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Continuing Classified Human Subjects Research Involving the Department of Energy Is Worrisome

A recent article by the Federation of American Scientists has described the existence of a dozen continuing classified human subjects research involving the Department of Energy and workers at DOE sites. [1] Unclassified human research studies are listed on a DOE database. [2] While there are more protections now than existed decades ago, there are reasons to wonder about the potential for more harm to human subjects than people expect.

The Department of Energy's current list of classified projects obtained by FAS through a Freedom of Information Act request is provided in Table 1. Project's intriguing names include "Moose Drool," "Little Workers," and "Idaho Bailiff."

Table 1. Projects Classified Human Subject Research by the Department of Energy (FY 2017).

Project Id	Title of Project (Unclassified Title)	Classified in Whole or in Part	Number of Subjects Participating	Risk Level (Minimum, Greater Than (M/GT)	Date for Next Continuing Review
IRC-C#1	Tristan	Whole	44	Minimal Risk (MR)	Nov 2, 2018
IRB-C#4	Helios	Part	40	MR	Nov 18, 2018
IRB-C#10	Moose Drool	Part	4	MR	Ended
IRB-C#15	Little Workers	Part	30	MR	May 23, 2018
IRB-C#16	Idaho Bailiff	Part	N/A-Big Data	MR	Feb 9, 2018
IRB-C#21	Geovisor	Part	10	MR	May 10, 2018
PNNL#2016-7	Active Data User Study-Chinchilla	Part	0	MR	Dec 15, 2017
ORNL#(13)-	Short Wave Infared Standoff Multi Model	Part	22	MR	Ended

[1] Steven Aftergood, *Federation of American Scientists*, "Classified Human Subjects Research Continues at DOE," August 10, 2018. https://fas.org/blogs/secrecy/2018/08/doe-hsr/

[2] Department of Energy, Human Subjects Research Database at https://science.energy.gov/ber/human-subjects/education-and-resources/hsrd/

Project Id	Title of Project (Unclassified Title)	Classified in Whole or in Part	Number of Subjects Participating	Risk Level (Minimum, Greater Than (M/GT)	Date for Next Continuing Review
131	Biometrics				
PNNL#2014-21	SPECIAL	Whole	N/A-Big Data	MR	June 18, 2018
PNNL#2017-02	Hidden Valley	Part	51	MR	Oct 16, 2018
PNNL#2017-03a	VAC Challenge-Mitigating Bias in Visual Analytic Interfaces	Part	51	MR	Oct 16, 2018
PNNL#2017-03b	VAC Challenge-Collecting User Interaction Logs to Eval. Bias Metrics	Part	100	MR	Jan 26, 2018

Source: Freedom of Information Act (FOIA) request by Steven Aftergood, Federation of American Scientists, from the Department of Energy, Final Response, HQ-2018-00158-F, August 7, 2018. https://fas.org/sgp/othergov/doe/hsr-2017.pdf

The past conducting of human research at the Idaho National Laboratory has included workers swallowing incapsulated radioactive materials in order to calibrate whole-body counters (from 1965 to 1972) and the Controlled Environmental Radioiodine Tests (CERTS) where volunteers agreed to stand downwind from intentional iodine-131 airborne releases (from 1963 to 1968), according to the portion of the Human Research Experiments collection for the Department of Energy. [3] [4] The role of this radioactive research was tame compared to some of the thousands of other human radiation research experiments, but one of the problems was the lack of follow-up with the volunteers to see if health problems occurred after the brief study ended. Health effects showing up months or years after the study have been be missed, perhaps deliberately, because of lack of follow-up.

Then there is the fact that the historical radiological releases from the Idaho National Laboratory released millions of curies over southeast Idaho's citizens. Beginning in the 1950s, millions of curies were released from stacks and open-air destructive nuclear fuel testing, fuel reprocessing, and accidents. When then State Governor Cecil Andrus asked what had been released, the Department of Energy had to begin a review of the accidents, tests and various operations they had conducted to try to estimate what they had released. DOE had long been

[3] DOE Human Radiation Experiments, List of Experiments for Idaho Sites at https://ehss.energy.gov/OHRE/roadmap/experiments/0491doca.html

[4] See also the Idaho National Laboratory Human Radiation Experiments Collection of documents for the Idaho site online at the "inldigitallibrary" at https://inldigitallibrary.inl.gov/SitePages/INL%20Research%20Library%20Digital%20Repository.aspx and general library online information at https://www.inl.gov/about-inl/general-information/research-library/

assuring people that no serious radiological releases had taken place based on various environment samples of sage, soil, rabbit thyroids, and by film badge. But they didn't actually know how many curies they had released nor of what radionuclides.

