

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of NextEra Energy Point Beach, LLC (Point Beach Nuclear Plant, Units 1 and 2)

Docket No. 50-266-2020-301
NRC-2021-0021
March 23, 2021

DECLARATION OF ARNOLD GUNDERSEN

Under penalty of perjury, I, Arnold Gundersen, declare as follows:

1. My name is Arnold Gundersen. I am sui juris. I am over the age of 18-years-old.
2. Physicians for Social Responsibility Wisconsin (PSR-WI) has retained Fairewinds Associates, Inc to review a license application to the nuclear regulatory commission to extend the licensed life of NextEra's Point Beach nuclear reactors until they have operated for 80-years and a related Environmental Report for NextEra Energy Point Beach, LLC's Point Beach Nuclear Plant, Units 1 and 2. My observations and conclusions are offered to a reasonable degree of scientific certainty based on my experience and relevant information sources.
3. This declaration examines and analyzes the technical and environmental issues regarding the License Renewal Request by NextEra for 20-more-years of operation extending the operating life of Point Beach Units 1 and 2 from a 60-year license to an 80-year license.
4. I have more than 50 years of experience in Nuclear Engineering, beginning in 1971 when I earned my Bachelor Degree in Nuclear Engineering (BSNE) from Rensselaer Polytechnic Institute (RPI) cum laude. I earned my Master Degree in Nuclear Engineering (MENE) from RPI via an Atomic Energy Commission Fellowship.

Cooling tower operation and cooling tower plume theory were my areas of study for my Nuclear Engineering Master Degree.

- 4.1. I began my career as a reactor operator and instructor in 1971 and progressed to the position of Senior Vice President for a nuclear licensee prior to becoming a nuclear engineering consultant and expert witness. My Curriculum Vitae is Attachment 1.
- 4.2. I have testified as an expert witness to the Nuclear Regulatory Commission (NRC) Atomic Safety and Licensing Board (ASLB) and Advisory Committee on Reactor Safeguards (ACRS), in Federal Court, the State of Vermont Public Service Board, the State of Vermont Environmental Court, the Florida Public Service Commission, and the California Public Utility Commission (CPUC).
- 4.3. I am an author of the first edition of the Department of Energy (DOE) Decommissioning Handbook.
- 4.4. I have more than 50-years of professional nuclear experience, *including and not limited to*: Cooling Tower Operation, Cooling Tower Plumes, Consumptive Water Loss, Nuclear Plant Operation, Nuclear Management, Nuclear Safety Assessments, Reliability Engineering, In-service Inspection, Criticality Analysis, Licensing, Engineering Management, Thermohydraulics, Radioactive Waste Processes, Decommissioning, Waste Disposal, Structural Engineering Assessments, Nuclear Fuel Rack Design and Manufacturing, Nuclear Equipment Design and Manufacturing, Prudency Defense, Employee Awareness Programs, Public Relations, Contract Administration, Technical Patents, Archival Storage and Document Control, Source Term Reconstruction, Dose Assessment, Whistleblower Protection, and NRC Regulations and Enforcement.
- 4.5. I am the chief engineer for Fairewinds Associates, Inc, an expert witness and paralegal services firm specializing in nuclear engineering, nuclear operations, and nuclear power plant safety analysis and assessment.

5. **Declaration Executive Summary:**

5.1. NextEra's Point Beach Units 1 and 2 were designed and built more than a half a century ago and are an obsolete and unsafe atomic reactor design. If a corporation applied today to build and operate these reactors, their design would not be approved, as the engineering configuration is unacceptable by today's standards. The reactors do not meet basic licensing requirements that protect the safety of nearby communities. Moreover, the Point Beach reactors' continued operation in their aged and unstable condition put nearby neighborhoods and the people who live and work in those communities at an increased risk for significant radiation exposure due to old, outdated, and poorly maintained equipment. Point Beach (PB) also uses water taken from Lake Michigan to cool its reactors. However, when the reactors finish using Lake Michigan water for cooling, each atomic reactor returns the heated wastewater to the Lake killing hundreds of millions of aquatic organisms yearly. Such actions show these reactors are environmental superpredator.

5.2. Additionally, electricity generated by NextEra's Point Beach reactors is more expensive than any form of electricity generated by renewable and sustainable sources, like wind and solar. Closing Point Beach and replacing that electric generating equipment with wind farms or other renewables enables much cheaper sustainable power generators to use the existing Point Beach transmission lines to send much more affordable renewable electricity into Wisconsin's Electric Grid. Closing NextEra's Point Beach Units 1 and 2 and replacing those vulnerable outmoded atomic reactors with renewables will significantly decrease the cost of electricity in Wisconsin and increase overall employment in Wisconsin. In contrast to continued operation of two aging atomic power plants, replacing that power with renewables would increase income to farmers, and such an arrangement would also maintain Wisconsin's tax revenues.

6. **The Point Beach Reactors Are Obsolete:**

6.1. I am 72 years old. In 1964, when I was in 9th grade, the initial engineering began on the two Point Beach design nuclear power reactors. Late in 1970, Point Beach Unit 1 began generating electricity, and three years later, in 1973, Point Beach Unit 2 also began generating electricity. During those years between 1970 and 1973, I earned my Bachelor of Science (BS) in Nuclear Engineering (BSNE), my Master of Engineering (ME) in Nuclear Engineering (MENE), and my AEC Atomic Energy Commission Reactor Operators License. Using a slide rule for calculations, as that was the equipment we all had, I began work at another early nuclear reactor that is now permanently scrapped because it was no longer considered safe.

6.2. When Point Beach was being designed and constructed during the mid to late 1960s, most engineering calculations used slide rules. The analyses that launched John Glenn into orbit and sent men to the moon, as detailed in the movie Hidden Figures, also were conducted using slide rules.¹ Mandatory seatbelt laws for automobiles were not promulgated until 1968, and at that time, there were also no pollution controls required on auto engine exhaust. Rivers were so polluted that they caught fire². As a result of increased air and water pollution, a nascent environmental movement began while Point Beach was under construction. Congress created the Environmental Protection Agency during the very early 1970s due to the grave ecological challenges throughout the entire U.S. The EPA began its environmental reviews after Point Beach Unit 1 was operating.

6.3. During the mid to late 1960s, when Point Beach was designed and constructed, *no large nuclear plants were in operation – large is defined as an electric power output greater than 400 megawatts-electric (MWe)*. Therefore, there was no template of a successful, safe nuclear power plant to use as a guide.

¹ <https://www.imdb.com/title/tt4846340/>

² <https://www.smithsonianmag.com/history/cuyahoga-river-caught-fire-least-dozen-times-no-one-cared-until-1969-180972444/>

- 6.4. Regulatory guidance and oversight were sadly lacking during the construction of Point Beach. The Atomic Energy Commission (AEC), the predecessor to the Nuclear Regulatory Commission (NRC), issued 10CFR50 Appendix A, the first set of General Design Criteria for atomic power plant construction during the early 1970s after construction on Point Beach Unit 1 was already almost complete. More importantly, the AEC implemented 10CFR50 Appendix B as law to ensure Quality Assurance requirements for the construction of all nuclear power plants well after PB Unit 1 started operation.
- 6.5. Due to its weak oversight of new atomic plant design as PB was being designed and constructed and began operation, Congress replaced the AEC with the NRC in 1975. According to the current website of the Nuclear Regulatory Commission:

Before the NRC was created, nuclear regulation was the responsibility of the AEC, which Congress first established in the Atomic Energy Act of 1946. Eight years later, Congress replaced that law with the Atomic Energy Act of 1954, which for the first time made the development of commercial nuclear power possible. The act assigned the AEC the functions of both encouraging the use of nuclear power and regulating its safety. **The AEC's regulatory programs sought to ensure public health and safety from the hazards of nuclear power without imposing excessive requirements that would inhibit the growth of the industry.** This was a difficult goal to achieve, especially in a new industry, and within a short time the AEC's programs stirred considerable controversy. An increasing number of critics during the 1960s charged that the AEC's regulations were insufficiently rigorous in several important areas, **including radiation protection standards, reactor safety, plant siting, and environmental protection...**

By 1974, the AEC's regulatory programs had come under such strong attack that Congress decided to abolish the agency. **Supporters and critics of nuclear power agreed that the promotional and regulatory duties of the AEC should be assigned to different agencies.** The Energy Reorganization Act of 1974 created the Nuclear Regulatory Commission; it began operations on January 19, 1975.³ **[Emphasis Added]**

³ <https://www.nrc.gov/about-nrc/history.html>

- 6.6. Despite all the unknown elements of the untested PB design, the AEC granted Point Beach a license to operate for its original 40 year design life.
- 6.7. Therefore, I conclude that Point Beach was designed and constructed during a period of insufficient regulatory oversight. At that time, the Atomic Energy Commission (AEC) was fulfilling its charter to actively promote new, untested atomic reactor designs, like that of Point Beach, without the benefit of adequate safety and environmental guidance.
- 6.8. Many US atomic reactors have closed or are planning to close shortly due to the inability to operate profitably without the high risk of a meltdown and a considerable investment to adhere to more stringent safety requirements. To date, there are 94 atomic reactors currently operating in the US with an average age of 39 years⁴.
- 6.9. The oldest US atomic reactor in operation is Nine Mile Point Unit 1, a Fukushima type reactor design located in upstate New York that went online one year before PB Unit 1 in December 1970.⁵
- 6.10. At 50 years old, PB is ten years older than the average US nuclear plant and one of the oldest atomic power sites in the United States.
- 6.11. In 2004, PB applied for a 20-year extension to its initial 40-year license approved by the NRC. Even then, it was clear that there is absolutely no factual basis to indicate that energy corporations can safely operate nuclear power plants as they approach 60-years of operation. Today, the data clearly shows that no nuclear plant anywhere in the United States has performed beyond 51-years.
- 6.12. Now, PB chooses to apply for an additional license extension to operate until it is 80-years-old. There is no scientific basis to assure that a 50-year-old atomic

⁴ <https://www.eia.gov/tools/faqs/faq.php?id=228&t=21>

⁵ <https://www.eia.gov/tools/faqs/faq.php?id=228&t=21>

facility like PB that was originally designed to operate for only 40-years can remain safe to run for 80-years.

7. **PB is Unsafe**

7.1. No nuclear plant in the US could be licensed today to operate with the outmoded safety systems included in PB's design. The NRC has already determined that the design of Point Beach is not safe for newer reactors.

7.2. There are numerous flaws at the Point Beach reactors that make it unsafe for this agency to approve the NextEra license extension to operate Point Beach for 80 years. Therefore, the license extension should be denied.

7.3. **The First Problem Is Its Tangential Turbine Hall**

7.3.1. Historically, Point Beach and many other early reactors have a turbine hall that is tangential to the reactor building and control room.

7.3.2. In this Point Beach photo (below), you will see the tall rectangular reactor buildings and the shorter, more extended rectangular turbine halls tangential to the reactor and nearer to the lake.⁶



⁶ https://madison.com/wsj/news/local/environment/point-beach-owner-seeks-to-run-wisconsins-last-nuclear-plant-for-80-years/article_d50ba0b6-f3ca-5129-81c2-757405a7bec8.html

7.3.3. This tangential design was inexpensive and was later determined to be unsafe. This approach is no longer an acceptable design anywhere in the world.

7.3.4. The PB design is unsafe because a turbine failure will send 600 lb. pieces of shrapnel hurtling at 600 mph into the containment, safety-related components, and the control room.

7.3.5. Construction of reactors built after Point Beach changed the turbine hall's orientation to be radially outward from the containment to protect the control room and its operators, the safety-related components, and the containment from the threat of turbine shrapnel.

7.3.6. The picture below is of the Callaway nuclear facility in Missouri, which incorporates this vital safety improvement.⁷



7.3.7. By reorienting the direction of the turbine hall to the radially outward design, the shrapnel would fly into the parking lot rather than the safety-related equipment, control room, and containment building in the event of a turbine failure.

⁷ <https://www.themaneater.com/stories/outlook/proposed-bill-would-fund-callaway-nuclear-plant>

7.3.8. Turbine failures are likely events. Fermi 2 in Michigan experienced turbine failure, as have other nuclear plants and airplane jet engines.

7.3.9. I have reviewed publicly available photos of the PB turbine hall and see no indication that shielding from turbine missile shields has been implemented. While PB cannot rotate its entire turbine hall to assure that a turbine failure does not result in safety-related consequences, there is a solution. To mitigate the impact of a turbine failure, PB could install an inexpensive “Energy Absorbing Turbine Missile Shield, US Patent #4397608A⁸. I conclude that to reduce the risk of damage to safety-related systems, structures, and components, PB should be required to install an energy-absorbing turbine missile shield around its turbine.

7.4. **What Is Embrittlement?**

7.4.1. Even before Point Beach's design, scientists had discovered that neutron radiation from inside the nuclear core would gradually destroy the thick metal nuclear reactor that surrounds that core. This phenomenon is called neutron embrittlement. If embrittlement becomes extensive, the dense metallic nuclear reactor can shatter like glass. The NRC has identified that NextEra's Point Beach Reactors are the most embrittled operating reactors in the United States.

