Environmental Defense Institute

News on Environmental Health and Safety Issues

November 2024 **Volume 35** **Number 11**

Idaho Cleanup Project Citizens Advisory Board meeting avoids admitting major Idaho Settlement Agreement milestones will be missed by decades

The Idaho Cleanup Project (ICP) Citizens Advisory Board (CAB) meeting was held October 23, 2024 at the Sun Valley Resort and via zoom if you signed up days in advance. [1] Presenters at the meeting presented Idaho Settlement Agreement milestone dates but avoided mentioning that the milestones would be missed and missed by decades, if ever met.

Calcine Disposition Will Not Be Road Ready by 2035 and May Not Even Have a Plan for Disposition by 2035

The disposition of calcine continues to go back to square one and do a little jig. All the previous NEPA decisions have been walked back virtually, if not in the actual paperwork. There is no decision — there is no concept of a plan — there is just the pretense of examining vitrification as if they would actually try to do it, see the July 2024 EDI newsletter. The Department of Energy is very much downplaying the option that they want to do is just dump the calcine in Idaho. The DOE, by reclassifying any high-level waste (HLW) to be pixy dust (aka low-level waste) and can dump it at the Idaho National Laboratory and likely with the Idaho Department of Environmental Quality's obedient blessing.

The calcine was to be repackaged by "hot isostatic pressing" and shipped to Yucca Mountain. **According to the 1995 Idaho Settlement Agreement, the calcine was to be "road ready" by December 31, 2035.** We likely won't even have a decision on what to do with the calcine by the date of the milestone.

INL Spent Nuclear Fuel Will Not Be Road Ready by 2035 or For Many Decades Beyond 2035

The Department of Energy stores a wide assortment of spent nuclear fuel, in addition to the spent nuclear fuel brought to the Idaho National Laboratory's Naval Reactor Facilities. The metric tons of non-Naval spent nuclear fuel at the INL totaled about 300 MT in the Nuclear

[1] Idaho Cleanup Project Citizens Advisory Board, October 23, 2024 meeting materials at https://www.energy.gov/em/icpcab/articles/icp-cab-meeting-materials-october-2024

Waste Technical Review Board (NWTRB) 2017 report. [2] The Department of Energy's ICP CAB meeting presentation stated there was 243.57 metric tons of EM-managed SNF, which excludes certain DOE-NE managed but non-naval spent nuclear fuel.

The DOE non-naval spent nuclear fuel at the Idaho National Laboratory includes Advanced Test Reactor highly enriched SNF, Three Mile Island Unit 2 debris and spent fuel, Fort St. Vrain SNF, Peach Bottom Unit 1 Core 1, Shippingport PWR SNF, Shippingport Light Water Breeder SNF, commercial spent nuclear fuel from the failed West Valley reprocessing plant (Big Rock Point and Robert E. Ginna SNF, dry storage casks containing SNF, and loss-of-fluid-test SNF, sodium-bonded SNF, and various fuels including domestic and foreign research reactor SNF (see the 2017 NWTRB report). Not counting naval SNF or sodium-bonded SNF, this entails about 1173 multipurpose containers. The wide variety of types and condition of the spent fuel adds cost and complexity to the SNF packaging needs.

According to the 1995 Idaho Settlement Agreement, the Department of Energy managed spent nuclear fuel is to be repackaged and "road ready" by January 1, 2035 and the spent nuclear fuel is to be removed from Idaho.

The DOE is seeking an SNF Staging Facility for SNF after the SNF has been repackaged. No design decisions have been made but they seek to place it in the flood plain at INTEC so it seems that a horizontal design like the one for Three Mile Island fuel would be needed in order to elevate the fuel above flood level.

Preliminary studies are beginning for SNF packaging and rather than build a new facility, they want to use the old CPP-603 Irradiated Fuel Storage Facility. Fort St. Vrain and Advanced Test Reactor fuel are stored at CPP-603 in dry storage.

Packaging the spent fuel would mean placing fuel into DOE standard canisters and then placing seven DOE standard canisters into a Multi-purpose canister, the type that DOE keeps telling the commercial nuclear industry that it is not an acceptable waste form. Very little was said about DOE's plans or the limited scope of the plans it may have for packaging the spent nuclear fuel at INL. More had been said at the Nuclear Waste Technical Review Board meeting held last August 2024.

As the Department of Energy has not proceeded with any actions to meet the Idaho Settlement Agreement's milestone to package SNF to ship spent nuclear fuel out of the state by 2035, there was no mention of about how many decades DOE would miss the Idaho Settlement Agreement milestone of January 1, 2035.

According to an Idaho Cleanup Project presentation at the Nuclear Waste Technical Review Board Meeting held August 29, 2024, the packaging of Department of Energy EM-managed spent nuclear fuel is finally slated to be conducted at the Idaho National Laboratory's Idaho

[2] U.S. Nuclear Waste Technical Review Board (NWTRB), Management and Disposal of U.S. Department of Energy Spent Nuclear Fuel. Arlington, December 2017.

Nuclear Technology and Engineering Center (INTEC) CPP-603 facility. [3] However, packaging DOE-EM managed spent nuclear fuel at the INL could take decades, perhaps 60 years.

DOE's Idaho Cleanup Project at the INL claims that a demonstration project in CPP-603 will load spent nuclear fuel in a configuration that will be "road ready," transportable and disposable. (See the September 2024 EDI newsletter.)

INTEC was formerly known as the chemical processing plant, and CPP-603 was built in stages between 1952 and 1974. The Irradiation Fuel Storage Facility of CPP-603 was built in 1974 for storing the Fort St. Vrain gas-cooled reactor spent nuclear fuel. Shipments of Fort St. Vrain fuel from Colorado ceased after only about one third of the SNF was shipped.

CPP-603 is not designed to receive welded-closed canisters, nor was its proposed replacement, the NRC-licensed, but never built Idaho Spent Fuel Facility.

For over two decades, the Department of Energy has been saying they would build a new facility for repackaging INL spent nuclear fuel and it was called the Idaho Spent Fuel Facility. Due to concerns over aging facilities, a design by Foster Wheeler was submitted to the U.S. Nuclear Regulatory Commission in 2001. [4] The Idaho Spent Fuel Facility was never built.

Now, in 2024, with no mention of the Idaho Spent Fuel Facility, DOE is posturing as though the decades-old CPP-603 is suitable. CPP-603 historically included spent nuclear fuel pools that were mismanaged and neglected. Safety problems at the dry spent fuel storage portion of CPP-603, for the public and for workers, need more examination.

Idaho Cleanup Project Citizens Advisory Board meeting held in October, leaves out discussion of safety problems

The Idaho Cleanup Project (ICP) Citizens Advisory Board (CAB) meeting was held October 23, 2024 at the Sun Valley Resort and via zoom if you signed up days in advance. [5]

Vehicle Accidents at Idaho Cleanup Project

The meeting reported on a vehicle collision with an Idaho National Laboratory bus on September 4. An SUV collided with an INL motorcoach carrying 29 passengers. The bus driver and four passengers were transferred by ground ambulance to a local hospital. The driver of the SUV (no passengers) was also transferred by ground ambulance to a local hospital. There were no fatalities. The INL's driver did a good job of trying to avoid the accident that occurred at what

[3] See Nuclear Waste Technical Review Board Summer meeting presentations for August 29, 2024 at https://www.nwtrb.gov/meetings/past-meetings/summer-2024-board-meeting---august-29--2024

[4] U.S. Nuclear Regulatory Commission, Policy Issue Notation Vote, Subject: Request for Authorization to Issue a License for the Idaho Spent Fuel Facility, Under 10 CFR Part 72, SECY-04-0199, October 26, 2004. See nrc.gov, ADAMS database ML042730592.pdf

[5] Idaho Cleanup Project Citizens Advisory Board, October 23, 2024 meeting materials at https://www.energy.gov/em/icpcab/articles/icp-cab-meeting-materials-october-2024

is called the "puzzle" where the INL's roads to Central Facilities and also to the Radioactive Waste Management Complex intersect with highway between Idaho Falls and Arco.

