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Nuclear promotion bill (ADVANCE) snuck into a Fire Protection bill (S.870) passes, further undermines nuclear regulatory oversight in the U.S.

The Senate passed S.870, the bill originally "An Act to amend the Federal Fire Prevention and Control Act of 1974 to authorize appropriations for the United States Fire Administration and firefighter assistance grant programs," but hijacked by nuclear boosters' pro-nuclear ADVANCE act bill. To make sure few people understood what was in the bill, the 93-page ADVANCE bill had to be snuck into the 3-page Fire Grants and Safety Act. [1] [2]

Dr. Edwin Lyman of Union of Concerned Scientists has this to say about the ADVANCE Act: *"It's extremely disappointing that, without any meaningful debate, Congress is about to erase 50 years of independent nuclear safety oversight by changing the NRC's mission to not only protect public health and safety but also to protect the financial health of the industry and its investors. Just as lax regulation by the FAA – an agency already burdened by conflicts of interests – can lead to a catastrophic failure of an aircraft, a compromised NRC could lead to a catastrophic reactor meltdown impacting an entire region for a [many] generation."*

"Make no mistake: This is not about making the reactor licensing process more efficient, but about weakening safety and security oversight across the board, a longstanding industry goal. The change to the NRC's mission effectively directs the agency to enforce only the bare minimum level of regulation at every facility it oversees across the United States."

Passage of this legislation will only increase the danger to people already living downwind of nuclear facilities from a severe accident or terrorist attack, and it will make it even more difficult for communities to prevent risky, experimental reactors from being sited in their midst."[3]

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[1] David Kraft, Nuclear Energy Information Service, Press Statement: Senate Nuclear Fetishists Take Lid Off of Pandora's Box, June 19, 2024, https://neis.org/press-statement-senate-nuclear-fetishists-take-lid-off-of-pandoras-box/

[2] See Accelerating Deployment of Versatile, Advanced Nuclear for Clean Energy (ADVANCE) Act, or https://docs/house.gov/billsthisweek/20240506/S 870 Peters updated.pdf and https://www.congress.gov/bill/118th-congress/senate-bill/870

[3] Edwin Lyman, Nuclear Power Safety Director, Union of Concerned Scientists, "'ADVANCE Act' Actually a Retreat on Nuclear Power Safety," June 17, 2024. https://www.ucsusa.org/about/news/advance-act-retreat-nuclear-power-safety

Congress has passed other recent legislation for nuclear reactors that use high-assay low-enriched uranium (HALEU) fuels that are more highly enriched in uranium-235 and create enormous nuclear weapons material proliferation problems: The 2020 Energy Act, directed DOE to share HALEU with private companies; and in October 2020, DOE announced a 50% cost-sharing program for two demo reactors, the X-energy high-temperature gas-cooled reactors and the sodium-cooled fast neutron reactor by TerraPower called Natrium. The Inflation Reduction Act of 2022 appropriated $700 million to develop civilian supplies of HALEU and the Consolidated Appropriations Act, 2024, added $2.72 billion more for LEU and HALEU.

A recent article by Scott Kemp, Edwin Lyman and others explains that nuclear fuel enrichment above 10 percent creates a proliferation problem and HALEU can be enriched to almost 20 percent. As little as 1000 kg (or 1 metric ton) of HALEU can be used to make a nuclear weapon. [4]

The high-temperature gas-cooled reactors (HTGRs) being promoted by the Department of Energy and Congress have a long history of uneconomic operation leading to premature permanent shutdown. [5] There is no practical reprocessing technology for the TRISO fuel for HTGRs that uses HALEU feedstock. And the HTGRs require refined carbon (graphite) that the main source is from China. The sodium-cooled fast reactors like TerraPower's Natrium have a long history of poor reliability. The sodium-cooled fast reactor built in France managed to be operated only 8 percent of the year and is considered very successful for that type of problem-prone reactor.

The Experimental Breeder Reactor – II (EBR-II) operated from 1965 to 1994 could provide about 19 megawatts-electric (MWe) to be utilized by the INL. [6] Some of the waste from EBR-II is being treated at INTEC, while EBR-II driver fuel is being pyroprocessed to make HALEU at INL's Materials and Fuels Complex and increasing the radiological airborne emissions from the INL 170-fold based on DOE/EA-2063. 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.

As nuclear weapons proliferation issues would be greatly increased in the U.S., the nuclear promotors also want HALEU-fueled reactors to operate other countries, further spreading the nuclear waste and nuclear weapons proliferation problems. Pyroprocessing facilities also worsen nuclear weapons proliferation problems.

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[4] R. Scott Kemp, Edwin S. Lyman, Mark R. Deinert, Richard L. Garwin, and Frank N. Von Hippel, *Science*, "The weapons potential of high-assay low-enriched uranium," June 6, 2024. https://www.science.org/doi/10.1126/science.ado8693

[5] M. V. Ramana, *Bulletin of the Atomic Scientists*, "The checkered operational history of high-temperature gas-cooled reactors," 72:3, 171-179, 2016. See nuclearfreenw.org or http://dx.doi.org/10.1080/00963402.2016.1170395

[6] Susan M. Stacy, *Proving the Principle – A History of The Idaho National Engineering and Environmental Laboratory 1949-1999*, Idaho Operations Office of the Department of Energy, DOE/ID-10799, 2000. p. 165 describes the EBR-II reactor but incorrectly overstates its electrical generation capacity as 62.5 megawatts. The EBR-II was a 62.6 megawatt (thermal) reactor with a 19 megawatt electrical generation capacity.

The AVANCE bill also allows the sell of nuclear facilities in the U.S. to foreign countries. This allows profit-seeking nuclear promotor's like TerraPower's Bill Gates to pilfer tax payer money via the Department of Energy, get free and false advertising from the Department of Energy, premature licensing approvals by the U.S. Nuclear Regulatory Commission, and then turn around and sell their unsafe and unreliable nuclear reactors that operate in the U.S. to foreign countries, and profit from the shoddy mess they have created.

So-called "advanced" nuclear reactors are not proven to be as safe as conventional reactors, let alone safer. [7] [8] Putting pressure on the U.S. Nuclear Regulatory Commission to shortcut nuclear reactor regulation will further undercut safety of nuclear reactors, whether large, small, or micro- sized. Cutting the regulatory costs will do little to lower the construction costs and won't lower the costs of managing and disposing of the spent nuclear fuel.