The estimates of the 1991 INEL Historical Dose Evaluation [5] continue to be found in error and to significantly underestimate what was released. [6] [7] [8] 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 **theoretical modeling was shown to underestimate the release**. In fact, many of the environmental monitoring records were deliberately destroyed before the 1991 report was released. [9] 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. [10]

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[5] 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

[6] 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.

[7] 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.

[8] 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.

[9] 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

[10] 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?

A Department of Energy list of human research experiments at various laboratories conducted before the mid-1990s is provided online. [11]

There are more guidelines now to avoid the problem of not obtaining consent from human subjects for the Department of Energy (or its predecessor organizations). But there were thousands of human radiation experiments conducted before about 1995. From the 1940s through mid-1990s, many cases of using uninformed human subjects are documented in Eileen Welsome's 1999 book *The Plutonium Files*. [12]

Between 1945 and 1947, eighteen unsuspecting medical patients were injected with plutonium supplied by Los Alamos chemist Wright Langham. Surviving patients and their survivors did not know that they had been injected with plutonium until documents were made public in the 1990. The patients injected with plutonium included eleven chosen by Rochester doctors who were paid to conduct the study. The patients' urine was collected after the injections, with the idea being to see the rate of plutonium excretion. Generally, about five micrograms of plutonium was injected into each patient, and this was five times the amount thought to be allowable for radiation workers at the time. The amount of plutonium injected was known to be harmful.

Contrary to a 1950 Los Alamos report by Wright Langham and others, the patients injected with plutonium were not necessarily selected on the belief that the patient was not expected to live much longer. Preference was given to a patient they thought would never ask questions and who would stay in the hospital for a month or more during which time their urine would be collected for analysis of plutonium in the urine.

The organs of some of the patients were harvested without permission of the deceased or their family…and not always after the patient died! The eighteen plutonium injection cases are summarized in Table 2 to show the places, dose amounts, and the inhumanity of injecting health harming amounts of plutonium into medical patients without their knowledge or consent and with no expectation of medical benefit to the patient. Suffering was knowingly inflicted both long term and in the short term as actual medical treatment was sometimes delayed.

Plutonium injections into the blood stream were a different chemical form that many workers will be exposed to and differ from lung inhalation events more common at the Department of Energy Complex. Plutonium via lung inhalation is strongly retained in the lungs depending on chemical solubility and particle size, but what enters the blood stream is strongly retained in the human body, with perhaps 15 percent of what enters the blood exiting the body via urine and fecal excretion.

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[11] DOE Human Radiation Experiments, List of Experiments at https://ehss.energy.gov/OHRE/roadmap/experiments/0491doca.html The list includes plutonium injection studies, tests at Brookhaven National Laboratory, Argonne National Laboratory, Hanford, Oak Ridge National Laboratory and others.

[12] Eileen Welsome, *The Plutonium Files America's Secret Medical Experiments in the Cold War*, The Dial Press, 1999. ISBN 0-385-31402-7

Of the plutonium that enters the blood stream (via injection or wound entry), about 50 percent will be retained in bone and will affect bone marrow where blood is produced. Thirty percent will be retained in the liver. Gonad and kidney health are also affected. [13] Radiation dose from the plutonium retained inside the human body will continue for many years.

Table 2. Eighteen people injected with plutonium without their knowledge or consent between 1945 and 1947.

Date of Injection (amount of plutonium)	Institution (code for person)	Person Injected (Age)	Condition (Date of death)	Notes
April 10, 1945 (4.7 micrograms) **Note that in 1945, the worker limit for Pu-239 was 1 microgram or 0.06 microcuries.**	Oak Ridge (HP-12)	Ebb Cade (55)	Broken bones in car accident. Died 8 years later at age 63. His brothers and sisters lived decades longer.	They pulled his teeth and delayed setting bone breaks for three weeks.
April 26, 1945 (6.5 micrograms)	University of Chicago (CHI-1)	Arthur Hubbard (late 60s)	Had squamous cell carcinoma before injection. (Lived 5 months.)	Organs harvested. Bone marrow and liver were the hottest.
May 1945 (unknown amount of plutonium-238)	University of California, Berkley (CAL-1)	Albert Stevens (age 58)	Misdiagnosed as having stomach cancer. (Lived 21 years, died at age 79)	Harvested spleen, a rib, lobe of liver, part of pancreas, lymph nodes, part of omentum for research purposes while patient was alive.
April 26, 1946 Plutonium-239, cerium and yttrium injected	University of California, Berkley (CAL-2)	Simeon Shaw (age 4)	Osteogenic sarcoma, not expected to live (Died January 6, 1947)	Harvested bone specimens while alive for no therapeutic reason.