Not mentioned were the Idaho Cleanup Project's continuing problem with vehicle accidents, with four occurring in September 2024 (and see December 2023 and July 2024 DNFSB monthly reports at dnfsb.gov). [6] On September 3, a driver in an articulating dump truck was hauling gravel and the driver lost control and the truck overturned. On September 10, at INTEC, an operator was using a yard dog truck to move a loaded waste trailer but damaged the trailer by not raising the landing gear prior to moving. On September 19, a driver in a government owned pickup truck struck a guardrail at INTEC near CPP-659, causing damage to the truck and guardrail. On September 23, a forklift operator was moving a loaded standard waste box at RWMC inside WMF-635 and the SWB slid off the forklift tines and feel about 8 inches to the ground. On August 12, 2024, a telehandler carrying two empty, stacked intermediate bulk container totes struck a passenger van near ARP IX structure (see the August monthly report issued September 6, 2024 at dnfsb.gov). **Again, none of these vehicle accidents were mentioned at the CAB meeting.**

Transuranic Waste at the Idaho Cleanup Project

Transuranic waste continues to be shipped from the Radioactive Waste Management Complex to the Waste Isolation Pilot Plant (WIPP) in New Mexico. The fabric tent structures for the Accelerated Retrieval Projects have now been taken down and the dangerous and expensive waste exhumation of very little "targeted" waste has ceased. Most of the radioactive waste will remain buried above the Snake River Plain Aquifer. The plan is to place a very deep soil cap of the waste. The depth of the soil cap is unusual and DOE avoids stating the depth, but the depth has to exceed the height of the stack of barrels of waste that the Department of Energy is leaving above ground at the RWMC. DOE is leaving an above ground stack of at Pad A, yet the **Department of Energy's graphics artistically omitted Pad A's stack of drums that extend about 20 ft above grade.**

There are over 10,000 transuranic waste drums remaining to be shipped to WIPP and the most difficult drums remain. Waste certification issues, difficult ones, remain and container integrity issues for certain waste streams resulted in leakage from drum(s) causing an evacuation at WIPP and caused transuranic waste drums to be returned to Idaho in 2022. Drum corrosion issues have occurred in drums that are only a few years old.

Not mentioned at the August ICP CAB meeting was a serious transuranic waste drum event that was reported in the Defense Nuclear Facilities Safety Board report for September, issued on October 5, 2024 at dnfsb.gov. The DNFSB reported that on September 23, operators were unloading 100-gallon criticality clean out puck drums from the BN510 waste stream. When one of the drums was tipped over, operators saw a brief

[6] Defense Nuclear Facilities Safety Board, see reports at https://www.dnfsb.gov/documents/reports

flame emanate from the bottom of the drum. Shipment of BN510 wastes [7] [8] have been suspended and this was not mentioned at the October ICP CAB meeting. The DNFSB has previously pressed the Department of Energy about the safety problems related to elevated flammable gas concentrations in transuranic waste drums, [9] yet DOE has continued to ignore the issues. So, consistent with its head in the sand approach, DOE did not want to mention this flame farted out of a transuranic waste drum in September. This is exactly the kind of thing that ICP CAB meetings used to report and should not have withheld from the CAB meeting.

Back in January 2022, the current cleanup contractor for the Department of Energy took over from exiting Fluor Idaho. The Department of Energy Idaho Field Office kept the lid on the problem waste shipments and waste drums shipped to WIPP had to be returned to the INL in 2022 (see the November 2022 Environmental Defense Institute newsletter). The 2022 April, July and August drum shipment problems to WIPP were not reported in the Idaho news until the October 14, 2022 article by Ridler. [10]

The Idaho Environmental Coalition had sent the waste to the Waste Isolation Pilot Plant (WIPP) in New Mexico. The 2022 article by Ridler quotes Ty Blackford, of the Idaho Environmental Coalition — the Department of Energy's cleanup contractor — as saying in October "The drum looked good when it left (Idaho)," he said during the Idaho Line Commission meeting. "But somewhere between here and there, bouncing down the road for 1,100 miles, something went wrong. So, we need to understand that in detail." Blackford will be

[7] Regarding the BN510 waste stream, see Idaho National Laboratory and Idaho Cleanup Project Site Treatment Plan, INL-STP, Revision 49, December 2023. BN510 may involve the Advanced Mixed Waste Treatment Facility and may involve cut up glove boxes and may involve many wastes mixed together from various sources. The waste composition is clear as mud. The AMWTF could compress drums into a puck and place several pucks into a drum. This made for very heavy drums and apparently the inability to have enough liquid absorbent to absorb corrosive liquid in the drum. The BN510 drums were known to have corrosion problems and yet leaky corroded-through drums were shipped to WIPP by the Idaho Environmental Coalition, who then pretended to not know of any problems. WIPP management has asked IEC to find a way to not put WIPP and its workers at risk. This is requiring placing the problem in drums inside another container. Basically, the Department of Energy at Idaho wanted IEC to ignore the problem and not worry about causing problems at WIPP.

[8] Regarding the BN510 waste stream, see Department of Energy letter to Defense Nuclear Facilities Safety Board, May 7, 2019, regarding safety implications of the April 2018 over-pressurization of four waste drums at the Idaho Cleanup Project's Accelerated Retrieval Project (ARP) V facility. See RPT-1644 "Chemical Compatibility Evaluation for Supercompacted Debris Waste Streams BN510, BN510.1, BN510.2, BN510.3, and BN510.4," Waste was supercompacted at the Advanced Waste Treatment Facility at the Idaho Cleanup Project.

[9] See Department of Energy letter to Defense Nuclear Facilities Safety Board, May 7, 2019, regarding safety implications of the April 2018 over-pressurization of four waste drums at the Idaho Cleanup Project's Accelerated Retrieval Project (ARP) V facility. See discussion of DOE-STD-5506 and the need to evaluate waste container deflagration evens in the facility's Safety Basis.

[10] Keith Ridler, *The Idaho Falls Post Register*, "Idaho resumes radioactive waste shipments to New Mexico" October 14, 2022. The article stated that the Waste Isolation Pilot Plant (WIPP) in New Mexico had again suspended shipments of transuranic radioactive waste from Idaho, yet this information had been withheld from the Idaho Cleanup Project Citizens Advisory Board.

leaving IEC this year in 2024. His mark having been made here so strikingly, as it had been at Hanford [11] before he came to Idaho.

In addition, in 2022, Region 10 Environmental Protection Agency cited violations at the Idaho Cleanup Project handling of transuranic waste last January at the Advanced Mixed Waste Treatment Project (AMWTP). The AMWTP operated by the Idaho Environmental Coalition had problems that led to a Stand Down in March. [12] [13] There was no mention at the April 26, 2022 Citizens Advisory Board meeting of the Stand Down at the Advanced Mixed Waste Treatment Project (AMWTP) which had stopped all waste handling and processing work so that operations management could review whether current procedures were adequate. Maintenance activities were also discontinued on March 7, 2022 due to misunderstandings of maintenance procedures among supervisory and craft personnel at AMWTP, according to the Defense Nuclear Facilities Safety Board memo.

The August 2024 ICP CAB meeting did discuss how aggressively the Department of Energy has worked to prop up IEC, despite Idaho Environmental Coalition's poor performance on safety.

