer expert documentation and expert agency comments relating to the interconnectedness of renewable energy generation as a solution to baseload and intermittency issues as already underway and arguably implemented within the foreseeable future for development in the Applicant's region of interest for the projected period of 2017 to 2037.

72. As further example, on January 6, 2010, nine European North Sea countries (Germany, France, Belgium, Denmark, Sweden, Norway, Great Britain and the Netherlands) announced an investment of $40 billion in an offshore undersea energy super smart grid for dedicated transmission of renewable energy. This investment and development supports a model that could be followed by the United States as well as other countries. [**Petitioners Exhibit #23**, January 6, 2010. "European Communities Unite to Invest $40 Billion in Huge Off-Shore Renewable Energy Super Grid," and **Petitioners' Exhibit #24**, January 7, 2010, Renewable Energy (Wind, Solar & Tide Power) Will Be Distributed Through A Super Grid in Europe"] As mentioned, in the

Davis-Besse region of interest, both the Great Lakes shoreline, as well as the coastline off of New Jersey, provide just such promising potential areas for offshore wind power development.

73. Consequently, the Petitioners contend that the Applicant's assertion in the Environmental Report that wind power is not and will not be "baseload," and thus is not suitable to replace Davis-Besse in the time frame 2017-2037, is inaccurate and not based on scientific analysis nor current events and is not sufficiently supported by expert documentation and expert agency comment. Similarly, with specific regard to the Applicant's region of interest, the Applicant's proffered description of wind and intermittency as projected into the requested federal relicensing action again does not provide a sufficiently complete or accurate scientific analysis of the potential alternative provided by the potential for both offshore and on land wind for 2017 to 2037. Again, the Applicant's hasty and premature dismissal of the wind energy alternative absent any discussion of the growing volume of current events, scientific studies, commercial ventures, and published expert reviews about solutions to intermittency suggests more avoidance by FENOC than an effort to inform the federal agency so that it can fulfill its NEPA duties.

74. The Petitioners further submit the expert document "Electric power from offshore wind via synoptic-scale interconnection," by authors from the Center for Carbon-free Power Integration, College of Earth, Ocean and Environment, University of Delaware, Newark, DE and School of Marine and Atmospheric Sciences, Stony Brook University, Stony Brook, NY, and published by the experts agency in the

Proceedings of the National Academy of Sciences (PNAS) of the United States in 2009.

75. The University of Delaware and Stony Brook University study concludes that: *"Based on 5 yr of wind data from 11 meteorological stations, distributed over a 2,500 km extent along the U.S. East Coast, power output for each hour at each site is calculated. Each individual wind power generation site exhibits the expected power ups and downs. But when we simulate a power line connecting them, called here the Atlantic Transmission Grid, the output from the entire set of generators rarely reaches either low or full power, and power changes slowly. Notably, during the 5-yr study period, the amount of power shifted up and down but never stopped."* [**Petitioners' Exhibit #25**, "Electric power from offshore wind via synoptic-scale interconnection," University of Delaware and Stony Brook University, Proceedings of the National Academy of Sciences, 2009, Abstract, page 1 of 6] This information is applicable to the FENOC Davis-Besse license extension ER in that New Jersey is within FENOC's region of interest, hence discussion of East Coast offshore wind is relevant. But in addition, insights gained from studying wind power interconnections and transmission technologies in the Atlantic Ocean could provide valuable information useful for offshore wind power development in the Great Lakes, as in Lake Erie.

76. The University of Delaware and Stony Brook University study underscores that the interconnectedness of wind farms by way of high voltage direct current transmission systems is reasonably foreseeable as a solution to intermittency of wind power to provide a baseload energy alternative with significantly less adverse human

environmental consequence. They state: *"In the study region, using our meteorologically designed scale and orientation, we find that transmission affects output by reducing variance, slowing the rate of change, and, during the study period, eliminating hours of zero production. The result is that electric power from wind would become easier to manage, higher in market value, and capable of becoming a higher fraction of electric generation (thus more CO2 displacement)."* [**Petitioners' Exhibit #25**, "Electric power from offshore wind via synoptic-scale interconnection," University of Delaware and Stony Brook University, Proceedings of the National Academy of Sciences, 2009, Abstract, page 6 of 6] The expert study further identifies "*The variability of wind power is not as problematic as is often supposed, since the electric power system is set up to adjust to fluctuating loads and unexpected failures of generation or transmission. However, as wind power becomes a higher proportion of all generation, it will become more difficult for electric system operators to effectively integrate additional fluctuating output. Thus, solutions that reduce power fluctuation are important if wind is to displace significant amounts of carbon-emitting energy sources. There are four near-term ways to level wind power and other fluctuating generation sources, 1) Expand the use of existing control mechanisms already set up to handle fluctuating load and unexpected equipment outages—mechanisms such as reserve generators, redundant power line routes, and ancillary service markets. This is how wind is integrated today (5). (ii) Build energy storage, as part of the wind facility or in another central location. (iii) Make use of distributed storage in loads, for example home heaters with thermal mass added or plug-in cars that can charge when the wind blows or even discharge to the grid*

*during wind lulls (6). (iv) Combine remote wind farms via electrical transmission, the subject of this article."* [**Petitioners' Exhibit #25**, "Electric power from offshore wind via synoptic-scale interconnection," University of Delaware and Stony Brook University, Proceedings of the National Academy of Sciences, 2009, Abstract, page 1 of 6]

77. Petitioners additionally submit expert documentation published by the Department of Energy's National Renewable Energy Laboratory in January 2010 further illuminating the tremendous penetration that wind energy can reasonably be expected to make during the requested federal relicensing action from 2017 to 2037. The "Eastern Wind Integration and Transmission Study," (EWITS) focuses on an aggressive technological push to merge wind power with innovative transmission systems principally High Voltage Alternating Current and Extremely High Voltage DC. NREL foresees that by 2024 it is reasonable to conclude that 20% to 30% of our electricity could be contributed from wind power. The study introduces the vision, "*Just a few years ago, 5% wind energy penetration was a lofty goal, and to some the idea of integrating 20% wind by 2024 might seem a bit optimistic. And yet, we know from the European experience—where some countries have already reached wind energy penetrations of 10% or higher in a short period of time—that change can occur rapidly and that planning for that change is critically important. Because building transmission capacity takes much longer than installing wind plants, there is a sense of urgency to studying transmission."* [**Petitioners' Exhibit #26**, "Eastern Wind Integration and Transmission Study," National Renewable Energy Laboratory (NREL), Department of Energy, January 2010, Preface, p. 15] FENOC's region of

interest falls within the Eastern Interconnection, making this study directly relevant to this proceeding.

78. Petitioners submit that rapidly developing technological improvements making wind a reliable, more efficient, less-adverse-to-the-human-environment generation source for the requested relicensing action time are not merely reasonably foreseeable but are in fact nearly at hand, and growing by leaps and bounds.

79. According to the Global Wind Energy Council, installed wind capacity alone by 2014 will reasonably reach 400 gigawatts, whereas current nuclear power capacity is about 376 gigawatts according to the World Nuclear Association. **[Petitioners' Exhibit #27**, "Global Wind Power Capacity May Rival Nuclear Within Four Years," Bloomberg News, September 23, 2010]

80. In fact, the U.S. Department of Energy's Energy Information Administration reported on December 22, 2010 that renewable energy now rivals nuclear power in the U.S., in that both provide 11% of primary energy production. But of course, renewable energy – especially wind power – is growing dramatically. In the meantime, any new reactors in the U.S. are years off still. Thus, renewable energy can be expected to surpass nuclear power by percentage of contribution to U.S. primary energy production in the near future, thanks in large part to the remarkable growth of wind power in the U.S., despite the economic downturn. [Petitioners' Exhibit #28, "What's new in EIA," Dec. 22, 2010]

81. NEPA case law requires consideration of "reasonably foreseeable" impacts, and not resolution of all unresolved scientific issues. *Jicarilla Apache Tribe v. Morton*, 471 F.2d 1275, 1280 (9th Cir. 1973). An environmental effect is "reasonably foreseeable"

if it is "sufficiently likely to occur that a person of ordinary prudence would take it into account in reaching a decision." *Sierra Club v. Marsh*, 976 F.2d 763, 767 (1st Cir. 1992). *Mid States Coalition for Progress v. Surface Transportation Board*, 345 F.3d 520 (8th Cir. 2003).

82. "NEPA is not designed to postpone analysis of an environmental consequence to the last possible moment. Rather, it is designed to require such analysis as soon as it can reasonably be done." *Kern v. United States Bureau of Land Management*, 284 F.3d 1062, 1072 (9th Cir. 2002). It is incumbent upon the NRC to realistically embrace the probabilities of technological advancements in sustainable energy development. The NRC cannot allow FENOC to game the license renewal process by claiming that technologies which are already here (for years wind, in fact, is the fastest-growing electrical generating source in North America, although in the past year or two, in terms of percentage growth, solar has the fastest growing) are infeasible or unreasonable seven or even twenty-seven years from now (2017 to 2037, the period of Davis-Besse's license extension for which FENOC has applied). This is particularly egregious if one considers where renewables were, in terms of technology and deployment, only 20 years in the past.

83. The Petitioners therefore contend that the assertion in the Applicant's Environment Report that the alternative of wind power is, and will remain, "unreasonable" during the relicensing action period of 2017 to 2037, and unsuitable to replace Davis-Besse, provides an incomplete and inaccurate scientific analysis. FENOC has not supported its conclusions with expert documents and expert agency comments.

84. The Petitioners further maintain that the Applicant's Environmental Report is significantly incomplete and inaccurate in analyzing the quality and potential of offshore wind power for the region of interest, specifically Lake Erie. FENOC does state that: "Areas suitable for wind energy applications must be wind-power Class 3 or higher (**NREL 1986**, Chapter 1). Coastal regions along Lake Erie in northwestern Ohio have an estimated wind power of Class 3, increasing to Class 5 over offshore areas (**NREL 1986**, Chapter 3) and some Class 6 areas mid-lake (**USDOE 2009a**)." Thus it's odd that a few sentences later, where FENOC does admit that "wind power in coastal Ohio along Lake Erie …is a feasible alternative to Davis-Besse license renewal in theory," it does not explicitly mention offshore Lake Erie or mid-lake Lake Erie as especially promising areas of wind power potential. [FENOC ER, Page 7.2-9]

85. There is great potential for offshore wind power development in the Great Lakes, including in Lake Erie, to grow dramatically and quickly. A report by Michigan State University's Land Policy Institute, entitled "Michigan's Offshore Wind Potential," published September 30, 2008, estimated that over 320,000 megawatts of wind power potential, all told, was accessible to the State of Michigan in the Great Lakes on its borders. Included in this calculation was but a very thin slice of Lake Erie's Western Basin. But the bulk of Lake Erie's wind power potential, stretching for hundreds of miles to the east, is accessible to the State of Ohio, as well as to the State of Pennsylvania. [Petitioners' Exhibit #29, Michigan State University, Land Policy Institute, Michigan's Offshore Wind Potential, September 30, 2008.] This report complements the efforts of Michigan Governor Granholm's Great Lakes Offshore

Wind (GLOW) initiative. GLOW has proposed three offshore wind farms in the Great Lakes around Michigan: one in extreme southern Lake Michigan, near New Buffalo; another in extreme northern Lake Michigan, near Escanaba; and the last where Saginaw Bay opens into Lake Huron.

86. A map published by AWS Truewind, entitled "Wind Resource of Ohio: Mean Annual Wind Speed at 100 Meters," show that vast stretches of the Lake Erie shoreline, as well as vast stretches of Lake Erie itself, are home to tremendous wind power potential. Broad bands of wind speeds from 8.0 to 8.5 meters/second along the shore build to even broader bands of wind speeds 8.5 to 9.0 meters/second further out. By mid-Lake Erie, areas with wind speeds of 9.0 to 9.5 meters/second are documented, as are smaller pockets with remarkable wind speeds topping 9.5 meters/second. NREL, as mentioned above, recognizes areas with wind speeds of 6.5 meters/second, or higher, as developable for their wind power potential.[Petitioners' Exhibit #30, "Wind Resource of Ohio: Mean Annual Wind Speed at 100 Meters," AWS Truewind.] Such wind power potential along the shore and offshore continues eastward in Pennsylvania, of course, also in FENOC's region of interest.

87. Another map published by AWS Truewind, entitled "Wind Resource of Ohio: Mean Annual Power Density at 100 Meters," shows that such wind speeds correspond to Wind Power Classes 5, 6, and 7 – the very highest on the scale, thus one of the most powerful wind power potential sites in the United States. [Petitioners' Exhibit #31, "Wind Resource of Ohio: Mean Annual Power Density at 100 Meters," AWS Truewind.]

88. The Applicant's ER has not cited such institutions as the European Wind Energy Association (EWEA). EWEA reported in September 2009 that "*There are currently 830 wind turbines now installed and grid connected, totaling 2,063 MW in 39 wind farms in nine European countries."* This nearly doubled a *global* figure reported by the U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy in 2008 that "*Only 1,077 MW of offshore wind capacity has been installed worldwide*." [**Petitioners' Exhibit #32**,"Oceans of Opportunity: Harnessing Europe's largest domestic resource," European Wind Energy Association. 09/27/2010.] This shows how fast offshore wind power can grow.

89. But EWEA later reported that *"In 2010 1,000 MW expected to be installed during 2010, a 71% market growth compared to 2009. Currently there are 16 offshore wind farms under construction, totaling over 3,500 MW and a further 52 wind farms have been fully consented, totaling more than 16,000 MW."* [**Petitioners' Exhibit #32**,"Oceans of Opportunity: Harnessing Europe's largest domestic resource," European Wind Energy Association. 09/27/2010.] Offshore wind power's rate of growth is increasing as time goes on.

90. EWEA goes on to report that "*By 2020, most of the EU's renewable electricity will be produced by onshore wind farms. Europe must, however, use the coming decade to prepare for the large-scale exploitation of its largest indigenous energy resource, offshore wind power. That the wind resource over Europe's seas is enormous was confirmed in June by the European Environment Agency's (EEA) 'Europe's onshore and offshore wind energy potential'. The study states that offshore wind power's economically competitive potential in 2020 is 2,600 TWh, equal to between 60% and*

*70% of projected electricity demand, rising to 3,400 TWh in 2030, equal to 80% of the projected EU electricity demand. The EEA estimates the technical potential of offshore wind in 2020 at 25,000 TWh, between six and seven times greater than projected electricity demand, rising to 30,000 TWh in 2030, seven times greater than projected electricity demand. The EEA has clearly recognised that offshore wind power will be key to Europe's energy future."* [**Petitioners' Exhibit #32**,"Oceans of Opportunity: Harnessing Europe's largest domestic resource," European Wind Energy Association. 09/27/2010.] Petitioners note that such time frames are within the proposed Davis-Besse license renewal, and that the inland sea of Lake Erie is Ohio's and Pennsylvania's equivalent of Europe's seacoasts in terms of wind power potential, albeit on a smaller physical scale. New Jersey, within FENOC's region of interest, also has tremendous offshore wind power potential.

91. More specific to the Applicant's stated region of interest, the Petitioners contend that the Environmental Report's discussion and evaluation of the offshore wind alternative contribution is overly vague, significantly inaccurate and not sufficiently complete.

92. In June, 2010, the Department of Energy's National Renewable Energy Laboratory (NREL) produced its expert assessment of offshore wind energy potential for the United States. The NREL document provides that "Table 1 shows the offshore wind resource by available square kilometers ($km^2$) of water and potential installed capacity in gigawatts (GW) for annual average wind speeds greater than 7.0 meters/second (m/s) at 90 m above the surface. A uniform factor of 5 megawatts/$km^2$ was applied to calculate the potential installed capacity. The resource is presented for individual states and the country as a whole. These resource estimates have not been

reduced by any environmental or water-use considerations. Detailed information by database element for each state is presented in Appendix B. The data presented in this report represents the first version of the offshore database." [**Petitioners' Exhibit #33,** "Assessment of Offshore Wind Energy Resources for the United States," NREL, June 2010, Table 1, "Offshore wind resource area and potential by wind speed interval and state within 50 nm of shore."] By NREL's assessment at Table 1 for FENOC's region of interest (OH, PA, NJ) there is a total resource of 155.5 gigawatts (GW) of offshore and deepwater wind alone (within 50 nautical miles). Petitioners submit that the omission of significant amounts of data and planning from these states within the region of interest is a significant failing of the FENOC Environmental Report that potentially leaves the NRC not only uninformed but misinformed for preparing an Environmental Impact Statement on the alternatives for the requested relicensing action from 2017 to 2037.

93. As such, Petitioners' contend that the Applicant's assertion that wind is not a reasonable alternative, in the face of such tremendous documented potential, is misleading, inaccurate and unfounded, as evidenced by current expert documentation and expert agency comments. The lack of scientifically accurate, substantially complete and timely documentation dooms the Applicant's assertion that wind is not a "reasonable alternative" and is meaningless for informing the NRC of projections of wind's alternative resource availability for the requested federal relicensing action.

94. FENOC must update its ER to recognize a major Obama administration event promoting offshore wind power in the Great Lakes. From October 26 to 27, 2010, leaders from the Obama administration, such as the Chair of the White House Council

on Environmental Quality Nancy Sutley, and the Secretary of Energy Steven Chu, joined with Great Lakes offshore wind power proponents in Chicago to promote expanding wind power in the Great Lakes. Sutley was quoted as saying: "President Obama has made an unprecedented commitment to renewable energy development in the United States. Increasing our wind power generation is a critical component to building greater energy independence and creating jobs here at home. We must improve and increase the lines of communication to bring wind development in the Great Lakes closer to fruition." Chu was quoted as saying: "The country's vast offshore wind resources have the potential to dramatically reduce America's dependence on fossil fuels, make us more economically competitive, and support new manufacturing jobs in the U.S. By working collaboratively with private industry and our state and Federal partners, we can help to accelerate and support the development of wind energy in the Great Lakes." FENOC must update its ER to reflect, and the NRC in its EIS must acknowledge, such major support from the White House and Department of Energy and its promise for wind power's potential development in the Great Lakes. [Petitioners' Exhibit #34, U.S. Department of Energy, Executive Office of the White House, and Great Lakes Wind Collaborative press release, "Obama Administration Hosts Great Lakes Offshore Wind Workshop in Chicago with Great Lakes Wind Collaborative," October 27, 2010.] The Applicant's cursory treatment and uninformative discussion of offshore wind energy is thus already significantly dated, inaccurate and substantially incomplete, given such breaking news.

95. With the rise of numerous wind advocacy consortia in the Great Lakes, such as the Ohio Wind Working Group [Petitioners' Exhibit #35, "Ohio Energy Resources

Division | Wind Farm Development," and Petitioners' Exhibit #36, "Welcome to Ohio Wind Working Group" homepage], the Great Lakes Wind Collaborative [Petitioners' Exhibit #37, "The Great Lakes Wind Collaborative" homepage.], the Michigan Great Lakes Wind Council [Petitioners' Exhibit #45, "Governor Granholm Signs Executive Order Creating Great Lakes Wind Council," February 6, 2009], and the Pennsylvania Wind Working Group [Petitioners' Exhibit #38, "Pennsylvania Wind Working Group" homepage.], offshore and on land wind power in such places as Ohio, Pennsylvania, Lake Erie, and beyond in the region of interest, and nearby, is poised to take off. The Great Lakes Wind Collaborative lists planned wind power projects in the Great Lakes region, including a 20 MW offshore wind power development near downtown Cleveland. [Petitioners' Exhibit #39, Great Lakes Wind Collaborative, "Proposed Offshore Wind Projects in the Great Lakes."] So is offshore and even deep water wind power off the New Jersey coast, thanks to Google's investment in the "backbone cable" transmission line, as mentioned above. The Great Lakes Wind Collaborative (GLWC) has undertaken numerous projects, including a "GLWC Regional Transmission Wind Workgroup Workplan, January 2010 to June 2011," [Petitioners' Exhibit #40, "GLWC Regional Transmission Wind Workgroup Workplan, January 2010 to June 2011."] The GLWC has also undertaken a "GLWC Wind Atlas Workgroup Workplan, January 2010 – June 2011." [Petitioners' Exhibit #41, "GLWC Wind Atlas Workgroup Workplan, January 2010 – June 2011."]

96. The Ohio Wind Working Group states on its homepage [http://ohiowind.org/Offshore-Wind.cms.aspx] that, regarding offshore wind power: "The Great Lakes represent one of the largest offshore wind market opportunities of

the next several decades. By some estimates, the wind resource technically available for electricity production is 250 gigawatts (GW), which is enough power for 75 million households. The State of Ohio is striving to make the Great Lakes home to the world's first offshore wind turbine in fresh water and become a center for wind innovation…As the shallowest and centrally-located lake, Lake Erie is favorably positioned to serve the emerging Great Lakes offshore wind market. Ohio is moving to take the lead on this opportunity by supporting the Great Lakes Wind Energy Center, which is a public-private partnership working to become a center of excellence for research, testing, and certification of new designs and equipment for offshore wind technologies. The goal is for Ohio to serve as the home of installation and support services needed to ship, install, maintain, and repair future offshore wind facilities in the Great Lakes." The Ohio Wind Working Group also reports that Ohio has 66,000 MW of potential wind power, enough to power the state two times over, and that by 2030 – during most of Davis-Besse's proposed license extension -- $7.6 billion of wind power related revenue could accrue within the State of Ohio. It concludes that "Lake Erie is uniquely positioned to serve the emerging Great Lakes offshore wind market."