[13] Casey Burns, George Perkins Marsh Institute, Clark University, Worcester, MA, "Overview of Plutonium and Its Health Effects," April 2002, Draft II. http://www2.clarku.edu/departments/marsh/projects/community/plutonium.pdf

Date of Injection (amount of plutonium)	Institution (code for person)	Person Injected (Age)	Condition (Date of death)	Notes
July 18, 1947 Injection into muscle instead of vein	University of California, Berkley (CAL-3)	Elmer Allen (adult negro)	Possible osteogenic sarcoma (Lived until 1991)	Leg harvested
October 16, 1945 (likely about 5 micrograms)	University of Rochester (HP-1)	Amedio Lovecchio (age 67)	Had needed a blood transfusion for a stomach ulcer. (Lived 14 years)	
October 23, 1945 (likely about 5 micrograms)	University of Rochester (HP-2)	William Purcell (age 48)	Hemophiliac (Died August 4, 1948)	
November 27, 1945 (4.9 micrograms)	University of Rochester (HP-3)	Eda S. Charlton (age 49)	Various minor health complaints. (Lived 40 years more, died of heart attack and stroke January 1983)	880 rem over a lifetime. Her red blood cells years later found to have "very rare" shapes and sizes.
November 27, 1945 (likely about 5 micrograms)	University of Rochester (HP-4)	Jean Daigneault (age 18)	Cushings syndrome. (Died April 19, 1947)	Had won swimming championship as a teen.
November 30, 1945 (likely about 5 micrograms)	University of Rochester (HP-5)	Paul Galinger (age 56)	Lou Gehrig's Disease expected to live less than one year (died April 29, 1946)	Organs harvested. Here they learn that 48 percent of the plutonium is in the liver.
February 1, 1946 (likely about 5 micrograms)	University of Rochester (HP-6)	John Mousso (age 44)	Addisons. Lived many decades.	
February 8, 1946 (likely about 5 micrograms)	University of Rochester (HP-7)	Edna Barthoff (age 59)	Heart disease. (died nine months after injection of pulmonary	

Date of Injection (amount of plutonium)	Institution (code for person)	Person Injected (Age)	Condition (Date of death)	Notes
			failure)	
February 20, 1946 (may have been a very high amount, 50 micrograms)	University of Rochester (HP-11)	Harry Slack (age 69)	Alcoholic with cirrohosis (died 6 days later)	
March 1946 (likely about 5 micrograms)	University of Rochester (HP-8)	Janet Stadt (age 41)	Scleroderma and stomach ulcer (Died 30 years after injection)	
April 3, 1946	University of Rochester (HP-9)	Fred Sours (age 64)	Dermatomyositis, a rare skin disorder (Died July 2, 1947 of pneumonia)	
July 16, 1946	University of Rochester (HP-10)	Daniel Nelson (age 52)	Severe heart disease (Died 10 years and 11 months after the injection)	
December 27, 1945 (Extremely high dose of 94.91 micrograms)	University of Chicago (CHI-2)	Una Macke (middle age)	Wide-spread cancer (Died January 13, 1946)	She began to vomit immediately after the injection. They made a dying woman suffer in her last days.
December 27, 1945 (Extremely high dose of 94.91 micrograms)	University of Chicago (CHI-3)	Man, unknown identity	Hodgkin's Disease (Died 170 days later)	

Source: Eileen Welsome, The Plutonium Files, The Dial Press, 1999.

A researcher from Los Alamos found that 48 percent of the plutonium had deposited in the liver of one human subject and he had not expected this. **The red blood cells of another patient were thought to be within normal limits, but years later, another test would indicate the cells were of "very rare" shapes and sizes. This could have been caused by the plutonium. But blood test results don't appear to have been routinely obtained.** The experiments were focused on urine and fecal excretion rates, yet the injection of plutonium-citrate differs from plutonium oxide forms more prevalent for plutonium worker exposure.