7.4.2. For a video further explaining these phenomena, see:

<https://www.fairewinds.org/nuclear-energy-education/nuclear-crack>

7.4.3. Reactor embrittlement can cause an atomic reactor to shatter like glass, creating what the Nuclear Regulatory Commission (NRC) calls a Class 9 Accident, which is the worst nuclear catastrophe presently acknowledged by the NRC. When the nuclear core leaves the atomic reactor and melts down into the containment, as it did at three of the atomic reactors at the

⁸ <https://patents.google.com/patent/US4397608A/en>

Fukushima Daiichi site in Japan beginning on March 11, 2011, the NRC calls each one of these nuclear calamities a Class 9 Accident.

7.4.4. According to the Nuclear Regulatory Commission,

Reactor pressure vessels, which contain the nuclear fuel in nuclear power plants, are made of thick steel plates that are welded together. Neutrons from the fuel in the reactor irradiate the vessel as the reactor is operated. This can embrittle the steel, or make it less tough, and less capable of withstanding flaws which may be present. Embrittlement usually occurs at a vessel's "beltline," that section of the vessel wall closest to the reactor fuel. Pressurized water reactors (PWRs) are more susceptible to embrittlement than are boiling water reactors (BWRs). ...Steels with a higher proportion of copper and nickel will tend to be more susceptible to embrittlement, than are steels with lower proportions of these two elements...⁹

7.4.5. Nuclear energy corporations cannot prevent neutron embrittlement of metal; it is similar to a spreading cancer in that engineers can monitor embrittlement progress. To create a viable monitoring program, *engineers had numerous samples of the exact metal inside each reactor placed inside the reactor prior to operation.* These samples are called *coupons*, and several are withdrawn periodically and measured in a laboratory to determine the progress of embrittlement.

7.4.6. Engineers designed the Point Beach reactors to operate for 40 years, and the reactors contained enough *sample coupons to last for 40 years of operation.* Now that the PB reactors are licensed to operate for 60-years, there are not enough coupons in the reactor core to test for embrittlement, let alone for an additional 20 years for the license extension request for 80 years to operate Point Beach.

7.4.7. Ten years after Point Beach became operational in 1981, personnel in the Office of the Governor of California were aware that nuclear reactor

⁹ NRC Fact Sheet on Reactor Pressure Vessel Issues, Embrittlement, <http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/prv.html>

embrittlement with its associated risk of a nuclear reactor failure and radiation leak was a serious problem.

7.4.7.1. Peter H. Gleick, a specialist in the office of Gov. Edmund G. Brown's assistant for energy and environment, wrote a Letter to the Editor of the *New York Times* dated November 7, 1981.

7.4.7.2. In that letter, Mr. Gleick said that nuclear reactor embrittlement "...may be the most serious known problem facing existing nuclear power plants... which could cause failure of the pressure vessel containing nuclear fuel." Mr. Gleick's full letter is inserted below.

To the Editor:

If The Pressure Vessel Of A Reactor Cracks

Your Oct. 24 editorial "Brittle Metal and Nuclear Safety" correctly calls attention to what may be the most serious known problem facing existing nuclear power plants - "pressurized thermal shock," which could cause the failure of the pressure vessel containing the nuclear fuel.

Although progressive embrittlement of the pressure vessel has always been anticipated, it now appears that many such vessels will become susceptible to cracking long before reaching their 30- to 40-year lifespan. This problem, however, is neither as avoidable nor as correctable as you suggest.

As you stated, both overcooling and high pressurization must exist before a vessel can crack. Yet there are situations where rapid cooling together with high pressurization is required in order to avoid a serious accident. The operator actions needed to avoid a serious reactor accident may be completely contradictory to those required to avoid cracking the pressure vessels.

For this reason, the Nuclear Regulatory Commission has taken the position that relying on operator action is not an acceptable solution to the risk of pressure vessel failure.

Similarly, the statement that correcting this problem involves catching the flaw early is accurate but misleading. Pressurized thermal shock is a problem that is most severe in the older generation of reactors - those built before the

mid-1970's (newer pressure vessels have better materials characteristics and are less susceptible to embrittlement).

As a consequence, catching the flaw early is not possible for most of these older reactors, which are already close to reaching unacceptable levels of embrittlement. Moreover, the "solution" described in the editorial, annealing of the vessel, requires emptying the entire core of nuclear fuel and heating the highly radioactive pressure vessel to several hundred degrees above its normal operating temperature for a very long period - perhaps up to several months.

Theoretically, the strength of the vessel is then recovered. In practice, however, no commercial nuclear reactor vessel has ever been annealed, and there are serious questions about the time required, the economic costs, the radiation exposure to workers and, in fact, whether or not this process will be successful.¹⁰

7.4.8. Mr. Gleick's 1981 letter to the *New York Times* was prescient except that he researched and wrote it 10-years after Point Beach Unit 1 began operation.

7.4.9. From the documents I reviewed, it is evident that nuclear industry experts and the Nuclear Regulatory Commission (NRC) have known the seriousness of reactor embrittlement and the radiation release consequences for the public should that failure occur.

7.4.10. In 1982, Demetrios L. Basdekas, an NRC Reactor Safety Engineer, expressed his concerns and frustrations in his letter to the editor, also published in the *New York Times*:

“There is a high, increasing likelihood that someday soon, during a seemingly minor malfunction at any of a dozen or more nuclear plants around the United States, the steel vessel that houses the radioactive core is going to crack like a piece of glass. The result will be a core

¹⁰ *New York Times*, November 7, 1981 *New York Times*, November 7, 1981
<http://www.nytimes.com/1981/11/07/opinion/l-if-the-pressure-vessel-of-a-reactor-cracks-084005.html>

meltdown, the most serious kind of accident, which will injure many people, and probably destroy the nuclear industry with it.”¹¹

7.5. **How Does Embrittlement Lead To The Failure Of The Atomic Reactor?**

7.5.1. If the nuclear reactor were to suddenly shut down during one of the dozens of atomic power mishaps that nuclear reactor design engineers and the NRC anticipate will happen, the safety system would immediately inject cool water into the reactor vessel in an attempt to cool the reactor core in hopes of preventing a meltdown.

7.5.2. However, in a seriously embrittled reactor like Point Beach, when that cool water is injected and comes in direct contact with the hot reactor vessel, it can cause “*Pressurized Thermal Shock*” (PTS). After this, the 8-inch thick steel reactor vessel may crack from PTS, causing it to break open and release massive radioactivity into the surrounding area and the environment. The sudden breach of the nuclear power reactor would dramatically increase the pressure inside the containment causing this last radiation barrier to fail also. Should this event occur, the Nuclear Regulatory Commission (NRC) has estimated that it will cause at least 7,000 cancer deaths and \$112 Billion in today’s dollars in property damage.¹²

7.5.3. While *no atomic reactor mishap*, or accident as the industry names them, *should be called routine*, this rapid cooling and sudden pressurization sequence can cause a radioactive disaster, yet the NRC and nuclear power industry have named them a “routine accident”.

¹¹ *New York Times*, March 29, 1982

¹² *Projected Impacts of Large-scale Radiological Releases at Atomic Reactors in the U.S. Calculation of Reactor Accident Consequences (CRAC-2)* report by U.S. NRC & Sandia National Lab, 1982

- 7.5.4. There have been several historical precursor sequences that prove that abrupt temperature and pressure changes do occur at operating nuclear power plants.
- 7.5.4.1. The first such precursor event happened at California's Rancho Seco atomic power reactor on March 20, 1978. When a worker dropped a light bulb, it, in turn, caused a cascade of electrical faults.
- 7.5.4.1.1. Instruments in the control room went haywire, leaving the reactor operators with no accurate instrumentation to rely upon while attempting to control the reactor.
- 7.5.4.1.2. The temperature inside the reactor dropped from 582°F to 285°F in one hour. The reactor pressure dropped from 2,200 psi to 1,600 psi. The reactor pressure jumped back to over 2,000 psi but at a low temperature when the reactor operators injected cold water.
- 7.5.4.2. The Rancho Seco "transient", as industry nuclear engineers call it, was a near miss that made it clear that reactors like Point Beach are susceptible to abrupt changes in temperature and pressure. Fortunately, while the abrupt changes in temperature and pressure severely stressed the nuclear reactor vessel welds, the Pressurized Thermal Shock (PTS) and nuclear vessel failure were avoided at Rancho Seco. *Why?* A major catastrophe was avoided at Rancho Seco because the reactor was new, and unlike Point Beach, the welds at Rancho Seco were not yet embrittled by long-term neutron bombardment that would have caused the reactor to shatter like glass.
- 7.5.5. More recent analyses show that an atomic reactor vessel can crack even when it is not under pressure. Hence, the damage the nuclear power industry has named "pressurized" thermal shock is now as clearly understood as damage from thermal shock. Clipped below is testimony to the NRC's Advisory Committee on Reactor Safeguards in 2014.

“Mr. Kirk: well, they're - and that's one of the - in fact, that was very much a surprise because in the - in the early analysis - in the 1980s analysis the no-pressure events were a priori screened out. But what we found in running the calculation is you can run a crack pretty much all the way through the wall.

Member Skillman: just with temperature.

Mr. Kirk: just with temperature.

Member Skillman: just with temperature.

Mr. Kirk: yes.”¹³

7.5.6. The NRC identified Point Beach as the most embrittled reactor still operating in the US¹⁴.

7.5.7. The six most embrittled nuclear reactors in the United States are:

- 7.5.7.1. Yankee Rowe (permanently closed 1992)
- 7.5.7.2. Genkai-1 (Japan, permanently closed 2015 after discovering coupon samples indicated much higher embrittlement than analysis predicted)
- 7.5.7.3. Point Beach
- 7.5.7.4. Palisades (closing in 2022)
- 7.5.7.5. Indian Point 3 (closing in 2021)
- 7.5.7.6. Diablo Canyon 1 (closing in 2024)
- 7.5.7.7. Beaver Valley (Scheduled to close in 2021 unless Pennsylvania approves more than a hundred million dollar yearly subsidy.)

7.5.8. Therefore, five of the six most embrittled reactors in the US have already been shuttered or will be closed during the next three years rather than addressing the safety-related embrittlement issue. Only the Point Beach reactors are not scheduled to be closed.

7.6. **Is There A Solution To Nuclear Reactor Embrittlement?**

7.6.1. It is disturbing to note that the *NRC and NextEra's alleged solution* to protect Point Beach against cracking and radiation releases from its

¹³ Advisory Committee on Reactor Safeguards, top of p.33, Oct. 16, 2014 transcript

¹⁴ NRC ADAMS Accession No. ML13077A156

increasing neutron embrittlement is simply to develop new operator administrative controls. These administrative controls are requirements that the atomic reactor operators at Point Beach must implement during a reactor emergency to avoid cracking the 8” thick steel atomic power reactor vessel.

7.6.1.1. These administrative controls require the reactor operators to raise the reactor's temperature before increasing the pressure, and unless the operators implement these controls perfectly, the reactor vessel will experience cracking.

7.6.1.2. This situation is analogous to a tractor-trailer driver being informed by his boss that the brakes on the tractor-trailer will fail at speeds above 50 miles per hour. However, rather than fix the brakes, the trucking company's administrative solution is to insist that the truck driver never exceed 49 miles per hour. Just as reactor vessel embrittlement gets significantly worse over time, bad brakes on the truck would demand that the driver reduce his speed further every year, or the truck would be pulled off the road and sold for scrap.

7.7. **How Is Reactor Embrittlement Determined?**

7.7.1. To measure embrittlement, when the Point Beach reactor vessels were manufactured, identical metallic samples, called coupons, were manufactured as well and were installed in the Point Beach reactors when the reactors were placed on site. The same system is used at other reactors to monitor embrittlement progression.

7.7.2. Originally, Point Beach was designed and anticipated to operate for only 40 years, so only 40-years-worth of coupon samples were manufactured and installed in the reactors. Now there are not enough sample coupons to remove from the reactor and test for embrittlement until the 60-year-license expires, let alone for an additional 20 more years for an 80-year-license to operate.

7.7.3. Unnervingly and without any scientific proof to do so, the Nuclear Regulatory Commission (NRC) has repeatedly modified its calculations allowing aging, embrittled nukes to continue to operate well past their lifespan and certainly in risky uncharted territory.

7.7.4. The process of determining the Nil-ductility transition temperature (the temperature below which the vessel will shatter) is not an exact science. A paper written, by Nikolaeva et al., in 2000 supports my assessment of uncertainty and complexity in the development of the embrittlement calculations:

The radiation embrittlement of reactor vessel materials is a **complex process**, which depends upon the conditions of a radiation in the microstructure and chemical composition of the steel. It is universally acknowledged that phosphorus, copper, nickel intensify the radiation embrittlement of vessel material the most... **The presence of a synergistic interaction of elements in the irradiation process and the complex interaction of metallurgical factors and the radiation conditions make it difficult to determine the degree to which impurities and alloying elements influence radiation embrittlement.**¹⁵
[Emphasis Added]

7.7.5. The NRC and the Point Beach reactors rely on using engineering analysis to extend the *useful life* of embrittled nuclear reactors, which has the net effect of reducing the safety margin of Point Beach. A paper written in 2000 by the Nuclear Energy Agency Nuclear Science Committee states that safety margins will be reduced by extending the “useful life” of embrittled reactors.