97. Petitioners contend that FENOC does not provide a complete discussion and evaluation of significant State and Federal sponsored activities that can be reasonably considered to impact the federal relicensing action for the region of interest during the 2017 to 2037 timeframe. Under NEPA's "rule of reason," while an agency is not required to consider all possible alternatives for each aspect of a proposed action, the agency does need to consider "a reasonable number of examples, covering the full

spectrum of alternatives." *Natural Resources Defense Council v. Morton*, 458 F.2d 827 (D.C Cir. 1972). In *Citizens Against Burlington, Inc. v. Busey*, 938 F.2d 190, 197-98 (D.C.Cir.1991), then-judge Thomas warned that outcome-controlled "rigging" of purpose and need violates NEPA, which "does not give agencies license to fulfill their own prophecies," *id.* at 195. Justice Thomas continued, "an agency may not define the objectives of its action in terms so unreasonably narrow that only one alternative from among the environmentally benign ones in the agency's power would accomplish the goals of the agency's action. . . ." *Id.*

98. NEPA requires: (1) that alternatives be presented in comparative form to provide meaningful choices to decision-makers and the public (40 C.F.R. §1502.14); (2) that "substantial treatment" be devoted to each alternative considered in detail, to enable reviewers to evaluate the comparative merits of each alternative (40 C.F.R. § 1502.14 (b)); and (3) that during the course of the NEPA process, no actions go forward that have adverse environmental impacts or would limit the choice of reasonable alternatives (40 C.F.R. § 1506.1).

99. Agencies must, to the fullest extent possible, "[s]tudy, develop, and describe appropriate alternatives to recommended courses of action in any proposal. . . " 42 U.S.C. § 4322(2)(E); *Idaho Conservation League v. Mumma*, 956 F.2d 1508, 1519-20 (9th Cir. 1992). It means examination of every alternative within the "nature and scope of the proposed action," *California v. Block*, 690 F.2d 753, 761 (9th Cir. 1982), "sufficient to permit a reasoned choice." *Methow Valley Citizens Council v. Regional Forester*, 833 F.2d 810, 815 (9th Cir. 1987).

100. "The existence of a viable, but unexamined alternative renders an environmental impact statement inadequate." *Idaho Conservation League, supra*. 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, 93 (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). When developing reasonable alternatives for NEPA purposes, the scope of alternatives must include the alternatives noted above and those reasonable alternatives outside the agency's jurisdiction (40 CFR § 1502.14(c). Consequently, these alternatives, "…include those [alternatives] that are practical or feasible ways from the technical and economic standpoint and using common sense, rather than simply desirable from the standpoint of the applicant." CEQ's *Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations*, Question 2a.

101. Petitioners assert that the complete omission of significant State, Federal, private industry, and non-governmental environmental support for numerous projects already in the advanced planning and development stages and scheduled to be operational in the region of interest in time for the proposed relicensing action (2017-2037) must be included by "the rule of reason" for this Environmental Report so that the NRC can prepare a meaningful Environmental Impact Statement.

102. However, the Applicant omits "high quality," "accurate scientific analysis," and "expert agency comments" with reference to the current planning and development of offshore wind, as well as on land wind, for the region of interest.

103. Contrary to the Applicant's uninformative silence, the Petitioners contend that there is substantial high quality, accurate scientific analysis with expert agency comment, substantial State and Federal expert documentation and support for aggressive development of offshore (in Lake Erie) and deep water (off the New Jersey coast) wind power that the Applicant has simply ignored or excluded from its Environmental Report, leading to a significantly deficient application for a 20 year license extension.

104. Significant federal government support for offshore wind development, through the U.S. Department of Energy (DOE) Office of Energy Efficiency and Renewable Energy (EERE), Wind and Water Power Program, is outlined in "*Creating an Offshore Wind Industry in the United States: A Strategic Work Plan for the United States Department of Energy, Fiscal Years 2011-2015."* [**Petitioners' Exhibit #42**, "*Creating an Offshore Wind Industry in the United States: A Strategic Work Plan for the United States Department of Energy, Fiscal Years 2011-2015,"* U.S. Department of Energy (DOE) Office of Energy Efficiency and Renewable Energy (EERE), Wind and Water Power Program, September 2010, Pre-decisional] The Petitioners acknowledge that the DOE has identified that "Key barriers to the development and deployment of offshore wind technology include the relatively high cost of energy, technical challenges surrounding installation and grid interconnection, and the untested permitting requirements for siting wind projects in federal and state waters." [**Petitioners' Exhibit #42**, "*Creating an Offshore Wind Industry in the United States: A Strategic Work Plan for the United States Department of Energy, Fiscal Years 2011-2015,"*

U.S. Department of Energy (DOE) Office of Energy Efficiency and Renewable Energy (EERE), Wind and Water Power Program, September 2010, Pre-decisional, *Executive Summary, Key Points, p.ii.*]

105. However, Petitioners argue that, contrary to the Applicant's Environmental Report's unsubstantiated assertions, these barriers are not without solutions and remedies which can be deployed in a timely manner, that they are not only reasonably surmountable, but already being aggressively addressed in pursuit of expansive offshore wind power development for the requested relicensing action period of 2017 to 2037.

106. The Petitioners point again to the referenced September 2010 DOE Strategic Work Plan as it has laid out a resourced work plan, schedule and details in the Offshore Wind Innovation and Demonstration Initiative to include the Applicant's region of interest that *"will work to lead the national effort to overcome these barriers and achieve the scenario of 54 GW at 7-9 cents per kilowatt-hour by 2030, with an interim target of 10 GW at 13 cents per kilowatt-hour by 2020*." [**Petitioners' Exhibit #42**, "*Creating an Offshore Wind Industry in the United States: A Strategic Work Plan for the United States Department of Energy, Fiscal Years 2011-2015,"* U.S. Department of Energy (DOE) Office of Energy Efficiency and Renewable Energy (EERE), Wind and Water Power Program, September 2010, Pre-decisional, *Executive Summary, Key Points, p.ii.*] This report goes on to state: "…offshore wind resource data for ***the Great Lakes***, U.S. coastal waters, and Outer Continental Shelf [including off of New Jersey's coast] up to 50 nautical miles from shore indicate that for annual average wind speeds above 8.0 m/s, the total *gross resource* of the United States is 2,957 GW or approximately three times the generating capacity of the current U.S. electric grid…The scale of this theoretical capacity implies that under reasonable economic scenarios, offshore wind can contribute to the nation's energy mix to

significant levels." [emphasis and note about New Jersey coast added by Petitioners; "Creating an Offshore Wind Industry in the United States," page 3.] Tellingly, the Great Lakes are nearly as oft mentioned in this study as is the Eastern seaboard.

107. The Petitioners argue that FENOC's omission of significant expert documentation (much of which was available prior to the publication of the application) renders the current Environmental Review to be an amassing of meaningless detail, or worse. The Petitioners therefore contend that the application is clearly unacceptable to inform the NRC's Supplemental Environmental Impact Statement. FENOC certainly must update the ER by including current data reflecting the dramatic growth of wind power, both on and offshore.

108. Because the Applicant's Environmental Report omits significant expert documents and expert statements, it cannot be said to be "sufficiently complete" to inform the NRC on the alternative of wind energy for the relicensing action for the period of 2017 to 2037. As the Petitioners have previously presented, the on- and offshore wind power potential for the region of interest is neither recognized nor tagged, nor is the significant development of federal, state, and non-governmental organization involvement in promoting wind power. All this is simply omitted, leaving the NRC unawares and uninformed.

109. Nor does the Applicant's Environment Report provide any specificity for the significant potential development of offshore (Lake Erie in OH and PA) and deepwater (NJ) wind energy for the region of interest to raise its evaluation to such a level as NEPA sets forth to "rigorously explore and objectively evaluate" the energy alternatives for this requested relicensing action for period of 2017 to 2037.

110. The Applicant omits the most significant and germane information for the region of interest regarding wind power potential. The Applicant simply makes no effort to reasonably evaluate the wind power alternative's potential, and is completely silent for the requested relicensing action period. In view of the Applicant's silence, the Petitioners have submitted expert documentation from federal agencies as well as state groups, showing, for example, that up to 250 gigawatts (250,000 megawatts, or well over 250 times the electrical production of Davis-Besse) of developable wind power potentials exists on the Great Lakes.

111. The Petitioners further point out that contrary to the aim and intent of NEPA, to thoroughly discuss and evaluate the alternatives to the requested federal action "to the fullest extent possible," as set forth at Sec. 102 [42 USC § 4332] (C)(iii), the Applicant's Environmental Report has provided very little specificity, and certainly not a sufficiently complete evaluation, of the wind power potential for the region of interest.

112. Petitioners have submitted expert documentation that further illuminates the substantial support for implementing offshore, deepwater, and land-based wind harvesting for a power as a reasonable alternative to FENOC's requested relicensing action, where the current potential for offshore and deepwater wind is estimated at nearly 155.5 gigawatts of electricity from Ohio, Pennsylvania, and New Jersey. [**Petitioners' Exhibit #33,** "Assessment of Offshore Wind Energy Resources for the United States," NREL, June 2010, Table 1, "Offshore wind resource area and potential by wind speed interval and state within 50 nm of shore."] To that figure can be added the on land wind power potential in those states.

113. While the Applicant should have known about the expert documentation from circa 2008, and more recently, by the Department of Energy and NREL for wind energy potential, they chose not to include any such reports in their evaluation for the Environmental Report for the requested relicensing action period of 2017 to 2037. [**Petitioners' Exhibit #43**, "20% Wind Energy by 2030: Increasing Wind Energy's Contribution to U.S. Electricity Supply," July 2008]

114. Furthermore, in addition to the Applicant's significant omission of little to no analysis or evaluation of expert documentation, as well as the support of state and federal government agencies and industry groups, not to mention environmental groups, the Applicant has not provided sufficient analysis and evaluation, or even insight, for any planning by any of the states in the region of interest to develop offshore or onshore wind power potential for delivery to the electricity market by the requested relicensing action period of 2017 to 2037.

115. Petitioners submit that the assertions made by the Applicant in the Environmental Report continue to be superseded by current events and expert documents so as to render their conclusion that the wind power alternative will not be viable to offset the requested relicensing action in 2017 to 2037 as incomplete, insufficient and unsupported. The Petitioners submit the expert document "Large Scale Offshore Wind Power in the United States: Assessment of Opportunities and Barriers, US Department of Energy National Renewable Energy Laboratory, September 2010. [**Petitioners' Exhibit #44**, "Large Scale Offshore Wind Power in the United States: Assessment of Opportunities and Barriers," US Department of Energy National Renewable Energy Laboratory, September 2010] The NREL document identifies that

deepwater wind technology is already in the demonstration phase, launched in 2009 off the coast of Norway. [**Petitioners' Exhibit #44**, "Large Scale Offshore Wind Power in the United States: Assessment of Opportunities and Barriers," US Department of Energy National Renewable Energy Laboratory, September 2010, Executive Summary, Page 6.] NREL states that "Under reasonable economic assumptions, offshore wind can be expected to penetrate the U.S. market on a large scale without introducing substantial new technology—such as large-scale grid storage or smart grid load management. Although these analyses are still preliminary, NREL's Regional Energy Deployment System (ReEDS) model (formerly called the Wind Deployment System [WinDS] model) shows offshore wind penetration of between 54 GW and 89 GW by 2030 when economic scenarios favoring offshore wind are applied." [**Petitioners' Exhibit #44**, "Large Scale Offshore Wind Power in the United States: Assessment of Opportunities and Barriers," US Department of Energy National Renewable Energy Laboratory, September 2010, Executive Summary, Page 7.] 2030 falls well within the 2017 to 2037 timeframe of Davis-Besse's proposed license extension. The Petitioners submit that a significant proportion of that penetration can be within the Applicant's region of interest.

116. The NREL document further states at Section 2.4, The Contribution of Offshore Wind, "*Offshore wind has the potential to address all three issues: the energy supply, the environment, and the economy. Offshore wind uses the vast renewable wind resources adjacent to the ocean perimeter of the United States, which are domestic, indigenous, inexhaustible energy supplies in close proximity to our urban energy load centers. Offshore wind turbines can convert the strong ocean winds into clean, renewable power with no*

*harmful emissions. Offshore wind has the potential to contribute significantly to the revitalization of the U.S. manufacturing sector, which will help strengthen both the economies of coastal states and the U.S. economy as a whole…Recognizing these issues, the Obama administration has strengthened the nation's commitment to renewable energy and clarified some of the actions needed to reduce our dependence on fossil fuels and bring emission levels in line with IPCC recommendations. The administration has set forth the following specific clean energy actions for the United States (White House 2009):*

*• Double this nation's supply of renewable energy in the next 3 years.*

*• Invest $15 billion per year to develop technologies like wind power and solar power, advanced biofuels, clean coal [sic], and more fuel-efficient cars and trucks.*

*• Cut our carbon pollution by about 80% by 2050, and create millions of new jobs.*

*• Lease federal waters for projects to generate electricity from wind, as well as from ocean currents and other renewable sources.*

*• Put the nation on the path to generating 20% or more of our energy from renewable sources by 2020.*

*As a contributor to the overall solutions, the offshore wind resource in the United States has the potential to deliver substantial amounts of clean electricity to U.S. consumers. The National Renewable Energy Laboratory (NREL) estimates that the gross U.S. offshore wind resource over all water depths, in regions with annual average wind speeds greater than 8.0 m/s, is 2,957 GW(1 GW = 1,000 MW).*[2] *If average winds of 7.0 m/s are included, the estimated wind resource grows to 4,150 GW (Heimiller et al., 2010; see also Section 4).This is approximately four times the*

*electricity generating capacity of the U.S. electric grid."* [**Petitioners' Exhibit #44**, "Large Scale Offshore Wind Power in the United States: Assessment of Opportunities and Barriers," US Department of Energy National Renewable Energy Laboratory, September 2010, pages 12-13.]

117. The Petitioners submit that the Applicant has not only summarily dismissed the wind energy alternative from its Environmental Review without sufficient review, evaluation and the support of expert documents and expert comments, but also has similarly dismissed all of the other renewable energy alternatives that include solar generated electricity, as well as efficiency, which will make significant contributions to the region of interest for the requested relicensing action from 2017 to 2037, so as to make the relicensing action unnecessary. This dismissal without taking the "hard look" as required by NEPA serves more to misinform the US Nuclear Regulatory Commission than provide the agency with an adequate evaluation so that it can carry out its duties as required by NEPA.

118. Finally, development of wind energy is a legal binding requirement for FirstEnergy. As pointed out by Dr. Alvin D. Compaan, Distinguished University Professor of Physics, Emeritus, The University of Toledo, at the People's Hearing on Davis-Besse's proposed license extension held December 18, 2010 at St. Mark's Episcopal Church in Toledo, Ohio, Ohio Senate Bill 221 (SB 221, passed in the spring of 2008) and the Alternative Energy Portfolio Standard *requires* FirstEnergy to achieve 12.5% generation from renewables by 2025. On-land wind power, offshore wind power, and distributed generation qualify for SB 221 credit. Dr. Compaan

points out the important fact that costs for achieving such legally binding requirements can be passed on to ratepayers, making implementation that much easier for FirstEnergy to accomplish. Dr. Compaan pointed out that the quality of certain regions of wind power potential on Lake Erie rival those of Texas and the Great Plains states. He adds that stimulating renewable energy such as wind power creates jobs in Ohio, an added socio-economic benefit associated with the alternative. Specifically, Ohio has a large number of manufacturers that are suppliers for wind turbines, and that maintenance of wind turbines creates many jobs. [Petitioners' Exhibit #50, Dr. Al Compaan presentation at People's Hearing on Davis-Besse license extension, St. Mark's Episcopal Church, Toledo, Ohio, December 18, 2010.]

119. Bolstering Dr. Compaan's points about the job creation and economic benefit potential of wind power – both in the present and ever more so in the future -- the Ohio Wind Working Group asserts on its website that: "Wind power provides tremendous economic benefits to local communities"; "When it comes to wind, Ohio has the best supply chain in the country"; "In 2006, wind generated $250 million in revenue, creating a total of 1,700 direct and indirect jobs in Ohio"; and "By 2030, Ohio could benefit from $7.6 billion in revenue from the wind industry". [Ohio Wind Working Group homepage, http://ohiowind.org/, scrolling headlines transcribed by Petitioners on December 26, 2010.]

120. Regarding jobs, wind power ranks among the top job generators in the energy industry, outperforming coal and nuclear. Wind generates 13.3 jobs per million dollars invested, twice coal (6.86 jobs per million dollars invested) and three times

nuclear (4.2 jobs per million dollars invested). [Petitioners' Exhibit #51, "Job Creation per $1 Million Investment," Heidi Garrett-Peltier and Robert Pollin, University of Massachusetts Political Economy and Research Institute; infrastructure multipliers and assumptions are presented in "How Infrastructure Investments Support the U.S. Economy: Employment, Productivity and Growth," Political Economy Research Institute, January 2009 – see Petitioners' Exhibit #52.] Again, this is relevant to FENOC's ER due to the tremendous socio-economic benefits to be derived from development of wind power's potential.

**CONCLUSION**

121. The contention rule is not a "fortress to deny intervention." *Matter of Duke Energy Corp.* (Oconee Nuclear Power Plant), 49 NRC at 335 (quoting *Philadelphia Elec. Co.* (Peach Bottom Atomic Power Station, Units 2 and 3), 8 AEC 13, 20-21 (1974), *rev'd in part*, CLI-74-32, 8 AEC 217 (1974), *rev'd in part, York Committee for a Safe Environment v. N.R.C.*, 527 F.2d 812 (D.C. Cir. 1975)). There is no requirement that the substantive case be made at the contention stage. *Matter of Entergy Nuclear Generation Co., et al.* (Pilgrim Nuclear Power Station), 50-293-LR (ASLB Oct. 16, 2006), 2006 WL 4801142 at (NRC) 85 (quoting *Oconee*, 49 NRC at 342)).

122. The Commission has explained that the requirement at § 2.309(f)(1)(v) 'does not call upon the intervenor to make its case at [the contention] stage of the proceeding, but rather to indicate what facts or expert opinions, be it one fact or opinion or many, of which it is aware at that point in time which provide the basis for its contention.' *A*

*petitioner does not have to provide a complete or final list of its experts or evidence or prove the merits of its contention at the admissibility stage*. And, as with a summary disposition motion, the support for a contention may be viewed in a light that is favorable to the petitioner, so long as the admissibility requirements are found to have been met. The requirement '*generally is fulfilled when the sponsor of an otherwise acceptable contention provides a brief recitation of the factors underlying the contention or references to documents and texts that provide such reasons*.' (Emphasis supplied) The Petitioners' recitation in support of its contention is not brief; the evidence of FENOC's poor consideration of wind power as a serious alternative to the continuation of Davis-Besse's operation from 2017 to 2037 is overwhelming. The Environmental Report fails the standards of NEPA, and as well, NRC regulations and case law interpretations. Petitioners seek admission as intervenors in this relicensing to set the record straight, and to prove that the licensee must take a hard look at far more than it has revealed so far in its perfunctory ER. The presumption that an operating Davis-Besse atomic reactor is the best that can be done respecting the environment is therefore less supportable than ever.

**CONTENTION TWO: SOLAR POWER**

**Declaration and Curriculum Vitae of Alvin Compaan,**
**Intervenors' Expert Witness of Contention #2 embedded here.**

123. Contention Two: Solar Electric (Photovoltaic) Power. The FirstEnergy Nuclear Operating Company (hereinafter, FENOC) Environmental Report fails to adequately evaluate the full potential for renewable energy sources, such as solar electric power or photovoltaics (hereinafter "solar power"), to offset the loss of energy production from

Davis-Besse, and to make the requested license renewal action from 2017 to 2037 unnecessary. In violation of the requirements of 10 C.F.R. §51.53(c)(3)(iii) and of the GEIS § 8.1, the FENOC Environmental Report (§ 7.2) treats all of the alternatives to license renewal except for natural gas and coal plants as unreasonable and does not provide a substantial analysis of the potential for significant alternatives, such as solar power, in the Region of Interest for the requested relicensing period of 2017 to 2037. The scope of the Supplemental Environment Impact Statement (SEIS) is improperly narrow, and the issue of the need for Davis-Besse as a means of satisfying demand forecasts for the relicensing period must be revisited due to dramatically-changing circumstances in the regional energy mix that are currently underway already during this decade of Davis-Besse's remaining operating license (2010 to 2017), and can especially be expected to accelerate and materialize over two decades to come covering FENOC's requested license extension period (2017 to 2037).

**Basis**

124. The entire discussion of solar power in the First Energy application for renewal is reproduced below. This illustrates the shallow and cursory treatment of this very viable alternative to a 20-year license extension of Davis-Besse.

From: *Davis-Besse Nuclear Power Station, License Renewal Application, Environmental Report (pp. 7.2-9,10)*

Solar Power

Solar power technologies, both photovoltaic (PV) and thermal, depend on the availability and strength of sunlight. As such, it is an intermittent source of energy, requiring energy storage or a supplemental power source to provide electric power at night. Solar resource availability in Ohio, western Pennsylvania, and northern West Virginia is low compared to other parts of the United States. The three-state region, for

example, has about 3.3 kWh per square meter per day of solar radiation, which is less than half of that available in the southwestern United States (**NRC 1996**, Figure 8.2).

The land requirement for solar technology is large. As noted in the GEIS, it requires 14 to 35 acres for every 1 MWe generated, depending on the solar technology (**NRC 1996**, Sections 8.3.2 and 8.3.3). At a minimum, it would require approximately 12,740 acres to replace the 910 MWe produced by Davis-Besse. In addition, although solar technologies produce no air pollution, little or no noise, and require no transportable fuels, many solar power technologies are still in the demonstration phase of development and cannot be considered competitive with fossil or nuclear-based technologies in grid-connected applications, due to high costs per kilowatt of capacity (**NRC 1996**, Section 8.3.2). Lastly, since the output of solar generated power is dependent on the availability of sunlight, supplemental energy sources would be required to meet the base-load capacity of Davis-Besse.

For the reasons noted, FENOC does not consider solar power to be a reasonable alternative to renewal of Davis-Besse's operating license.

## Overview of claims

125. In the following discussion, we will introduce and support the following claims regarding the omissions, errors, and inadequacies in the Environmental Report of the First Energy Nuclear Operating Company (hereinafter FENOC) License Renewal Application:

1. FENOC has failed to recognize that the solar industry has developed rapidly since 1996. FENOC uses only one reference to support its case against solar power and that reference is seriously outdated, the publication itself being over 14 years old (**Petitioners' Exhibit #53**, Generic Environmental Impact Statement for License Renewal of Nuclear Plants: Main Report (NUREG-1437, Volume 1)). In those 14 or 15 years, the quality and availability of solar modules has increased dramatically while the cost of solar power has dropped substantially.