Aquifer contamination from Test Area North from radioactive material dumping and chemical contamination, particularly from TCE, continues to migrate into the Snake River Plain Aquifer. Once in the aquifer, the contamination flows down gradient and becomes more diluted by virtue of spreading out in the aquifer. The Department of Energy's irresponsible dumping of radioactive and chemical wastes in wells at INL's Test Area North has not been effective and DOE has never taken any responsibility for its contractor's dumping (which was probably at DOE's direction). When asks about the rate of the migration of contaminants in the aquifer, DOE responded that it takes 150 years for contamination to reach Thousand Springs. If it takes 150 years for contamination to migrate from the INL to Thousand Springs, then why was INL reprocessing radioactive contamination detected in wells south of the INL in just a few years after the reprocessing had commenced?

Idaho Cleanup Project resumes Integrated Waste Treatment Unit Operation after more clogging problems

The Integrated Waste Treatment Unit (IWTU) radioactive operations resumed operation in late August (see the August monthly report by the dnfsb.gov). The Integrated Waste Treatment Unit operated briefly earlier this year in early March but soon had to be shut down due to

[11] Joshua Frank, *Atomic Days – The Untold Story of the Most Toxic Place in America*, Haymarket Books, 2022. ISBN: 978-1-64259-828-5. See page 121 regarding half-witted attempt to cover for mistakes regarding 2017 plutonium inhalation by 257 workers at Hanford during building demolition overseen by Blackford.

[12] Department of Energy Occurrence Report, "Less Than Adequate Conduct of Operations for Multiple Procedure Violations," Advanced Mixed Waste Treatment Facility, EM-ID—IEC-AMWTF-2022-0001. Notification date: February 24, 2022.

[13] Defense Nuclear Facilities Safety Board memo from Erin A. McCullough to Christopher J. Roscetti, Subject: Idaho National Laboratory (INL) Report for March 2022, April 1, 2022. See dnfsb.org.

problems with the plant. The IWTU was built to treat the remaining liquid sodium-bearing radioactive waste now stored in aging tanks and about 730,000 gallons remain to be treated.

Earlier in the year, the process offgas filter (PGF) was clogged up and so radioactive gases were bypassing the filter. Repairs at the IWTU require challenging radiological work. [14] It was stated at the meeting that no radiological doses exceeding administrative levels were received, but no level was stated and no individual worker doses were stated. Typically, the Department of Energy's administrative level for radiological doses is 2 rem per year, while the annual dose limit is actually 5 rem per year. Elevated cancer risks are detected at about 400 millirem per year, but few radiation workers know that, or how reproductive health is adversely affected by low doses of radiation.

Clogging issues continue to be a challenge for the IWTU and processing the radioactive liquid sodium-bearing waste stored in decades old tanks at the Idaho National Laboratory is expected to continue for more than 5 more years.

The storage volume for the dry waste that results from treated sodium-bearing waste continues to grow and new vaults are being added. The originally planned number of vaults for treated sodium bearing waste was 37 vaults, but was increased to 78 vaults. The meeting didn't say the currently expected number of vaults that will be needed. Each vault holds 16 waste canisters, so more than 1248 canisters will be needed. The DOE stated that is will continue to refine the storage estimates… or in other words, they don't know how many canisters and vaults will actually be needed. A new additive to reduce clumping and clogging is increasing the volume of dry waste that will be generated above the estimated 78 vaults, apparently.

The DOE has long hoped to send the treated waste to the Waste Isolation Pilot Plant (WIPP) in New Mexico, but the waste has not been accepted for disposal at WIPP.

The State of Idaho continues to levy monetary fines of $6000 per day for failure to complete treatment of the radioactive and chemically-laden sodium bearing waste and clean and close the storage tanks at the Idaho Nuclear Technology and Engineering Center (INTEC) located at the Idaho National Laboratory.

The failure to treat the high-level radioactive liquid sodium bearing waste at the Idaho National Laboratory has resulted in missing waste tank closure milestones agreed upon between the Department of Energy and the State of Idaho. These compliance milestones are not part of the Idaho Settlement Agreement; they are part of a consent order for hazardous waste.

Between March 2015 and March 2024, over $14 million dollars in penalties were assessed. The penalty of $6000/day can be expected to continue for several more years until the waste tanks are cleaned and closed in accordance with the Notice of Noncompliance-Consent Order, as agreed to by the State of Idaho and the Department of Energy.

[14] U.S. Defense Nuclear Facilities Safety Board monthly reports for the Idaho National Laboratory for March and April, 2024 at https://www.dnfsb.gov

The money can be used to fund Supplemental Environmental Projects (SEPs). These Supplemental Environmental Projects are to be environmentally beneficial but must not be otherwise legally required of DOE. The State of Idaho decides which SEPs to fund.

There have been over two dozen funded SEP projects. Two projects under consideration for 2024 include two waste and recycling infrastructure upgrade projects for the Shoshone Bannock Tribes and Lincoln County and sewage collection system upgrade in Bingham County. Some past projects like the restoring of natural creek flow and vegetation to improve water quality with funding given to the Nature Conservancy Restoration Projects appear to have obvious benefits.

Possible project ideas are identified "through public information, knowledge of local needs, DEQ, CAB member input, community contacts, contacts with elected officials, and others." The problem is the secrecy about the opportunity for funding these beneficial projects. The Department of Energy emphasizes that it has no requirement to advertise the availability of SEP funds for potential projects. The Idaho Department of Environmental Quality decides which projects to fund.

Large amounts of money have been given to the Idaho Department of Water Resources and the projects do not appear to have any obvious benefit to the public or environment. Over $ 3.7 million went to groundwater characterization and monitoring that appears it is not for public benefit. It is not to monitor contamination, nor is it monitoring where people live.

Idaho Cleanup Project Citizens Advisory Board meeting holds so-called "Public Meeting" in Sun Valley for Naval Reactors Facilities S5G Demolition

The Idaho Cleanup Project (ICP) Citizens Advisory Board (CAB) meeting was held October 23, 2024 at the Sun Valley Resort and via zoom if you signed up days in advance. [15] The minimally announced "public meeting" for NRF S5G Demolition was embedded in the Sun Valley meeting, [16] and could only be attended by Zoom if you signed up days in advance.

To avoid scrutiny of their plans, few people knew about the "public meeting" to sign up or to review documents. They avoided having the public there and avoided having to respond to any real questions.

The Submarine 5th Generation General Electric (S5G) Prototype Facility at the Naval Reactors Facility (NRF) was used for testing the design and for training personnel at the NRF facility on the INL site. The S5G Prototype Facility includes the prototype itself, the basin, surrounding sub-grade cells, and above-grade water treatment equipment. The radioactivity of

[15] Idaho Cleanup Project Citizens Advisory Board, October 23, 2024 meeting materials at https://www.energy.gov/em/icpcab/articles/icp-cab-meeting-materials-october-2024

[16] 30-Day Public Comment Period for the Naval Reactors Facility Submarine 5th Generation General Electric Final End State. https://www.energy.gov/em/events/30-day-public-comment-period-naval-reactors-facility-submarine-5th-generation-general

the reactor vessel was evaluated and it appears that NRF simply ignored any other radioactivity without providing monitoring or basis for doing so, other than to say the other radioactive contamination would be below that of the reactor vessel. [17] [18] [19]

The Navy's stated main reason for S5G demolition was to make room for a warehouse and said at the meeting that it is difficult to even construct an ordinary building at the remote Idaho site.

