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Idaho Cleanup Project Citizens Advisory Board held a virtual meeting in August

The hope of an in-person meeting in Idaho Falls for the Department of Energy's Idaho Cleanup Project (ICP) Citizens Advisory Board (CAB) evaporated due to rising COVID cases and so the meeting held August 18 was a virtual meeting. [1]

While Fred Hughes of Fluor Idaho, the head of the current cleanup contractor for the Department of Energy participated in the meeting as he had since Fluor Idaho became the contractor, the meeting introduced Fluor Idaho's replacement, the Idaho Environmental Coalition, LLC (IEC) of Tullahoma, Tennessee. The Idaho Environmental Coalition includes Jacobs, North Wind Portage, Navarro Research and Engineering, Oak Ridge Technologies and Spectra Tech. Concerns over work force distraction and uncertainty due to the cleanup contract change were discussed at the meeting. A ninety-day transition period to the new cleanup contractor will take place starting October 1.

Although the State of Idaho Department of Environmental Quality has never stated it at an ICP CAB meeting, I discovered that in 2020 the State did issue a Notice of Violations (NOV) to Fluor Idaho over the four drums of hazardous chemical and radioactive waste that exploded at ARP-V in 2018. [2] The lapse of two years allowed Fluor Idaho's signatory Fred Hughes and Department of Energy signatory Rick Provencher to evade RCRA penalties like jail time for signing off on a RCRA hazardous waste document for a very unsafe process that included

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[1] Idaho Cleanup Project Citizens Advisory Board August 18, 2021 meeting agenda and presentations at https://www.energy.gov/em/icpcab/articles/icp-cab-meeting-materials-august-2021

[2] Department of Energy Occurrence Report, EM-ID—FID-RWMC-2020-0001, Notice of Violations (NOV) from Idaho Department of Environmental Quality Associated with ARP-V-Event. Description of Occurrence: On 03/16/2020 Fluor Idaho received a Notice of Violation (NOV) from the Idaho Department of Environmental Quality (ID-DEQ) for RCRA violations associated with the 04/11/2018 ARP-V drum overpressurization event (A repackaged sludge drum experienced over-pressurization, which ejected the drum's lid. Over the course of five hours, a total of 4 drums experienced the over-pressurization.) The ID-DEQ NOV letter consisted of eight violations presumably taken from RPT-1659, "Formal Cause Analysis for the ARP V (WMF-1617) Drum Event at the RWMC." The violations are as follows: Violation No. 1: Failure to Adequately Characterize Mixed Waste with Item Description Code SD-176, "Pre-1980 INL-Exhumed SDA Homogenous Solids"
Violation No. 2: Failure to Comply with Waste Acceptance Criteria and Miscellaneous Storage and Treatment Requirements for WMF-1617
Violation No. 3: Failure to Ensure Proper Operation and Maintenance
Violation No. 4: Failure to Minimize the Possibility of Fire, Explosion, or Sudden or Non-Sudden Release
Violation No. 5: Failure to Adequately Train Personnel - Waste Characterization and Operations
Violation No. 6: Failure to Adequately Train Personnel - Radiological Control Technicians
Violation No. 7: Failure to Comply with Emergency Coordinator Requirements
Violation No. 8: Failure to Comply with Container Management Requirements

blowing off the warnings given by in-house experts. The State of Idaho notice violations are in addition to the violations cited by the Department of Energy. [3]

Integrated Waste Treatment Unit (IWTU) Status

A status of the Integrated Waste Treatment Unit was given and the IWTU is not slated to begin treating radioactive material before October 1 but it could happen before Fluor Idaho's exodus. The Department of Energy's IWTU failed to meet its 2012 milestone to treat the liquid high-level radioactive sodium-bearing waste from spent nuclear fuel reprocessing at the Idaho National Laboratory's INTEC facility. Process Gas Filter re-design and testing and canister decontamination system testing have been completed. The facility has been in re-design and testing since 2012.

The roughly 900,000 gallons of radioactive liquid sodium bearing waste is currently stored in three stainless steel tanks within concrete vaults. The IWTU will create a dry powdery waste that is placed into canisters, with 16 canisters per vault and an unstated number of vaults being required for the treated sodium bearing waste storage.

Startup of radioactive operations at IWTU will begin with emissions testing to establish final air permit conditions with the State of Idaho using 100 percent sodium-bearing waste rather than the "simulant" used for testing the process. Based on past presentations to the CAB, details regarding the comprehensiveness of that testing or the monitoring for routine operations of IWTU have not been encouraging. It has been indicated that after during actual operations, alpha emitters such as plutonium would not be monitored despite the potential for variations in alpha emitting radionuclides in the different waste tanks and possible stratification of waste in the tanks. **The State of Idaho will usually emphasize that they have no enforcement authority concerning radioactive emissions.**

IWTU comments are due Sept 2 on the Department of Energy's extension of the time they expect it will take to treat the sodium-bearing waste.

Calcine Waste Status

The calcine, a dry, powdery radioactive high-level waste resulting from spent nuclear fuel reprocessing, was discussed and the methods of moving some the calcine to new bin sets is continuing. The technology that the Department of Energy stated it would use for disposal of the calcine is hot isostatic pressing (HIP), but the Department of Energy is reviewing possible alternative technologies from Savannah River such as Cold Crucible Induction Melter (CCIM).