2. The cost of solar power has been falling dramatically and is projected to continue falling so that "grid parity" is likely to occur around 2014-2016, just when the license extension is proposed to start.
3. Suitability of solar in the FENOC territory. FENOC's discussion of the solar resource appropriate for flat solar modules (kWh of sunlight per square meter per day) in the region is seriously understated. It is not appropriate to take an average over the FENOC service area but to take the best regions, which actually coincide closely with the location of Davis-Besse. Furthermore, FENOC considered only *direct* solar radiation (clear sky conditions) when all flat solar panels also collect *indirect* solar radiation scattered from clouds and haze.
4. Solar power has a $CO_2$ footprint that is much smaller than the full fuel chain of nuclear.
5. FENOC, as well as other utilities, is currently under a State-of-Ohio mandate to generate at least 25% of its electricity from advanced and renewable sources, including solar. An extension of the Davis-Besse operating license would not meet any of these requirements. However, the State of Ohio provides incentives to FENOC to build or contract for the installation of solar power resources in Ohio.
6. Solar power is an intermittent power source, however, the delivery of solar power closely follows the time-of-day demand curve.
7. Economical sources of energy storage and back-up power are available to provide good base-load power, in conjunction with solar. One example will be discussed in this document, namely, underground compressed air storage. In fact FENOC,

in a press release 13 months ago, announced the acquisition of the Norton Energy Storage facility which in the near term could generate at least "268 MW" of electricity and "has the potential to be expanded to up to 2,700 MW of capacity." [Petitioners' Exhibit #54, First Energy Press Release of 11/23/2009.] This facility, already owned by First Energy, thus has the potential to deliver about three times the power of Davis-Besse.

**1. Solar industry development since 1996**.

126. The discussion and single citation used by FENOC in their claim to the inadequacy of solar power as an alternative to a 20 year extension of the Davis-Besse operating license are badly out of date. [Petitioners' Exhibit #23] In fact the solar industry worldwide has developed very rapidly since 1996. The data from Table 1 show the annual production of solar electric modules by country and region from 1988 onward. [Petitioners' Exhibit #55, Data assembled by A. Compaan from yearly issues of PV News, April issue] Note that the worldwide production showed relatively slow growth until about 1997 which marked the beginning of national incentive programs, notably in Japan and Germany. However, in the decade between 1997 and 2006 the compound annual growth rate (CAGR) has been about 40% per year and much higher in the last three years (between 50% and 100%). For 2010, preliminary estimates indicate that the growth will be almost 100%, with annual production doubled over the 10,000 MW production of 2009. In fact, the world's largest manufacturer of solar modules in 2009 was First Solar which has its only U.S. manufacturing plant in Perrysburg, OH, only a few miles from Davis-Besse.

127. Whereas in 1996 the total worldwide production of solar panels was under 89 MW or less than 10% of the power output of the Davis-Besse reactor, in 2010 the worldwide production will be more than 20 times the Davis-Besse output. Of course the installation of solar power as an alternative would be expected to occur smoothly over several years.

128. Consequently, we argue that the FENOC Environmental Report is seriously deficient in its consideration of the solar power industry as a viable alternative power source for FENOC customers.

**Table 1. Solar Module Production by country or region (in MW) [Data from PV News, Petitioners' Exhibit #55]**

| *Year* | *Rest of World* | *Europe* | *Japan* | *United States* | *Total* | *Increase (yr over yr)* |
|---|---|---|---|---|---|---|
| 1988 | 3 | 6.7 | 12.8 | 11.1 | 33.6 | |
| 1989 | 4 | 7.9 | 14.2 | 14.1 | 40.2 | 1.20 |
| 1990 | 4.7 | 10.2 | 16.8 | 14.8 | 46.5 | 1.16 |
| 1991 | 5 | 13.4 | 19.9 | 17.1 | 55.4 | 1.19 |
| 1992 | 4.6 | 16.4 | 18.8 | 18.1 | 57.9 | 1.05 |
| 1993 | 4.4 | 16.55 | 16.7 | 22.44 | 60.09 | 1.04 |
| 1994 | 5.6 | 21.7 | 16.5 | 25.64 | 69.44 | 1.16 |
| 1995 | 6.35 | 20.1 | 16.4 | 34.73 | 77.6 | 1.12 |
| 1996 | 9.75 | 18.8 | 21.2 | 38.85 | 88.6 | 1.14 |
| 1997 | 9.4 | 30.4 | 35 | 51 | 125.8 | 1.42 |
| 1998 | 18.7 | 33.5 | 49 | 53.7 | 154.9 | 1.23 |
| 1999 | 20.5 | 40 | 80 | 60.8 | 201.3 | 1.30 |
| 2000 | 23.42 | 60.66 | 128.6 | 74.97 | 287.65 | 1.43 |
| 2001 | 41 | 86.38 | 171.22 | 100.3 | 390.5 | 1.36 |
| 2002 | 53 | 135 | 251 | 121 | 562 | 1.44 |
| 2003 | 81 | 210 | 364 | 103 | 742 | 1.32 |
| 2004 | 140 | 314 | 602 | 139 | 1195 | 1.61 |
| 2005 | 312.5 | 472.6 | 833 | 153 | 1771 | 1.48 |
| 2006 | 687 | 680 | 926.9 | 179.6 | 2474 | 1.40 |
| 2007 | 1484 | 1063 | 937 | 269 | 3753 | 1.52 |
| 2008 | 3440 | 1949 | 1268 | 399 | 7056 | 1.88 |
| 2009 | 6627 | 1930 | 1508 | 595 | 10660 | 1.51 |

### 2. Cost of solar power

129. According to Sam Baldwin, Director of the Office of Energy Efficiency and Renewable Energy, U.S. DOE in a presentation on 6/2/05 the levelized cost of electricity (LCOE) from solar in 1996 was $0.25/kwh. [Petitioners' Exhibit #56, slide 13 of presentation.] However, as seen in Fig. 1 of Baldwin, the cost of solar modules has been dropping rapidly, driving down the LCOE from solar. In addition, installation costs are being reduced and larger projects are being built that also drive down the costs of solar. The latest data and projections are given in the graph from Deutsche Bank in 2009. [Petitioners' Exhibit #57, Deutsche Bank presentation by Steven O'Rourke.] The data and projections show that by 2014 the lowest cost solar electricity will be $0.15 / kWh

and by 2017 the cost of solar electricity will be equivalent to conventionally generated electricity.

130. Again, it is ironic that the lowest cost producer of solar modules is First Solar in Perrysburg, OH. First Solar has announced that their module manufacturing cost is $0.75/peak watt. A solar power facility requires mounting racks and inverters to convert the DC power into AC. This balance of systems must be added to the module cost. However, with the standard 20-25 year warranty offered by module manufacturers, the levelized cost of electricity from a large, utility-scale installation in Nevada of First Solar panels reached grid parity in 2008 with a generating cost of 7.5 cents per kilowatt-hour.[Petitioners' Exhibit #58, *Greentech Media*, December 12, 2008]

131. Thus, the contention of prohibitively high solar electricity costs by FENOC in the Environmental Report of their License Renewable Application is badly outdated and does not account for the rapid decrease in costs since the 1996 data they have cited.

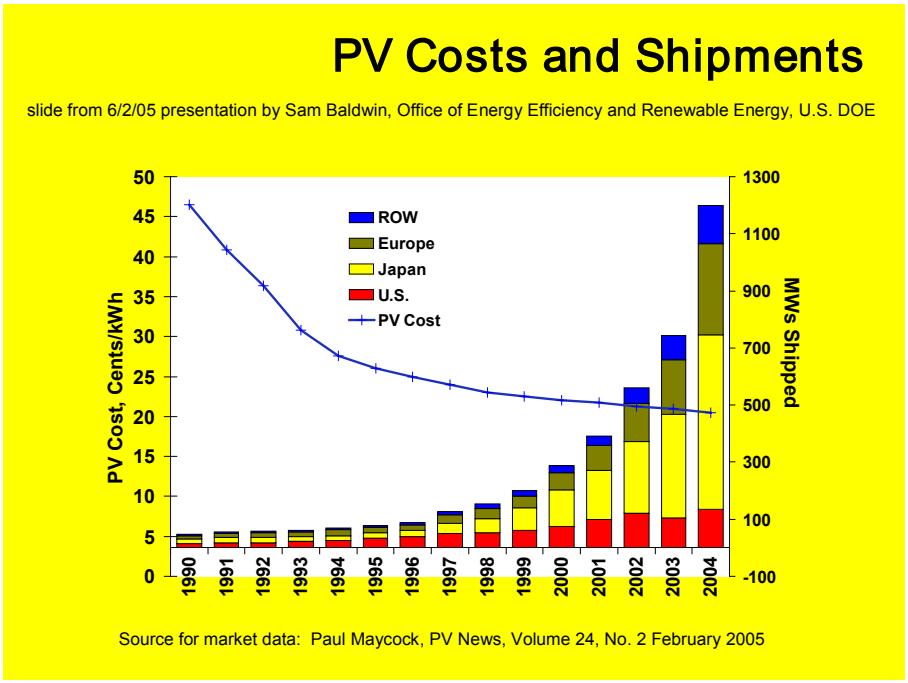
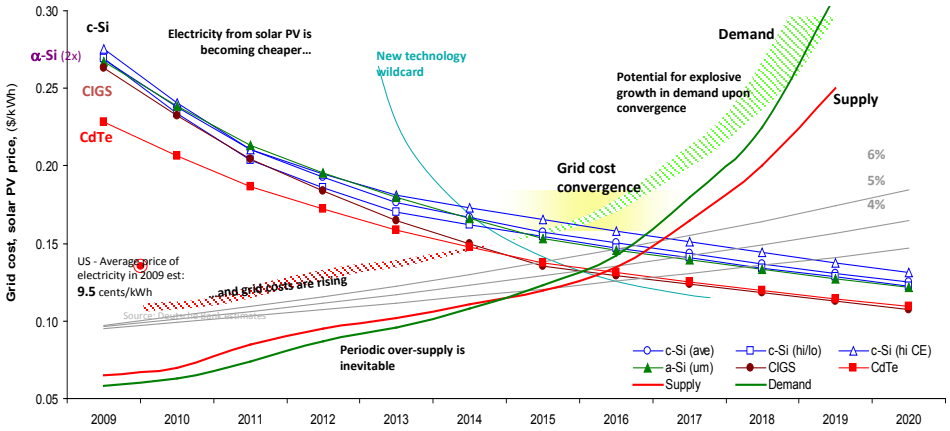



Fig. 1. from Petitioners'Exhibit #56.

# Electricity Price Convergence – 5 to 6 Years

## Solar PV industry – long-term outlook




**Definitions:**

*First Generation PV*: bulk crystalline silicon (monocrystalline, multicrystalline)
*Second Generation PV*: Inorganic thin films (CdTe, a-Si:H, a-SiGe, nc-Si:H, CIGS)
*Third Generation PV*: nanostructures, organic/hybrid, advanced concepts

**Source: Deutsche Bank 2009**

Fig. 2. from Petitioners' Exhibit #57

### 3. Suitability of solar in the FENOC territory.

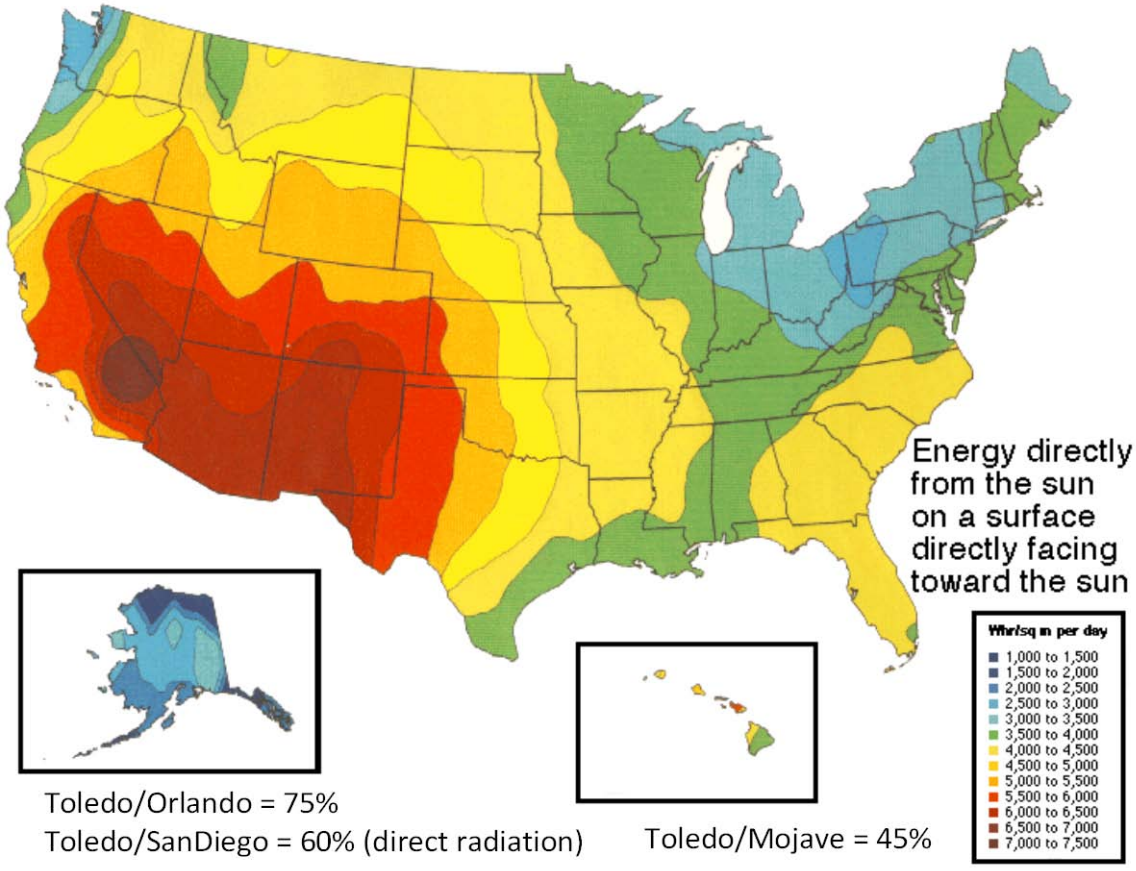
132. In its application dismissing the potential of solar power, FENOC appears to rely almost exclusively on data from [Petitioners' Exhibit #53 (NUREG-1437)]. NUREG-1437 states: "The most promising geographic area for the expansion of PV systems is the West; the Midwest and South have some potential." However this claim is based on the common misperception that solar energy from flat modules, the most common type of photovoltaic panel, is only generated from direct radiation from the sun, so-called "direct solar" irradiance. However, all flat panel modules collect light quite well over much of the sky. Thus the appropriate measure of photovoltaic solar energy production is the full-sky or global radiation. The distinctions are clear from two solar maps of the U.S. included below.

133. The first map on the next page (Fig. 3) [Petitioners' Exhibit #59] from the NREL web site, shows that much of Ohio and other First Energy territory receives about 45 to 50% of the direct solar radiation that might be received in the very best area of the U.S., namely the Mojave Desert in south-eastern California and southern Nevada. However, the appropriate resource is "direct plus indirect" solar radiation or the global solar radiation which is shown in the second map. Considering full sky radiation, the ratio of insolation between northern Ohio and the Mojave Desert is about 67%. This ratio is the appropriate comparison for the amount of electricity that would be generated by a large or small array of flat solar panels. This is shown in the second map, Fig. 4. [Petitioners' Exhibit #60.]

134. Considerations of economic potential for FENOC customers would need to include the cost of long distance transmission of power from the southwestern U.S. In addition, the absence of adequate capacity extremely high voltage transmission lines would provide some barriers to dependence on remote generation of solar power.

135. In recognition of the viability of solar power with current incentives and its growing cost-effectiveness even without incentives, FENOC's neighboring utility AEP [American Electric Power] has completed a 10 MW solar farm near Upper Sandusky, Ohio. This solar power farm is adjacent to FENOC service territory with equivalent or higher solar irradiance.

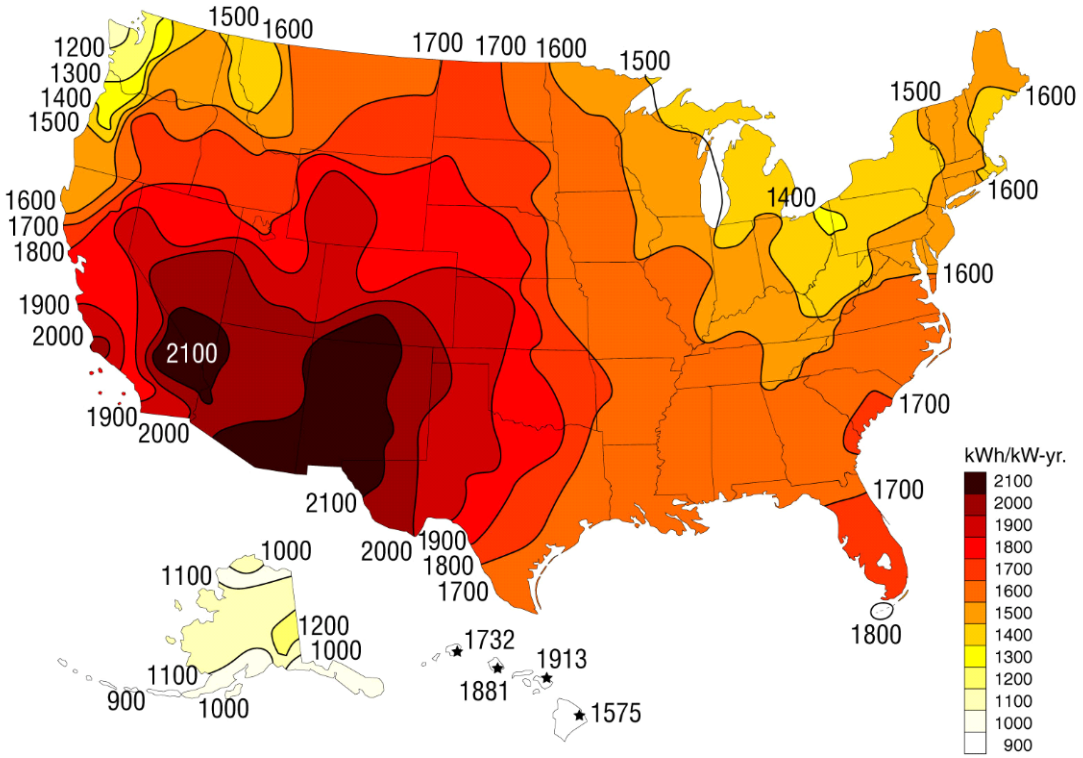
# Average Daily Solar Radiation 1961-1990




Toledo/Orlando = 75%

Toledo/SanDiego = 60% (direct radiation)

Toledo/Mojave = 45%






Toledo/Orlando = 86%  Toledo/San Diego = 79%  (full sky radiation)

136. **Is there enough suitable roof area for BIPV?** This question has been addressed in a comprehensive study by Paidipati, Frantzis, Sawyer, and Kurrasch of Navigant Consulting. Paidipati, *et al* [J. Paidipate, L. Frantzis, H. Sawyer, and A. Kurrasch, "Rooftop Photovoltaics Market Penetration Scenarios," Subcontract Report, NREL/SR-581-42306.] [Petitioners' Exhibit #61] analyzed rooftop data on a state-by-state basis, including the "PV access factors" of tree shading, other shading, structural soundness, orientation, etc, and concluded that, on-average the access factor for PV is about 25% for residential rooftops and 60% for commercial rooftops. They then used various business models with a variety of incentives from "business-as-usual," to various incentivized policies. Their "best case, Solar America Initiative" incentivized results are shown in Table 2.

137. Note that this study does not indicate the limits of rooftop availability but only Paidipate, et al's best judgment of the BIPV penetration of the utility market that could be achievable by 2015. The result shows that about 3.5% of the electricity market could be provided by rooftop PV already by 2015 under suitable incentives. This translates into a cumulative installation of 24,712 MW of PV on rooftops by 2015 and would generate jobs for more than 33,000 full-time installers by 2015.

138. A large amount of additional rooftop space is available for more PV. This study was focused on the small fraction that could be installed under various incentive models. The important consideration is that PV installations on rooftops require no separately

dedicated land area, contrary to the claim by FENOC in the Environmental Report that "The land requirement for solar technology is large." A much larger opportunity for solar installations is on highway right-of-ways. An example of this is the installation of solar power for the Toledo Veterans Skyway Bridge on overpass embankments nearby. This was reported in the Toledo Blade, April 14, 2010. The installations have now been completed.

Table 2. Nationwide PV Penetration for the Best Incentive Case, SAI System Pricing. [From Paidipate, et al., Petitioners' Exhibit #61]

| Year | Annual Installations [MW] | Cumulative Installation [MW] | Installers Required [FTE] | Market Penetration [%] |
|---|---|---|---|---|
| 2007 | 251 | 733 | 1,864 | 0.16% |
| 2008 | 1,237 | 1,970 | 7,793 | 0.41% |
| 2009 | 622 | 2,593 | 4,328 | 0.51% |
| 2010 | 1,187 | 3,780 | 7,974 | 0.70% |
| 2011 | 1,496 | 5,276 | 9,357 | 0.92% |
| 2012 | 2,383 | 7,659 | 13,868 | 1.27% |
| 2013 | 2,807 | 10,466 | 14,989 | 1.64% |
| 2014 | 6,724 | 17,190 | 32,780 | 2.55% |
| 2015 | 7,522 | 24,712 | 33,208 | 3.47% |

## 4. Solar power's $CO_2$ emission footprint

139. Although nuclear power has low carbon dioxide emissions during power production, the carbon emissions from the overall fuel and power plant lifecycle are significant. An analysis of more than 100 lifecycle emission studies was done by B. Sovacool and published in Energy Policy **36**, 2950-2963 (2008).[Petitioners' Exhibit #1] The best estimate of emissions from nuclear power plants was given as 66 grams of $CO_2$ equivalent per kWh. These emissions come, e.g., mostly from the mining, milling, enrichment, waste management and disposal and decommissioning. Solar power also has no emissions during power generation. Again there are some emissions during manufacture, mining, milling and purification. Several groups have analyzed emissions from PV power, most recently Kim and Fthenakis. [Petitioners' Exhibit #62, V.M.

