UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of	)	Docket No. 50-255 NRC-2021-0036
Entergy Nuclear Operations, Inc., Entergy Nuclear Palisades, LLC, Holtec International, and Holtec Decommissioning International, LLC	)	March 29, 2021
(Palisades Nuclear Plant and Big Rock Point Site)	)	

* * * * *

DECLARATION OF ROBERT ALVAREZ

Under penalty of perjury, I, Robert Alvarez ("Declarant"), declare as follows:

1. I have been retained by Beyond Nuclear, Michigan Safe Energy Future and Don't Waste Michigan to advise them concerning the storage of and associated expenses related to radioactive waste management and disposition during the decommissioning of the Palisades nuclear plant, as well as the ongoing irradiated nuclear fuel management at the Big Rock Point Site.

2. My curriculum vitae is attached to this Declaration as Exhibit A and is incorporated fully herein.

3. My response is attached to this Declaration as Exhibit B and is incorporated fully herein.

4. I hereby state that I have conducted my own investigation of the facts stated in my response and that my expressions of opinion are based upon my judgment.

5. Further Declarant saith naught.

03-29-2021
Date

Robert Alvarez
Robert Alvarez

Exhibit B: RESPONSE OF ROBERT ALVAREZ

Re: "Alvarez arrived at this conclusion by assuming that repackaging will cost between $40,000 and $87,000 per assembly; however, the source he cites for this proposition (a presentation given to the Nuclear Waste Technical Review Board in 2016) does not include any per-assembly cost data."

Applicants' Answer Opposing Beyond Nuclear et al.'s Petition to Intervene and Hearing Request, March 22, 2021, Page 20.

Robert Alvarez's Reply: The citation I provided by Jarrell to the NWTRB (U.S. Nuclear Waste Technical Review Board) does indeed provide per-assembly cost data on p. 16 of the presentation. Moreover, the presentation given to the NWTRB was given in 2015 not 2016, as stated in the reply by Holtec.
https://www.nwtrb.gov/docs/default-source/meetings/2015/june/jarrell.pdf?sfvrsn=7

Re: "On his first point, the sole source cited by Alvarez is a 2013 presentation that appears to be a statistical analysis of fuel cooling properties by varying cask design.(96) But Alvarez misrepresents the presentation, which he cites for the proposition that "minimal cooling times prior to emplacement of high burnup SNF into a dry cask range from 25 to 30 years."(97) The presentation actually says, "[t]ransfer from pool to cask within 5 years after reactor discharge is possible for smaller cask sizes, even for high burnup fuels," and "[i]ndividual assemblies could be cool enough, in principle, to load into dry storage at very early times, within days to weeks of reactor shutdown."(98) The "Minimum Cooling Time" table shows a minimum period prior to dry storage for assemblies with burnup of 45,000 MWd/MTU (generally considered "high burnup fuel"(99)) of approximately 3 years.(100) Alvarez provides no support for his order-of-magnitude greater time period, nor does he provide any support for his guesses about the volume of high burnup fuel present at Palisades.(101)"

Applicants' Answer Opposing Beyond Nuclear et al.'s Petition to Intervene and Hearing Request, March 22, 2021, Pages 24-25.

