Environmental Defense Institute

News on Environmental Health and Safety Issues

October 2022 **Volume 33** **Number 10**

A review of the 'refusal to dismiss' the case alleging that Battelle Energy Alliance management was well-aware of known extremely dangerous hazard associated with damaged ZPPR fuel plates that contaminated workers in 2011

The plutonium inhalation event in 2011 at the Idaho National Laboratory's Zero Power Physics Reactor (ZPPR) facility contaminated sixteen workers with plutonium-239, americium-241 and other radionuclides. One worker, Brian Douglas Simmons, among the most highly exposed in the group of workers, continued working for Battelle Energy Alliance while mounting a successful legal challenge against his employer.

B. Lynn Winmill Chief Judge United States District Court refused to dismiss the case, denying Battelle Energy Alliance's motion to dismiss and also denying BEA's motion to reconsider. [1] [2]

BEA contended that Simmons' exposure was the result of a typical industrial accident and that his claims fall under Idaho's worker's compensation laws. Normally, claims that are compensable under state or federal worker's compensation laws cannot be brought under the Price Anderson Act (PAA). **However, injuries that result from the willful or unprovoked physical aggression of the employer can be brought under PAA.**

That test, of willful or unprovoked physical aggression by Battelle Energy Alliance was met, as the judge cited another case, *Dominguez ex rel. Hamp v. Evergreen Res., Inc.*, 121 P.3d 938, 942 (Idaho 2005) as an example of why the case against Battelle Energy Alliance should not be dismissed.

In *Dominguez*, Allan Elias ordered two of his employees to clean a 25,000-gallon tank filled with cyanide-laced sludge. Even though Elias knew cleaning the tank was extremely dangerous and would injure his employees, Elias did not warn either of them. *Id*. Contrary to federal regulations, no permit had been prepared, there had been no special employee training,

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[1] Simmons v. Battelle Energy Alliance, LLC, Opinion, Case No. 4:14-cv-00294-BLW, 07-30-2015, BRIAN SIMMONS, Plaintiff, v. BATTELLE ENERGY ALLIANCE, LLC, Defendant, B. Lynn Winmill Chief Judge United States District Court, MEMORANDUM DECISION AND ORDER.

[2] Simmons v. Battelle Energy Alliance, LLC, Opinion, Case No. 4:14-cv-00294-BLW, 04-12-2016, BRIAN SIMMONS, Plaintiff, v. BATTELLE ENERGY ALLIANCE, LLC, Defendant, B. Lynn Winmill Chief Judge United States District Court, MEMORANDUM DECISION AND ORDER.

appropriate safety equipment was not provided, and no attendant was standing by. *Id*. The employees were subsequently injured by the toxic fumes and Elias was uncooperative with emergency personnel. *Id*. At 941. The Idaho Supreme Court ruled that Dominguez, one of the employees, "alleged a willful or unprovoked physical aggression by his employer, and therefore his claim falls into a statutory exception to the exclusive remedy rule." *Id*. At 943. Therefore, *Dominguez* stands for the proposition that an employer acts with willful or unprovoked physical aggression when the employer intentionally orders an employee to perform an act that the employer knows will injure the employee.

The judge found that the facts alleged in Simmons' amended complaint are substantially similar to those recited in *Dominguez*. Simmons' alleges, among other things, that BEA knew that ordering Simmons to repackage the fuel plate would result in Simmons' injury, failed to warn Simmons of the danger, failed to follow federal safety regulations, and intentionally exposed Simmons to radioactive particles.

Battelle Energy Alliance (BEA), despite being warned multiple times by the Independent Safety Oversight Chairman that finding a damaged plutonium plate was more likely than BEA management realized and that procedures needed to be put in place should damaged plates be encountered, BEA management approved the inadequate working planning for the fuel plate repackaging. The warnings had been conveyed to the MFC Nuclear Operations Director in 2009 and again in 2010 and the Deputy Director in 2011, yet BEA had failed to take any action to put recommended mitigations in place, such as procedures for abnormal conditions.

No procedures were put in place for the possibility of encountering of the buildup of dispersible plutonium (and americium) powder and workers were not told of the Chairman's warnings. Inadequate nuclear safety analyses by BEA since 2005 centered on the invalid and unverified presumption that encountering plutonium plates in the facility with degraded cladding was "extremely unlikely" and so it was not treated as a plausible hazard.

When Brian Douglas Simmons, [3] an operator and only age 27 at the time of the November 8, 2011 ZPPR plutonium inhalation event, asked what to do in the event of a fire or finding a power, the Shift Supervisor directing the work responded (captured on video [4]) "not a valid question." [5]

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[3] Brian Douglas Simmons, died August 29, 2022 at age 38. A memorial service was held September 17 at Wood Funeral Home in Idaho Falls, Idaho. He had been living in Maricopa, Arizona at the time of his death.

[4] United States Department of Energy, Office of Hearings and Appeals, In the Matter of Ralph Stanton, In the Matter of Brian Simmons, Case Nos: FIA-13-0047, FIA-13-0048, Issued: July 17, 2013, wherein DOE denies the videotape because it is a "contractor-owned record." Stanton and Simmons do obtain the videotape of the event through further legal action. The video debunks some the BEA's claims that the workers were touching their faces and drinking liquids. It also contains Brian Simmons asking about what to do if they find powder or there is a fire, which BEA denied had occurred.

[5] U.S. Department of Energy Office of Health, Safety and Security Accident Investigation Report, *Plutonium Contamination in the Zero Power Physics Reactor Facility at the Idaho National Laboratory, November 8, 2011*, January 2012. See page 14, page E-6, and E-8.

Brian Simmons, an extremely fit young person, experienced an immediate adverse shift in his health after the 2011 plutonium inhalation event. BEA medical dictations would record that no vomiting occurred, despite Brian reporting vomiting the day of the accident. Both Brian Simmons and Ralph Stanton would be told by BEA medical that their malaise after accident was due to the flu, despite white blood cell counts dropping rather than increasing. The flu would increase the white blood cell counts but plutonium and americium in the blood stream would kill blood lymphocytes and reduce white blood cell counts, which is exactly what happened.

BEA would eventually offer, many months after the accident, to show Brian his detailed radiation dose assessment and ask that he sign that he had been able to review it, despite not being allowed to actually see the report. And BEA made signing that he had seen his dose assessment (without being allowed to actually see it) a necessary condition for renewing his radiation worker qualifications. Ralph Stanton, working side by side with Brian, would receive the same request to sign that he had been able to review his radiation dose assessment, without being allowed to actually see it, and Ralph also refused to fraudulently sign that he had.

