Environmental Defense Institute

News on Environmental Health and Safety Issues

June 2019 **Volume 30** **Number 6**

Ralph Stanton's "Nuclear Nightmare" — A "Must Read" for Radiation Workers and Their Families

Ralph Stanton's life and his family's life were forever changed by the plutonium inhalation event on November 8, 2011 at the Idaho National Laboratory's Materials and Fuels Complex (MFC) during examination of fuel plates for the Zero Power Research Reactor (ZPPR). He has written a detailed narrative, titled *Our Nuclear Nightmare* describing his experience. You can find it on our website. [1]

Idaho National Laboratory management directed Stanton to proceed with ZPPR fuel plate inspection, despite unclear warnings on the plates and despite previously warning, 17 times, by the Safety Oversight Chairman for MFC, that plate inspections in the facility were unsafe. [2]

Ralph describes numerous irregularities that occurred with regard to records pertaining to his dose and how his radiation dose was assessed. This is an important warning to all radiation workers for Department of Energy sites. Radiological dose estimated by Department of Energy contractors are used in determining eligibility of state Worker's Compensation and for determining eligibility for Energy Employee Occupational Illness Compensation. So, if the contractor underestimates your radiation exposure, you might not be eligible for compensation for illnesses arising from your exposure.

The assumption that past radiation worker exposures at INL were carefully monitored and recorded is changing as analysts in radiation dose reconstruction for the National Institute for Occupational Safety and Health (NIOSH) [3] continue to investigate the ability to reconstruct radiation doses for worker illness compensation claims under the Energy Employee Occupational Illness Compensation Act. [4] Recently, their investigations have led to statement

---

[1] Ralph Stanton, *Our Nuclear Nightmare*, 2019 at http://www.environmental-defense-institute.org/publications/OURNUCLEARNIGHTMARE.pdf

[2] Department of Energy, Office of Health, Safety and Security (HSS), Accident Investigation Report, "Plutonium Contamination in Zero Power Physics Reactor Facility (ZPPR) at the Idaho National Laboratory" accident 11/8/11 at the Materials and Fuels Complex (MFC). http://energy.gov/hss/downloads/investigation-november-8-2011-plutonium-contamination-zero-power-physics-reactor.

[3] NIOSH Radiation dose reconstruction for EEOICPA at http://www.cdc.gov/niosh/ocas/ and http://www.cdc.gov/niosh/ocas/ineel.html

[4] 42 USC 7384, The Act--Energy Employees Occupational Illness Compensation Program Act of 2000 (EEOICPA), as Amended and see the website for the Center for Disease Control, National Institute of Occupational Safety and Health, Division of Compensation Analysis and Support at http://www.cdc.gov/niosh/ocas/ and U.S. Department of Labor, Office of Workers' Compensation Programs, EEIOCPA Program Statistics, http://www.dol.gov/owcp/energy/regs/compliance/weeklystats.htm

that radiation monitoring may not have been conducted effectively for alpha contamination in the 1960 and 70s — but other decades remain to be investigated.

While radiation dose reconstruction for Energy Employee compensation does not rely solely on DOE contractor dose estimates for inhalation of radiological materials, it relies on available records, including logbooks and other records documenting contamination levels as well as worker lung count and bioassay information. Without the information, reasonable dose reconstruction impossible — and illness compensation may be denied.

Since 2011, the Environmental Defense Institute has provided many newsletter articles pertaining to the November 8, 2011 ZPPR plutonium accident, [5] lung counts, dose estimation and the Energy Employee Occupational Illness Compensation Program.

After the ZPPR event, workers were not told of their radiation dose for almost 9 months. Ralph Stanton was told his lung counts indicated a very low intake. Yet, Ralph could not return to radiation work for months because of his elevated bioassay (urine and fecal) results because he was excreting elevated levels of radionuclides. Only after returning to radiation work would he later find out that his excretion rates had remained elevated and did not justify his return to radiation work.

Throughout the ordeal, he was being denied radiation dose estimate information from the company. Obtaining his radiation dose estimation documentation required a lengthy Freedom of Information Act request process. And once obtained, he was on his own to interpret the technical information.

Instead of medical help that interfaced with dosimetry experts as policy would suggest, there was months of stonewalling and refusing to provide dose information to Ralph or in-house medical folks. An "expert" was hired who was told that their doses were low simply lectured the men contaminated in the ZPPR accident not to be concerned. Then the expert admitted not knowing that the men had positive bioassay results from excreting elevated levels of americium-241 and other radionuclides months after the accident.

Ralph wrote: "**My years spent working at the Idaho National Laboratory showed me that there was the way it was supposed to be, and then there was the way it was."** Read his complete story, *Our Nuclear Nightmare,* 2019 at http://www.environmental-defense-institute.org/publications/OURNUCLEARNIGHTMARE.pdf

[5] Tami Thatcher, Environmental Defense Institute, newsletter articles for the ZPPR accident, search our website newsletters at http://www.environmental-defense-institute.org/edipubs.html and see, in particular, these articles: all articles in the October 2013 newsletter; "INL Managers Deny Any Responsibility for ZPPR Accident," and Boise Weekly Half-Life Article Debate, by Ralph Stanton," in May 2014; "Three events show that the Idaho National Laboratory still doesn't know how to monitor airborne alpha contamination," in May 2016; "Public Integrity reports that widespread bad behavior of Department of Energy contractors goes unpunished, including Idaho National Laboratory contractor Battelle Energy Alliance," in August 2017, "Understanding your lung count results," in January 2018, and others.

Leadership in Nuclear Energy (LINE) held May 16 in Idaho Falls

An Idaho Leadership in Nuclear Energy (LINE) meeting was held May 16 in Idaho Falls in the Idaho National Laboratory Meeting Center on MK Simpson drive. [6] Fortunately, the room had a high ceiling — because there was a lot of hot air — but few meaningful answers to important questions about issues like spent nuclear fuel and high-level waste (HLW) disposal, economic costs, marketability, environmental monitoring and accident risks.