Several years ago, when John Kotek, Nuclear Energy Institute, formerly of the Department of Energy, held public meetings on consent-based siting of spent nuclear fuel and high-level waste,

[3] U. S. Department of Energy website "Department of Energy Cites Fluor Idaho, LLC for Nuclear Safety Program Violations, November 20, 2020 at https://www.energy.gov/articles/department-energy-cites-fluor-idaho-llc-nuclear-safety-program-violations See also https://www.energy.gov/sites/prod/files/2020/11/f80/Preliminary%20Notice%20of%20Violation%20for%20Fluor%20Idaho_0.pdf

those meetings included actively promoting untruths about disposal of the calcine in granite in North or South Dakota even though both of those states had already refused to let the borehole research to be conducted. Even when Yucca Mountain was still considered a possibility, the calcine was a terrible waste form for disposal at Yucca Mountain because once the container is corroded the waste is highly soluble. And the packaging of the calcine via hot isostatic pressing was a billion dollars of technically risky and expensive work.

The calcine which are in stainless steel bins interconnected by piping inside partially below grade concrete silos are vulnerable to flooding and modest seismic events. These partially above and partially below ground facilities that won't continue to confine the highly radioactive and highly soluble powdery material in these conditions and the results are catastrophic and cannot be remediated. Whether the calcine is leaching into the aquifer or blowing in the wind, or both, will depend on the accident.

It is vitally important for the calcine to not continue to be stored in seismically and flood vulnerable bin sets at the INL. As a step in the right direction, it is a very important activity to move the calcine from the earliest vintage bin sets to newer bin sets that are less seismically fragile.

DOE Spent Nuclear Fuel Status

The Department of Energy is planning to move Peach Bottom fuel from older Generation-1 below grade dry storage vaults at CPP-749 to Generation-2 vaults because of moisture problems in the oldest concrete storage units. Fuel degradation status has not been discussed. And it was stated that "Equipment problems have delayed ATR transfers to CPP-603." This involves the transfer of ATR high enriched, high burnup fuel from CPP-666 wet storage to CPP-603 dry storage. The transfer of spent fuel from wet storage at INL facilities is about 61 percent complete and is to be completed by December 31, 2023, according to the Idaho Settlement Agreement.

About 0.03 metric tons heavy metal of nuclear fuel in the form of TRIGA elements used in research reactors have been shipped out of state for reuse.

There are about 220 different types of spent nuclear fuel at the Idaho National Laboratory and this wide diversity of spent nuclear fuel designs complicate packaging it to be "road ready" for the January 1, 2035 Idaho Settlement Agreement milestone to remove the naval spent fuel and other spent nuclear fuel from the state. INL's DOE spent nuclear fuel, about 268 metric tons heavy metal, was stated to be about 51 percent of the volume of spent fuel in the DOE Complex. Only the Fort St. Vrain and the Three Mile Island fuel is stored under an NRC license. The rest, even if from a commercial nuclear power plant, is only under Department of Energy oversight.

While the Navy has continued packaging their fuel for dry storage and shipment, there is no repository to send the fuel to and no clear design requirements. The Department of Energy has not been funding building a fuel repackaging facility which is believed to take 15 years to build and this does not include the time to repackage the fuel.

But there is a tremendous amount of work that needs to be done to be able to repackage and ship this spent nuclear fuel. Building a facility to repackage the fuel would take an estimated 15 years. The work to design the basket internals for each fuel type and to complete the design of a DOE standard canister to put the spent fuel into will also take considerable time and effort. Sitting back and doing nothing means leaving the spent fuel in Idaho in a variety of deteriorating storage conditions. The DOE is planning to design a Spent Nuclear Fuel Staging Facility to support a future spent nuclear fuel repackaging facility.

The NWTRB issued a report summarizing a multi-year review of Department of Energy spent nuclear fuel in December 2017. [4] The NWTRB report summarizes the issues of waste disposal and spent nuclear fuel with an emphasis on the storage at the Idaho National Laboratory, Hanford and Savannah River Site. Also see EDI the February 2021 newsletter for an overview of the spent nuclear fuel at the INL. [5]

The Department of Energy is seeking project funding for a concrete pad to place the spent fuel on, but is not yet seeking funding for a spent nuclear fuel repackaging facility. The Department of Energy is also reviewing whether there are new developments that would improve the existing Foster-Wheeler design which was approved by the U.S. Nuclear Regulatory Commission. **It is odd how the Department of Energy can commit to spending billions of dollars on advanced reactor research but can't see its way clear to address decades-old commitments to manage its spent nuclear fuel.**

The transfer of Experimental Breeder II reactor spent fuel from INTEC's CPP-666 to the Materials and Fuels Complex is continuing and it supports the recovery of uranium-235 at the Fuel Conditioning Facility for the High Assay Low Enriched Uranium (HALEU) fuel. This recovery results in enormously high radioactive emissions to the Idaho skies and the facility is located close to Idaho Falls. If not taken to the Fuel Conditioning Facility, the fuel is stored at the Radioactive Scrap and Waste facility which places the spent nuclear fuel and other radioactive wastes in metal cylinders in the ground, just below grade.

The INL's EBR-II fuel is the feedstock for its high-assay low-enriched uranium (HALEU), DOE/EA-2087, being pyroprocessed at INL's Materials and Fuels Complex and increasing the radiological airborne emissions from the INL 170-fold according to DOE/EA-2063. (See the Environmental Defense Institute February 2021 newsletter.) DOE plans to treat at least 165 pounds of sodium-bonded EBR II driver fuel pins into material for high assay low enriched uranium fuel production (HALEU) each year until all pins have been treated, no later than the end of 2028.