The battle to obtain their detailed dose assessments would entail being told by BEA to request it from the Department of Energy. Then the Department of Energy would explain how it was "BEA work product" and not a DOE document and so DOE could not provide it. The Freedom of Information Act (FOIA) requests would be time consuming and cumbersome. Eventually, BEA provided the contrived low-balled dose assessments, that incompetently did not account for americium-241 ingrowth in the body from the inhaled plutonium-241.

Despite Brian being told that his dose was low, under 2 rem, and being made to seek counseling from employee assistance for his concerns, he would patiently and effectively seek legal remedy for the failure of BEA management to protect workers from the plutonium inhalation hazard.

The case did not go to trial and likely ended in a settlement. The following articles will describe how the work had involved repackaging ZPPR plutonium plates with management-approved inadequate work planning and inadequate radiological controls largely based on BEA's inadequate but Department of Energy approved nuclear safety analysis. The safety analysis stated that damaged cladding would be "extremely unlikely" or less likely than a 1-in-10,000 year event. The safety analysis also stated that worker doses in the event of a conservatively evaluated accident were *negligible*.

New estimates that BEA management was aware of had increased the likelihood of encountering plates with defective cladding but this information was withheld from the workers, including Brian Simmons and Ralph Stanton, most at risk of plutonium inhalation during their work at the fume hood.

The extent to which the fume hood fan alignment resulted in malfunctioning hood air flow would not be discovered until after completion of the DOE's Accident Investigation Report, which was not updated for various issues it had not addressed.

The containers of the plutonium fuel plates were labeled with unusual warnings, including that some of the plates were wrapped in plastic and cladding was swollen. Plastic had been used despite the well-known prohibition of having plastic in proximity to plutonium metal because of the plastic enhances the formation of pyrophoric plutonium hydrides.

The accident investigation report omits that the Department of Energy's stated commitments in 1995 to address then identified plutonium safety problems at the ZPPR facility such as the problem of plutonium metal stored in proximity to plastic, had never been addressed.

The ZPPR fuel in clamshell containers with external labeling indicating compromised plates were specified for repackaging on November 8, 2011 when the plutonium and americium inhalation event occurred.

The ZPPR plutonium plates were to be packaged into stainless steel 3013 "paint cans" and to be shipped to another DOE laboratory with the reason given as "research."

No radiological air monitoring in the breathing zone of the hood nor upstream of the HEPA filters was available during the planned work. The only radiological air monitoring available was incorrectly placed and inappropriate for the planned work. No radiological contamination levels in the hood or the material to be handled were specified that would void the Radiological Work Permit during the handling of the plutonium plates. And the fans for the fume hood were weeks later, and not addressed in the DOE's Accident Investigation Report, were found to have been misaligned, greatly diminishing the airflow through the fume hood.

The Department of Energy and Battelle Energy Alliance would stress that the workers who were directed to cut into the plastic had caused the accident and that they should have called a "Stop Work." The Department of Energy would also stress that the Battelle Energy Alliance's estimated radiation doses from the accident were low.

Year after year, Battelle Energy Alliance ignored the in-facility worker hazards at the ZPPR Facility

The work planning for packaging damaged plutonium fuel plates on November 8, 2011 had relied on the documented safety analysis for the Zero Power Physics Reactor (ZPPR) nuclear facility which had been approved by the Department of Energy annually. This safety analyses had not considered the buildup of plutonium corrosion products including hydride powder over time during storage, over about thirty years, in the *nominally sealed* clamshell containers.

Two of the clamshells containing the plutonium plates to be repackaged on November 8, 2011 had externally visible labeling indicating compromised fuel plates. The Nuclear Facility Manager was consulted about the abnormal labelling the day of the accident and he immediately, by phone, directed that the work proceed.

The Department of Energy's Accident Investigation Report would examine witness testimony and historic documentation, including the previously missing ZPPR Suspect Fuel Log,

and would determine that the plutonium fuel plate involved in the accident was damaged prior to being stored over 30 years ago.

This damage resulted in a breach of the stainless-steel cladding, which in turn allowed air (oxygen) and moisture (water) to infiltrate the fuel plate and react with the transuranic alloy. This assumption is supported the ZPPR Suspect Fuel Plate Log and by labeling seen on the clamshell that contained this fuel element prior to the accident, as well as witness testimony concerning the material condition observed during the accident, according to the DOE's Accident Investigation Report.

Since BEA took over the contract in 2005, BEA management and the Department of Energy had continued to assert, year after year, that there were no plutonium plates with damaged cladding in the ZPPR facility. This was despite a Suspect Fuel Log once used by the facility, a history of several damaged plates and a DOE Occurrence Report involving damaged plutonium plates. The long missing Suspect Fuel Log curiously showed up on an office shelf after the accident. Also, the DOE Occurrence Report for the November 8, 2011 plutonium inhalation event states that regarding the loss of information related to plate history, that "It was unclear if this was intentional (i.e., loss of records) …" [6]

The Nuclear Facility Manager (NFM) and Shift Supervisor (SS) had directed the work to proceed on November 8, 2011, even after workers called a time-out after encountering labeling on the clamshell container containing a plutonium fuel plate that indicated a problem.

Past experience had shown that workers invoking a "Stop Work" for inadequate radiological work controls were made to understand that they put their employability at risk. In fact, workers calling a "Stop Work" could simply be removed from the job and other workers brought in to perform the work. Multiple radiological control problems had been identified at the Materials and Fuels Complex where the Zero Power Physics Reactor facility is located, in the Department of Energy's Accident Investigation Report for the November 8, 2011 event.

A DOE-appointed review board would find that Battelle Energy Alliance management ignored repeated warnings from its appointed Independent Safety Review Chairman of worker safety issues specifically involving ZPPR fuel plates and BEA could have prevented the accident that exposed a dozen workers to high levels of airborne radiological contamination. [7]

The Idaho National Laboratory Director, John Grossenbacher, would later state that **the workers** — who followed the BEA-appointed Nuclear Facility Manager's instructions, the BEA-appointed Shift Supervisor's instructions and adhered to the inadequately planned work approved by BEA — should have known better than to inspect the 30-year-old plates. **The**

[6] Department of Energy Occurrence Report, NE-ID—BEA-ZPPR-2011-0001, "ZPPR Workroom Pu Contamination Event in MFC-775," Update September 25, 2012.

[7] U.S. Department of Energy Office of Health, Safety and Security Accident Investigation Report, *Plutonium Contamination in the Zero Power Physics Reactor Facility at the Idaho National Laboratory, November 8, 2011*, January 2012.

exposed workers who were operators at the facility had no knowledge of the multiple safety analysis discrepancies or of the Independent Safety Review Chairman's multiple warnings.

