Public Comment Submittal on the U.S. Department of Energy's Versatile Test Reactor Draft Environmental Impact Statement (VTR EIS) (DOE/EIS-0542)

Comment submittal by Tami Thatcher, February 11, 2021.

Comments Due: February 16, 2021. Sent by email to VTR.EIS@Nuclear.Energy.gov

BACKGROUND

The draft Environmental Impact Statement for the Versatile Test Reactor (VTR) considers the potential environmental impacts for the construction and operation a new Department of Energy regulated test reactor, and associated facilities for post-irradiation evaluation of fuels and other materials, VTR driver fuel production (fuel feedstock and fuel fabrication), and the managing of its spent nuclear fuel. The VTR would be a 300 megawatt (thermal) fast neutron reactor that does not generate electricity and is only used for high neutron bombardment of fuels and other materials. The VTR is a pool-type, sodium-cooled reactor with a fast-neutron spectrum and will use a uranium-plutonium-zirconium metal fuel.

GE Hitachi Nuclear Energy is working with the Idaho National Laboratory on the VTR conceptual design based on its PRISM reactor, which was based on the Experimental Breeder II reactor. [1] The EBR II which was operated by Argonne National Laboratory – West at the Idaho site which is now the Materials and Fuels Complex (MFC) at the INL, although the EBR II has been dismantled. The 60-year-old pyroprocessing facility at MFC, the Fuel Conditioning Facility (FCF) remains at the former EBR II complex.

SUMMARY OF VTR EIS INADEQUACY

I disapprove of the DOE's preferred alternative, to construct the VTR at either proposed location, the Idaho National Laboratory or the Oak Ridge National Laboratory because of cost, accident risk and nuclear weapons proliferation concerns.

I disapprove of the DOE's extensive plutonium fuels feedstock and fabrication processes, either at the INL or the Savannah River Site, also because of cost, accident risk and nuclear weapons proliferation concerns.

The Department of Energy's Federal Register notice that is in Appendix A of the VTR EIS – actually quotes DOE as having an objective of the VTR to lead to **reduced nonproliferation concerns**. Translated this means DOE's stated goal is to *increase the proliferation concerns* – Which may be an error by the DOE, but it is exactly the opposite of what we all want – which is to reduce proliferation concerns and keep nuclear weapons material like plutonium-239 out of nuclear weapons.

[1] Press Release, GE Hitachi, "GE Hitachi and PRISM Selected for U.S. Department of Energy's Versatile Test Reactor Program," November 13, 2018. https://www.ge.com/news/press-releases/ge-hitachi-and-prism-selected-us-department-energys-versatile-test-reactor-program

The VTR project creates added nuclear weapons proliferation risks, above and beyond the pyroprocessing technology, capable of separating plutonium from the spent nuclear fuel. The INL has already sold the pyroprocessing technology to South Korea, purportedly for waste reduction, although neither the U.S. nor the VTR project use pyroprocessing for that purpose. The VTR's extensive use of plutonium in its fuel, 20 percent by weight, will create many opportunities for diverting weapons-usable plutonium in a form that is not coupled with high levels of gamma radiation from fission products that are present in spent nuclear fuel.

The Department of Energy's plutonium disposition programs, including the failed MOX plant have had the effect of weakening both domestic and international standards for securing nuclear material. The VTR program will clearly have the impact of weakening such standards, especially as it seeks to import nuclear materials from abroad, transport them around the U.S., and weaken security restrictions for materials at commercial nuclear power plants or envisioned Department of Defense nuclear power suppliers. The cost of shipping containers, of shipping escorts and at plant security for storage will provoke cost-cutting measures, should fast reactors and other reactor designs become more prevalent in the U.S. or in other countries that customers are being sought.

The VTR EIS is ambiguous as to what specific U.S. surplus plutonium is actually feasible and cost effective to use for creating the VTR metal fuel. In fact, it appears that the 34 metric tons of plutonium (24 MT for VTR fuel and 10 MT of scrap from making the VTR fuel) is likely to come from the Europe, either the UK or France rather than from U.S. excess weapons plutonium. The VTR EIS must acknowledge the impact of increasing U.S. plutonium inventory from importing additional plutonium from abroad. And should the VTR program be terminated due to cost or an accident, the imported plutonium will have significantly increased, rather than decreased the amount of surplus plutonium requiring storage and ultimately, disposal in the U.S.

The VTR EIS needs to include the amount of plutonium that will be used in experiment fuels and materials. The VTR EIS needs to provide a bounding estimate of the irradiated fuels and materials (other than VTR fuel) that DOE will have as waste, and must identify the individual radionuclides and their curie amounts and where these wastes will be disposed of. It is unacceptable for the DOE to deem irradiated fuels as not being spent nuclear fuel when used in research or as experiments, in order to bury over the Snake River Plain aquifer at the INL.

The routine radiological emissions from VTR fuel and its fueled and non-fueled experiments and the isotopes program pose unacceptable continuing and escalating harm to the public, above the radiological releases the public is already emersed in from the INL. The VTR EIS has failed to acknowledge the past and ongoing radiological releases from the INL and has failed to acknowledge the harm that is clearly seen in Idaho cancer incidence statistics.

The VTR EIS has failed to come to grips with the inadequate environmental surveillance program that gives the Department of Energy the ability to not give data to the U.S. Environmental Protection Agency as well as gives the DOE the ability to hide unfavorable environmental monitoring results and allows incorrect attribution as to the source of elevated levels of radionuclides in air, water or soil. The VTR EIS must address the gaps and errors in the Department of Energy's environmental surveillance program, currently at idahoeser.com.

Construction of the VTR at the Idaho National Laboratory's Materials and Fuels Complex enables and requires the use of seismically inadequate facilities including the already 60-yer-old Fuel Conditioning Facility (FCF) and other hot cells.

The VTR if built at the MFC escalates the routine radiological emissions and accident risks to communities near the INL, including Blackfoot, Idaho Falls and Rexburg.

The VTR costs for construction are grossly underestimated as are the life cycle costs. The U.S. taxpayer will be on the hook for billions of dollars in the effort to construct the VTR. Inadequate completion of the design prior to beginning construction has failed in previous Department of Energy projects, notably the Department of Energy's Savannah River Site's cancelled MOX plant.

DOE's goal is private profits at taxpayer expense — and then to leave the taxpayer on the hook for the long-term radiological waste management of spent nuclear fuel, high-level waste and other radioactive waste, if all goes well, and extensive radiological cleanup if sometimes it doesn't.

The groups or companies that want experiments in a materials' testing reactor will typically only pay for the cost of fabricating and installing the experiment. The needed safety evaluations may or may not be paid for by the experimenters. But in no case have I seen the experimenters pay any substantial portion of the material test reactor's construction or operating costs. The extent to which, again, the profits will be privatized while the tax payer pays for this high-risk gamble must be included in the VTR EIS.

The VTR EIS has relied on the inadequate and deeply flawed DOE EISs for spent nuclear fuel management and disposal. The Department of Energy has no disposal program. The Department of Energy has not admitted how many trillions of dollars it may spend in trying to find a way to safely dispose of the nation's spent nuclear fuel and high-level waste. Whether or not it is feasible for a repository to actually safely contain the waste must be revisited.

The Department of Energy has long argued that the disposal of commercial spent nuclear fuel was paid for by the fee collected from electricity generated by commercial nuclear reactors, the $0.001/kWh fee authorized by the Nuclear Waste Fund. That fee is no longer being collected because a court found that the Department of Energy has no spent nuclear fuel disposal program, and the DOE has no appropriate cost estimate of what the SNF disposal program will cost. The collected fee has been implied to cover the cost of spent nuclear fuel disposal but the $30 or so billion that has been collected would be consumed by repackaging or packaging the SNF into disposable containers.

The Department of Energy has failed to estimate the costs of spent nuclear fuel and high-level waste disposal, although it has revealed that those costs may be many trillions of dollars, that have not been allocated to address the waste disposition. This places a tremendous burden on future generations and the VTR EIS must not ignore it.

The cost of the spent nuclear fuel disposition of the VTR fuel, the scrap from fuel fabrication, the experiment fuel, and the spent fuel to be created as the result of research in the VTR must be addressed. The cost of continued repackaging of the spent nuclear fuel and what technology and

facilities must be available to repackage the VTR fuel must be explained. The VTR EIS must explain how VTR spent nuclear fuel will be dealt with if the aging FCF facility is not available for removal of the sodium and making the spent fuel ingots.

The unique VTR fuel, treated and untreated, creates new unanalyzed problems for repository disposal and the VTR EIS must address when and how this will be addressed and who will bear the costs.

The DOE's EISs for spent nuclear fuel management are inadequate. And spent nuclear fuel management is unsustainable from a growing cost liability point of view that places an enormous burden on future generations to continue to try to isolate the waste from air, soil and water by repeatedly repackaging the waste and/or by continuing to seek a repository to adequately confine the waste.

The VTR EIS must acknowledge that the DOE has already exceeded its allotted limit of spent nuclear fuel and HLW in Yucca Mountain. The VTR EIS must explain how after decades of promising to open a repository but failing to, that the DOE, with no repository program since 2010, is going to obtain a repository.

The VTR EIS downplays the accident risks without technical basis and greatly increases the risk of radiological accidents that may be devastating for SE Idaho.

It downplays the isotope production role of the VTR and it is almost as if the Department of Energy sought to create the most expensive, least reliable, most electricity-use intensive, most accident-prone way of irradiating isotopes by selecting the VTR.

VTR accident release fractions underestimate the radiological impacts and as always, the idealized wind dispersion uniformly spreads the radiation around so that no one in particular is terribly harmed, except if you were near to the accident or it was a beyond-design-basis accident, which, world-wide, nuclear reactors tend to have every decade or so.

The VTR may leave citizens uncompensated for transportation accidents and facility accidents. The Price-Anderson Act is designed to undercompensate citizens and may not compensate citizens for certain contamination events such as transportation accidents.

DOE oversight is notoriously inadequate and often fails to protect workers, the public and the environment. This draft VTR EIS is pretending that Department of Energy regulatory oversight of the VTR will mean prudent, effective oversight but the history of the Department of Energy nuclear oversight proves otherwise. See the 2014 accidents at the Waste Isolation Pilot Plant (WIPP) and the 2011 plutonium inhalation event at the Idaho National Laboratory's Materials and Fuels Complex, which were both found to illuminate the fact that both DOE operations had multiple failed safety programs and failed to implement DOE regulations.

Department of Energy nuclear facilities, including its reactors, are notorious for the practice of lacking as-built drawings and of failure to maintain facility drawings as design changes are made. This alone increases the likelihood of an accident at a DOE-regulated facility. But there are other reasons for the increased accidents risks because of DOE's ability to keep plant

problems secret in order to avoid public scrutiny and DOE's loose way of ignoring existing requirements.

DOE is ignoring state and federal laws regarding protections for the State of Nevada where the Yucca Mountain repository was to be sited, the State of New Mexico where the Waste Isolation Pilot Plant (WIPP) is located, and many states as DOE proclaimed that it could reclassify high-level waste to low-level waste, at whim. And the DOE is ignoring its legal settlement with the State of Idaho to remove the spent nuclear fuel stored at the Idaho National Laboratory. The Department of Energy has sought to unravel the Idaho Settlement Agreement, rather than do the work to comply with it.

DOE's failure to adequately design facilities for and inspect those facilities and the spent nuclear fuel they hold is long standing and has required state and federal intervention to get DOE to begin to address its problems. EBR II spent nuclear fuel corroded in an INL spent fuel pool while the DOE had not inspected the fuel or taken timely actions to address the deteriorating fuel, even as the strontium levels workers were exposed to were recognized. DOE's messes often require federal and state intervention, but by then, the messes are so large that that little cleanup is accomplished even with billions of dollars of cleanup money annually, for the INL, Hanford, Savannah River Site and others.

Reliance on institutional controls to forever repackage spent nuclear fuel in Idaho violates NEPA. There is no repository despite winks and hints that Yucca Mountain would be opening soon. The consequences of spent nuclear fuel blowing in the wind are devastating, cannot be remediated and the importance of our land and our lives is frequently diminished because we live in the "low population zone."

DOE's past isotope production has been far more polluting than DOE admits and it will be far worse placed closer to Idaho Falls and in a riskier reactor.

The VTR EIS needs to present the total plutonium-241 and amercicium-241 releases from the INL and the VTR operations including isotope production and include the Pu-2341 and Am-241 releases. The VTR EIS needs to present the historical plutonium and americium releases because the environmental surveillance reports for the INL through the years have been inconsistent in whether or not plutonium and americium was reported. These actinides decay through a series of radioactive decays and persist in the environment. Plutonium-241 decays to americium-241. Americium-241 is an alpha emitter but also has a gamma ray that penetrates into tissue by 1 centimeter.

The Department of Energy knows very well the extremely large increases in the predicted thyroid cancer incidence from americium-241 and other radionuclides and must present this information in the EIS. [2] The VTR EIS cannot simply focus on the deaths from cancer, it must include cancer incidence, particularly from radionuclides with now recognized far higher thyroid cancer incidence risk per rem. The VTR EIS also must not ignore the elevated rates of cancer

[2] T.R. Hay and J.P. Rishel, Pacific Northwest National Laboratory, Department of Energy, *Revision of the APGEMS Dose Conversion Factor File Using Revised Factor from Federal Guidance Report 12 and 13*, PNNL-22827, September 2013. https://www.pnnl.gov/main/publications/external/technical_reports/PNNL-22827.pdf

incidence and death in children and younger adults, which we also see in communities surrounding the INL.

DOE's environmental monitoring program is inadequate and the program is designed more around hiding the INL's contamination than revealing it.

Cancer rates in counties surrounding the INL are elevated, particularly for the incidence of thyroid cancer. The VTR EIS has failed to address the continuing radiological releases of Pu-241 and Am-241 from the INL. The VTR EIS has selected 2018 environmental surveillance, while ignoring far higher annual releases during the last 20 years. The DOE's environmental surveillance reporting has unexplained gaps, omissions and technically unsupportable explanations that deny radionuclides are from the INL. The DOE's environmental surveillance reports have routinely explained the Am-241 as being from past nuclear weapons testing, when in fact, numerous CERCLA cleanup reports have found extensive at-facility radiological contamination, including Am-241, that cannot be attributed to past weapons testing.

DOE ignores scientific evidence, the diverse compelling human epidemiology of more health harm from radiation so that it can avoid costs and inconvenience of tighter worker and public radiological protection

Workers harmed by the Department of Energy's operations are often denied illness compensation by the Energy Employee Occupational Illness Compensation Program while the program slowly conducts investigations into the inadequacies of the INL radiological protection programs.

VTR worsens radioactive waste disposal issues for LLW and GTCC as does the Department of Energy's High-Level Waste Reclassification effort. Spent nuclear fuel deemed "experimental" can be buried over the Snake River Plain aquifer on the Department of Energy site.

VTR and associated research will in no way work to reduce energy poverty in developing countries, but it may produce energy poverty and poverty in general, in the U.S.

The VTR EIS must discuss the problems associated with weapons proliferation, spent nuclear fuel management, radioactive waste (other than spent fuel), routine radiological releases, and the actual health and financial harm to citizens from the routine and accident radiological emissions.

The VTR EIS must provide more transparency overall and must provide a comprehensive explanation of the costs that will plague future generations of people from routine emissions, from accidents and from spent nuclear fuel management and other radioactive waste disposal.

The VTR EIS as written white washes the radioactive waste problems and ignores the financial burdens. The VTR project will have devastating effects wherever it is built because of the ongoing emissions and the damage to human health for people working at the project and people living anywhere near it.

I don't think I can possibly convey how terrifying the VTR project is, because I've seen through the years the reality of family, friends, coworkers, and other people in southeast Idaho

whose lives have been shortened by the radiological releases from the Idaho National Laboratory.