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[4] U.S. Nuclear Waste Technical Review Board, "Management and Disposal of U.S. Department of Energy Spent Nuclear Fuel – Report to the United States Congress and the Secretary of Energy," December 2017. http://www.nwtrb.gov/our-work/reports/management-and-disposal-of-u.s.-department-of-energy-spent-nuclear-fuel-(december-2017)

[5] See the February 2021 Environmental Defense Institute newsletter article by Tami Thatcher "Existing spent nuclear fuel, including commercial SNF at the Idaho National Laboratory on track to miss Idaho Settlement Agreement milestones," http://www.environmental-defense-institute.org/publications/News.21.Feb.pdf

Although there had been six DOE reportable occurrences since the beginning of May, the Department of Energy was mum on what any of them were. In particular, the Department of Energy was mum on the recent incident this June involving the shipment of spent nuclear fuel from INTEC to MFC where a spent fuel trailer carrying a non-DOT cask containing spent nuclear fuel became unhitched to the tractor that was towing it on an INL road. [6]

PCE Contamination Investigation in Westbay Wells

The Department of Energy made a presentation on the long investigation of the Westbay well perchloroethylene (PCE) contamination. This contamination was first detected back in 2016 and it was suggested that the tubing inside the special deep multi-level monitoring wells had been the source of the contamination. Now they suspect that the tanker truck used in construction of the wells was the source. Not explained in the presentation was that water had to be placed in the tubing inside the well and that this water had come from transporting water in a tanker truck from another INL well to the multi-level wells. The tubing water did not interface with the aquifer and should not have entered sampling bottles. However, it was admitted that inadvertent and unknown amounts of tubing water enter the sample bottles sometimes.

Not answered in the brief 20-minute presentation was how the tanker truck got contaminated with PCE. Public questioning was not allowed despite being ahead of schedule.

I have a few guesses. PCE is a degreaser. Greasy, oily messes result whenever spent nuclear fuel or irradiation targets, are dissolved in acid and then an oil like kerosine is added to extract uranium and plutonium. While concentrated chemical packages of waste have been disposed of at the INL over the Snake River Plain aquifer at the Radioactive Waste Management Complex, greasy messes would fowl up radioactive waste ponds and are not suited for resin-bed cleanup that could be used for the cleanup of liquid systems. So, there could have been the temptation to put greasy liquids in a tanker truck and haul them to an inconspicuous place to dump the liquid. Then PCE might have been used to rinse the tanker truck. Why would I have such a fantastic imagination? Because I have been told on more than one occasion that in the past, tanker trucks were seen parked in odd places where there was no known well or facility. I was only told this because spotting a tanker truck out in the desert had indicated to the witness that something odd was going on and perhaps radioactive liquid was being dumped onto the soil at the INL. The cover-up nature of the presentation and the undocumented extended investigation of the PCE

[6] Department of Energy Occurrence Report, EM-ID—FID-FUELRCSTR-2021-0001, Trailer Detaches from Tractor while Hauling Spent Nuclear Fuel Inside HFEF-14 Cask. Description of Occurrence: On Monday, June 28, 2021 a trailer being used to transport the spent nuclear fuel loaded Hot Fuel Examination Facility (HFEF)-14 cask detached from the tractor while on the haul road between the Idaho Nuclear Technology and Engineering Center (INTEC) and the Materials and Fuels Complex (MFC). The cask remained securely attached to the trailer and did not appear to have moved or have sustained any damage. Radiological Technicians that were accompanying the shipment performed surveys and found no detectable levels of contamination and confirmed that radiological levels were within limits, unchanged from pre-transport surveys. Mechanics were dispatched to inspect the tractor and trailer at the event site, but the visual inspection was unable to determine the cause of the trailer detaching from the tractor. They recommended that the tractor be taken to Central Facilities Area (CFA) for inspection and that the trailer king pin be inspected before hooking onto another tractor for transport.

discovery in the Westbay wells, Middle 2050A and Middle 2051, has only made me more suspicious.

The PCE contamination presentation titled "Westbay Well rehabilitation update" also did not address the effect on random amounts of tubing fluid on the quality of the contamination sampling results by the U.S. Geological Survey or why the problem took so long to detect, years after the wells were installed around 2005.

Idaho Leadership in Nuclear Energy (LINE) meeting emphasis on how to grease legislation for Advanced Reactors

The Idaho Leadership in Nuclear Energy (LINE) meeting held August 20 virtually using Webex was all about promoting "advanced reactors" and emphasized how to make legislative law changes to make sure all possible tax breaks are given to advanced reactor developers and that any regulatory impediments are removed. [7] Nothing negative about any proposed reactor, advanced or not-so-advanced was discussed during the LINE meeting. But you can find out about some of the disadvantages of nuclear energy by reading what Edwin Lyman of Union of Concerned Scientists has to say. [8] [9]

The Idaho LINE meetings have never been about truth or about balance — the meetings have always been about how to help the Idaho National Laboratory and the economic advantages of doing so.

This meeting was no different. Under the guise of finding clean energy solutions, the Idaho National Laboratory is all about finding solution — as long as the solution requires designing, testing or building a nuclear reactor. How long these solutions take and how much they cost, how polluting they are, how expensive it will be to attempt to isolate the spent nuclear fuel and the lack of any program by the Department of Energy for disposal of the spent nuclear fuel — does not appear to enter the equation.

The meeting started off with several enormous gloss-overs by Department of Idaho Operations Manager Robert Boston. It is really more concerning what he didn't say, than what he did say.