The mistakes in the Department of Energy's safety analyses for the Zero Power Physics Reactor facility were not random mistakes. Had the possibility of finding degraded cladding on the plutonium metal fuel plate cladding been considered, more time and expense would be required to repackage the plates. By ignoring the buildup of plutonium and americium hydrides during storage, the deeply flawed DOE-approved documented safety analyses for the ZPPR facility gave the false impression, expressed with an educated and authoritative hubris, that an accident at the facility would have 'negligible' consequences for workers or the public.

The long-standing but deeply flawed conclusions of the documented safety analyses being approved annually by the Department of Energy as the basis for interim operations, were at the heart of the gross underestimation of the needed radiological controls including air monitoring.

Yet, the Nuclear Facility Manager who had approved the work planning would have been best positioned to see the disconnect between the safety analysis and the actual facility history and condition.

Despite recommendations over the years that fuel surveillance inspections be conducted, no inspections of the plutonium plates had been conducted since the reactor had shut down in the early 1990s. **Applicable emergency response procedures for the facility had long been cancelled and not put in place for this planned plutonium plate packaging despite the Independent Safety Oversight Chairman's specific recommendation that such procedures were needed for worker safety.**

The Department of Energy had for years recognized that worker safety for workers in the workroom at the ZPPR facility had not been properly addressed. [8] Yet year after year, this was not addressed. **Despite the problem in the safety analyses of the lack of radiological dose consequences to in-facility workers being identified as recently as 2005, as of 2011, no in-facility dose evaluations for the Zero Power Physics Reactor facility had been conducted.**

The Department of Energy Idaho Field Office stated their position was that rigorous "Integrated Safety Management" would ensure adequate safety despite the numerous inadequacies in the DOE-approved documented safety analyses.

[8] Robert Boston et al., Department of Energy, "Department of Energy Review of the Materials and Fuels Complex Documented Safety Analysis," Conference preprint, circa 2006. This paper states that in 2005 (when Battelle Energy Alliance took over ANL-W), it had been found that Materials and Fuels Complex documented safety analysis reports did not meet the safe harbor provisions of 10 CFR 830 Subpart B, Nuclear Safety Management Rule and upgrades would be a multiyear process. The problems identified include the use of mitigated accident evaluation rather than unmitigated and the lack of in-facility work dose consequence analysis. The ZPPR risk ranking is prioritized as the second highest of 7 facilities. The paper describes how the safety analysis process was to intentionally defer to the future any problems such as references that cannot be found to support the accident analysis or quality or seismic capability of structures, systems and components. Reliance was to be placed on rigorous "Integrated Safety Management."

"Integrated Safety Management" involves (1) Define the Scope of Work, (2) Analyze the Hazards, (3) Develop and Implement Hazard Controls, (4) Perform Work Within Controls, and (5) Provide Feedback and Continuous Improvement. **What actually happened is that the deeply flawed DOE-approved documented safety analyses for the ZPPR facility was used to justify not analyzing the hazards or implementing hazard controls to protect workers.**

Contrary to 10 CFR 830 compliant safety analyses, the safety analysis for the ZPPR facility had not implemented any controls to protect workers.

The safety analysis for the ZPPR facility was a misapplication of the DOE Handbook, DOE-HDBK-3010-94 in many ways and not the least being the Respirable Fraction (RF) being sited (0.04) which was too low for corrosion at room temperature.

BEA had recently updated its safety analysis for the ZPPR facility and had increased the estimated likelihood of finding damaged cladding on plutonium plates. Yet, this had not resulted in entering the federal rule mandated 'unreviewed safety question' process or the proper evaluation of the worker hazard, needed mitigations for worker protection or a competent analysis for the now expected event.

Although not admitted in the DOE's accident investigation report, the negative influence of the Department of Energy and its stance that its inadequate safety analyses would be compensated for by rigorous "Integrated Safety Management" was deeply involved with the avoidance of the "unreviewed safety question" process at the Materials and Fuels Complex during the multi-year ongoing safety analysis upgrades.

The Nuclear Facility Manager had recently updated the ZPPR fuel surveillance procedure, deleting warnings and other information and precautionary steps. It appears to me that the Nuclear Facility Manager for the ZPPR facility knew that the plates to be packaged for shipping to another facility were damaged. It also appears to me that the radiological monitoring was intentionally deficient so that the contamination levels would not be recorded.

There was no effort expended in the safety analysis or any other hazard analysis to estimate the level of plutonium and americium powder that could have built up over time, not even for swollen plutonium plates wrapped in plastic decades before.

Battelle Energy Alliance nuclear management chose to have no procedure in place for the possibility of encountering damaged plutonium plates. The DOE's Accident Investigation Report reveals that numerous deficiencies had been documented over the years in addition to the Independent Safety Oversight Chairman's warnings but had not been acted upon.

The Department of Energy approved documented safety analysis for the Department of Energy's ZPPR facility relied on wishful thinking, ignorance of actual facility history and condition, forgetting any previous vulnerability assessment and the misapplication of the DOE Handbook for accident conditions involving the plutonium fuel plates.

Despite the selected plates having warning labels and not having been inspected in thirty years and despite the ZPPR Nuclear Facility Manager (NFM) being aware of the recently acknowledged increase in the likelihood of encountering damaged cladding on plutonium plates, the NFM approved the radiological work package for repackaging the plutonium plates with no hazard analysis being conducted. Also, for months prior to the plate repackaging, BEA management and DOE would have been aware of this ZPPR plutonium packaging work activity for shipment of certain plates to another DOE facility.

The radiological work package (RWP) for repackaging the plates did not provide any limit on contamination levels that would require stopping the work, except for high contamination levels on the cart used for the closed clamshells. No proper radiological air monitoring was required because it is assumed that the cladding would not be defective, based on the safety documentation currently in effect. The required Radiological Control Manager's signature was not on the radiation work package, only the NFM, the Shift Supervisor and the surrogate MFC Radiological Control Supervisor. The whole thing was flying under the radar in order to avoid proper hazard mitigation and was not in compliance with work planning procedures at the facility.

The radiological controls for repackaging the plutonium plates were based on the assumption that the plate cladding would not be defective. **Yet the NFM was aware that the documented safety analysis (draft) had been modified and had increased the likelihood of finding defective plates from "extremely unlikely" to "anticipated." This should have resulted in a formal "unreviewed safety question." This change to an "anticipated" event is also a game changer with regard to how rigorously the in-facility worker hazard should have been analyzed and mitigated.** Yet despite numerous USQ qualified personnel, including the NFM, being aware of the new estimate of the likelihood of an accident, not only is no action taken to issue an "unreviewed safety question." And the work to repackage the plates is treated as though encountering defective plates is not possible.