VTR Creates Added Weapons Proliferation Risks

Fast reactors fission plutonium-239 more efficiently, yet the VTR with its uranium-238, uranium-235, and plutonium (and zirconium) fuel actually result in only a slight reduction in the plutonium-239, about 10 percent less in the spent fuel than in the fresh fuel. The presence of uranium-238 in a fissioning reactor produces plutonium-239 by neutron capture.

Manufacture, storage and transportation of the 20 percent by weight plutonium fuel for the VTR creates a significant nuclear weapons proliferation risk. And because of the large stocks of weapons-usable plutonium-239 for the VTR fuel, the VTR and associated reactor research will promote nuclear weapons material proliferation.

The atomic bomb dropped on Nagasaki during WWII contained 6.2 kg Pu-239. The VTR will use 400 kg of Pu-239 annually. **The VTR increases the risk of nuclear weapons material proliferation.**

The Department of Energy's Federal Register notice that is in Appendix A of the VTR EIS – actually quotes DOE as having an objective of the VTR to lead to **reduced nonproliferation concerns**. Translated this means DOE's goal is to *increase the proliferation concerns* – Which may be an error by the DOE, but it is exactly the opposite of what we all want – which is to reduce proliferation concerns and keep nuclear weapons material like plutonium-239 out of nuclear weapons.

The VTR Costs for Construction Are Grossly Underestimated, As Are the Life Cycle Costs

The Versatile Test Reactor cost estimates are likely to double several more times during design and construction.

The completion of the VTR can be reasonably expected to have years of schedule delays. This means that the VTR and projects that would test nuclear materials for new reactor designs will be too late to address climate concerns, a touted reason for the research VTR reactor.

The Department of Energy's project for far less complex conversion of 34 metric tons of surplus plutonium to mixed oxide fuel at the now cancelled Savannah River Site Mixed-Oxide Fuel Fabrication Facility was originally estimated to cost $1.4 billion to construct and be operating in 2004. By 2016, it was estimated to cost $17.2 billion and be completed by 2048. [3] [4] The Department of Energy sunk almost $8 billion into the MOX facility which was cancelled in 2018. The U.S. Government Accountability Office reports that the approaches for managing or disposal of Department of Energy's roughly 57 metric tons (MT) of surplus plutonium has gyrated considerably over the last 20 years, and remains uncertain.

[3] Douglas Birch and R. Jeffrey Smith, *Center for Public Integrity*, "Nuclear Waste: A $1 Billion Energy Department Project Overshoots Its Budget by 600 Percent," June 25, 2013. https://publicintegrity.org/national-security/nuclear-waste-a-1-billion-energy-department-project-overshoots-its-budget-by-600-percent/

[4] U.S. Government Accountability Office, Surplus Plutonium Disposition, GAO-20-166, October 2019. https://www.gao.gov/assets/710/702239.pdf

The disposal of surplus plutonium by "dilute and dispose" is estimated to cost only half what the cancelled MOX project would cost. But it relies on having a place to dispose of the plutonium. There is no licensed facility, no facility under construction and no facility on the horizon for disposal of the surplus plutonium. The state law and federal laws intended to protect New Mexico are not respected by the Department of Energy, which tends to see the Waste Isolation Pilot Plant (WIPP) as the solution to all of its waste problems.

The Department of Energy had high hopes and a lot of hype for the failed MOX plant at the Savannah River Site. DOE hoped that the MOX fuel, a mixture of uranium and plutonium oxide, would find U.S. electrical utilities wanting to burn the MOX fuel in their nuclear reactors but DOE couldn't even give the fuel away. And with the Department of Energy's inability to control costs, quality, scheduled delivery of MOX fuel, or expected MOX fuel performance, the MOX facility at Savannah River Site was cancelled after spending almost $8 billion.

For the VTR project, the DOE now says it wants to fabricate over 24 MT over 60 years, of U-20Pu-10Zr metal fuel for the Versatile Test Reactor, build a nuclear reactor, manage the spent nuclear fuel, and all for less money than the failed Savannah River MOX plant. The MOX plant used existing technology for compressing the MOX powder into pellets, baking in furnaces and machining to a precise size needed to fit inside nuclear fuel rods. [5]

The Experimental Breeder Reactor II (EBR II) was a sodium-cooled, pool-type fast reactor. Yet, the EBR II primarily used uranium-zirconium metal fuel, not the 20 percent plutonium fuel, the uranium-plutonium-zirconium metal fuel that the DOE is planning to use for the VTR. The proposed fuel for the VTR is experimental, and poses significant cost, schedule and safety risks.

The Versatile Test Reactor cost estimates are likely to double several more times during construction. The construction costs are only a portion of the life cycle costs. And the ultimate costs of spent nuclear fuel and nuclear waste management are unknown.

Private Profits at Taxpayer Expense

This VTR project is intended to promote private company profits at tax payer expense. For this reason, Department of Energy fails to acknowledge the full extent of economic costs of spent nuclear fuel (and high-level waste) disposal. This EIS fails to disclose the full cost of continued storage of spent nuclear fuel (and high-lever waste) as waste requires repackaging facilities and requires security.

No one in the U.S. or in other countries has wanted a PRISM sodium-cooled, fast reactor. For decades, PRISM has been available for the commercial sector to build. The push for sodium-cooled reactors and for fast reactors in general needs to be assessed honestly for what it is – simply a way to funnel money to a few individuals who are seeking tax payer money to fund research and nuclear projects.

The groups or companies that want experiments in a materials' testing reactor will typically only pay for the cost of fabricating and installing the experiment. The needed safety evaluations

[5] Douglas Birch and R. Jeffrey Smith, *Center for Public Integrity*, "Nuclear Waste: A $1 Billion Energy Department Project Overshoots Its Budget by 600 Percent," June 25, 2013. https://publicintegrity.org/national-security/nuclear-waste-a-1-billion-energy-department-project-overshoots-its-budget-by-600-percent/

may or may not be paid for by the experimenters. But in no case have I seen the experimenters pay any substantial portion of the material test reactor's construction or operating costs. The extent to which, again, the profits will be privatized while the tax payer pays for this high-risk gamble must be included in the VTR EIS.

Nuclear Energy Will Not Solve Energy Poverty

The VTR takes the U.S. in the wrong direction of failed spent nuclear fuel disposal and subsequent nuclear reactors, like TerraPower's reactors, will proliferate nuclear weapons material wherever these reactors are operated or wherever their fresh or spent fuel is stored or transported. TerraPower and others are seeking to sell nuclear reactors outside the U.S. using loans orchestrated to help solve "energy poverty." Where will the spent nuclear fuel from those reactors end up? And who will pay for the continued storage and the hoped-for disposal of that spent nuclear fuel?

This VTR project, opens flood gates of federal funding for plutonium fast breeder reactors, as well as other reactor designs. Existing light-water reactors for electricity generation in the U.S. already generate plutonium and higher actinides in extensive amounts. The higher enrichment fuels and the higher plutonium fuels create even more challenging pre-disposal and post-disposal containment and criticality issues.

The U.S. utilities are not enthusiastic about buying nuclear reactors. And for this reason, the nuclear reactor promoters are seeking financial loans for countries outside the U.S. The purported rationale is to address "energy poverty." Can you imagine? The most expensive way of generating electricity, and fast reactors are double the construction cost of conventional slow neutron "thermal neutron spectra" reactors that our pressurized water and boiling water reactors are. The U.S. nuclear electricity generating plants want the Department of Energy to take their spent fuel, pay for the packaging that's been performed, pay for security where the fuel is stored, and pay for repackaging the fuel for disposal. The U.S. Department of Energy has no idea how many trillions of dollars it will ultimately cost to continue seeking a permanent solution to isolate the radio-toxic material for millennia. And the nuclear industry wants to put these higher enriched, higher burnup fuels, highly attraction terrorist targets, highly accident-prone reactors — in countries with *energy poverty*?

Because U.S. utilities and investors don't want the added liability and cost of new nuclear reactors, the Department of Defense is being conned into thinking that moving truck-load sized nuclear reactors to medical or other military or non-military installations would be a dandy idea. Very likely to have very little in the way of environmental monitoring. And who cares if there is no place to dispose of the spent nuclear fuel. We'll just leave it here, there, and everywhere.

The VTR EIS Has Relied on Inadequate and Deeply Flawed EISs for Spent Nuclear Fuel Management and Disposal

The draft VTR EIS relies on out-of-date, inappropriate, now known to be inadequate Department of Energy spent nuclear fuel disposal environmental impact statements. The draft VTR EIS relies on the deeply flawed assumptions in other Department of Energy EISs for the management of the spent nuclear fuel (and high-level waste).

The Versatile Test Reactor is expected to use 24 MT of plutonium over 60 years and based on the tables in the EIS while generating short-lived and long-lived fission products and other actinides at tremendous expense, the VTR will only burnup 10 percent of the plutonium. The VTR, while not designed as a breeder to make more plutonium, still leaves about as much plutonium to dispose of, and now additional fission products which complicate disposal, for disposal in a repository that does not exist and for which the DOE has no program to obtain.

Burning plutonium in fast reactors could shuffle the spent nuclear fuel problem a bit, but according to the Blue Ribbon Commission report from 2012, it doesn't solve the problem. It does not alleviate the need for long term disposal in a geologic repository. [6]

The fact is that the Department of Energy **has no spent nuclear fuel disposal program** for either its DOE-owned spent fuel or for the spent nuclear fuel from commercial nuclear power plants. Consolidated interim storage is not a substitute for a permanent solution.

The fact is that the Nuclear Waste Fund that collected fees from electricity generated by nuclear power plants has been discontinued and the $30 billion or so that it collected is not even enough money to package commercial spent nuclear fuel in disposal containers, let alone to license and construct a repository.

The many trillions of dollars that this will cost the U.S. taxpayer to continue to seek a repository is not being opening and honestly presented, as the Idaho National Laboratory conducts propaganda sessions for TerraPower and others hoping to create profits from the VTR at the taxpayer's expense.

The Department of Energy is pretending it must comply with the recent legislation to seek the VTR with low-balled cost estimates, yet the DOE habitually ignores state and federal laws. For example, the amount of spent nuclear fuel and HLW allocated to the DOE for the failed Yucca Mountain repository effort is limited and the DOE already has exceeded its lawful allotment. The Nuclear Waste Policy Act remains the law; it limits the quantity of spent nuclear fuel from commercial nuclear power plants to 63,000 metric tons heavy metal (MTHM), 2,333 MTHM for DOE SNF and 4,667 MTHM for HLW. The quantity of commercial SNF, DOE SNF, and DOE-managed HWL are each greater than DOE's allotment for the first repository. [7] But DOE hasn't obtained its first repository, which by law, would be at Yucca Mountain.

The Department of Energy promised to begin disposal of spent nuclear fuel by 1998. Then came other promised dates that have come and gone. The U.S. Nuclear Regulatory Commission believed those empty promises from the Department of Energy, expecting to disposal by 1998, then 2008, and then by the first quarter of this century. [8] The Department of Energy's rapidly evolving waste emplacement concepts continued to evolve as every assumption about how the repository would contain the waste didn't hold up. No utility has packaged its spent nuclear fuel

[6] Blue Ribbon Commission of America's Nuclear Future. 2012. (It uses 2010 estimates for spent fuel quantities) www.brc.gov

[7] U.S. Nuclear Waste Technical Review Board (NWTRB), Management and Disposal of U.S. Department of Energy Spent Nuclear Fuel. Arlington, December 2017. See p. 15.

[8] Nuclear Regulatory Commission, 10 CFR 51, Waste Confidence-Continued Storage of Spent Nuclear Fuel, Federal Register, Vol. 78, No. 178, September 13, 2013.

into DOE's recommended "transport, aging and disposal" TAD canister. The Yucca Mountain repository concept also relies on never designed titanium drip shields that no one honestly believes are feasible to install decades after the waste is emplaced.

The draft EIS must address that fact that the Department of Energy has no spent nuclear fuel repository program and hasn't since 2010. It must address the fact that the Department of Energy **has no credible cost estimate for the costs of disposal of now-existing spent nuclear fue**l plus the fuel from already operating reactors. Few people know that there is already more than double the amount of spent nuclear fuel (and high-level waste) than Yucca Mountain was set to legally hold. And few people know that if nuclear energy were to make a dent in climate, we would need a new Yucca Mountain every year.

While the Department of Energy's estimated releases from the proposed Yucca Mountain repository are unbelievably low, this in an artifact of reducing the water infiltration rates through the corroding waste containers. Using more realistic water infiltration rates and their variability over time results in far higher releases.

The heat load of the spent nuclear fuel placed in the repository poses a risk to the structure of the repository and the DOE never actually decided whether to use a "hot" repository or a "cool" repository design. The amount of waste and how it is spaced in the repository obviously affect the ability to cool thermally hot spent nuclear fuel.

The criticality issues for Yucca Mountain have grown substantially as the enrichment level used in commercial nuclear power plants has increased. It has also grown because YM originally was not envisioned to dispose of the Department of Energy's highly enriched fuels. And another change has been the included possibility of disposal of surplus plutonium at Yucca Mountain. The Department of Energy concedes that criticalities are possible in the repository, yet it does not address the harm to the repository or the additional spacing requirements.

Doubling the capacity of Yucca Mountain, the slated 70,000 metric tons of spent nuclear fuel and high-level waste, may seem easy, when only the fraudulent radionuclide trickle-out radiation doses are reviewed but in reality, is far more problematic. The slated capacity of Yucca Mountain already required skirting around seismic faults and required 40 miles of underground tunnels.

U.S. Nuclear Regulatory Commission Chairman Kristine Svinicky recently characterized the nation's growing inventory of spent nuclear fuel as having a volume that would fit in a football field. That the head of the agency that would grant a license to the Department of Energy's proposed Yucca Mountain repository would omit the realities of the difficulties of safely containing the spent nuclear fuel is very telling of the mindset of the NRC. The NRC wants to grow nuclear energy no matter the cost to rate-payers, taxpayers, or to humanity. All the NRC has to do is sign off that they believe the DOE's safety case for repository provides a "reasonable expectation" of meeting stipulated requirements.

An online briefing "What Congress Needs to Know About Pending Nuclear Waste Legislation" was held November 13, 2020 by the Environmental and Energy Study Institute, with guest speakers Robert Alvarez, Institute for Policy Studies; Don Hancock, Southwest

Research and Information Center; and Diane D'Arrigo, Nuclear Information and Resource Service to explain hazards associated with spent nuclear fuel and history pertaining to the Nuclear Waste Policy Act. [9]

The State of Nevada was attentive to the DOE's rapidly changing disposal concepts and the many times that technically indefensible studies were used to form the basis for how long it would take the waste containers to corrode and how long it would take radionuclides from the waste to migrate to groundwater.

The VTR EIS cites various DOE EISs that are grossly inadequate as well as inconsistent in every essential aspect related to the spread of radiological material and the harm. The Yucca Mountain safety evaluations assumed 0.9999 efficiency for HEPA filters and that there would be no releases from spent fuel stored outdoors and without HEPA filtering. The Yucca Mountain safety evaluations have used fraudulent and unscientific water infiltration modeling to lower predicted doses from the migration of radionuclides from the disposed of waste. The Yucca Mountain EIS assumes the design of spent fuel canisters, the "TADs," that have not been used for commercial spent nuclear fuel storage

When the Department of Energy twice proposed a disposal container for the commercial nuclear power plant owners to use, they ignored it. The electrical utilities would choose cheaper canister designs not intended for disposal because they planned on it becoming the Department of Energy's problem. And this means that the problem would be solved at the expense of the U.S. taxpayer. And the U.S. Nuclear Regulatory Commission did everything in its power to limit the utilities' costs.

The U.S. Nuclear Regulatory Commission claims to have accepted the highly speculative safety case for DOE's proposed Yucca Mountain, yet no construction license was ever issued.

Current law prohibits consolidated interim storage about 10,000 metric tons (MT). Despite this, the U.S. NRC is planning to license two far larger consolidated interim storage facilities for spent nuclear fuel. One facility is in New Mexico and the other in Texas.