Boston said that INL will prove that nuclear energy can be deployed rapidly by its goal of commercializing the MARVEL reactor in three years. While multiple MARVEL reactors could be grouped together, he did not mention that a MARVEL reactor will produce less than 100 kW in electricity. The reality is that nuclear energy is far too slow to deploy and far too expensive to ever aid in addressing climate change. And the Department of Energy's approach of embracing

[7] Idaho Leadership in Nuclear Energy at https://line.idaho.gov/agendas-and-meetings/

[8] Elliott Negin, *Scientific American*, " 'Advanced' Nuclear Reactors? Don't Hold Your Breath," July 23, 2021. https://www.scientificamerican.com/article/lsquo-advanced-rsquo-nuclear-reactors-don-rsquo-t-hold-your-breath/

[9] 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. https://www.ucsusa.org/sites/default/files/2021-05/ucs-rpt-AR-3.21-web_Mayrev.pdf

each and every nuclear reactor design concept can only result in requiring more time and money wasted on nuclear reactors.

Boston said that the Department of Energy addresses seismic design issues for its nuclear facilities and that the Department of Energy was also helping NuScale, a not-so-advanced small modular reactor, by providing the ground motion studies.

He didn't mention that with all of the Department of Energy's excellent support, NuScale is on its third attempt to find a suitable location to build its small modular reactor at the Idaho National Laboratory. The reasons for abandoning the first location said to be due to seismic considerations; however, I have found only limited information about why the first and second proposed locations were abandoned.

Much work remains for the NuScale's seismic probabilistic risk assessment to be completed, including the need for soil and rock data from borehole drilling at the third proposed site.

The NuScale reactor is seismically vulnerable for several important reasons and will never be safe in any location. The reactor modules natural circulation doesn't work if the module tips over. The seismic design of the large building, the large crane and the very frequent lifting of reactor modules, up to 12 reactor modules to refuel and the tall sender upright reactor modules make for a seismically unsafe design overall.

The Department of Energy knows that virtually every tank and building build at the INL prior to the late 1990s was not adequately seismically designed due to its underestimating the seismic motion at the Idaho National Laboratory. This includes the Advanced Test Reactor, the Materials and Fuels Complex and the Idaho Nuclear Technology and Engineering Center (INTEC) where the calcine bin sets are located. The Department of Energy actually fraudulently approved MFC safety basis documents before 2005 which they have endeavored to upgrade, including the seismic studies, since then.

The Department of Energy's approach to seismic analysis of buildings and other problematic structures was to continue to say that they were still evaluating it. By using the strategy of indefinitely analyzing the problem, they could avoid telling the truth about significant seismic vulnerabilities at its nuclear facilities.

Boston stated that the environmental monitoring programs around the INL were good programs. He did not point out that the environmental monitoring studies that are conducted by the Department of Energy's contractor at IdahoEser.com are increasingly tardy. In mid-August 2020, the 2019 and 2020 annual reports were not available, nor the second, third and fourth quarters of 2019 available. (The 2019 Idahoeser.com reports became available in late August.) He did not discuss the continued contortions of the program to avoid detecting those radionuclides that could only come from Idaho National Laboratory effluents. He did not discuss why entire sample distributions are negative radioactivities, which are physically impossible but would occur when the blank is more radioactive than the sample. The negative radioactivities are

not real, but they can have a real influence on reducing stated average and peak contamination results in the monitoring program.

He said the aquifer monitoring shows that things are fine. But just because the most egregious aquifer contamination by the Department of Energy ceased in the 1980s at INTEC where deepwell injection of radioactive waste was a disposal solution, and much of the contamination have dispersed and has moved downgradient in the aquifer to the Magic Valley and to the Snake River, does not mean that the Department of Energy should be allowed to say that now everything is fine especially when its hand-maiden, the U.S. Geological Survey has used every mechanism at its disposal to contort, destroy, or avoid telling the true contamination levels in the aquifer when off of the INL site. As wells on the INL appear less contaminated, the long-lived radioactive and chemical contaminants flow south of the INL to communities and to the Snake River.

Robert Boston concisely addressed several of the key concerns the public might have, and he grossly misrepresented the reality in each case.

But on a brighter note, Boston said that the Department of Energy was going to try to help locate funding for upgrades for the Mackay dam, which if it floods will not only wipe out the town of Mackay, it will flood nuclear facilities on the INL such as the Three Mile Island spent nuclear fuel and other spent fuel storage and also the calcine bin sets and the Advanced Test Reactor. The Mackay dam was designed and partially built to one design and then the design was modified although not documented adequately. It is a poorly designed and poorly maintained dam that poses high risk to the INL and it really must be addressed while the water levels are low as they are now during the current drought.

The LINE meeting included a representative of Rocky Mountain Power, now owned by Warren Buffet and their recent agreement with Bill Gates' Terra Power to build a sodium-cooled reactor in Wyoming. [10] I have to say that this is an extremely sad development that I fear will cause serious increases in the price of electricity.

According to the TerraPower website, the Natrium reactor project slated for Wyoming will feature a 345 MW sodium-cooled fast reactor with a molten salt-based energy storage system that can boost the system's output to 500 MW for more than five and a half hours when needed. [11] The Department of Energy is to provide several billion dollars for the project. [12]

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[10] Joseph Guzman, Thehill.com, "Bill Gates, Warren Buffett building nuclear reactor in nation's biggest coal-producing state – An advanced nuclear reactor will be built in Wyoming, June 3, 2021. https://thehill.com/changing-america/sustainability/energy/556702-bill-gates-and-warren-buffett-building-nuclear-reactor

[11] TerraPower, "Natrium ™ Reactor Demonstration Project Will Bring Clean Energy and Jobs to the State, web page dated June 2, 2021. https://www.terrapower.com/natrium-demo-wyoming-coal-plant/

[12] U.S. Department of Energy, "U.S. Department of Energy Announces $160 Million in First Awards under Advanced Reactor Demonstration Program, October 13, 2020. https://www.energy.gov/ne/articles/us-department-energy-announces-160-million-first-awards-under-advanced-reactor DOE is awarding TerraPower LLC (Bellevue, WA) and X-energy (Rockville, MD) $80 million each in initial funding to build two advanced nuclear

Amid the hyperventilating talk at the LINE meeting by the speakers and the evasion of any meaningful adult discussion of the spent nuclear fuel waste problem, there was not much said about the Versatile Test Reactor not being funded for 2022.