After the DOE's Accident Investigation Report was issued, an update to the DOE Occurrence Report was issued. [9] The updated DOE Occurrence Report states that the NFM and the Shift Supervisor who had approved the work package and were directing the work to proceed despite the labeling on the clamshells for the plates, **each had been aware of the newly developed increase in the likelihood of finding a damage plutonium plate and yet had not communicated this to the operators to perform the work the day of the accident.** Personnel in the Nuclear Safety and Radiological Controls organizations were also informed of the increased likelihood of encountering defective plates, yet took no action regarding proper evaluation of worker hazard controls.

The updated DOE Occurrence Report includes information that the hood fan found to be operating was not the intended fan. The tagged out-of-service Fan-107B, was operating rather

[9] Department of Energy Occurrence Report, NE-ID—BEA-ZPPR-2011-0001, "ZPPR Workroom Pu Contamination Event in MFC-775," Update September 25, 2012.

than Fan-107A. Fan-107B, however, had a partially closed damper, and was not supposed to be used. **The updated Occurrence Report states that "As such, no exhaust fan was in operation for the workroom south fume hood during the event." In another section of the Occurrence Report, it is stated that "The action resulted in an out of service fan (107B) being placed in service causing substantially reduced airflow through the south fume hood ultimately affecting the hoods [sic] ability to contain and control any loose contamination."**

The improper fan alignment was completely unknown when the DOE's Accident Investigation Report was issued. The malfunctioning condition of air flow from the hood, that at least "substantially reduced airflow through the south fume hood" is all that is known about the actual operability of the hood when the easily dispersible plutonium and americium hydride powder was released on November 8, 2011.

Somehow, despite a malfunctioning hood, and 5.5 million disintegrations per minute detected on a swipe in the hood, BEA would soon declare that the radiological doses were low. To support this, BEA would have to destroy the logbook containing the initial nasal swab data and would have to manipulate the lung count reports to prevent the actual plutonium and americium intakes from being revealed. [10] [11]

After the accident, Battelle Energy Alliance would find that "Representatives from other DOE sites including Pacific Northwest National Laboratory (PNNL), Oak Ridge National Laboratory (ORNL) Y12 Facility, Washington Safety Management Solutions (WSMS), and the Savannah River Site (SRS) provided information regarding radiological work within fume hoods. **Although radioactive materials are routinely handled inside fume hoods, none of the sites indicated that handling of plutonium inside a fume hood is an acceptable or allowed practice at their facilities.**"

BEA would also discover that, unlike BEA's loose operational standards for the ZPPR hood, **other DOE facilities require verification of proper airflow into the hood prior to conducting work in a hood** — even for less hazardous materials inspected in their fume hoods.

The Department of Energy, who approved of the unverified assumptions and inadequate analyses in the ZPPR safety analyses, would continue to direct blame to the workers in the facility who were doing exactly what they were directed to do. The training material would be directed to those workers rather than to the management of the facility, the safety analysts or the radiological control management. [12]

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[10] Tami Thatcher, Slide Presentation for Environmental Defense Institute, "Review of Ralph Stanton's Radiation Dose from the 2011 Plutonium Inhalation Event at the Idaho National Laboratory – Part 2," March 2022 at http://www.environmental-defense-institute.org/publications/PowerptLowDose.pdf

[11] Tami Thatcher, Slide Presentation for Environmental Defense Institute, "Review of Ralph Stanton's Radiation Dose from the 2011 Plutonium Inhalation Event at the Idaho National Laboratory – Part 1, Lung Counting," February/March 2022 at http://www.environmental-defense-institute.org/publications/PowerptLungCount.pdf

[12] Department of Energy, Radiological Safety Training for Plutonium Facilities, DOE-HDBK-1145-2013, March 2013. This training material only faintly addresses the hydride problem with ZPPR fuel, the radiological control failures, the years of safety analyses errors, the misuse of the DOE-HDBK-3010 guidance and fails to address that

The Department of Energy's Accident Investigation Report that found that BEA management had been warned, on multiple occasions, of the high likelihood of encountering damaged plutonium ZPPR plates, and that despite these warnings, BEA management had refused to take action to protect workers inspecting plutonium plates.

BEA management failed to ensure that the history of the damaged plates was reviewed and refused to put procedures and mitigations in place to protect workers. BEA management also failed to apply proper hazard identification and mitigation in work planning.

When workers at the ZPPR facility saw the hand written warnings on the containers of the plutonium plates and requested direction by the Nuclear Facility Manager for the facility, the NFM immediately and without any additional review directed that the work was to continue. The workers were directed to cut into the plastic coverings of the plutonium plates. This action, that of cutting into the plastic, which was directed by the BEA appointed nuclear facility manager, was later called the direct cause of the accident.

As the DOE's Accident Investigation Report found evidence of the failure to provide adequate plutonium hazard training, and certainly inadequate understanding of the plutonium hazard was involved, in response to the November 8, 2011 accident, DOE created a new DOE plutonium hazard training handbook. But the new DOE handbook did not address the incompetent work planning, the years of incompetent nuclear safety analyses that the Department of Energy had continued to approve, or the plutonium storage hydride hazard. The year-after-year repeated errors and invalid assumptions by the safety analysis and nuclear management professionals would be ignored in the new plutonium training handbook. And the training handbook also did not address the BEA decision to keep the workers most likely to be affected by the hazard uninformed of new information about the increased likelihood of the hazard, of defective cladding on the plutonium plates. The new training manual would emphasize that workers who were following instructions and performing work as directed needed training, rather than the facility management and safety analysts, and the training would emphasize that the accident at the ZPPR facility had caused very low radiation doses.

management refused to act to protect workers from an identified expected event. The problem of underestimating the amount of buildup of radioactive powder and the health harm is not actually addressed by this terribly inadequate document which grossly misrepresents causes and consequences of the November 8, 2011 accident at the Idaho National Laboratory's Zero Power Physics Reactor facility.

Year after year, Battelle Energy Alliance ignored the possible buildup of plutonium hydrides at the ZPPR Facility

The Department of Energy's Accident Investigation Report [13] states that over time, well-understood reactions between the air and moisture, which were present in the clamshell, and the metallic plutonium fuel alloy formed transuranic oxides and hydrides – likely including (but not limited to) UO2, PuO2, AmO2, PuH3, and AmH3. For example, assuming Pu is the radionuclide, the formation of such compounds can generally be characterized by the following equations:

$$Pu + H2 \rightarrow PuH2$$

$$Pu + 2H2O \rightarrow PuO2 + 2H2$$

According to the accident investigation report, these oxide and hydride compounds have far different physical properties than any of their constituents (i.e., transuranics, hydrogen, and oxygen); and this fact is important in understanding this 2011 accident, **since these new compounds readily form aerosols that are easily dispersible.** During the fuel packaging operation in the ZPPR Workroom on November 8, 2011, these compounds were liberated, thus resulting in the accidental uncontrolled release of radioactivity.