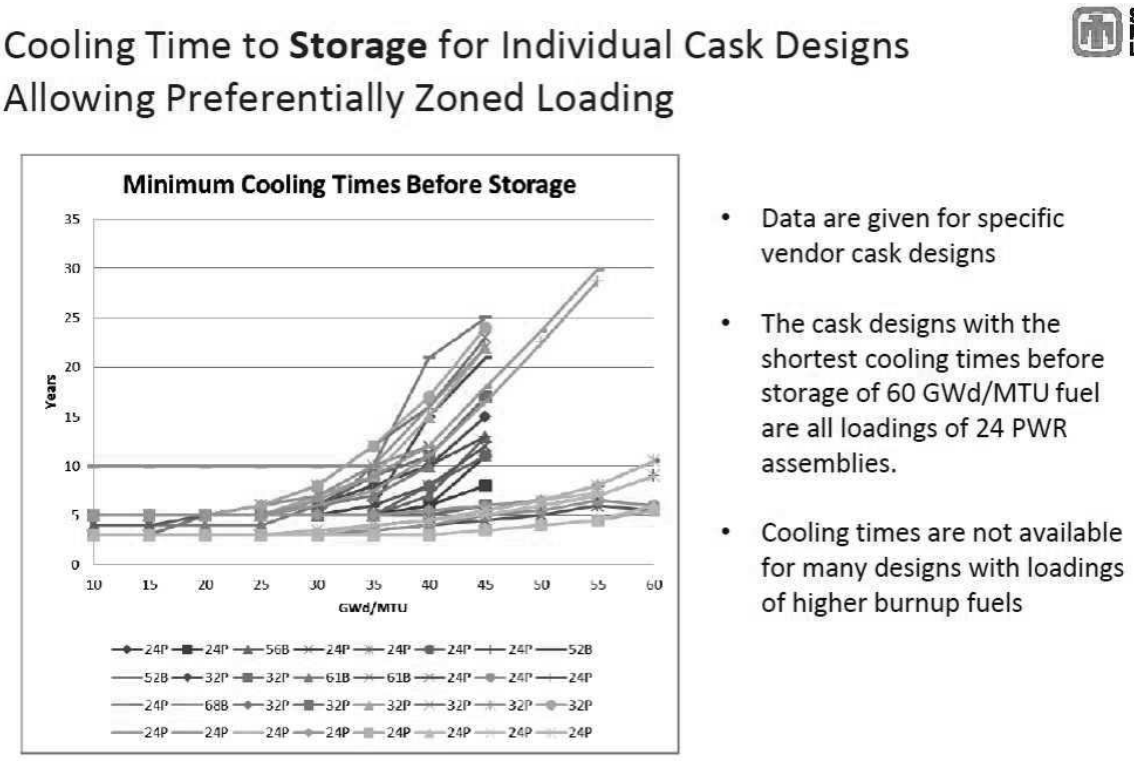
Robert Alvarez's Reply: The 2013 presentation by SNL (Sandia National Lab) does note that transfer from pool to cask within 5 years after reactor discharge is possible for smaller cask sizes, even for high burnup fuels. However, the Sandia analysis also states that " Increased burnup results in increased pool storage time. Full loadings of high burnup fuels in very large casks may require decades of aging in pools." Holding dozens of assemblies, the HI-STORM 100 Holtec cask is not considered to be a smaller cask size. A small cask size described by Jarrell (2015) would hold 4-9 assemblies.

Furthermore, researchers at the Energy Department's Sandia National Laboratory stated in 2015:

"Current DPCs are designed to hold a large number of CSNF [commercial spent nuclear fuel] assemblies to minimize the time for loading the canister at the reactor….For the commonly sized

DPC of 32 PWR assemblies (Figure 7) with a burnup of 40 GWd/MTHM (i.e., CSNF just below the transition to high-burnup fuel), repository designs with representative canister spacing in crystalline rock with ventilation and in salt would require between 35 and 70 years to cool before disposal (Figure 13). For high burnup fuel (60 GWd/MTHM), it would require between 65 and 105 years to cool before disposal. For a repository in sedimentary clay or crystalline rock that is backfilled with clay, the cooling times could be excessively long, between 225 and 300 years."[1]

As the chart below indicates, the 2013 Sandia analysis I reference also indicates that cooling times for high burnup SNF that is preferentially loaded in to MPC (Multi-Purpose Canister) casks can be far greater than 5 years.



Source: SAND2013-1698C

With respect to high burnup SNF, the reply falsely asserts that I have no data with respect to the burnups at Palisades. As of 12/31/2013 based on 23 fuel discharge cycles, about 20% of the Palisades SNF is high burnup (308 assemblies). Since then, Palisades has had 4 additional fuel discharge cycles, which are mostly high burnup.

Spent fuel data I rely upon are from those reported to the U.S. Department of Energy in its Nuclear Fuel Survey (U.S. Energy Information Administration, Form GC-859, "Nuclear Fuel Data Survey," 2013). The DOE GC-859 database is used by the NRC (NUREG-7227).

[1] Christine Stockman and Elena Kalinina, Cooling Times for Storage and Transportation of Spent Nuclear Fuel, Sandia National Laboratories, SAND2013-1698C, January 25, 2013. https://www.osti.gov/servlets/purl/1504841

According to NUREG-7227, "The GC-859 database, which is maintained by the US Energy Information Administration (EIA), documents information on every SNF assembly discharged from US commercial reactors from 1968 to 2013." This includes the burnup for each individual SNF assembly.