No funding has been included for the Versatile Test Reactor for 2022, [13] [14] a sodium-cooled fast neutron test reactor, that uses electricity but does not generate electricity. The VTR was to have been completed as soon as 2027, but it now appears that a decision on whether or not to build it may not be made by then.

The VTR promotors claim that it is needed for testing for the new advanced reactors designs needed to address climate change. Yet they are saying that DOE will provide generous funding for and build both the TerraPower Natrium sodium-cooled fast reactor and X-energy's XE-100 high temperature gas cooled reactors before the VTR would be available. But if the Natrium is to built as soon as proponents are claiming, then it can be built without the additional experimental test data from the VTR.

Arguments are being made that VTR is "crucial" for U.S. national security, apparently because Russia has a test reactor for fast neutron spectra. [15] [16] Any argument that users will pay for the use of the VTR facility would be in denial of the reality of nuclear materials testing conducted in the past — the money pays for preparing the experiment and rarely if ever contributes anything toward the construction or the operational costs of the nuclear test reactor. An argument that the VTR is needed for addressing climate change is simply ignoring the time frame that solutions are needed. The nuclear industry uses climate change as a selling point to get nuclear reactor funding and I see no evidence that the Department of Energy and the nuclear industry can design and construct these reactors in a time frame fast enough to be relevant to climate change. The Department of Energy has had the lead in foot dragging and delaying the work to obtain affordable and rapid solutions because no solution is satisfactory unless it includes major nuclear funding.

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reactors that can be operational within seven years. The awards are cost-shared partnerships with industry that will deliver two first-of-a-kind advanced reactors to be licensed for commercial operations. The Department will invest a total of $3.2 billion over seven years, subject to the availability of future appropriations, with our industry partners providing matching funds.

[13] American Nuclear Society, NuclearNewswire, "House appropriators pass bill with more funding for nuclear energy," July 19, 2021. https://www.ans.org/news/article-3082/house-appropriators-pass-bill-with-more-funding-for-nuclear-energy/ The bill generously funded all things nuclear except it allocated $0 for the Versatile Test Reactor rather than the requested $145 million for 2022.

[14] House of Representatives, 117th Congress, Report 117-98, Energy and Water Development and Related Agencies Appropriations Bill, 2022, July 20, 2021. https://www.congress.gov/117/crpt/hrpt98/CRPT-117hrpt98.pdf

[15] *ANS Nuclear Café*, "The VTR is "crucial" for U.S. national security, Atlantic Council leaders contend," August 4, 2021. https://www.ans.org/news/article-3128/the-vtr-is-crucial-for-us-national-security-atlantic-council-leaders-contend/

[16] Thomas Graham Jr. and Richard W. Mies, *The National Interest*, "The Versatile Test Reactor is Crucial for U.S. Global Leadership in Nuclear Energy," August 3, 2021. https://www.ans.org/news/article-3128/the-vtr-is-crucial-for-us-national-security-atlantic-council-leaders-contend/

Arguments for canceling the Versatile Test Reactor are made by Edwin Lyman [17] including the real concern that nuclear reactors are too slow to deploy and therefore may not be relevant to solving climate change. And he points out that the Natrium reactor has serious safety flaws and actually uses more uranium than current reactors for the same amount of electricity.

Idaho Department of Environmental Quality Downplays the High Levels of Radioactivity Detected in 2019 from the INL

The Idaho Department of Environmental Quality's 2019 annual surveillance report for the Idaho National Laboratory and surrounding areas [18] continued the usual statements that the radioactivity detected in its air monitoring program, stating "These values are within the expected range due to global fallout from historic above-ground nuclear weapons testing."

While you wouldn't know it by looking only at the 2019 report, the DEQ detected higher than typical strontium-90 and cesium-137 in its air monitoring program during 2019.

Unlike other years where strontium-90 was rarely detected in the analysis of air filter composite samples, the DEQ detected strontium-90 at all eleven station locations in 2019. **The maximum concentration of strontium-90 in 2019 was 148.4 plus-or-minus 36.6 attoCuries per cubic meter (aCi/m^3), nearly a factor of 10 higher than average detections in the DEQ annual reports made publicly available.** [19] In many years, DEQ's composite filter monitoring might have only a single detection of Sr-90, and the average value when detected is about 15 aCi/m^3. The other highest detected Sr-90 value since 2013 was 23.2 plus-or-minus 9.1 aCi/m^3 at the Rest Area (near the Radioactive Waste Management Complex) in 2013.

In 2019, the DEQ found its first detection of cesium-137 in its air monitoring program since 2013, with a detection of 130 ± 50 attoCuries/m^3. The highest value of Cs-137 in air detected by the Environmental Protection Agencies Radnet monitoring of Idaho Falls, in the last thirty years was 6.6 attoCuries/m^3. The Radnet values for Idaho Falls during 1986, the year of the Chernobyl accident were far higher, in many thousands of attocuries despite the INL's claim during its *Chernobyl Talks* that Chernobyl fallout was not detected at the INL.