The cleanup of "legacy waste" at the Radioactive Waste Management Complex was described by the Department of Energy. The amount of targeted waste remaining to be exhumed from burial was presented; but not the amount of radioactive waste remaining buried. Only the most egregious chemically laden waste is being removed. [7] [8] Of the 5.69 acres to be exhumed of the 35 burial ground acres of the burial ground, much of the exhumed waste is returned for burial. [9] [10] The soil cap over the waste was mentioned; but not the cost of it nor the need for maintaining the cap throughout millennia nor environmental monitoring needs.

The four drums that exploded April 2018 at the Idaho Cleanup Project were barely mentioned despite remaining issues regarding questions about how to prevent and respond to similar events. Potential pending hazardous waste enforcement actions by the State Department of Environmental Quality was not discussed regarding the failure of the Department of Energy

---

[6] Leadership in Nuclear Energy Commission 3.0, Agendas and Minutes, https://line.idaho.gov/agendas-and-meetings/

[7] U.S. Department of Energy, 2008. Composite Analysis for the RWMC Active Low-Level Waste Disposal Facility at the Idaho National Laboratory Site. DOE/NE-ID-11244. Idaho National Laboratory, Idaho Falls, ID and U.S. Department of Energy, 2007. Performance Assessment for the RWMC Active Low-Level Waste Disposal Facility at the Idaho National Laboratory Site. DOE/NE-ID-11243. Idaho National Laboratory, Idaho Falls, ID. Available at INL's DOE-ID Public Reading room electronic collection. (Newly released because of Environmental Defense Institute's Freedom of Information Act request.) See https://www.inl.gov/about-inl/general-information/doe-public-reading-room/

[8] See the CERCLA administrative record at www.ar.icp.doe.gov (previously at ar.inel.gov) and see also Parsons, Alva M., James M. McCarthy, M. Kay Adler Flitton, Renee Y. Bowser, and Dale A. Cresap, Annual Performance Assessment and Composite Analysis Review for the Active Low-Level Waste Disposal Facility at the RWMC FY 2013, RPT-1267, 2014, Idaho Cleanup Project. And see Prepared for Department of Energy Idaho Operations Office, Phase 1 Interim Remedial Action Report for Operable Unit 7-13/14 Targeted Waste Retrievals, DOE/ID-11396, Revision 3, October 2014 https://ar.inl.gov/images/pdf/201411/20141103009 60BRU.pdf

[9] See the July 2017 EDI newsletter for a timeline for the burial ground at the Radioactive Waste Management Complex and other cleanup information at http://www.environmental-defense-institute.org/publications/News.17.July.pdf

[10] U.S. Department of Energy, 2008. Composite Analysis for the RWMC Active Low-Level Waste Disposal Facility at the Idaho National Laboratory Site. DOE/NE-ID-11244. Idaho National Laboratory, Idaho Falls, ID and U.S. Department of Energy, 2007. Performance Assessment for the RWMC Active Low-Level Waste Disposal Facility at the Idaho National Laboratory Site. DOE/NE-ID-11243. Idaho National Laboratory, Idaho Falls, ID. Available at INL's DOE-ID Public Reading room electronic collection. (Newly released because of Environmental Defense Institute's Freedom of Information Act request.) See https://www.inl.gov/about-inl/general-information/doe-public-reading-room/

and its cleanup contractor, Fluor Idaho, to conduct required analyses to prevent the drum explosions.

The DOE discussed the proposed new high neutron flux test reactor, the Versatile Test Reactor, that DOE plans to oversee design, licensing, operation and regulation. The same DOE that choose to not perform safety analysis or chemical compatibility analyses to prevent waste drum explosions at the Idaho site says it can provide regulation of a unique sodium-cooled fast reactor. And they want us to think they can build it on budget and on schedule despite years of cost and schedule overruns on projects around the DOE Complex, including the Integrated Waste Treatment Unit which was supposed to complete its mission in 2012 but still hasn't started up.

New legislation to proceed with Yucca Mountain as the disposal site for spent nuclear fuel and HLW was briefly mentioned, seeming to avoid signaling any particular difficulty. Yet, the stance by the DOE at recent Idaho Cleanup Project Citizens Advisory Board meetings was to emphasize that there is no need for a facility to package spent nuclear fuel at the Idaho National Laboratory for shipping because there is no disposal facility such as a repository at Yucca Mountain on the horizon. The DOE's proposed changes have called for HLW, to be "reinterpreted" as low-level waste, based on cost or any criteria of DOE's choosing, as the DOE is hoping to leave the waste at some of its DOE sites forever. There hasn't been enough communication to know what the DOE has in mind regarding Idaho's waste. Local DOE manager planning pertaining to the Idaho Settlement Agreement milestones, like shipping spent nuclear fuel and calcine HLW out of the state, appears to be to retire before the Settlement Agreement milestones are all missed.

The presentation on the NuScale small modular reactor facility planned to be built at the Idaho National Laboratory mentioned that the site selection process is on its third iteration. However, there was no mention of construction cost uncertainty. Idaho Falls ratepayers will soon be at the mercy of the construction costs which typically can be double the rosy estimates which is already $60/MWH, which is far higher than current electricity pricing. Curiously, large and long-established power companies like Idaho Power and Rocky Mountain Power chose to avoid the economic risks of the NuScale venture. There was no mention of the new accident risks created by the new facility due to the shared pool and allowed installation of modules in the same pool where other modules will be at power.

Nationwide, renewable energy is approaching the percentage of energy provided by nuclear power, yet is dismissed from consideration in Idaho Falls — because the sun doesn't shine 24/7. Batteries are dismissed due to cost. But, just how realistic is the NuScale cost estimate? Idaho Falls and other city rate payers under the UAMPS umbrella will find out. These rate payers will also owe the cost of decommissioning and for waste storage and disposal.

Another type of reactor discussed at the LINE meeting are called "microreactors." It is a concept I think only the Department of Defense could love — or afford. And the accident risks for these up to 10 MW reactors are probably not micro-sized when transportation, security, sabotage, and other design factors are considered.

The propensity of the LINE Commission to embrace only the positive aspects about nuclear energy while downplaying or ignoring the waste disposal problems, the risk of spiraling construction costs, and accident risks is a dis-service to Idaho citizens and to the nation. The State-sponsored promotion of all things nuclear also encourages the State to go easy on the Department of Energy when it violates laws including hazardous waste laws that set the stage for four drums to explode last April 2018.