Specific ZPPR plutonium fuel plates were to be packaged in 3013 cans and shipped to another Department of Energy facility. Why these ZPPR plates, with unusual labeling indicating cladding problems, had been selected for packaging on November 8, 2011 has not been explained.

The plutonium plates in the clamshells with the unusual written markings on their containers indicating suspect plates were apparently not brought out for conducting a variety of lucrative passive screening measurements and active measurement using x rays and electronic neutron generators by guests from the U.S. and abroad, including foreign nationals, for active interrogation measurements to be used for detecting special nuclear material. [14]

The ZPPR safety analyses by career professionals was being relied on to justify not having appropriate procedures in place. The deeply flawed safety analysis stated for years that encountering damaged cladding on a plutonium plate was "extremely unlikely" despite various sources of information describing damaged plutonium plates. [15] The DOE-approved safety

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[13] U.S. Department of Energy Office of Health, Safety and Security Accident Investigation Report, *Plutonium Contamination in the Zero Power Physics Reactor Facility at the Idaho National Laboratory, November 8, 2011*, January 2012.

[14] D. L. Chichester et al., Idaho National Laboratory, *Capabilities of the INL ZPPR to Support Active Interrogation Research with SNM* [Special Nuclear Material], INL/CON-08-14197, Preprint, CAARI, August 2008.

[15] There had been several instances of damaged plutonium plates. See the DOE's Accident Investigation Report and also G. L. Fogle et al., Argonne National Laboratory for the Department of Energy, *A Study of the Oxidation and Swelling Behavior of ZPPR Fuel Under Ambient Conditions*, ANL-80-117, circa 1980. The ANL-80-117 report also makes recommendations regarding ZPPR plutonium metal fuel inspections and repackaging. It appears that

analysis stated that finding a damaged plate would cause no more than *negligible* worker radiation doses. **Less emphasized was that these workers doses were based on workers that had evacuated to the bus lot, not workers inside the ZPPR workroom.**

The low-balled potential accident dose estimates were based on the assumption that none of the plutonium fuel plates in the *nominally sealed* clamshells had the buildup of hydride powder from corrosion in thirty years. [16] The evolution from previous safety documentation that claimed the clamshells were airtight is not explained. The corrosion of the plutonium metal fuel cannot be accurately predicted without fuel inspections, but fuel inspection had not been conducted in thirty years. The corrosion would allow the buildup of "powder" including highly respirable hydrides. Plastic wrapping also increased the ability for hydride buildup. [17] The Department of Energy's Standard DOE-STD-1128-2008 [18] and the 2013 version, reaffirmed in 2020,[19] specifically states that

- Plastics "shall" be excluded from the primary container for metal and oxide plutonium forms
- Metal and oxide plutonium forms shall be sealed in primary containers for extended storage, and
- Surveillance of stored materials is required.

In contrast to the long-known requirements, at the Idaho National Laboratory's Zero Power Physics Reactor facility, some of the plutonium metal was stored with plastic wrapping inside the primary container, the clamshell containers were not sealed, and surveillance of stored materials had not been conducted for thirty years.

These conditions were not addressed by the DOE-approved documented safety analysis because of the *long-standing myth* that for all of the plates, the stainless-steel cladding was undamaged.

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some conclusions in the report are misapplied to ZPPR plutonium metal fuel stored for decades, uninspected and wrapped in plastic that can enhance hydride formation. The pyrophoric nature studied has not included conditions favoring hydride formation as the damaged plastic-wrapped plates had.

[16] U.S. Department of Energy Office of Health, Safety and Security Accident Investigation Report, *Plutonium Contamination in the Zero Power Physics Reactor Facility at the Idaho National Laboratory, November 8, 2011*, January 2012. See Table 2-3 for the age of some of the damaged plates.

[17] Department of Energy, DOE Standard, Stabilization, Packaging, and Storage of Plutonium-Bearing Materials, DOE-STD-3013-2012, March 2012. The ZPPR reactor was operated between 1969 and 1992. Some of the damaged plates were reported in the 1970s and 1980s, see Table 2-3, for fuel in clamshell 45 M that was reported as damaged in 1982.

[18] Department of Energy, DOE Standard, Good Practices for Occupational Radiological Protection in Plutonium Facilities, DOE-STD-1128-2008, December 2008.

[19] Department of Energy, DOE Standard, Good Practices for Occupational Radiological Protection in Plutonium Facilities, DOE-STD-1128-2013, April 2013 Reaffirmation January 2020. page 2-26.

The vulnerabilities of plutonium storage at MFC have been known for decades, yet nothing was changed to protect workers. [20] In fact, many changes that reduced worker safety had been made, such as reduced radiological monitoring, removal of radiological air monitoring equipment, and others. Past reports of these vulnerabilities, i.e, DOE-EH-0415 Volume II Part 5, for ANL-W, have been now been removed from DOE's osti.gov information repository.

Of note, plutonium hydrides are extremely pyrophoric upon being unsealed and exposed to oxygen and no procedure for the event of a fire was in place at the facility. A 1995 report states: **"Finely divided plutonium hydride is pyrophoric in air at room temperature."** [21] The fire hazards analysis for most Idaho National Laboratory nuclear facilities were also in the perpetual state of not being issued.

In addition to all this, the work to repackage plutonium plates that day also did not include needed specific procedures to ensure that the 3013 cans did not exceed compliance limits for grams of plutonium and heat loading. The safety analysis was based on two clamshells in the hood. The work involving four clamshells, and only two 3013 cans appeared to lack both adequate safety analysis and criticality analysis, in addition to ignoring the highly respirable plutonium and americium hydrides that had built up by corrosion over thirty years in the damaged plutonium plates. These deficiencies are not fully addressed.

The BEA safety analyses also failed to comprehend the special fire hazard posed by unwrapping plutonium plates and exposing the plates to air. The hydrides that had built up by corrosion, with hydrogen that could be scavenged from the plastic wrapping on the suspect plates, are known to spontaneously ignite, even at room temperature and can continue burning, releasing airborne radioactive particles far in excess of what had been assumed in the BEA safety analysis for the ZPPR workroom. [22] The exothermic reaction and its associated thermal and dispersal hazards were known prior to the November 8, 2011 plutonium inhalation event at the Zero Power Physics Reactor facility. This 2016 paper by John Haschke and Long N. Dinh gives additional insight into the pyrophoric nature of plutonium hydrides, and states what has long been known, that the reaction can initiate spontaneously after exposure of the hydride to air **at room temperature.**

One of the clamshells brought out for packaging on November 8, 2011 stated on the outer container that material was **wrapped in plastic**, while another clamshell containing a single fuel plate that was wrapped in plastic had not stated on the outer label that plastic wrapping was used.