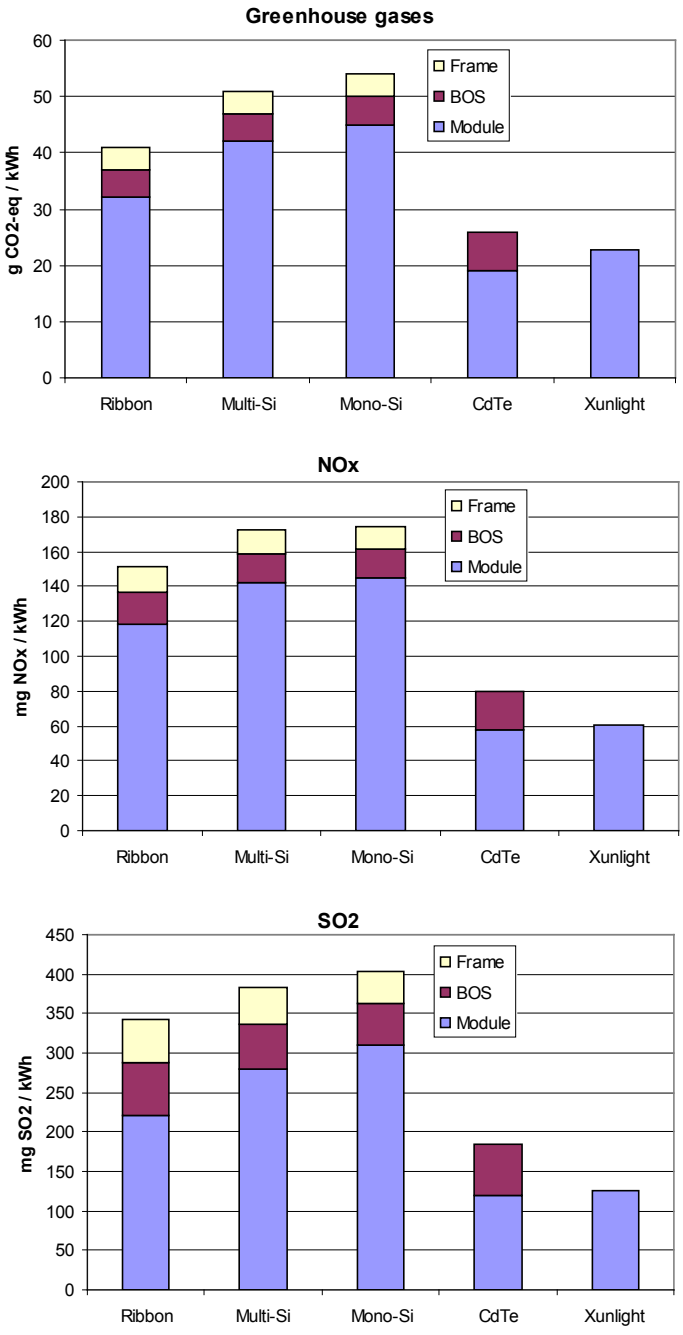


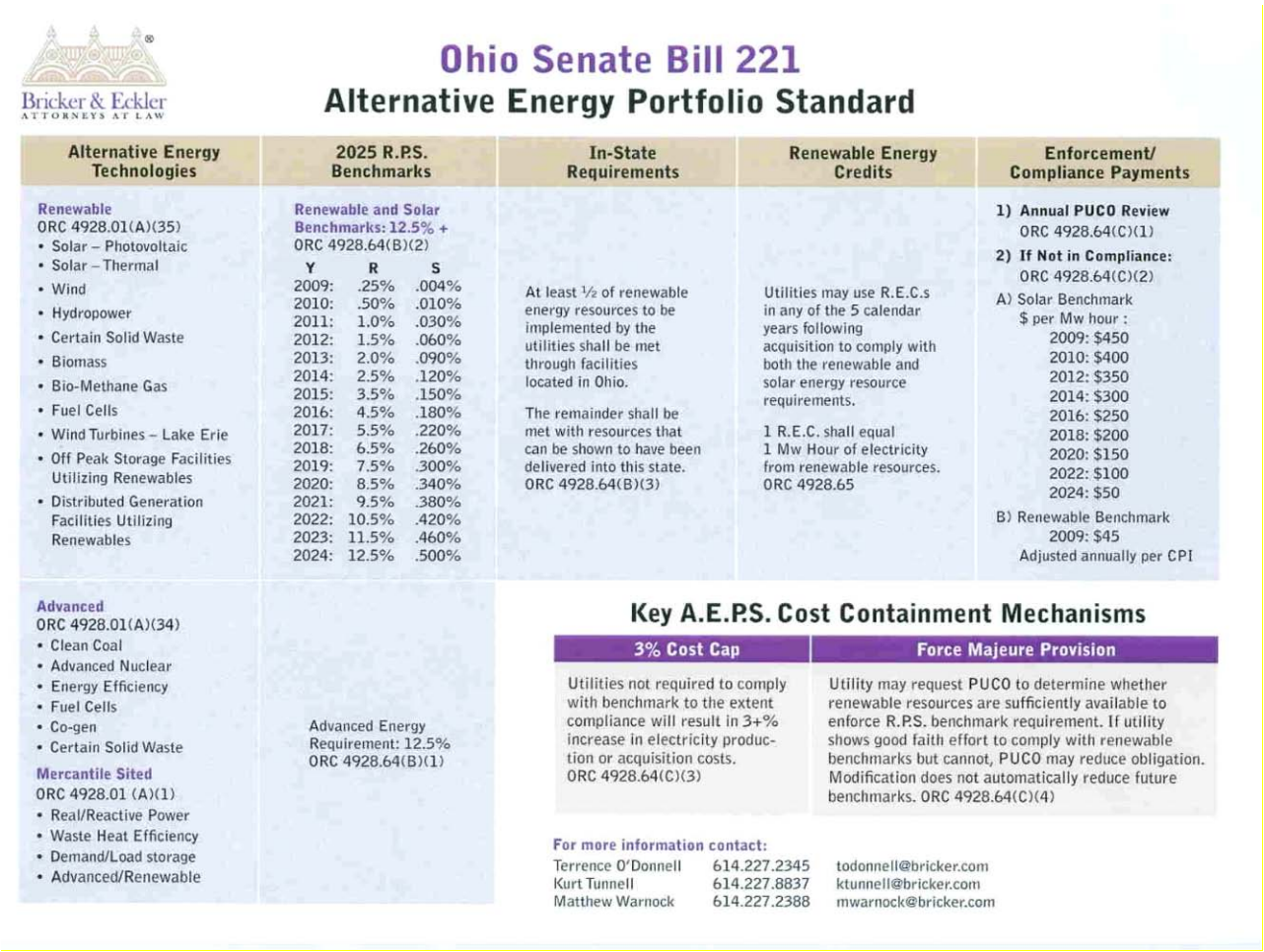

Fig. 5. From Petitioners' Exhibit 62

Fthenakis, H.C. Kim, and E. Alsema, Environ. Sci. Technol. 42, 2168-2174 (2008).] Their data are summarized in the figure adjacent and include emissions from all energy sources including from mining, purification, materials suppliers and the electricity used in module production. For energy used in solar module production, Kim and Fthenakis used the average generation mix currently in the U.S. Their results show even lower $CO_2$ equivalent emissions from solar power than from nuclear.

### 5. State of Ohio mandates for solar and other renewable power generation

140. Starting in 2009, the electric utilities in Ohio are required, by Senate Bill 221 which became State law in 2008 [Petitioners' Exhibit #63, Ohio Revised Code, O.R.C. 4928.64-.66), to meet benchmarks that increase year by year to a total fraction of 25% of advanced energy by 2025. Half of this, or 12.5%, must come from renewable sources including at least 0.5% from solar. The progressive mandates are summarized in Table 3 below assembled by the law firm of Brickler and Eckler. [Petitioners' Exhibit #64]

141. Table 3. Summary of Ohio's Alternative Energy Portfolio Standard



Bricker & Eckler
ATTORNEYS AT LAW

# Ohio Senate Bill 221
## Alternative Energy Portfolio Standard

| Alternative Energy Technologies | 2025 R.P.S. Benchmarks | In-State Requirements | Renewable Energy Credits | Enforcement/ Compliance Payments |
|---|---|---|---|---|
| **Renewable**<br>ORC 4928.01(A)(35)<br>• Solar – Photovoltaic<br>• Solar – Thermal<br>• Wind<br>• Hydropower<br>• Certain Solid Waste<br>• Biomass<br>• Bio-Methane Gas<br>• Fuel Cells<br>• Wind Turbines – Lake Erie<br>• Off Peak Storage Facilities Utilizing Renewables<br>• Distributed Generation Facilities Utilizing Renewables | **Renewable and Solar Benchmarks: 12.5% +**<br>ORC 4928.64(B)(2)<br>Y R S<br>2009: .25% .004%<br>2010: .50% .010%<br>2011: 1.0% .030%<br>2012: 1.5% .060%<br>2013: 2.0% .090%<br>2014: 2.5% .120%<br>2015: 3.5% .150%<br>2016: 4.5% .180%<br>2017: 5.5% .220%<br>2018: 6.5% .260%<br>2019: 7.5% .300%<br>2020: 8.5% .340%<br>2021: 9.5% .380%<br>2022: 10.5% .420%<br>2023: 11.5% .460%<br>2024: 12.5% .500% | At least ½ of renewable energy resources to be implemented by the utilities shall be met through facilities located in Ohio.<br><br>The remainder shall be met with resources that can be shown to have been delivered into this state.<br>ORC 4928.64(B)(3) | Utilities may use R.E.C.s in any of the 5 calendar years following acquisition to comply with both the renewable and solar energy resource requirements.<br><br>1 R.E.C. shall equal 1 Mw Hour of electricity from renewable resources.<br>ORC 4928.65 | **1) Annual PUCO Review**<br>ORC 4928.64(C)(1)<br>**2) If Not in Compliance:**<br>ORC 4928.64(C)(2)<br>A) Solar Benchmark<br>$ per Mw hour :<br>2009: $450<br>2010: $400<br>2012: $350<br>2014: $300<br>2016: $250<br>2018: $200<br>2020: $150<br>2022: $100<br>2024: $50<br>B) Renewable Benchmark<br>2009: $45<br>Adjusted annually per CPI |
| **Advanced**<br>ORC 4928.01(A)(34)<br>• Clean Coal<br>• Advanced Nuclear<br>• Energy Efficiency<br>• Fuel Cells<br>• Co-gen<br>• Certain Solid Waste<br>**Mercantile Sited**<br>ORC 4928.01 (A)(1)<br>• Real/Reactive Power<br>• Waste Heat Efficiency<br>• Demand/Load storage<br>• Advanced/Renewable | Advanced Energy Requirement: 12.5%<br>ORC 4928.64(B)(1) | | | |

### Key A.E.P.S. Cost Containment Mechanisms

| 3% Cost Cap | Force Majeure Provision |
|---|---|
| Utilities not required to comply with benchmark to the extent compliance will result in 3+% increase in electricity production or acquisition costs.<br>ORC 4928.64(C)(3) | Utility may request PUCO to determine whether renewable resources are sufficiently available to enforce R.P.S. benchmark requirement. If utility shows good faith effort to comply with renewable benchmarks but cannot, PUCO may reduce obligation. Modification does not automatically reduce future benchmarks. ORC 4928.64(C)(4) |

**For more information contact:**

| | | |
|---|---|---|
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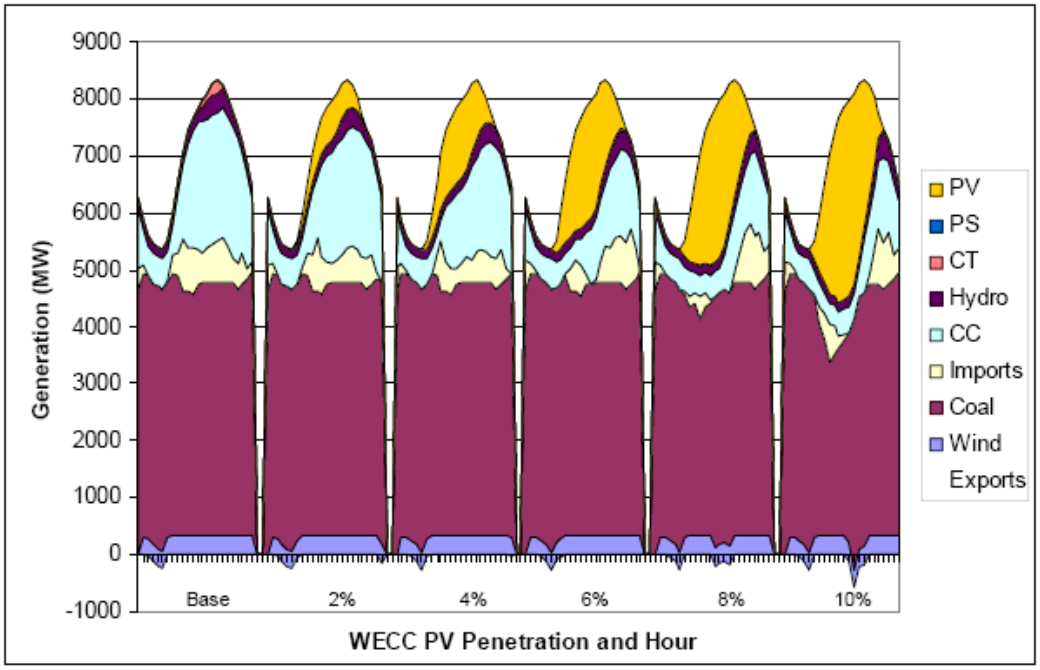
142. It should be noticed that "advanced nuclear" can be used to satisfy the State requirement for some of this mandate, up to12.5%. However, an extension of operation of the current Davis-Besse facility will not satisfy this requirement. By contrast, solar power has a specific set-aside requirement. One of the important features of SB221 is that the costs to a utility such as FENOC are permitted to be passed on to the ratepayers. However, if First Energy fails to meet the mandated step requirements in any given year, it will be assessed a substantial penalty (for 2010 the penalty is $400/MWh) that cannot be passed on to the customer.

143. Thus, were FENOC to choose the solar power alternative to a Davis-Besse license extension, it would simultaneously satisfy the State of Ohio mandate included in SB221. In fact, the full renewable energy mandate of 12.5% by 2025 is substantially greater than the 8.3% fraction of power currently supplied by Davis-Besse. (FENOC Environmental Report, page 7.1-3)

### 6. Solar power meets electricity time-of-day demand curve

144. Solar power naturally is an intermittent resource, but it carries an important advantage from the fact that it closely follows the demand curve for electricity. Denholm, Margolis, and Milford (NREL/TP-581-42305) [Petitioners' Exhibit #65, P. Denholm, R. Margolis, and J. Milford, "Production Cost Modeling for High Levels of PV Penetration"] in their 2008 study have provided an analysis for Colorado that includes the details of the state's fuel mix and how it changes during seasons and time-of-day. This analysis for Colorado can illustrate similar issues for the territory of FENOC, although the mix of power sources is different. For example much more coal is used by FENOC and some nuclear. Figure 6 below shows that PV contributes strongly to reducing the demand on fuels used for peak power generation because PV contributes near the peak of the demand curve. Whether the PV penetration is 2% or 10%, PV always reduces the peak demand. With a PV penetration of 10% of overall electricity generation, the peak demand is reduced by about 12% and solar will contribute 13.5% of the annual load. This peak demand typically draws on the most expensive fuel sources such as gas turbines in Colorado.




Simulated Dispatch in Colorado for a Summer Day in 2007 with Various PV Penetration Scenarios. [CT=combustion gas turbine, CC=combined cycle gas turbine, PS=pumped hydro storage] [from Petitioners' Exhibit #65]

145. Displacement of coal for electricity generation has the greatest direct *environmental* benefits, but some analysts argue that displacing natural gas has the greater *economic* benefit because it is very useful as a transportation fuel and in the production of chemical feedstocks. PV is particularly effective at displacing natural gas for electricity generation. Thus, as shown in Claim 7 below, PV will replace natural gas as a peak load power source releasing natural gas to be used more effectively in combination with underground compressed air storage for load smoothing.

146. Considerations of time-of-day availability of PV and details of the fuel mix will vary from state-to-state. On average the GHG [green house gas] emissions will be less than derived without consideration of these factors. However, it is likely that carbon cap and

trade policies will be implemented during the time frame of the requested Davis-Besse license extension and these would place a premium on generation sources with the lowest emissions. This would further favor solar power.

**7.Energy storage for solar—underground pressurized air caverns**

147. There are many technologies suitable for storage of energy produced by solar power. Of these, pumped water into existing reservoirs has been used for many years. Others such as batteries and water electrolysis combined with hydrogen fuel cells remain expensive for utility-scale operations. However, one of the least expensive and widely available is the use of compressed air storage in underground caverns (e.g., old natural gas reservoirs). This has been discussed by Ken Zweibel, James Mason and Vasilis Fthenakis. [Petitioners' Exhibit #66. Scientific American, January 2008, pp. 64-73.] We quote from their discussion of "Pressurized Caverns" (p. 68, 69):

> The great limiting factor of solar power, of course, is that it generates little electricity when skies are cloudy and none at night. Excess power must therefore be produced during sunny hours and stored for use during dark hours. Most energy storage systems such as batteries are expensive or inefficient.
>
> Compressed-air energy storage has emerged as a successful alternative. Electricity from photovoltaic plants compresses air and pumps it into vacant underground caverns, abandoned mines, aquifers and depleted natural gas wells. The pressurized air is released on demand to turn a turbine that generates electricity, aided by burning small amounts of natural gas. Compressed-air energy storage plants have been operating reliably in Huntorf, Germany, since 1978 and in McIntosh, Ala., since 1991. The turbines burn only 40 percent of the natural gas they would if they were fueled by natural gas alone, and better heat recovery technology would lower that figure to 30 percent. Studies by the Electric Power Research Institute in Palo Alto, Calif., indicate that the cost of compressed-air energy storage today is about half that of lead-acid batteries. The research indicates that these facilities would add three or four cents per kWh to photovoltaic generation, bringing the total 2020 cost to eight or nine cents per kWh.

> Electricity from photovoltaic farms in the Southwest would be sent over high-voltage DC transmission lines to compressed-air storage facilities throughout the country, where turbines would generate electricity year-round. The key is to find adequate sites. Mapping by the natural gas industry and the Electric Power Research Institute shows that suitable geologic formations exist in 75 percent of the country, often close to metropolitan areas. Indeed, a compressed-air energy storage system would look similar to the U.S. natural gas storage system. The industry stores eight trillion cubic feet of gas in 400 underground reservoirs. By 2050 our plan would require 535 billion cubic feet of storage, with air pressurized at 1,100 pounds per square inch. Although development will be a challenge, plenty of reservoirs are available, and it would be reasonable for the natural gas industry to invest in such a network."

148. In their analysis above, Zweibel, et al, focused on the use of solar in the U.S. southwest and is predicated on the establishment of new, efficient long-distance transmission infrastructure. However, their analysis is valid also for regional energy storage with regional solar power.

149. In fact, the importance of compressed air energy storage in underground reservoirs in the First Energy service territory was recognized by First Energy very recently with their announcement of the purchase of the Norton Energy Storage Project in Ohio. [Petitioners' Exhibit #54, FE Press Release, November 23, 2009]. We quote from that press release:

> AKRON, Ohio – FirstEnergy Generation Corp., a subsidiary of Akron, Ohio-based FirstEnergy Corp. (NYSE: FE) today announced that it has purchased the rights to develop a compressed-air electric generating plant on a 92-acre site in Norton, Ohio, from CAES Development Company, LLC. The transaction includes rights to a 600-acre underground cavern, formerly operated as a limestone mine, that is ideal for energy storage technology.
>
> "The compressed-air technology envisioned at this site would essentially operate like a large battery, storing energy at night for use during the day when it is needed," said Anthony J. Alexander, president and chief executive officer of FirstEnergy. "Because many renewable energy sources – such as wind – are intermittent, they don't always produce power when electricity demand is high. The energy storage aspects of this

> project would provide a way to harness renewable energy to be used when customers need it, making this project a key component to our region's overall renewable energy strategy."
>
> ****
> "A compressed-air energy storage project of this size has the potential to be a major step in advancing electricity storage and balancing load demand," said Arshad Mansoor, vice president of Power Delivery and Utilization at the Electric Power Research Institute. "This could be a key component in integrating large-scale intermittent renewables onto the nation's grid system."
>
> The company is evaluating its options related to the project, but has not yet committed to development scope or timing. However, an initial phase could involve installing two to four units capable of generating a minimum of 268 megawatts (MW) of electricity. With 9.6 million cubic meters of storage, the Norton Energy Storage Project has the potential to be expanded to up to 2,700 MW of capacity.
>
> Currently, there are two commercial-scale compressed air electric generating facilities: a 110 MW plant in McIntosh, Ala., operated by PowerSouth Cooperative that began service in 1991; and a 290 MW facility in Bremen, Germany, that has been in operation since 1978. While there are other compressed-air projects under development, none is expected to be comparable in size and scope to the Norton facility.

150. As detailed in the press release, this single facility has the capacity to provide storage for up to 2700 MW of capacity which is about three times the size of the 908 MW Davis-Besse nuclear plant.

151. Thus, it is our contention that wide-scale installation of solar power combined with a storage facility such as the Norton Project, already acquired by First Energy, is a very viable alternative to the license extension for 20 more years of operation of the Davis-Besse nuclear facility. We have also shown that compressed air storage in underground caverns is a very cost-effective technology for energy storage to complement solar power. In fact First Energy has already purchased a facility in Ohio with more than three times the capacity of Davis-Besse. Furthermore, in Ohio, the Advanced Energy Portfolio

Standard enacted by Senate Bill 221 provides significant incentives to First Energy and FENOC to develop solar power as a major part of its renewable energy portfolio.