> "The primary purpose for separating the removal action for the S5G Prototype Facility (NRF-633P) removal action from the S5G Test Plant Building (NRF-633A) is to allow the repurposing and continued use of the NRF-633A building as an operational warehouse at the Naval Reactors Facility (NRF)." [20]

The S1W, A1W and S5G reactor prototypes built at NRF were used to test the prototypes and were used as training facilities for Navy nuclear propulsion plant operators. Initial operation of the S1W (Westinghouse submarine) began in 1953 and it was defueled in 1989. The A1W (concept for the USS ENTERPRISE aircraft carrier) was built in 1956 and was shutdown in 1994. The A1W was defueled and lay up work was completed in 1999. The S5G was built in 1965 (General Electric submarine) and it was shutdown in 1995, with defueling and lay up completed in 1999. [21]

Reactor operation and spent nuclear fuel reprocessing, largely supporting NRF, resulted in years of contaminating the Snake River Plain Aquifer with percolation ponds and deep injection wells. Radioactive waste burial in unlined pits over the Snake River Plain Aquifer continues today, even when the navy had other choices for disposal of long-lived radioactive waste. [22]

The Atomic Energy Commission (AEC) is the predecessor to the Department of Energy, that from the beginning was almost exclusively focused on designing and manufacturing nuclear weapons and nuclear reactors for naval uses. About 1954, the AEC focused on expansion of the

---

[17] U.S. Department of Energy, Idaho Field Office, *Engineering Evaluation/Cost Analysis for the Naval Reactors Facility S5G Final End State Including Disposition of Reactor Vessel*, DOE/ID-12081, October 2024. See Administrative Record (AR) Information Repository [ARIR] at https://idahoenvironmental.com/ARIR/

[18] Idaho Cleanup Project, *S5G Prototype End-of-Service Radiological Source Term*, TBL-616, Revision 3, June 5, 2023. See Administrative Record (AR) Information Repository [ARIR] at https://idahoenvironmental.com/ARIR/

[19] Idaho Cleanup Project, *Radiological Human health Risk Assessment for Decommissioning of the S5G Prototype Facility*, EDF-1135, Revision 1, July 31, 2023. See Administrative Record (AR) Information Repository [ARIR] at https://idahoenvironmental.com/ARIR/

[20] Department of Energy, Letter to Region 10 EPA and the Idaho DEQ, Subject: Addendum to the Action Memo for General Decommissioning Activities under the Idaho Cleanup Project (DOEID-11293, Revision4), August 20, 2024, CCN 333105. See Administrative Record (AR) Information Repository [ARIR] at https://idahoenvironmental.com/ARIR/

[21] Bechtel Marine Propulsion Corporation, Prepared for U.S. Department of Energy, Naval Reactors Facility, Environmental Summary Report, NRF-OSG-ESH-00456, August 2017.

[22] Idaho National Laboratory, "Explanation of Significant Differences Between Models Used to Assess Groundwater Impacts for the Disposal of Greater-Than-Class C Low-Level Radioactive Waste and Greater-Than-Class-C-Like Waste Environmental Impact Statement (DOE/EIS-0375D) and the Environmental Assessment for the INL Remote-Handled Low-Level Waste Disposal Project (INL/EXT-10-19168)," INL/EXT-11-23102, August 2011. http://www.inl.gov/technicalpublications/documents/5144355.pdf

commercial nuclear industry. [23] The AEC was later divided into the Department of Energy and the Nuclear Regulatory Commission.

The U.S. Geological Survey spent years monitoring and not monitoring and not reporting radiological and chemical contamination in the aquifer. It was not until the U.S. Environmental Protection Agency conducted investigations in the 1990s that many contaminated sites at the Idaho National Laboratory were documented.

But even the EPA has been complicit in covering up the extent of INL radiological contamination. When the EPA was investigating the phosphate mining contamination in Pocatello, Idaho, the EPA detected unusually high ratios of uranium-235 in the water at Arco, Idaho. Yet, the EPA never explained the finding of elevated levels of uranium-235 in Arco, Idaho, that could only have come from the reprocessing of naval spent nuclear fuel. The little town of Arco is only 20 miles from the INL's INTEC stack and the wind often blew toward Arco at night-time. (The oddly high uranium-235 levels at the Pocatello courthouse remain a mystery. It is not Nevada weapons testing fallout, or from phosphate ore. It may be from the INL but it could be from university research or transportation of government materials.)

The U.S. Environmental Protection Agency collected data for Arco, Idaho from samples takin in 1980 for use in a comparison to areas near Pocatello, and selected data are presented in Table 8. [24] While this data excluded radionuclides such as cesium-137 or plutonium that likely would have been present, the data are informative because of the detailed assessment of uranium-234, uranium-235, and uranium-238 for various locations in Idaho. Even though these results were presented in terms of mrem/yr lung dose, **it is the proportions of each of these radionuclides that is of interest.**

At Arco, the proportion of uranium-235 to uranium-238 is higher than in naturally occurring uranium and it is also higher than occurring in the Pocatello area, despite higher uranium levels overall in Pocatello due to the phosphate ore industry. The higher levels of uranium-235 at Arco would be explained by INL air emissions from the past reprocessing of highly enriched uranium (HEU) spent fuel at the INL, due to nightly wind reversals and close proximity to INTEC.

The proportion of U-234 to U-238 by activity (and by lung dose) would be 50/50 for natural uranium. But as seen in the Table 1, the amount of U-234 is often higher than U-238 which is indicative of influences of weapons fallout and/or nuclear reactor fuel. I have noted this to be the case to some extent generally throughout the northwest and not just near the INL.

[23] Brett Tingley, *The Warzone*, "The U.S. Government Hides Some Of Its Darkest Secrets At The Department Of Energy, May 13, 2021. https://www.twz.com/35197/the-department-of-energy-may-be-the-best-place-to-keep-a-secret

[24] E. G. Baker, H. D. Freeman, and J. N. Hartley, *Idaho radionuclide exposure study: Literature review*, October 1, 1987.

Table 1. Average Annual Lung Dose (mrem/yr) for Insoluble Radionuclides.

Radionuclide	Sewage plant near Pocatello RR	Hayes Fire Station, Pocatello	Pocatello airport	Pocatello courthouse	Chubbuck school	Howe, Idaho	Arco, Idaho
U-234	2.3	0.37	0.41	0.41	0.63	0.12	0.23
U-235	0.13	0.033	0.061	0.11	0.068	0.023	0.06
U-238	1.8	0.32	0.32	0.29	0.58	0.10	0.17
Ratio of U-235/ U-238	***0.072***	***0.103***	***0.19***	***0.379***	***0.117***	***0.23***	***0.35***

Table notes: E. G. Baker, H. D. Freeman, and J. N. Hartley, *Idaho radionuclide exposure study: Literature review*, October 1, 1987.

While the lung doses appear low, and the stated lung dose is low for Arco, what I want to point out is the proportion of U-235 to U-238. **The ratio of U-235 to U-238, by activity, shows Arco, Idaho having a ratio of 0.35 when naturally occurring uranium would have a ratio of 0.047.** So, we are seeing levels of uranium-235 in our environment that are far above naturally occurring levels but, in the table above, the levels are usually below 0.23.

The data in Table 1 are from 1980 and show clearly that Arco's proportion of uranium-235 in soil are not naturally occurring and are excessive. The data point to INL air emissions affecting communities off-site that the INL and the Department of Energy are still not being truthful about. There are human consequences to the lies, as can be seen in cancer data for Arco, Idaho. The INL's INTEC fuel reprocessing and calcining have ended. So, a reasonable question is not only what emissions are continuing but also what radionuclides are still building up as higher actinides decay.