Many electrical utilities are seeking to move their spent nuclear fuel away from places the U.S. NRC never should have allowed the spent fuel to be "indefinitely" stored: ocean coastlines and lake shores, among them. These consolidated interim storage sites are planning to accept spent nuclear fuel in non-disposable containers. The proposed consolidated interim storage facilities will have no capability for repackaging a damaged canister, nor repackaging for disposal if a repository were found. And importantly, the Nuclear Waste Policy Act sought to prevent consolidated storage that would have the effect of lessoning the effort to attain a permanent solution for the permanent isolation of the radioactive waste, which remains radio-toxic for millennia.

To help the SONGS utility understand their options for moving their spent fuel farther from the California coastline, they have hired a consultant, North Wind. A tangled web of possibilities

[9] Environmental and Energy Study Institute (EESI) briefing at https://www.eesi.org/briefings/view/111320nuclear#RSVP and see "Yucca Mountain in Brief at https://www.eesi.org/files/Letter_to_Congress-Yucca_Mountain_in_Brief.pdf

was presented at a public meeting for the San Onofre spent fuel but currently there is no place to move their spent nuclear fuel to. [10]

The utility is also concerned that the full costs of transportation and storage may not be fully reimbursable from the Judgment Fund from the litigation with the Department of Energy's partial breach of contract in failure to start disposing of the spent nuclear fuel from commercial nuclear power plants. Also, it was pointed out that utility customers may not be fully shielded from liability for accidents involving storage of spent nuclear fuel at private storage facilities. Utilities want the Department of Energy to take ownership of the spent nuclear fuel. But the Department of Energy has no place to put it. The Nuclear Waste Policy Act of 1982 and amended in 1987 sought specifically to avoid letting up the pressure on the Department of Energy to obtain permanent, safe disposal of spent nuclear fuel. The DOE was restricted from obtaining interim spent fuel storage unless it had obtained a license for a facility for permanent disposal.

Both the U.S. NRC and the Department of Energy are touting consolidated interim storage as though it were equivalent to obtaining a permanent solution for isolating the radioactive waste. They know that repackaging will be needed, acknowledged to be needed every one hundred years or so. Yet both proposed consolidated storage facilities the NRC is planning to approve this year do not have any canister repackaging or isolation capability.

So why would the U.S. NRC be ready and willing to license two consolidated interim storage facilities that by design will not include any capability to repackage damaged canisters? The answer that the U.S. NRC has given is that the situation is similar to the spent fuel facility it licensed in Utah but which was never built. The U.S. NRC said that the Private Fuel Storage facility in Utah did not need any repackaging capability because if a canister of spent nuclear fuel was damaged, it would be sent back to the licensee that generated the waste.

This is important to understand, as the Department of Energy is actively promoting nuclear energy and failing to mention its continuing failure to find a permanent solution to safety isolate the spent nuclear fuel (and high-level waste) and failing to discuss the problems of short-sighted consolidated interim storage that the U.S. NRC is ready to approve. The challenges of spent nuclear fuel disposal are greater now than they were assumed to be 40 years ago. In fact, the technology to safety isolate these radioactive wastes from our air, soil and water has not been found and this is whispered by the U.S. Nuclear Waste Technical Review Board.

The ridiculousness of the NRC's argument that the consolidated storage facilities have no need for repackaging capability because they would just require the waste to be returned to the utility that generated it shows the extent of nonsensical lying the agency is prone to. A damaged canister cannot be legally shipped. And spent nuclear fuel being sent to a consolidated storage site may have shut down its reactors and decommissioned all its facilities. The NRC's argument that the compromised canister would simply be shipped back to the utility that generated the spent nuclear fuel is utterly absurd. But this is the quality of thought that the NRC has put into much of its licensing and its "waste confidence" rule and its subsequent environmental impact

[10] San Onofre Nuclear Generating Station (SONGS), 11/20/20, North Wind slide presentation https://www.songscommunity.com/_gallery/get_file/?file_id=5faf01792cfac225d3c64352&ir=1&file_ext=.pdf

statement for continued storage of spent nuclear fuel. The NRC gave up on trying to keep track of the latest promised date that a repository would be available and now assumes that a repository will become available "when needed." The NRC also assumes that the facilities to repackage the spent nuclear fuel, every 100 years or so, will also become available "when needed." And it simply isn't the NRC's problem what the cost is, or who pays for it, as long as it is not one of its licensees, the electrical utilities who operated nuclear reactors.

The technology to repackage the spent nuclear fuel canisters used prevalently by commercial nuclear power plants does not exist. It is recognized that these operations will pose many worker risks and radiological release risks as well as billions of dollars in cost. The disposal canister designs do not exist. And the capability to terminate the radiological release from a damaged canister does not exist. This is problem for the U.S. NRC who assumes no liability for the releases. And actually, the U.S. NRC undermines the radiological monitoring where spent nuclear fuel is stored so that citizens won't know that actual release levels either.

The VTR EIS fails to mention that the Department of Energy has no designed disposal canister for its spent nuclear fuel, for disposal at the repository that the DOE has long promised but, in fact, does not exist, and was never licensed or constructed.

The Department of Energy is rushing to create more spent nuclear fuel, both DOE-owned SNF and new kinds of commercial spent nuclear fuel, while ignoring the problems we already face from decades of spent nuclear fuel accumulation. Each new variety of spent fuel cladding type, enrichment type, burnup and design require new storage and disposal analyses and designs, and more indefinite storage facilities, which fall to the U.S. taxpayer to fund.

VTR Spent Nuclear Fuel Poses Unevaluated Storage and Disposal Risks

Table D-4 in the VTR EIS lists 6112.2 grams of plutonium-239 per assembly of fresh fuel and 5550 grams after use in the reactor to a burnup of 6 percent. There are 66 fuel assemblies in a VTR core and additional in-vessel spent nuclear fuel storage locations where fuel is stored at least one year before removal. The VTR, thus gives a tiny reduction in the amount of plutonium-239, while creating millions of curies of short- and long-lived fission products that complicate storage and disposal. The VTR is expected to use 400 kg annually of plutonium-239 and 24 metric tons over 60 years of operation. The nuclear fuels it will test in the VTR are an additional waste stream for which the Department of Energy has granted to itself the ability to pretend that nuclear fuels used in experiments or tests are not actually spent nuclear fuel. This allows the Department of Energy to bury such material in shallow landfills as it has at the Idaho National Laboratory and at other national laboratories.

The VTR EIS states that about 2 metric tons of spent VTR fuel would need to be treated annually at the MFC FCF (the Fuel Conditioning Facility with pyroprocessing capability). But the throughput of the FCF has not been that high according to the 2017 U.S. Nuclear Waste

Technical Review Board. Annually averages have been about 0.3 MT/yr between 1996 and 2009 and only a rate of 0.1 MT/yr between 2009 and 2013. [11]

The VTR EIS must explain how the backlog of all existing spent fuel to be treated at the MFC's FCF will be addressed.

The VTR EIS has presented Table B-27, as an estimate of treating VTR fuel at FCF based on the current radiological releases from FCF. The current level of usage or the fuel characteristics of the fuel being treated at FCF for HALEU is much higher than previous levels at FCF but it is not clear that even the currently high radiological releases from FCF will bound future releases from FCF for the VTR feedstock and 2 metric tons annually of VTR SNF treatment is conducted.

The VTR EIS must make much more information available about how the radiological routine emissions have been estimated and how they will bound future FCF releases that include treating VTR spent fuel. The VTR EIS also needs to explain why it can't do more to reduce these huge levels of airborne radiological releases and so close to many communities.

Then VTR EIS must explain the risk and consequence of failing to treat all the VTR spent fuel to remove the sodium and make SNF ingots, if due to funding cuts or program cuts or unavailability of the FCF due to aging, accidents, etc. prevents VTR spent fuel treatment. The tendency for DOE to not timely provide treatment of spent nuclear fuels is prevalent at the INL and other DOE sites. The VTR EIS needs to include a summary of DOE's continuing failure with many of its other projects, such as the failure to treat leaking tanks at Hanford, Hanford vitrification plant delays, INL Integrated Waste Treatment Unit delays, failure to repackage spent nuclear fuel at the INL in order to meet the 1995 Idaho Settlement Agreement, etc. Why should claims to meet stated performance levels for waste treatment in the VTR EIS have much credibility?

As it is now known that the spent nuclear fuel packaged at commercial nuclear reactor sites has used welded-closed canisters where currently there is no technology developed to safely or affordably open the canisters in order to replace a damaged canister or in order to repackage the spent nuclear fuel into a disposable canister, the VTR EIS needs to answer questions about of the VTR spent nuclear fuel storage system. Namely, does the technology exist to open the casks and the VTR ingot canisters inside the casks and safely remove the spent fuel ingots for repackaging?

With the DOE's disposal canister not designed, licensed or built, how, when and where will the VTR fuel be repackaged for disposal? The VTR EIS must answer how many DOE repository disposal canisters will be needed for the VTR spent fuel ingots. The VTR EIS must answer what kind of facility will be needed for the VTR spent fuel ingots to be repackaged, perhaps many decades from VTR closure?

The VTR EIS must acknowledge that the DOE has already exceeded its allotted limit of spent nuclear fuel and HLW in Yucca Mountain. The VTR EIS must explain how after decades of promising to open a repository but failing to, that the DOE, with no repository program since

[11] U.S. Nuclear Waste Technical Review Board (NWTRB), Management and Disposal of U.S. Department of Energy Spent Nuclear Fuel. Arlington, December 2017. See p. 97.

2010, is going to obtain a repository. The VTR EIS must explain whether it expects DOE to obtain a repository by 2048 or if it has some other date in mind. How will the FCF still be operable decades from now? The VTR EIS must explain the costs of continued repackaging of the spent nuclear fuel as it waits for a repository to open. The VTR EIS must explain how DOE is going to obtain a repository for existing SNF that would already fill the Yucca Mountain repository to capacity allowed by law and then obtain a second repository for the VTR SNF.

The VTR fuel is unique and poses higher and different risks than other fuels slated for disposal. The VTR EIS must examine the repository performance issues for the VTR fuel, in terms of criticality, migration of contaminants, pyrophoricity and other differences from commercial spent nuclear fuels so that any repository licensing issues worsened by VTR SNF are identified. The VTR EIS must explain how and when this evaluation will take place and who will pay for it.

And given decades of the DOE struggling to deal with U.S. surplus plutonium, the VTR EIS needs to be honest about the likelihood of importing much or all of the plutonium to be used for VTR fuel from foreign countries' plutonium from their commercial spent nuclear fuel reprocessing. The reduction in impurities from the reprocessed foreign SNF may be attractive to the VTR project but the harm of making the U.S. now shoulder the burden of an added approximately 34 MT plutonium is not fully admitted in the VTR EIS because it is simply waiving at past spent nuclear fuel EISs that are clearly inadequate to be relied upon for existing SNF let alone for the added VTR spent nuclear fuel.

The VTR EIS fails to provide enough information about the spent fuel ingot forms and fails to acknowledge that no DOE EIS for spent fuel management addresses this SNF form.

On page B-55 of the VTR EIS, it simply states "This treated fuel would be stored at the site until an offsite storage option (either an interim storage facility or a permanent repository when either becomes available for VTR fuel), at which time it would be shipped off site."

It is currently not legal for the Department of Energy to use a consolidated interim storage facility for SNF because no license has yet been obtained for a repository. There is no permanent repository, no license for one, nor is there a program to obtain a permanent repository. And there's already more spent nuclear fuel and HLW than will fit in one repository, by law. So, the VTR EIS statement is testament to a lack of transparency in disclosing the truth about the problems the U.S. will face in dealing with spent nuclear fuel disposal from the VTR project.

The VTR EIS must also evaluate the risk that the VTR spent nuclear fuel is not treated by pyroprocessing, i.e., in the FCF, to remove the sodium and make to spent fuel ingots. If the facilities do not remain available due to lack of funding or other reasons, the VTR metallic U-Pu-Zr spent nuclear fuel has not been evaluated for any DOE disposal facility. The untreated sodium-bonded SNF could pose additional criticality, instability, and safety risks for repository disposal and actually preclude disposal in a repository. The uniqueness of the VTR metallic U-Pu-Zr fuel and how it may pose additional difficulties in its disposal in treated ingot form and if left untreated, must be explained in the VTR EIS.

The lack of coverage and the overall inadequacy of existing DOE spent fuel management EISs must also be addressed by updating and reissuing those EISs before the VTR can be fully evaluated.

VTR Radioactive Waste Disposal (Other Than Spent Nuclear Fuel) is Not Adequately Explained

The radionuclides and the curie amount of each and the location where the radioactive waste will be disposed of, is generally missing from the VTR EIS. The authors perhaps did not want to reveal just how much radioactive waste they would pour into open-air evaporation ponds to release to Idaho skies or admit how much radioactive waste they would be burying over the Snake River Plain aquifer. The VTR EIS must be much more specific about the radioactive waste it will generate, include radionuclides and curie amounts and where, specifically, the radioactive waste will be disposed of.

The low level and mixed low-level waste generated from treating VTR spent fuel, in pounds, are identified in Table B-28 without saying what radionuclides would be in the waste. The VTR EIS did not say when the low-level waste would likely exceed greater-than-class-C levels, which limits the disposal options. The VTR EIS must state where this waste will be disposed of. The VTR EIS must include the specific radionuclide and curie amounts in this waste and where this waste is expected to be disposed of. The DOE disposes of low-level radioactive waste at the INL over the Snake River Plain aquifer, particularly if no LLW facility will accept the waste.

On page B-51, the VTR EIS, again, hides more than it reveals, stating: “The sealed steel shells of stabilized salt and iron would be transferred to a packaging station where they would be placed in road-ready containers for shipment to a temporary waste storage location. Iron from sodium stabilization, sodium salt, and the processed plenums (sodium-free steel clads either as ingots or as scrap metal) would be treated as remote-handled low-level radioactive waste.”

The VTR EIS must identify the radionuclides and composition of the non-SNF waste. It must identify where the temporary storage location is and how it will be protected from fire, structural damage, neglect, etc. Because it is stated to be treated as “remote-handled low-level radioactive waste” it is expected to have a significant level of gamma radiation. The VTR EIS, here, as in many other places, leaves much to the imagination – what is in the waste, where will it be stored and where will it be disposed of.

The VTR feedstock and fuel fabrication processes create large radioactive waste streams. The VTR EIS must explain specifically the HEPA filter performance it has assumed for all building and stack releases (i.e., from FCF and HFEF). And although it is difficult to get DOE to keep its EIS commitments, the design and performance level of the HEPA filters needs to be a stated commitment. I have seen at the INL, failure to replace HEPAs or failure to keep fans to the HEPAs operable.

The VTR EIS has listed pounds of radioactive waste streams, i.e., in Tables B-34 and B-39, but fails to say when, where and how the radioactive waste will be disposed of. The DOE allows itself (or has the ability to allow itself) to shallowly bury radioactive waste at the INL over the Snake River Plain aquifer that is greater-than-class C waste, that may be remote-handled waste,

that may include any amount of test material that is actually spent nuclear fuel. And rather than use clay-lined or other design precautions, as the Idaho CERCLA Disposal Facility for cleanup wastes, the DOE uses the Radioactive Waste Management Complex or its replacement. The VTR EIS must explain all of the radioactive waste, radionuclides and curie amounts of each, it plans to bury over the Snake River Plain aquifer from the VTR project. It must explain the radionuclides and curie amounts of each, that it plans to dispose of outside the INL and state specifically where all radioactive waste will be disposed of.

The VTR EIS must explain where the Liquid Radioactive Waste System mentioned in Appendix B will dispose of the waste water, i.e., the waste water it says will be exported via truck from VTR. The VTR EIS must explain where this waste water will go. The open-air evaporation ponds that the INL is using is spreading inadequately characterized and inadequately monitored radionuclides to the Idaho skies. And in fact, the limited monitoring is not publicly available and is destroyed every two years. And in fact, the discharges historically and ongoing have included radioactively laden resins with radionuclides from the Advanced Test Reactor, and once in the evaporation ponds are released to the Idaho skies.