**Legal Arguments in Support of Contention 2**

152. NEPA (42 U.S.C. §§ 4321-37) requires the NRC to examine environmental impacts that could be caused by its discretionary decision to allow a license extension to FENOC. NEPA obliges a federal agency to consider every significant aspect of the environmental impact of a proposed action and (2) ensure that the federal agency will inform the public that it has indeed considered environmental concerns in its decision-making process. *Baltimore Gas & Elec. Co. v. Natural Resources Defense Council*, 462 U.S. 87, 97 (1983); *see also* 42 U.S.C. § 4332(2)(c) (identifying requirements of an EIS).

153. The FENOC Environmental Report must contain "any new and significant information regarding the environmental impacts of license renewal of which the applicant is aware." 10 C.F.R. § 51.53(c)(3)(iv). Respecting "Category 2" issues, (1) the applicant must make a plant-specific analysis of environmental impacts in its Environmental Report, 10 C.F.R. § 51.53(c)(3)(ii), and (2) NRC Staff must prepare a Supplemental Environmental Impact Statement (SEIS), id. § 51.95(c). Contentions implicating Category 2 issues ordinarily are deemed to be within the scope of license renewal proceedings. *See Matter of Amergen Energy Co.* (Oyster Creek), 50-0219-LP, 2006 NRC Lexis 195 (Feb. 27, 2006). Although the environmental review mandated by NEPA need not include all theoretically possible environmental effects arising out of an action, the NRC is obliged to make reasonable forecasts of the future. *Northern States*

*Power Co.* (Prairie Island Nuclear Generating Plant, Units 1 & 2), ALAB-455, 7 NRC 41, 48, 49 (1978); *Hydro Res., Inc*., LBP-04-23, 60 NRC 441, 447 (2004), *review declined*, CLI-04-39, 60 NRC 657 (2004).

154. In the context of the required NEPA review to ascertain whether there are less harmful alternatives to the proposed federal license extension of Davis-Besse, the renewable energy alternative of solar photovoltaic is demonstrably unique, significant, and compelling when compared to the proposed Davis-Besse relicensing activity because such alternative can be demonstrated to have significantly less adverse human environmental impacts than nuclear power. This unique quality is owed to the abundant availability of the energy source and the sheer reality that it does not have a carbon producing fuel cycle as does uranium. The solar alternative further does not have the radiological impacts and risks of the uranium fuel chain, which is an inevitable part of the environmental impacts associated with a 20 year license extension at Davis-Besse.

155. The latest facts, then, depict significant and accelerating increases in use of solar photovoltaic energy as a generating source in 2010, and suggest that nuclear will soon be passed by because of safety, waste disposal and its comparative economic disadvantages. In light of the evidence produced herein by Petitioners', FENOC's depiction in the ER of out-of-date data and Applicant's fundamental misunderstanding of the technological concepts which are rapidly altering the prospects for solar power threaten 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).

156. NEPA requires: (1) that alternatives be presented in comparative form to provide meaningful choices to decision-makers and the public (40 C.F.R. §1502.14); (2) that "substantial treatment" be devoted to each alternative considered in detail, to enable reviewers to evaluate the comparative merits of each alternative (40 C.F.R. § 1502.14(b)); and (3) that during the course of the NEPA process, no actions go forward that have adverse environmental impacts or would limit the choice of reasonable alternatives (40 C.F.R. § 1506.1). Agencies must, to the fullest extent possible, "[s]tudy, develop, and describe appropriate alternatives to recommended courses of action in any proposal. . . " 42 U.S.C. § 4322(2)(E); *Idaho Conservation League v. Mumma*, 956 F.2d 1508, 1519-20 (9th Cir. 1992). There must be examination of every alternative within the "nature and scope of the proposed action," *California v. Block*, 690 F.2d 753, 761 (9th Cir. 1982), "sufficient to permit a reasoned choice." *Methow Valley Citizens Council v. Regional Forester*, 833 F.2d 810, 815 (9th Cir. 1987). "The existence of a viable, but unexamined alternative renders an environ-mental impact statement inadequate." *Idaho Conservation League, supra*. 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, 93 (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).

157. When developing reasonable alternatives for NEPA purposes, the scope of

alternatives must include the alternatives noted above and those reasonable alternatives outside the agency's jurisdiction (40 CFR § 1502.14(c)). Consequently, these alternatives "…include those that are practical or feasible ways from the technical and economic standpoint and using common sense, rather than simply desirable from the standpoint of the applicant." *CEQ's Forty Most-Asked Questions Concerning CEQ's National Environmental Policy Act Regulations*, Question 2a. Petitioners' factual presentation exposes significant deficiencies in the Environmental Report, which NEPA requires be corrected prior to serious consideration of the ER under NEPA.

## CONTENTION 3: SOLAR AND WIND IN COMBINATION

### The Relicensing GEIS Is Stale, Dated and NEPA Non-Compliant; Commercial Wind And Solar Photovoltaic Baseload Power Should Be Considered Under NEPA as a Single, Combined-Source Alternative

158. NEPA further requires in the consideration of alternatives to the license extension for Davis-Besse a combination of commercial wind-generated baseload power, combined with commercial solar photovoltaic-generated baseload power. Petitioners incorporate as though rewritten fully herein the facts, arguments, legal points and authorities and rationales contained in Contentions 1 and 2 of this Petition.

### Legal Argument in Support of Admission of the Contention

159. Petitioners submit that the requirement that "discrete" power generating sources must be compared to the nuclear option on their sole merits and not in combination with any other alternative is unfair and a denial of due process under NEPA. It is unfair because as wind and photovoltaic sources proliferate and become directly competitive at the cost per installed

kilowatt, there is a strong likelihood that both will (indeed, are) experiencing dramatic expansion. Hence market realities seem to be excluded from serious NEPA consideration as a matter of agency policy, something which the Commission affirmed just two years ago. *Exelon Generation Co., LLC* (Early Site Permit for Clinton ESP Site), CLI-05-29, 62 NRC 801, 806 (2005); *see also Entergy Nuclear Operations, Inc.* (Indian Point, Units 2 and 3), LBP-08-13, 68 NRC 43, 205 (2008) (neither the NRC nor the applicant have the mission (or power) to implement a general societal interest in energy efficiency).

160. It is incumbent on the Commission to not indulge in a self-imposed ignorance, the turning of a blind eye or actual censure of expert opinion and material fact to define otherwise "reasonable alternatives" out of existence. "NEPA's requirement for forecasting environmental consequences far into the future implies the need for predictions based on existing technology and those developments which can be extrapolated from it." *Natural Resources Defense Council, Inc. v. Nuclear Regulatory Commission (Vermont Yankee I*), 547 F.2d 633, 637, 6 ELR 20615 (D.C. Cir. 1976), *rev'd on other grounds sub nom. Vermont Yankee Nuclear Power Corp. v. Natural Resources Defense Council, Inc.*, 435 U.S. 519, 8 ELR 20288 (1978). Similarly, FENOC is not free to favor legitimate technical information over bad. *See, Seattle Audubon Society v. Espy*, 998 F.2d 699, 703-04 (9th Cir. 1993) (overturning decision which "rests on stale scientific evidence, incomplete discussion of environmental effects . . . and false assumptions").

161. NRC regulation`s (10 C.F.R. § 51.45(b)(3)) requires that "[t]he discussion of alternatives shall be sufficiently complete to aid the Commission in developing and exploring, pursuant to section 102(2)(E) of NEPA, 'appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources.'

To the extent practicable, the environmental impacts of the proposal and the alternatives should be presented in comparative form...." It appears from this regulation that it is obligatory for FENOC as applicant to combine solar and wind alternatives into a single renewable power generation source for consideration under NEPA using, of course, up-to-date data and assumptions about both, such as have been presented in this Petition.

162. The NRC announced years ago that it intended to review and update its GEIS every decade: "On a 10-year cycle, the Commission intends to review the material in this appendix and update it if necessary." *Footnote 2, 10 CFR Part 51, Subpt. A, App. B* at 47. Yet despite the fact that in the intervening 14 years, many changes have emerged concerning the availability, fast-improving economics, and technological progress of energy alternatives and conservation strategies, there has been no review nor upgrade of the GEIS to address the realities of today's power generation market. Admittedly, there is a revised NUREG-1437 under consideration, but the same appears not to have been finalized by the NRC. See http://www.nrc.gov/reading

-rm/doc-collections/nuregs/staff/sr1437/r1/v2/index.html . The public comment period on this new document closed in late April 2010, prior to the notice of FENOC's application for the Davis-Besse license renewal. If the revised Generic EIS is finalized as promulgated, the objections raised by Intervenors in this Petition concerning the pressing need to revisit Category 1 issues will not have been favorably redressed via regulation.

163. The 1996 Generic EIS' parameters must be deemed legally void under NEPA's requirement that "every significant aspect of environmental impact" be considered. *Baltimore Gas & Elec. Co. v. Natural Res. Def. Counsel, Inc.*, 462 U.S. 87, 97 (1983) (NEPA "places upon an

agency the obligation to consider every significant aspect of the environmental impact of a proposed action").

164. A 2005 Indian Point options analysis discussed how in practical terms the advance notice of retirement of Indian Point via NRC denial of license renewal, only 8 years in the future, would stimulate developers of competing energy sources to complete various projects which were contemplated or in some stage of development but not yet built:

> Project developers are keenly tuned to market dynamics in New York. They would realize that retiring IP would cause market energy and capacity values to increase across the downstate region. These price signals would be important, given IP's size and location, to encourage the development of new generation and/or transmission projects that would replace the lost capacity. These new generation projects could include decentralized and renewable resource options. If the retirement of IP were announced in advance, developers would be able to calculate the economic feasibility of their projects and pursue those that make financial sense in time to maintain the state's reliability requirement.

*Indian Point Retirement Options, Replacement Generation, Decommissioning/Spent Fuel Issues, and Local Economic/Rate Impacts*, prepared for the County of Westchester and the County of Westchester Public Utility Service Agency, by Levitan & Associates, Inc., June 9, 2005, pp. 30 and 31.

165. Petitioners suggest a similar effect would be visible across FENOC's region of interest: that over the coming 7 years, with the regulatory certainty there would be no more power generated

at Davis-Besse, that market forces would support a (continuation of the) boom that wind and solar photovoltaic will be delivering throughout much of the country. It is unques-tionably time to let the market decide.

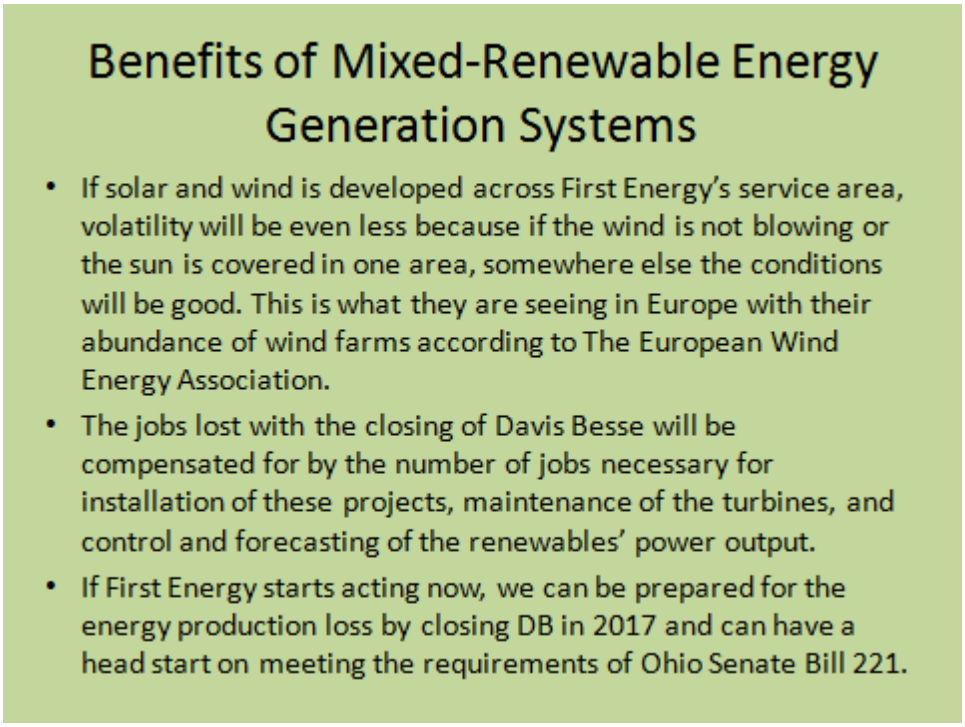
166. When an agency is identifying reasonable alternatives for NEPA purposes, the scope of reasonable alternatives includes alternatives outside the sponsor's and NRC's jurisdiction. 40 CFR 1502.14(c). These alternatives "…include those [alternatives] that are practical or feasible ways from the technical and economic standpoint and using common sense, rather than simply desirable from the standpoint of the applicant." *CEQ's Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations*, Question 2a. NEPA requires an applicant to look at feasible, nonspeculative, reasonable alternatives. The reasonable alternatives for license renewal proceedings must be feasible technically and available commercially. *Entergy Nuclear Operations, Inc.* (Indian Point, Units 2 and 3), LBP-08-13, 68 NRC 43, 205 (2008). Commercial wind and solar photovoltaic fulfill all of these criteria.

167. In sum, "when a reasonable alternative has been identified, it must be objectively consid-ered by the evaluating agency so as not to fall victim to 'the sort of tendentious decisionmaking that NEPA seeks to avoid.'" *Private Fuel Storage, L.L.C.* (Independent Spent Fuel Storage Installation), LBP-01-34, 54 NRC 293, 302 (2001), citing I-291 *Why? Association v. Burns*, 372 F. Supp. 223, 253 (D. Conn. 1974), *aff'd* 517 F.2d 1077 (2d Cir. 1975). A "hard look" for a superior alternative is a condition precedent to a licensing determination that an applicant's proposal is acceptable under NEPA. *Public Service Co. of New Hampshire (Seabrook Station, Units 1 & 2)*, ALAB-471, 7 NRC 477, 513 (1978).

168. FENOC has not undertaken the requisite "hard look" at commercial wind energy or solar as alternatives, as has previously been established by the evidence submitted in support of Contentions Nos. 1 and 2 of this Petition. Moreover, NRC's misunderstanding both of NEPA and of its own regulations concerning supplementation of the Davis-Besse EIS are unfairly and incorrectly denying serious consideration of the coming, combined effects of solar and wind within the FENOC ROI. The NEPA interpretation which limits comparisons of nuclear discretely to renewables ignores practical market realities even as it denies the public the due process assurances and environmental democracy which are NEPA guarantees. Petitioners urge that this contention be admitted for litigation.

169. Petitioners proffer Exhibit #67, "Notes from Davis-Besse re-licensing community hearing" by Kathryn Hoepfl, undergraduate student of physics at the University of Toledo. This is a summary of her presentation made at the People's Hearing on the Davis-Besse license extension held at St. Mark's Episcopal Church in Toledo on December 18, 2010. In her prepared remarks, conclusions, and graphs, Kathryn Hoepfl shows that a combination of wind power and solar power can readily replace not only the electricity output from Davis-Besse after 2017, but also the jobs. It should be mentioned that, given the long process of decommissioning at Davis-Besse post permanent shutdown, the extensive clean up of radioactive and toxic chemical contamination of the soil and groundwater as well as Lake Erie sediments needed, as well as the need to safeguard and secure Davis-Besse's on-site irradiated nuclear fuel indefinitely into the future, many jobs will persist at the site long after the reactor is closed.

170. Kathryn Hoepfl's conclusions are summarized in her following "closing points":




**CONTENTION FOUR: SEVERE ACCIDENT COST UNDERESTIMATED**

171. Contention Four: Severe Accident Cost Underestimated.

172. An Environmentally-related Contention Supported by Evidence. If a hearing is granted, Petitioners intend to bring forward expert testimony in support of this contention during succeeding stages of this proceeding. Key aspects of Contention Four are discussed individually under headlines below.

Petitioners acknowledge and give credit to Friends of the Coast and New England Coalition for their ground-breaking work on this Contention's conception, to which Petitioners are deeply indebted. Friends of the Coast and New England Coalition submitted their contention, "D. CONTENTION FOUR- SEVERE ACCIDENT COST UNDERESTIMATED" as part of their "PETITION FOR LEAVE TO INTERVENE, REQUEST FOR HEARING, AND ADMISSION OF CONTENTIONS**,** In the Matter

of FPL Energy Seabrook, LLC (NextEra, Inc) (Seabrook Station, Unit 1 – License Renewal Application)," submitted to the Secretary of the NRC on October 20, 2010 (Docket No. 50-443). However, Petitioners take sole responsibility for any errors of omission or commission contained in this contention.

173. Contention Four: 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.

174. Contention Four Is Within the Scope of These Proceedings: Under 10 CFR §2.309, a petitioner is required to show that the issue raised in the contention is within the scope of the proceeding. The National Environmental Policy Act, NEPA, 42 USC § 4332, is the "basic charter for protection of the environment." 40 CFR § 1500.1(a). Its fundamental purpose is to "help public officials make decisions that are based on understanding of environmental consequences, and take decisions that protect, restore and enhance the environment." 40 CFR § 1500.1(c). The NRC regulations implementing NEPA for Nuclear Plant license renewals are in 10 CFR §51(c) "Operating license renewal stage."

175. In its application for license renewal of Davis-Besse, FENOC was required under 10 CFR § 51 to provide an analysis of the impacts on the environment that will result if it is allowed to continue beyond the initial license. The primary method by which NEPA ensures that its mandate is met is the "action-forcing" requirement for preparation of an EIS. *Robertson v. Methow*

*Valley,* 490 U.S. at 348-49 (1989).The environmental impacts that must be considered in an EIS include those which are "reasonably foreseeable" and have "catastrophic consequences, even if their probability of occurrence is low." 40 CFR §1502.22(b)(1). The fact that the likelihood of an impact may not be easily quantifiable is not an excuse for failing to address it in an EIS. NRC regulations require that "to the extent that there are important qualitative considerations or factors that cannot be quantified, these considerations or factors will be discussed in qualitative terms." 10 CFR§51.71.

176. The regulation governing licensing renewals requires the Applicant FENOC for renewal to submit an Environmental Report. 10 CFR 51.53(c)(1). The NRC then uses the ER to prepare an EIS or Environmental Assessment, although it has an independent obligation to "evaluate and be responsible for the reliability" of the information. 10 CFR §51.70.

177. In a petition for intervention, contentions that seek compliance with NEPA must be based on the applicant's Environmental Report (ER). 10 CFR§2.309(f)(2). Under 10 CFR §51 (c)(3)(ii) the plant is required to provide an ER that contains analyses of the environmental impacts of the proposed action, including the impacts of refurbishment activities, if any, associated with license renewal and the impacts of operation during the renewal term for those issues identified as Category 2 issues in Appendix B to subpart A of that part. Under 10 CFR §51(c)(ii)(L) "if the staff has not previously considered severe accident mitigation alternatives for the applicant's plant in an environmental impact statement or related supplement or in an environmental assessment, a

consideration of alternatives to mitigate severe accidents must be provided." Severe Accidents are a Category 2 issue in Subpart B to Appendix A of section 51, which states "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." Contentions implicating Category 2 issues ordinarily are deemed to be within the scope of license renewal proceedings. *See In the Matter of Florida Power & Light Company (Turkey Point Nuclear Generating Plant, Units 3 and 4),* 54 NRC 3, 11-13 (hereinafter, *Turkey Point)*. As FENOC did not consider mitigation alternatives for accidents in the environmental impact statement of its original licensing, this issue is within the scope of this proceeding.

**THE ISSUE RAISED IN THE CONTENTION IS MATERIAL**

178. 10 CFR 2.309(f)(iv) requires that the Petitioner "Demonstrate that the issue raised in the contention is material to the findings the NRC must make to support the action that is involved in the proceeding." In discussing the materiality requirement, the Atomic Safety and Licensing Board considering the license renewal for Millstone Nuclear Power Station stated "In order to be admissible, the regulations require that all contentions assert an issue of law or fact that is material to the outcome of a licensing proceeding; that is, the subject matter of the contention must impact the grant or denial of a pending license application. Where a contention alleges a deficiency or error in the application,

the deficiency or error must have some independent health and safety significance." *In the Matter of Dominion Nuclear Connecticut, Inc.* (Millstone Nuclear Power Station, Units 2 and 3) Docket Nos. 50-336-LR, 50-423-LR ASLBP No. 04-824-01-LR July 28, 2004, p. 7. See Private Fuel Storage, L.L.C. (Independent Spent Fuel Storage Installation), LBP-98-7, 47 NRC 142, 179-80 (1998), aff'd in part, CLI-98-13, 48 NRC 26 (1998). The deficiency highlighted in this contention has enormous independent health and safety significance. By underestimating the cost of a severe accident in its SAMA analysis FENOC incorrectly discounts possible mitigation alternatives. This could have enormous implications for public health and safety because a potentially cost effective mitigation alternative might not be considered that could prevent or reduce the impacts of that accident. Petitioners allege the Environmental Report's SAMA analysis is deficient and the deficiency could significantly impact health and safety.

**THERE IS A SUBSTANTIAL BASIS FOR THE CONTENTION**

**179.** The ER is required to include "a consideration of alternatives to mitigate severe accidents (SAMA)." 10 C.F.R. 51.53 (c)(3)(ii)(L). That analysis depends on an accurate calculation of the cost of a severe accident in order to have a base line against which to measure proposed mitigation measures. However, FENOC's SAMA analysis for Davis-Besse instead minimized costs likely to be incurred in a severe accident, but this appears not to be justified. Each of the following, individually and together with one or more of the others, improperly minimized costs likely to result in a severe accident:

a. 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, the consequence figures appeared minimal.

b. Minimization of the potential amount of radioactive material released in a severe accident.

c. Use of an outdated and inaccurate proxy, the MACCS2 computer program, to perform its SAMA analysis.

d. 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.

e. 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.

f. 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, 95 percentile values.