Small and micro-sized reactors do not reduce the "back-end" nuclear waste problems – they increase the nuclear waste problems. Reprocessing is polluting and expensive. The potential ability of a deep geologic repository to safely confine the waste remains a speculative and obscenely expensive experiment. Replacement power for nuclear energy will remain needed for unreliable nuclear energy when safety or reliability problems arise. And despite the hype, nuclear energy deployment will rely on fossil fuel plants. The so-called advanced reactors remain vulnerable to terrorism and warfare. Routine radiological emissions from nuclear plants have already caused more health harm to Americans than the nuclear industry is admitting.

Compensation for the property damage and health harm to citizens adversely affected by radiological releases may be nil, especially for reactor modules below 100 MWe based on the Price Anderson Act. The plethora of technically immature advanced reactors being promoted by the Department of Energy assures only the maximum burden on the U.S. taxpayer, and is a diversion away from appropriate solutions.

Every legislator who voted for the promotion of nuclear energy should have to answer why they are promoting reckless spending on nuclear energy that won't combat climate change. The twenty questions I think legislators should have to answer are listed in my newsletter last August 2023. [9]

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[7] Edwin Lyman, *Union of Concerned Scientists*, "'Advanced' Isn't Always Better – Assessment the Safety, Security, and Environmental Impacts of Non-Light-Water Nuclear Reactors, March 18, 2021. https://www.ucsusa.org/resources/advanced-isnt-always-better

[8] Frank von Hippel, *Bulletin of the Atomic Scientists*, "Bill Gates' bad bet on plutonium-fueled reactors," March 22, 2021. https://thebulletin.org/2021/03/bill-gates-bad-bet-on-plutonium-fueled-reactors/#post-heading

[9] Environmental Defense Institute, Special addition to the August 2023 newsletter on August 8, 2023 (with subsequent updates), "Top Twenty Questions About Expanding Nuclear Energy," August 8, 2023 at http://www.environmental-defense-institute.org/publications/News.23.AugustTwenty.pdf

Department of Energy's Paul Murray talks about DOE's focus on making the public comfortable with spent nuclear fuel

A video by the American Nuclear Society included discussion of how the long-term management of spent nuclear fuel remains a fundamental challenge for nuclear, now and in the future. The former ANS president Steve Nesbit moderated the presentation. Nesbit stated that the U.S. nuclear repository program is at an impasse and that there is no work on Yucca Mountain or any other repository site.

In the video presentation of Department of Energy's Paul Murray, Deputy Assistant Secretary for Spent Fuel and Waste, DOE Nuclear Energy, formerly of Orano, admits that there is no repository site, design or program. [10]

In the program, Murray is asked various questions about the status of the DOE's spent nuclear fuel repository status and nuclear energy. Murray stated that Congress has mandated that DOE focus on obtaining one or more federal consolidated interim storage facilities. DOE is designing a consolidated interim storage facility and Murray said he expects one to be built by the last 2030s.

The Blue-Ribbon Commission report had recommended consolidated interim storage of spent nuclear fuel. In 2010, President Obama created the Blue-Ribbon Commission on America's Nuclear Future and the commission issued its report in 2012. The BRC's strategy included "**prompt efforts** to develop one or more geologic disposal facilities" and "p**rompt efforts** to develop one or more consolidated interim storage facilities." [11] DOE is ignoring the BRC commission report recommendation to site and develop one or more geologic disposal facilities.

While DOE gives excuses that it can only do what Congress appropriates money to, the DOE is ignoring existing Nuclear Waste Policy Act restrictions regarding federally owned consolidated storage of commercial spent nuclear fuel. Existing law limits the size of consolidated storage and ties it to obtaining a construction license for a permanent repository. The existing law is being ignored by DOE, as it promotes new nuclear reactors that greatly expand not only the metric tons of spent fuel from new reactors, but more canisters and more space in a repository will be disproportionately required due to the higher enrichment and high burnup. The nuclear waste from the variety of small modular reactors (water-, molten-salt-, and sodium-cooled SMR designs) can be expected to "increase the volume of nuclear waste in need of management and disposal by factors of 2 to 30" for each megawatt produced. [12]

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[10] See American Nuclear Society, "Spending Time on Spent Nuclear Fuel with the Department of Energy," February 12, 2024. Video presentation with former ANS President Steve Nesbit and DOE's Paul Murray at https://www.ans.org/webinars/view-snfdoe/

[11] Blue Ribbon Commission on America's Nuclear Future, "Report to the Secretary of Energy," January 2012.

[12] Lindsay M. Krall, Allison M. Macfarlane, and Rodney C. Ewing, *PNAS*, "Nuclear waste from small modular reactors," Received June 26, 2021, Published May 31, 2022, https://doi.org/10.1073/pnas.2111833119.

There was no mention by Nesbit or Murray that under current federal law, consolidated interim storage of spent nuclear fuel is not allowed unless in conjunction with a permanent repository.

The Department of Energy's Draft Environmental Impact Statement for HALEU issued in March 2024 [13] (in both Volume 1 and Volume 2) lists the two proposed consolidated "interim" storage sites granted licenses by the NRC: Holtec International in Lea County, New Mexico and Interim Storage Partners, Andrews, Texas. [14] [15] My comments and a presentation on the Department of Energy's promotion of HALEU feedstock are on the Environmental Defense Institute website home page. [16] [17]

The DOE failed to mention that both New Mexico and Texas have passed bills prohibiting consolidated storage of spent nuclear fuel. The DOE also failed to mention that the court in Texas found that NRC did not have the authority to authorize away-from-reactor consolidated storage because Congress made requirements in the Nuclear Waste Policy Act that the NRC ignored. The company promoting non-federal consolidated interim storage in Texas, Interim Storage Partners, is appealing the court decision. [18]

The Environmental Impact Statements for those consolidated interim storage (CIS) facilities is limited to the NRC licensing period for those facilities, and what happens after the licenses expire and over time as spent nuclear fuel degrades and storage canisters are breached, is not evaluated. Thus, the Draft HALEU EIS citing these other CIS EISs that do not consider what happens after a perhaps 40-year NRC license for spent nuclear fuel storage expires should there be no repository to send the spent fuel to or the canisters are not safe to ship or the canisters begin to breach from corrosion. The lack of viable long-term consideration of human health and the environment of consolidated interim storage of spent nuclear fuel safety exemplifies the

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[13] U.S. Department of Energy, *Draft Environmental Impact Statement for Department of Energy Activities in Support of Commercial Production of High-Assay Low-Enriched Uranium (HALEU)*, DOE/EIS-0559, March 2024. https://www.energy.gov/ne/haleu-environmental-impact-statement Public comment is open until April 22, 2024 and comments may be sent to HALEU-EIS@nuclear.energy.gov

[14] U.S. Nuclear Regulatory Commission, *Federal Register*, Vol. 86, No. 178, "Interim Storage Partners, LLC; WCS Consolidated Interim Storage Facility; Issuance of Materials License and Record of Decision," September 17, 2021. This is the consolidated storage facility proposed for Andrews County, Texas. (The consolidated storage facility could store up to 40,000 metric tons heavy metal.)