The Department of Energy continues to and historically has not adequately reported the radionuclides disposed of via open-air evaporation ponds. The INL operations, including the radioactive waste evaporation ponds, have been releasing larger amounts of radioactivity than they have declared in annual environmental surveillance reports or NESHAPs reports. The VTR EIS must explain why yellow-bellied marmots in Pocatello contain numerous short-lived radionuclides that could only have come from the Advanced Test Reactor. The VTR EIS must explain why the Department of Energy has allowed unstated amounts of radionuclides, not declared in air effluent estimates for NESHAPs reporting to continue to be flushed from the ATR to the evaporation ponds. The trucking of waste water to evaporation ponds is inadequately monitored and there is inadequate oversight of the radiological releases from the evaporation ponds.

The decontamination and decommissioning of the VTR will also no doubt result in additional "forever" contamination sites at the INL such as those currently expected to require preventing humans from digging, living or visiting there, throughout millennia via the use of "active" administrative controls. Thus, the push by the U.S. Nuclear Regulatory Commission is to increase access of nuclear waste to ordinary landfills in communities around the U.S.

In Idaho, we have extensive radioactive disposal not just at the INL but also at the US Ecology Grandview hazardous waste site that accepts radioactive waste from around the country and the world, despite not being a low-level radioactive waste dump. The U.S. NRC is the regulator for radioactive waste disposal outside of Department of Energy facilities. The NRC is aggressively promoting using ordinary landfills for nuclear waste And the U.S. NRC has allowed *special nuclear material* including plutonium to be disposed of, in Idaho, at the Grandview facility that is not even a radioactive waste dump. The loop hole for RCRA hazardous waste dumps has allowed extensive soil, air and water radiological contamination on the Boise side of the State of Idaho, which most people don't even know about. The VTR EIS must explain where it expects its radioactive waste to be disposed of.

VTR Siphons Money from Real Climate Solutions

The completion of the VTR can be reasonably expected to have years of schedule delays. This means that the VTR and projects that would test nuclear materials will be too late to address climate concerns. The high cost of VTR siphons scare money away from real climate change solutions. And any meaningful increase in the use of nuclear energy would mean needing a new Yucca Mountain repository every year. [12] The Department of Energy has no repository and no repository program and the VTR EIS tries to hide this because it would reasonably mean that making plans to create far more spent nuclear fuel is of high adverse environmental impact.

VTR Accident Risks Downplayed but May Devastate SE Idaho

The VTR EIS tries to down play the reactor accident risk, yet acknowledges that the core disruption of the sodium-cooled fast reactor, the VTR, can cause accident consequences "in the hundreds or thousands of rem to the public," and "can have very high, likely fatal doses."

Fast Reactors such as the VTR are prone to have something called "core disruptive accidents" where the core explodes. Because monitoring these reactors is difficult, coolant stratification, coolant channel blockages, voids in the coolant or other unexpected situations can occur unpredictably. Partial melting and movement of the fuel can then result in the reconfiguration of the fuel in the core and a low yield explosion that destroys the reactor and releases a devastating amount of fission products and actinides like plutonium-239 to blow in the wind.

Even with light-water reactors, like Fukushima or Three Mile Island, the "experts" had much confusion as to what was going on, or what to do about it. The problem can be compounded for certain circumstances in sodium-cooled fast reactors and there won't be time to respond.

The VTR EIS asserts and with no evidence that the VTR will be safer than conventional reactors. We will be lucky if the VTR is as safe as conventional LWRs because of the unknowns about the new design and because a test reactor changes nuclear-fueled-experiments and other experiments frequently, leaving little time for analyzing the new core configuration's safety.

Fast reactors have high density core and require a coolant that doesn't slow the neutrons down, like liquid metals, molten salt or helium gas. In 1951, the EBR I, a small sodium-cooled fast reactor, operated at what is now the Idaho National Laboratory. [13] It experienced a core melt down. Fast reactors can fission plutonium, americium and curium as well as breed plutonium by neutron capture by uranium-238.

The U.S. fleet of commercial nuclear reactors are "slow" neutron reactors or thermal reactors that use fuel consisting of uranium-238 and less than 5 percent enrichment in uranium-235. These thermal neutron reactors are water-moderated to slow down the neutrons. These conventional nuclear reactors also produce plutonium, americium and curium. There is plentiful uranium-238 and when it absorbs a neutron, it will, following successive decays, create

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[12] Edited by Allison M. Macfarlane and Rodney C. Ewing, *Uncertainty Underground Yucca Mountain and the Nation's High-Level Nuclear Waste*, The MIT Press, 2006. Page 4.

[13] Sonal Patel, *Power Magazine*, "Rapid Advancements for Fast Nuclear Reactors," March 1, 2019. https://www.powermag.com/rapid-advancements-for-fast-reactors/

plutonium-239. The plutonium-239 that builds up in a conventional reactor may fission in conventional reactors or absorb a neutron without fissioning, producing plutonium-240, plutonium-241 etc. through successive neutron captures. Plutonium-239 is produced in and will fission in thermal reactors. All commercial nuclear spent fuel contains most of the original uranium-238 and uranium-235 plus a host of fission products and a large amount of actinides including plutonium-239 and other plutonium isotopes along with americium and curium.

Mistakes made in a test reactor design or its operation can lead to disaster. The VTR is to be located 30 miles from Idaho Falls at INL's MFC, the proposed location for the VTR, and it can mean Idaho Falls and surrounding communities face forever contamination, financial devastation to home and business values because loss due to radiological contamination is not insurable, not to mention illness and much reduced life expectancy.

Materials testing reactors, including the VTR, are used to test reactor materials, typically for the military. The reactor size in megawatts-thermal makes them sound relatively small in comparison to large 3000 MW-thermal (or 1000 MW-electric) nuclear plants. But these test reactors have very high enrichment and high burnup, which means disproportionately high fission products can be released from an accident.

The VTR is a very high-power density which makes cooling the fuel a greater challenge than conventional reactors. And these reactors run with changing configurations due to varied experimental materials and their coolants.

The added risk posed by making one mistake in the calculations for the new configuration of experiments in the VTR not only add to the material-at-risk to be released by an accident, these experiments can be the cause of a reactor accident.

The rapid configuration changes of the experiment configurations make safety review very challenging and the pressure to take short cuts is real.

There are more mistakes and close calls than the DOE discloses to the public. Put the experiment in the wrong position, or over irradiate the test and experiments can swell and get stuck so they are difficult to remove, or welds that burst and contaminate the loop or the coolant or a problem may affect the entire core. Materials testing is more of an ongoing high-wire circus act that poses all kinds of risks to workers and to reactor safety if a mistake is made. If the basic reactor of the VTR were safer than a conventional reactor, the materials testing function would still significantly increase the risk.

The draft VTR EIS is disclosing some of the horrendous risks all while dismissing the risks as overly conservative. The draft VTR EIS is placing more emphasis on speculative propaganda than on honest assessment of VTR accident risks.

This VTR EIS wrongly asserts that a severe accident at the VTR is less likely than for a conventional light-water reactor. **The likelihood of a severe radiological release from the VTR is high not only because of the reactor and fuel design and its sodium coolant but also because of the wide variety of materials it will be testing.**

The VTR EIS acknowledges that accident likelihood has not been studied and there is no probabilistic risk assessment of the likelihood of an accident. Yet the VTR EIS asserts that a beyond-design-basis accident for the VTR is less likely than for a conventional light-water reactor. The VTR EIS also acknowledges that consequences of an accident at the VTR "can be in the hundreds or thousands of rem to the public," and "can have very high, likely fatal doses," see Appendix D of the VTR EIS.

Construction of the VTR at the Idaho National Laboratory's Materials and Fuels Complex builds in the **use of seismically inadequate facilities** including the Fuel Conditioning Facility (FCF) and other hot cells. This is completely unacceptable, particularly for the proposed 60-year mission.

Chapter 4 of the VTR EIS says the economic harm from a beyond-design-basis accident is discussed in Section D.4.9.4. But it's not. Its discussed in D.4.9.8. And the discussion low-balls the economic harm of an accident. It is really no wonder why the Department of Energy refused to give hard copies of the draft VTR EIS and provided so little time for review – their EIS is full of mistakes, both small and exceedingly large, like relying on spent nuclear fuel disposition programs that don't exist.

The VTR EIS promotes the lower population around the Idaho site location compared to the Oak Ridge location. I know from experience as a safety analyst at the Idaho National Laboratory, that the Department of Energy will take more shortcuts and underfund needed maintenance and safety features precisely because of the population being low and therefore, doesn't matter.

The Economic Impact of an Accident at the VTR is Grossly Understated in the VTR EIS

The economic impact of an accident at the VTR is grossly understated in the VTR EIS and must address decades of non-use of farm land, worthless real estate, long-term evacuation of residents and elevated levels of health harm, not limited to cancer. The cost of remediation to the local hospitals which become contaminated would likely exceed the entire cost figure the EIS presents.

The EIS must explain the insurance availability, or lack-there-of, for radiological contamination from radiological emissions from operations associated with the VTR, including the lack of analysis of realistic impacts to containers during transportation.

The Accident Release Fractions Low-ball the Radiological Releases from a VTR Accident

Accident release fractions from a VTR accident are not known now, nor will they be known after an accident. The cost of attempting to clean up the reactor site would cost more than the economic figure the EIS presents for total economic cost of than accident.

Not only have the accident release fractions been low-balled for PRISM, they continue to be low-balled in order to reduce the estimated accident consequences.

Errors and Omissions in VTR EIS Radionuclide Composition

Table D-8 for 4-year cooled VTR fuel includes Ru-103 and Ru-106. But Table D.7 for 220-day cooled VTR fuel lists Ru-105 and Ru-106, but does not list Ru-103.

Table D-8 has omitted numerous uranium isotopes which may be useful to monitor in the environment as they are not naturally occurring, e.g., thorium decay feeding uranium-232 and uranium-236. Fully inclusion of radionuclides in Table D-8 would be helpful even if expected dose is small because the chemical form of the uranium, etc. may make it far more harmful than currently estimated based on natural uranium.

Due to the limited time to review, there may certainly be many more errors than I have recognized thus far.

The VTR May Leave Citizens Uncompensated for Transportation Accidents and Facility Accidents

As a country, we have not found the money to keep up with normal and expected repair of our crumbling roads, railways and bridges. Bridge and railway accidents have increased during the last twenty years, as has the severity of fires involved with railway transport of oil.

Yet the nuclear promotors want to greatly increase the transportation of nuclear waste and in larger and heavier containers. The Price Anderson Act does not compensate citizens for radiological releases from transportation accidents that may result in contaminated homes, property, businesses and shortened life spans and disease. The radiological contamination could be severe, despite assertions and active government-sponsored propaganda campaigns to the contrary.

The VTR Will Be A Giant Electricity User Just to Keep the Sodium Coolant Liquid

Keeping the sodium from hardening requires continuous heating and that requires a lot of electricity, even when the reactor is not running. While the reactor is running, the VTR will require electricity for cooling the reactor. The Hanford Fast Flux Test Facility, a sodium-cooled fast reactor operated the reactor over the course of 10 years but operated the sodium-coolant for 20 years! The VTR is an electrical usage drain for our region.

Historical Proof of Inadequate Department of Energy Regulatory Oversight

The Department of Energy's draft Environmental Impact Statement for the Versatile Test Reactor relies on speculation that the VTR will be operated safely. Core disruption events at the VTR would destroy many lives and even more livelihoods.

The Department of Energy's track record, specifically at the Idaho National Laboratory's Materials and Fuels Complex, is to cover up safety deficiencies, especially those deficiencies associated with offsite radiation dose to the public. At MFC, seismic studies were "lost" for years, the safety analysis documentation remained unfinalized for years because no one could agree on how to finagle the radiation doses to be low enough, the DOE officially approved safety documentation as 10 CFR 830 compliance when it knew the documentation was not at all compliant.

Then in 2005, Battelle Energy Alliance took over the contract, pointed to the skeleton in the closet, and DOE admitted that the nuclear facility safety documents were not 10 CFR 830

compliant. DOE agreed that it would take many more years to actually make the safety bases for MFC anywhere near code-of-federal regulations compliant.

Despite the Department of Energy signing off on the Materials and Fuels Complex safety bases as code-of-federal regulations compliant about 20 years ago, when it was not compliant, the DOE also bolstered its argument by saying nothing bad was going to happen because of the strong safety culture at MFC.

But at INL's MFC, the condition of safety processes, safety equipment, and safety attitude was still so poor that managers at MFC ignored written warnings of high hazard to workers and MFC managers directly caused the plutonium inhalation event in 2011. After conducting 6 years of safety bases updates, the MFC managers actively ignored repeated warnings of worker radiological safety risks – and the preventable accident was not prevented and 16 workers (and actually more) were harmed by the 2011 plutonium inhalation event at MFC.

And the best the contractor, Battelle Energy Alliance, could do was blame workers despite even the DOE investigation report blaming management. The contractor also produced fraudulent lung count results to lie about the magnitude of the accident.

And because it was clearly Battelle Energy Alliance management's fault and there were multiple inadequate safety programs, BEA was quick to (1) falsify the urine and fecal sample results and the lung count results and (2) to attempt to coerce workers to sign that they had received information about their radiation dose when in fact, they hadn't. Radiation dose information from DOE contractors is not to be believed when high doses would get the contractors hands slapped (with fines). BEA blamed the workers even when DOE's own accident investigation found no fault by the workers who were contaminated.

And these events follow years of hiding adverse findings about seismic safety at MFC and the DOE's other test reactor, the Advanced Test Reactor as well as other safety problems that often were not reported.

There may be one agency worse at nuclear reactor safety regulation than the U.S. Nuclear Regulatory Commission and that is the Department of Energy, which has set its sights on overseeing safety at the VTR presumably because of military missions that aren't being discussed. And now we have the U.S. Nuclear Regulatory Commission Chairman Kristine Svinicky actually bragging about how the NRC is hiring former Department of Energy personnel and placing them in high positions in the NRC.

VTR EIS Ignores Repeated Accidents with Inadequate Emergency Response

The VTR EIS fails to acknowledge decades of repeated inadequate emergency preparation for site emergencies in terms of training, decontamination, radiological medical treatment, inadequate emergency radiological monitoring during and after the emergency.

Not only was the emergency response to the Department of Energy WIPP accidents inadequate in 2014, and the Department of Energy plutonium inhalation event at INL in 2011, it was inadequate at the INL's Radioactive Waste Management Complex in 2018 when, due to deliberate actions to ignore the known contents of waste drums, four waste drums forcefully

expelled their powdery contents within a fabric enclosure. The fire department responded to the event due to activation of a fire alarm and the fire department had no idea a radiological event had occurred. The radiation constant air monitors did not alarm and the facility had no available radiological support with knowledge of what might have happened in the facility and had no radiological support staff with self-contained breathing apparatus training – because it was assumed that no matter the unreasonable risks they were taking, there would not be an event.

In fact, the Department of Energy actually avoids any oversight or evaluation of the emergency preparedness of facilities that it recognizes have large deficits. It is for this reason that the Department of Energy has long avoided any oversight assessment of the INL's Materials and Fuels Complex emergency preparedness.

The VTR EIS fails to acknowledge that the routine and emergency monitoring will ignore the uranium-235 released by the accident as well as inadequate actinide (plutonium, americium, curium, etc.) monitoring because of intentional environmental monitoring inadequacies to avoid implicating the INL as the source of the contamination. The decay products from plutonium-240 and uranium-236 are thorium decay progeny which the environmental monitoring falsely asserts are from naturally occurring thorium-232. The elevated levels of uranium-234, uranium-235, uranium-236 are intentionally not delineated by the specific isotope so the DOE can falsely claim that the uranium is naturally occurring.

From the 1961 SL-1 accident where radiological monitoring was especially inadequate for emergency responders, to the 2011 plutonium inhalation accident caused by management failure to heed repeated warnings of high worker risks and the multiple failures that caused the event and the multiple failures in responding to the event, to the 2018 four drums of waste that exploded and fire fighters, once again, responded without support of adequate training or radiological support personnel.