## FENOC'S USE OF PROBABILISTIC MODELING UNDERESTIMATED THE TRUE CONSEQUENCES OF A SEVERE ACCIDENT

### BASIS

180. The regulatory requirement that nuclear plants perform a SAMA analysis states: "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." (Appendix B to Subpart A of 10 CFR §51.53.) Petitioners contend, contrary to NRC, that the "societal and economic impacts from severe accidents" are unlikely to be small for all plants and simply appear so by the use of methods that minimized consequences as set forth in this Motion.

181. In other words, ***even though*** the probability of a severe accident is so low that the impacts can be considered small, all plants must still consider alternatives to mitigate the consequences of those accidents.

182. In its ER, Entergy estimated the severe accident risk by using the Probabilistic Safety Analysis (PSA) Model and a Level 3 model developed by the MACCS2 code. Using this method, the application states that "Risk is defined as the product of consequence and frequency of accidental release." Application ER E.4.20. In using the PSA Model to estimate risk, Seabrook was following standard NRC and industry practice. However "practice" is not a regulation.

183. In the license renewal proceeding for Turkey Point, the board used the following interpretation of the regulations to dismiss the Petitioners concerns about particular severe accidents. It stated, ". . . the commission's environmental regulations in 10 C.F.R. Part 51 do not require probabilistic risk assessments. Section 51.53(c) lists the information the Applicant must include in its environmental report, and a probabilistic risk analysis of multiple failures is not specified. Likewise sections 51.71(d) and 51.95(c) set forth the requirements the

agency must follow in preparing the draft and final SEIS for the Turkey Point license renewal, and nowhere do those provisions require the preparation of a probabilistic risk analysis of multiple failures." *Turkey Point,* supra at 23-24. It went on to say, ". . . section 51.53(c) does not require the Applicant broadly to consider severe accident risks. Rather, it only requires the Applicant to consider "severe accident mitigation alternatives" (SAMA). 10 C.F.R. § 51.53(c)(3)(ii)(L). *Id.* at 26. While in that instance the licensing board used this argument to reject the Petitioners contention related to Emergency Preparedness, the board's reading of the regulatory requirement is also instructive here. It would make no sense for the NRC to require Severe Accident Mitigation Analysis if an Applicant could simply multiply all consequences of an accident by extremely low probability and thus reject all possible mitigation as too costly.

184. It is widely recognized that probabilistic modeling can underestimate the deaths, injuries, and economic impact likely from a severe accident. By multiplying high consequence values with low probability numbers, the consequence figures appear far less startling. For example a release that would cause 100,000 cancer fatalities would only appear to cause 1 cancer fatality per year if the associated probability of the release were 1/100,000 per year. This issue was central to a New York case, *Indian Point Special Proceeding*, US Nuclear Regulatory Commission, Atomic Safety and Licensing Board, Recommendations to the Commission, October 24, 1983, p. 107. Before the proceeding, the NRC ruled that all testimony on accident consequences must also contain a discussion of accident probabilities. In its decision, the three-judge

ASLB panel concluded that "the Commission should not ignore the potential consequences of severe-consequence accidents by always multiplying those consequences by low probability values." Further, Kamiar Jamali's (DOE Project Manager for Code Manual for MACCS2) *Use of Risk Measures in Design and Licensing Future Reactors* in Reliability Engineering and System Safety 95 (2010) 935-943 (see "Jamali Attachment") makes clear that "PRA" uncertainties are so large and so 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, Pg., 935)

185. In addition, in his report on the likely consequences of an accident at the Indian Point Nuclear Plant, Dr. Edwin S. Lyman (Union of Concerned Scientists, Senior Scientist) stresses that intentional acts represent a class of accidents that should not be considered using probabilistic modeling. "Accident probabilities are not relevant for scenarios that are intentionally caused by sabotage. Severe releases resulting from the simultaneous failure of multiple safety systems, while very unlikely if left up to chance, are precisely the outcomes sought by terrorists seeking to maximize the impact of their attack. Thus the most unlikely accident sequences may well be the most likely sabotage sequences." Edwin S. Lyman, PhD, *Chernobyl on the Hudson? The Health and Economic Impacts of a*

*Terrorist Attack at the Indian Point Nuclear Plant*, Union of Concerned Scientists, p. 16 (September, 2004 -- Available on the internet at: http://www.ucsusa.org/nuclear_power/nuclear_power_risk/sabotage_and_attacks_on_reactors/impacts-ofa-terrorist-attack.html. FENOC failed to model intentional acts in its analysis of external events. FENOC ER E.3.1.2 (FENOC ER, E.3.1.2, Pages E-25 to E-27, "External Events," only considers Internal Fires, Seismic Events, and Other External Events (namely, high winds, external floods, extreme rainfall, and transportation and nearby facility accidents.)

**THE SAMA ANALYSIS FOR DAVIS-BESSE MINIMIZES THE POTENTIAL AMOUNT OF RADIOACTIVE RELEASE IN A SEVERE ACCIDENT**

**BASIS**

186. FENOC's SAMA analysis minimized the potential amount of radioactive releases in a potential severe accident at Davis-Besse by: (1) not considering a severe accident in the irradiated nuclear fuel pool, either alone or in combination with a reactor core accident; and (2) using a source term to estimate the consequences of the most severe accidents with early containment failure based on radionuclide release fractions generated by the MAAP code (a proprietary industry code that has not been validated by NRC), which are smaller for key radionuclides than the release fractions specified in NRC guidance such as NUREG-1465 and its recent reevaluation for high-burnup fuel. (L. Soffer, et al. U.S. Nuclear Regulatory Commission, "Accident Source Terms for Light-Water Nuclear Power Plants: Final Report," NUREG-1465, February 1995; Energy Research, Inc., "Accident Source Terms for Light-Water Nuclear Power Plants:

High-Burnup and MOX Fuels: Final Report," ERI/NRC 02-202, November 2002.) Therefore the source term used by NextEra results in lower consequences than would be obtained from NUREG-1465 release fractions and release durations.

**SAMA Analysis of Irradiated Nuclear Fuel Risks Is Required By NRC Regulations**

187. FENOC did not consider a severe accident involving the irradiated nuclear fuel pool at Davis-Besse resulting from either human error, mechanical failure or an act of malice, although such accidents are reasonably foreseeable. The offsite cost risk of a pool fire is substantially higher than the offsite cost of a release from a core-damage accident. Further, SAMAs designed to avoid or mitigate conventional accidents may be different than SAMAs designed to avoid or mitigate irradiated nuclear fuel accidents. Moreover, the radiological consequences of an irradiated-nuclear-fuel-pool fire are significantly different from the consequences of a core-damage accident.

188. Further, FENOC did not consider the potential interactions between the pool and the reactor in the context of severe accidents at Davis-Besse. There the irradiated-nuclear-fuel storage pool is located outside but immediately adjacent to the reactor's containment and shares some essential support systems with the reactor. There could be at least three types of interactions between the pool and reactor. (Dr. Gordon Thompson, Risks of Pool Storage of Spent Fuel at Pilgrim Nuclear Power Station and Vermont Yankee, A Report for the Massachusetts Attorney General by IRSS, May 2006, Pgs., 12, 16. NRC Electronic Library, Adams Accession Number ML061630088.)

189. First, a pool fire and a core-damage accident could occur together, with a common cause. For example, a severe earthquake could cause leakage of water from the pool, while also damaging the reactor and its supporting systems to such an extent that a core-damage accident occurs. Second, the high radiation field produced by a pool fire could initiate or exacerbate an accident at the reactor by precluding the presence and functioning of operating personnel. Third, the high radiation field produced by a core-damage accident could initiate or exacerbate a pool fire, again by precluding the presence and functioning of operating personnel. Many core-damage sequences would involve the interruption of cooling to the pool, which would call for the presence of personnel to provide makeup water or spray cooling of exposed irradiated nuclear fuel. The third type of interaction was considered in a license-amendment proceeding in regard to expansion of irradiated-nuclear-fuel-pool capacity at the Harris nuclear power plant. Such accidents are conceivable and would result in a very high magnitude of release.

190. Although 10 C.F.R. § 51.53(c)(3)(ii)(L), does not provide a definition of severe accidents, the GEIS (See NUREG-1437, Generic Environmental Impact Statement for License Renewal of Nuclear Plants (May 1960) [hereinafter GEIS]; Final Rule, "Environmental Review for Renewal of Nuclear Power Plant Operating Licenses," 61 Fed., Reg., 28, 467 (June 5, 1960, amended by 61 Fed. Reg. 66, 537 (Dec. 18, 1996); 10 C.F.R. Pt. 51, Subpart A, Appendix B, p.1), 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.)

191. 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. (Due to 40 years of operations, the "inventory of radioactive materials" in Davis Besse's irradiated nuclear fuel pool will be many times over that in its reactor core. Any claims that the irradiated nuclear fuel storage pool contains the second largest inventory after the reactor core has long not been true at Davis-Besse, as the storage pool has filled to capacity – and beyond – with irradiated nuclear fuel.)

192. 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 at Davis-Besse has long been the largest inventory of radioactive materials – the irradiated nuclear fuel storage pool.

**Source Terms Used By FENOC**
**to Estimate the Consequences of Severe Accidents**

193. The source terms used by FENOC to estimate the consequences of severe accidents (radionuclide release fractions generated by the Modular Accident Analysis Progression, MAAP14) code, has not been validated by NRC. They are consistently smaller for key radionuclides than the release fractions specified in NUREG-1465 and its recent revision for high-burnup irradiated nuclear fuel. The source term used results in lower consequences than would be obtained from NUREG-1465 release fractions and release durations.

194. It has been previously observed that MAAP generates lower release fractions than those derived and used by NRC in studies such as NUREG-1150. A Brookhaven National Laboratory study that independently analyzed the costs and benefits of one SAMA in the license renewal application for the Catawba and McGuire plants noted that the collective dose results reported by the applicant for early failures

> …seemed less by a factor between 3 and 4 than those found for NUREG-1150 early failures for comparable scenarios. The difference in health risk was then traced to differences between [the applicant's definitions of the early failure release classes] and the release classes from NUREG-1150 for comparable scenarios … the NUREG-1150 release fractions for the important radionuclides are about a factor of 4 higher than the ones used in the Duke PRA. The Duke results were obtained using the Modular Accident Analysis Package (MAAP) (See, for example, FENOC ER. Page 4.20-1 and E-17) code, while the NUREG-1150 results were obtained with the Source Term Code Package [NRC's state-of-the-art methodology for source term analysis at the time of NUREG-1150] and MELCOR. Apparently the differences in the release fractions … are primarily attributable to the use of the different codes in the two analyses. (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.)

195. Thus the use of source terms generated by MAAP, a proprietary industry code that has not been independently validated by NRC, appears to lead to anomalously low consequences when compared to source terms generated by NRC staff. In fact, NRC has been aware of this discrepancy for at least two decades. In the draft "Reactor Risk Reference Document" (NUREG-1150, Vol. 1), NRC noted that for the Zion plant (a four-loop PWR), that "comparisons made between the Source Term Code Package results and MAAP results indicated that the MAAP estimates for environmental release fractions were significantly smaller. It is very difficult to determine the precise source of the differences observed, however, without performing controlled comparisons for identical boundary conditions and input data." (U.S. NRC, "Reactor Risk Reference Document: Main Report, Draft for Comment," NUREG-1150, Volume 1, February 1987, p. 5-14.) We are unaware of NRC having performed such comparisons.

196. The NUREG-1465 source term was also reviewed by an expert panel in 2002, which concluded that it was "generally applicable for high-burnup fuel." (J. Schaperow, U.S. NRC, memorandum to F. Eltawila, "Radiological Source Terms for High-Burnup and MOX Fuels," December 13, 2002.) This and other insights by the panel on the NUREG-1465 source term are being used by the NRC in "radiological consequence assessments for the ongoing analysis of nuclear power plant vulnerabilities." (J. Schaperow (2002), op cit. In light of this, it is clear that Next Era should not have used a MAAP-generated source terms in its SAMA analysis.)

## THE SAMA ANALYSIS FOR DAVIS-BESSE USES AN OUTDATED AND INACCURATE PROXY TO PERFORM ITS SAMA ANALYSIS, THE MACCS2 COMPUTER PROGRAM

### BASIS

197. **The MACCS2 Code:** The Applicant's SAMA analysis uses MELCOR Accident Consequence Code System (MACCS2) computer program. (See, for example, FENOC ER, E.3.4, Page E-33; E.3.4.3, Page E-35, Table E.3-13, Page E-87; Table E.3-19, Page E-96; Page E-192, footnotes 16 and 17; as well as Page 4.20-2) There is no NRC regulation *requiring* the use of that code, or any other particular code. It was a choice by FENOC and the wrong choice, certainly without considerably updating it. The code is not QA'd (Chanin, D.I. (2005), "The Development of MACCS2: Lessons Learned," [written for:] *EFCOG Safety Analysis Annual Workshop Proceedings*, Santa Fe, NM, April 29–May 5, 2005. Available online at: Full text: http://chaninconsulting.com/downloads/the%20development%20of%20maccs2.pdf, revised 12/17/2009. http://chaninconsulting.com/index.php?resume.) – the codes MACCS & MACCS2 were developed for research purposes not licensing purposes –for that reason they were not held to the QA requirements of NQA-a (American Society of Mechanical Engineering, QA Program Requirements for Nuclear Facilities, 1994). Rather they were developed using following the less rigorous QA guidelines of ANSI/ANS 10.4. [American Nuclear Standards Institute and American Nuclear Society, *Guidelines for the Verification and Validation of Scientific and Engineering Codes for the Nuclear Industry*, ANSI/ANS 10.4, La Grange Park, IL (1987). ] A further defect of the code is that

there is no explanation of exactly how it works – its assumptions and bases for those assumptions- how it interacts with long-term dose accumulation models. The cost formula and assumptions contained in the MACCS2 underestimate the costs likely to be incurred as a result of a severe accident, as explained further below. The cost formula and assumptions contained in the MACCS2 underestimate the costs likely to be incurred as a result of a severe accident, explained in greater detail further below. As an example, the code incorrectly models doses in the code's EARLY and CHRONC modules. In CHRONC (7 days after the accident to 30 years) the code incorrectly assumes the indoor dose is essentially zero; whereas in reality, the indoor dose at this stage of the accident becomes equivalent to the outdoor dose. If correctly modeled, the indoor dose would increase by a factor of 2-4.

**USE OF AN INAPPROPRIATE AIR DISPERSION MODEL, THE STRAIGHTLINE 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.**

**BASIS**

198. In determining the geographic concentration of radionuclides released in a severe accident, FENOC used an atmospheric dispersion model not appropriate for Davis-Besse's Great Lakes shoreline site. They used a steady-state, straight-line Gaussian plume model that is incorporated, or embedded, in the MACCS2 code. The plume model underestimated the area likely to be affected in a severe accident and the dose likely to be received in those areas. Instead, FENOC should have modeled transport and deposition using a site appropriate variable plume

model such as AERMOD or CALPUFF. Meteorological research performed at coastal sites, including along the coast of Massachusetts, support our contention. (Regarding sea breezes, see for example: Miller, Samuel T.K.; Keim, Barry; Synoptic-Scale Controls on the Sea Breeze of the Central New England Coast**,** **AMS Journal Online,** Volume 18, Issue 2 (April 2003), available on line at: http://journals.ametsoc.org/doi/full/10.1175/1520-0434%282003%29018%3C0236%3ASCOTSB%3E2.0.CO%3B2; Angevine, Wayne; Trainer, Michael; McKeen, Stuart; Berkowitz, Carl; Mesoscale Meteorology of the New England Coast. Gulf of Maine and Nova Scotia: Overview, JOURNAL OF GEOPHYSICAL RESEARCH, VOL. 101, NO. D22, PP. 28,893-28,901, 1996 doi:10.1029/95JD03271, available on line at: http://www.agu.org/pubs/crossref/1996/95JD03271.shtml; Thorp, Jennifer E., Eastern Massachusetts Sea Breeze Study, Thesis Submitted to Plymouth State University in Partial Fulfillment of the Requirements for the Degree of Master of Science in Applied Meteorology, May 2009; Colby Jr, F.P.., 2004: Simulation of the New England Sea Breeze (Attachment B): The effect of grid spacing. WEA Forecast., 19, 277-285; Journal of Applied Meteorology and Climatology 2006; 45: 137-154; Modeling of the Coastal Boundary Layer and Pollutant Transport in New England, Wayne M. Angevine, Michael Tjernström and Mark Žagar, available on line at: http://journals.ametsoc.org/doi/pdf/10.1175/JAM2333.1. Regarding similar dynamics on the Great Lakes shoreline, the U.S. National Oceanographic and Atmospheric Administration's National Weather Service states on its website "The Sea Breeze" that "While the sea breeze is generally

associated with the ocean, they can occur along the shore of any large body of water such as the Great Lakes." See http://www.srh.weather.gov/srh/jetstream/ocean/seabreezes.htm. Keith C. Heidorn, PhD., also wrote on May 10, 2000 that "The lake breeze is similar to the *sea breeze* found along sea coasts." See his discussion of Great Lakes breeze phenomena at http://www.islandnet.com/~see/weather/almanac/arc2000/alm00may2.htm.)

**The straight-line Gaussian plume model**

199. The straight-line Gaussian plume model assumes that a released radioactive plume travels in a steady-state straight-line, i.e., the plume functions much like a beam from a flashlight. The MACCS2 code used by FENOC is based upon this straight-line, steady-state model; it also assumes meteorological conditions that are steady in time and uniform spatially across the study region. However, site specific meteorological conditions at Davis-Besse's location shows that the assumption of a steady-state, straight-line plume is inappropriate – winds are variable and dose will be more concentrated than modeled and extend over a larger area.

200. The accuracy of a straight-line steady-state Gaussian air dispersion model decreaces with distance from the source of the release. For that reason, EPA does not approve of use of a straight-line Gaussian plume to predict the dispersion of a pollutant beyond 32 miles. Therefore the Applicant's use of the ATMOS model (see ER Page E-36, E.3.5.2.3 ATMOS at Page E-44-45, etc.) to predict dispersion in a 50-mile radius of the plant, an area which includes the highest population

concentrations, is unacceptable. Within 50 miles of Davis-Besse are the following major population centers: southern Metro Detroit, including downtown; almost all of Windsor, Ontario, Canada; Monroe, Michigan; all of Toledo; and the western edge of Metro Cleveland [see "Map Showing 50 Mile Radius around Davis-Besse Nuclear Power Plant."]

201. FENOC's straight-line, steady-state Gaussian plume model does not allow consideration for the fact that the winds for a given time period may be spatially varying, and it ignores the presences of Great Lakes "sea breeze" circulations which dramatically alter air flow patterns. Because of these failings the straight-line Gaussian plume model is not appropriate for the Davis-Besse's Great Lakes shoreline location.

202. The immediately adjacent presence of Lake Erie (the drinking water supply for many millions of people downstream in the U.S., Canada, and numerous Native American/First Nations) greatly affects atmospheric dispersion processes and is of great importance to estimating the consequences in terms of human lives and health effects of any radioactive releases from the facility, and that the transport, diffusion, and deposition of airborne species emitted along a shoreline can be influenced by mesoscale atmospheric motions. These cannot be adequately simulated using a Gaussian plume model.

**The Sea Breeze Effect**

203. The sea breeze effect, ignored by FENOC's model, is a critical feature to consider at Davis-Besse's Great Lakes shoreline location. Great Lakes "sea breeze" winds heading initially "out to sea" on Lake Erie are drawn back on

shore when the land becomes warmer than the water – sometimes penetrating inland here 20-40 miles. (See, for example, attached document, Thorp, Jennifer E., Eastern Massachusetts Sea Breeze Study, Thesis Submitted to Plymouth State University in Partial Fulfillment of the Requirements for the Degree of Master of Science in Applied Meteorology, May 2009, "Thorp Sea Breeze" Attachment. Again, as mentioned above, "While the sea breeze is generally associated with the ocean, they can occur along the shore of any large body of water such as the Great Lakes." (NOAA NWS) and "The lake breeze is similar to the *sea breeze* found along sea coasts." (Keith C. Heidorn, PhD.))

The reverse occurs as the land cools. Great Lakes "sea breeze" pulls the plume down towards the land surface increasing dose to the population. If the same meteorological conditions (strong solar insolation, low synoptic-scale winds) that are conducive to the formation of "sea breezes" at a coastal or Great Lakes shoreline site occurred at a non-coastal location, the resulting vertical thermals developing over a pollution source would carry contaminants aloft. In contrast, at a coastal or Great Lakes shoreline site, the "sea breeze" would draw contaminants across the land and inland subjecting the population to potentially higher radiation doses from a radiological release from Davis-Besse. Straight-line Gaussian plume are thereby non-conservative. FENOC, by ignoring this important and well-documented sea coast and Great Lakes shoreline phenomena, underestimates consequence.

204. The presence of a Great Lakes shoreline "sea breeze" circulation changes the wind directions, wind speeds, and turbulence intensities, both spatially and temporally, throughout its entire area of influence. The classic reference

*Meteorology and Atomic Energy*, (Section 2-3.5) (Slade, David, *Meteorology and Atomic Energy*, 1968. Prepared by Air Resources Laboratories, et al. For the Division of Reactor Development and Technology, US AtomicEnergy Commission.) succinctly comments on the importance of sea breeze circulations as,

> The sea breeze is important to diffusion studies at seaside locations because of the associated changes in atmospheric stability, turbulence and transport patterns. Moreover its almost daily occurrence at many seaside locations during the warmer seasons results in significant differences in diffusion climatology over rather short distances.

Again, as mentioned previously, "While the sea breeze is generally associated with the ocean, they can occur along the shore of any large body of water such as the Great Lakes," (NOAA NWS) and "The lake breeze is similar to the *sea breeze* found along sea coasts." (Keith C. Heidorn, PhD.)