Idaho DEQ Rubber-stamps AMWTP RCRA Permit, I Submit Petition for Review

The Idaho Department of Environmental Quality (DEQ) has rubber-stamped renewal of the hazardous waste RCRA permit for the Advanced Mixed Waste Treatment Project (AWMTP) operated by the Department of Energy at the Idaho National Laboratory by its contractor Fluor Idaho, LLC. On April 18, the DEQ issued its response to public comment on the permit, stating:

> *Any person who filed comments on the draft permit may petition DEQ's Director, within 30 calendar days of this decision, to review any condition of the final permit. Petitions must include reasons supporting the review and demonstrate that any issues being raised were raised during the comment period. To the extent required by these regulations, and when appropriate, such Petitions must also show that the condition in question is based on: (1) A finding of fact or conclusion of law that is clearly erroneous, or (2) was an exercise of discretion or an important policy consideration that the Director should review in accordance with IDAPA 58.01.05.013 [40 CFR Section 124.19(a)].*

Because I had provided public comment, I was able to submit a Petition. After doing so, I was contacted by the Idaho DEQ and informed that the information provided above was incorrect and that the Petition needed to be processed according to a different law, the Rules of Administrative Procedure before the Board of Environmental Quality, IDAPA 58.01.23, as referenced in IDAPA 58.01.05.996. [11]

The Petition I submitted is available on the Environmental Defense Institute's website. [12]

I wanted to document in my Petition the deliberate actions by the Department of Energy and by Fluor Idaho that led to the explosion of four waste drums. The DOE and Fluor Idaho chose not to conduct required chemical compatibility analysis, they chose not to heed expert advice

---

[11] https://adminrules.idaho.gov/rules/current/58/580123.pdf 58.01.23 – Rules of Administrative Procedure Before the Board of Environmental Quality and https://adminrules.idaho.gov/rules/current/58/580105.pdf. 58.01.05 – Rules and Standards for Hazardous Waste. 996. Administrative appeals of agency actions shall be governed by IDAPA 58.01.23, "Rules of Administrative Procedure Before the Board of Environmental Quality."

[12] Tami Thatcher, Petition of Idaho Department of Environmental Quality for Review of *HWMA/RCRA Hazardous Waste Treatment and Storage Permit Renewal for the AMWTP*, Case Docket No. 0105-19-01, May 2019. http://www.environmental-defense-institute.org/publications/IDEQpetition.pdf

pertaining to waste contents, and they chose not to conduct required nuclear safety analysis to protect workers, the public and the environment.

I also wanted to document that two explosions occurred in 2018 at facilities granted RCRA permits by the Idaho DEQ. There was the explosion of four drums at the Radioactive Waste Management Complex in April 2018, and the explosion at a RCRA and radioactive waste facility operated by US Ecology Idaho at Grandview last November.

There may be no one at the DEQ willing to enforce hazardous waste RCRA laws, and there may be no one at the DEQ that even understands hazardous waste laws, but I felt it was necessary to officially communicate that the DEQ, by continuing to "assume" that its Permittees will soon begin complying with the permits is putting workers, the public and the environment at risk. The DEQ's continued lack of enforcement signals to the Permittees that they can continue with "business as usual."

Idaho National Laboratory's Radioactive Waste Management Complex is where the AMWTP is located and the Accelerated Retrieval Project (ARP) V is where the four waste drums exploded. The waste that exploded at ARP V came from the AMWTP and was to return to the AMWTP. But for months, that didn't stop the Idaho DEQ from claiming that the four drums that exploded had nothing to do with the AMWTP.

Last fall, U.S. Department of Energy cleanup contractor Fluor Idaho issued a report on the causes of the explosion of the four waste drums last April, which screams for the need for strong DEQ enforcement action, but so far there has been none. [13]

The DEQ's responses to public comment fail to acknowledge the report transmitted March 12, 2019, where the DNFSB stated that **"DOE-ID lacks effective controls to prevent or mitigate deflagrations in drums of repackaged waste."** [14] The report details why the Department of Energy's response to understanding how to prevent future transuranic waste drum explosions remains inadequate, and why the new mitigations put in place are inadequate. The DNFSB found that Fluor Idaho's limited mitigations, which included the use of thermal monitoring during and immediately following repackaging and a 24 hour hold time after sorting the waste prior to repackaging, do not provide adequate hazard protection.

A meeting was to be held in Washington D.C. on May 22 to discuss how DOE plans to provide technically sound assumptions regarding excessive gas buildup in waste drums that exceeds what drum vents are capable of providing, but the meeting was postponed. The DNFSB has found that the Department of Energy and its contractors have continued to make incorrect assumptions about gas buildup, the likelihood and consequence of drum explosions, and the efficacy of certain mitigative measures. The DNFSB found that DOE Standard 5506-2007,

[13] Idaho Cleanup Project Core, "Formal Cause Analysis for the ARP V (WFM-1617) Drum Event at the RWMC," October 2018. https://fluor-idaho.com/Portals/0/Documents/04_%20Community/8283498_RPT-1659.pdf

[14] Defense Nuclear Facilities Safety Board, Letter to Secretary of Energy, March 12, 2019 with attached staff report "Idaho Waste Drums with Elevated Methane Concentrations," See dnfsb.org or https://ehss.energy.gov/deprep/2019/FB19M12A.PDF

Preparation of Safety Basis Documents for Transuranic (TRU) Waste Facilities, **contains assumptions that are not technically supported** and actually promotes inadequate safety analysis by not requiring technical analysis when it is needed.

No matter to the Idaho DEQ — knowing that there are inadequate hazard mitigation and response procedures in place and knowing the actions of its Permittees to ignore RCRA permit requirements — DEQ has rubberstamped the AMWTP permit.