[15] U.S. Nuclear Regulatory Commission, *Federal Register*, Vol. 88, No. 92, "Holtec International; HI-STORE Consolidated Interim Storage Facility," May 12, 2023. (The consolidated storage facility could store up to 100,000 metric tons heavy metal.)

[16] Tami Thatcher, Public Comment Submittal on the Draft Environmental Impact Statement for Department of Energy Activities in Support of Commercial Production of High-Assay Low-Enriched Uranium (HALEU), DOE/EIS-0559, April 22, 2024. www.environmental-defense-institute.org/publications/CommentDOEhaleu2024.pdf

[17] Tami Thatcher, The Downside of Expanding Nuclear Energy – Unspoken High Costs and Harm, June 27, 2024. www.environmental-defense-institute.org/publications/ThatcherHALEUpowerpt.pdf

[18] Radwaste Solutions, *Nuclear Newswire, American Nuclear Society*, "ISP takes spent fuel storage case to the Supreme Court," June 14, 2014. https://www.ans.org/news/article-6121/isp-takes-spent-fuel-storage-case-to-the-supreme-court/

lacking consideration beyond more than perhaps a handful of years that is rampant throughout the Draft HALEU EIS.

As stated by DOE's Paul Murry, the Department of Energy is promoting its consent-based siting of consolidated interim [forever] storage parking lot dumps without siting one or more geologic repositories. [19]

Murray stated that "There's a lot of money and interest in advanced nuclear reactors. So, the spent nuclear fuel coming out of those advanced reactors is interesting. As a government, we ultimately have to take ownership of that spent nuclear fuel and put it into a geologic repository. Some of those fuel types don't exactly match up to original waste that was considered to go into a repository. And the original waste that we were looking at to go into a repository, 30 or 40 years ago, isn't what we've got 30 or 40 years later."

The repository program is back to square one and the growing variety of fuel to be disposed of are not being studied as DOE conducts some limited research on various potential generic repository rock types.

Murry, while admitting that the Department of Energy has no repository site and no program to site a repository, said that the emphasis is on messaging to the public, with help from social scientists, to convince the public that disposal, transportation and storage of spent nuclear fuel will be safe.

Murray stated in the February program that the DOE's new rail car, the Atlas, was being tested. On June 5, 2024, it was reported that the Atlas railcar developed by the DOE to transport spent nuclear fuel has been certified by the Associated of American Railroads to operate on all major freight railroads in the USA. The twelve-axle railcar is designed to transport shipments weighing up to 480,000 pounds. [20] The DOE also has the 8-axle Fortis railcar to handle lighter loads. [21]

On the high burnup demo program at Dominion's nuclear reactors, the instrumented dry storage cask containing spent nuclear fuel needs to be taken somewhere where the fuel can be examined. Murray was involved in early promotion of the instrumented cask at Dominion.

That research cask is expected to be brought to the Idaho National Laboratory at some point, still years away. However, the research is already obsolete as fuel burnups in that cask have now been exceeded and are not representative of the higher burnup fuels that are being used in U.S. nuclear reactors.

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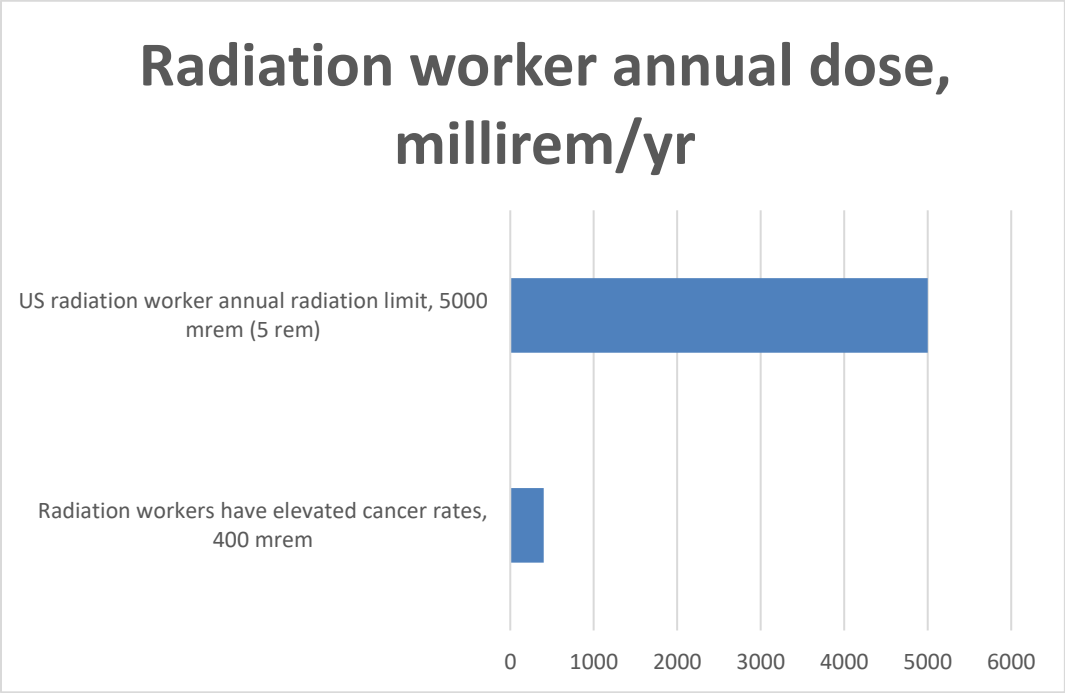
[19] U.S. Department of Energy, Office of Nuclear Energy, *Consent-Based Siting Process for Federal Consolidated Interim Storage of Spent Nuclear Fuel,* April 2023.