The VTR EIS fails to acknowledge that the lack of proper decontamination facilities means that an injured worker is going to radiologically contaminate medical facilities in Idaho Falls.

DOE Actively Seeks to Undermine State and Federal Laws

The VTR EIS implies by listing various laws that the Department of Energy complies with state and federal laws and complies with meaningful DOE regulations and Orders.

In fact, DOE has for years sought to send radioactive waste to WIPP despite laws prohibiting it.

DOE has for years been seeking consolidated interim storage of spent nuclear fuel and in quantities prohibited by law because the NWPA laws sought to prevent DOE from simply providing above ground storage rather than obtaining permanent disposal.

The DOE has been recognized by the courts as modifying it radioactive waste DOE Orders at whim, which means no EIS that cites a DOE Order can be relied upon.

The DOE has ignored federal law and state legal agreements by unilaterally declaring it can declare its high-level waste is now low-level waste, and with vastly reduced disposal limitations.

The DOE has made a practice of not referring to the sodium-bearing waste at the INL as high-level waste, despite not having made any steps to officially reclassify it as such — because of the legal challenges this may bring. But not calling the waste high-level waste, it can misinform citizens and State of Idaho officials, however.

VTR EIS Actively Ignores the Current Scientific Evidence of Radiation Health Harm

The Department of Energy's accepted modeling of health risk from radionuclide emissions (routine or from accidents) actively ignores diverse, compelling human epidemiology. I have been told that the reason is "that somebody high up has decided that the benefit of changing the radiation protection standards isn't worth the cost." This basic description comes from university professors and INL lab directors. Basically, the Department of Energy has decided that protecting your health, or your child's health or protecting human beings in the future from its growing inventory of radioactive waste just isn't worth the cost. It would, after all, increase the cost of nuclear waste disposal and it would require reducing airborne emissions from its facilities.

The rates of cancer for children continue to be elevated, especially in counties surrounding the Idaho National Laboratory. The incidence of thyroid cancer is double in the counties surrounding the INL and double that of all other counties in Idaho and double the rates for the country from the SEER database. This is a consistent result over a decade. As thyroid cancer incidence was climbing everywhere, is has been consistently double in the counties surrounding the INL (and unlike the VTR EIS, I reviewed all the counties). The VTR EIS presents some of the cancer data and is silent on the trends. The VTR EIS is also silent on many radiogenic cancers such as male breast cancer. And the VTR EIS is silent on the rates of childhood cancer which are elevated.

The Department of Energy, while accepting lower tabulated radiation doses and focusing on whole-body doses exclusively, has remained silent on the increased thyroid cancer incidence rates from various alpha emitters, and especially americium-241. Due to the low tissue weighting value, whole body dose estimates are not affected much by the elevated thyroid doses.

A 2013 Pacific Northwest National Laboratory (PNNL) report incorporating Federal Guidance Report 13 tabulated whole body and organ specific dose conversion factors for an average half-male and half-female at various ages. [14] The 2013 PNNL report is to be used for calculating radiation dose but not the risk of higher radiation risks recognized in the EPA's 1999 Federal Guidance Report 13. Buried near the end of the PNNL report is a chart of how wildly increased the thyroid cancer incidence was for various radionuclides, by a factor of 10, of 100, of 1000, of 10,000 and of 100,000! See Figure 1.

[14] T.R. Hay and J.P. Rishel, Pacific Northwest National Laboratory, Department of Energy, *Revision of the APGEMS Dose Conversion Factor File Using Revised Factor from Federal Guidance Report 12 and 13*, PNNL-22827, September 2013. https://www.pnnl.gov/main/publications/external/technical_reports/PNNL-22827.pdf

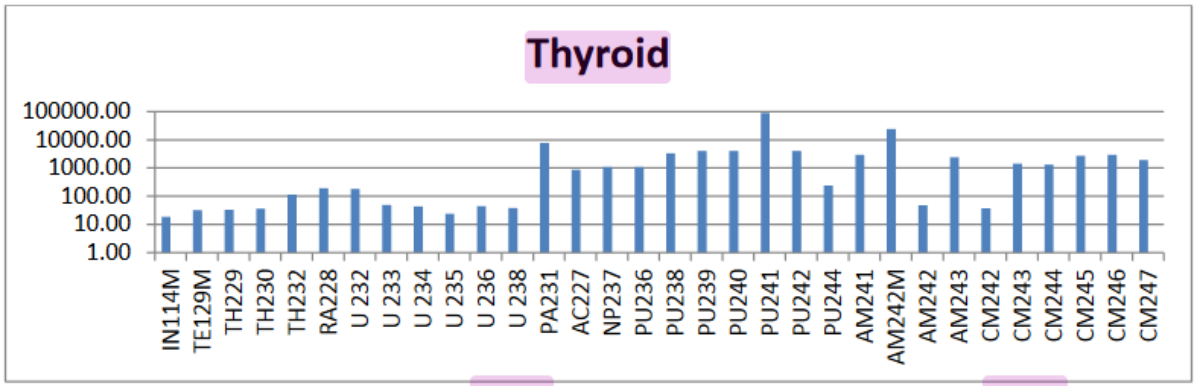

Figure 1. Ratio of the revised Federal Guidance Report (FGR) 13 thyroid dose conversion factors (DCFs) to the original Department of Energy (HUDUFACT.dat) thyroid DCF for radionuclides having the largest increases. (PNNL-22827)

The radionuclides in Figure 1 include thorium, uranium and uranium decay progeny, plutonium, curium and americium. The thyroid cancer incidence rate increases for plutonium-238, plutonium-239, plutonium-240, plutonium-241 and americium-241 is over 1000.

It is important to understand that for many years, releases of these various americium, curium and plutonium radionuclides were not stated or were understated by the Department of Energy in its environmental monitoring reports. The 1989 INEL Historical Dose Evaluation does not list americium-241 as a radionuclide that it released. Yet, there is evidence of extensive americium-241 contamination at INL facilities when CERCLA cleanup investigations were conducted in the early 1990s.

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.

Epidemiology of thousands of radiation workers found elevated cancer risk occurring at an average 200 mrem/yr. [15] An INL-specific study found radiation and nonradiation workers at the site had higher risk of certain cancers. [16] The US Nuclear Regulatory Commission and the

[15] 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.)

[16] "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/

Department of Energy maintain that their 5 rem/yr worker exposure limit is protective despite compelling scientific evidence to the contrary. [17]

The NRC cancelled funding of what would have been the first meaningful epidemiology study of health near US nuclear facilities. They claimed it would cost too much (at $8 million) and take too long. [18]

The US NRC prefers reliance on the 1980s epidemiology study that mixed children and adults and populations near and far from nuclear plants and predictably found no harm. [19] The NRC actively ignores the irrefutable studies from Germany that found increased cancer and leukemia rates of children living near each of the plants. [20] [21] [22]

The U.S. NRC knows that if people knew the harm of living near nuclear power plants, just from routine radiological emissions, it would be the end of nuclear energy.

Realistic and Based on Newer Available Information is Ignored in the Radiation Health Impacts Presented in the VTR EIS

The negative health impacts from radiation in general and from the INL specifically have not been addressed in the VTR EIS. Isotope production and separation processes, even with no reactor accident, are poisoning people in Idaho and this matters at least as much as the detailed tracking of pygmy rabbits which is included in the EIS.

Decades of continuing radiological releases from the Idaho National Laboratory have harmed the health of people living in the counties within 100 miles of the INL. In a state beset with high levels of radioactive contamination from past nuclear weapons testing and INL radiological releases and the Grand View and Bruneau hazard waste dumps that have accepted radioactive waste via an NRC loop hole, only the counties near the INL do citizens of Idaho have double the

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[17] "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.

[18] 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.

[19] NCI (National Cancer Institute) 1990. Cancer in Populations Living near Nuclear Facilities. 017-042-00276-1. Washington, DC: Superintendent of Documents, U.S. Government Printing Office.

[20] Kaatsch P, Kaletsch U, Meinert R, Michaelis J.. 1998. An extended study of childhood malignancies in the vicinity of German nuclear power plants. Cancer Causes Control 9(5):529–533.

[21] The study is known by its German acronym KiKK (Kinderkrebs in der Umgebung von Kernkraftwerken): Kaatsch P, Spix C, Schmiedel S, Schulze-Rath R, Mergenthaler A, Blettner M 2008b. Vorhaben StSch 4334: Epidemiologische Studie zu Kinderkrebs in der Umgebung von Kernkraftwerken (KiKK-Studie), Teil 2 (Fall-Kontroll-Studie mit Befragung). Salzgitter: Bundesamt für Strahlenschutz.

[22] Kaatsch P, Spix C, Schulze-Rath R, Schmiedel S, Blettner M.. 2008. . Leukemia in young children living in the vicinity of German nuclear power plants. Int J Cancer 122(4):721–726.

incidence of thyroid cancer compared to the rest of the state and the rest of the limited regions in the U.S. where cancer statistics are tracked. Thyroid cancer incidence rose rapidly state- and country-wide, but near the INL, and for years, the thyroid cancer incidence rates have been roughly double that of the rest of the state and the country (via the SEER cancer database).

The routine emissions from the Idaho National Laboratory and also from U.S. Nuclear Regulatory Commission approved radioactive waste disposal on the western side of the state of Idaho are poisoning the state, as airborne contamination results in gyrating public drinking water contamination. The VTR EIS and the Department of Energy fail to acknowledge the airborne pathway into our drinking water supplies.

Public water supplies are intermittently monitored, yet reveal gyrating levels of high levels of gross alpha emitters which usually cannot be shown to be from natural uranium and thorium levels or from past weapons testing fallout. Monitoring programs routinely seek to avoid reporting elevated levels of radionuclides in water, air and soil. These programs, including the state program for the INL and the DOE's contractor for environmental reporting, actively use poor sampling protocols, data deletion, biased blanks for count comparison, and false narratives to explain elevated results.

The VTR EIS Ignore Elevated Rates of Thyroid Cancer Incidence in Counties Surrounding the INL and Other Radiation Health Issues

The VTR EIS generally fails to address the Department of Energy's refusal to acknowledge strong epidemiology that shows far more cancer risk and other health risks than the biased and inadequate models it relies on.

The VTR EIS specifically implies that its radiation monitoring and radiation health models are adequate.

The VTR EIS fails to address the inadequacy of the radiation health modeling despite years of double the thyroid cancer incidence in the counties surrounding the INL. As the DOE has been forbidden to conduct epidemiology because of its many past efforts to improperly bias human epidemiology, the assessment of growingly obvious health impacts of INL radiological releases must be conducted by properly independent evaluation. This has not been done, as is evident in the VTR EIS which displays some of the increased cancer rates yet fails to utter any recognition of the obvious doubling of thyroid cancers in counties surrounding the INL. The incidence of thyroid cancer has been doubling for years and is wide-spread, yet the rates ramp up at double the rest of Idaho and the US, in the counties surrounding the INL. Refusing to recognize the impact, which would not be predicted by DOE's accepted radiological release estimates and radiation health models, is immoral as well as not based on scientific integrity.

In 1975, the rate of thyroid cancer incidence for men and women combined was 4.8 per 100,000 in the US. In 2015, thyroid cancer incidence reached 15.7 per 100,000 according to the Surveillance, Epidemiology, and End Results Program (SEER) website. Thyroid cancer incidence and mortality in the US may have finally leveled off after years of increases, according to the National Cancer Institute, Surveillance, Epidemiology, and End Results Program (SEER).

[23] However, several counties surrounding the Idaho National Laboratory have roughly double (or more) the thyroid cancer incidence than the Idaho state average and US average.

The SEER 9 region is roughly 10 percent of the US population and includes parts of California [San Francisco and Oakland], Connecticut, Georgia [Atlanta only], Hawaii, Iowa, Michigan [Detroit only], New Mexico, Utah, and Washington [Seattle and Puget Sound region]. [24]

Thyroid cancer incidence in the US increased, on average, 3.6 percent per year during 1974-2013, from 4.56 cases per 100,000 person-years in 1974-1977 to 14.42 cases per 100,000 person-years in 2010-2013. These thyroid cases were not trivial: the mortality also increased. Mortality increased 1.1 percent per year from 0.40 per 100,000 person-years in 1994-1997 to 0.46 per 100,000 person-years in 2010-1013 overall and increased 2.9 percent per year for SEER distant stage papillary thyroid cancer. [25] From 1974 to 2013, the SEER 9 region cancer data included 77,276 thyroid cancer patients and 2371 thyroid cancer deaths.

Bonneville County, where Idaho Falls is located, has double the thyroid cancer rate of the US and double the rate compared to the rest of Idaho, based on the Cancer Data Registry of Idaho (CDRI) for the year 2017. [26] See Table 1.

Table 1. Bonneville County thyroid cancer incidence rate compared to the rest of Idaho, 2017.

Cancer type	Sex	Rate in Bonneville County	Adjusted Rate in Bonneville County	Rate for remainder of Idaho
Thyroid	Total	28.2	30.7	14.2
	Male	16.0	17.8	7.4
	Female	40.3	43.5	21.0

Table notes: Rates are expressed as the number of cases per 100,000 persons per year (person-years). Rates are expressed as the number of cases per 100,000 persons per year (person-years). Adjusted rates are age and sex-adjusted incidence rates for the county using the remainder of the state as standard. Data from Factsheet for the Cancer Data Registry of Idaho, Idaho Hospital Association. Bonneville County Cancer Profile. Cancer Incidence 2013-2017. https://www.idcancer.org/ContentFiles/special/CountyProfiles/BONNEVILLE.pdf

Some people have wondered if the thyroid incidence rate is due to overdiagnosis of elderly patients — no, it is not. A study of pediatric thyroid cancer rates in the US found that in pediatric

[23] National Cancer Institute, Surveillance, Epidemiology, and End Results Program, Cancer Stat Facts: Thyroid Cancer. https://seer.cancer.gov/statfacts/html/thyro.html

[24] National Cancer Institute, Surveillance, Epidemiology, and End Results Program, Cancer Query System. https://seer.cancer.gov/canques/incidence.html

[25] Hyeyeun Lim et al., JAMA, "Trends in Thyroid Cancer Incidence and Mortality in the United States, 1974-2013," April 4, 2017. https://pubmed.ncbi.nlm.nih.gov/28362912/ or https://jamanetwork.com/journals/jama/fullarticle/2613728

[26] C. J. Johnson, B. M. Morawski, R. K., Rycroft, Cancer Data Registry of Idaho (CDRI), Boise Idaho, Annual Report of the Cancer Data Registry of Idaho, *Cancer in Idaho – 2017*, December 2019. https://www.idcancer.org/ContentFiles/AnnualReports/Cancer%20in%20Idaho%202017.pdf

patients with thyroid cancer diagnosed from 1973 to 2013, the annual percent change in pediatric cancer incidence increased from 1.1 percent per year from 1973 to 2006 and markedly increased to 9.5 percent per year from 2006 to 2013. [27]

Some people have wondered if the increased rate of incidence is due to overdiagnosis of trivial nodules — no, it is not. The figures for the incidence rates for large tumors and advanced-stage disease suggest a true increase in the incident rates of thyroid cancer in the United States. I've seen this just from a handful of acquaintances in Idaho Falls.

For pediatric patients, the thyroid incidence rate was 0.48 cases per 100,000 person-years in 1973 to 1.14 cases per 100,000 person-years in 2013. The incidence rate for large tumors were not significantly different from incidence rates of small (1-20 mm) tumors.

Both thyroid cancer US trend studies (by Lim and by Qian) used the SEER cancer incidence file maintained by the National Cancer Institute and includes 9 high-quality, population-based registries.