The Petition for Review of the AMWTP permit, which DEQ has stated will not result in any changes to its rubber-stamped permit, is at http://www.environmental-defense-institute.org/publications/IDEQpetition.pdf and corrected coversheet at http://www.environmental-defense-institute.org/publications/NoticePetitionAMWTP.pdf

NuScale Small Modular Reactors — Might Not Be Safer or Cheaper

At the LINE meeting held in May, Doug Hunter, CEO of Utah Associated Municipal Power Systems, stated that NuScale is on the third iteration to select a suitable site on the Idaho National Laboratory's 890 square mile site. The original site proposed was east of the Radioactive Waste Management Complex and south of the highway to Arco. The most recent site is said to be further west. The issue may be site-specific seismic analysis, but few details were provided.

NuScale is hoping for NRC to approve its design, which will lock cities under UAMPS into the contract to pay for construction costs, no matter how high the costs rise. Fluor Corp. and other investors have invested more than half a billion dollars into NuScale and the Department of Energy has provided another $275 million. [15]

Each reactor module is 75 feet high and 15 feet in diameter and weighs about 700 tons, and the modules are submerged in a shared pool. Each module is now expected to be able to generate up to 60 megawatts of electricity. If the facility has the full capacity of twelve modules, it will be able to generate 720 megawatts. The power generation capacity figures have been evolving.

NRC reviews of the proposed NuScale small modular reactors have noted that having up to 12 reactor modules in a single pool posed unique risk considerations. The ability to install or perform maintenance on a module while other modules are operating at power poses unique risks where operating experience is not available. A dropped module or other lifted component, perhaps due to human error or to reactor building crane failure, could impact an operating module. [16] Thus, building crane reliability and all aspects of load handling are extremely important. Yet, a member of the Advisory Committee on Reactor Safeguards found that NuScale

[15] Bennett Hall, Albany Democrat-Herald, "NuScale's big gamble: Banking on NRC approval, company gears up to build first nuke plant," March 17, 2019. https://democratherald.com/business/local/nuscale-s-big-gamble-banking-on-nrc-approval-company-gears/article_0876247b-e7df-58b4-9498-fea628ecd63b.html

[16] U.S. Nuclear Regulatory Commission, Summary NuScale Environmental Audit Report October 16, 2018 to November 30, 2018, ADAMS Accession No. ML19037A490.

had not adequately described cask drops or module drops in the accident analysis chapter of the safety analysis, despite a single failure potentially causing a drop. [17]

A June 2018 internal memorandum at the NRC described the request for additional information regarding NuScale's Seismic Design and Design of Category I Structures. [18] And a November 2018 internal memorandum at the NRC described issues such as the requirements for conducting seismic analysis and development of a fluid-structure interaction correction factor for the Reactor Building pool. [19] It indicates that the seismic analyses for the NuScale facility has not been completed and they are still figuring out how to conduct the seismic analysis.

Another June 2018 internal memorandum at the NRC described questions posed to NuScale concerning NuScale's proposed use of Probabilistic Risk Assessment (PRA) of the design to screen accident scenarios despite the PRA not being of the technical adequacy and completeness needed for this purpose. Specifically, NuScale proposed "screening," — that is, leaving out — the maximum hypothetical accident for the reactor based on estimated frequency being below 1.0E-6/yr. And the NRC also questioned how plant-specific PRA findings would be addressed if risks were higher than the design-specific PRA. [20]

In a recent U.S. Nuclear Regulatory Commission letter to NuScale, the NRC stated that "To date, NuScale and the staff have identified 29 highly challenging review issues…A few of the remaining highly challenging issues, along with a small number of other issues, may make the Phase 2 public milestone schedule difficult to achieve." [21]

The NRC's letter also explained: "The most notable unresolved issue is related to the application of the single failure criterion to the inadvertent actuation block valve. On December 14, 2018, NuScale requested via a letter that the Commission clarify the single failure criterion (ADAMS Accession No. ML18351A145). Another issue is the accident source term for which NuScale is considering approaches that may deviate from past regulatory precedent. The NRC held a public meeting on this subject on December 12, 2018, to continue efforts to identify a path forward. NuScale has committed to providing additional information to the staff this month on its preferred approach. Additional issues that could extend beyond the Phase 2 milestone pertain to boron dilution and stratification concerns in the long-term cooling analysis, reactor vessel flange tool design and demonstration of fuel integrity following a seismic event with fuel located in either the flange tool or operating bay, margin between peak containment pressure and the containment design pressure, resolution of RAIs associated with thermal-hydraulic and neutronic

[17] Official Transcript of Proceedings Nuclear Regulatory Commission, Advisory Committee on Reactor Safeguards, March 7, 2019, ADAMS Accession No. ML19088A327.
[18] U.S. Nuclear Regulatory Commission Memorandum, Omid Tabatabai to Samuel S. Lee, June 8, 2018. ADAMS Accession No. ML18156A236.
[19] U.S. Nuclear Regulatory Commission Memorandum, Marieliz Vera to Samuel S. Lee, November 7, 2018. ADAMS Accession No. ML18304A227.
[20] U.S. Nuclear Regulatory Commission Memorandum, Getachew Tesfaye to Samuel S. Lee, June 22, 2018. ADAMS Accession No. ML18173A260.
[21] U.S. Nuclear Regulatory Commission letter to Thomas Bergman, NuScale Power LLC, Subject: NuScale Design Certification Application Review Status, January 17, 2019. ADAMS Accession No. ML19008A270.

response during design-basis events, and submittal of revised containment and accident analyses necessitated by updates to the safety analysis methodology and changes to the associated thermal-hydraulic code."

In summary, NuScale may have designed a safer reactor, but the design as a whole appears to have safety problems. There are building crane failures and certain seismic vulnerabilities and other vulnerabilities that are rather unique. In addition to the design-specific aspects, the plant-specific aspects such as the site-specific hazard are difficult to assess and not much information is being shared publicly. The NRC is going to be pressured to approval the design, whether it's actually safe or not.

Atlantic Council issues report promoting nuclear energy, doesn't worry about existing and future radioactive waste and spent nuclear fuel disposal

U.S. Senator from Idaho, Mike Crapo recently wrote an editorial to promote the goal of "protecting America's longstanding leadership on nuclear energy." He describes recent legislation to promote nuclear energy — all at the taxpayers and electricity ratepayers' expense. He was named as an honorary co-chair of a recent report by the Atlantic Council Task Force on U.S. Nuclear Energy Leadership. [22] [23] Both the senator and the Atlantic Council worry that Russia or China will lead in nuclear energy. Hate to break it to you, Senator Crapo, but the U.S. has already lost its lead.