As many commercial light water reactors begin to approach the end of their licensed lifetime, nuclear utilities have started to investigate the possibility of extending the operating life of reactors beyond the originally licensed 30-40 years. **Longer reactor operating times mean higher neutron and gamma fluence levels and/or smaller safety margins ...** High energy

¹⁵ Embrittlement of Low-Alloy Structural Steel by Neutron Irradiation, Atomic Energy, Vol. 88, No.4, 2000: Nikolaeva, Nikolaev, Kevorkyan, Kryukov & Korolev, <http://link.springer.com/article/10.1007%2F02673611#page-2>

neutron bombardment degrades the structural integrity of RPVs¹⁶. **[Emphasis Added]**

7.7.6. Robert Pollard, a senior nuclear engineer with the Union of Concerned Scientists, was one of the world's first scientists to identify the danger and degree of uncertainty in embrittlement calculations within the nuclear engineering and scientific community.

If you really want a good fight, ask people about the reliability of those safety estimates. **The method the NRC and the industry uses is called probabilistic risk assessment. It's designed to get around a rather impressive lack of concrete evidence...** In a probabilistic risk assessment, you estimate the likelihood of an event that initiates a transient, then estimate the likelihood of the reaction to that event, the reaction to that reaction, and so on down the line. Westinghouse, for example, has a model that starts with 17 possible initiators and runs through event trees to more than 8,200 end points... But there are inevitable differences of opinion about the value of those calculations... Not everyone agrees with the calculations. **“The NRC may consult its Ouija board and come up with a number”, says Robert Pollard of the Union of Concerned Scientists, “but the error bands are so large that it is essentially useless.”** ... “There’s no dispute that current emergency systems would not be able to cope with the fracture of the reactor vessel... The defense in depth argument disappears when you talk about pressurized thermal shock.” **[Emphasis Added]**¹⁷

7.8. Even though neutron embrittlement of the Point Beach reactors present a clear and present danger, the NRC and Point Beach have relied upon error-prone analytical calculations rather than use all the tools available to identify just how serious the embrittlement threat has become as Point Beach ages.

¹⁶ *Prediction Of Neutron Embrittlement In The Reactor Pressure Vessel*, Nuclear Energy Agency Nuclear Science Committee, 2000 <https://www.oecd-nea.org/science/docs/2000/nsc-doc2000-5.pdf>

¹⁷ *Thermal shock-new nuclear-reactor safety hazard?* Edward Edelson, *Popular Science*, June 1983, <http://static1.1.sqspcdn.com/static/f/356082/25715973/1417195845950/June+1983+Popular+Science.pdf?token=a42WKwrX5fEjMEeVND6FGLOKmWc%3D>

7.8.1. A review of the publicly available files in the NRC's ADAMS database indicates that the NRC has granted waivers for each of the five most embrittled reactors still operating to avoid testing their actual embrittlement through the measurement of their actual metallurgical coupons. *At Diablo Canyon, the NRC has allowed the unit to avoid testing any coupon samples for almost two decades*, and at Palisades, Indian Point, and Point Beach, I could find no record of coupon samples being tested for at least ten years. When Yankee Rowe was completely dismantled in 1992, it is unfortunate for the safety of the whole industry that the vessel was not tested to determine how significant its embrittlement was. With so many embrittled atomic reactors closing during the next several years (Indian Point Unit 3 in April 2021, Palisades in 2022, and Diablo Canyon 1 in 2024), we are provided with significant and vital opportunities to perform nuclear *autopsies* (comprehensive analyses) on those badly embrittled Reactor Pressure Vessels (RPVs) to learn lessons and provide real world physical data for an accurate analysis of the PB 80-year license extension application process.

7.8.2. As the US nuclear fleet ages, the NRC has systematically removed conservative calculational aspects of the embrittlement process to allow continued operation. The NRC has not incorporated the actual data from coupons in the remaining five worst atomic power reactors in the U.S. to be used for the embrittlement analysis applied to NextEra's Point Beach reactors to allow their continued operation. Instead of evaluating Point Beach's specific metallurgy, the NRC has allowed Point Beach and its cohorts to use analytical techniques that ignore the data from sample coupons it could readily test. Additionally, there is no scientific basis by which the Point Beach reactors should continue operating unless there is a complete physical analysis of the coupons from its reactors and the five other reactors that are its embrittled cohorts.

7.8.3. Therefore I conclude that Point Beach's continued operation violates 10CFR50 Appendix A, Criterion 14.

Criterion 14—Reactor coolant pressure boundary. The reactor coolant pressure boundary shall be designed, fabricated, erected, and tested so as to have an extremely low probability of abnormal leakage, of rapidly propagating failure, and of gross rupture.

7.8.4. During the last 50 years of operation, Point Beach has failed to develop an adequate coupon program to physically test the integrity of the RPV for PB's operational life. As defined in Appendix A Criterion 14, "testing" obviously does not include analytical techniques prone to error. There is inadequate coupon data specific to PB to justify its continued operation beyond its 50th year, let alone until it reaches 80. BP has been violating GDC 14 by not testing coupons and relying on analytical handwaving instead!

7.8.5. The NRC already knows the Point Beach reactor vessel to be the most embrittled vessel in the nation. PB was not "designed and fabricated... to have an extremely low probability of abnormal leakage, of rapidly propagating failure, and of gross rupture." Thus the NRC's acknowledgment proves that the Point Beach reactors fail to meet Criterion 14.

8. **Waivers**

8.1. With Point Beach's first license renewal application to change from 40 to 60 years and its most recent license renewal application to operate from 60 to 80 more years, NextEra Corporation has not made any commitments to improve the reactors' physical condition to meet modern safety standards. Instead, NextEra is proposing to create a checklist at the Point Beach reactors that allows for periodically monitoring the degrading state of concrete, pipes, wires, and other systems designed to prevent radiation releases in a disaster that may occur at PB.

8.2. This is an important distinction. Point Beach was designed in 1965 with a design life of 40-years. In its latest application to operate for 80-years, PB is not

committing to meet any new safety criteria. Instead, PB agrees to monitor its mid-1960s design to identify any further degradation in a facility designed before the Nuclear General Design Criteria were implemented and before Nuclear Quality Assurance standards even existed.

- 8.3. Since there are no nuclear reactors older than 51 years old, PB's proposed monitoring and inspection program is an academic exercise that is not based upon physical or scientific data.
- 8.4. It is essential to ask what happens when an aging nuclear facility like PB uses this license extension inspection process and identifies material degradation exceeding its license extension commitments? When this occurs, the reactor owner asks for a *waiver* from the NRC to continue to operate even though it has failed to meet its extended license requirements.
- 8.5. As current reactors age beyond their original 40-year design life and the NRC approves 40-60 year license extensions, the waiver process allows these degrading and unsafe reactors to continue running even after inspections have identified degradation beyond anticipated levels. The NRC has never closed a nuclear facility when the initial extended inspection plan indicates an exceeded inspection parameter.
- 8.6. Granting a license extension based upon an academic analysis of potential degradation for 80 years of operation must not allow exceedances to be glossed over by future NRC waivers. When an energy corporation, like NextEra, exceeds its license extension plan, the NRC must commit to immediate plant closure.

9. **Superpredator**

- 9.1. Power plants that killed fish and other aquatic organisms were not regulated when the Point Beach reactors were commissioned and designed. There was no Environmental Protection Agency to promulgate regulations of cooling water

intake from and heated water discharges to Lake Michigan. The EPA finally recognized the thermal pollution effects from atomic reactors after Point Beach was already in operation.

- 9.2. Nuclear reactors are the least efficient means of electric production because they discharge more heat into the environment than any other electricity production method. The so-called iconic image of two giant hyperbolic cooling towers frequently defines atomic power plants. Cooling towers are associated with nuclear power plants (NPPs) because NPPs have the lowest Carnot Cycle Efficiency of any form of electric generation, meaning that atomic power reactors create a disproportionately large amount of waste heat for the electricity they produce when compared to coal, oil, and natural gas.
- 9.3. Cooling towers exist for two reasons: first, to prevent the entrainment and death of fish eggs and larva in the high temperatures that exist within the PB condensers, and second, to ensure the tremendous amount of waste heat *is not* discharged directly into Lake Michigan, where it can significantly damage aquatic species like spawning fish, plankton, and other biota upon which all marine species are dependent for survival. The environmental damage caused by the waste heat from Point Beach to the Lake Michigan ecosystem is staggering, making it a superpredator.
- 9.4. More stringent environmental laws are now in place than in 1965 concerning the discharge of waste heat, and those laws are effectively applied to stop license renewal at other NPPs that are destroying their cooling water source with their waste heat.
- 9.5. Significant public and State opposition requiring the use of cooling towers as a condition for any 20-year operating extension has already occurred at three U.S. atomic power reactor sites. Rather than spend the money necessary to retrofit those plants and install cooling towers as demanded by appropriate state water control authorities, the reactor owners chose to close the reactors.

- 9.6. Oyster Creek, located on Barnegat Bay in New Jersey and owned by Exelon Corporation, applied *successfully* for a 20-year license extension from the NRC in 2009 but was denied the ability to discharge its waste heat into the Bay at the State permit level. Environmental groups, the State of New Jersey, and Exelon then negotiated an agreement that the plant would close by 2019 rather than operate until 2029 with a 20-year license extension, and Exelon would not install cooling towers for Oyster Creek. Exelon chose to give up the additional 10-years of operation of Oyster Creek and those profits rather than installing cooling towers.
- 9.7. On January 9, 2017, Entergy Corp, the State of New York, and environmental groups agreed to close the Indian Point Units 2 and 3 nuclear reactors in 2020 and 2021 rather than install cooling towers for Entergy's proposed licensure venture. The negotiated settlement determined that Entergy would not build cooling towers during the last three and four years of proposed operation prior to Indian Point's final shutdown, and Entergy would not seek to operate either reactor beyond 2021.
- 9.8. The situation at Point Beach Units 1 & 2 is strikingly similar to the failed attempts at Oyster Creek and Indian Point Units 2 & 3 to continue to operate without cooling towers despite significant environmental damage. When environmental groups, state environmental boards, and state attorneys general oppose 20-year license extensions, most nuclear power plants in the U.S. do not successfully receive the final 20-year license extension. Back fitting a cooling system that will mitigate ongoing environmental damage from nuclear power waste heat is critical to saving aquatic life, fishing, and survival of lakes, rivers, and ocean bays for other important community and financial purposes.
- 9.9. Nukes are the most thermodynamically inefficient way of producing electricity (Carnot efficiency). As such, they discharge an enormous amount of waste heat (hot water), and they consume a massive amount of cold water.

- 9.10. The PB reactors were designed well before NEPA (the National Environmental Policy Act) when killing fish and other aquatic organisms were not a concern. More modern designs require cooling towers.
- 9.11. Hundreds of millions of gallons of cold lake water containing fish, millions of fish larva, and other aquatic organisms are removed from the lake, heated by 30 degrees in the condenser, and killed each day; hence PB is a superpredator.
- 9.12. Additionally, abnormally hot chemically treated water is discharged back into the lake every day, allowing non-native species that thrive on warmer water to invade Point Beach environs and multiply in Lake Michigan.
- 9.13. Other aging nukes were forced to install cooling towers to continue past their original 40-year licensure. Diablo Canyon, Oyster Creek, Indian Point, others and chose to close rather than protect the environment.
- 9.14. There is a solution to save the aquatic biome of Lake Michigan. Require NextEra to install cooling towers for the two Point Beach atomic reactors.

10. **Cost Of Alternatives**

- 10.1. The economic case presented by NextEra PB in the Environmental Reports to justify its continued operation is flawed.
- 10.2. Due to competitive pressures from renewable and sustainable energy, old operating nuclear plants no longer produce electricity at competitive prices.
- 10.3. While building new nuclear plants costs tens of billions of dollars, old nuclear plants like PB have almost no market value. Most recently, Entergy sold its 838 MWe Fitzpatrick nuclear plant in upstate New York to Exelon. The sale price was \$110M, which included fresh nuclear fuel, 600 trained employees, and the

transfer of hundreds of millions of dollars to Exelon from the Fitzpatrick decommissioning fund.¹⁸ Fitzpatrick was given away.