**Behavior of Plumes over Water**

205. FENOC's Gaussian plume model appears to assume that plumes blowing "out to sea" (offshore over Lake Erie) would have no impact. However a plume over water, rather than being rapidly dispersed, will remain tightly concentrated due to the lack of turbulence, and will remain concentrated until winds blow it onto land [Zager *et al*.; Angevine et al. 2006]. This can lead to hot spots of radioactivity in places along the sea coast or Great Lakes shoreline, certainly to Detroit/Windsor, Toledo, and Cleveland, bringing larger doses over a greater geographic area than modeled and with high population concentrations. (In

addition to Angevine, Miller and Thorp see: Jan Beyea, Ph.D., Report to The Massachusetts Attorney General on the potential consequences of a spent fuel pool fire at the Pilgrim or Vermont Yankee Nuclear Power Plant, May 25, 2006 Pg., 11, NRC Electronic Library, Adams Accession No. ML061640329, also viewable online at http://www.cipi.com/PDF/Beyea_Pilgrim_Vermont_Yankee_report_for_Mass_AG_may_25_2006.pdf.)

**Terrain Effects**

206. Although FENOC claims that "The terrain in the western Lake Erie region is mostly flat and has little influence on the weather." (ER, Page 2.10-1), it is still very troubling that ATMOS does not allow consideration of the fact that the winds for any given period of time may be spatially varying. The 1997 User Guide for MACCS2, SAND 97-0594 (Chanin, D.I., and M.L. Young, Code Manual for MACCS2:Volume 1, User's Guide, SAND97-0594 Sandia National Laboratories, Albuquerque, NM, (1997), available on line at: http://www.doeal.gov/SWEIS/OtherDocuments/481%20MACCS2%20Vol%201.pdf) makes the point: "The atmospheric model included in the code does not model the impact of terrain effects on atmospheric dispersion." Terrain effects can have a highly complex impact on wind field patterns and plume dispersion. Wind blowing inland will experience the frictional effects of the surface which decrease speed and direction. EPA has recognized that "geographical variations can generate local winds and circulations, and modify the prevailing ambient winds and circulations" and that "a*ssumptions of steady-state straight-line*

*transport both in time and space are inappropriate.*" [EPA Guidelines on Air Quality Models (Federal Register Nov. 9, 2005, Section 7.2.8, Inhomogeneous Local Winds, italics added.] EPA's November 9, 2005 modeling Guideline (Appendix A to Appendix W) lists EPA's "preferred model;" the Gaussian plume model used by FENOC (ATMOS) is not on the list. EPA recommends that CALPUFF, a non-straight-line model, be used for dispersion beyond 50 kilometers. (Appendix A to Appendix W to 40 CFR Part 51, EPA Revision to the Guideline on Air Quality Models: Adoption of a Preferred General Purpose (Flat and Complex Terrain) Dispersion Model and Other Revisions; Final Rule, November 9, 2005. http://www.epa.gov/scram001/guidance/guide/appw_05.pdf.)

207. The essential difference between the models that EPA recommends for dispersion studies and the two-generation-old Gaussian plume model (ATMOS) used by FENOC is more than determining where a plume will likely to go. Major improvements in the simulation of vertical dispersion rates have been made in the EPA models by recognizing the importance of surface conditions on turbulence rates as a function of height above the ground (or Lake Erie) surfaces. We know that turbulence rates and wind speeds vary greatly as a function of height above a surface depending upon whether the surface is rough or smooth (trees vs. over water transport) (Roughness), how effectively the surface reflects or absorbs incoming solar radiation (Albedo) and the degree that the surface converts latent energy in moisture into thermal energy (Bowen ratio). These parameters are included in the AERMOD and CALPUFF models and determine the structure of

the temperature, wind speed and turbulent mixing rate profiles as a function of height above the ground. FENOC's ATMOS model does not include these parameters. This is an especially important deficiency when modeling facilities located along coastlines, such as Davis-Besse.

208. Additionally, the MACCS2 Guidance Report, June 2004 (28 MACCS2 Guidance Report June 2004 Final Report page 3-8:3.2 Phenomenological Regimes of Applicability) itself warns that the "code does not model dispersion close to the source (less than 100 meters from the source)," thereby ignoring re-suspension of contamination blowing offsite and affecting deposition in offsite communities and adding to costs.

209. The fact that the MACCS2's ATMOS model was inappropriate for use at Davis-Besse should have been apparent to FENOC from reading the MACCS2 Guidance Report, June 2004, referenced directly above. It additionally warned that the code "should be applied with caution at distances greater than ten to fifteen miles, especially if meteorological conditions are likely to be different from those at the source of release." There are large potentially affected population concentrations more than 10-15 miles from Davis-Besse - for example: Detroit/Windsor; Toledo; Cleveland. Further, the MACCS2 Guidance Report, June 2004 said that, "Gaussian models are inherently flat-earth models, and perform best over regions where there is minimal variation in terrain." Although FENOC states at ER 3.1.1 (see also Page 2.1-1) that "The topography of the site and vicinity is flat with marsh areas bordering the lake and the upland area rising to only 10 to 15 feet above the lake low water datum level in the

general surrounding area. The site itself varies in elevation from marsh bottom, below lake level, to approximately six feet above lake level," even slight variations in the surrounding region's topography, including forests and urban cityscapes, make overly simplistic meteorological radiation plume dispersion models inappropriate.

**Input Data**

210. Another significant defect in FENOC's model is that its meteorological inputs (e.g., wind speed, wind direction, atmospheric stability and mixing heights) into the MACCS2 are based on data collected from just one site – at Davis-Besse itself. In addition, data from just three years were collected, 2006 to 2008, and, worse, "2008 meteorological data were deemed to be not viable as MACCS2 input." (FENOC ER, E.3.4.3, METEOROLOGICAL DATA) Such scant measurement data, from one meteorological station, will definitely not suffice to define the Great Lakes "sea breeze" or capture variability.

**Government and Independent Studies**

211. Government and independent studies support Petitioners' claim that a straight line Gaussian plume model cannot account for the effects of complex terrain on the dispersion of pollutants from a source. Therefore its use is inappropriate for use for FENOC's analysis to determine the potential area of impact and deposition in a severe accident at Davis-Besse. Take the following examples from Nuclear Regulatory Commission, EPA, DOE, and National Research Council:

**NUCLEAR REGULATORY COMMISSION**

212. **1972:** NRC Regulatory Guide 123 (Safety Guide 23) On Site Meteorological Programs 1972, states that, "at some sites, due to complex flow patterns in non-uniform terrain, additional wind and temperature instrumentation and more comprehensive programs may be necessary."

213. **1977:** NRC began to question the feasibility of using straight line Gaussian plume models for complex terrain. *See* U.S.NRC, 1977, Draft for Comment Reg. Guide 1.111 at 1c (pages 1.111-9 to 1.111-10).

214. **1983**: In January 1983, NRC Guidance [ **NUREG-0737,** Supplement 1 "Clarification of TMI Action Plan Requirements," January 1983 Regulatory Guide 1.97-Application to Emergency Response Facilities; 6.1 Requirements], suggested that changes in on-site meteorological monitoring systems would be warranted if they have not provided a reliable indication of monitoring conditions that are representative within the 10-mile plume exposure EPZ (emergency planning zone).

215. **1996**: The NRC acknowledged the inadequacy of simple straight-line Gaussian plume models to predict air transport and dispersion of a pollutant released from a source in a complex terrain when it issued RTM-96, *Response Technical Manual,* which contains simple methods for estimating possible consequences of various radiological accidents. In the glossary of that document, the NRC's definition of "Gaussian plume dispersion model" states that such models have important limitations, including the inability to "deal well with complex terrain." NUREG/BR-0150, Vol.1 Rev.4, Section Q; ADAMS Accession Number ML062560259,

*216.* **2004:** A NRC research paper, *Comparison of Average Transport and Dispersion Among a Gaussian, a Two-Dimensional and a Three-Dimensional Model*, Lawrence Livermore National Laboratory, October, 2004 at 2. ("Livermore Report") had an important caveat added to the Report's summary about the scientific reliability of the use of a straight-line Gaussian model in complex terrains:

. . . [T]his study was performed in an area with smooth or favorable terrain and persistent winds although with structure in the form of low-level nocturnal jets and severe storms. In regions with *complex terrain*, particularly if the surface wind direction changes with height, *caution should be used.* Livermore Report at 72 (Emphasis added)

217. **2005:** In December, 2005, as part of a cooperative program between the governments of the United States and Russia to improve the safety of nuclear power plants designed and built by the former Soviet Union, the NRC issued a Procedures Guide for a Probabilistic Risk Assessment, related to a Russian Nuclear Power Station. The Guide, prepared by the Brookhaven National Laboratory and NRC staff, explained that atmospheric transport of released material is carried out assuming Gaussian plume dispersion, which is "generally valid for flat terrain." However, the Guide added the caveat that in "specific cases of plant location, such as, for example, a mountainous area or a valley, more detailed dispersion models may have to be considered." *Kalinin VVER-1000 Nuclear power Station Unit 1 PRA, Procedures Guide for a Probabilistic Risk Assessment,* NUREG/CR- 6572, Rev. 1 at 3-114; excerpt attached as Exhibit

"Kalinin PRA," full report available at http://www.nrc.gov/reading-rm/doc-collections/nuregs/contract/cr6572.

218. **2007:** NRC revised their Regulatory Guide 1.23, Meteorological Monitoring Programs for Nuclear Power Plants. On page 11, the section entitled *Special Considerations for Complex Terrain Sites* says that, "At some sites, because of complex flow patterns in nonuniform terrain, additional wind and temperature instrumentation and more comprehensive programs may be necessary. For example, the representation of circulation for a hill-valley complex or a site near a large body of water may need additional measuring points to determine airflow patterns and spatial variations of atmospheric stability. Occasionally, the unique diffusion characteristics of a particular site may also warrant the use of special meteorological instrumentation and/or studies.

The plant's operational meteorological monitoring program should provide an adequate basis for atmospheric transport and diffusion estimates within the plume exposure emergency planning zone [i.e., within approximately 16 kilometers" (10 miles)]. (For example, if the comparison of the primary and supplemental meteorological systems indicates convergence in a lake breeze setting, then a "keyhole" protective action recommendation (e.g., evacuating a 2-mile radius.) These excerpts from Regulatory Guide 1.23 demonstrate that the NRC recognizes there are certain sites, such as those located in coastal areas, like Seabrook, that multiple meteorological data input sources are needed for appropriate air dispersion modeling. Not simply one or two meteorological towers onsite. Since the straight-line

Gaussian plume model is incapable of handling complex flow patterns and meteorological data input from multiple locations, Regulatory Guide 1.23 demonstrates NRC's recognition that it should not be used at any site with complex terrain.

219. **2009:** NRC made a presentation to the National Radiological Emergency Planning Conference (*Ibid.*) concluded that the straight-line Gaussian plume models cannot accurately predict dispersion in a complex terrain and are therefore scientifically defective for that purpose [ADAMS – ML091050226, ML091050257, and ML091050269 (page references used here refer to the portion attached, Part 2, ML091050257).] Most reactors, if not all, are located in complex terrains. In the presentation, NRC said that the "most limiting aspect" of the basic Gaussian Model, is its "inability to evaluate spatial and temporal differences in model inputs" [Slide 28]. Spatial refers to the ability to represent impacts on the plume after releases from the site e.g., plume bending to follow a river valley or sea breeze circulation. Temporal refers to the ability of the model to reflect data changes over time, e.g., change in release rate and meteorology [Slide 4]. Because the basic Gaussian model is non-spatial, it cannot account for the effect of terrain on the trajectory of the plume – that is, the plume is assumed to travel in a straight line regardless of the surrounding terrain. Therefore, it cannot, for example, "'curve' a plume around mountains or follow a river valley." NRC 2009 Presentation, Slide 33. Further NRC says that it cannot account for transport and diffusion in coastal sites subject to the sea breeze. The NRC says that the sea breeze causes the plume to change direction caused by

differences in temperature of the air above the water versus that above the land after sunrise. If the regional wind flow is light, a circulation will be established between the two air masses. At night, the land cools faster, and a reverse circulation (weak) may occur [Slide 43]. Turbulence causes the plume to be drawn to ground level [Slide 44]. The presentation goes on to say that, "Additional meteorological towers may be necessary to adequately model sea breeze sites" [Slide 40]. The significance of all this is that Davis-Besse is immediately adjacent to Lake Erie, and thus subject to Great Lakes shoreline "sea breezes," and, despite FENOC's ER claims that the surrounding region is completely flat, there are forested hills (such as Ottawa Hills, Ottawa Park, and the former Stranahan Estate, now known as Wildwood Preserve Metropark, near Toledo), especially to the southeast beginning about 50 miles away; there are also river valleys in the region, including the Detroit River valley between Michigan and Ontario, the Maumee River valley that flows into Lake Erie at Toledo, the Sandusky River valley that flows into Lake Erie at Sandusky County, and the Cuyahoga River valley that flows into Lake Erie at Cuyahoga County, to name but a few. [Petitioners' Exhibit, Map showing Ohio rivers.]

220. Significantly, the NRC 2009 Presentation then discussed the methods of more advanced models that *can* address terrain impact on plume transport, including models in which emissions from a source are released as a series of puffs, each of which can be carried separately by the wind, (NRC 2009 Presentation Slides 35, 36). This modeling method is similar to CALPUFF. Licensees are not required, however, to use these models in order to more

accurately predict where the plume will travel to base protective action recommendations.

**EPA**

**221.** Likewise, EPA recognized the need for complex models. For example: EPA's 2005 Guideline on Air Quality Models says in Section 7.2.8 *Inhomogenous Local Winds* that,

> In very rugged hilly or mountainous terrain, along coastlines, or near large land use variations, the characterization of the winds is a balance of various forces, such that the assumptions of steady-state straight line transport both in time and space are inappropriate. (Fed. Reg., 11/09/05).

222. EPA goes on to say that, "In special cases described, refined trajectory air quality models can be applied in a case-by-case basis for air quality estimates for such complex non-steady-state meteorological conditions." This EPA Guideline also references an EPA 2000 report, *Meteorological Monitoring Guidance for Regulatory Model Applications,* EPA-454/R-99-005, February 2000. Section 3.4 of this Guidance for Coastal Locations, discusses the need for multiple inland meteorological monitoring sites, with the monitored parameters dictated by the data input needs of particular air quality models.

*223.* EPA concludes that a report prepared for NRC (31 Raynor, G.S.P. Michael, and S. SethuRaman, 1979, *Recommendations for Meteorological Measurement Programs and Atmospheric Diffusion Prediction Methods for Use at Coastal Nuclear Reactor Sites.*NUREG/CR-0936, U.S. Nuclear Regulatory Commission, Washington, DC.) provides a detailed discussion of considerations

for conducting meteorological measurement programs at coastal sites, for reactors on large bodies of water. Most important, EPA's November 2005 Modeling Guideline (Appendix A to Appendix W) lists EPA's "preferred models" and the use of straight line Gaussian plume model, called ATMOS, is not listed. Sections 6.1 and 6.2.3 discuss that the Gaussian model is not capable of modeling beyond 50 km (32 miles) and the basis for EPA to recommend CALPUFF, a non – straight line model.

(http://www.epa.gov/scram001/guidance/guide/appw_05.pdf)

**DOE**

224. DOE, too, recognizes the limitations of the straight-line Gaussian plume model. They say for example that Gaussian models are inherently flat-earth models, and perform best over regions of transport where there is minimal variation in terrain. Because of this, there is inherent conservatism (and simplicity) if the environs have a significant nearby buildings, tall vegetation, or grade variations not taken into account in the dispersion parameterization. (MACCS2 Guidance Report June 2004 Final Report, page 3-8:3.2 Phenomenological Regimes of Applicability)

**National Research Council**

225. Tracking and Predicting The Atmospheric Dispersion of Hazardous Material Releases Implications for Homeland Security, Committee on the Atmospheric Dispersion of Hazardous Material Releases Board on Atmospheric Sciences and Climate Division on Earth and Life Studies, National Research

Council of the National Academies, 2003. The report discusses how the analytical Gaussian models were used in the 1960s and tested against limited field experiments in flat terrain areas performed in earlier decades.

226. In the 1970s the US passed the Clean Air Act which required the use of dispersion models to estimate the air quality impacts of emissions sources for comparison to regulatory limits. This resulted in the development and testing of advanced models for applications in complex terrain settings such as in mountainous or coastal areas. In the 1980s, further advances were made with Lagrangian puff models and with Eulerian grid models. Gaussian models moved beyond the simple use of sets of dispersion coefficients to incorporate Monin-Obukhov and other boundary layer similarity measures which are the basis of contemporary EPA models used for both short range and long range transport applications. Helped enormously by advances in computer technologies, in the 1990s, significant advances were made in numerical weather prediction models and also further improve dispersion models through the incorporation of field experiment results and improved boundary layer parameterization. The decade starting with the year 2000 has seen improved resolution of meteorological models such as MM5 and the routine linkage of meteorological models with transport and dispersion models as exemplified by the real time forecasts of detailed fine grid weather conditions available to the public at Olympic events. Computational Fluid Dynamics (CFD) models which involve very fine grid numerical simulations of turbulence and fluid flow began to see applications

in atmospheric dispersion studies. The next decade will see routine application of CFD techniques to complex flows associated with emergency response needs.

227. The nuclear industry does not show evidence of keeping up with these technological advances. For use in modeling air quality concentrations, the NRC uses straight-line Gaussian dispersion algorithms that date back to the 1960s. Complex flow situations such as those associated with flow around complex terrain features (such as urban cityscapes, forested hills, or river valleys in the region around Davis-Besse) or that would incorporate Great Lakes shoreline "sea breeze" circulations are not simulated. For emergency response applications, the NRC does not seem to require any advanced modeling to be installed at nuclear power plants. As but one example of the complex topographical features in Davis-Besse's region, consider the Cuyahoga River Valley – meaning "Crooked River" in the original Native American language, which gives way to deep forests and rolling hills. [Petitioners' Exhibit, "National Park Service: Cuyahoga Valley National Park, Ohio."]

**Atmospheric Scientists and Meteorologists**

228. For over three decades atmospheric scientists and meteorologists have been identifying problems in the use of models similar to ATMOS for such settings. Example: Steven R. Hanna, Gary A. Briggs, Rayford P. Hosker, Jr., National Oceanic and Atmospheric Administration, Atmospheric Turbulence and Diffusion Laboratory, *Handbook on Atmospheric Diffusion* (1982).

229. The inability of a simple Gaussian plume model to accurately predict air transport and dispersion in complex terrains is such a basic flaw that it is discussed in a textbook for a college-level introductory course in environmental

science and engineering (Environmental Science and Engineering, J. Glynn Henry & Gary W. Heinke, (Prentice-Hall 1989) at 528 (Chapter 13 authored by William J. Moroz). In listing the assumptions that are made to develop a simple straight line Gaussian plume model, the textbook warns that:

> The equation is to be used over relatively flat, homogeneous terrain. It should not be used routinely in coastal or mountainous areas, in any area where building profiles are highly irregular, or where the plume travels over warm bare soil and then over colder snow or ice covered surfaces.

182. In addition, FENOC used NRC's "practice" of using mean consequence values in their SAMA analysis, resulting in averaging of potential consequences that minimized the findings and conclusions on the meteorological modeling.

## 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

### Basis

183. The ER is required to include "a consideration of alternatives to mitigate severe accidents (SAMA)." 10 CFR 51.53(c )(30(ii)(L) That analysis depends upon an accurate calculation of the cost of a severe accident in order to have a base line against which to measure proposed mitigation measures. FENOC, instead, severely minimized decontamination and clean-up costs, health costs (that includes inaccurately modeling evacuation time estimates), and minimized and ignored a myriad of other economic costs that belong in a SAMA analysis.

### Decontamination and Clean Up Costs

184. The SAMA analysis for Davis-Besse uses the outdated and inaccurate MACCS2 code to calculate decontamination and clean up costs. The cost formula used in the MACCS2 underestimates costs likely to be incurred as a result of a dispersion of radiation. Therefore FENOC's SAMA analysis significantly underestimates the costs associated with an accident.

185. The MACCS2 Decontamination Plan is described in part in the Code Manual for MACCS2: Volume I, User's Guide (NUREG/CR-6613, Vol. 1) Prepared by D. Chanin and M.I. Young, May 1998. Section 7.5 Decontamination Plan describes some of the assumptions. It says at 7-10 that,

> Many decontamination processes (e.g., plowing, fire hosing) reduce groundshine and resuspension doses by washing surface contamination down into the ground. Since these processes may not move contamination out of the root zone, the WASH-1400 based economic cost model of MACCS2 assumes that farmland decontamination reduces direct exposure doses to farmers without reducing uptake of radioactivity by root systems. Thus decontamination of farmland does not reduce the ingestion doses produced by the consumption of crops that are contaminated by root uptake.

Simply from this section of the document, it becomes clear what is wrong. For example: (1) It says the economic cost model, is based on WASH-1400; WASH-1400, in turn, was based on clean up after a nuclear explosion. However, cleanup after a nuclear bomb explosion is not comparable to clean up after a nuclear reactor accident and assuming so will underestimate cost. Nuclear explosions result in larger-sized radionuclide particles;

reactor accidents release small sized particles. Decontamination is far less effective, or even possible, for small particle sizes. Nuclear reactor releases range in size from a fraction of a micron to a couple of microns; whereas nuclear bomb explosions fallout is much larger -- particles that are ten to hundreds of microns. These small-sized nuclear reactor particulate releases can get wedged into small cracks and crevices of buildings making clean up extremely difficult or impossible.

186. WASH-1400's referenced nuclear weapon clean up experiments involved cleaning up fallout involving large mass loading where the there was a small amount of radioactive material in a large mass of dirt and demolished material. Only the bottom layer will be in contact with the soil and the massive amount of debris can be swept up with brooms or vacuums resulting in a relatively effective, quick and cheap cleanup that would not be the case with a nuclear reactors fine particulate.

187. Third, a weapon explosion results in non-penetrating radiation so that workers only require basic respiration and skin protection. This allows for cleaning up soon after the event. In contrast a reactor release involves gamma radiation and there is no gear to protect workers from gamma radiation. Therefore cleanup cannot be expedited and decontamination is less effective with the passage of time.