Americium-241, plutonium-238 and plutonium-239 are still frequently detected by the Department of Energy's environmental surveillance that includes Arco. INL emissions have continued from cleanup activities, operation of the Advanced Test Reactor, spent fuel handling at the Naval Reactors Facilities, and other operations. The DOE denies that radionuclides from the INL have left the INL site, and continues to falsely claim that the contamination is due to global weapons testing fallout.

Aalo Atomics, Amazon deal, Microsoft support of TMI-1 restart, and other proposed nuclear projects, a November 2024 status

The United States Department of Energy continues to promote just about every conceivable new nuclear reactor proposal and because new reactor design, licensing and build take so long, the restart of uneconomical and unsafe shuttered nuclear reactors is being sought despite the

reality that these reactors cannot be deployed in time or with a capacity relevant to combating climate change.

Apparently, Idaho Falls Power learned nothing from the cancelled NuScale project and hubris-fueled hope springs eternal with an agreement announced in September that Idaho Falls Power made an agreement with Aalo Atomics that could lead to the siting of seven sodium-cooled microreactors and a power purchase agreement for Idaho Falls. The project is "slated to go online before the end of the 2020s," yet "is not expected to come on line before 2030. [25] Given the early stages of lack of design, lack of NRC review or engagement, don't hold your breath for the Aalo sodium-cooled reactors to come online any time soon. Idaho Falls has invested in gas-fired units for power and so the cost and risk of the small sodium-cooled reactors is simply to put rate payers' money toward speculative nuclear projects — projects that are too slow to reduce carbon emissions. [26] [27] [28] [29]

Money is flowing to the TerraPower Natrium reactor money-pit project in Kemmerer, Wyoming for a sodium-cooled liquid metal fast neutron reactor designed on the Experimental Breeder Reactor (EBR-II) built at the Idaho National Laboratory. Because the Natrium reactor won't be online any time soon, coal plants are being converted to gas plants. Basically, the schemes for adding nuclear energy are ensuring the longevity of coal and gas.

Bill Gates has wasted precious years on his "traveling-wave" reactor that was never built, and he has set his sites on building a fast reactor called *Natrium*. The *Natrium* reactor slated for Kemmerer, Wyoming, will be too small to make a difference and too late to make a difference. In fact, coal and gas-fired plants will be relied upon in Kemmerer Wyoming as the *Natrium* project sucks in federal dollars and will not be deployed in time to make a dent in climate change.

PacifiCorp, which operates as Rocky Mountain Power may have tentatively agreed to take on ownership of the power plant sometime after it goes into operation in 2030. PacifiCorp has coal plants, that the news article stated it wanted to retire. That seems to imply reducing carbon fuel

---

[25] NuclearNewswire, "Aalo and Idaho Falls Power reach agreement on potential microreactor siting, September 18, 2024. https://www.ans.org/news/article-6396/aalo-and-idaho-falls-power-reach-agreement-on-potential-microreactor-siting/

[26] See the October 2024 Environmental Defense Institute newsletter article "Newcomer Aalo Atomics adds to the plethora of proposed new nuclear reactors in the U.S.," at http://environmental-defense-institute.org/publications/News.24.Oct.pdf

[27] See the October 2024 Environmental Defense Institute newsletter article "Nuclear energy is unaffordable AND even an impossibly vast expansion of nuclear energy by 2050 will not put a dent in carbon emissions," at http://environmental-defense-institute.org/publications/News.24.Oct.pdf

[28] See the October 2024 Environmental Defense Institute newsletter article "Small modular reactor and microreactor accident consequences can cause catastrophic public radiation doses," at http://environmental-defense-institute.org/publications/News.24.Oct.pdf

[29] See the October 2024 Environmental Defense Institute newsletter article "Never economical and highly polluting spent fuel reprocessing – Looking at the lessons not learned" at http://environmental-defense-institute.org/publications/News.24.Oct.pdf

use, but in reality, PacifiCorp is converting its coal plants to gas plants, signaling it does not expect Natrium to be running any time soon.

The EBR-II generated about 20 MW-electric and the proposed TerraPower Natrium reactor would generate 345 MWe — which is a significant increase in the size of the reactor. The fuel for Natrium will use HALEU fuel and will not be "burning the waste" as DOE has falsely claimed. The disposal of its spent nuclear fuel will require reprocessing but no one is talking about who will pay for it or how polluting it is to pyroprocess the fuel. Sodium-bonded fuel cannot be disposed of in a repository without reprocessing. No problem since there is no repository for spent nuclear fuel and there is no program for a repository.

Microsoft owner Bill Gates is behind the TerraPower Natrium project sodium-cooled fast neutron reactor. Microsoft is also seeking the restart of Three Mile Island Unit 1 in Pennsylvania, [30] Microsoft signed a 20-year power purchase agreement with Constellation that relies on the restart of the uneconomical Three Mile Island Unit 1. Bill Gates wants to make sure that leaky steam generators spew radionuclides all throughout the Pennsylvania countryside and put people at risk until TMI-1 does a TMI-2. [31]

The Department of Energy also been paying TerraPower for work pertaining to uranium-233 stores at Oak Ridge. TerraPower signed a collaboration agreement with Cardinal Health NPHS to produce and distribute TerraPower's actinium-225 product, with is generated using the thorium-229 extracted in Oak Ridge. The actinium-225 will be used in drug trials involving targeted alpha therapy for diseases such as breast, prostate, colon, and neuroendocrine cancers, melanoma, and lymphoma. [32] [33]This Oak Ridge project was touted at the October ICP CAB meeting in an unbalanced way, but not unexpected given the continual emphasis on the positive while minimizing or omitting the true costs, safety problems and harm of the nuclear industry's environmental and human health damage.

X-Energy continues to promote its 80 MWe high-temperature gas-cooled (HTGR), and TRISO-fueled reactor design. While HTGR's have been built, reliability problems remain a

[30] Constellation webpage: Constellation to Launch Crane Clean Energy Center, Restoring Jobs and Carbon-Free Power to the Grid, September 20, 2024. https://www.constellationenergy.com/newsroom/2024/Constellation-to-Launch-Crane-Clean-Energy-Center-Restoring-Jobs-and-Carbon-Free-Power-to-The-Grid.html

[31] See the October 2024 Environmental Defense Institute newsletter article "Efforts announced to reopen Three Mile Island Unit 1 (the one that didn't melt down); pollution for local communities but electricity for predicted needs of data centers," at http://environmental-defense-institute.org/publications/News.24.Oct.pdf

[32] Department of Energy, Oak Ridge Office of Environmental Management, webpage: TerraPower, Cardinal Health, Isotek, and DOE Celebrate Historic Achievement in Next Generation Cancer Treatment, April 11, 2024. https://www.energy.gov/orem/articles/terrapower-cardinal-health-isotek-and-doe-celebrate-historic-achievement-next

[33] Department of Energy, webpage: U-233 Processing in Oak Ridge Exceeds EM Priority Goal, June 20, 2024. https://www.energy.gov/em/articles/u-233-processing-oak-ridge-exceeds-em-priority-goal Uranium-233 created in the 1950s and 1960s for potential use in reactors, U-233 proved to be an unviable fuel source, according to the Department of Energy. Half of the U-233 inventory, 350,000 pounds, was disposed of between 2011 and 2017. Isoteck extracts the thorium-229, and TerraPower distributes the actinium-225 to pharmaceutical companies to support clinical trials. Thorium-229 and actinium-225 are decay products of uranium-233. Uranium-233 is fissile and weapons-usable material.

consistent problem. With few details about the reasons for continued difficulty in operating China's new high-temperature gas-cooled reactors, little power is being generated from them. Difficulties had caused years of delays in operation of the new reactors, and now it appears that it remains challenging to keep them operating. *The World Nuclear Industry Status Report 2024* tracks how much power is being generated by nuclear energy worldwide and much more about the nuclear industry. [34]

Another company, Ultra Safe Nuclear Corp (USNC), with a similar HTGR concept for a 15 MWe reactor has filed for bankruptcy protection. [35] Ultra Safe caught Canada's interest, but no reactor has been built in Canada nor in the U.S. A research reactor based on Ultra Safe's concepts is proposed for University of Illinois at Urbana-Champaign. [36] USNC was also one on three picks to design experiments for the Idaho National Laboratory's new 20-MWth Demonstration of Microreactor Experiments (DOME) testbed.