The U.S. taxpayer already subsidized China's reactor technology when Westinghouse sold its AP-1000 nuclear reactor technology to China. The companies that sold nuclear reactors over the recent decades have faced bankruptcy. In the U.S., Westinghouse Toshiba has faced bankruptcy from the cost overruns on the four U.S. AP-1000 plants. The French company Areva faced bankruptcy because of cost overruns at a reactor under construction in Finland and was bailed out by the French taxpayer.

The companies that couldn't sell their reactors during the recent decades haven't gone bankrupt. General Electric Hitachi found no buyers for its a sodium-cooled fast reactor, but may help to build the Versatile Test Reactor that the Idaho National Laboratory is vying for.

What kind of crazy is it to want to expand the use of nuclear energy when there currently is no way to contain the hazardous material in the spent nuclear fuel for the millennia that the material is hazardous?

---

[22] Atlantic Council, US Nuclear Energy Leadership: Innovation and the Strategic Global Challenge – Report of the Atlantic Council Task Force on US Nuclear Energy Leadership," May 2019. ISBN-13: 978-1-61977-589-3. https://www.atlanticcouncil.org/images/publications/US_Nuclear_Energy_Leadership-.pdf

[23] U.S. Senator Mike Crapo, The Idaho Falls Post Register, Editorial: "If the US doesn't lead on nuclear energy, others will," May 24, 2019. The column originally ran on CNBC: https://www.cnbc.com/2019/05/22/us-must-reassert-global-leadership-in-nuclear energy-or-lose-out-to-russia-and-china.html

The radioactively contaminated sites in the United States are countless. They include 129 Department of Energy sites that have long-lived waste that will remain there forever, uranium mining and milling sites, and many other radioactively contaminated sites. [24] There is no geologic repository for spent nuclear fuel from the commercial nuclear power plants or spent nuclear fuel and high-level waste from Department of Energy research and weapons production. There is far more waste, transuranic waste and other waste, envisioned for the Department of Energy's Waste Isolation Pilot Plant (WIPP) in New Mexico than the facility can hold. A disposal site for the nation's Greater-Than-Class C waste has not been obtained.

Low level waste sites like the one at Clive, Utah and Andrews, Texas and radioactive waste at hazardous waste RCRA landfills like the US Ecology Idaho Grandview site accept radioactive waste from around the country. The U.S. Nuclear Regulatory Commission is looking at ways of allowing ordinary municipal landfills to accept radioactive waste in order to make disposal cheaper for the industry. This all means the release of more radioactive contaminants into our air, soil and water.

Many public drinking water systems around the US are contaminated with radionuclides — usually without explanation of the source of the radioactivity. Environmental Working Group (EWG) has summarized some recent years of public drinking water contamination helps to spot light problems in the nation's drinking water. [25] [26]

In fact, the drinking water sampling programs are designed to assume that the radioactivity is naturally occurring and does not require identification of which radionuclides are causing elevated gross alpha or gross beta radiation levels in the water. The technology to identify the radionuclides, gamma spectrometry, has been available for decades. But no standards have been written to allow public water systems to conduct this testing, not even periodically or when elevated levels of gross alpha or beta cannot be explained by naturally-occurring radionuclides. While areas near Department of Energy sites like the Idaho National Laboratory may have ongoing environmental monitoring programs that may give the appearance of independent monitoring, the monitoring programs are still geared to cover up problems. Other parts of Idaho do not have environmental monitoring programs. The programs that do exist repeatedly do not identify the source of radiological contamination. In Idaho, elevated cancer rates are met with advice to stop smoking — the epidemiology is totally out of touch with the radiological and chemical exposures from environmental contamination.

In Idaho, the radiological contamination of our public drinking water supplies extends across the state, and isn't just from historical nuclear weapons testing. In southeast Idaho, historical

---

[24] M.A. Boyd, *Annals of the ICRP*, "Contaminated sites from the past: experience of the US Environmental Protection Agency," March 24, 2016. https://journals.sagepub.com/doi/full/10.1177/0146645316633937

[25] Environmental Working Group at www.ewg.org and see their tap water database at https://www.ewg.org/tapwater/ Use the map to select the state and an option for seeing water provider's violations in the state can be selected to view a summary of violators (2014 to 2017).

[26] U.S. Environmental Protection Agency, Enforcement and Compliance History Online at https://echo.epa.gov/help/facility-search/drinking-water-search-results-help

releases to soil can be resuspended and there are ongoing airborne releases from the Idaho National Laboratory that reach our drinking water. In southwest Idaho, historical and ongoing disposal of radioactive waste at hazardous waste dump at Grandview operated by US Ecology Idaho and the historical disposal of waste at Bruneau (called Site B by the U.S. Environmental Protection Agency), appear to have caused wide-spread radiological contamination, although the primary source of the contamination has not been determined — and never will be if the polluter's continue to hold Idaho's leaders on a leash.

Ignoring virtually all of the nuclear contamination issues in the U.S., Senator Crapo calls for doubling down on subsidies for nuclear energy. Senator Crapo wants the American taxpayer to forever pay for nuclear energy research and for nuclear waste disposal. That investment, so far, after decades of U.S. nuclear investment, hasn't aided our economy or put a dent in carbon emissions. But it already has polluted the nation in countless places.

Crapo says that funding has been secured for demonstrating the viability of recycling nuclear fuel from the Navy's nuclear-powered ships and submarines. The last effort to recycle the Navy's fuel at the Idaho National Laboratory's INTEC put poison into the Snake River Plain Aquifer and our air. The high-level waste from Naval fuel reprocessing remains poised over the aquifer and so far, has no disposal site outside of the state of Idaho. There are radionuclides released during reprocessing that cannot be stopped by filters like carbon-14 and iodine-129.