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[17] Edwin Lyman, Opinion Contributor, The Hill, "It's time to cancel the Versatile Test Reactor," July 27, 2021. https://thehill.com/opinion/energy-environment/565024-its-time-to-cancel-the-versatile-test-reactor

[18] Department of Environmental Quality Idaho National Laboratory Oversight Program, *DEQ-INL Oversight Program Annual Report 2019*, undated. Accessed August 2021 at https://www.deq.idaho.gov/idaho-national-laboratory-oversight/inl-oversight-program/monitoring-activities/ Note that the detailed air monitoring filter analysis results are reported in the first quarter of the following year, so 2019 filter particular results would be reported in the first quarter report of 2020. The dates that the reports are issued is not being recorded by DEQ but typically lag by months or over a year after the time the monitoring was conducted.

[19] Radiological air monitoring of gross alpha and gross beta are reported in a variety of units: 1.0 femtoCuries/cubic meter (fCi/m3) which is equal to 1.0E-15 Ci/m3 which is also equal to 1.0E-15 microcuries per milliliter (uCi/mL). Similarly, air filter particulate results are reported in a variety of units: 1.0 attoCuries/cubic meter (aCi/m3) which is equal to 1.0E-18 Ci/m3 which is also equal to 1.0E-18 microcuries per milliliter (uCi/mL). Note that there are 1000 milliLiters in 1 liter and there are 1000 liters in 1 cubic meter.

The air monitoring program includes the monitoring of gross alpha and gross beta radiation in air. Is it any wonder that the DEQ detected the highest concentration of gross beta in its air monitoring program available online was detected in 2019 at 167.8 femtoCuries/m^3? The average value for gross beta in air for 2013 to 2018 was less than 32 femtoCuries/m^3, although there was a peak in 2015 of 155.2 femtoCuries/m^3.

In the air filter particulate analysis for plutonium and americium, however, the DEQ found 2019 values that were oddly low. The DEQ does not acknowledge that the results for plutonium-238, plutonium-239 and americium-241 were more than a factor of 10 below its data from 2013 to 2018. The 2019 filter results are reported in detail in a quarterly report and summarized in the annual report. The filter results are normally reported in attoCuries per cubic meter (or 1.0E-18 curies per cubic meter) but in 2019, the DEQ reported the detailed filter results in femtoCuries per cubic meter (or 1.0E-15 curies per cubic meter). A value of 1000 aCi/m^3 is equal to 1 fCi/m^3. The DEQ used the usual attoCuries per cubic meter when stating the filter results for Pu-238, Pu-239 and Am-241 in the annual report. While the detailed and the annual report are in agreement, although expressed in different units, there appears to be a problem in the results. The DEQ, upon my query, was not aware of any analytical improvements that would have increased its detection capability for the actinide filter analysis. If the DEQ's Pu-238, Pu-239 and Am-241 results for 2019 are correct, then the values have markedly decreased in 2019. But I suspect that the results are actually mis-recorded and are 10 times higher than stated. This would mean that the Pu-239 and Am-241 peak values in 2019 are double the average values from recent years. The range of Pu-239 detection values from annual air filter particulate analysis from 2013 to 2018 was 0.9 ± 1.3 aCi/m^3 to 4.9 ± 2.6 aCi/m^3, while the DEQ's oddly low reported concentrations for Pu-239 in 2019 ranged from 0.3 ± 0.2 aCi/m^3 to 0.7 ± 0.5 aCi/m^3.

Edwin Lyman, Union of Concerned Scientists, calls out increased fission product releases from the Idaho National Laboratory's Advanced Reactor Test due to testing of TRISO fuel. Elevated fission product releases were discussed in TRISO fuel presentations for the fourth quarter of 2019. [20] [21]

The environmental monitoring at the INL reveals very elevated radionuclides in air, with far higher gross beta levels detected on the INL site at the Experimental Field Station. Correspondingly, there are missing weeks of air monitoring data at Howe, Idaho, north of the Advanced Test Reactor.

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[20] 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. https://www.ucsusa.org/sites/default/files/2021-05/ucs-rpt-AR-3.21-web_Mayrev.pdf

[21] Joe Palmer, Idaho National Laboratory, Presented at the Gas-Cooled Reactor Program Annual Review July 14, 2020 via Videoconference from the Idaho National Laboratory, *AGR-5/6/7 Irradiation Summary as of the End of Cycle 167A*, https://art.inl.gov/Meetings/GCR%20Program%20Review%20July%202020/Presentations/Session%202/04_PALMER_AGR%205-6-8%20Irradiation%20Summary.pdf Plots huge increase in gamma counts from the end of Cycle 166A, around September 30 through October 7, 2019. Maximum 95,535.81 counts per second.

The quarterly reports for 2020 show that the State of Idaho's environmental monitoring program for air monitoring in Idaho Falls did not collect any radiological air monitoring data from July 1 to September 18 in 2020. [22]

Despite having some strong program elements, the DEQ is trying too hard to not attribute elevated radiological detects to the Idaho National Laboratory when the radiological contamination is certainly due to INL operations.

The DEQ is actively downplaying Idaho National Laboratory elevated radiological emissions and the citizens of Idaho deserve what the DEQ purports to provide, an honest and effective radiological monitoring program.