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[20] Department of Energy, *Plutonium Working Group Report on Environmental, Safety and Health Vulnerabilities Associated with the Department's Plutonium Storage*, Vol. I, DOE/EH-0415, November 1994. And Vol. II, Part 5, *Argonne National Laboratory-West Working Group Assessment Team Report*, Attachment A, November 1994.

[21] Department of Energy, Office of Environmental Management, *Taking Stock A Look at the Opportunities and Challenges Posed by Inventories from the Cold War Era*, Plutonium and Nuclear Materials Management and Safeguards System Materials, Materials in Inventory Report, DOE/EM-0275-V2B, October 31, 1995. Page 49.

[22] John M. Haschke and Long N. Dinh, *Journal of Alloys and Compounds*, "Chemistry and kinetics of the pyrophoric plutonium hydride-air reaction, LLNL-JRNL-686320, March 18, 2016.

In 1995, the Department of Energy created an implementation plan for the Defense Nuclear Facilities Safety Board issued Recommendation 94-1. [23] Sub-recommendation 1b included that storage of plutonium metal and oxide should be in conformance with DOE-STD-3013-94 which addressed the use of 3013 cans. And, also Sub-recommendation 4: "**That preparations be expedited to repackage the plutonium metal that is in contact with, or in proximity to, plastic [emphasis added]** or to eliminate the associated existing hazard in any other way that is feasible or reliable. Storage of plutonium materials generated through this remediation process should be such that containers need not be opened again for additional treatment for a reasonable long time."

In the DOE's implementation plan from 1995, DOE agreed that material in close proximity to plastic would undergo periodic sampling, surveillance and monitoring and repackaging those forms or packaging configuration where problems are found on a priority basis. **The DOE states that "The term 'in proximity to plastic' means that direct communication between the plutonium and the plastic is possible (i.e., there is no airtight container separating them)."**

Despite the DOE's implementation plan issued in 1995, some plutonium metal fuel remained wrapped in plastic and uninspected in the ZPPR facility until November 8, 2011 when, without adequate hazard analysis and without hazard mitigations used previously in the ZPPR facility, some material was finally to be placed in 3013 packaging.

So, with well-known and documented risk of plutonium hydride formation due to having proximity to plastic, the reason for the plutonium plates having been wrapped in plastic indicating compromised cladding, and the known applicability of the DNFSB's 94-1 Recommendations and the Department of Energy's own formal implementation plan known to be applicable to the ZPPR facility by 1995, the Department of Energy had not inspected plutonium metal ZPPR fuel for decades.

The issue of well-known risks associated with plastic in proximity to plutonium metal seems to have been forgotten by the Department of Energy as well as it 1995 Implementation Plan that it had not implemented at the ZPPR facility.

When DOE finally gets around to placing the compromised plutonium fuel in 3013 cans on November 8, 2011, hazard analysis is not performed and the DOE's Accident Investigation Report does not mention the known problems associated with plastic stored in proximity to plutonium metal. The plutonium training handbook created after the 2011 accident also fails to address that problem of plastic in proximity to plutonium metal due to the hydride formation the plastic enhances by providing hydrogen.

It adds to my opinion that the ZPPR plutonium plates selected for packaging on November 8, 2011 had selected because they were known to be compromised ZPPR plutonium metal plates.

[23] Department of Energy, *Defense Nuclear Facilities Safety Board Recommendation 94-1, Implementation Plan*, DNFSB/MISC-051, February 28, 1995.

These damaged plates were finally going to be packaged into sealed stainless steel 3013 cans for shipment to another DOE lab for storage.

Was keeping this work under the radar about cost savings of not being burdened with having to implement what they knew would be appropriate mitigations such as using a glove box? Or was it more about not letting others know that the compromised plutonium was being sent to another laboratory for storage and not actually for "research"? The DOE's more recent accounting of surplus plutonium includes ZPPR plutonium plates but not where they are located.

Several years after the accident in 2014, BEA would nonchalantly describe "Damage to the cladding is a concern because even a small hole can allow air and moisture to be exposed to the fuel. The fuel will oscillate through the hydride oxide cycle (like the ZPPR Uranium fuel …) over a long period of time and eventually turn into an oxide powder. This turns the metal fuel into a useless highly reactive hydride powder that can burn and spread (contamination) quickly during handling." [24] The ZPPR facility had acknowledged the hydride buildup problem for uranium fuel plates due to many problems encountered but had not, prior to 2011, acknowledged the hydride problem for plutonium fuel plates.

Battelle Energy Alliance's inadequate radiological control at the ZPPR Facility

Radiological control personnel had apparently believed the Department of Energy-approved but highly flawed nuclear safety analyses by BEA that stressed the robust integrity of the stainless-steel clad plutonium fuel plates. The safety analysis declared that worker doses in the event of an accident would be *negligible* (or under 5 rem). Radiological control decisions were based on the flawed documented safety analysis rather than actual work activities, competent hazard evaluation or Department of Energy regulatory guidance for radiological monitoring.

Radiological control had approved the work to be performed on November 8, 2011 on the basis of an expected derived air concentration (DAC) for plutonium-239 below about 0.3 DAC. Working for 2000 hours per year in a 1.0 DAC environment would yield a 5 rem whole body dose or a 50 rem organ dose, depending on which was limiting. Yet the only radiation Constant Air Monitor (CAM) in the room was 15 ft away and located in an air current expected to flow toward the hood used to repackage the plates.

This CAM would ultimately alarm and workers would evacuate based on this alarm. But this CAM, poorly located for the workers at the fume hood, did not alarm until reaching 100's of DAC for plutonium-239. **The recommended alarm value is typically near 8 DAC and would also be properly placed to monitor the workers breathing space.**

[24] Charles W. Solbrig, Jason Andrus, Chad Pope, Idaho National Laboratory, *World Journal of Nuclear Science and Technology*, "ZPPR Fuel Element Thermal Stress-Strain Analysis, February 2014, https://www.scirp.org/html/9-1090177_45501.htm

In response to the November 8, 2011 plutonium inhalation event, the Department of Energy would issue a handbook to supplement training for plutonium facilities. [25] The handbook states: "Airborne radioactivity is easily influenced by air currents, and air samplers (fixed or CAMs) should be strategically placed to represent the workers' 'breathing space.' "

It would seek to help train Battelle Energy Alliance in some additional subtle nuances such as: "To properly deal with unexpected adverse situations in a plutonium facility, a well-developed [sic] program and trained personnel should be in place."