188. Also ignored is radioactive waste disposal. In a weapon's wake, the waste could be shipped to Utah or to the Nevada Test Site. The Greater-Than-Class C (GTCC) waste expected in a reactor accident would not have a repository likely available to receive such a large quantity of material in the foreseeable future. Also, the costs incurred for safeguarding the wastes and preventing their being re-suspended are not accounted for in the model. Even optimistically assuming a repository becoming available, (Utah's site is

approximately one-square mile and the volume of waste from a severe accident at Davis-Besse would likely require a larger facility) it seems unlikely that there would be a sufficient quantity of transport containers and communities not objecting to the hazardous materials going over their roads, rails, and/or waterways and through their communities during transport.

189. (2) The User's Guide described decontamination processes as "plowing" and "fire hosing." We know that CERLA, EPA and local authorities would not allow use of those methods. Fire hosing and plowing does not decontaminate, it simply moves the contamination from one place to another –only to reappear again later in groundwater, re-suspended into the air, or in food. Therefore cleanup will take far longer, be more expensive, and its success (defined as returning to pre-accident status) unlikely.

190. Apparently missing from consideration is that forests, wetlands and shorelines cannot realistically be cleaned up and decontaminated. The area within 50-miles of Davis-Besse consists of miles of beaches, rivers, wetlands, forests and park land

191. Additionally, urban areas will be considerably more expensive and time consuming to decontaminate and clean than rural areas. There are numerous water and urban areas within 50-miles.

192. The US Department of Homeland Security has commissioned studies for the economic consequences of a Rad/Nuc attack and although much more deposition would occur in reactor accident, magnifying consequences and costs, there are important lessons to be learned from these studies.

193. Barbara Reichmuth's study, "Economic Consequences of a Rad/Nuc attack: Cleanup Standards Significantly Affect Cost," 2005 (Economic Consequences of a

Rad/Nuc attack: Cleanup Standards Significantly Affect Cost, Barbara Reichmuth, Steve Short, Tom Wood, Fred Rutz, Debbie Swartz, Pacific Northwest National Laboratory, 2005("Reichmuth" Attachment), Table 1, Summary Unit Costs for D &D (Decontamination and Decommissioning), Building Replacement, and Evacuation Costs, provides estimates for different types of areas, from farm or range land to high density urban areas. Reichmuth's study also points out that the economic consequences of a Rad/Nuc event are highly dependent on cleanup standards. "Cleanup costs generally increase dramatically for standards more stringent than 500 mrem/yr;" however currently a cleanup standard is not agreed upon by NRC and EPA and appears to range from 15 mrem/yr to 5 rem/yr.

194. The General Accounting Office (GAO) reports that the current EPA and NRC cleanup standards differ and these differences have implications for both the pace and ultimate cost of cleanup. (GAO, "Radiation Standards Scientific Basis Inconclusive, and EPA and NRC Disagreement Continues," June 2004.) FENOC does not appear to account for this issue.

195. A similar study was done by Robert Luna, *Survey of Costs Arising from Potential Radionuclide Scattering Events*. ("Survey of Costs Arising From Potential Radionuclide Scattering Events," Robert Luna, Sandia National Laboratories, Waste Management 2008 Conference, February 24-28, 2008, Phoenix AZ ("Luna" Attachment) Luna concluded that,

> "…the expenditures needed to recover from a successful attack using an RDD [radiological dispersal device] type device …are likely to be significant from the standpoint of resources available to local or state governments. Even a device that contaminates an area of a few hundred acres (a square kilometer) to a level that

requires modest remediation is likely to produce costs ranging from $10M to $300M or more depending on the intensity of commercialization, population density, and details of land use in the area." (Luna, Pg., 6)

196. Therefore 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.

197. In place of the outdated decontamination costs figure in the MACCS2 code, the SAMA analysis for Davis-Besse should incorporate, for example, the analytical framework contained in the 1996 Sandia National laboratories report concerning site restoration costs (Site Restoration: Estimation of Attributable Costs from Plutonium-Dispersal Accidents, SAND96-0957, David Chanin, Walt Murfin, UC-502, (May 1996), available on line at: http://chaninconsulting.com/index.php?resume) as well as studies examining Chernobyl and RDD type devices.

198. The Sandia Site restoration study analyzed the expected financial costs for cleaning up and decontaminating a mixed-use urban land and Midwest farm and range land. The study was commissioned by DOE to estimate activities likely to be involved in the decontamination of an accident involving the dispersal of plutonium. Although there would be many differences in a nuclear reactor accident, the methodology and conclusions to estimate costs are directly useful.

199. The study recognized that earlier estimates (such as incorporated in WASH-1400 and up through and including MACCS2) of decontamination costs are incorrect because they examined fallout from nuclear explosion of nuclear weapons that produce large particle sizes and high mass loadings.

200. For an extended decontamination and remediation operation in a mixed-use urban area with an average population density, Site restoration predicted a cleanup cost of $311,000,000 per square km using offsite disposal and $309,000,000 per square km using on-site disposal. (Site restoration, Pg., 6-5)

201. The costs would be much higher for example for the metropolitan areas of Detroit, Windsor, Toledo, and Cleveland, considering that they are industrial, tourist, educational, transportation, port, and financial centers. The economic losses stemming from the stigma effects of a severe accident would be staggering. The Sandia Site restoration study further says,

> "In comparing the numbers of cancer health effects that could result from a plutonium-dispersal accident to those that could result from a severe accident at a commercial nuclear power plant, it is readily apparent that the health consequences and costs of a severe reactor accident could greatly exceed the consequences of even a "worst-case" plutonium-dispersal accident because the quantities of radioactive material in nuclear weapons are a small fraction of the quantities present in an operating nuclear power plant." (Site restoration, Pg., 2-3, 2-4)

202. FENOC lists under decontamination costs the costs of farm and non-farm decontamination and the value of farm and non-farm wealth. However nowhere is there a discussion of the loss of, and costs to remediate, the economic infrastructure that make business, tourism and other economic activity possible. Economic infrastructure is the basic physical and organizational structures needed for the operation of a society or enterprise, or the services and facilities necessary for an

economy to function. The term typically refers to the technical structures that support a society, such as roads, water supply, sewers, power grids telecommunications, and so forth. Viewed functionally, infrastructure *facilitates* the production of goods and services; for example, roads enable the transport of raw materials to a factory, and also for the distribution of finished products to markets. Also, the term may also include basic social services such as schools and hospitals.

203. FENOC also appears to ignore the indirect economic effects or the "multiplier effects." For example, depending on the business done inside the building contaminated, the regional and national economy could be negatively impacted. A resulting decrease in the area's real estate prices, tourism, and commercial transactions could have long-term negative effects on the region's economy.

204. FENOC must be required to take all of these real cleanup costs into account. FENOC's SAMA analysis fails to do so and grossly underestimates costs making mitigations not appear cost effective.

**Health Costs**

205. Health costs are an important part of economic consequences. FENOC's "life lost" value is much too low. EPA values a life lost at $6.1 million (U.S.E.P.A., 1997, The Benefits and Costs of the Clean Air Act, 1970 to 1990, Report to US Congress (October), pages 44-45). The current ER assigns a value of $2,000 per person-rem (FENOC ER, E, Page E-48).

206. 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.

207. FENOC underestimates the population-dose related costs of a severe accident by relying inappropriately on a $2,000/person-rem conversion factor. FENOC's use of the conversion factor is inappropriate because it (1) does not take into account the significant loss of life associated with early fatalities from acute radiation exposure that could result from some of the severe accident scenarios included in FENOC's risk analysis; and (2) underestimates the generation of stochastic health effects by failing to take into account the fact that some members of the public exposed to radiation after a severe accident will receive doses above the threshold level for application of a dose- and dose-rate reduction effectiveness factor (DDREF).

208. The $2,000/person-rem conversion factor is intended to represent the cost associated with the harm caused by radiation exposure with respect to the causation of "stochastic health effects," that is, fatal cancers, non-fatal cancers, and hereditary effects. (38 U.S. Nuclear Regulatory Commission, Office of Nuclear Regulatory Research, "Reassessment of NRC's Dollar Per Person-Rem Conversion Factor Policy," NUREG-1530, 1995, p. 12.) The value was derived by NRC staff by dividing the Staff's estimate for the value of a statistical life, $3 million (presumably in 1995 dollars, the year the analysis was published) by a risk coefficient for stochastic health effects from low-level radiation of 7x10-4/person-rem, as recommended in Publication No. 60 of the International Commission on Radiological Protection (ICRP). (This risk coefficient includes nonfatal stochastic health effects in addition to fatal cancers.) But the use of this conversion factor in FENOC's SAMA analysis is inappropriate in two

key respects. As a result FENOC underestimates the health-related costs associated with severe accidents.

209. First, the $2,000/person-rem conversion factor is specifically intended to represent only stochastic health effects (e.g. cancer), and not deterministic health effects "including early fatalities which could result from very high doses to particular individuals." (39 U.S. NRC (1995), op cit., p. 1.) However, for some of the severe accident scenarios evaluated by FENOC at Davis-Besse, we estimate that large numbers of early fatalities could occur representing a significant fraction of the total number of projected fatalities, both early and latent. This is consistent with the findings of the Generic Environmental Impact Statement for License Renewal of Nuclear Plants (NUREG-1437). (40 U.S. NRC, Generic Environmental Impact Statement for License Renewal of Nuclear Plants, NUREG-1437, Vol. 1, May 1996, Table 5.5.) Therefore, it is inappropriate to use a conversion factor that does not include deterministic effects.

210. According to NRC's guidance, "the NRC believes that regulatory issues involving deterministic effects and/or early fatalities would be very rare, and can be addressed on a case-specific basis, as the need arises." (U.S. NRC, "Reassessment of NRC's Dollar Per Person-Rem Conversion Factor Policy (1995), op cit., p.13.) Based on our estimate of the potential number of early fatalities resulting from a severe accident at Davis-Besse, this is certainly a case where this need exists.

211. Second, the $2,000/person-rem factor, as derived by NRC, also underestimates the total cost of the latent cancer fatalities that would result from a given population dose because it assumes that all exposed persons receive dose commitments below the

threshold at which the dose and dose-rate reduction factor (DDREF) (typically a factor of 2) should be applied. However, for certain severe accident scenarios at Davis-Besse evaluated by FENOC, we estimate that considerable numbers of people would receive doses high enough so that the DDREF should not be applied. (The default value of the DDREF threshold is 20 rem in the MACCS2 code input.) This means, essentially, that for those individuals, a one-rem dose would be worth "more" because it would be more effective at cancer induction than for individuals receiving doses below the threshold. To illustrate, if a group of 1,000 people receive doses of 30 rem each over a short period of time (population dose 30,000 person-rem), 30 latent cancer fatalities would be expected, associated with a cost of $90 million, using NRC's estimate of $3 million per statistical life and a cancer risk coefficient of 1x10-3/person-rem. If a group of 100,000 people received doses of 0.3 rem each (also a population dose of 30,000 person-rem), a DDREF of 2 would be applied, and only 15 latent cancer fatalities would be expected, at a cost of $45 million. Thus a single cost conversion factor, based on a DDREF of 2, is not appropriate when some members of an exposed population receive doses for which a DDREF would not be applied.

212. A better way to evaluate the cost equivalent of the health consequences resulting from a severe accident is simply to sum the total number of early fatalities and latent cancer fatalities, as computed by the MACCS2 code, and multiply by the $3 million figure. Again, we do not believe it is reasonable to distinguish between the loss of a "statistical" life and the loss of a "deterministic" life when calculating the cost of health effects.

213. Another way to explain why FENOC's estimates of how many lives might be lost are too low is to look at the 1982 Sandia National Laboratory report, using 1970 census data, that estimated the number of cancer deaths at Davis-Besse in a severe accident to be 10,000; early fatalities 1,400; and early injuries 73,000. Peak fatalities were estimated by CRAC to occur within 20 miles of Davis-Besse; and peak injuries to occur with 65 miles of Davis-Besse from a core melt. (CRAC-2, Calculation of Reactor Accident Consequences, U.S. Nuclear Power Plants, Sandia National Laboratory, 1982.)

214. The population of the affected area, no matter what model is used, has greatly increased during the intervening almost 40 years. Further CRAC was based on old, and now outdated, dose response models.

215. In the SAMA, cancer incidence was not considered; neither were the many other potential health effects from exposure in a severe radiological event (National Academy of Sciences, BEIR VII Report, 2005).

216. FENOC's cost-benefit analysis ignored a marked increase in the value of cancer mortality risk per unit of radiation at low doses (2-3 rem average), as shown by recent studies published on radiation workers (Elizabeth Cardis *et al*., "Risk of cancer risk after low doses of ionising radiation: retrospective cohort study in 15 countries." *British Medical Journal* (2005) 331:77. Available on line at: http://www.bioone.org/doi/abs/10.1667/RR1443.1?cookieSet=1&prevSearch=) and by the Techa River cohort (Krestinina LY, Preston DL, Ostroumova EV, Degteva MO, Ron E, Vyushkova OV, et al. 2005. Protracted radiation exposure and cancer mortality in the Techa River cohort. Radiation Research 164(5).602-611. Available on line at:

http://www.bioone.org/doi/abs/10.1667/RR3452.1). Both studies give similar values for low dose, protracted exposure, namely (1) cancer death per Sievert (100 rem). According to the results of the study by Cardis et al. and use of the risk numbers derived from the Techa River cohort the SAMA analyses prepared for Seabrook needs to be redone. It seems clear that a number of additional SAMAs that were previously rejected by the applicant's methodology will now become cost effective.

217. Cancer incidence and the other many health effects from exposure to radiation in a severe radiological event (National Academy of Sciences, BEIR VII Report, 2005) must be considered; they were not. Neither did FENOC appear to consider indirect costs. Medical expenditures are only one component of the total economic burden of cancer. The indirect costs include losses in time and economic productivity and liability resulting from radiation health related illness and death.

218. Petitioner's examination of FENOC's Emergency Response analysis shows that the Applicant's evacuation time input data into the code were unrealistically low and unsubstantiated; and that if correct evacuation times and assumptions regarding evacuation had been used, the analysis would show far fewer will evacuate in a timely manner, increasing health-related costs. Little to no indication is provided, for example, that the following site-specific variables that would slow response time were taken into consideration in the analysis: shadow evacuation; evacuation time estimates during inclement weather coinciding with high traffic periods such as commuter traffic, peak commute time, holidays, summer beach/holiday traffic; notification delay delays because notification is largely based on sirens that cannot be heard indoors above normal ambient noise with windows closed or air conditioning systems operating.

**A myriad of other economic costs were underestimated or totally ignored by the applicant that when added together would in all likelihood add up collectively to a significant amount**

219. For example, FENOC did not appear to include in their economic cost estimates the business value of property and the incurred costs such as costs required from job retraining, unemployment payments, and inevitable litigation. They used an assumed value of non-farm wealth that appeared not justified by review of Banker and Tradesmen sales figures. FENOC appears to underestimate Farm Value, 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.

**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, 95 Percentile Values**

**Basis**

220. FENOC fails to consider the uncertainties in its consequence calculation resulting from meteorological variations by only using mean values for population dose and offsite economic cost estimates. Dr. Edwin S. Lyman, Senior Staff Scientist, Union of Concerned Scientists report commissioned by Riverkeeper, Inc., November 2007, "A Critique of the Radiological Consequence Assessment Conducted in Support of the Indian Point Severe Accident Mitigation Alternatives Analysis" (Report available at NRC Electronic Library, Adams Accession Number ML073410093) provides valuable lessons to apply to Davis-Besse's SAMA.

221. The consequence calculation, as carried out by the MACCS2 code, generates a series of results based on random sampling of a year's worth of weather data. The code

provides a statistical distribution of the results. We find, based on calculations done at other reactors such as Indian Point, that the ratio of the 95th percentile to the mean of this distribution is typically a factor of 3 to 4 for outcomes such as early fatalities, latent cancer fatalities and off-site economic consequences.

222. Kamiar Jamali (*Use of risk in measures in design and licensing of future reactors,* Reliability Engineering and Safety System 95 (2010) 935-943 www.elsevier,com/locate/ress; Kamiar Jamali, DOE Project Manager for Code Manual for MACCS2: Vol. 1, User's Guide (NUREG/CR 6613/SAND 97-0594, Vol.1; DOE Project Manager for Code Manual for MACCS2: Vol. 2, Preprocessor Codes COMIDA A2, FGRDCF, DCF2 (NUREG/CR 6613/SAND 97-0594, Vol. 2); member of the working group for DOE Standard Guidance for Preparation DOE 5480.22(TSR) and DOE 5480.23 (SAR) Implementation Plans, November 1994.) observes that,

> "It is well- known that quantitative results of PRAs, in particular, are subject to various types of uncertainties. 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 or commission, magnitudes of source terms, radionuclide release and transport, atmospheric dispersion, biological effects of radiation, dose calculations, and many others. (935)."

223. Despite such warnings, FENOC has unconvincingly performed suspect sensitivity analyses, inadequately dealing with such "Uncertainty" in its ER.

**Summary**

224. The SAMA analysis included in the Davis-Besse Environmental Report is incomplete. FENOC's SAMA analysis instead minimized costs likely to be incurred in a severe accident so as mitigation to reduce risk appeared not to be justified by: (1) 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, the consequence figures appeared minimal. (2) Minimization of the potential amount of radioactive material released in a severe accident. (3) Use of an outdated and inaccurate proxy, the MACCS2 computer program, to perform its SAMA analysis. (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. (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. (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, 95 percentile values.

225. Petitioners do not offer examples of how this cost benefit equation might have been skewed in favor of no mitigation. The dramatic minimization of costs by FENOC are such that it should be obvious that many SAMAs would be cost effective if the described defects in the analysis were addressed. In *Duke Energy Corp.*, at 13, the licensee argued that NEPA could not require it to implement any particular SAMA,

regardless of the how the cost-benefit calculations come out, and therefore there was no remedy possible for the Petitioners. But the board rejected this argument, saying "While NEPA does not require agencies to select particular options, it is intended to 'foster both informed decision-making and informed public participation, and thus to ensure the agency does not act upon incomplete information, only to regret its decision after it is too late to correct' (*citing Louisiana Energy Services* (Claiborne Enrichment Center), CLI-98-3, 47 NRC 77, 88 (1998))." It then said "if 'further analysis' is called for, that in itself is a valid and meaningful remedy under NEPA." In this contention, Petitioners point to a material deficiency in the Application that the Applicant has drastically under counted the costs of a severe accident that could have led to erroneously rejecting mitigation alternatives and a requirement for further analysis could produce a very different outcome of the proceeding.

**CONCLUSION: CONTENTIONS ONE TO FOUR**

226. To reiterate verbatim the concluding arguments already given at the conclusion of Contention One: Wind Power, above, but this time to apply them to all four contentions above: The contention rule is not a "fortress to deny intervention." *Matter of Duke Energy Corp.* (Oconee Nuclear Power Plant), 49 NRC at 335 (quoting *Philadelphia Elec. Co.* (Peach Bottom Atomic Power Station, Units 2 and 3), 8 AEC 13, 20-21 (1974), *rev'd in part*, CLI-74-32, 8 AEC 217 (1974), *rev'd in part, York Committee for a Safe Environment v. N.R.C.*, 527 F.2d 812 (D.C. Cir. 1975)). There is no requirement that the substantive case be made at the contention stage. *Matter of Entergy Nuclear Generation Co., et al.* (Pilgrim Nuclear Power Station), 50-293-LR (ASLB Oct. 16, 2006), 2006 WL 4801142 at (NRC) 85 (quoting *Oconee*, 49 NRC at

342)).

227. The Commission has explained that the requirement at § 2.309(f)(1)(v) 'does not call upon the intervenor to make its case at [the contention] stage of the proceeding, but rather to indicate what facts or expert opinions, be it one fact or opinion or many, of which it is aware at that point in time which provide the basis for its contention.' *A petitioner does not have to provide a complete or final list of its experts or evidence or prove the merits of its contention at the admissibility stage*. And, as with a summary disposition motion, the support for a contention may be viewed in a light that is favorable to the petitioner, so long as the admissibility requirements are found to have been met. The requirement '*generally is fulfilled when the sponsor of an otherwise acceptable contention provides a brief recitation of the factors underlying the contention or references to documents and texts that provide such reasons*.' (Emphasis supplied) The Petitioners' recitation in support of its contention is not brief; the evidence of FENOC's poor consideration of wind power as a serious alternative to the continuation of Davis-Besse's operation from 2017 to 2037 is overwhelming. The Environmental Report fails the standards of NEPA, and as well, NRC regulations and case law interpretations. Petitioners seek admission as intervenors in this relicensing to set the record straight, and to prove that the licensee must take a hard look at far more than it has revealed so far in its perfunctory ER. The presumption that an operating Davis-Besse atomic reactor is the best that can be done respecting the environment is therefore less supportable than ever.

/Signed by Kevin Kamps & submitted by Digital Certificate Pro Se on behalf of Petitioners/

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December 27, 2010

December 27, 2010

UNITED STATES OF AMERICA
BEFORE THE NUCLEAR REGULATORY COMMISSION
OFFICE OF THE SECRETARY

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| In the Matter of | ) |
| | ) |
| FIRSTENERGY NUCLEAR OPERATING COMPANY | ) |
| | ) DOCKET NO. 50-346 LRA |
| DAVIS-BESSE NUCLEAR POWER STATION, UNIT 1 | ) NRC-2010-0298 |
| | ) |
| Regarding the Renewal of Facility Operating License NPF-003 for a 20-Year Period | ) |
| | ) |

**CERTIFICATE OF SERVICE OF REQUEST FOR HEARING AND PETITION TO INTERVENE**

The Petitioners certify that a copy of the foregoing "REQUEST FOR HEARING AND PETITION TO INTERVENE" has been provided to the U.S. Nuclear Regulatory Commission Electronic Information Exchange by Digital Certificate for service to the listed individuals and all others on the service list in this proceeding on this 27th day of December, 2010.

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