INL's Radionuclide Emissions in 2019, Unusual and Elevated Levels of Uranium-234, Uranium-238, Zinc-65 and Chlorine-36

The Department of Energy's Idaho National Laboratory environmental surveillance contractor, which varies every few years, puts the quarterly and annual reports on the Idahoeser.com website. [23]

The monitoring program includes various kinds of radiological and chemical contaminant monitoring both on and off of the INL site. The INL airborne effluents as estimated by Battelle Energy Alliance and the Idaho Cleanup Project are stated in the annual report and based on those, the estimated maximum radiation dose from air immersion, air inhalation and from ingestion is estimated for the "maximally exposed individual" called the MEI.

Each facility at the INL releases a variety of radionuclides and often in curie amounts that vary from year to year. Since 2000, the total curies released from the INL has ranged from 1330 curies to 16,833 curies. The estimated radiation dose to the MEI has ranged from 0.008 mrem to 0.131 mrem. And the radionuclides that are the dominant contributors to the radiation dose tend to shift considerably from year to year. Reactor operations release tritium, argon-41, iodine-131, chromium-51 and other radionuclides; irradiated material processing releases actinides, fission products and cladding activation products, fuel processing releases krpton-85 and other radionuclides, cleaning up nuclear weapons production waste from Rocky Flats involves actinides such as americium, plutonium and uranium, and we are discovering what the recovery of enriched uranium from Experimental Breeder Reactor II (EBR-II) fuel involves releasing as the high-assay low-enriched uranium fuel process ramps up at the Materials and Fuels Complex.

In 2019, INL's releases of uranium-234 and uranium-238 releases skyrocketed, as did the release of zinc-65 and chlorine-36. The release of cesium-137 was about 10 times higher than

[22] See the rarely trended and ever-shrinking set of INL environmental monitoring reports by the Idaho Department of Environmental Quality as decades of monitoring reports are no longer online at https://www.deq.idaho.gov/idaho-national-laboratory-oversight/inl-oversight-program/monitoring-activities/

[23] Department of Energy's contractor for Environmental Monitoring for the Idaho National Laboratory and surrounding areas at http://idahoeser.com/Publications.html

previous recent years and strontium-90 releases remained high. INL's Materials and Fuels Complex was the primary source of these radionuclides, and the MFC is located far closer to Idaho Falls than the Advanced Test Reactor, Idaho Nuclear Technology and Engineering Center (INTEC) or the Radioactive Waste Management Complex. (That is why it is especially concerning when the Idaho DEQ collected no air monitoring data in Idaho Falls from July to September in 2020 but the complete annual reports for 2020 are not yet available.)

The variety of radionuclides released from INL's nuclear facilities includes many dozens of radionuclides, but there are 20 radionuclides that have been the main contributors to the estimated dose, see Table 1. These are tritium, carbon-14, chlorine-36, argon-41, chromium-51, cobalt-60, zinc-65, krypton-85, strontium-90, antimony-125, iodine-129, iodine-131, cesium-137, plutonium-238, plutonium-239, plutonium-240, plutonium-241, americium-241, uranium-234 and uranium-238. In Table 2, I show the dominant radionuclides contributing to radiation dose from INL airborne effluents for 2015 and 2019.

Extremely long-lived radionuclide iodine-129, with a 16 million year half-life, continues to be steadily released from spent fuel at INTEC, primarily from Three Mile Island Unit II spent nuclear fuel debris that the Department of Energy brought to Idaho, graciously sparing people living around the failed reactor in Pennsylvania. The low energy beta emitter is difficult to detect in the environment, but finds its way into living tissue.

High energy gamma emitter iodine-131 has a short half-life of about 8 days, but it is pervasively released from Advanced Test Reactor operations. The thyroid absorbs the radioactive iodine and is also affected by other radionuclides introduced to the body by inhalation or ingestion. All of the counties surrounding the INL have had over a decade of twice the incidence of thyroid cancer than the rest of Idaho or the rest of the country. (Read about thyroid cancer in the Environmental Defense Institute July 2020 newsletter article "Troubling Increases in U.S. Thyroid Cancer Incidence Rates' and Counties Around the Idaho National Laboratory Roughly Double State and National Thyroid Cancer Rates."

Radiation dose in rem is based on absorbed dose, the decay of the radionuclide, the biological retention of the radionuclide and qualitative judgment by people in the nuclear industry that death by cancer would occur due to irradiation of that organ. In other words, the millirem dose understates the true overall harm to health from harm to the immune system, increased rates of heart disease, all other illnesses and shortened life span.

The dilution of the radionuclides in air is highly averaged and not based on the reality of actual plume movement and rain-out. Nothing about the radiation dose is nearly as precise or conservative as the Department of Energy would like it to appear. The Department of Energy's Idahoeser reports of environmental monitoring continually compare the radiation dose to what it deems the limit on exposure to the public, 100 mrem/yr. In fact, the U.S. Environmental Protection Agency limit on dose to the public is 10 mrem/yr. In no way is 100 mrem/yr a benign value that could be exceeded year after year without causing a health catastrophe especially for mothers, children and the unborn.

Table 1. The top twenty radionuclides that tend to be the main contributors to estimated radiation dose from airborne radionuclide effluents at the Idaho National Laboratory.