Enriched uranium and neptunium contamination at local school in Ohio from Portsmouth uranium enrichment plant undergoing decommissioning by the Department of Energy

A middle school in Piketon, Ohio will remain closed following radiological contamination believed to originate from a now-closed uranium enrichment plant, the Portsmouth Gaseous Diffusion Plant that began operating in the 1950s. Local homes are also contaminated even though the enrichment plant operated by USEC closed in 2001. Ohio residents worry about cancer and leukemia deaths, which appear to be elevated over the past few years. [27]

The plant is in the process of being decommissioned by the Department of Energy and is only a few miles from the school. The enrichment plant buildings are being torn down and to the disapproval of local residents, the buildings are being disposed of on the enrichment plant site.

Enriched uranium was detected and neptunium-237 were detected in air filter monitoring by the Department of Energy. The DOE says the levels were far below established thresholds of public health concern. Neptunium-237 is an alpha emitter with a radioactive half life of 2.1

[27] Chuck Johnston and Susan Scutti, *CNN*, "Ohio town worries about safety after radioactive contamination is found at middle school," May 14, 2019. https://www.cnn.com/2019/05/14/health/ohio-middle-school-radioactivity-bn/index.html

million years, and it has decay progeny protactinium-233 which has a relatively high gamma energy. Neptunium-237 can be used in nuclear weapons or as target material to produce plutonium-238.

An expert who collected samples, Dr. Michael Ketterer, NAU Professor, says that the neptunium-237 is likely from the enrichment facility and not nuclear weapons testing fallout, according to an WOUB Public Media interview, because the concentrations were about 100 times higher than global fallout from nuclear weapons testing. [28] [29]

Uranium ore has uranium-234, uranium-235 and uranium-238; enrichment is intended to increase the amount of uranium-235 to the desired percentage above natural levels. But during the Cold War era, "recycled" uranium was recovered from plutonium production reactors and the recovered uranium was blended with ore-extracted uranium feed. This practice meant that gaseous diffusion plants in the U.S. contained more uranium-236 and other radioactive contaminants: technetium-99, neptunium-237, plutonium, and americium-241. The radioactive contaminants listed in a Department of Energy report from 2013 include "The predominant radionuclides emitted from PORTS [Portsmouth Gaseous Diffusion Plant] operations are uranium, technetium-99, and small amounts of transuranic radionuclides (americium-241, neptunium-237, plutonium-238, and plutonium-239/240.)" [30] [31]

Former Portsmouth Gaseous Diffusion Plant lead scientist David Manuta, was interviewed by WOSU's All Sides with Ann Fisher, as saying "Any amount of Neptunium just basically sets off alarms and sirens for me." [32] Manuta now frequently works on behalf of former Department of Energy workers suffering diseases and whose claims have been denied under the Energy Employee Occupational Illness Compensation program. Manuta, who specializes in chemical exposure claims, met with several former energy workers from the Idaho National Laboratory last month in Idaho Falls.

---

[28] Jordan Kelley, *WOSU Public Media*, "Update: Students Will be Moved to Alternate Locations Next School Year," April 30, 2019. https://woub.org/2019/04/30/dangerous-chemicals-detected-in-pike-county-school/

[29] Michael E. Ketterer, Ph.D., Professor Emeritus, Chemistry and Biochemistry, Northern Arizona University, memo to Elizabeth D. Lamerson and citizens of Pike County, Ohio, "Investigation of anthropogenic uranium, neptunium, and plutonium in environmental samples near Piketon, Ohio," April 27, 2019. https://woub.org/wp-content/uploads/2019/04/Ketterer-Szechenyi-NAU-Piketon-27Apr2019_V7.pdf

[30] Fluor-B&W Portsmouth LLC for the U.S. Department of Energy, "Environmental Monitoring Plan for the Portsmouth Gaseous Diffusion Plant Piketon, Ohio," DOE/PPPO/03-0009&D4, FBP-ER-RCRA-WD-PLN-0056, Revision 2, February 2013. https://www.emcbc.doe.gov/SEB/PortsmouthISS/Documents/Document%20Library/Site%20Environmental%20Monitoring%20Plan.pdf

[31] Transuranics are radionuclides often having extremely long half-lives. Many decay progenies may be created before reaching a stable, non-radioactive state. See our factsheet at http://www.environmental-defense-institute.org/publications/decayfact.pdf. See also an ANL factsheet at https://www.remm.nlm.gov/ANL-ContaminationFactSheets-All-070418.pdf

[32] Nick Evans, *WOSU Public Media, WOSU Radio*, "Former Portsmouth Lead Scientist Criticizes Federal Response to Radiation," May 16, 2019. https://radio.wosu.org/post/former-portsmouth-lead-scientist-criticizes-federal-response-radiation

The Portsmouth enrichment plant made weapons-grade enriched uranium and lower enriched uranium for nuclear power plants from 1954 to 2001. Like other Department of Energy sites, the plant sickened workers, poisoned the environment and comes with expensive cleanup costs — that will never really clean up the radiological and chemical contamination. The enrichment plant used the chemical trichloroethylene, and the chemical remains the most pervasive groundwater contaminant at the site. The plant has contaminated air, soil and groundwater for decades. Workers have faced illness and claim denials. The multi-billion-dollar cleanup funded by taxpayers will require monitoring — forever. [33] The harm is not fully reflected in a few recent air or dust samples. The genetic damage from radiological and chemical exposures to workers and people living near the site won't be undone by the cleanup. Exposure of children to contamination and the children of exposed parents have higher risk of illness and cancer.

Uranium was detected in local milk in 2003, yielding the highest predicted radiation dose. [34] **Uranium, often dismissed as "naturally occurring," includes more than cancer and leukemia risk; its health effects that are not considered in federal inhalation and ingestion standards include mutagenic, tumorigenic, teratogenic, cytotoxic, and neurotoxic effects similar to lead.** [35]

The school has noted high cancer deaths of students and the county has the second highest rate of cancer in Ohio. There are two other former Department of Energy contaminated sites in Ohio: the Fernald site located 18 miles northwest of Cincinnati, Ohio that operated from 1952 until 1989 and processed uranium metals, [36] and Mound located 10 miles southwest of Dayton, Ohio, that operated from 1948 to 2003. [37] Each of these sites employed large numbers of workers and caused serious chemical and radiological contamination. Looking at a few airborne contamination reports near one school may not explain the health risks these families actually face. And looking at state cancer statistics at one location, it shouldn't be a comfort to have the second highest rates in the state given the long legacy of environmental contamination and radiation exposure to workers.