The 2013 plutonium training handbook provides briefly a summary of the November 8, 2011 accident, **emphasizes that the estimated radiological doses were low.** It also neglects to mention how botched the DOE-approved documented safety analyses for the facility had been, year after year or how DOE contractor Battelle Energy Alliance management had refused to address repeated warnings of unmitigated worker risk due to handling the plutonium plates was, even after multiple warnings, in person and in writing.

The radionuclide composition of the ZPPR plutonium plate fuel, such as the amount of americium-241 in the airborne contaminants, which accounted for nearly half of the dose, was unknown by the radiological control organization during work planning and during emergency response to the accident. The DOE's new plutonium training manual did not include the need to address material composition prior to conducting work, the need to assess ingrowth of americium-241 in the inhaled material, or the need to include americium-241 ingrowth inside the body after the inhalation of plutonium-241 which is in high proportion to plutonium-239 in the ZPPR plutonium plates.

Battelle Energy Alliance's deeply flawed safety analyses contributed to but does not fully explain the inadequate radiological control in the ZPPR facility. **When Battelle Energy Alliance sought to remove radiological air monitors upstream of the HEPA filters in the air flow from the fume hood, analyses would be created stating that the monitors were not needed, all without actually considering the necessary monitoring and alarm functions that were needed.**

For radiological control for the facility, basic concepts for proper placement of constant air monitors (CAMs) were apparently not understood.

Then, the day of the accident, incorrect information from the readouts for the alarming CAMs was given to Central Facilities Area (CFA) medical and REAC/TS emergency response, that grossly understated the level of airborne radiological contamination that workers had been exposed to.

BEA Radiological Control would state that a maximum of 97 derived air concentration (DAC) units had been detected, yet the inadequately positioned CAM had alarmed on plutonium-

[25] Department of Energy, Radiological Safety Training for Plutonium Facilities, DOE-HDBK-1145-2013, March 2013.

239 only after reaching over 500 DAC, with the CAM positioned 15 ft away from the workers and in an air current flowing toward the hood (that is, if the hood fan was drawing any air to the hood). Closer to the workers breathing space, the derived air concentration (DAC) may have been far higher than 500 DAC, as high as 5.5 million DAC and in the small particle sizes that greatly increase the absorption of radioactive material into the blood stream and organs and tissues of the body.

When it comes to radiation dose from an inhalation of plutonium, particle size and solubility matter

Plutonium mixtures contain differing ratios of plutonium-239, plutonium-240 and plutonium-241. Weapon-grade plutonium has the least plutonium-240 and -241. Fuel-grade plutonium has from 7 to 19 percent plutonium-240. The longer the uranium-238 is irradiated in a reactor, the more plutonium-240 and plutonium-241 is created by neutron capture. The plutonium-241 decays to americium-241 and higher amounts of americium-241 will occur in fuel-grade plutonium than in weapon-grade plutonium.

Plutonium-239 and americium-241 are bone seekers. How rapidly they enter the blood stream and are retained in bone depends on the particle size and the solubility of the particles. Following the November 8, 2011 plutonium inhalation event from a fuel-grade plutonium metal fuel alloy plate, BEA refused to investigate the particle size of the inhaled plutonium and americium.

Highly insoluble particles remain in the lungs, undissolved. BEA conducted a solubility study, of particles that had oxidized for months before the study and that was a technically invalid study for reasons among which are the shortened duration of the study. And while plutonium and americium are recognized bone seekers, the effect while in the blood stream which could have been monitored by blood draws, was tested by only a single blood draw.

The accepted modeling of the red bone marrow dose would suggest a much lower dose than the bone dose; however, for the unique composition of the ZPPR fuel and the hydride formation, I suspect that the bone marrow dose model is unreliable and may underestimate the radiation dose to the bone marrow from this inhalation event. With only one blood draw, differentiating between lymphocyte killing in the blood stream would not be distinguished from bone marrow damage. No modern medical study relies on the methodology used by the Department of Energy’s bone marrow assumptions.

The more soluble the radioactive particle and the smaller the particle size, the higher the estimated radiation dose. Therefore, BEA sought to find arguments that the material was mostly insoluble and of the larger 5 um particle size in order to lower the dose. Nothing about BEA’s radiation dose assessment or medical oversight was reliable. In fact, the coverup of the actual radiation doses began within hours of the event, as the nasal swab data documented in the logbooks was made to disappear and the logbooks were apparently destroyed.

I have reviewed the lung counting conducted by BEA for the November 8, 2011 event and I have noted many irregularities throughout the lung counting report. I believe that the americium-241 peak was manipulated in multiple ways in order to lower the Am-241 result. The Am-241, 59.5 kev gamma, is considered more reliable than the plutonium measurement and is used to derive the plutonium-239 intake based on composition of the fuel plate. An upper bound dose based on the lung counting was tabulated by the Oak Ridge National Laboratory because the Idaho National Laboratory had no procedure in order to ascertain the radiation dose from a lung count result.

The lung counts conducted at the Idaho National Laboratory do not reflect the inhalation intakes because the lung counts were manipulated to lower the americium-241 peaks. The dose estimates by the Oak Ridge National Laboratory, therefore, are not representative of an upper bound dose because of the undocumented and unwarranted manipulations of the lung count results.

The lung count reports contain numerous irregularities, including the program being unable to calculate the background level for Am-241 at 59.5 kev because the gamma peak was not in the expected gamma energy range. No rapid clearance from the lungs would have been expected. None of the lung count report discrepancies have been explained by the Department of Energy or BEA. These discrepancies are not typical and are not consistent with cases where no contamination was detected.

For additional information on how Battelle Energy Alliance arrived at an unrealistically low radiation dose estimate for one worker at November 8, 2011 accident at the MFC ZPPR facility, see the slide presentations at the Environmental Defense Institute website. [26] [27] And also see Environmental Defense Institute's newsletter articles from March and April 2022, and others, regarding the November 8, 2011 accident at the Zero Power Physics Reactor (ZPPR) facility.

[26] Tami Thatcher, Slide Presentation for Environmental Defense Institute, "Review of Ralph Stanton's Radiation Dose from the 2011 Plutonium Inhalation Event at the Idaho National Laboratory – Part 2," March 2022 at http://www.environmental-defense-institute.org/publications/PowerptLowDose.pdf

[27] Tami Thatcher, Slide Presentation for Environmental Defense Institute, "Review of Ralph Stanton's Radiation Dose from the 2011 Plutonium Inhalation Event at the Idaho National Laboratory – Part 1, Lung Counting," February/March 2022 at http://www.environmental-defense-institute.org/publications/PowerptLungCount.pdf

Department of Energy Surplus Plutonium Disposition Plans for the ZPPR Fuel

The plutonium in the Zero Power Physics Reactor (ZPPR) fuel plates had long been listed in the Department of Energy's surplus plutonium reports. Since the production of weapons plutonium in the U.S. basically ceased in 1989, there have been a number of plans for disposition of the ZPPR plutonium fuel plates.