As the SEER 9 region thyroid incidence peaked at 15.7 per 100,000, and the State of Idaho thyroid incidence average was 14.2 per 100,000, Bonneville County reached thyroid cancer rates of 30.9 per 100,000. [28] But other counties near the Idaho National Laboratory also have elevated thyroid cancer incidence rates: Madison (29.3 per 100,000), Fremont (27.9 per 100,000), Jefferson (28.9 per 100,000), and Bingham (28.6 per 100,000). But let's not forget Butte county. Butte county's thyroid cancer rate of 45.9 per 100,000 puts it in a class by itself. Much of Butte county is within 20 miles of the INL and nothing says radiation exposure like Butte's leukemia rate at 3 times the state rate and myeloma at 5 times the state average rate.

The news headline for the Idaho cancer register report issued in 2018 read that "cancer trends for Idaho are stable." [29] That is what citizens were supposed to take away from the 2017 cancer rate study in Idaho. Why were citizens not told about any of the cancers in the counties in Idaho that significantly exceeded state average cancer rates and exceeded the rest of the US? [30]

The wide-spread thyroid cancer incidence increases in the US do not appear to be due to radiation exposure. I suspect other governmentally permitted and highly profitable environmental toxins related to our food and perhaps also cell phone use. **But the rates that are double the rest of Idaho and the US in only counties near the Idaho National Laboratory are, I believe, due to the radiological releases from INL and are perhaps aggravated by airborne chemical releases from the INL.**

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[27] Z. Jason Qian et al., *JAMA*, "Pediatric Thyroid Cancer Incidence and Mortality Trends in the United States, 1973-2013," May 23, 2019. https://pubmed.ncbi.nlm.nih.gov/31120475/ or https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6547136/

[28] Environmental Defense Institute February/March 2020 newsletter article "Rate of cancer in Idaho continues to increase, according to Cancer Data Registry of Idaho."

[29] Brennen Kauffman, *The Idaho Falls Post Register*, "New cancer report on 2017 shows stable cancer trends for Idaho," December 13, 2018.

[30] https://statecancerprofiles.cancer.gov/

The Department of Energy and the State of Idaho are actively ignoring the likely environmental causes of elevated rates of cancer in the communities surrounding the INL and especially the elevated rates of childhood cancer.

The forty-first annual report of the Cancer Data Registry of Idaho (CDRI) was issued in December 2019 for the year 2017. [31] While the rate of some cancers decreased, the bad news for the State of Idaho is that the overall rate of cancer incidence continues to increase.

And, very importantly, childhood cancers in Idaho continue to increase. Pediatric (age 1 to 19) cancer increased at a rate of about 0.6 percent per year in Idaho from 1975 to 2017, see https://www.idcancer.org/pediatriccancer.

The rate of childhood cancer incidence in Bonneville County exceeded the remainder of the state for boys, based on the adjusted rate of cancer incidence. For girls the rate was high, but not above the remainder of the state, see Table 2.

Table 2. Bonneville County childhood cancer incidence rate compared to the rest of Idaho, 2017.

Cancer type	Sex	Rate in Bonneville County	Adjusted Rate in Bonneville County	Rate for remainder of Idaho
Pediatric Age 0 to 19	Total	17.8	17.9	18.2
	Male	19.0	**19.3**	19.1
	Female	16.5	16.5	17.2

Table notes: Rates are expressed as the number of cases per 100,000 persons per year (person-years).

The INL has continued to release radionuclides to the air within 50 miles of the lab with radionuclides including iodine-131, iodine-129, americium-241, strontium-90, cobalt-60, plutonium-238, plutonium-239, ruthenium-103, cesium-134 and cesium-137 and many others. And while doing so, has continued to insinuate that all the radionuclides are from former nuclear weapons testing or some other mysterious source. A study published in 1988 found the mallard ducks near the ATR Complex percolation ponds at the Idaho National Laboratory to be full of transuranic radionuclides including plutonium-238, plutonium-239, plutonium-240, americium-241, curium-242 and curium-244. [32] An employee who I knew had the habit of jogging around

[31] C. J. Johnson, B. M. Morawski, R. K., Rycroft, Cancer Data Registry of Idaho (CDRI), Boise Idaho, Annual Report of the Cancer Data Registry of Idaho, *Cancer in Idaho – 2017*, December 2019. https://www.idcancer.org/ContentFiles/AnnualReports/Cancer%20in%20Idaho%202017.pdf

[32] O. D. Markham et al., Health Physics, "Plutonium, Am, Cm and Sr in Ducks Maintained on Radioactive Leaching Ponds in Southeaster Idaho," September 1988. https://pubmed.ncbi.nlm.nih.gov/3170205/ (This study evaluated the concentrations of strontium-90, plutonium-238, plutonium-239, plutonium-240, americium-241, curium-242 and curium-244 in the tissues of mallard ducks near the ATR Complex reactive leaching ponds at the Idaho National Laboratory. It found the highest concentrations of transuranics occurred in the gastrointestinal tract, followed closely by feathers. Approximately 75%, 18%, 6% and 1% of the total transuranic activity in tissues analyzed were associated with the bone, feathers, GI tract and liver, respectively. Concentrations in the GI tracts were similar to concentrations in vegetation and insects near the ponds. The estimated total dose rate to the ducks from the Sr-90 and the transuranic nuclides was 69 millrad per day, of which 99 percent was to the bone. The

the radioactive waste ponds at lunchtime. He died of liver cancer in his 50s. This health-conscious non-smoker was told, like the rest of us, that the radioactivity in the ponds was mainly tritium and was of no health concern what-so-ever.

The stated radionuclide releases from the Idaho National Laboratory to air have often been incomplete or underestimated the releases. The stated "effective dose equivalent" whole body dose has been a *fictional* fraction of a millirem.

The INL releases tons of volatile organic compounds with chlorine compounds to the air, such as the vapor extraction of carbon tetrachloride from buried Rocky Flats waste at the INL's Radioactive Waste Management Complex. A few years ago, EPA monitoring found high levels of carbon tetrachloride in Idaho Falls air. This emission is said to be within federal guidelines, but because chlorine compounds are so unhealthy for the thyroid, the prevalent chemical toxins that are released by the INL that are not even discussed in its environmental monitoring reports may need to be considered in light of elevated thyroid cancer incidence rates near the INL.

The radiation dose reconstruction analysts for the Center for Disease Control, who determine eligibility for the Energy Employee Occupational Illness Compensation Program (EEOICP) continue to ignore what went on and what is still going on at INL facilities, particularly the ATR Complex formerly known as the Test Reactor Area. The radiation dose reconstruction has continued to pretend that the fuel composition of the operating reactors and lack of fuel melt in these reactors means that workers were not exposed to airborne contamination. The CDC need only look at the radionuclides in the ducks. The levels of transuranics including americium-241 and curium in the air at the ATR Complex and other facilities at the INL are sometimes extensive. [33] [34]

The extensive airborne concentrations of americium-241 at the INL may be important to the underestimation of thyroid doses and risks of thyroid cancer incidence. A 1993 study estimated that the dose to the thyroid from americium-241 to be about 1.42 times that delivered to bone. They concluded that the thyroid dose is much higher from americium-241 than has been reported in people. [35]

On the potential health harm of americium-241, the Agency for Toxic Substances and Disease Registry has stated that: "The radiation from americium is the primary cause of adverse health effects from absorbed americium. Upon entering the body by any route of exposure, americium moves relatively rapidly through the body and is deposited on the surfaces of the

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estimated dose to a person eating one duck was 0.045 mrem. The ducks were estimated to contain 305 nanoCuries of transuranic activity and 68.7 microCuries of strontium-90.)

[33] F. Menetrier at al., *Applied Radiation Isot*., "The Biokinetics and Radiotoxicology of Curium: A Comparison With Americium," December 2007. https://pubmed.ncbi.nlm.nih.gov/18222696/ (This study found that the biokinetics of curium are very similar to those of americium-241. Lung and bone tumor induction appear to be the major hazards. Retention in the liver appears to be species dependent.)

[34] R. L. Kathren, Occupational Medicine, "Tissue Studies of Persons With Intakes of the Actinide Elements: The U.S. Transuranium and Uranium Registries," April-June 2001. https://pubmed.ncbi.nlm.nih.gov/11319054/ (This study finds that the dose coefficients for alpha radiation induction of bone sarcoma may be too high while those for leukemia are a factor six too low.

[35] G. N. Taylor et al., Health Physics, "241Am-induced Thyroid Lesions in the Beagle," June 1993. https://pubmed.ncbi.nlm.nih.gov/8491622/

bones where it remains for a long time. As americium undergoes radioactive decay in the bone, alpha particles collide with nearby cell matter and give all of their energy to this cell matter. The gamma rays released by decaying americium can travel much farther before hitting cellular material, and many of these gamma rays leave the body without hitting or damaging any cell matter. The dose from this alpha and gamma radiation can cause changes in the genetic material of these cells that could result in health effects such as bone cancers. Exposure to extremely high levels of americium, as has been reported in some animal studies, has resulted in damage to organs.

The VTR EIS Addresses Isotope Production by Unrealistically Underestimating Radiological Releases and Health Harm

The VTR EIS relies on various previous EISs, including the Isotope EIS, which has grossly underestimated the health harm from airborne releases associated with DOE's isotope product and examination of tests.

The VTR EIS randomly choose to reference the 2018 environmental report, when the airborne radiological releases over the last 15 years have included indications of far higher releases. The assumption that these releases have not been harmful is not born out by the facts, where health facts are available.

The environmental monitoring of radionuclides that can clearly be linked to the INL releases is deliberately biased to avoid reporting or explaining the high level of radionuclides not related to past weapons fallout or to phosphate mining or phosphate operations.

When **short-lived activation products from the INL** are present in marmot tissues, the DOE's environmental monitoring program simply erased those radionuclides from the final report and didn't explain how gamma spectrometry had identified those radionuclides in the marmot tissues.

VTR EIS Ignores INL Environmental Monitoring Program Deficits

The VTR is increasing the radiological releases as well as moving the releases closer to more populated Idaho communities. The airborne releases, when controlled, will be toward Idaho Falls and communities north of Idaho Falls.

The actual releases from the Idaho National Laboratory are commonly low-balled and do not represent the actual releases. The methodology of how the releases are estimated is withheld. The actual releases of highly radioactively-laden resin beads from the Advanced Test Reactor is one example of **deliberate omission** of known radioactive releases to air.

I believe the reason for such inadequate reporting of radionuclide emissions and inadequate environmental monitoring by the DOE's environmental surveillance contractor is to hide the releases from the Idaho National Laboratory and specifically hide releases associated with isotope production and irradiation test examinations. These releases include americium-241,

which the environmental monitoring reports almost laughably attribute to past nuclear weapons testing.

I also believe that the fraudulent use of the ATR Complex evaporation pond as the dumping ground for highly radioactive resin beads discharged from the Advanced Test Reactor continues to be covered up. The evaporation pond was not designed to receive the radioactively laden resin beads, but it would explain why so many activation products from the ATR are being spread airborne and yet are not included as radiological releases from the INL. In other words, the INL is releasing unreported radionuclides, repeatedly, and knows it.

A large fraction of the radiation workers harmed by reliance on the Department of Energy's radiation protection programs have been denied compensation. It is known that more investigations of past releases and radiological programs are needed, and yet the Energy Employee compensation program moves ever so slowly to acknowledge the deficits and even slower to work toward completing the investigations.

The actual harm from Idaho National Laboratory radiological releases is far greater than the very low estimated radiation doses from annual environmental surveillance reports would indicate. Some indication of the higher health harm is available and must be examined by independent organizations other than the Department of Energy. The DOE has a long record of lying about epidemiology and still must not be allowed to perform or control such studies. But the studies are still needed and would show how disconnected the low millirem doses from the INL are from the actual health harm evident in our communities.

Cancer rates in counties surrounding the INL are elevated, particularly for the incidence of thyroid cancer. The VTR EIS has failed to address the continuing radiological releases of Pu-241 and Am-241 from the INL. The VTR EIS has selected 2018 environmental surveillance, while ignoring far higher annual releases during the last 20 years. The DOE's environmental surveillance reporting has unexplained gaps, omissions and technically unsupportable explanations that deny radionuclides are from the INL. The DOE's environmental surveillance reports have routinely explained the Am-241 as being from past nuclear weapons testing, when in fact, numerous CERCLA cleanup reports have found extensive at-facility radiological contamination, including Am-241, that cannot be attributed to past weapons testing.

The VTR EIS needs to present the total plutonium-241 and amercicium-241 releases from the INL and the VTR operations including isotope production and include the Pu-2341 and Am-241 releases. The VTR EIS needs to present the historical plutonium and americium releases because the environmental surveillance reports for the INL through the years have been inconsistent in whether or not plutonium and americium was reported. Plutonium-241 decays to americium-241. Americium-241 is an alpha emitter but also has a gamma ray that penetrates into tissue by 1 centimeter.

If yellow-bellied marmots in Pocatello had short-lived activation products in their tissues that cannot be from past weapons testing or from the phosphate industry, why weren't questions asked about where the short-lived radioactive manganese, zirconium, cerium and others came from? Why did gamma spectrometry detect these radionuclides both on and off the INL site?

Why were the results of the marmot tissue sampling program white-washed? And why weren't additional follow-on studies conducted?

Currently, public drinking water monitoring does not prescribe (or even allow) determining how much americium-241, plutonium-239 and other man-made radionuclides are in the water. The water supplies can and do become contaminated by the airborne radiological contamination. And even the Department of Energy's environmental monitoring program omits determination of the level of man-made contamination from elevated levels of uranium-235 from enriched nuclear fuel and from reactor-produced uranium isotopes such as uranium-232 and uranium-236. The presumption that uranium in our air, water and soil is naturally occurring is false and the monitoring programs are designed to prevent determining the level of radioactivity from Idaho National Laboratory emissions. The VTR releases will consist of not only plutonium-239, americium-241, it will include plutonium-240, uranium-232, and uranium-236 which feed the thorium-232 decay series and the elevated levels of decay products such as thallium-208 are attributed to naturally occurring thorium-232 decay but are actually due to the release of radionuclides from the INL. The levels of radium-228 are elevated in our region not by naturally occurring thorium but by the release of plutonium-240 and uranium-236.

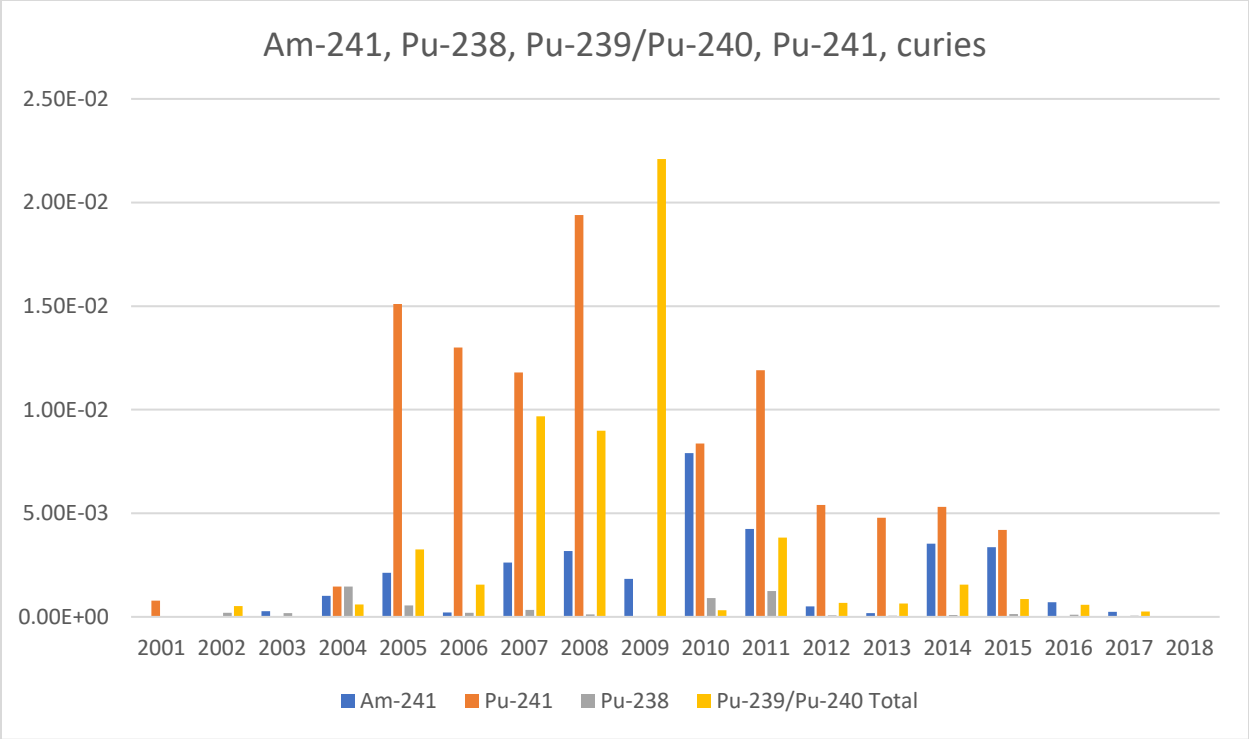
The Department of Energy's environmental monitoring programs are often wrong about the source of contamination as it attributes elevated levels of airborne americium-241 to past nuclear weapons testing. There is no independent oversight and no error reporting or review of the DOE's highly biased and inadequate environmental monitoring program, see idahoeser.com.