---

[33] Tom Beyerlein and Lynn Hulsey, *Dayton Daily News*, Part of series OHIO'S NUCLEAR LEGACY: Troubled past, uncertain future, "Piketon: A troubled past," November 12, 2006. https://www.daytondailynews.com/news/piketon-troubled-past/yVz7hjdC8z4bi9pz6MgWOJ/

[34] EQ Midwest, Inc.. Prepared for U.S. Department of Energy Office of Environmental Management, "U.S. Department of Energy Portsmouth Annual Environmental Report for 2003 Piketon, Ohio," DOE/OR/11-3152&D1, November 2004. https://www.osti.gov/servlets/purl/1179265

[35] Arjun Makhijani, Ph.D., and Brice Smith, Ph.D., Institute for Energy and Environment (IEER), "Costs and Risks of Management and Disposal of Depleted Uranium from the National Enrichment Facility Proposed to be Built in Lea County New Mexico by LES (plus 2005 update)," https://ieer.org/resource/depleted-uranium/costs-risks-management-disposal/#return-note-1150-1 This reports includes numerous citations of research on uranium health effects by the Armed Forces Radiobiology Research Institute in Bethesda, Maryland.

[36] Annie Makhijani and Arjun Makhijani, Institute for Energy and Environment (IEER), "Shifting Radioactivity Risks: A Case Study of the K-65 Silos and Silo 3 Remediation and Waste Management at the Fernald Nuclear Weapons Site," August 2006. http://westvalleyfactsofwny.org/IEER_K-65_report.pdf

[37] Department of Energy, Office of Legacy Management, Mound, Ohio, Site, https://www.lm.doe.gov/Mound/Sites.aspx?view=2

Hanford's Building 324 project brought to a halt in early April following uncontrolled radiological contamination

Workers for CH2M Hill at Hanford's Building 324 found uncontrolled spread of strontium-90 after drilling through hot cell floor. [38] The highly contaminated soils under the building were to be ***addressed*** prior to demolishing the building. Cesium-137, strontium-90, plutonium and americium were expected contaminants. Building 324 was constructed in 1965 and includes hot cells and laboratories. The building is located approximately 1,000 ft from the Columbia River at the Hanford site.

In 2014, the Department of Energy requested a report by an independent organization, the Consortium for Risk Evaluation with Stakeholder Participation (CRESP). The report referred to as the "Risk Review Project" about Hanford by CRESP is a Hanford site-wide evaluation of the human health, nuclear safety, and environmental risks. The report states that accidents that may occur during retrieval of subsurface contamination at Building 324 have the potential to affect the offsite public. [39] The risk report by CRESP estimated that the unmitigated radiological dose in rem to a person within 100 meters of the event at Building 324 could receive a dose of 258 rem from a waste handling accident and a member of the public could receive 79 rem.

As frightening as the CRESP report, it appears to be an overly rosy assessment of the problems at Hanford. A report issued by the Defense Nuclear Facilities Safety Board (DNFSB) estimated far higher radiation doses to workers and the public from a Building 324 accident. [40] The DNFSB estimated inhalation doses from a fire at the facility would be 3165 rem onsite and 916 rem to the offsite public. Both the CRESP and DNFSB reports estimated far higher potential radiation exposures than the Department of Energy contractor for the cleanup.

According to the CRESP report, the contaminated soil is believed to have occurred in 1986 when a spill of highly radioactive liquid migrated through a breach in the B-Cell liner. The spill released 883,000 curies of cesium-137 and 388,000 curies of strontium-90; both radionuclides have about a 30-year half life and have decayed to about half of the original release. But other ongoing spills may have penetrated the leaking cell. **In 2010, contamination beneath B-Cell**

---

[38] Susannah Frame, *K5News*, "Contamination events force project shut down at Hanford nuclear site – Work was halted at the eastern Washington nuclear site after highly radioactive particles spread inside the most contaminated building on the site," May 16, 2019. https://www.king5.com/article/news/investigations/contamination-events-force-project-shut-down-at-hanford-nuclear-site/281-31e25448-4b84-4a42-a068-ad8be72b1b92

[39] Consortium for Risk Evaluation with Stakeholder Participation (CRESP), Vanderbilt University, Nashville, TN, "Hanford Site-Wide Risk Review Project – Final Report," August, 31, 2018. Available from http://www.cresp.org/hanford/ or https://www.emcbc.doe.gov/SEB/CPCC/Documents/Document%20Library/Other/Hanford%20Sitewide%20Risk%20Review%20Project%20Final%20Report%20%20(8-31-18).pdf

[40] Defense Nuclear Facilities Safety Board, Bruce Hamilton, Acting Chair to DOE Secretary James Richard Perry, September 7, 2018, Transmittal of April 16, 2018 Staff Issue Report on Hanford Site 324 Building Radiological Safety. https://www.dnfsb.gov/sites/default/files/document/15911/Radiological%20Safety%20at%20324%20Building%20B-Cell%20%5B2018-100-044%5D.pdf

indicated contamination up to 8,900 rad/hour in the soil. Characterization of the amounts of other radionuclides such as plutonium and americium are apparently incomplete, and the CRESP report seems to gloss over unknown quantities of long-lived radionuclides and their fate over time, perhaps because of the wide-spread long-lived contamination at Hanford. The DNFSB memo identifies elevated neutron levels in the soil below the B-Cell, due to the presence of plutonium-238 and also curium-243 and curium-244 in the sampled soil — not even mentioned in the CRESP report.

The cleanup plans for the contaminated soil have evolved over the years. The contaminated soil had not even been identified when decommissioning of the building commenced. The CRESP report indicated that the B-Cell foundation would stay in place over the contamination, leaving contaminated soil with an unknown quantity of various radionuclides behind, vulnerable to water inundation that could spread the contamination, ultimately into the Columbia River. The DNFSB report, which is more current, indicates that the most highly contaminated soil is to be remotely excavated and then placed in other hot cells at the facility. These hot cells will then be grouted, which could be effective until the cesium and strontium decay away. But what about the long-lived radionuclides in the waste? If they run out of space to store the high-activity soil permanently in hot cells, they plant to ship the containers to the disposal facility Environmental Remediation Disposal Facility (ERDF).