- 10.4. Even if the initial cost to build an atomic plant is zero, the operating cost (salaries, fuel, repairs) is more expensive than the renewable alternatives. As Amory Lovins frequently notes:

Most U.S. nuclear power plants cost more to run than they earn. Globally, the *World Nuclear Industry Status Report 2019* documents the nuclear enterprise's slow-motion commercial collapse—dying of an incurable attack of market forces. Yet in America, strong views are held across the political spectrum on whether nuclear power is essential or merely helpful in protecting the Earth's climate—and both those views are wrong. In fact, building new reactors, or operating most existing ones, makes climate change worse *compared with spending the same money on more-climate-effective ways to deliver the same energy services*. Those who state as fact that rejecting (more precisely, declining to bail out) nuclear energy would make carbon reduction much harder are in good company, but are mistaken... Nuclear owners strive to beat coal and gas while their allies often disparage or suppress renewables. Yet most US nuclear plants are uneconomic just to run, so many are closing. To keep milking those old assets instead, their powerful owners seek and often get multi-billion-dollar bailouts from malleable state legislatures for about a tenth of the nuclear fleet so far, postponing the economic reckoning by shooting the market messenger.¹⁹

- 10.5. Because PB has entered into a very favorable power purchase agreement for itself and NextEra with the State of Wisconsin, Wisconsin ratepayers subsidize the Point Beach reactors.
- 10.6. Point Beach's Environmental Report ignores the option of replacing the reactors with wind turbines, whose total cost (install/operate) is much lower than the price just to continue to operate the Point Beach reactors. Additionally, installing wind power would be much safer for the environment and surrounding

¹⁸ <https://www.bizjournals.com/albany/news/2016/08/09/entergy-selling-upstate-nuclear-power-plant-for.html>

¹⁹ <https://www.forbes.com/sites/amorylovins/2019/11/18/does-nuclear-power-slow-or-speed-climate-change/?sh=7b7c0a27506b>

communities rather than continuing to operate old aging and unsafe atomic reactors way past the time they were designed to run.

- 10.7. Thus, PB's continued operation will increase the cost of power to consumers compared to if it were to be replaced by renewables.
- 10.8. PB's Environmental Report ignores the existing transmission lines emanating from the current facility that provides a significant economic incentive to build local wind farms.
- 10.9. While closing PB will involve job changes for the PB staff, the staff has the correct skill set such that the new robust wind industry will provide them with jobs if they choose to remain in the electric generation field and want to stay locally.
- 10.10. Wind farms to replace PB will provide economic incentives for struggling farmers through yearly payments to use their land. This incentive to local farmers more than offsets the effect of Point Beach's closure on the local community.
- 10.11. Wind farms create taxable assets to offset most of the taxes paid by the NextEra facilities.
- 10.12. Additional construction jobs will be created for half a decade as Point Beach is decommissioned and dismantled.
- 10.13. Electric rates in Wisconsin will be lower if renewable alternatives replace PB.
- 10.14. Replacing an atomic facility with renewables has already begun to happen at a recently closed nuclear reactor owned by NextEra in Iowa. In an article entitled "*Huge solar farm planned for decommissioned Duane Arnold nuclear plant site*", the *Iowa Gazette* outlines NextEra's plans to replace the aging nuclear plant with a 3,500-acre solar farm.

For more than four decades, the name of former Cedar Rapids utility executive Duane Arnold has been synonymous with nuclear power in Iowa. Now it could have a new connotation: a massive solar energy project planned for 2023 near the now-idle Duane Arnold Energy Center... It is expected to produce up to 690 megawatts of solar energy — even more than the single-unit nuclear plant generated.²⁰

11. In my opinion, closing NextEra Point Beach and installing renewable generation like wind and solar by using PB's existing transmission lines will lower electric rates in Wisconsin, create jobs, increase farmers' income, maintain the tax base, and create a more viable future for local communities.

–END–

Attachments:

Attachment 1 – Curriculum Vitae

I declare under penalty of perjury that the preceding is true and correct.

Executed this 23rd day, March 2021 in Charleston, South Carolina

_____/s/_____

Arnold Gundersen, Chief Engineer, Fairewinds Associates, Inc
MENE [Master Engineering Nuclear Engineering], RO [Reactor Operator]

²⁰ <https://www.thegazette.com/subject/news/business/duane-arnold-nuclear-plant-solar-farm-nextera-energy-palo-ia-20210318>

For more than four decades, the name of former Cedar Rapids utility executive Duane Arnold has been synonymous with nuclear power in Iowa. Now it could have a new connotation: a massive solar energy project planned for 2023 near the now-idle Duane Arnold Energy Center... It is expected to produce up to 690 megawatts of solar energy — even more than the single-unit nuclear plant generated.²⁰

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Arnold Gundersen 3/23/21

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**Arnold Gundersen, Curriculum Vitae
Chief Engineer, Fairewinds Associates, Inc
March 2021**

Education and Training

ME NE Master of Engineering Nuclear Engineering
 Rensselaer Polytechnic Institute, 1972
 U.S. Atomic Energy Commission Fellowship
 Thesis: Cooling Tower Plume Rise

BS NE Bachelor of Science Nuclear Engineering
 Rensselaer Polytechnic Institute, Cum Laude, 1971
 James J. Kerrigan Scholar

RO Licensed Reactor Operator, U.S. Atomic Energy Commission,
 License # OP-3014

Patents

Energy Absorbing Turbine Missile Shield – U.S. Patent # 4,397,608 – 8/9/1983

Honors

U.S. Atomic Energy Commission Fellowship, 1972
B.S. Degree, Cum Laude, RPI, 1971, 1st in nuclear engineering class
Tau Beta Pi (Engineering Honor Society), RPI, 1969 – 1 of 5 in sophomore class of 700
James J. Kerrigan Scholar 1967–1971
Publicly commended to U.S. Senate by NRC Chairman, Ivan Selin, in May 1993 – “It is true...everything Mr. Gundersen said was absolutely right; he performed quite a service.”

Expert Qualifications – including and not limited to:

- Chief Engineer, Fairewinds Associates, Inc, 2003 to present
- Nuclear Engineering, Safety, and Reliability Expert
- Federal and Congressional hearing testimony, Expert Witness testimony, Public Utility Commission Testimony, state legislative hearings, community stakeholder expert witness
- Vermont Community Research Fellow, University of Vermont
- Former Senior Vice President Nuclear Licensee
- Former Licensed Reactor Operator
- Atomic Energy Commission Fellow
- 50 years of nuclear industry experience and oversight

Publications

Co-author — *Radioactive Isotopes Measured at Olympic and Paralympic Venues in Fukushima Prefecture and Tokyo, Japan, Journal of Environmental Engineering Science* Volume 38, Number 2, 2021, Mary Ann Liebert, Inc., DOI: 10.1089/ees.2020.0139
Co-author with corresponding author Dr. Marco Paul Johann Kaltofen, Department of Physics, Worcester Polytechnic Institute (WPI), Worcester, MA, USA and Maggie Gundersen, Founder of Fairewinds Energy Education, Charleston, SC, USA.

- Co-author — *Science of the Total Environment* (STOTEN) published a peer-reviewed article entitled: *Radioactively-hot particles detected in dusts and soils from Northern Japan by combination of gamma spectrometry, autoradiography, and SEM/EDS analysis and implications in radiation risk assessment*. Co-authored with Dr. Marco Kaltofen, Worcester Polytechnic Institute (WPI), it details the analysis of radioactively hot particles collected in Japan following the Fukushima Dai-ichi meltdowns.
[<http://www.sciencedirect.com/science/article/pii/S0048969717317953>]
- Published Lecture — *The Lessons of the Fukushima Daiichi Nuclear Accident* published in the *International Symposium on the Truth of Fukushima Nuclear Accident and the Myth of Nuclear Safety*, August 30, 2012 University of Tokyo, Iwanami Shoten Publishers, Tokyo, Japan
- Published Lecture -- *Crisis Without End: The Medical and Ecological Consequences of the Fukushima Nuclear Catastrophe, from the Symposium at the New York Academy of Medicine, The New Press, 2014, Chapter 12, What Did They Know and When*
- Author — *The Echo Chamber: Regulatory Capture and the Fukushima Daiichi Disaster, Lessons from Fukushima*, February 27, 2012, Greenpeace International
- Author — *Fukushima Daiichi: Truth and The Way Forward*, Shueisha Publishing, February 17, 2012, Tokyo, Japan.
- Co-author — *DOE Decommissioning Handbook, First Edition*, 1981-1982, invited author.

Presentations, Events, & Media (located @ end of CV)

Committee Memberships

- Current member and founding member, Board of Directors, Fairewinds Energy Education Corp, 501(c)3
- Vermont Yankee Public Oversight Panel, appointed 2008 by President Pro-Tem Vermont Senate
- National Nuclear Safety Network – Founding Board Member
- Three Rivers Community College – Nuclear Academic Advisory Board
- Connecticut Low Level Radioactive Waste Advisory Committee – 10 years, founding member
- Radiation Safety Committee, NRC Licensee – founding member
- ANSI N-198, Solid Radioactive Waste Processing Systems

University Fellowship, Teaching, and Academic Administration

- University of Vermont Community Research Fellow, appointed January 2016 through 2018
- Community College of Vermont – Mathematics Professor – 2007 through Spring 2013
- Rensselaer Polytechnic Institute (RPI) – Advanced Nuclear Reactor Physics Lab

Expert Witness Testimony and Nuclear Engineering Analysis and Consulting

Before The United States Of America Nuclear Regulatory Commission Office of The Secretary Declaration Of Arnold Gunderson To Support The Motion To Reopen Proceeding And Request To Amend Contention By The Blue Ridge Environmental Defense League And Its Chapter Concerned Citizens Of Shell Bluff Regarding Southern Nuclear Operating Company's Request For A License Amendment And Exemption For Unit 3 Auxiliary Building Wall 11 Seismic Gap Requirements, Lar-20-001, December 7, 2020. In the Matter of the Southern Nuclear Operating Company License

Amendment Application for Combined License NPF-91 at the Vogtle Electric Generating Plant Unit 3. Docket No. 52-025-LA-3

Before The United States Of America Nuclear Regulatory Commission Office of The Secretary
In the Matter of the Southern Nuclear Operating Company License Amendment Application for Combined License NPF-91 at the Vogtle Electric Generating Plant Unit 3. Docket No. 52-025-LA-3
Declaration of Arnold Gundersen to Support The Petition For Leave To Intervene And Request For Hearing By The Blue Ridge Environmental Defense League And Its Chapter Concerned Citizens Of Shell Bluff Regarding Southern Nuclear Operating Company's Request For A License Amendment And Exemption For Unit 3 Auxiliary Building Wall 11 Seismic Gap Requirements, Lar-20-001

Before the State of Vermont Public Utilities Commission, Surrebuttal Testimony of Arnold Gundersen. December 1, 2017. VTPUC Docket 8880, Joint Petition of NorthStar Decommissioning Holdings, LLC.

Before the State of Vermont Public Utilities Commission, Testimony of Arnold Gundersen Supporting the New England Coalition: An Evaluation of The Financial Risks to Vermont In the Proposed Sale of The Entergy Nuclear Vermont Yankee Power Plant Site to NorthStar Decommissioning Holdings, LLC. August 30, 2017. VTPUC Docket 8880, Joint Petition of NorthStar Decommissioning Holdings, LLC.

Before the United States District Court Northern District Of Illinois, Steve Lawson And Darla Lawson, Other Similar Situated Individuals, Plaintiffs, Vs. General Electric, And Does 1-200, Defendants. Expert Witness Report by Arnold Gundersen, Prepared for Plaintiffs Attorney: Charles A. Bonner, Esq. Sb# 85413. May 25, 2017. Analysis of radiation exposure to GE journeyman welder.

Before the Public Utilities Commission of The State of California – January 27, 2017 – Prepared Direct Testimony of Arnold Gundersen of Fairewinds Associates, Inc., For San Luis Obispo Mothers for Peace regarding the: Application of Pacific Gas and Electric Company for Approval of the Retirement of Diablo Canyon Power Plant, Implementation of the Joint Proposal, and Recovery of Associated Costs Through Proposed Ratemaking Mechanisms Application 16-08-006 (Filed August 11, 2016)

Nuclear Regulatory Commission Before the Secretary – May 2, 2016, – Declaration of Arnold Gundersen To Support the Petition for Leave to Intervene And Request For Hearing By The Blue Ridge Environmental Defense League Regarding Southern Nuclear Operating Company's Vogtle Electric Generating Plant Units 3 And 4 Request For License Amendment And Exemption: Containment Hydrogen Igniter Changes (LAR-15-003)
Fairewinds Energy Education Report Submitted to NRC in Response to an Advance Notice of Proposed Rulemaking for Regulatory Improvements for Decommissioning Power Reactors: – March 17, 2016, The Nationwide Failures of Decommissioning Regulation: Decommissioning Trust Funds or Slush Funds?

Fairewinds Energy Education Report Submitted to NRC for Public Comment to Staff Regarding the Decommissioning of the Vermont Yankee Atomic Reactor – March 23, 2015, Vermont Yankee's Decommissioning as an Example of Nationwide Failures of Decommissioning Regulation

NRC Before the Atomic Safety and Licensing Board (ASLB) – December 1, 2014, Gundersen Declaration Palisades Embrittlement, Docket No. 50-255, Entergy, Palisades, Petition to Intervene

and for A Public Adjudication Hearing of Entergy License Amendment Request for Authorization to Implement 10 CFR §50.61a, Alternate Fracture Toughness Requirements For Protection Against Pressurized Thermal Shock Events.

NRC Before the Commission – November 6, 2014, *Second Supplemental Declaration of Arnold Gundersen*, In the Matter of Florida Power & Light Co., Docket No. 50-389, St. Lucie Plant, Unit 2.