[20] *World Nuclear News*, "DOE-designed railcar cleared for use," June 5, 2024. https://www.world-nuclear-news.org/Articles/DOE-designed-railcar-cleared-for-use

[21] American Nuclear Society, "DOE receives AAR approval of its spent fuel transport railcar," June 11, 2024. https://www.ans.org/news/article-6108/doe-receives-aar-approval-of-its-spent-fuel-transport-railcar/

Radiation Protection Standards Unfortunately Don't Protect Radiation Workers or Women, Children or the Child In-Utero

The radiation protection standard for radiation workers in the U.S. allows workers 5 rem per year. But the study of radiation workers has indicated elevated cancer rates from a few years of far lower reported annual doses. [22] Elevated cancer rates were observed with as little as a decade of work with doses averaging only 400 millirem per year. Epidemiology of thousands of radiation workers found elevated cancer risk occurring at an average 200 mrem/yr. [23]



The cancer risk is not reduced when radiation doses are received in small increments, as the nuclear industry has long assumed. And while the radiation exposure limits have been built around cancer mortality rates, there are many other adverse health effects including heart disease, compromised immune system, and others. Infertility and birth defects arising from radiation worker exposures are not tracked.

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[22] Richardson, David B., et al., "Risk of cancer from occupational exposure to ionizing radiation: retrospective cohort study of workers in France, the United Kingdom, and the United States (INWORKS), BMJ, v. 351 (October 15, 2015), at http://www.bmj.com/content/351/bmj.h5359 Richardson et al 2015 This cohort study included 308,297 workers in the nuclear industry.

[23] Richardson, David B., et al., "Risk of cancer from occupational exposure to ionizing radiation: retrospective cohort study of workers in France, the United Kingdom, and the United States (INWORKS), BMJ, v. 351 (October 15, 2015), at http://www.bmj.com/content/351/bmj.h5359 Richardson et al 2015] (And please note that studies of high leukemia risk in radiation workers and of ongoing studies to assess health effects of high and low-linear energy transfer internal radiation must also be studied in addition to this one on external radiation.)

The Department of Energy has largely thwarted efforts to have epidemiology conducted near the INL. Epidemiology that was conducted of INL workers found unexplained elevated levels of certain radiogenic cancers in both radiation and non-radiation workers. At the Idaho National Laboratory, radiation workers who were monitored for radiation work along with co-workers who did not perform radiation work, both had elevated cancer rates. An INL-specific study found radiation and nonradiation workers at the site had higher risk of certain cancers. [24]

The US Nuclear Regulatory Commission and the Department of Energy maintain that their 5 rem/yr worker exposure limit is protective despite compelling scientific evidence to the contrary. [25] Other countries limit their radiation workers to 2 rem/yr. While many workers in the U.S. won't exceed 2 rem/yr, some critical work that requires high radiation exposures will force higher doses for some workers. And even those radiation workers who have low doses annually (below 400 mrem/yr) will still have elevated cancer rates. The unmonitored radiation doses from inhalation, as well as from living near a nuclear power plant, may contribute to the elevated cancer rates. Bias in the way radiation doses are analyzed can also understate the dose because the depth of penetration of the dose affects whether the dose is larger to internal organs or to organs, like testicles, that are not deep to the body (in men).

It has been observed that women are more vulnerable to cancer from radiation exposure than men. And children are more vulnerable than adults. Female children are more vulnerable than male children. Female children exposed to radiation are especially vulnerable to breast cancer.

Before the late 1990s, radiation risks to females were generally treated as roughly equal to the radiation risks to males. But by the late 1990s, studies of the survivors of the atomic bombing of Japan in 1945 by the International Commission on Radiation Protection (ICRP) had higher radiation risk harm to women than men, for the same dose. And the studies showed higher cancer risk to children, especially female children, than to adults for the same dose. The National Research Council BEIR VII report issued in 2006 found even higher risks to women and children. [26] [27] [28]

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[24] "An Epidemiology Study of Mortality and Radiation-Related Risk of Cancer Among Workers at the Idaho National Engineering and Environmental Laboratory, a U.S. Department of Energy Facility, January 2005. http://www.cdc.gov/niosh/docs/2005-131/pdfs/2005-131.pdf and http://www.cdc.gov/niosh/oerp/ineel.htm and Savannah River Site Mortality Study, 2007. http:/ /www.cdc.gov/niosh/oerp/savannah-mortality/

[25] "Health Risks from Exposure to Low Levels of Ionizing Radiation BEIR VII – Phase 2, The National Academies Press, 2006, http://www.nap.edu/catalog.php?record_id=11340 The BEIR VII report reaffirmed the conclusion of the prior report that every exposure to radiation produces a corresponding increase in cancer risk. The BEIR VII report found increased sensitivity to radiation in children and women. Cancer risk incidence figures for solid tumors for women are about double those for men. And the same radiation in the first year of life for boys produces three to four times the cancer risk as exposure between the ages of 20 and 50. Female infants have almost double the risk as male infants.

[26] "Health Risks from Exposure to Low Levels of Ionizing Radiation BEIR VII – Phase 2, The National Academies Press, 2006, http://www.nap.edu/catalog.php?record_id=11340 The BEIR VII report reaffirmed the conclusion of the prior report that every exposure to radiation produces a corresponding increase in cancer risk. The BEIR VII report found increased sensitivity to radiation in children and women. Cancer risk incidence figures for solid tumors for women are about double those for men. And the same radiation in the first year of life for boys

In the 1950s, Dr. Alice Stewart found increases in childhood leukemia and cancer rates in children who were exposed *in utero* to medical radiation in doses less than 500 millirem. [29] [30]

Elevated rates of infant mortality and birth defects were found in communities near the Department of Energy's Hanford site, but workers were not told of these epidemiology results and newspapers did not report the findings. [31]

The 2012 NAS study acknowledged the airborne and liquid effluent radiological releases from commercial nuclear power plants, stating "At present, nuclear plants typically release between a few curies and several hundred curies per year in airborne effluents." [32]

To the nuclear industry, averaging the contamination levels throughout the year is adequate. And to the nuclear industry, emphasizing the average release from a nuclear plant is acceptable. But the variability matters, especially the maximum levels that the unborn, developing child in utero is exposed to. There is variability due to differing plant designs, variability due to particular operating modes (such as refueling a boiling water reactor), and variability to due plant degradation such as steam generator tube ruptures in pressurized water reactors.