The big movers are now murky deals being made with owners of data centers for speculative power purchase needs. Data centers are speculating that they will need a lot more electrical energy, and rather than seek efficiencies, they are seeking the highest cost and highest risk form of electrical energy from nuclear energy.

New nuclear is so slow to deploy that the restart of uneconomical and unsafe nuclear plants is being sought. The cost of restarting these nuclear plants and the cost of an accident may at least seem like progress, as the new nuclear is not materializing any time soon and will be many years beyond 2030, if ever. Exotic materials needed for sodium-cooled reactors, fluoride or molten-salt reactors will likely mean premature closures due to material failures.

Amazon is investing in X-Energy HTGR small modular nuclear reactors. Google plans to purchase energy from Kairos Power, that seeks an exotic fluoride-cooled high-temperature reactor. None of these reactors will be online by 2030. [37] Kairos Power will require so much additional materials research that apparently Google doesn't plan to need more energy any time soon.

Jeff Bezos of Amazon, and owner of *The Washington Post*, is seeking a purchase agreement to purchase energy from the Susquehanna nuclear plant in Pennsylvania, but the FERC recently

---

[34] A Mycle Schneider Consulting Project, Paris, *The World Nuclear Industry Status Report 2024*, September 2024. WNISR Project website www.WorldNuclearReport.org

[35] Sonal Patel, *Powermag*, "Major Microreactor Developer Enters Bankruptcy Amid Nuclear Industry Surge," October 29, 2024. https://www.powermag.com/major-microreactor-developer-enters-bankruptcy-amid-nuclear-industry-surge/

[36] See United States Nuclear Regulatory Commission website regarding new reactors, pre-application activities at https://www.nrc.gov/reactors/new-reactors.html

[37] Shannon Najmabadi and Evan Halper, *Washington Post*, "Amazon doubles down on nuclear energy with deal for small reactors," October 16, 2024. https://www.spokesman.com/stories/2024/oct/16/amazon-doubles-down-on-nuclear-energy-with-deal-fo/

rejected to arrangement over concerns that it would unfairly shift costs to other energy consumers. [38]

A partial list of new nuclear reactors is provided below in Table 2.

Table 2. Partial list of nuclear reactors including the Versatile Test Reactor, Natrium, X-energy's Xe-100, and other reactors.

Reactor name	Reactor type/ Fuel type	MW-thermal	MW-electric	Fissile Material	Special notes
Materials Testing					
Versatile Test Reactor (DOE/EIS-0542)	Fast neutron, sodium-cooled, U-Pu-Zr	300 MWth	None	Uranium-plutonium-zirconium metal	Uses but does not generate electricity. Very high accident consequences.
Commercial electrical power					
TerraPower & GE Hitachi *Natrium*	Fast neutron, sodium-cooled, U-Zr	840 MWth	345 MWe	Uranium-zirconium-hydride using HALEU	High project risk. High accident risk. High risk of frequent repairs. High risk of premature shutdown like other similar reactors.
GE Hitachi *BWRX-300*	Fast neutron, sodium-cooled, U-Zr ?	?	300 MWe	?	Clinch River site proposed
X-energy's *Xe-100*	High-temperature gas cooled (HTGR), TRISO "pebble bed"	200 MWth times 4	Xe-100, 80 MWe; 4-pack is 320 MWe	TRISO (tristructural isotropic) uranium fuel from HALEU DOE Advanced Reactor Demonstration Program, 2020, promised up to $ 1.2 Billion.	High risk of frequent repairs. TRISO fuel used in Fort St. Vrain reactor. No containment. No existing technology for reprocessing.

[38] Ethan Howland, *UtilityDive*, "FERC rejects interconnection pact for Talen-Amazon data center deal at nuclear plant," November 4, 2024. https://www.utilitydive.com/news/ferc-interconnection-isa-talen-amazon-data-center-susquehanna-exelon/731841/

Reactor name	Reactor type/ Fuel type	MW-thermal	MW-electric	Fissile Material	Special notes
Hermes, Kairos Power	Fluoride salt cooled high-temperature reactor	320 MWth or reduced scale	140 MWe, Or reduced scale	TRISO fuel	Received DOE Advanced Reactor Demonstration Program money.
NuScale Small Modular Reactor	Light-water pressurized reactor, standard PWR fuel with MOX and other fuels envisioned The reactor modules are submerged in a common pool and lifted modules pose a risk to entire facility.	?	NuScale 50 MWe Various uprating to 60 MWe and even higher. For 60 MW per module, a 12-pack plant is 720 MWe	<4.95 percent enriched standard PWR fuel, hope to use plutonium mixed oxide fuel (MOX) and/or higher enrichment fuels. Zirconium-clad fuel poses hydrogen generation when overheated, like all PWRs.	High risk of frequent and costly repairs. Hot risk of premature shutdown due to materials reliability and novel design. Accident risks not better than conventional PWRs. **(UAMPs project cancelled November 2023.)**
Project Pele Mobile reactor	HTGR or other		1 to 5 MWe	TRISO fuel	Department of Defense High target risk at deployed at military bases. Likely to become permanent stranded fuel site where ever deployed.
Aurora *Oklo*	Oklo, a $25-million startup company (Aurora Powerhouse) Compact fast neutron microreactor	4 MWth	1.5 MWe	HALEU	Creates spent nuclear fuel problems without any significant benefit. **(Design application denied by NRC**

Reactor name	Reactor type/ Fuel type	MW-thermal	MW-electric	Fissile Material	Special notes
					due to insufficient information)
Ultra Safe Nuclear Corporation (USNC)	HTGR demonstration project		15 MWe	TRISO fuel	Canada at Ontario's Chalk River site, As of November 2024, little progress.
University of Illinois at Urbana-Champaign -	HTGR, Proposed research reactor based on Ultra Safe concepts				
Westinghouse *eVinci*	Westinghouse Canada eVinci Micro Reactor		200 kWe to 5 MWe		
Terrestrial Integral Molten Salt Reactor (IMSR)	?	?	?	?`	?
MARVEL	Sodium-potassium-cooled, HALEU	100 kWth	"less than 100 kWe" Expect 20 kWe (0.02 MWe)	150 kg of 20 percent enriched U-235 (U-Zr-Hydride fuel in stainless-steel cladding	Testing planned at INL's TREAT facility
Aalo Atomics – Idaho Nuclear Project	Sodium-cooled fast neutron reactor		10 MWe	HALEU fuel, U-Zr-Hydride fuel	As of 11/6/2024, only one document at nrc.gov describing Aalo.
Molten Salt or Chloride Reactor	Molten Chloride Reactor Experiment (MCRE) DOE/EA-2209.	200 kWth	None for the research experiment	Not enough information. Note that the fuel is in the reactor coolant. Any significantly scaled-up reactor would be many decades away.	Preliminary research with no reprocessing capability and hold up of gaseous radiological releases.