NRC Atomic Safety and Licensing Board (ASLB) – October 10, 2014 – *Diablo Canyon Nuclear Power Plant, Units 1 and 2 – Gundersen Affidavit Supporting Friends of the Earth's Petition to Intervene: In the matter of Pacific Gas & Electric Company Docket No. 50-275-LR & Docket No. 50-323-LR, License Renewal Application.*

NRC Hearing Request – *Declaration of Arnold Gundersen Supporting Hearing Request*, March 10, 2014 – retained by Southern Alliance for Clean Energy (SACE) in the matter of Florida Power & Light Co., Docket No. 50-389, St. Lucie Plant, Unit 2

NRC ASLB Proceeding Fermi Unit 3 52-033-COL – October 30, 2013 – Retained by Don't Waste Michigan, Beyond Nuclear et al, Oral Expert Witness Testimony regarding Contention 15: Quality Assurance.

State of Utah Seventh District Court of Emory County – September 25, 2013 – Retained by HEAL Utah et al as an expert witness testifying on cooling tower consumptive use of water for a proposed nuclear power plant owned by Blue Castle Holdings and located on the Green River. Defendants were Kane County Water Conservancy District.

Canadian Nuclear Safety Commission – May 29-30, 2013 – Retained by Durham Nuclear Awareness to present expert witness testimony in hearings regarding the proposed life extension for the Pickering Nuclear Station owned Ontario Power Generation.

Nuclear Regulatory Commission – May 30, 2013 – Expert witness report Before the Secretary NRC *in the Matter of Detroit Edison Nuclear Power Station: Rebuttal Testimony of Arnold Gundersen Supporting of Intervenors' Contention 15: DTE COLA Lacks Statutorily Required Cohesive QA Program.* Retained by Don't Waste Michigan, Beyond Nuclear et al.

Nuclear Regulatory Commission – May 20, 2013 – Expert witness report Before the Secretary NRC *in the Matter of Davis Besse Nuclear Power Station: Expert Witness Report of Arnold Gundersen to Support the Petition for Leave to Intervene and Request for Hearing by Beyond Nuclear, Citizens Environment Alliance Southwest Ontario Canada, Don't Waste Michigan, and The Sierra Club.* Retained by Beyond Nuclear, Citizens Environment Alliance Southwest Ontario Canada, Don't Waste Michigan, and The Sierra Club.

Nuclear Regulatory Commission – May 6, 2013 – Expert witness report Before the Secretary NRC: *Expert Witness Report of Arnold Gundersen to Support the Petition for Leave to Intervene and Request for Hearing by The Blue Ridge Environmental Defense League, Bellefonte Efficiency and Sustainability Team, And Mothers Against Tennessee River Radiation.* Retained by BREDL et al.

Nuclear Regulatory Commission – April 30, 2013 – Expert witness report to Atomic Safety and Licensing Board: *Testimony of Arnold Gundersen Supporting of Intervenors Contention 15: DTE*

Cola Lacks Statutorily Required Cohesive QA Program. Retained by Don't Waste Michigan, Beyond Nuclear et al.

Canadian Nuclear Safety Commission (CNSC) – April 29, 2013 – Expert witness report to Canadian Nuclear Safety Commission (CNSC): *Analysis of The Relicensing Application for Pickering Nuclear Generating Station.* Retained by Durham Nuclear Awareness.

Nuclear Regulatory Commission – January 16, 2013 – Expert witness presentation to NRC Petition Review Board: *2.206 Presentation San Onofre Units 2 and 3 Replacement Steam Generators Meeting with Petitioner Friends of the Earth, Requesting Enforcement Action Against Southern California Edison Under 10 CFR 2.206*

Expert Witness Report for Friends of The Earth – July 11, 2012 – *San Onofre's Steam Generators: Significantly Worse Than All Others Nationwide*, Fairewinds Associates, Inc

Expert Witness Report for Friends of the Earth – May 15, 2012 – *San Onofre Steam Generator Failures Could Have Been Prevented*, Fairewinds Associates, Inc

Expert Witness Report for Friends of the Earth – April 10, 2012 – *San Onofre Cascading Steam Generator Failures Created by Edison: Imprudent Design and Fabrication Decisions Caused Leaks*, Fairewinds Associates, Inc

Expert Witness Report for Friends of the Earth – March 27, 2012 – *Steam Generator Failures at San Onofre: The Need for A Thorough Root Cause Analysis Requires No Early Restart*, Fairewinds Associates, Inc

Expert Witness Report for Greenpeace – February 27, 2012 – *Lessons from Fukushima: The Echo Chamber Effect*, Fairewinds Associates, Inc

Nuclear Regulatory Commission – December 21, 2011 – Expert witness report to Atomic Safety and Licensing Board: *Prefiled Direct Testimony of Arnold Gundersen Regarding Consolidated Contention RK-EC-3/CW-EC-1 (Spent Fuel Pool Leaks)*

New York State Department of Environmental Conservation – November 15-16, 2011 – Expert witness report for Riverkeeper: hearing testimony regarding license extension application for Indian Point Units 2 and 3 – contention: tritium in the groundwater.

Nuclear Regulatory Commission – November 10, 2011 – Expert witness report entitled: *Fukushima and the Westinghouse-Toshiba AP1000, A Report for the AP1000 Oversight Group by Fairewinds Associates, Inc*, and Video. Submitted to NRC by the AP1000 Oversight Group.

Nuclear Regulatory Commission – October 7, 2011 – *Testimony to the NRC Petition Review Board Re: Mark 1 Boiling Water Reactors*, Petition for NRC to shut down all BWR Mark 1 nuclear power plants due to problems in containment integrity in the Mark 1 design.

New York State Department of Environmental Conservation – October 4, 2011 – *Prefiled Rebuttal Testimony of Arnold Gundersen On Behalf of Petitioners Riverkeeper, Inc., Scenic Hudson, Inc., And Natural Resources Defense Council, Inc. To The Direct Testimony of Matthew J. Barvenik (Senior Principal GZA Geoenvironmental, Inc.) Regarding Radiological Materials*

Southern Alliance for Clean Energy (SACE) submission to TVA Board of Directors – August 3, 2011– Expert witness report entitled: *The Risks of Reviving TVA's Bellefonte Project*, and Video prepared for the Southern Alliance for Clean Energy (SACE).

New York State Department of Environmental Conservation, July 22, 2011 – Prefiled Direct Testimony of Arnold Gundersen On Behalf of Petitioners Riverkeeper, Inc., Scenic Hudson, Inc., And Natural Resources Defense Council, Inc. Regarding Radiological Materials

Nuclear Regulatory Commission – May 10, 2011 – *Comment to the proposed rule on the AP1000 Design Certification Amendment Docket ID NRC-2010-0131 As noticed in the Federal Register on February 24, 2011* Retained by Friends of the Earth as Expert Witness.

Nuclear Regulatory Commission – May 10, 2011 – *Comment to the proposed rule on the AP1000 Design Certification Amendment Docket ID NRC-2010-0131 As noticed in the Federal Register on February 24, 2011* Retained by Friends of the Earth as Expert Witness.

NRC Advisory Committee on Reactor Safeguards (ACRS) – May 26, 2011 – Lessons learned from Fukushima and Containment Integrity on the AP1000.

Vermont Energy Cooperative (VEC) – April 26, 2011 – Presentation to the Vermont Energy Cooperative Board of Directors, *Vermont Yankee – Is It Reliable for 20 more years?*

Vermont State Nuclear Advisory Panel (VSNAP) – February 22, 2011 – Testimony and presentation entitled the *Vermont Yankee Public Oversight Panel Supplemental Report* regarding management issues at the Vermont Yankee Nuclear Power Plant to the reconvened Vermont State Nuclear Advisory Panel.

Vermont State Legislature Senate Committee on Natural Resources and Energy – February 8, 2011. Testimony: *Vermont Yankee Leaks and Implications*. (<http://www.leg.state.vt.us/jfo/envy.aspx>)

Vermont State Legislature – January 26, 2011 – House Committee on Natural Resources and Energy, and Senate Committee on Natural Resources and Energy – Testimony regarding Fairewinds Associates, Inc's report: *Decommissioning the Vermont Yankee Nuclear Power Plant and Storing Its Radioactive Waste* (<http://www.leg.state.vt.us/jfo/envy.aspx>). Additional testimony was also given regarding the newest radioactive isotopic leak at the Vermont Yankee nuclear power plant.

Vermont State Legislature Joint Fiscal Committee Legislative Consultant Regarding Entergy Nuclear Vermont Yankee – Decommissioning the Vermont Yankee Nuclear Power Plant and Storing Its Radioactive Waste January 2011. (<http://www.leg.state.vt.us/jfo/envy.aspx>).

U.S. Nuclear Regulatory Commission Advisory Committee on Reactor Safeguards (NRC-ACRS) AP1000 Sub-Committee – Nuclear Containment Failures: Ramifications for the AP1000 Containment Design, Supplemental Report submitted December 21, 2010.
(<http://fairewinds.com/reports>)

Vermont State Legislature Joint Fiscal Committee Legislative Consultant Regarding Entergy Nuclear Vermont Yankee – Reliability Oversight Entergy Nuclear Vermont Yankee, December 6, 2010.
Discussion regarding the leaks at Vermont Yankee and the ongoing monitoring of those leaks and ENVY's progress addressing the 90-items identified in Act 189 that require remediation.
(<http://www.leg.state.vt.us/jfo/envy.aspx>).

U.S. Nuclear Regulatory Commission Atomic Safety and Licensing Board (NRC-ASLB) – Declaration of Arnold Gunderson Supporting Blue Ridge Environmental Defense League's Contention Regarding Consumptive Water Use at Dominion Power's Newly Proposed North Anna Unit 3 Pressurized Water Reactor in the matter of Dominion Virginia Power North Anna Power Station Unit 3 Docket No. 52-017 Combined License Application ASLBP#08-863-01-COL, October 2, 2010.

U.S. Nuclear Regulatory Commission Atomic Safety and Licensing Board (NRC-ASLB) – Declaration of Arnold Gunderson Supporting Blue Ridge Environmental Defense League's New Contention Regarding AP1000 Containment Integrity on the Vogtle Nuclear Power Plant Units 3 And 4 in the matter of the Southern Nuclear Operating Company Vogtle Electric Generating Plant, Units 3&4 Combined License Application, Docket Nos. 52-025-COL and 52-026-COL and ASLB No. 09-873-01-COL-BD01, August 13, 2010.

Vermont State Legislature Joint Fiscal Committee Legislative Consultant Regarding Entergy Nuclear Vermont Yankee – July 26, 2010 – Summation for 2009 to 2010 Legislative Year for the Joint Fiscal Committee Reliability Oversight Entergy Nuclear Vermont Yankee (ENVY) Fairewinds Associates 2009-2010. This summary includes an assessment of ENVY's progress (as of July 1, 2010) toward meeting the milestones outlined by the Act 189 Vermont Yankee Public Oversight Panel in its March 2009 report to the Legislature, the new milestones that have been added since the incident with the tritium leak and buried underground pipes, and the new reliability challenges facing ENVY, Entergy, and the State of Vermont. (<http://www.leg.state.vt.us/jfo/envy.aspx>)

U.S. Nuclear Regulatory Commission Atomic Safety and Licensing Board (NRC-ASLB) – Declaration of Arnold Gunderson Supporting Blue Ridge Environmental Defense League's Contentions in the matter of Dominion Virginia Power North Anna Station Unit 3 Combined License Application, Docket No. 52-017, ASLBP#08-863-01-COL, July 23, 2010.

Florida Public Service Commission (FPSC)

Licensing and construction delays due to problems with the newly designed Westinghouse AP1000 reactors in *Direct Testimony in Re: Nuclear Plant Cost Recovery Clause by The Southern Alliance for Clean Energy (SACE)*, FPSC Docket No. 100009-EI, July 8, 2010.

U.S. Nuclear Regulatory Commission Advisory Committee on Reactor Safeguards (NRC-ACRS) AP1000 Sub-Committee – Presentation to ACRS regarding design flaw in AP1000 Containment – June 25, 2010 Power Point Presentation: <http://fairewinds.com/content/ap1000-nuclear-design-flaw-addressed-to-nrc-acrs>.

U.S. Nuclear Regulatory Commission Atomic Safety and Licensing Board (NRC-ASLB) – Second Declaration of Arnold Gundersen Supporting Supplemental Petition of Intervenors Contention 15: DTE COLA Lacks Statutorily Required Cohesive QA Program – June 8, 2010.

NRC Chairman Gregory Jaczko, ACRS, Secretary of Energy Chu, and the White House Office of Management and Budget – AP1000 Containment Leakage Report Fairewinds Associates - Gundersen, Hausler, 4-21-2010. This report, commissioned by the AP1000 Oversight Group, analyzes a potential flaw in the containment of the AP1000 reactor design.

Vermont State Legislature House Committee on Natural Resources and Energy – April 5, 2010 – Testified to the House Committee on Natural Resources and Energy – regarding discrepancies in Entergy’s TLG Services decommissioning analysis. See *Fairewinds Cost Comparison TLG Decommissioning* (<http://www.leg.state.vt.us/jfo/envy.aspx>).