Most of the airborne effluents are from radioactive iodines, krypton, xenon, argon fission and activation gases, and radioactive particulates such as cobalt-58, and cobalt-60, cesium-134 and cesium-137, chromium-51, manganese-54 and niobium-95, and tritium, see Table 1.

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produces three to four times the cancer risk as exposure between the ages of 20 and 50. Female infants have almost double the risk as male infants.

[27] Arjun Makhijani, Ph.D., Brice Smith, Ph.D., Michael C. Thorne, Ph.D., Institute for Energy and Environmental Research, *Science for the Vulnerable Setting Radiation and Multiple Exposure Environmental Health Standards to Protect Those Most at Risk*, October 19, 2006.

[28] Read the Environmental Defense Institute August 2020 newsletter article, "Rising radiation-induced cancer incidence rates and higher risks to women and children," at http://www.environmental-defense-institute.org/publications/News.20.Aug.pdf

[29] Gayle Greene, *The Woman Who Knew Too Much – Alice Stewart and the Secrets of Radiation*, The University of Michigan Press, 1999. ISBM 0-472-11107-8

[30] John W. Gofman, M.D., Ph.D., Committee for Nuclear Responsibility, Inc., "Radiation-Induced Cancer from Low-Dose Exposure: An Independent Analysis," 1990. (See page 741, "Diagnostic irradiation on the order of 1 to 2 rads, delivered to the fetus in utero provoked about a 50% increase in the frequency of a variety of childhood cancers and of childhood leukemia." And page 746, "the risk in cancer-leukemia risk with each additional film is consistent with a linear relationship between number of films (@ 200-400 millirads per film) and cancer-leukemia risk.)

[31] Kate Brown, *Plutopia – Nuclear Families, Atomic cities, and the Great Soviet and American Plutonium Disasters*, Oxford University Press, 2013. ISBN 978-0-19-985576-6. Note that many publications use spelling variation Mayak instead of Maiak. *Plutopia* documents the elevated percentage of deaths among infants in the Richland population in the 1950s. Elevated fetal deaths and birth defects in Richland were documented by the state health reports, yet Hanford's General Electric doctors and the Atomic Energy Commission that later became the Department of Energy failed to point these statistics out. The local newspapers failed to write of it. The Department of Energy has continued to fail to tell radiation workers and the public of the known risk of increased infant mortality and increased risk of birth defects that result from radiation exposure.

[32] Committee on the Analysis of Cancer Risks in Populations near Nuclear Facilities, Nuclear and Radiation Studies Board Division of Earth and Life Studies, National Research Council of the National Academies, *Analysis of Cancer Risks in Populations Near Nuclear Facilities: Phase 1*, 2012. ISBN 978-0-309-25571-4

Table 1. Common radionuclides in reported airborne effluent releases from nuclear plants.

Category	Commonly Reported Radionuclides
Fission and activation gases	Krypton-85, Krypton-85m, Krypton-87, Krypton-88 Xenon-131, Xenon-131m, 133, 133m, 135, 138 Argon-41
Iodines/halogens	Iodine-131, Iodine-132, 133, 134, 135 Bromine-82
Particulates	Cobalt-58, Cobalt-60 Cesium-134, Cesium-137 Chromium-51 Manganese-54 Niobium-95
Tritium	Hydrogen-3

Table source: U.S. Nuclear Regulatory Commission, *Radioactive Effluents from Nuclear Power Plants, Annual Report 2007*, Office of Nuclear Reactor Regulation, 2007. See also NAS Analysis of Cancer Risks in Populations Near Nuclear Facilities: Phase I, 2012, page Table 2.1.

Pressurized water reactors (PWRs) generally released more tritium than boiling water reactors (BWRs). Both PWRs and BWRs release fission/activation gases and tritium. However, BWRs generally released greater quantities of radionuclides than PWRs prior to about 1980, according to the 2012 *Analysis of Cancer Risks in Populations Near Nuclear Facilities: Phase I* report. BWRs release more iodine and "particulates," such as cesium-137, than PWRs.

Both BWRs and PWRs exhibit significant variability in releases of all airborne effluent categories, about six orders of magnitude of variability in noble gas releases, over seven orders of magnitude of variability in iodine releases; over four orders of magnitude of variability in particulates releases; and about three orders of magnitude variability in tritium releases. In general, the variability differences are greater among PWRs than BWRs.

Problems were noted by citizens but ignored by the nuclear regulators around the Limerick plant. [33] [34] Concerned citizens asked not to be ignored. But that is exactly what has happened.

[33] Dr. Lewis Cuthbert, Alliance for a Clean Environment, *More Protective Radiation Standards – PRM-51-11* (comment submittal), January 29, 2007. https://www.nrc.gov/docs/ML0703/ML070300663.pdf

[34] Dr. Lewis Cuthbert, Alliance for a Clean Environment, *Tooth Fairy Research Results Reported, Child Cancer Soars in Montgomery, Philadelphia Counties Rising Radiation from Limerick Nuclear Plant May Be Cause, April 14, 2005 (and more) (Comment submittal)*. https://www.nrc.gov/docs/ML1130/ML11306A245.pdf " 'High local levels of Sr-90 and childhood cancer after Limerick began operations must be taken seriously by plant operators

The elevated cancer incidence, childhood cancer deaths, elevated infant and neonatal mortality and learning disabilities didn't matter to the nuclear promoters.

A recent 2022 NAS report ignored the variable airborne radiological releases from pressurized water and boiling water reactors as it cited a selected and low-balled radiation exposure from **external radiation** of 1 millirem dose to the public from nuclear power plants. [35] It ignored the tremendous problem in **internal radiation**, especially for children and the unborn, developing child.

The U.S. NRC cancelled what would have been the first meaningful epidemiology study of health effects near US nuclear reactors, [36] despite the German epidemiology study of children living near nuclear plants have roughly double the incidence of cancer and leukemia and similar findings resulted from the study of clusters of childhood leukemia near nuclear sites including Sellafield, Dounreay and La Hague where an excess of 300-fold infant leukemia were found. [37] [38] [39]

Nuclear promotors have focused on cancer deaths, ignoring other adverse health outcomes and then refused to adequately study even the cancer deaths.

Airborne radiological releases from nuclear power plants affect downwind residents but contaminated foods are distributed unevenly. Radioactive contamination that lands on pastures grazed by dairy cattle results in radioactively contaminated milk. Radioactive contamination also affects garden produce. Thus, the inhalation and ingestion of radionuclides varies according to location as well as diet.