Table notes: MWth is megawatts-thermal energy, MWe or simply MW is megawatts-electric energy. The listed proposed new reactors does not include all proposed nuclear reactors in the US. See U.S. Nuclear Regulatory Commission licensing status at nrc.gov. HALEU is high assay low-enriched uranium. Note regarding past, current or under construction reactors: the nominally 1000 MWe Westinghouse AP1000 under construction is a light-water pressurized reactor, 1000 MWe, fuel of uranium oxide of 4.55 percent uranium-235 enrichment; existing Advanced Test Reactor, 250 MW-thermal, 93 percent enriched uranium-235; formerly operated Fort St. Vrain high-temperature gas-cooled reactor, 330 MWe, used TRISO fuel; formerly operated Peach Bottom reactor, 40 MWe; formerly operated Hanford's Fast Flux Test Facility reactor was a 400 MW-thermal fast neutron sodium-cooled reactor; formerly operated INL's Experimental Breeder Reactor II (EBR-II) was a fast neutron sodium-cooled pool-type reactor of 62.5 MW-thermal (19 MWe), see Perry et al., Seventeen Years of LMFBR Experience: Experimental Breeder Reactor II (EBR-II), CONF-820465—2, April 1982 at https://www.osti.gov/servlets/purl/6534205 . Some MWth information added from Edwin Lyman, Union of Concerned Scientists, *"Advanced" isn't always better – Assessing the Safety, Security, and Environmental Impacts of Non-Light-Water Nuclear Reactors*, March 2021.

EPA seeks public comment on use of radioactive phosphogypsum for road base in Florida

The U.S. Environmental Protection Agency is poised to approve the use of phosphogypsum as part of road base material for a roadway in Mulberry, Florida. Comments are due by November 8, 2024. [39]

Processing phosphate ore to make fertilizer creates liquid waste and also solid waste known as phosphogypsum that is stacked in waste piles called phosphogypsum stacks. Phosphate ore naturally contains radioactive uranium and thorium and their decay products.

Uranium concentrations in phosphate ores range from about 7 to 100 picocuries per gram (pCi/g). Thorium occurs at lower levels, between 0.1 to 0.6 pCi/g. The fertilizer product also contains radioactivity, with the concentration of radium-226 varying between about 5 to 30 pCi/g. The phosphogypsum waste also contains toxic constituents including arsenic, lead, cadmium, fluoride and others. [40]

In 2019, the total production of phosphate rock in the U.S. was estimated at 23 million metric tons and most of the production was for making fertilizer. About 90 percent of the domestic production capacity is in Florida, North Carolina, and Tennessee, with Florida alone accounting for about 80 percent of current capacity. The phosphate industry in the western U.S. is primarily in Idaho.

In Idaho, the J.R. Simplot and FMC Corporation began phosphate operations in the 1940s. The FMC plant produced elemental phosphorus from thermal processes, generously sharing

[39] Notice of Pending Approval for Other Use of Phosphogypsum at https://www.epa.gov/radiation/phosphogypsum

[40] Center for Biological Diversity letter to the U.S. Environmental Protection Agency, Re: Notice of Intent to Sue for Failure to Perform a Nondiscretionary Duty under the Resource Conservation and Recovery Act, February 13, 2024.

polonium-210 across the valley. Operations at FMC ceased in 2001. The area known as the Eastern Michaud Flats Contamination Pocatello, Idaho, became a Superfund Site with a Record of Decision issued in 1998. [41] In 2023, the Justice Department and EPA announced a settlement with J.R. Simplot to improve hazardous waste management and resolve allegations that certain waste streams were not properly managed. [42]

In the past, phosphogypsum, that is produced from dissolving with sulfuric acid, was used in road construction but was banned in 1992 when EPA amended 40 CFR 61 Subpart R. Phosphate slag is produced when a thermal process is used for conversion of phosphate ore to elemental phosphorus. Phosphate slag has been measured as high as 50 pCi/g. Slag was also used for highway construction road base, railroad ballast and general construction. Its use in cement and concrete was banned by the state of Idaho in 1977 for use in habitable construction. But many homes in southeast Idaho poured radioactive concrete foundations and basements prior to 1977.

Phosphogypsum is also applied for agricultural use if the certified average concentration of radium-226 is no greater than 10 pCi/g (see the EPA's TENORM webpage already cited.)

Stacks of phosphogypsum continue to grow. The radioactive decay products can emanate into the air, and can be released and leach into groundwater.

Back in 2020, the EPA approved the use of phosphogypsum in road projects, but in 2021, the EPA under the Biden administration wisely withdrew that approval. [43] An interesting technical review of the use of phosphogypsum in road base was conducted by SC&A published on June 10, 2020. [44] The SC&A study overall found that the risk assessment that had been submitted to support the use of phosphogypsum had aspects that low-balled the predicted radiation doses. The SC&A study looks at the various radionuclides in the phosphogypsum and presents their dose coefficients. The problem that road base typically extends beyond the asphalt of the road had not been addressed, nor had runoff to groundwater or uptake in food been addressed.

The various radionuclides in phosphogypsum emit alpha, beta and gamma radiation. Radon is a known inhalation health risk. The other radionuclides are problematic when ingested. The gamma rays from bismouth-214 are high energy gammas that dominate the "shine" dose from external exposure.

---

[41] https://cumulis.epa.gov/supercpad/SiteProfiles/index.cfm?fuseaction=second.cleanup&id=1001308#bkground

[42] Justice.gov, Press Release, Justice Department Announces Settlement with J.R. Simplot to Improve Hazardous Waste Management and Reduce Emissions at Idaho Facility, July 11, 2023. https://www.justice.gov/opa/pr/justice-department-announces-settlement-jr-simplot-improve-hazardous-waste-management-and

[43] United States EPA, Request to Use Phosphogypsum in Government Road Projects: Supporting Documents, webpage, https://www.epa.gov/radiation/request-use-phosphogypsum-government-road-projects-supporting-documents On June 30, 2021, the EPA withdrew previously granted conditional approval to use phosphogypsum in government road construction projects. On October 14, 2020, the EPA had approved the use of phosphogypsum in road construction projects. Under the Clean Air Act regulations, EPA may approve a request for a specific use of phosphogypsum is it is determined that the proposed use is at least a protective of human health as placement in a stack.

[44] SC&A, *Technical Review of the Fertilizer Institute Risk Assessment for Additional Use of Phosphogypsum in Road Base*, Prepared for U.S. Environmental Protection Agency, June 10, 2020.

The EPA has a very low bar for approving alternate uses of phosphogypsum — it just needs to be as safe as the unsafe stacks of phosphogypsum. The fertilizer industry argues that using phosphogypsum in roads is safer than piling it in towering "stacks" in Florida. [45] [46]

Phosphogpypsum is the solid waste from the "wet process" where sulfuric acid is used to dissolve phosphate ore. Radionuclides present in the phosphate ore are unevenly divided between the phosphogypsum and the waste liquid, with about 80 percent of the radium-226 concentrated in the phosphogypsum. Radium concentrations at phosphogypsum stacks range from 11 to 35 picocuries per gram (pCi/g). [47] Radium-226 decays to radon-222 which is a gas and so the stacks can release radon-222 to the environment. Radon-222 decays to polonium-218, then lead-214, bismouth-214, lead 210, bismouth-210, polonium-210 and finally to stable lead-206.

The radioactive decay series of uranium-238 is shown in Table 3. Uranium decay series decay by alpha particle and by beta particle decay. Some decays give off gamma rays. According to the 2020 SC&A study, in groundshine, the radiation dose is dominated by the radon-222 decay series, and is dominated by the high energy gamma of bismouth-214. Inhalation dose comes from a variety of radionuclides but is dominated by lead-210, radium-226 and thorium-230. Soil ingestion is dominated by lead-210, polonium-210, radium-226, bismouth-210 and thorium-230. [48]

The uranium decay series means that despite uranium's long half-life, there are the decay products in the ore. And even the short-lived decay products are continuously replenished. The toxicity of the uranium is not the dominant effect in radiation doses from exposure to phosphgypsum in road bed or other applications.