There is 3.5 metric tons (MT) of plutonium in ZPPR fuel plates within 29,000 plates of metal alloy fuel and 0.3 MT of ZPPR fuel in 21,000 pins of mixed oxide fuel. [28] [29] [30] The ZPPR fuel was made from material from the United Kingdom rather than from U.S. plutonium production. The ZPPR facility was operated at the Argonne National Laboratory West (ANL-W) until becoming part of the Idaho National Laboratory and being renamed the Materials and Fuels Complex (MFC) in 2005.

It was planned that the ZPPR plutonium fuels would be processed at the Savannah River Site in the Plutonium Immobilization Plant, but that plant was cancelled in November 1999. Processing of the ZPPR fuel, which had operated only at very low power and is not considered "used" or "spent" nuclear fuel, was complicated by the ingrowth of americium-241 in the fuel.

The Department of Energy, having no disposition path for the bulk of the ZPPR fuel, is calling the ZPPR fuel a "national asset material."

Other surplus plutonium in "spent" fuel was slated to be sent to a geologic repository, but there isn't one. And the plutonium surplus pit plutonium metal was to be sent for Pit Disassembly and Conversion Facility and MOX [mixed oxide] Fuel Fabrication Facility. But the MOX plant at Savannah River Site was defunded in 2018 due to it cost and schedule overruns. [31]

Revised proposed plans are to send much of the DOE's surplus plutonium (not including ZPPR fuel) to the Waste Isolation Pilot Plant (WIPP) in New Mexico, greatly increasing, 10-fold, the amount of plutonium to be disposed of at WIPP. These are examples of the Department of Energy not keeping its commitments. DOE often can't manage to build the facilities it proposes and also the DOE fails to stay within the radioactive material limits agreed to for storage or disposal facilities such as WIPP.

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[28] Blue Ridge Environmental Defense League, Plutonium: The Last Five Years, webpage at https://www.bredl.org/sapc/pu-reportii.htm

[29] Department of Energy, *Plutonium: The First 50 Years*," DOE/DP-0137, February 1996 and "*The United States Plutonium Balance, 1944-2009, An Update of DOE/DP-0137*," June 2012. See at osti.gov.

[30] Department of Energy and National Nuclear Security Administration, *Final Surplus Plutonium Disposition Supplemental Environmental Impact Statement Summary*, DOE/EIS-0283-S2, April 2015.

[31] National Academies of Sciences, Engineering, and Medicine, *Review of the Department of Energy's Plans for Disposal of Surplus Plutonium in the Waste Isolation Pilot Plant*, Washington, DC: The National Academies Press, 2020. https://doi.org/10.17226/25593 Surplus plutonium, 48.2 MT, but not ZPPR fuel has been slated for disposal in WIPP. Only 4.8 MT of plutonium-239 to be emplaced in WIPP, the addition of 48.2 MT of surplus plutonium in WIPP greatly increases the plutonium inventory disposed of at WIPP.

The damaged ZPPR fuel plates that were placed in 3013 "paint" cans were said to be sent to another DOE laboratory for MOX research. It would seem that perhaps about 0.4 MT of ZPPR fuel has been 3013 canned and is no longer stored in Idaho.

Purifying the ZPPR fuel in order to make MOX fuel, fuel that the DOE could not even give away to nuclear power plants in the U.S., would have required additional processes and expense to handle the high level of plutonium-240, plutonium-241 and the americium-241 buildup. The termination of the entire MOX fuel program proposed by DOE means that this disposition path is not viable for any amount of ZPPR fuel.

Department of Energy's Gloss-Over Consent-Based Summary

The Department of Energy has recently issued a report summarizing comments received in its Request for Information on Consent-Based Siting of spent nuclear fuel and high-level waste. [32] The actual comments from the public are in a separate, but available document, 1693 pages long.

The report acknowledges the major theme of distrust in the Department of Energy's nuclear waste management efforts. The report also states that supporters of consolidated interim storage supporters focused on the benefits of removing spent nuclear fuel from existing nuclear power plant sites, because those communities never agreed to the long-term storage of spent nuclear fuel. And the report states that "Removal would also meet DOE's contractual obligations and thereby limit broader taxpayer liabilities."

But the report found a greater number of commenters expressed opposition to consolidated interim storage because such facilities could become de facto permanent disposal sites given the lack of progress in developing a repository. And many commenters had concerns for transportation of the nuclear waste across the country.

The comment summary is informative and yet non-committal. It states: "…the Department is committed to making every reasonable effort to incorporate the public's input in developing a consent-based siting process that is responsive to stakeholder concerns and suggestions."

In the end, the DOE's report is window dressing in a light-hearted presentation with more attention given to the color scheme used in the document than to the realities of high costs and human health harm from the proposed consolidated interim storage of spent nuclear fuel and high-level waste.

DOE's report avoids communicating candidly the realities of the deadly waste that will require repackaging and yet the proposed consolidated interim storage does not provide for

[32] Office of Nuclear Energy, Department of Energy, Consent-Based Siting webpage at https://www.energy.gov/ne/consent-based-siting and Responses to RFI on Using a Consent-Based Siting Process To Identify Federal Interim Storage Facilities at https://www.energy.gov/ne/articles/responses-rfi-using-consent-based-siting-process-identify-federal-interim-storage. The Consent-Based Siting Request for Information Comment Summary and Analysis, September 2022 report and separate public comment report are online.

repackaging degraded or aging canisters. See my comments on the Environmental Defense Institute home page [33] or the DOE's comment set of comment submittals. [34]

Articles by Tami Thatcher for October 2022. Additional editing for clarity has been made since first issued.

[33] Public Comment Submittal on the U.S. Department of Energy's Request for Information (RFI) on Consent-Based Siting and Federal Interim Storage, March 2, 2022, by Tami Thatcher at http://www.environmental-defense-institute.org/publications/ConsentBased2022comment.pdf

[34] Office of Nuclear Energy, Department of Energy, Responses to RFI on Using a Consent-Based Siting Process To Identify Federal Interim Storage Facilities, including the link to the Public comment, can be found at https://www.energy.gov/ne/articles/responses-rfi-using-consent-based-siting-process-identify-federal-interim-storage