The harm depends on gender and the age of exposure and it is known that women are more vulnerable than men, and children are more vulnerable than adults. Radiological sampling of

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and regulators.' Limerick, a plant with two reactors, began operations in December 1984 and reached full capacity in January 1990. During the early years of operation, cancer and leukemia death rates for children under age 15 in both Montgomery and Philadelphia Counties were well below the national rate. But in the post-startup period (1991-2002), cancer mortality jumped 48.0% and 22.3 %, respectively, compared to a national decline of 20.3 %. For leukemia deaths, rates rose 16.0 % and 46.4 %, compared to a national decline of 27.6 %. Montgomery and Philadelphia counties lie southeast of Limerick, which is the downwind direction for much of the year."

[35] National Academies of Sciences, Engineering, and Medicine, *Leveraging Advances in Modern Science to Revitalize Low-Dose Radiation Research in the United States*, Washington, DC: The National Academies Press, 2022. http://nap.nationalacademies.org/26434 or https://doi.org/10.17226/26434.

[36] NRC (Nuclear Regulatory Commission) 2010. NRC Asks National Academy of Sciences to Study Cancer Risk in Populations Living near Nuclear Power Facilities. NRC News No. 10-060, 7 April 2010. Washington, DC: NRC. The framework for the study was reported in "Analysis of Cancer Risks in Populations Near Nuclear Facilities; Phase I (2012). See cancer risk study at nap.edu.

[37] P Kaatsch et al., Int J Cancer, "Leukaemia in young children living in the vicinity of German nuclear power plants," 2008 Feb 15;122(4):721-6. http://www.ncbi.nlm.nih.gov/pubmed/18067131

[38] Spix C, Schmiedel S., Kaatsch P, Schulze-Rath R, Blettner M., Eur J Cancer, "Case-control study on childhood cancer in the vicinity of nuclear power plants in Germany 1980-2003." 2008 Jan;44(2):275-84.Epub 2007 Dec 21. http://www.ncbi.nlm.nih.gov/pubmed/18082395

[39] Chris Busby, "Infant Leukaemia in Europe after Chernobyl and its Significance for Radioprotection; a Meta-Analysis of Three Countries Including New Data from the UK," Chapter 8 of *ECRR Chernobyl: 20 Years On – Health Effects of the Chernobyl Accident*, Editors C.C. Busby and A. V. Yablokov, 2006.

milk that was conducted in the U.S. allowed levels of radioactivity that we now know were harmful. Diminishing radioactivity levels in the diet were accompanied by immediate and significant morbidity and mortality reductions among infants and young children, from 1965 to 1970.

Joseph J. Mangano and others published a study, "Infant Death and Childhood Cancer Reductions after Nuclear Plant Closings in the United States. The study found that following nuclear power plant closures, decreases in the radioactivity of milk has been noted and reductions in deaths among infants who had lived downwind and within 64 km of each nuclear plant were noted. Cancer incidence in children younger than 5 years of age were also noted to fall significantly after the shutdowns. [40]

Jay M. Gould and Benjamin A. Goldman would write in their book *Deadly Deceit – Low Level Radiation High Level Cover-Up* of excess infant deaths near the Department of Energy's Savannah River Site and near the 1979 Three Mile Island nuclear accident. [41]

Elevated rates of infant mortality and birth defects were found in communities near the Department of Energy's Hanford site, but workers were not told of these epidemiology results and newspapers did not report the findings. [42]

Following the 1986 Chernobyl nuclear disaster, a comprehensive study also found a spike in perinatal mortality (still-births plus early neonatal deaths) in several countries that received airborne radioactivity from Chernobyl. The amount of airborne radioactivity to cause this was far smaller than generally assumed. [43] The doses to the fetus from Chernobyl that caused observed harm in Germany and Poland were below 100 millirem. (The 1986 Chernobyl accident alone is responsible for over one million deaths according the independent analysis rather than estimates from nuclear energy promotors. [44])

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[40] Joseph J. Mangano, Jay M. Gould, Ernest J. Sternglass, Janette D. Sherman, Jerry Brown and William McDonnell, Radiation and Public Health Project, "Infant Death and Childhood Cancer Reductions after Nuclear Plant Closings in the United States," *Archives of Environmental Health*, Vol. 57 (No.1), January/February 2002.

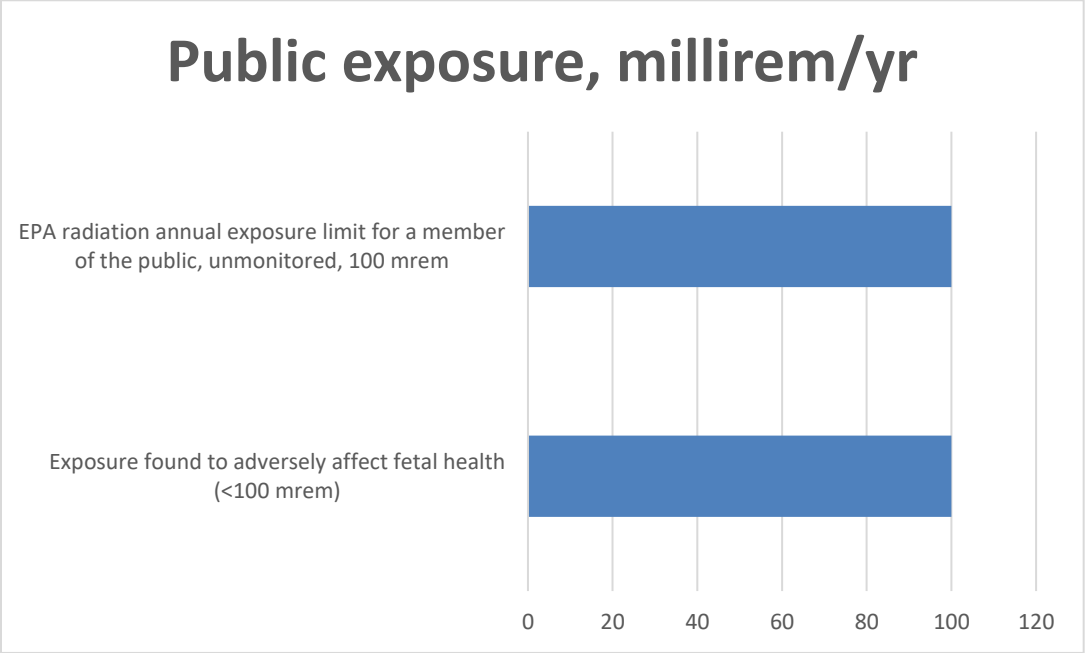
[41] Jay M. Gould and Benjamin A. Goldman, *Deadly Deceit – Low Level Radiation High Level Cover-Up,* Four Walls Eight Windows New York, 1990. ISBN 0-941423-35-2. The finding of excess infant deaths near the Department of Energy Savannah River site around the 1970s and near the 1979 Three Mile Island nuclear accident are described in Jay Gould's book *Deadly Deceit*.