Radionuclide	Half-life	100 mrem per year "Derived Concentration Guide" inhalation of air, uCi/mL	100 mrem per year "Derived Concentration Guide" in water, uCi/mL	Common source of the contaminant
Tritium (H-3)	12.3 year	2.1E-7 (water vapor)	1.9E-3	Advanced Test Reactor, INTEC. A 10 year high of 1600 curies in 2008.
Carbon-14	5,700 year	6.6E-10	6.2E-5	Spent fuel, cladding and reactor coolant
Chlorine-36	301,000 year	1.0E-10	3.2E-5	
Argon-41	1.83 hour	1.4E-8 for cloud immersion	-	Advanced Test Reactor
Chromium-51	27.7 day	9.4E-8	7.9E-4	Advanced Test Reactor
Cobalt-60	5.27 year	1.2E-10	7.2E-6	Irradiation target cladding
Zinc-65	244 days	1.6E-9	8.3E-6	Irradiation target cladding
Krypton-85	10.7 year	3.6E-6 for cloud immersion	-	Spent fuel dissolution
Strontium-90	28.6 year	2.5E-11	1.1E-6	Various
Antimony-125	2.73 year	3.1E-10	2.7E-5	INTEC
Iodine-129	16,000,000 year	1.0E-10	3.3E-7	Rather steady and continuing releases from INTEC TMI-2 fuel and stack
Iodine-131	8.04 day	4.1E-10	1.3E-6	Advanced Test Reactor
Cesium-137	30.2 year	9.8E-11	3.0E-6	Various and now especially MFC
Plutonium-238	87.7 year	3.7E-14	1.5E-7	Various
Plutonium-239	24000 year	3.4E-14	1.4E-7	
Plutonium-240	6580 year	3.4E-14	1.4E-7	Decays to radium-228
Plutonium-241	14.35 year	1.8E-12	7.6E-6	Decays to Am-241
Americium-241	458 year	4.1E-14	1.7E-7	

Uranium-234	246,000 year	4.0E-13	6.8E-7	MFC
Uranium-238	4.47E9 year	4.7E-13	7.5E-7	MFC

Table notes: For the 100 mrem/yr "Derived Concentration Guide" values for air and water, see Department of Energy DOE-STD-1196. But note that the limit on radiation dose from airborne emissions is actually 10 mrem/yr. The unit uCi/mL stands for microcurie/milliliter, or 1.0E-6 curie/liter. Note that all plutonium, americium and uranium isotopes decay through a long series of radioactive decay products. The Idahoeser.com report for 2019 did not include chlorine-36 or uranium derived dose concentration data.

Table 2. Radionuclides contributing to estimated radiation dose from airborne radionuclide effluents at the Idaho National Laboratory for 2015 and 2019.

Radionuclide	**Curies released by INL in 2015**	**2015 MEI mrem due to INL air effluents**	**Curies released by INL in 2019**	**2019 MEI mrem due to INL air effluents**
Tritium (H-3)	532	0.0111	450	0.0011
Carbon-14	0.988		0.683	
Chlorine-36	-		7.19E-3	0.0035
Argon-41	561	0.0025	884	
Chromium-51	-		-	
Cobalt-60	1.30E-2		8.22E-3	
Zinc-65	3.26E-5		0.16	0.0019
Krypton-85	733		51.1	
Strontium-90	3.05E-2	0.0020	2.36E-2	
Antimony-125	7.33E-4		-	
Iodine-129	2.15E-2	0.0037	1.31E-3	
Iodine-131	1.1E-2		9.0E-2	
Cesium-137	0.0239	0.0010	0.267	0.0314
Plutonium-238	1.33E-4		-	
Plutonium-239	6.73E-4	0.0019	1.94E-5	
Plutonium-240	1.90E-4	0.0004	1.88E-6	
Plutonium-241	4.19E-3		-	
Americium-241	3.36E-3	0.0093	7.19E-5	
Uranium-234	-		5.88E-2	0.0430
Uranium-238	-		1.29E-1	0.1124
		Total 0.033 mrem, 2015		Total 0.0588 mrem, 2019

Table notes: MEI is the hypothetical maximally exposed individual located near the Idaho National Laboratory residing south of the INL near the Big Southern Butte. A mrem is the annual radiation dose in units of millirem, or 1.0E-3 rem. The source data for the radionuclide curie releases and the estimated radiation dose is from the Department of Energy's Idahoeser.com website for those years.

In order to keep the annual doses below 10 mrem/yr from airborne emissions, it is important to keep the annual estimated doses below 1 mrem/yr because these seemingly insignificant and low mrem doses understate the harm of these radiological emissions.

The harm from radionuclides incorporated into the bodies tissues is known by many independent experts to be 10 to 100 to 1000 more harmful than the 1 mrem dose would indicate. The difference between the harm of external radiation and internal radiation is actually conjecture and many experts know that the way external and internal radiation are currently equated is not valid.

In past newsletters I've talked about the increased vulnerability of females, children and the unborn to radiation. I've also pointed out the increased cancers, especially in children in the counties surrounding the INL.

Comparing external radiation to internal radiation from inhalation and ingestion of radionuclides is like the difference between a random shoot being fired and hitting you versus a bomb placed underneath your car with you in it. Which would you rather take your chances with? The internal radionuclide in your muscle, in your bone marrow, in your gonads, in your DNA is a like a bomb well-placed to ensure that damage will be caused.

The continued and chronic releases of radionuclides from the INL since about 1952 continue to build up long-lived radionuclides in southeast Idaho. Some of these radionuclides are very difficult to detect, like iodine-129. Others are not monitored like uranium and its decay products, traditionally under the guise that any uranium or thorium is naturally occurring. The uranium released by the INL is not of the same particle size or chemical form as natural uranium and likely to cause far more harm that the official predictions indicate. Troops returning from war in the Middle East had illnesses and increased cases of birth defects likely resulting from the exposure to airborne depleted uranium.

Articles by Tami Thatcher for September 2021. (Minor editorial corrections have been made since the initial release.)