There were other injections without consent including six patients injected with uranium at University of Rochester, including Mary Jeanne Connell who was a healthy 24-year-old. There were the 74 Fernald 7-year-old boys in Massachusetts, orphans, fed oatmeal mixed with radioactive iron or calcium between 1946 and 1953. There were the 751 pregnant mothers given radioactive iron at Vanderbilt University Hospital in the mid-1940s where a later study found four cancer deaths in the exposed children and none in a control group. The women were told they were being given vitamins and the limited follow-up only happened as the institution hoped to prove there had been no harm. [14] And there were nearly 200 patients irradiated over almost fifteen years at whole body radiation facilities at Oak Ridge and Cincinnati until 1974 which had so little benefit, if any, that no studies comparing the whole body radiation treatments to other cancer treatments were even published. [15]

Another case of human research was conducted on an entire community, Newburgh, New York, when fluoride was put into their public drinking water. This ties into the same government agency, the Atomic Energy Commission, that was conducting radiation experiments because it related to uranium processing for nuclear reactors. From 1945 to 1956, the classified operation "Program F" secretly gathered and analyzed blood and tissue samples from Newburgh citizens. Researchers funded by the government have suppressed the adverse effects of fluoride exposure. Much of the research was funded because the government was polluting with fluoride associated with uranium processing and did not want to lose lawsuits over fluoride exposures. Along with tooth and bone problems, diminished IQ may be caused by fluoride ingestion. Studies of central nervous system effects have been and are still being withheld from the files of the U.S. National Archives. [16]

The point of this trip down memory lane is to illustrate just how easily U.S. radiation researchers ignored ethics even after concerns were raised and World War II had ended. In 1947, the Atomic Energy Commission, predecessor to the Department of Energy, developed new rules for human experiments that stipulated (1) that no experiment could be undertaken unless it was expected to benefit the patient, (2) the medical file should contain documentation showing

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[14] DOE Human Radiation Experiments, ACHRE report are unethical human experiments at https://ehss.energy.gov/ohre/roadmap/achre/chap5_5.html

[15] Eileen Welsome, *The Plutonium Files America's Secret Medical Experiments in the Cold War*, The Dial Press, 1999. ISBN 0-385-31402-7

[16] Chris Bryson and Joel Griffiths, *Fluoride Action Network*, "Fluoride, Teeth, and the Atomic Bomb," September 1997. http://fluoridealert.org/articles/wastenot414/

patient consent, and (3) at least two doctors should certify in writing that the possible effects of the treatment had been explained and that the patient consented. These guidelines were immediately ignored as thousands of human research experiments were conducted during three decades of cold war research.

Radiation researchers prior to the 1990s were willing to be deceptive and they put research and their careers ahead of the human beings they would inflict harm and suffering upon. With the display of willingness of researchers and medical practitioners to inflict harm when they have personal benefit to conducting research, I am not certain that this human problem has been solved.

U.S. Nuclear Regulatory Commission to Focus on Public Perception, Ignoring Numerous Recommendations to Conduct More Rigorous Testing of Spent Nuclear Fuel Transportation Containers

After a National Academy of Sciences study strongly endorsed full-scale tests be conducted on spent nuclear fuel transportation casks in 2006 [17] and the U.S. Nuclear Regulatory Commission Package Performance Study suggested full-scale transportation accident tests in 2003, [18] so far as of 2018 there has been no testing performed to verify that shipping containers will perform as predicted by computerized analysis.

The NRC decided that full scale testing of severe accident conditions would be expensive and that Yucca Mountain is not happening anytime soon. The Blue Ribbon Commission report told the NRC that the status of the Yucca Mountain repository should not drive NRC's decision to not perform transportation accident testing because of their opinion that an interim storage site needed to be developed. [19]

Don't let the title of the 2014 report by Sandia Laboratory for the Department of Energy fool you. Absolutely no testing has been conducted. **In its report "Full-Scale Accident Testing in Support of Spent Nuclear Fuel Transportation," the Department of Energy spins a gibberish excuse that all they really need to do is convince themselves that the public perception of spent nuclear fuel transportation is satisfactory and therefore no full-scale transportation accident testing is needed.** [20]