[42] Kate Brown, *Plutopia – Nuclear Families, Atomic cities, and the Great Soviet and American Plutonium Disasters,* Oxford University Press, 2013. ISBN 978-0-19-985576-6. Note that many publications use spelling variation Mayak instead of Maiak. *Plutopia* documents the elevated percentage of deaths among infants in the Richland population in the 1950s. Elevated fetal deaths and birth defects in Richland were documented by the state health reports, yet Hanford's General Electric doctors and the Atomic Energy Commission that later became the Department of Energy failed to point these statistics out. The local newspapers failed to write of it. The Department of Energy has continued to fail to tell radiation workers and the public of the known risk of increased infant mortality and increased risk of birth defects that result from radiation exposure.

[43] Alfred Korblein, "Studies of Pregnancy Outcome Following the Chernobyl Accident," from *ECRR Chernobyl: 20 Years On – Health Effects of the Chernobyl Accident*, Editors C.C. Busby and A. V. Yablokov, 2006.

[44] Alexey V. Yablokov, Vassily B. Nesterenko, and Alexey V. Nesterenko, Consulting Editor Janette D. Sherman-Nevinger, *Chernobyl – Consequences of the Catastrophe for People and the Environment*, Annals of the New York Academy of Sciences, Volume 1181, 2009.

The U.S. Environmental Protection Agency and also the Department of Energy assume that a protective dose limit for the public is 100 millirem per year. These are unmonitored doses to every member of the public, man, woman and child, every year. In reality, the 100 millirem per year dose limit is not protective of human health and it is devastating to the unborn child developing *in utero*.



Robin Whyte wrote in the *British Medical Journal* in 1992 about the effect in neonatal (1 month) mortality and stillbirths in the United States and also in the United Kingdom. The rise in strontium-90 from nuclear weapons testing from 1950 to 1964 has been closely correlated, geographically, with excess fetal and infant deaths. The doses from strontium-90 due to atmospheric nuclear weapons testing were less than 50 millirem (or 0.5 millisievert), according the Chris Busby. Radioactive fallout from atmospheric nuclear weapons testing would not only include strontium-90, it would include iodine-131, tritium, cesium-137, and other radionuclides, including plutonium. [45]

[45] R. K. Whyte, *British Medical Journal*, "First day neonatal mortality since 1935: re-examination of the Cross hypothesis," Volume 304, February 8, 1992. https://www.bmj.com/content/bmj/304/6823/343.full.pdf

Attempts to redesign and repair the Integrated Waste Treatment Unit ongoing after IWTU breaks down after brief radioactive operations in 2023

The Integrated Waste Treatment Unit began treating radioactive waste last year in April 2023. Treatment of the roughly 900,000 gallons of liquid high-level radioactive waste stored in underground tanks, called sodium bearing waste, was to have completed treatment over a decade ago by the end of 2012.

The IWTU treatment of the sodium bearing waste last year created 140 canisters of waste but over 1200 canisters of the waste will be needed. The IWTU was expected to resume operations this March but it was not restarted and is not expected to resume operation this year.

In addition to known operational problems, clogging issues and mercury removal problems, and process gas filter (PGF) component breakage was found in May. Because the plant had been processing radioactive material, it took many weeks to extract and inspect the broken components.

Years ago, experts warned that the IWTU design would have clogging issues and it turns out they were right. Even after over a decade of full-scale testing using a non-radioactive simulant material to test the IWTU, small-scale testing at the Hazen facility in Colorado, and continuing redesign efforts, the IWTU remains problem plagued.

The Department of Energy's presentation to the ICP CAB states that challenges remain to resolve the process gas filter system bypass issues, counter the denitration mineralization reformer (DMR) high differential temperature operational issues, address the agglomerate formation, (i.e., clogging issues), and evaluate the mercury removal issues and loading of granular activated carbon (GAC) issues. [46]

The current regulatory milestones require that 15 percent of the waste be treated annually on a 3-year running average. No date was given for resuming IWTU operations as the evaluation, repair and redesign of IWTU continues.

The originally planned number of vaults for treated sodium bearing waste was 37 vaults, but was increased to 78 vaults. Each vault holds 16 waste canisters, or 1248 canisters. 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 IWTU was designed for a limited operating life and was to have treated the radioactive waste in one year of operation, but it is now recognized that it will take many years of run and repair operations to treat the waste.

[46] Idaho Cleanup Project Citizens Advisory Board, Office of Environmental Management, June 12, 2024 meeting at Fort Hall, Idaho. https://www.energy.gov/em/icpcab/articles/icp-cab-meeting-materials-june-2024

Each shutdown now will also require flushing out the system. Simulant runs do not create radioactive waste, but radioactive operation with a portion of the material being simulant creates more waste. Newly generated waste is also being added to the tanks.

The radioactive waste is stored in underground tanks and these tanks of high-level radioactive waste cannot be closed until the IWTU treatment of waste is completed. Failure to clean and close the waste tanks has caused the Department of Energy to be fined a monetary penalty by the State of Idaho. Continued use of the decades-old tanks poses the risk of tank leakage and contamination.

Now that the IWTU has operated with radioactive waste, the work to investigate and repair or modify the plant involves workers getting radioactive exposure. No information was provided at the Idaho Cleanup Project Citizens Advisory Board meeting on June 12 about the radiation exposures to workers from IWTU repairs.

The DOE allows workers 5 rem per year, but the study of radiation workers has indicated elevated cancer rates from a few years of far lower reported annual doses. [47] The cancer risk is not reduced when radiation doses are received in small increments, as the nuclear industry has long assumed. And while the radiation exposure limits have been built around cancer mortality rates, there are many other adverse health effects including heart disease, compromised immune system, and others. Infertility and birth defects arising from radiation worker exposures are not tracked.