Vermont State Legislature Joint Fiscal Committee Legislative Consultant Regarding Entergy Nuclear Vermont Yankee – February 22, 2010 – The Second Quarterly Report by Fairewinds Associates, Inc to the Joint Legislative Committee regarding buried pipe and tank issues at Entergy Nuclear Vermont Yankee and Entergy proposed Enexus spinoff. See two reports: *Fairewinds Associates 2nd Quarterly Report to JFC* and *Enexus Review by Fairewinds Associates*. (<http://www.leg.state.vt.us/jfo/envy.aspx>).

Vermont State Legislature Senate Natural Resources – February 16, 2010 – Testified to Senate Natural Resources Committee regarding causes and severity of tritium leak in unreported buried underground pipes, status of Enexus spinoff proposal, and health effects of tritium.

Vermont State Legislature Senate Natural Resources – February 10, 2010 – Testified to Senate Natural Resources Committee regarding causes and severity of tritium leak in unreported buried underground pipes. <http://www.youtube.com/watch?v=36HJiBrJSxE>

Vermont State Legislature Senate Finance – February 10, 2010 – Testified to Senate Finance Committee regarding *A Chronicle of Issues Regarding Buried Tanks and Underground Piping at VT Yankee*. (<http://www.leg.state.vt.us/jfo/envy.aspx>).

Vermont State Legislature House Committee on Natural Resources and Energy – January 27, 2010 – *A Chronicle of Issues Regarding Buried Tanks and Underground Piping at VT Yankee*. (<http://www.leg.state.vt.us/jfo/envy.aspx>).

Submittal to Susquehanna River Basin Commission, by Eric Epstein – January 5, 2010 – *Expert Witness Report of Arnold Gundersen Regarding Consumptive Water Use of the Susquehanna River by The Proposed PPL Bell Bend Nuclear Power Plant* in the Matter of RE: Bell Bend Nuclear Power Plant Application for Groundwater Withdrawal Application for Consumptive Use BNP-2009-073.

U.S. Nuclear Regulatory Commission Atomic Safety and Licensing Board (NRC-ASLB) – Declaration of Arnold Gundersen Supporting Supplemental Petition of Intervenors Contention 15: Detroit Edison COLA Lacks Statutorily Required Cohesive QA Program, December 8, 2009.

U.S. NRC Region III Allegation Filed by Missouri Coalition for the Environment – Expert Witness Report entitled: *Comments on the Callaway Special Inspection by NRC Regarding the May 25, 2009*

Failure of its Auxiliary Feedwater System, November 9, 2009.

Vermont State Legislature Joint Fiscal Committee Legislative Consultant Regarding Entergy Nuclear Vermont Yankee – Oral testimony given to the Vermont State Legislature Joint Fiscal Committee October 28, 2009. See report: *Quarterly Status Report - ENVY Reliability Oversight for JFO* (<http://www.leg.state.vt.us/jfo/envy.aspx>).

Vermont State Legislature Joint Fiscal Committee Legislative Consultant Regarding Entergy Nuclear Vermont Yankee – The First Quarterly Report by Fairewinds Associates, Inc to the Joint Legislative Committee regarding reliability issues at Entergy Nuclear Vermont Yankee, issued October 19, 2009. See report: *Quarterly Status Report - ENVY Reliability Oversight for JFO* (<http://www.leg.state.vt.us/jfo/envy.aspx>).

Florida Public Service Commission (FPSC) – Gave direct oral testimony to the FPSC in hearings in Tallahassee, FL, September 8 and 10, 2009 in support of Southern Alliance for Clean Energy (SACE) contention of anticipated licensing and construction delays in newly designed Westinghouse AP 1000 reactors proposed by Progress Energy Florida and Florida Power and Light (FPL).

Florida Public Service Commission (FPSC) – NRC announced delays confirming my original testimony to FPSC detailed below. My supplemental testimony alerted FPSC to NRC confirmation of my original testimony regarding licensing and construction delays due to problems with the newly designed Westinghouse AP 1000 reactors in *Supplemental Testimony in Re: Nuclear Plant Cost Recovery Clause by The Southern Alliance for Clean Energy*, FPSC Docket No. 090009-EI, August 12, 2009.

Florida Public Service Commission (FPSC) – Licensing and construction delays due to problems with the newly designed Westinghouse AP 1000 reactors in *Direct Testimony in Re: Nuclear Plant Cost Recovery Clause by The Southern Alliance for Clean Energy (SACE)*, FPSC Docket No. 090009-EI, July 15, 2009.

Vermont State Legislature Joint Fiscal Committee Expert Witness Oversight Role for Entergy Nuclear Vermont Yankee (ENVY) – Appointment from July 2009 to May 2010. Contracted by the Joint Fiscal Committee of the Vermont State Legislature as an expert witness to oversee the compliance of ENVY to reliability issues uncovered during the 2009 legislative session by the Vermont Yankee Public Oversight Panel of which I was appointed a member along with former NRC Commissioner Peter Bradford for one year from July 2008 to 2009. At the time, Entergy Nuclear Vermont Yankee (ENVY) was under review by Vermont State Legislature to determine if it should receive a Certificate for Public Good (CPG) to extend its operational license for another 20-years. Vermont was the only state in the country that had legislatively created the CPG authorization for a nuclear power plant. Act 160 was passed to ascertain ENVY's ability to run reliably for an additional 20 years.

U.S. Nuclear Regulatory Commission – Expert Witness Declaration regarding Combined Operating License Application (COLA) at North Anna Unit 3 *Declaration of Arnold Gundersen Supporting Blue Ridge Environmental Defense League's Contentions* (June 26, 2009).

U.S. Nuclear Regulatory Commission – Expert Witness Declaration regarding Through-wall Penetration of Containment Liner and Inspection Techniques of the Containment Liner at Beaver Valley Unit 1 Nuclear Power Plant *Declaration of Arnold Gundersen Supporting Citizen Power's*

Petition (May 25, 2009).

U.S. Nuclear Regulatory Commission – Expert Witness Declaration regarding Quality Assurance and Configuration Management at Bellefonte Nuclear Plant *Declaration of Arnold Gundersen Supporting Blue Ridge Environmental Defense League’s Contentions in their Petition for Intervention and Request for Hearing*, May 6, 2009.

Pennsylvania Statehouse – Expert Witness Analysis presented in formal presentation at the Pennsylvania Statehouse, March 26, 2009 regarding actual releases from Three Mile Island Nuclear Accident. Presentation may be found at: <http://www.tmia.com/march26>

Vermont Legislative Testimony and Formal Report for 2009 Legislative Session – As a member of the Vermont Yankee Public Oversight Panel, I spent almost eight months examining the Vermont Yankee Nuclear Power Plant and the legislatively ordered Comprehensive Vertical Audit. Panel submitted Act 189 Public Oversight Panel Report March 17, 2009 and oral testimony to a joint hearing of the Senate Finance and House Committee on Natural Resources and Energy March 19, 2009. <http://www.leg.state.vt.us/JFO/Vermont%20Yankee.htm>

Finestone v Florida Power & Light Company (FPL) (11/2003 to 12/2008) Federal Court – Plaintiffs’ Expert Witness in United States District Court for the Southern District of Florida. Retained by Plaintiffs’ Attorney Nancy LaVista, from Lytal, Reiter, Fountain, Clark, Williams, West Palm Beach, FL. Case# 06-11132-E. This case involved two plaintiffs in cancer cluster of 42 families alleging that illegal radiation releases from nearby nuclear power plant caused children’s cancers. Production request, discovery review, preparation of deposition questions and attendance at Defendant’s experts for deposition, preparation of expert witness testimony, preparation for Daubert Hearings, ongoing technical oversight, source term reconstruction and appeal to Circuit Court.

U.S. Nuclear Regulatory Commission Advisory Committee Reactor Safeguards (NRC-ACRS) – Expert Witness providing oral testimony regarding Millstone Point Unit 3 (MP3) Containment issues in hearings regarding the Application to Uprate Power at MP3 by Dominion Nuclear, Washington, and DC. (July 8-9, 2008).

Appointed by President Pro-Tem of Vermont Senate Shumlin (later elected as Vermont Governor) to Legislatively Authorized Nuclear Reliability Public Oversight Panel – To oversee Comprehensive Vertical Audit of Entergy Nuclear Vermont Yankee (Act 189) and testify to State Legislature during 2009 session regarding operational reliability of ENVY in relation to its 20-year license extension application. (July 2, 2008 to present).

U.S. Nuclear Regulatory Commission Atomic Safety and Licensing Board (NRC-ASLB) –Expert Witness providing testimony regarding *Pilgrim Watch’s Petition for Contention 1 Underground Pipes* (April 10, 2008).

U.S. Nuclear Regulatory Commission Atomic Safety and Licensing Board (NRC-ASLB) – Expert Witness supporting *Connecticut Coalition Against Millstone in Its Petition for Leave to Intervene, Request for Hearing, And Contentions Against Dominion Nuclear Connecticut Inc.’s Millstone Power Station Unit 3 License Amendment Request for Stretch Power Uprate* (March 15, 2008).

U.S. Nuclear Regulatory Commission Atomic Safety and Licensing Board (NRC-ASLB) –
Expert Witness supporting *Pilgrim Watch’s Petition for Contention 1: specific to issues regarding the integrity of Pilgrim Nuclear Power Station’s underground pipes and the ability of Pilgrim’s Aging Management Program to determine their integrity.* (January 26, 2008).

Vermont State House – 2008 Legislative Session –

- House Committee on Natural Resources and Energy – Comprehensive Vertical Audit: *Why NRC Recommends a Vertical Audit for Aging Plants Like Entergy Nuclear Vermont Yankee (ENVY)*
- House Committee on Commerce – Decommissioning Testimony

Vermont State Senate – 2008 Legislative Session –

- Senate Finance – testimony regarding Entergy Nuclear Vermont Yankee Decommissioning Fund
- Senate Finance – testimony on the necessity for a Comprehensive Vertical Audit (CVA) of Entergy Nuclear Vermont Yankee
- House Committee on Natural Resources and Energy – testimony regarding the placement of high-level nuclear fuel on the banks of the Connecticut River in Vernon, VT

U.S. Nuclear Regulatory Commission Atomic Safety and Licensing Board (NRC-ASLB) – MOX
Limited Appearance Statement to Judges Michael C. Farrar (Chairman), Lawrence G. McDade, and Nicholas G. Trikouros for the “Petitioners”: Nuclear Watch South, the Blue Ridge Environmental Defense League, and Nuclear Information & Resource Service in support of *Contention 2: Accidental Release of Radionuclides, requesting a hearing concerning faulty accident consequence assessments made for the MOX plutonium fuel factory proposed for the Savannah River Site.* (September 14, 2007).

Appeal to the Vermont Supreme Court (March 2006 to 2007) – Expert Witness Testimony in support of *New England Coalition’s Appeal to the Vermont Supreme Court Concerning: Degraded Reliability at Entergy Nuclear Vermont Yankee as a Result of the Power Uprate.* New England Coalition represented by Attorney Ron Shems of Burlington, VT.

State of Vermont Environmental Court (Docket 89-4-06-vtec 2007) – Expert witness retained by New England Coalition to review Entergy and Vermont Yankee’s analysis of alternative methods to reduce the heat discharged by Vermont Yankee into the Connecticut River. Provided Vermont’s Environmental Court with analysis of alternative methods systematically applied throughout the nuclear industry to reduce the heat discharged by nuclear power plants into nearby bodies of water and avoid consumptive water use. This report included a review of the condenser and cooling tower modifications.

U.S. Senator Bernie Sanders and Congressman Peter Welch (2007) – Briefed Senator Sanders, Congressman Welch and their staff members regarding technical and engineering issues, reliability and aging management concerns, regulatory compliance, waste storage, and nuclear power reactor safety issues confronting the U.S. nuclear energy industry.

State of Vermont Legislative Testimony to Senate Finance Committee (2006) – Testimony to the Senate Finance Committee regarding Vermont Yankee decommissioning costs, reliability issues, design life of the plant, and emergency planning issues.

U.S. Nuclear Regulatory Commission Atomic Safety and Licensing Board (NRC-ASLB) – Expert witness retained by New England Coalition to provide Atomic Safety and Licensing Board with an independent analysis of the integrity of the Vermont Yankee Nuclear Power Plant condenser (2006).

U.S. Senators Jeffords and Leahy (2003 to 2005) – Provided the Senators and their staffs with periodic overview regarding technical, reliability, compliance, and safety issues at Entergy Nuclear Vermont Yankee (ENVY).

10CFR 2.206 filed with the Nuclear Regulatory Commission (July 2004) – Filed 10CFR 2.206 petition with NRC requesting confirmation of Vermont Yankee's compliance with General Design Criteria.

State of Vermont Public Service Board (April 2003 to May 2004) – Expert witness retained by New England Coalition to testify to the Public Service Board on the reliability, safety, technical, and financial ramifications of a proposed increase in power (called an uprate) to 120% at Entergy's 31-year-old Vermont Yankee Nuclear Power Plant.