The DOE's environmental monitoring contractor routinely does not provide quarterly monitoring reports, incorrectly attributes INL radiological releases to historical weapons testing, fails to provide trending information, when it provides trending, fails to explain the large gaps in data availability. There is no independent or honest assessment and oversight of the lapses common to the DOE's environmental monitoring program.

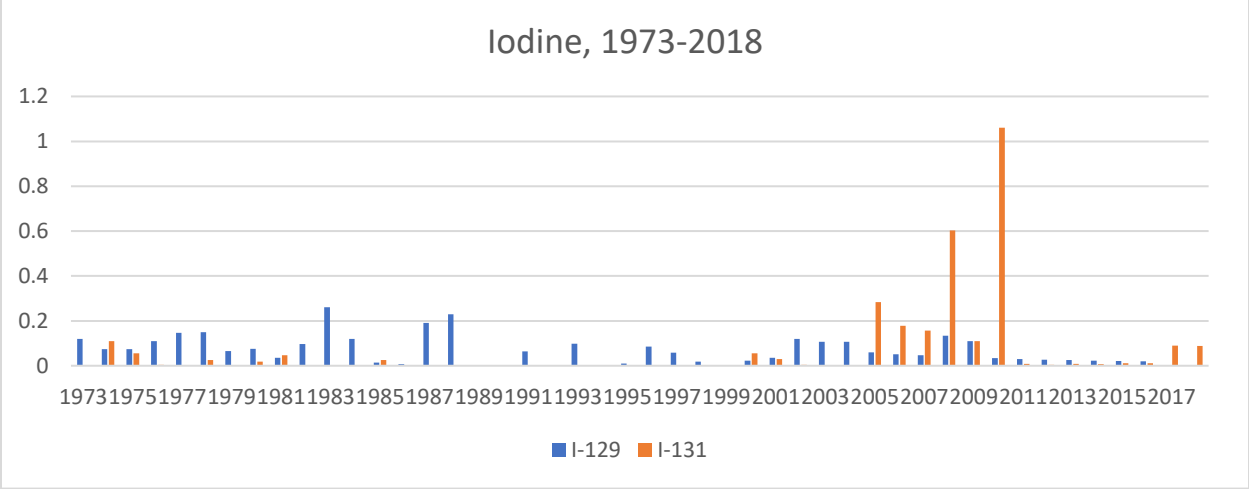
The VTR EIS fails to address the inadequate and actually fraudulent environmental monitoring by its contractors, including the annual environmental surveillance report contractor, which incorrectly attributes americium-241 from the INL to past nuclear weapons testing.

Take a look at the plutonium and americium-241 releases from the Idaho National Laboratory between 2001 and 2017 based on Department of Energy environmental monitoring reports. [36] The State of Idaho DEQ does not display, report or trend any data before 2013….and I can see why. The huge releases from the INL between 2004 and 2013 are shocking and certainly would not fit well with a tourist brochure for visiting Idaho.

[36] Department of Energy's environmental monitoring reports, see idahoeser.com and inldigitallibrary.inl.gov.



Then let's take a look at the iodine-129 and iodine-131 releases between 1973 and 2017, in curies. The State of Idaho DEQ went from displaying all of their environmental monitoring reports to displaying ten years of the reports, to know displaying only six years of annual reports and only 4 years of quarterly data reports from 2013 to 2018. **Again, here you can see why the Idaho DEQ didn't want to display INL monitoring data before 2013.**



The plutonium and americium-241 and the iodine-129 and iodine-131 are not the only radionuclides with elevated releases from the INL. But these radionuclides might have influenced the elevated thyroid cancers in Bonneville County reported for 2013 to 2017.

Iodine-129 with its 16-million-year half-life has higher inhalation and ingestion dose conversion factors than iodine-131 with its 8-day half-life. While iodine-131 does give a higher air emersion and ground shine dose, the iodine-129 dose often is a dominant dose contributor for INL airborne releases.

The VTR EIS fails to address the rather short-lived radionuclides produced in nuclear reactors that were found in marmot tissue as far away as Pocatello Idaho which cannot have come from past weapons testing or radioactive disposal activities such as importation of radioactive waste via train car past Pocatello to US Ecology Grandview Idaho.

The VTR EIS ignores the past radiological releases, their resuspension and buildup in the environment.

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, see Table 3.

The EA cumulative impacts evaluation is arbitrary and misleading and fails to address the buildup of radionuclides in our air, water and soil and fails to acknowledge the inadequacy of the environmental surveillance programs.

People might eventually catch on that Idaho is getting more and more radiologically polluted — but with all the deliberate omissions and dis-information, probably not before it's too late.

Table 3. Estimated annual air pathway dose (mrem) to Idaho communities from normal operations to the maximally exposed offsite individual from proposed projects, including the estimated dose from expanding capabilities at the Ranges based on DOE/EA-2063.

Current and Reasonably Foreseeable Future Action	Estimated Annual Air Pathway Dose (mrem)
National Security Test Range	0.04[e]
Radiological Response Training Range (North Test Range)	0.048[d]
Radiological Response Training Range (South Test Range)	0.00034[a]
HALEU Fuel Production (DOE-ID, 2019)	1.6[a]
Integrated Waste Treatment Unit (ICP/EXT-05-01116)	0.0746[h]
New DOE Remote-Handled LLW Disposal Facility (DOE/ID 2018)	0.0074[a]
Recapitalization of Infrastructure Supporting Naval Spent Nuclear Fuel Handling (DOE/EIS 2016)	0.0006[c]
TREAT (DOE/EA 2014)	0.0011[a]
DOE Idaho Spent Fuel Facility (NRC, 2004)	0.000063[a]
Plutonium-238 Production for Radioisotope Power Systems (DOE/EIS 2013)	0.00000026[b]
Total of Reasonably Foreseeable Future Actions on the INL Site	1.77[g]
Current (2018) Annual Estimated INL Emissions (DOE2019a)	0.0102[f]
Total of Current and Reasonably Foreseeable Future Actions on the INL Site [**DOE WOULD INCREASE INL'S AIRBORNE RELEASES BY OVER 170 TIMES**]	1.78[g]

Table notes:

a. Dose calculated at Frenchman's Cabin, typically INL's MEI for annual NESHAP evaluation.

b. Receptor location is not clear. Conservatively assumed at Frenchman's Cabin.

c. Dose calculated at INL boundary northwest of Naval Reactor Facility. Dose at Frenchman' Cabin likely much lower.

d. Dose calculated at INL boundary northeast of Specific Manufacturing Capability. Dose at Frenchman's Cabin likely much lower.

e. Sum of doses from New Explosive Test Area and Radiological Training Pad calculated at separate locations northeast of MFC near Mud Lake. **Dose at Frenchman's Cabin likely much lower. PLEASE NOTE THAT THE PUBLIC AT MUD LAKE IS CLOSER TO THE RELEASE THAN TO FRENCHMAN'S CABIN.**

f. Dose at MEI location (Frenchman's Cabin) from 2018 INL emissions (DOE 2019a). The 10-year (2008 through 2017) average dose is 0.05 mrem/year. **PLEASE NOTE THAT MANY RADIOLOGICAL RELEASES ARE IGNORED AND NOT INCLUDED IN THE RELEASE ESTIMATES IN NESHAPS REPORTING.**

g. This total represents air impact from current and reasonably foreseeable future actions at INL. It conservatively assumes the dose from each facility was calculated at the same location (Frenchman's Cabin), which they were not.

h. Receptor location unknown, according to the Department of Energy, the agency that is supposed to know the receptor location.

The VTR EIS ignores many the ongoing radiological releases including the decision by the U.S. Department of Energy to allow the DOE to release long-lived radionuclides to air and soil at the Idaho National Laboratory, from the Expanding Capabilities at the National Security Test Range and the Radiological Response Training Range at Idaho National Laboratory (DOE/EA-2063) at

The VTR EIS fails to address the existing contamination levels in communities and drinking water. The draft EA fails to acknowledge that current INL radiological airborne monitoring is woefully inadequate because (1) emissions from the INL are usually based on estimates and not the reality, (2) the current environmental monitoring programs are designed to be inadequate, (3) the reports are tardy by nearly a year and are increasingly tardy, and (4) the quarterly and annual environmental monitoring reports are not reliable and are prone to "lost samples" or "air monitor not functioning" excuses.

Historical and current radiological monitoring programs omit INL releases, and are designed to hide, not reveal, the level and the source of radiological contamination.

The VTR EIS fails to truthfully discuss the multitude of INL CERCLA cleanup sites that cannot be released in 2095, as it goes about creating more CERCLA sites at the INL.

DOE expects to continue increasing the "normal background" radiation levels both on and off the Idaho National Laboratory site until our communities all receive unhealthy levels of radionuclide ingestion and inhalation.

"Normal background levels" are already elevated above what was naturally occurring and continue to rise. By selecting a contaminated area to determine "normal background," it appears to me that this is how some radiological facilities can claim to operate within "normal expected background" no matter what radiological release incident just occurred.

The DOE continues to not disclose what it considers "normal background levels" on and off the INL or to trend how the "normal background levels" have changed over time.

The INL's past practices of inflating "normal background levels" meant that employees worked in contaminated areas that when assessed independently during CERCLA cleanup investigations in 1995, these facilities had to be disposed of as radiological waste. Various INL areas had been highly contaminated for decades, and yet not monitored or controlled as such. See the Administrative Record for CERCLA cleanup at the Idaho National Laboratory at https://ar.icp.doe.gov .

The VTR EIS fails to acknowledge that the DOE's allowable radiation level of 100 mrem/yr would devastate public health

The VTR EIS relies on the DOE's allowable radiation level of 100 mrem/yr and implies that reaching such high levels would not be a devastation to the health of people in our communities.

By no means is the DOE's 100 mrem/yr dose limit to the public protective of human health. DOE ignores the epidemiology that shows that a few years of an average 400 mrem/yr to adult radiation workers increases cancer risk. Exposure of pregnant women to DOE's allowed 100 mrem/yr dose would greatly harm fetal health. The DOE ignores all modern epidemiology

studies for human health effects that show harm greater than DOE chose to believe decades ago, especially to the unborn, and to females and children.

The VTR EIS fails to address the fact the radiation workers are still wrongly told that there is no evidence of damage to DNA or genetic effects from radiation exposure to humans. DOE's radiation workers are not told of the infertility and increased risk of birth defects from radiation.

The VTR EIS fails to address the fact that the investigations into worker contamination at the INL historically are not complete and do find evidence of inadequate worker protection. The investigations continue at a snail's pace by the Center for Disease Control's National Institute of Occupational Safety and Health (NIOSH) for the Energy Employee Occupational Illness Compensation Program. Meanwhile, injured workers and their survivors die, having had their illness claim wrongly denied.

The VTR EIS needs to acknowledge the inadequacy of the 5,000 mrem/yr limit to actually protect adult radiation workers. The VTR EIS needs to acknowledge the extent that radiological records of contamination in urine and fecal samples is withheld from workers, enabling errors and deliberate falsifications. Many workers go to medical providers and the worker lacks exposure and radiological intake history, let alone accurate radiological (and chemical) intake information.

The public as well as radiation workers need to keep in mind that, despite what they may have been taught:

- The cancer risk is not reduced when radiation doses are received in small increments, as the nuclear industry has long assumed. [37]

- Despite the repeated refrain that the harm from doses below 10 rem cannot be discerned, multiple and diverse studies from human epidemiology continue to find elevated cancer risks below 10 rem and from low-dose-rate exposure. [38]

- The adverse health effects of ionizing radiation are not limited to the increased risk of cancer and leukemia. Ionizing radiation is also a contributor to a wide range of chronic illnesses including heart disease and brain or neurological diseases.

The public and radiation workers take cues from their management that they should not be concerned about the tiny and easily shielded beta and alpha particles. DOE-funded fact sheets often spend more verbiage discussing natural sources of radiation than admitting the vast amounts of radioactive waste created by the DOE. The tone and the meta-message from the

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[37] 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.

[38] US EPA 2015 http://www.regulations.gov/#!documentDetail;D=NRC-2015-0057-0436 . For important low-dose radiation epidemiology see also John W. Gofman M.D., Ph.D. book and online summary of low dose human epidemiology in "Radiation-Induced Cancer from Low-Dose Exposure: An Independent Analysis," Committee for Nuclear Responsibility, Inc., 1990, http://www.ratical.org/radiation/CNR/RIC/chp21.txt And see EDI's April 2016 newsletter for Ian Goddard's summary and listing of important human epidemiology concerning low dose radiation exposure.

DOE, the nuclear industry, is that if you are educated about the risks, then you'll understand that the risks are low. Yet, these agencies continue to deny the continuing accumulation of compelling and diverse human epidemiological evidence that the harm of ingesting radionuclides is greater than they've been claiming.

The biological harm that ionizing radiation may cause to DNA is mentioned sometimes but it is emphasized that usually the DNA simply are repaired by the body. And the training to radiation workers will mention that fruit flies exposed to radiation passed genetic mutations to their offspring but workers are told that this phenomenon has never been seen in humans even though, sadly, the human evidence of genetic effects has continued to accumulate. Birth defects and children more susceptible to cancer are the result.

Gulf War veterans who inhaled depleted uranium have children with birth defects at much higher than normal rate. The same kinds of birth defects also became prevalent in the countries where citizens were exposed to DU. There are accounts to suggest that the actual number of birth defects resulting from the World War II atomic bombs dropped on Japan and by weapons testing over the Marshall Islands have been underreported. The Department of Energy early on made the decision not to track birth defects resulting from its workers or exposed populations. But people living near Hanford and near Oak Ridge know of increased birth defects in those communities.

In radworker training, there may be discussion of the fact that international radiation worker protection recommends only 2 rem per year, not 5 rem per year. There is no mention of recent human epidemiology showing the harm of radiation is higher than previously thought and at low doses, below 400 mrem annually to adult workers, increased cancer risk occurs.

There is no mention of the oxidative stress caused as ionizing radiation strips electrons off atoms or molecules in the body at energies far exceeding normal biological energy levels. And there is no discussion explaining the harm of inhaling or ingesting radioactive particles of fission products such as cesium-137, strontium-90, or iodine-131; of activation products such as cobalt-60; or transuranics such as plutonium and americium; or of the uranium itself.

The volatile or gaseous radionuclides, some of which can't be contained even with air filters — include technetium-99, tritium, carbon-14, iodine-129, argon-39, krypton-85, and radon-222 as the volatile radionuclides dominating the proposed Greater-Than-Class C radioactive waste disposal for the Andrews County, Texas facility. In Idaho, it appears that the DOE fails to adequately address these gaseous emissions from waste and other sources.

Often radionuclides with low curie levels dominate the harm to human health from radioactive waste disposal. So, when DOE states an overall curie level without stating which radionuclides and their specific curie levels, neither the radiotoxicity nor the longevity of the radioactive waste has been indicated.