As for cost, Holtec assumes that all SNF from the two sites will be removed by 2041. If this date is missed, which is a chronic problem for the nuclear industry, Sandia researchers conclude that: "Stranded storage costs are large because the annual maintenance costs of storing CSNF ranges from $0.2 million/yr to $1 million/yr when the reactor is operating but increase to between $4.5 million/yr and $10 million/yr when the reactor is decommissioned and storage costs can no longer be shared (i.e., up to 20 times the cost at an operating site)." This cost could effectively double, given the M&O (Management and Operations) of spent nuclear fuel at the two sites.

Finally repackaging of the 432 assemblies in the 18 VSC-24 casks is on a scale that has yet to be undertaken in the Unites States. It will involve transport, opening removal and emplacement into several new canisters. It will require the continued operation of the reactor pool and all that entails, especially since dry hot cells to handle commercial SNF remain yet-to-be deployed. It appears that not a single power reactor spent nuclear fuel cask in the U.S. has been repackaged. Given the lack of actual experience in repackaging, cost projections contain elements of speculation that cannot be penciled way. For instance, the estimated cost of managing low-level radioactive waste from removing spent fuel to new canisters is estimated by the DOE at $9,500 per assembly and could be more than the cost to load the assembly in any canister.[2]

The costs I estimated provide a layer of uncertainty that provide some conservatism based on respected sources. If they match up with Holtec's assertions, then the costs allocated for SNF management to be drawn from the D&D (Decommissioning and Decontamination) fund are excessive.

[2] U.S. Department of Energy, Office of Nuclear Energy, Standardized Transportation, Aging, and Disposal (STAD) Canister Design, Presentation to the Nuclear Waste Technical Review Board, June 24, 2015. http://www.nwtrb.gov/meetings/2015/june/jarrell.pdf

ROBERT ALVAREZ

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CURRENT POSITIONS

SENIOR SCHOLAR, AND DIRECTOR OF THE NUCLEAR POLICY PROJECT, INSTITUTE FOR POLICY STUDIES, WASHINGTON, D.C. 2011- to the present

PREVIOUS EMPLOYMENT

ADJUNCT PROFESSOR, JOHNS HOPKINS SCHOOL OF ADVANCED STRATEGIC INTERNATIONAL STUDIES, 2013-2020

SENIOR POLICY ADVISOR TO THE SECRETARY
U.S. DEPARTMENT OF ENERGY
WASHINGTON, D.C. – 1993-1999

Responsibilities:

- Led and coordinated initiatives and developed policies on behalf of the Secretary relative to nuclear weapons, worker illness compensation, nuclear non-proliferation, nuclear material controls, environmental cleanup, nuclear safety, and asset management.

- Performed technical and policy analyses for the Secretary regarding the U.S . nuclear weapons production complex, commercial nuclear energy, nuclear material management and disposition, nuclear arms reductions with Russia, environmental, safety and health and DOE management issues.

- Oversight of Department-wide labor policies for some 100,000 contract employees.

Accomplishments:

- Led DOE expert teams in a sensitive U.S. Nuclear nonproliferation project to safely secure plutonium-bearing spent fuel at the Yongbyon, nuclear weapons site in North Korea - as part of Agreed Framework between the United States and the Democratic Peoples Republic of Korea.

- Led and developed a successful legislative effort to establish a federal compensation program for Department of Energy nuclear weapons workers with occupational diseases.

- Participated in vulnerability assessments regarding spent nuclear fuel, plutonium and highly-enriched uranium at DOE sites.

- Developed first DOE-wide strategic “Roadmap” for strategic management of the DOE’s nuclear material inventory.

- Established the first Department-wide Asset Inventory and Management program that generated some $60 million in revenues.

- Developed successful procurement plan to stabilize some 700,000 metric tons of depleted uranium hexafluoride - roughly half of the uranium ever mined in the world.

- Established a medical monitoring program for former DOE nuclear weapons workers.

CHIEF INVESTIGATOR
COMMITTEE ON GOVERNMENTAL AFFAIRS
U.S. SENATE, WASHINGTON, D.C.

Years Employed: 1988-93

Responsibilities:

- Prepared and reviewed legislation for the Chairman relative to energy, labor, environment, safety, health, and nuclear weapons issues.
- Oversight, investigations, studies and audits of the U.S. Department's of Energy, Defense, and Interior, Food and Drug Administration, Nuclear Regulatory Commission, National Aeronautic and Space Administration, and Environmental Protection Agency.
- Produced reports, prepared Committee hearings and speech writing for the Chairman.