International Nuclear Safety Testimony – Ten Days advising the President of the Czech Republic (Vaclav Havel) and the Czech Parliament on their energy policy for the 21st century.

Nuclear Regulatory Commission (NRC) Inspector General (IG) – Assisted the NRC Inspector General in investigating illegal gratuities paid to NRC Officials by Nuclear Energy Services (NES) Corporate Officers. In a second investigation, assisted the Inspector General in showing that materially false statements (lies) by NES corporate president caused the NRC to overlook important violations by this licensee.

State of Connecticut Legislature – Assisted in the creation of State of Connecticut Whistleblower Protection legal statutes.

Federal Congressional Testimony –

- Publicly recognized by NRC Chairman, Ivan Selin, in May 1993 in his comments to U.S. Senate, “It is true...everything Mr. Gundersen said was absolutely right; he performed quite a service.”
- Commended by U.S. Senator John Glenn, Chair NRC Oversight Committee for public – for testimony to NRC Oversight Committee

PennCentral Litigation – Evaluated NRC license violations and materially false statements made by management of this nuclear engineering and materials licensee.

Three Mile Island Litigation – Evaluated unmonitored releases to the environment after accident, including containment breach, letdown system and blowout. Proved releases were 15 times higher than government estimate and subsequent government report.

Western Atlas Litigation – Evaluated neutron exposure to employees and license violations at this nuclear materials licensee.

Commonwealth Edison – In depth review and analysis for Commonwealth Edison to analyze the efficiency and effectiveness of all Commonwealth Edison engineering organizations, which support the operation of all of its nuclear power plants.

Peach Bottom Reactor Litigation – Evaluated extended 28-month outage caused by management breakdown and deteriorating condition of plant.

Presentations, Events, & Media

- *Three Mile Island (TMI) Presentations and Events, March 23 through March 27, 2019*
 - *A Legacy of Lies, PennState TMI 40th Commemoration Keynote, March 27, 2019, followed by 4-TV interviews, available on CSPAN*
 - *NBC TV Andrea Mitchell Interview, filmed 2019-3-26, aired March 28, 2019*
 - *Presentation Pennsylvania State House Rotunda, Harrisburg, PA, March 25, 2019*
 - *TMI Survivors Banquet, Keynote and Q&A, March 23, 2019*
 - *Media Interviews with WHP 21 (CBS), WGAL (NBC), WHP 27 (ABC)*
 - *Keynote Harrisburg Historical Society, keynote, Harrisburg, Pennsylvania March 23, 2019*
- *The Fukushima Vogtle Connection, hosted by Georgia Wand and Nuclear Watch South, March 9, 2019*
- *Power Lines Documentary Premier at Emory University, Atlanta, GA, October 2018*
- *CCTV, Nuclear Free Future TV with host Margaret Harrington, Picking Up the Pieces from Atoms for Peace, May 10, 2018*
- *CCTV, Nuclear Free Future TV with host Margaret Harrington, Nuclear Update with Fairewinds Energy Education - March 10, 2018*
- *Chicago, NIRS meetings and group presentations November 28 to December 4, 2017*
- *Radio Interviews, November 2017: David Goodman, October 25, 2017; Project Censored with Mickey Huff, November 2017*
- *Fukushima Prefecture, Japan, September 7-18, 2017, Arnie Gundersen and Dr. Marco Kaltofen, research and data review technical meeting with the Deputy Director General and the Senior Associate with the Japanese Atomic Energy Agency (JAEA). Trip to Japan was organized and funded by Fairewinds Energy Education.*
- *CCTV, Nuclear Free Future TV with host Margaret Harrington, Fukushima, Three Mile Island, and Chernobyl, March 30, 2017*
- *Radio Ecoshock, Alex Smith Interview, Nuclear Power Is Not a Climate Change Solution, January 26, 2017*
- *38 Years and Five Meltdowns Later: The Real Lessons from TMI (Three Mile Island), March 25, 2017, keynote presentation hosted by Three Mile Island Alert, Harrisburg, PA*
- *Arnie Gundersen speaks with Margaret Prescod, March 14, 2017, Sojourner Truth Radio, Pacifica Radio on the Sixth-Year Commemoration of the Fukushima Daiichi nuclear power disaster.*
- *Arnie Gundersen interviewed on Radiation Rattles Robot in Fukushima, Newsday - BBC World Service, High levels of nuclear radiation have forced a robot to cut short its investigations of the Fukushima reactor in Japan. The probe's mission was to clean a passage to enable further robotic exploration, February 10, 2017.*
- *Extreme Nuclear Dangers, Radio Ecoshock host Alex Smith interviews Arnie Gundersen, the relationship between the nuclear power industry and nuclear weapons development, February 2, 2017.*

- *Arnie Gundersen Appears on Project Censored with Dan Simon, Ted Rall, and Maggie Gundersen*, November 27, 2016
- *Arnie Gundersen Appears on Solartopia's Green Power and Wellness Hour*, November 16, 2016
- *Nuclear Power Is Not "Green Energy": It Is a Fount of Atomic Waste*, Published in Truthout, November 14, 2016
- *Powerstruggle Sneak Preview Panel Discussion*, Northampton, MA (October 23, 2016) Brattleboro, VT (Nov 3, 2016), organized by Turning Tide Productions
- *Is Solar Power in Nuclear Disaster Exclusion Zones Advisable?* published in *The Bulletin of the Atomic Scientists*, September 15, 2016
- *CO2 Smokescreen Presentation*, Montreal, Canada, invited speaker at the World Social Forum at the University of Quebec at Montreal (August 8, 2016) & McGill University, (August 10, 2016)
- *Gendai Business Online* exclusive interview with Fairewinds Chief Engineer Arnie Gundersen entitled: *American nuclear expert warns: "There is a possibility that now in Fukushima recontamination is occurring."*, June 14, 2016.
- *Seacoast Anti-Pollution League Annual Meeting*, Seabrook, NH, organized by the Seacoast Anti-Pollution League, open to the public, May 16, 2016
- *Arnie Gundersen Appears on Project Censored with Medea Benjamin*, March 30, 2016
- *Pilgrim Coalition Decommissioning Forum*, Plymouth, MA, organized by the Pilgrim Coalition, March 23, 2016
- *Osaka Global Environment Forum 2016*, in Osaka City, Japan, organized by Choetsu Kiko Association of Osaka and Friends of the Earth, February 27, 2016
- *Peace Forum Presentation*, in Kobe City, Japan, organized by YMCA, UNICEF, and Kobe Cooperative, February 22, 2016
- *Nuclear and Human Beings after Fukushima Event*, in Hiroshima City, Japan organized by Hiroshima YMCA, and Hiroshima Cooperative HANWA (Hiroshima Alliance for Nuclear Weapons Abolition), February 20, 2016
- *Peace Event at Jimmy Carter Civic Center*, in Konu-town Miyoshi, Hiroshima, Japan organized by Peace Platform, February 17, 2016
- *Middlebury College Student Global Affairs Conference: Power and Protest*, Middlebury, VT at Middlebury College, invited speaker for a student organized event, January 22, 2016
- *Ready for the Big One? Diablo Canyon Earthquake Vulnerability*, San Luis Obispo, invited guest of the San Luis Obispo Mothers for Peace, December 2, 2015
- *Expect the Unexpected: Nuclear Power's Unlearned Lessons*, California Polytechnic Institute, December 1, 2015
- *World in Danger: From Fukushima to California*, University of California at Berkeley, in conversation with Joanna Macy, November 22, 2015
- *World in Danger: The Fukushima - California Connection*, Point Reyes Station, in conversation with Mary Beth Brangan, November 21, 2015
- *World in Danger: Fukushima*, Sonoma State University, in conversation with Majia Nadesan, November 18, 2015
- *Fukushima's Impact at Five Years*, World Uranium Symposium 2015: Fukushima Workshop, April 2015, Quebec, Canada
- *Did Tesla Just Kill Nuclear Power?* May 1, 2015, Article written by journalist Jeff McMahon for *Forbes Magazine* that captures the excitement and buzz surrounding Tesla's big announcement and Arnie's auspicious speech
- *Building New Nukes Would Make Global Warming Worse* April 30, 2015, Presentation at Northwestern University, Chicago, IL

- *Fairewinds' Report: Vermont Yankee's Decommissioning As An Example of Nationwide Failures of Decommissioning Regulation presented to the Senate Committee for Natural Resources and Energy* April 22, 2015, Presentation Vermont Statehouse, Montpelier, VT
- *An Economic Analysis of the Cost of Nuclear Power* April 14, 2015, Presentation at the World Uranium Symposium, Quebec City, Quebec, Canada, Keynote Speaker
- *Commemoration of Meltdown at Fukushima Daiichi: 4-Years Later* March 11, 2015, Presentation to the House of Commons in London, England
- *Should Nuclear Energy Be Expanded to Help Create a More Sustainable Future?* November 20, 2014, Invited guest speaker in Debate at Hofstra University
- *Radiation Knows No Borders* August 2, 2014, Invited speaker at The Wave Conference, Life Chiropractic West, San Francisco, CA
- *Thirty-Five Years and Five Meltdowns Later: The Real Lessons of Three Mile Island* March 28, 2014, Three Mile Island at 35 (TMI@35) Symposium at Penn State, Harrisburg, PA, Keynote Speaker
- *The Nuclear Renaissance? Is It Too Big To Fail?* November 20, 2013, University North Carolina, Chapel Hill, NC.
- *Speaking Truth to Power* October 22, 2013 – Clarkson University, Potsdam, NY
- *The United States at A Crossroads: Two Futures* October 17 2013, Global Forum, Waitsfield, Vermont
- *A Road Less Taken: Energy Choices for the Future* – October 16, 2013, Johnson State College, Johnson, Vermont.
- *Fukushima: Ongoing Lessons for Boston* – October 9, 2013 – Boston, Massachusetts State House. Speakers were Arnie Gunderson, Former Japanese Prime Minister Naoto Kan, Former NRC Chair Gregory Jaczko, Former NRC Commissioner Peter Bradford, and Massachusetts State Senator Dan Wolf.
- *Fukushima: Ongoing Lessons for New York* – October 8, 2013 – New York City 82nd Street YMCA. Speakers were Arnie Gunderson, Riverkeeper President Paul Galley, Former Japanese Prime Minister Naoto Kan, Former NRC Chair Gregory Jaczko, Former NRC Commissioner Peter Bradford, and Ralph Nader.
- *Fukushima: Ongoing Lessons for California* – June 4, 2013 – New York City 82nd Street YMCA. Speakers were Arnie Gunderson, Riverkeeper President Paul Galley, Former Japanese Prime Minister Naoto Kan, Former NRC Chair Gregory Jaczko, Former NRC Commissioner Peter Bradford, and Friends of the Earth Nuclear Campaigner Kendra Ulrich.
- *What Did They Know and When? Fukushima Daiichi Before and After the Meltdowns*, Symposium: The Medical and Ecological Consequences of the Fukushima Nuclear Accident, The New York Academy of Medicine, New York City, NY, March 11, 2013
- *A Mountain of Waste 70 Years High*, Presentation: *Old and New Reactors*, University of Chicago, December 1, 2012
- Congressional Briefing September 20, 2012; invited by Representative Dennis Kucinich
- Presentations in Japan August/September 2012: Presentation at University of Tokyo (August 30, 2012), Presentation at Japanese Diet Building (members of the Japanese Legislature - August 31, 2012), Presentation to citizen groups in Niigata (September 1, 2012), Presentations to citizen groups in Kyoto (September 4, 2012), Presentation to Japanese Bar Association (September 2, 2012), and Presentation at the Tokyo Olympic Center (September 6, 2012)
- Multi-media Opera: *Curtain of Smoke*, by Filmmaker Karl Hoffman, Composer Andrea Molino, and Dramatist Guido Barbieri, Rome, Italy (2012-5-21,22)
- *Curtain of Smoke* Symposium (2012-5-21), with Dr. Sherri Ebadi 2004 Nobel Laureate

- The Italian National Press Club Rome (2012-5-21) with Dr. Sherri Ebadi 2004 Nobel Laureate: the relationship between nuclear power and nuclear weapons,
- Radio 3 Rome (2012-5-21) Discussion of Three Mile Island and the triple meltdown at Fukushima Daiichi (Japan),
- Sierra Club Panel Discussions (2012-5-5): Consequences of Fukushima Daiichi with Paul Gunter and Waste Disposal with Mary Olson,
- Physicians for Social Responsibility Seattle (2012-3-17),
- Fukushima Daiichi Forum with Chiho Kaneko, Brattleboro, VT (2012-3-11),
- Physicians for Global Responsibility Vancouver (2012-3-11) Skype Video Lecture,
- University of Vermont (2 – 2011),
- Boston Nuclear Forum, Boston Library (6/16/11),
- Duxbury Emergency Management (6/15/11),
- Vermont State Nuclear Advisory Panel (VSNAP),
- New Jersey Environmental Federation (5/14/11),
- Press Conference for Physicians for Social Responsibility (5/19/11),
- St. Johnsbury Academy – Nuclear Power 101.