Uranium and thorium and their decay products may be natural but in concentrated form in drinking water, soil or air, they are harmful. Radioactive waste disposal classification has often left out concentration limits for these radionuclides. Massive amounts of depleted uranium are considered Class A radioactive waste but won't be safe at the end of 100 years but will actually

be more radioactive through decay progeny. The DOE has typically ignored its extensive releases of uranium and transuranic radionuclides to Idaho communities.

Plutonium-238, plutonium-239, and other transuranic radionuclides in radioactive waste in what appear to be low curie amounts also pose health harm. Is DOE planning to say that they stayed below some curie amount, while not disclosing the actual radionuclides released?

Cancer rates for uranium are typically based on natural forms for uranium and not chemically altered forms that may be more soluble in the human body. The internal radiation cancer harm is not based on solid epidemiological evidence and there are experts from Karl Z. Morgan to Chris Busby to Jack Valentine that understand that the accepted models may understate the cancer harm by a factor of 10, 100 or more. The nuclear industry continues to ignore the epidemiological evidence that implies tighter restrictions are needed.

Importantly, the chemical forms released by the INL may be more harmful than predicted because of particle size, temperatures during processing or releases, or other factors which may affect retention in the human body.

The DOE has long given presentations to the public that deliberately withheld information about long-lived radionuclide contamination. Even now, when filters are evaluated and found to have americium-241, plutonium-238 and plutonium-239, for example, the DOE and State of Idaho usually pretend to not know the source of the radionuclides.

Monitoring of waste burial sites for CERCLA at INL has often been inadequate and biased to hide contamination findings by reduced monitoring and reduced reporting. Spotty monitoring of land and the aquifer means “no discernable trend could be found.”

At the Idaho National Laboratory, formerly the Idaho National Engineering and Environmental Laboratory, the Idaho National Engineering Laboratory, and the National Reactor Testing Station, historical releases were monitored yet not actually characterized as to what and how many curies were released. When asked by the governor in 1989 to provide an estimate of the radionuclides released from routine operations and accidents, the Department of Energy issued the “INEL Historical Dose Evaluation.” [39] [40] It has been found to have underestimated serious releases by sometimes 10-fold. Furthermore, the past environmental monitoring used all along to claim no significant releases had occurred were not used in the INEL Historical Dose Evaluation. The environmental records that could have been used against the Department of Energy or its contractors were destroyed.

The Center for Disease Control commenced reviewing the DOE’s radiological release estimate that were the basis for denying that any epidemiological study was needed in Idaho communities near the site. The CDC in 2007 issued its review of the 1989 study and found many

[39] US Department of Energy Idaho Operations Office, “Idaho National Engineering Laboratory Historical Dose Evaluation,” DOE-ID-12119, August 1991. Volumes 1 and 2 can be found at https://www.iaea.org/inis/inis-collection/index.html

[40] Environmental Defense Institute’s comment submittal on the Consent-based Approach for Siting Storage for the nation’s Nuclear Waste, July 31, 2016. http://www.environmental-defense-institute.org/publications/EDIXConsentFinal.pdf

releases, some of the largest ones, underestimated by a factor of 7. [41] Errors causing underestimation of the INL releases continue to be found as energy worker compensation studies have continued. The INL was originally called the National Reactor Testing Station, later called the Idaho Engineering Laboratory, and then the Idaho National Engineering and Environmental Laboratory before being named the Idaho National Laboratory.

The estimates of the 1991 INEL Historical Dose Evaluation [42] continue to be found in error and to significantly underestimate what was released. [43] [44] [45] Theoretical and idealized modeling of the releases were used for estimating the releases for the 1991 INEL HDE without using environmental monitoring to confirm the estimates — except for the 1961 SL-1 accident in which the environmental monitoring showed that the **theoretical modeling had underestimated the release**. In fact, many of the environmental monitoring records were deliberately destroyed before the 1991 report was released. [46] INL airborne releases included a long list of every fission product that exists including iodine-131, long-lived I-129, tritium, strontium-90, cesium-37, plutonium, and uranium.

The source documents for the INEL HDE are in fact part of the Human Radiation Experiments collection of DOE documents. Why? Because there was enough information available for the DOE to know that showering nearby communities and their farms and milk cows with radiation really was likely to be harmful to their health. The INL (formerly the NRTS, INEL and INEEL) takes up dozens of volumes of binders in the DOE's Human Radiation Experiments collection and that isn't including the boxes of documents no one can get access to or the records that were deliberately disposed of. [47]

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[41] Center for Disease Control, CDC Task Order 5-2000-Final, Final Report RAC Report No. 3, by Risk Assessment Corporation, October 2002. https://www.cdc.gov/nceh/radiation/ineel/to5finalreport.pdf

[42] US Department of Energy Idaho Operations Office, "Idaho National Engineering Laboratory Historical Dose Evaluation," DOE-ID-12119, August 1991. Volumes 1 and 2 can be found at https://www.iaea.org/inis/inis-collection/index.html p. 40

[43] Risk Assessment Corporation, "Identification and Prioritization of Radionuclide Releases from the Idaho National Engineering and Environmental Laboratory," October 8, 2002, https://www.cdc.gov/nceh/radiation/ineel/to5finalreport.pdf See p. 117, 118 for SL-1.

[44] SENES Oak Ridge, "A Critical Review of Source Terms for Select Initial Engine Tests Associated with the Aircraft Nuclear Program at INEL," Contract No. 200-2002-00367, Final Report, July 2005. http://www.cdc.gov/nceh/radiation/ineel/anpsourceterms.pdf See p. 4-67 for Table 4-13 for I-131 estimate for IET's 10A and 10B and note the wrong values for I-131 are listed in the summary ES-7 table.

[45] CDC NIOSH, "NIOSH Investigation into the Issues Raised in Comment 2 for SCA-TR-TASK1-005," September 3, 2013. https://www.cdc.gov/niosh/ocas/pdfs/dps/dc-inlspcom2-r0.pdf See p. 3 stating various episodic releases underestimated by the INEL HDE: IET 3, IET 4 and IET 10.

[46] Chuck Broscious, Environmental Defense Institute Report, "Destruction and Inadequate Retrieval of INL Documents Worse than Previously Reported," Revised September 1, 2018. http://environmental-defense-institute.org/publications/DocDestruction.pdf

[47] February 1995, the Department of Energy's (DOE) Office of Human Radiation Experiments published *Human Radiation Experiments: The Department of Energy Roadmap to the Story and Records* ("The DOE Roadmap"). See also the INL site profile on Occupational Environmental Dose: http://www.cdc.gov/niosh/ocas/pdfs/tbd/inl-anlw4-r2.pdf) Most of the documents in the DOE's Human Radiation Experiments collection remain perversely out of public reach. Documents are said to be stored at the INL site, out of state in boxes, [Good luck with getting these documents via the Freedom of Information Act] and in the National Archives. I found that retrieving documents from the National Archive would require extensive fees for searches and copying. Where is the transparency in creating a document collection that cannot be viewed by the public?

DOE and the CDC still not disclosing the full extent of historical releases, including the magnitude of the 1961 SL-1 release which affected communities including Atomic City and Mud Lake.

Communities near the INL, include Atomic City to the south and Mud Lake to the north and Osgood west of the MARVEL project have been adversely affected already and isn't the harm done to those poor people enough?

The Atomic Energy Commission, predecessor of the Department of Energy, claimed that no other fission products were detected other than 0.1 Curies of strontium-90 and 0.5 curies of cesium-137 within the perimeter fence of the SL-1. [48] The derived release fractions based on trying to fit the AEC claims to a computer derived release fraction show that the AEC claimed low curie amount releases are fiction. Never before or since has a reactor fuel had such low release fractions! The AEC not only left out many radionuclides, they underestimated the amount of the fission product releases from the accident by a factor of over 22 for iodine-131, 588 for Cs-137 and 277 for Sr-90. And even with the low-balled curie releases, the SL-1 accident was a serious accident.

Despite what Risk Assessment Corporation (RAC) writes about prevailing meteorological conditions at the time of the SL-1 accident being characteristic of the typical conditions at the time of year, the conditions were not typical. During the accident, the prevailing winds were from the north to northeast for 100 hours with an extremely strong inversion. Typical conditions are a prevailing wind in the opposite direction during the daytime, with wind reversals at night typical. The SL-1 radionuclide plume blew south toward American Falls and Rupert, Idaho.

The SL-1 reactor fission product inventory consisted of radionuclides produced during the excursion and also radionuclides the had built up in the fuel during previous reactor operations. The operating history of the reactor consisted of 11,000 hours for a total of 932 MW-days. The reactor accident resulted in a total energy release of 133 MW-seconds. Roughly 30 percent of the core's fuel inventory was missing from the vessel, when examined after the accident. [49] [50] [51]

Risk Assessment Corporation used the computer code RSAC to calculated a fission product inventory based on operation of the reactor at a power level of 2.03 MW (mega-watts) for 458 days, followed by a shutdown period of 11 days and the excursion power level of 88,700 MW for a period of 0.015 seconds. The Center for Disease Control did not call out what were obvious

[48] Report by Risk Assessment Corporation for Centers for Disease Control and Prevention, Department of Health and Human Services, *Final Report Identification and Prioritization of Radionuclide Releases from the Idaho National Engineering and Environmental Laboratory*, RAC Report No. 3, CDC Task Order S-2000-Final, October 2002, pages 117, 118. https://www.cdc.gov/nceh/radiation/ineel/TO5FinalReport.pdf

[49] Department of Energy, Idaho National Engineering Laboratory Historical Dose Evaluation, DOE/ID-12119, August 1991. See https://inldigitallibrary.inl.gov

[50] Atomic Energy Commission, "Final Report of the SL-1 Recovery Operation," IDO-19311, June 27, 1962. See p. III-77 regarding fuel damage. https://inldigitallibrary.inl.gov/PRR/163644.pdf

[51] Atomic Energy Commission, "Additional Analysis of the SL-1 Excursion Final Report of Progress July through October 1962," IDO-19313, November 21, 1962. See p. 27 Table I-VIII. https://inldigitallibrary.inl.gov/PRR/163644.pdf

discrepancies and which meant that the SL-1 radiological consequences have been grossly understated.

Sage brush samples were collected and according to the AEC, the "gamma spectra of representative samples indicated that the activity was due to iodine-131. (IDO-12021, p. 131)

It was customary for the AEC to monitor jack rabbit thyroids and the iodine-131 levels before the SL-1 accident, for jack rabbit thyroids were typically 100 picocuries per gram. After the SL-1 accident, the levels were as high as 750,000 picocuries per gram at the SL-1, 180,000 picocuries/gram at nearby Atomic City, located south of the SL-1, and 50,000 picocuries per gram at Tabor, a farming community southeast of SL-1 and west of Blackfoot, and 11,200 picocuries at Springfield. These rabbit thyroid results reveal much higher rabbit thyroid iodine-131 levels than produced by the other large episodic and routine releases from the Idaho National Laboratory during the 1950s and 1960s. [52] [53] [54] [55]

The DOE has lied to the public about the SL-1 accident and still publishes false information about the SL-1 accident, you can read my report about the consequences of the SL-1 accident on the Environmental Defense Institute website, *The SL-1 Accident Consequences*, at http://environmental-defense-institute.org/publications/SL-1Consequences.pdf and the cause of the SL-1 accident on the Environmental Defense Institute website, *The Truth about the SL-1 Accident – Understanding the Reactor Excursion and Safety Problems at SL-1* at http://environmental-defense-institute.org/publications/SL-1Accident.pdf

The VTR EIS Implies by Listing Various Department of Energy Regulations but Fails to Assess How Likely DOE is to Ignore Compliance

From the DOE's nuclear weapons testing at the Nevada Testing Station, in the Pacific islands, and elsewhere, the DOE told people they were safe and then covered up epidemiology that showed people had increased rates of leukemia and cancer from the fallout. The DOE claimed its releases from the INL were too low to cause harm, but when asked to state what it had released to the Idaho skies, the DOE didn't know. Then when the DOE issued a report of estimated releases through its history to 1989, reviews by the Center for Disease Control found the releases had been significantly underestimated. It is also documented that many environmental monitoring records were subsequently destroyed, which would have indicated more contamination that the DOE wanted others to know about. The DOE has lost or destroyed worker radiation dose records throughout its history when the records would show elevated doses. The DOE uses secrecy, document destruction, omission of key information during public presentations, and adherence to providing false information about its plans, and breaks its commitments. The DOE would not have conducted any cleanup at all if other federal agencies

[52] Atomic Energy Commission, "1958 Health and Safety Division Annual Report, IDO-12012, See p. 72, 73 for iodine-131 in sage brush and rabbit thyroids. https://inldigitallibrary.inl.gov/PRR/112697.pdf

[53] Atomic Energy Commission, "Annual Report of Health and Safety Division, 1959," IDO-12014, See p. 88 for iodine-131 in rabbit thyroids. https://inldigitallibrary.inl.gov/PRR/112700.pdf

[54] Atomic Energy Commission, "Health and Safety Division Annual Report, 1960," IDO-12019, See p. 91 for iodine-131 in rabbit thyroids. https://inldigitallibrary.inl.gov/PRR/90927.pdf

[55] Atomic Energy Commission, "Health and Safety Division Annual Report, 1961," IDO-12021, See p. 128, 133 for iodine-131 in jack rabbit thyroids. https://inldigitallibrary.inl.gov/PRR/163656.pdf

had not been able to say that hazardous chemical laws needed to apply to DOE sites, allowing CERCLA cleanup investigations. The DOE has systematically lied about the pervasive long-lived radionuclides at sites likes the INL, omitting what it well knew, that uranium, plutonium and americium were included in soil and perched water. It omitted this information so well that the DOE and the U.S. Geological Survey have often, without justification, omitted the reporting of extensive radiological contamination at the INL, later found by CERCLA investigations.

DOE lied about its radiological releases decades ago from nuclear weapons testing, reactor testing, and reactor accidents and other operations and it continues to misinform the public about its past and about current contamination.

The Department of Energy has a long history of telling workers they are protected from radiological hazards — but workers got illnesses. Nationwide, billions of dollars of illness compensation have been paid out under the Energy Employee Illness Compensation Program Act (EEICOPA) even with two-thirds of INL claims denied.

The Department of Energy has a long history of saying its radiological releases were too small to affect the public — but studies found that the public had higher infant mortality and certain cancers and leukemia.

The Department of Energy has rightfully earned and continues to earn the public's distrust. The Department of Energy must not be allowed to unilaterally reclassify HLW waste because the DOE cannot be trusted to comply with its own regulations should its regulations or DOE Orders be deemed inconvenient or costly.

The Idaho National Laboratory along with other Department of Energy operations at Hanford and Rocky Flats have a long tradition of falsification of lung count results. The last situation requiring lung counts, reported that lung counts were not required, despite lung counts being required. Workers are not informed that their lung count results can be manipulated in order to obtain lowered intake results.

The VTR EIS Fails to Acknowledge that the DOE has a Record of Not Disclosing Safety Problems Publicly or Accurately and Usually Fails to Publish the Public Comment Submittals

The Department of Energy routinely makes its unusual occurrence reports and other safety information impossible or difficult for the public to obtain. If reported, the public can expect months of delay before information is available publicly.

The DOE has also conducted numerous public comment opportunities, only to refuse to publish those public comments such as the consent-based interim spent nuclear fuel storage meetings conducted a few years ago. [56] [57]

[56] Before ending the consent-based siting effort, information found about the Department of Energy's consent-based siting at www.energy.gov/consentbasedsiting and its Integrated Waste Management and Consent-based Siting booklet at http://energy.gov/ne/downloads/integrated-waste-management-and-consent-based-siting-booklet

[57] Environmental Defense Institute's comment submittal on the Consent-based Approach for Siting Storage for the nation's Nuclear Waste, July 31, 2016. http://www.environmental-defense-institute.org/publications/EDIXConsentFinal.pdf