The commencement of IWTU operations allowed the INL to receive a shipment of spent nuclear fuel from Byron Generating Station in Illinois, a commercial nuclear power plant, to support research and testing. Failure to meet Idaho Settlement Agreement milestones had prevented shipments of commercial spent nuclear fuel for research to the INL.

Idaho Cleanup Project Citizens Advisory Board Meeting held in June at Fort Hall

The Idaho Cleanup Project Citizens Advisory Board (ICP CAB) meeting was held June 12, 2024 in Fort Hall. [48]

Presentations were given on cleanup project progress, including transuranic waste shipments, the continuing problems at the Integrated Waste Treatment Unit, the transfer of Peach Bottom spent nuclear fuel to undamaged storage vaults at the INTEC, demolition of buried waste retrieval tents called the Accelerated Retrieval Projects (ARPs), preparation for soil cap construction, transuranic waste shipping and waste certification challenges, Naval Reactors

[47] Richardson, David B., et al., "Risk of cancer from occupational exposure to ionizing radiation: retrospective cohort study of workers in France, the United Kingdom, and the United States (INWORKS), BMJ, v. 351 (October 15, 2015), at http://www.bmj.com/content/351/bmj.h5359 Richardson et al 2015 This cohort study included 308,297 workers in the nuclear industry.

[48] Idaho Cleanup Project Citizens Advisory Board, Office of Environmental Management, June 12, 2024 meeting at Fort Hall, Idaho. https://www.energy.gov/em/icpcab/articles/icp-cab-meeting-materials-june-2024

demolition efforts at S1W and A1W prototypes, and expansion of the Idaho CERCLA Disposal Facility for NRFs non-CERCLA waste streams.

The previous plans for calcine treatment have been scrapped and since it is back to square-one, DOE is investigating vitrification technologies to treat the high-level waste called calcine that resulted from spent nuclear fuel reprocessing at the INL.

The DOE's cleanup project has been working to make progress on difficult tasks, but the cleanup milestones from the Idaho Settlement Agreement that matter the most are on track to be missed and missed by a lot. There is no repository to ship the INL's spent nuclear fuel to nor is there any facility for preparing the INL's spent nuclear fuel for shipment out of state. There is no repository to ship the calcine to, nor has a treatment method been chosen. And there is no repository to ship the treated sodium bearing waste to.

The Department of Energy continues to monitor the Snake River Plain aquifer below Test Area North and remains as befuddled now as several years ago. The treatment of radioactive and chemically-laden contamination dumped at the INL years ago has been ongoing and DOE doesn't know if the treatment has helped. The treatment actually causes the radionuclides to migrate into the aquifer more quickly, which means spreading the contamination throughout the aquifer.

Once contamination is in the aquifer, the contamination continues to flow downgradient. Monitoring has been insufficient and DOE does not know whether its actions have benefit. The DOE does continue to assert that the contamination will have migrated away from the most contaminated sites by 2095. Contamination sampling in wells is conducted in a manner that depth of contamination is unknown and mixing of contaminated and uncontaminated levels in the wells makes the results unreliable.

The solution to the ambiguity of the state of the contamination is to have many speakers, all cheerful, picture the contamination plumes and assure the public of their confidence that the cleanup goals will be met by 2095 for the volatile organic compounds (primarily trichloroethylene [TCE] and 1,2-dichloroethane [DCE]) and the many radionuclides. Only strontiun-90 and cesium-137 are mentioned, but there is no reason to expect that there are not other radionuclides not being mentioned or monitored.

Its all acceptable because there are "currently no groundwater receptors." That means, as long as no one drinks the water, everything is fine. Just let the contamination migrate southward away from the monitored wells, and by the magic of dilution, there is the appearance of progress.

The uranium and plutonium metal fines, along with reactive sodium and potassium, is transferred to a hot cell and a plexiglass chamber filled with argon gas is used to make an oxygen-poor environment. Extremely fine mists of water are introduced in the argon chamber (at INTEC). Infrared cameras and monitors gauge the level of reaction, allowing adjustment of the oxygen level and water mists. The goal is to treat the reactive metals so that it is safe to ship for disposal. The treated plutonium and uranium is then placed in 55-gallon drums and shipped to an

unidentified disposal facility. (See the Department of Energy's ICP CAB June Newsletter, shared but not available online at this time.)

Finally, at the ICP CAB meeting held last February, there was no permission granted for the public to ask any questions. And when there are public comment sessions, the DOE and the CAB are instructed not to respond to anything said during public comment. The CAB meetings do have a box that questions can be submitted via hand-written questions on small cards. I submitted several questions at the February meeting. I received an email asking for a few word clarifications, which I promptly provided. Yet, as of June, no answers to my questions were provided. The DOE says it fell through the cracks. Here are the questions I submitted last February that are still not answered:

- Let's see data. What are RWMC aquifer monitoring trends and contamination since CAB last presented data? The "shifts" are for which contaminants? [DOE mentioned "shifts" in the February meeting without saying what contaminants or the direction of the shifts.]
- Why not discuss DOE-STD-5506-2021 for TRU deficiencies at ICP? [DOE's February presentation listed the DOE standard but did not discuss safety implications.]
- Why were assumptions made that lowered the level of the calcine contaminants. Low Kd's [migration coefficients] not based on calcine studies.
- Flood levels and risk at INTEC ignore the non-known high risk of Mackay Dam failure. Why?
- Why isn't the TWMC soil cap designed with consideration of waste heat load? Will the covered SDA become a smoldering dump?
- What radiological monitoring confirms IWTU airborne emission levels? When and where is it reported?
- Isn't liquid residual in [transuranic] TRU waste drums a major cause of waste drum corrosion? And isn't DOE occurrence reporting making that clear? [Other reasons being offered for TRU waste drum corrosion during February meeting don't hold water or PCBs for that matter because only certain drum loading campaigns have leaking drum problems.]

DOE's secretive funding handouts for Supplemental Environmental Projects (SEPs)

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.

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. Knowing what I know about the IDWR’s lack of interest in protection of the public or adequate regulations, I have to wonder if the money given to the Idaho Department of Water Resources (IDWR) for well drilling and geophysical characterization could be a gift to a few mining interests. Maybe someone would like to explain the public or environmental benefit of this SEP funding to IDWR.

Articles by Tami Thatcher for July 2024.

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