More than 200 Educational videos on nuclear safety, reliability and engineering particularly Fukushima issues. Videos may be viewed @ fairewinds.org (501c3 non-profit)

Expert commentary (hundreds of TV, radio, print media, and internet interviews): CNN (8), The John King Show (16), BBC, CBC, Russia Today, Democracy Now, Al Jazeera America, KPBS (Radio & TV) VPR, WPTZ, WCAX, WBAI, CCTV, NECN, Pacifica Radio, CBC (radio & TV) (4), Rachel Maddow Show, *Washington Post*, *New York Times*, *Tampa Bay Times*, *The Guardian*, *Bloomberg* (print & TV), *Reuters*, *Associated Press*, *The Global Post*, *Miami Herald*, *Orange County Times*, *LA Times*, *Al Jazeera* (print), *The Tennessean*, The Chris Martinson Show, *Mainichi News*, TBS Japan, *Gendai Magazine*, NHK television, *Scientific American*. *Huffington Post* (Paris) named Fairewinds.com the best go to site for information about the Fukushima Daiichi accident (5/9/11).

Special Remediation Expertise:

Director of Engineering, Vice President of Site Engineering, and the Senior Vice President of Engineering at Nuclear Energy Services (NES) Division of Penn Central Corporation (PCC)

- NES was a nuclear licensee that specialized in dismantlement and remediation of nuclear facilities and nuclear sites. Member of the radiation safety committee for this licensee.
- Department of Energy chose NES to write *DOE Decommissioning Handbook* because NES had a unique breadth and depth of nuclear engineers and nuclear physicists on staff.
- Personally, I wrote the “Small Bore Piping” chapter of the DOE’s first edition *Decommissioning Handbook*, personnel on my staff authored other sections, and I reviewed the entire *Decommissioning Handbook*.
- Served on the Connecticut Low Level Radioactive Waste Advisory Committee for 10 years from its inception.
- Managed groups performing analyses on dozens of dismantlement sites to thoroughly remove radioactive material from nuclear plants and their surrounding environment.
- Managed groups assisting in decommissioning the Shippingport nuclear power reactor. Shippingport was the first large nuclear power plant ever decommissioned. The decommissioning of Shippingport included remediation of the site after decommissioning.

- Managed groups conducting site characterizations (preliminary radiation surveys prior to commencement of removal of radiation) at the radioactively contaminated West Valley site in upstate New York.
- Personnel reporting to me assessed dismantlement of the Princeton Avenue Plutonium Lab in New Brunswick, NJ. The lab's dismantlement assessment was stopped when we uncovered extremely toxic and carcinogenic underground radioactive contamination.
- Personnel reporting to me worked on decontaminating radioactive thorium at the Cleveland Avenue nuclear licensee in Ohio. The thorium had been used as an alloy in turbine blades. During that project, previously undetected extremely toxic and carcinogenic radioactive contamination was discovered below ground after an aboveground gamma survey had purported that no residual radiation remained on site.

Additional Expert Qualifications – including and not limited to:

- Nuclear engineering management assessment, prudence assessment, contract administration, assessment and review
- Nuclear power plant licensing and permitting – assessment and review
- Decommissioning experience: including radioactive waste processes, storage issue assessment, and waste disposal
- Nuclear safety and risk assessment, source term reconstruction, dose assessments, criticality analysis, and thermohydraulic assessment (i.e. power plant steam generation)
- Systems engineering and structural engineering assessments
- Cooling tower operation, cooling tower plumes, thermal discharge assessment, and consumptive water use
- Technical patents, nuclear fuel rack design and manufacturing, and nuclear equipment design and manufacturing
- Reliability engineering, & aging plant management assessments, in-service inspection
- Employee awareness programs, whistleblower protection, and public communications
- Quality Assurance (QA) & records

Nuclear Engineering Experience 1970 to Present

Expert witness testimony in nuclear litigation and administrative hearings in federal, international, and state court and to Nuclear Regulatory Commission, including but not limited to: Three Mile Island, US Federal Court, US NRC, NRC ASLB, ACRS, and Petition Review Board, California Public Utilities Commission, Canadian Nuclear Safety Commission (CNSC), Diet (Parliament) Japan, House of Commons (UK), Vermont State Legislature, Vermont State Public Service Board, Vermont Public Utility Commission, Florida Public Service Board, Czech Senate, Connecticut State Legislature, Western Atlas Nuclear Litigation, U.S. Senate Nuclear Safety Hearings, Peach Bottom Nuclear Power Plant Litigation, and Office of the Inspector General NRC, and numerous Congressional Briefings and Hearings.

Nuclear Engineering, Safety, and Reliability Expert Witness 1990 to Present

- Fairewinds Associates, Inc – Chief Engineer, 2005 to Present
- Arnold Gundersen, Nuclear Safety Consultant and Energy Advisor, 1995 to 2005
- GMA – 1990 to 1995, including expert witness testimony regarding the accident at Three Mile Island.

Nuclear Energy Services, Division of PCC (Fortune 500 company) 1979 to 1990

Corporate Officer and Senior Vice President - Technical Services – Responsible for overall performance of the company's Inservice Inspection (ASME XI), Quality Assurance (SNTC 1A), and Staff Augmentation Business Units – up to 300 employees at various nuclear sites.

Senior Vice President of Engineering – Responsible for the overall performance of the company's Site Engineering, Boston Design Engineering and Engineered Products Business Units. Integrated the Danbury based, Boston based and site engineering functions to provide products such as fuel racks, nozzle dams, and transfer mechanisms and services such as materials management and procedure development.

Vice President of Engineering Services – Responsible for the overall performance of the company's field engineering, operations engineering, and engineered products services. Integrated the Danbury-based and field-based engineering functions to provide numerous products and services required by nuclear utilities, including patents for engineered products.

General Manager of Field Engineering – Managed and directed NES' multi-disciplined field engineering staff on location at various nuclear plant sites. Site activities included structural analysis, procedure development, technical specifications and training. Have personally applied for and received one patent.

Director of General Engineering – Managed and directed the Danbury based engineering staff. Staff disciplines included structural, nuclear, mechanical and systems engineering. Responsible for assignment of personnel as well as scheduling, cost performance, and technical assessment by staff on assigned projects. This staff provided major engineering support to the company's nuclear waste management, spent fuel storage racks, and engineering consulting programs.

New York State Electric and Gas Corporation (NYSE&G) — 1976 to 1979

Reliability Engineering Supervisor – Organized and supervised reliability engineers to upgrade performance levels on seven operating coal units and one that was under construction. Applied analytical techniques and good engineering judgments to improve capacity factors by reducing mean time to repair and by increasing mean time between failures.

Lead Power Systems Engineer – Supervised the preparation of proposals, bid evaluation, negotiation and administration of contracts for two 1300 MW NSSS Units including nuclear fuel, and solid-state control rooms. Represented corporation at numerous public forums including TV and radio on sensitive utility issues. Responsible for all nuclear and BOP portions of a PSAR, Environmental Report, and Early Site Review.

Northeast Utilities Service Corporation (NU) — 1972 to 1976

Engineer – Nuclear Engineer assigned to Millstone Unit 2 during start-up phase. Lead the high velocity flush and chemical cleaning of condensate and feedwater systems and obtained discharge permit for chemicals. Developed Quality Assurance Category 1 Material, Equipment and Parts List. Modified fuel pool cooling system at Connecticut Yankee, steam generator blowdown system and diesel generator lube oil system for Millstone. Evaluated Technical Specification Change Requests.

Associate Engineer – Nuclear Engineer assigned to Montague Units 1 & 2. Interface Engineer with NSSS vendor, performed containment leak rate analysis, assisted in preparation of PSAR

and performed radiological health analysis of plant. Performed environmental radiation survey of Connecticut Yankee. Performed chloride intrusion transient analysis for Millstone Unit 1 feedwater system. Prepared Millstone Unit 1 off-gas modification licensing document and Environmental Report Amendments 1 & 2.

Rensselaer Polytechnic Institute (RPI) — 1971 to 1972

Critical Facility Reactor Operator, Instructor – Licensed AEC Reactor Operator instructing students and utility reactor operator trainees in start-up through full power operation of a reactor.

Public Service Electric and Gas (PSE&G) — 1970

Assistant Engineer – Performed shielding design of radwaste and auxiliary buildings for Newbold Island Units 1 & 2, including development of computer codes.

Additional Publications (continued from front page)

Co-author — *Fairewinds Associates 2009-2010 Summary to JFC, July 26, 2010* State of Vermont, Joint Fiscal Office, (<http://www.leg.state.vt.us/jfo/envy.aspx>).

Co-author — *Supplemental Report of the Public Oversight Panel Regarding the Comprehensive Reliability Assessment of the Vermont Yankee Nuclear Power Plant July 20, 2010*, to the Vermont State Legislature by the Vermont Yankee Public Oversight Panel.

Co-author — The Second Quarterly Report by Fairewinds Associates, Inc to the Joint Legislative Committee regarding buried pipe and tank issues at Entergy Nuclear Vermont Yankee and Entergy proposed Enexus spinoff. See two reports: *Fairewinds Associates 2nd Quarterly Report to JFC* and *Enexus Review by Fairewinds Associates*.

Co-author — Fairewinds Associates, Inc *First Quarterly Report to the Joint Legislative Committee*, October 19, 2009.

Co-author — *Report of the Public Oversight Panel Regarding the Comprehensive Reliability Assessment of the Vermont Yankee Nuclear Power Plant*, March 17, 2009, to the Vermont State Legislature by the Vermont Yankee Public Oversight Panel.

Co-author — *Vermont Yankee Comprehensive Vertical Audit – VYCVA – Recommended Methodology to Thoroughly Assess Reliability and Safety Issues at Entergy Nuclear Vermont Yankee, January 30, 2008 Testimony to Finance Committee Vermont Senate*.

Co-author — *Decommissioning Vermont Yankee – Stage 2 Analysis of the Vermont Yankee Decommissioning Fund – The Decommissioning Fund Gap*, December 2007, Fairewinds Associates, Inc. Presented to Vermont State Senators and Legislators.

Co-author — *Decommissioning the Vermont Yankee Nuclear Power Plant: An Analysis of Vermont Yankee's Decommissioning Fund and Its Projected Decommissioning Costs*, November 2007, Fairewinds Associates, Inc.

Media Organizations - including and not limited to:

Featured Nuclear Safety and Reliability Expert (1990 to present) for Television, Newspaper, Radio, & Internet – Including, and not limited to: CNN: JohnKingUSA, CNN News, Earth Matters; DemocracyNow, NECN, WPTZ VT, WTNH, VPTV, WCAX, RT, CTV (Canada), CCTV Burlington, VT, CAN TV (Chicago Access), ABC, TBS/Japan, Bloomberg: EnergyNow, KPBS, Japan National Press Club (Tokyo), Italy National Press Club (Rome), The Crusaders, Front Page, Five O'Clock Shadow: Robert Knight, Mark Johnson Show, Steve West Show, Anthony Polina Show, WKVT, WDEV, WVPR, WZBG CT, Seven Days, AP News Service, Houston Chronicle, Christian Science Monitor, Reuters, The Global Post, International Herald, The Guardian, New York

Times, Washington Post, LA Times, Miami Herald, St. Petersburg Times, Brattleboro Reformer, Rutland Herald, Times-Argus, Burlington Free Press, Litchfield County Times, The News Times, The New Milford Times, Hartford Current, New London Day, Vermont Daily Briefing, Green Mountain Daily, EcoReview, Huffington Post, DailyKos, Voice of Orange County, AlterNet, Common Dreams, Gendai Media, Truthout, Progressive Radio Network, Project Censored and numerous other national and international blogs

Public Service, Cultural, and Community Activities

2008 to Present –Fairewinds Energy Education Corp 501(C)3 non-profit board member

2005 to Present – Public presentations and panel discussions on nuclear power safety, reliability, economics, waste disposal, and decommissioning at numerous universities and colleges in the US, Canada, and Japan – including: DePaul University, Plymouth State University, Northwestern University, Life Chiropractic West, Middlebury College, McGill University, Hofstra University, New York School of Medicine, Cal Poly, Sonoma State, Amherst College, University of Vermont, Vermont Law School, Tokyo University, and before the Nuclear Regulatory Commission in hearings, Federal Court, Town and City

Select Boards, Legal Panels, Local Schools, and via National & International Media: Television, Radio, Print, & Internet.

2007-2008 – Energy Production – created concept of Solar Panels on Burlington High School; worked with Burlington Electric Department and Burlington Board of Education Technology Committee on Grant for installation of solar collectors for Burlington Electric peak summer use; Grant was developed with assistance from Senator Sanders.

Vermont State Legislature – Public Testimony to Legislative Committees regarding nuclear power and energy issues

NNSN – National Nuclear Safety Network, Founding Advisory Board Member, meetings with and testimony to the Nuclear Regulatory Commission Inspector General (NRC IG)

New York State Electric & Gas (NYSE&G) Speakers Club speaking about nuclear waste issues.

Northeast Utilities Representative Conducting Public Lectures on Nuclear Safety Issues with the Northeast Utilities Speakers Bureau

End