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[17] National Academy of Sciences, *Going the Distance: The Safe Transport of Spent Nuclear Fuel and High-Level Radioactive Waste in the United States*, National Academies Press, 2006.
[18] U.S. Nuclear Regulatory Commission, *Package Performance Study Test Protocols*, NUREG-1768, 2003.
[19] Blue Ribbon Commission on America's Nuclear Future, Report to the Secretary of Energy, 2012.
[20] U.S. Department of Energy, *Full-Scale Accident Testing in Support of Spent Nuclear Fuel Transportation*, Fuel Cycle Research & Development, Sandia National Laboratories, FCRD-NFST-2014-000375, September 2014. http://large.stanford.edu/courses/2017/ph241/watson2/docs/sand2014-17831r.pdf

Other countries don't just pretend to care about citizen safety — other countries have conducted more rigorous testing of spent nuclear fuel shipping containers and they impose far more restrictive speed limits and so forth for their transportation by truck or rail. See the U.S. Nuclear Waste Technical Review Board meeting presentation at the June meeting by the nuclear power program in Switzerland. [21]

In the U.S. an increasing number of severe train accidents have occurred. And crumbling road and bridge infrastructure is real.

The number of past spent nuclear fuel shipments in the U.S. for commercial spent nuclear fuel from 1964 to 1989 is 2623 casks shipments. [22] [23] Of these, 223 shipments were between 3.1 and 3.3 MTU with the remaining 2400 shipments less than 2 MTU per cask, usually far less.

There have been 850 naval spent fuel shipments, 236 U.S. research fuel shipments and 250 foreign research fuel shipments, totaling 1336 shipments.

Future spent nuclear fuel shipments of 10 MTU per cask involve much more fuel per cask and much more weight of the fuel and cask combination. In fact, should spent fuel shipping to a repository commence as planned, with 35,000 to 100,000 shipments over 25 years, there would be more spent nuclear fuel shipped in a single year than has been shipped in the U.S. since the first nuclear plants began operating. [24] And in that time, road, bridge, and rail infrastructure has been crumbling and rail accidents from human error and other causes increasing and have continued increasing since the NRC study reexamined accident frequencies in 2000. [25] The severity of accidents also has increased due to increased transportation of oil that sustains long burning high temperature fires.

The U.S. NRC knows that its transportation container requirements are not very stringent, but they expect the containers to withstand more serious fires than their regulations require. They claim that the likelihood of a release of radioactivity from a spent fuel container is one-in-one-

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[21] Mark Whitmill, Kernkraftwerk Gosgen Daniken AG (KKG), Switzerland, U.S. Nuclear Waste Technical Review Board Summer Board Meeting in Idaho Falls, June 13, 2018. See www.nwtrb.gov The government of Switzerland makes exacting requirements for cask design and requires that they "demonstrate that the casks will withstand all static and dynamic loads during normal operation and under hypothetical accident conditions." A double lid system is mandatory. They require sub-criticality for the most unfavorable cask arrangement and complete flooding. They require demonstrating adequate performance including resistance to aging effects during the planned usage period for all materials. They have far fewer cask shipments and far fewer miles to travel across their country than the U.S. Switzerland has voted to phase out nuclear energy.

[22] Science Applications International Corporation, Oak Ridge, Tennessee, "Historical Overview of Domestic Spent Fuel Shipments Update," ORNL/Sub—88-997962/1, July 1991. https://www.osti.gov/servlets/purl/5430848

[23] NEI webpage Factsheet at https://www.nei.org/resources/fact-sheets/safe-secure-transportation-used-nuclear-fuel says that the NRC says there have been 1300 safe SNF shipments in the U.S. based on NRC document NUREG/BR-0292, Rev. 2 at https://www.nrc.gov/reading-rm/doc-collections/nuregs/brochures/br0292/ It is unclear how the 1300 safe SNF shipments number was determined from the NUREG/BR-0292 document over the past 35 years.