[45] Bruce Ritchie, *E&ENews*, "EPA gives preliminary OK to using waste in 'radioactive roads,'" October 10, 2024. https://www.eenews.net/articles/epa-gives-preliminary-ok-to-using-waste-in-radioactive-roads/

[46] Florida Polytechnic University (FIPR), Phosphogypsum and the EPA Ban, webpage accessed 11/5/2024, at https://fipr.floridapoly.edu/about-us/phosphate-primer/phosphogypsum-and-the-epa-ban.php.

[47] United States Environmental Protection Agency, TENORM: Fertilizer and Fertilizer Production Wastes, webpage at https://www.epa.gov/radiation/tenorm-fertilizer-and-fertilizer-production-wastes (Phosphate rock contains Naturally Occurring Radioactive Materials (NORM), When processing concentrates NORM in the waste products, they become known as Technologically Enhanced Naturally Occurring Radioactive Materials (TENORM).

[48] SC&A, *Technical Review of the Fertilizer Institute Risk Assessment for Additional Use of Phosphogypsum in Road Base*, Prepared for U.S. Environmental Protection Agency, June 10, 2020.

Table 3. Uranium decay products.

Nuclide	Half-Life	Decay mode
Uranium-238	4.5 billion yr	Alpha
Thorium-234	24.1 day	Beta
Protactinium-234	1.17 minute	Beta
Uranium-234	240,000 yr	Alpha
Thorium-230	77,000 yr	Alpha
Radium-226	1600 yr	Alpha, 6.7 keV gamma
Radon-222	3.82 day	Alpha
Polonium-218	3.05 minute	Alpha
Lead-214	26.8 minute	Beta, 250 keV gamma
Bismouth-214	19.9 minute	Beta, 1500 keV gamma
Polonium-214	1.6E-4 seconds	Alpha
Lead-210	22.3 year	Beta, 4.8 keV gamma
Bismouth-210	5.0 day	Beta
Polonium-210	138.4 day	Alpha
Lead-206	Stable	

Sources: SC&A, *Technical Review of the Fertilizer Institute Risk Assessment for Additional Use of Phosphogypsum in Road Base*, Prepared for U.S. Environmental Protection Agency, June 10, 2020. And gamma energies are cited (but not necessarily up-to-date) from Argonne National Laboratory in collaboration with U.S. Department of Energy, *Radiological and Chemical Fact Sheets to Support Health Risk Analyses for Contaminated Areas*, March 2007. https://www.remm.nlm.gov/ANL_ContaminantFactSheets_All_070418.pdf

Studies of human health have focused on cancer rates and often on cancer mortality rather than cancer incidence. However, there are other adverse health effects from radiation exposure including compromising the immune system, heart disease, infertility and others. A growing and diverse amount of information shows us that radiation exposure disproportionately negatively impacts females, children, and the child developing in utero.

The old assumption that 100 millirem per year doses were benign has been shown to be false, especially for the developing child. The U.S. Environmental Protection Agency's wrong assumptions and limited studies of radiation health are not protective, especially for the very young. [49] [50]

[49] See the August 2024 Environmental Defense Institute newsletter article, "Nuclear energy promotors continue to ignore adverse impacts to children and the unborn child," at http://environmental-defense-institute.org/publications/News.24.Aug.pdf

Despite decades of study of radiation effects on humans, and the knowledge that children and particularly, the unborn child is particularly vulnerable to radiation, the radiation protection standards used by the U.S. Department of Energy and by the U.S. Nuclear Regulatory Commission and by the U.S. Environmental Protection Agency fail to protect adults, as well as children and the developing child.

Radiological contamination affects adults and children. Radiological contamination affects the child developing *in utero* by the air, food and water consumed by the mother. In addition, egg and sperm of the parents are affected by radiological contamination in air, food and water and therefore, the not-yet-conceived child is also affected by radiological releases.

Birth defects, spina bifida, cleft palate, limb reduction defects, malformation of heat and central nervous system, anencephaly, neural tube defects, Down syndrome and congenital malformations were observed to increase after *in utero* exposure following the 1986 Chernobyl nuclear disaster. [51] But in addition to harm caused by exposure to the developing child *in utero*, harm can also occur from damage to the sperm or egg prior to conception.

The harm to the unborn child has been observed to occur at radiation doses far below the levels claimed by the International Commission on Radiological Protection (ICRP) that is used by the Navy, Department of Energy, Nuclear Regulatory Commission and other U.S. state and federal agencies. The ICRP continues to claim that doses below 10 rem would not harm the unborn child despite compelling and diverse evidence that harm is caused to the unborn child at doses far below 10 rem.

The study of meticulously monitored naval personnel found far higher cancer incidence than the general population, over 9 times the rates of cancer from what had been deemed low radiation doses. See the August 2024 EDI newsletter article "Navy's own data for over 65,000 individuals reveal that Naval personnel have cancer rates exceeding none times the national average and navy continues the gaslighting." [52] [53] [54] [55]

---

[50] See the August 2024 Environmental Defense Institute newsletter article, "Fukushima accident caused an increase in infant deaths, and more death closer to the accident," at http://environmental-defense-institute.org/publications/News.24.Aug.pdf

[51] Chris Busby et al., *Medicine, Conflict and Survival*, "The evidence of radiation effects in embryos and fetuses exposed to Chernobyl fallout and the question of dose response," 2009; Vol. 25. No. 1, January-March 2009, 20-40.

[52] See the August 2024 Environmental Defense Institute newsletter article "Navy's own data for over 65,000 individuals reveal that Naval personnel have cancer rates exceeding nine times the national average and Navy continues the gaslighting," at http://environmental-defense-institute.org/publications/News.24.Aug.pdf

[53] See the September 2024 Environmental Defense Institute newsletter article "Undocumented subtraction of elevated background can underestimate external radiation dose, according to energy worker compensation studies by NIOSH," at http://environmental-defense-institute.org/publications/News.24.Sept.pdf

[54] Chris Busby, *Counterpunch*, "Cancer in US Navy Nuclear Powered Ships," March 6, 2020. https://www.counterpunch.org/2020/03/06/cancer-in-us-navy-nuclear-powered-ships/

[55] Dose Assessment and Recording Working Group (DARWG) with support from the Defense Threat Reduction Agency (DTRA), Submitted by the Office of the Assistant Secretary of Defense for Health Affairs, Final Report to the Congressional Defense Committees in Response to the Joint Explanatory Statement Accompanying the

The navy's own data show that their estimate of the rate of cancer for naval personnel has been grossly underestimated. It remains to be sorted out to what extent the actual radiation doses were underreported, or the radiation health models were incorrect. Until the reasons for the 9-fold increase in the rate of cancer in naval personnel is explained, no one should be placing any confidence in currently used radiation health risk models used in the U.S.

Articles by Tami Thatcher for November 2024.

Thatcher has a Bachelor of Science degree in Mechanical Engineering and worked as an Advisory Engineer for a Department of Energy contractor, specializing in nuclear facility probabilistic risk assessment and safety analysis. For over a decade, she has studied and written about nuclear energy accidents and risks, Department of Energy nuclear facility accidents and risks, environmental contamination around the Idaho National Laboratory, radiation protection issues for workers and the public, INL legacy cleanup issues, and spent nuclear fuel and high-level waste storage and disposal issues.

Department of Defense Appropriations Act, 2014, page 90, "Radiation Exposure," June 2014. https://www.health.mil/Reference-Center/Reports/2014/06/19/Radiation-Exposure-Report