Uranium and its Radium decay products increase leukemia risk, especially in children

We know that gamma radiation from medical X-rays or radiation exposure increases leukemia risk. [41] Alice Stewart's epidemiology showed that the children of mothers who were X-rayed while in utero experienced double the cancer and leukemia rate, at radiation doses thought at the time to be harmless. [42] [43] [44] The National Research Council's BEIR V committee concluded that radiation causes acute leukemia and chronic myeloid leukemia. [45] Radiation exposure to young children causes the highest risk of cancer and leukemia incidence. The

[41] See our July 2014 newsletter article "Why You Shouldn't Rely on the Nuclear Industry for Straight Answers about Radiation Health Risks," at http://www.environmental-defense-institute.org/publications/News.14.July-Final.pdf

[42] Alice M. Stewart, et al., "A Survey of Childhood Malignancies," British Medical Journal 2: 1495-1508, 1958.

[43] Alice M. Stewart, et al., "Preliminary Communication: Malignant Disease in Childhood and Diagnostic Irradiation In-Utero," *Lancet* 2: 447, 1956.

[44] Alice M. Stewart and George W. Kneale, "Radiation Dose Effects in Relation to Obstetric X-Rays and Childhood Cancers," *Lancet* 1: 1185-1188, 1970.

[45] Center for Environmental Health Studies, 44 Farnsworth Street, Boston, MA 02210, "Leukemia and Exposure to Ionizing Radiation," http://www2.clarku.edu/mtafund/prodlib/jsi/Leukemia_and_Exposure_to_Ionizing_Radiation.pdf

leukemia risk is greatly increased when exposure occurs at a very young age, according to BEIR VII results for cancer and leukemia risk for various age groups. [46]

Uranium inhalation or ingestion can cause leukemia. A study in 2010 found a 14-fold excess in childhood cancers and a 38-fold excess in leukemias in people ages 0 to 34 from exposures to depleted uranium from weapons used in Fallujah, Iraq. The other location noted by Chris Busby where childhood leukemia rates are unusually high is Fallon, Nevada. [47]

Table 1 provides cancer and leukemia morbidity risk coefficients based on the Federal Guidance Report 13, as tabulated by the Institute for Energy and the Environment (IEER). [48]

Table 1. Morbidity risk coefficients for selected radionuclides based on FGR 13.

Radionuclide	Bone Surface Dose Conversion Factor, rem/uCi, from FGR 13	Leukemia Ingestion Risk Coefficient, per Ci	Total Ingestion Risk Coefficient, per Ci
Radium-226	46.1	15.1	385
Radium-228	83.3	52.2	1040
Uranium-234	2.91	0.781	70.7
Uranium-238	2.63	1.32	64
Strontium-90	1.51	41.4	55.9

Table notes: Morbidity is cancer incidence. Ci is curie. Radiation dose is rem where 1 rem is equivalent to 0.1 Sieverts. Radiation dose per microcurie or 1.0E-6 curie is rem/uCi. Federal Guidance Report 13 is FGR 13. 1 Curie is 3.7E10 disintegrations/second or 3.7E10 becquerel.

Our food is not monitored for radionuclide content. Public drinking water in the U.S. is occasionally monitored for certain radionuclides, but the monitoring, by design, usually does not tell us which radionuclides are in the drinking water, other than uranium, radium-226 and radium-228. If uranium does not account for the level of "gross alpha" in the drinking water, the elevated gross alpha may be occurring from plutonium, americium etc. but usually no testing is conducted to determine the actual radionuclides in the water other than uranium, radium-226 and

[46] Board on Radiation Effects Research (BEIR), "Health Risks from Exposure to Low Levels of Ionizing Radiation: BEIR VII Phase 2," National Academies Press. www.nap.edu. 2006. BEIR VII, Annex 12D: Additional Examples of Lifetime Risk Estimates Based on BEIR VII Preferred Models," Tables 12D-1 and 12D-2 show lifetime risk estimates for cancer incidence and mortality from a specific radiation dose. https://www.nap.edu/read/11340/chapter/14#310

[47] Chris Busby, *Counterpunch*, Article appeared in *The Ecologist*, "Power Lines, Fallout and Childhood Leukemia," May 9, 2014. https://www.counterpunch.org/2014/05/09/power-lines-fallout-and-childhood-leukemia/

[48] Institute for Energy and Environment (IEER) website: Khou-TV: EPA underreports radiation in America's drinking water (2011) page at https://ieer.org/resource/audiovideo/khou-tv-matter-risk-radiation/ and see the spreadsheet available from the page under "IEER's calculations" at https://ieer.org/wp/wp-content/uploads/2011/09/Radiation_DrinkingWater_Calcs-2010.xlsx

radium-228. When gross beta monitoring is conducted, the specific radionuclides that contribute to the gross beta levels, such as strontium-90, are typically not identified.

According to the Minnesota Department of Health, "Two federal drinking water standards currently regulate alpha-emitting radionuclides. Both MCLs [maximum contaminant levels] use the upper end of the acceptable risk range – a 1:10,000 cancer risk. Critically, the gross alpha MCL is a crude assessment that only quantifies alpha particle radiation, and not the specific source radionuclides from which these alpha particles originate. Specific alpha-emitting radionuclides need to be identified to understand health risks, as residence time in the body, dose, and tissue-specific radiation effects vary greatly between different radioactive elements." [49]

I would add that the chemical processing, temperatures of processing, and particle sizes of the specific radionuclide also affect how the human body retains the material in the body.

Articles by Tami Thatcher for June 2019.

[49] James A. Jacobus, Minnesota Department of Health, "Naturally Occurring Radionuclides in Drinking Water are an Underestimated Public Health Risk," RP099. https://www.health.state.mn.us/communities/environment/risk/docs/guidance/dwec/radionpostsetac.pdf