Accomplishments:

- Drafted and helped enacted several pieces of legislation including: the creation of the Defense Nuclear Facility Safety Board (1988); control of radioactive emissions under the Clean Air Act (1990); establishment of a hazards material worker training program for the Department of Energy (1991); a workforce restructuring and community transition program for shutdown nuclear weapons facilities. (1992); and the termination of the U.S. atmospheric nuclear weapons test readiness program (1993).
- Helped create and foster the Department of Energy's Office of Environmental Restoration and Waste Management Program. (1988-89)
- Organized over 25 Committee hearings on a wide array of subjects.

FOUNDER, AND MEMBER OF THE BOARD OF DIRECTORS
ENVIRONMENTAL POLICY INSTITUTE
WASHINGTON, D.C. Years Employed: 1975-88

Responsibilities:

- Managed the Institute's research, Congressional communications, and citizen involvement relative to energy, environmental, health and military nuclear issues.
- Public speaking, political organizing and lobbying.
- Fund-raising for a $1.5 million annual budget.

Accomplishments:

- Provided the first credible independent technical research on the environmental, safety and health risks and legacies associated with the U.S. nuclear weapons program.
- Helped enact environmental legislation including the 1977 Clean Air Act, The Resource Conservation and Recovery Act amendments of 1986-92, The 1986 Superfund Act; as well as legislation to dispose of nuclear wastes (The Uranium Mill Tailings Radiation Control Act,

1978, The Nuclear Waste Policy Act, 1982, the Low-Level Waste Policy Act, 1987); and legislation to prevent the spread of nuclear weapons.

- Led the national environmental effort to strengthen radiation protection standards and provide compensation for radiation victims.
- Helped organize a Congressional investigation and successful lawsuit on behalf of the parents and children of Karen Silkwood, a deceased nuclear "whistle blower." In 1984 the Supreme Court upheld the jury verdict against the company that employed Ms. Silkwood.
- Helped organize diverse political coalitions around the country.
- Organized several scientific conferences and sponsored scientific and medical research published in peer-reviewed journals.

LEGISLATIVE AIDE
U.S. SENATOR JAMES ABOUREZK (D-SD), Washington D.C. Years Employed: 1973-75

Responsibilities:

- Indian affairs, environment, and energy issues.

Accomplishments:

- Helped enact the Indian health care Improvement Act.
- Defended Indian water rights in the Upper Colorado River Basin against large water diversions for environmentally destructive coal gasification plants.
- Uncovered a systematic effort by the Bureau of Indian Affairs and the US Public Health Service to have Indian women sterilized and to have Indian children serve as experimental subjects for drugs without proper informed consent.

AWARDS AND SPECIAL RECOGNITION

- Awarded two Secretarial Gold Medals, the highest honors bestowed by the Department of Energy.
- The John Barlow Martin Prize for Public Interest Journalism, Medill School of Journalism, Northwestern University, in 1989.
- Featured in National Public Television's Nova documentary - Hanford: the Nuclear Legacy - broadcast in February and August of 1990.
- Featured on CBS 60 Minutes story regarding my efforts to uncover military human radiation experiments -- broadcast in March 1994 and August 1995.
- Featured in an October 16, 1999 New York Times article regarding DOE high-level radioactive wastes.
- Featured on the History Channel program, "History's Mysteries" regarding the Karen Silkwood case (November 1999)
- Featured in a January 29, 2000 New York Times article regarding radiation risks to U.S. nuclear weapons workers.
- Featured in a January 30, 2000 Washington Post Article regarding health risks of nuclear weapons workers.
- Featured in the New York Times on April 30, 2000 and on National Public Radio's All Things Considered on May 8, 2000 regarding my experiences in the U.S. Department of Energy.
- Featured on CBS 60 Minutes on March 17, 2002 regarding Defense High-Level Radioactive Wastes.
- Featured on National Public Radio's All Things Considered in May 2003, and May 2010 regarding my experiences at North Korea's nuclear site and a primer on controlling nuclear materials.

EDUCATION

Attended the Dana School of Music in Youngstown, Ohio 1964-68, Majored in music theory and composition.

REFERENCES UPON REQUEST

PUBLICATIONS

Articles

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Radiation Exposure Standards, (letter) Bulletin of Atomic Scientists, November 1980.
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