[24] State of Nevada, Nuclear Waste Project Office, "Transportation of Spent Nuclear Fuel and High-Level Radioactive Waste to a Repository," Factsheet, 1999. http://www.state.nv.us/nucwaste/trans/trfact03.htm

[25] U.S. Nuclear Regulatory Commission, "Reexamination of Spent Fuel Shipment Risk Estimates," NUREG/CR-6672, 2000.

billion. But they have also admitted that they assume that the plastic neutron shielding may be damaged during a fire. **But, they have carefully avoided explaining what this means to an emergency responder, in terms of neutron radiation dose and corresponding health and reproductive health effects. Neutron dose is not detected by typical radiation instrumentation.**

High burnup fuel (i.e., fuel with burnups generally exceeding 45 GWd/MTU) may have cladding walls that have become relatively thin from in-reactor formation of oxides or zirconium hydride. The maximum temperature is lower for high burnup fuel, 570 C. See NRC Interim Staff Guidance ISG-11, Rev. 3. [26] This may mean that transportation testing for lower burnup fuels may not be adequate for high burnup fuels. It also means that there may be pressure to accept higher radiological release likelihood and consequence from transporting higher burnup fuels because while arguing that the regulatory requirements are met, but the NRC is happy with regulatory requirements for transportation that don't provide safety in real world accident conditions. Various real-world accident conditions that have exceeded regulatory requirements are discussed in the presentation. [27]

On the NRC website, Office of Public Affairs, "Safety of Spent Fuel Transportation" February 2017 [28] they state that on the basis of studies that consider real world accidents (which the brochure does not identify) the brochure states that the NRC believes spent fuel can continue to be shipped safely. But the NRC has not studied accidents involving high burnup fuels above 45 GWd/MTU. And they want the public to believe transportation of spent nuclear fuel is safe — **despite the lack of regulations that would require transportation containers to be shown to actually meet real world accident conditions and despite the lack of testing to verify that modeling is adequate to show container performance.**

In addition to the unaddressed fuel cladding issues involving high burnup fuel, transportation safety issues **due to aging effects from years of dry storage beyond two decades** pose an unanalyzed problem for both low and high burnup spent nuclear fuel. The U.S. Nuclear Waste Technical Review Board stated in 2010: "The technical information currently available, together with the experience gained to date in the dry storage of used fuel, demonstrates that used fuel can be safely stored in short term and then transported for additional storage, processing or repository disposal, at least for low burnup fuel. **However, additional information is required in order to demonstrate, with similarly high confidence, that high burnup fuel can be safely transported and any type of used fuel can be stored in dry storage facilities for extended**

[26] U.S. Nuclear Regulatory Commission, Interim Staff Guidance-11, Rev. 3, "Cladding Considerations for the Transportation and Storage of Spent Fuel," 2003. https://www.nrc.gov/reading-rm/doc-collections/isg/isg-11R3.pdf

[27] Douglas J. Ammerman and Carlos Lopez, Technical Workshop for the 2016 NTSF Meeting held June 7-8, 2016, "Testing and Certification for SNF Transportation Containers," Sandia National Laboratories, SAND2016-5285PE, https://www.osti.gov/servlets/purl/1368738

[28] NRC website, Office of Public Affairs, "Safety of Spent Fuel Transportation" February 2017 at https://www.nrc.gov/docs/ML1703/ML17038A460.pdf#page=6&zoom=auto,-265,619

periods without the fuel degrading to the extent that it may not perform satisfactorily during continued storage and subsequent transportation." [29]

Emergency Responders to Spent Nuclear Fuel Transportation Accidents: Will You Know Your Neutron Dose?

If you care about your reproductive health and you are an emergency responder to a spent nuclear fuel transportation accident fire, you may want to find out more about your potential neutron exposure and what it really means to your reproductive health as well as your overall health.

Neutrons are not stopped by lead or metal shielding. The neutrons are slowed by hydrogen. Therefore, the neutron shielding in a transportation case is made of plastic-like material. And the neutron shielding in a transportation cask is not assumed to survive for more than a few minutes after a fire.

In a U.S. Department of Energy document published in 2016, [30] it was stated that they made: "…**the assumption that the neutron shield disappears at the beginning of the fir**e, where neutron shields are typically hydrogenous materials which would provide some thermal shielding for minutes."

Some experts think the neutron shield will survive a fire. However, there are no requirements or testing to assure this. And there are so many variable container designs and fire accident conditions, that success in one event may not adequately inform you of the expected behavior in a different accident.

So, even if the SNF transportation cask/canister survive the fire and prevent the release of radioactive gaseous and particulates emissions from the spent fuel, and the gamma shielding of the container remains effective, the neutron dose could be large in any fire event involving spent nuclear fuel. [31] Should the transportation cask/canister be breached, over 8 million curies could be at risk of being released. See NUREG-2125 [32]

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[29] United States Nuclear Waste Technical Review Board, "Evaluation of the Technical Basis for Extended Dry Storage and Transportation of Used Nuclear Fuel," December 2010. https://sanonofresafety.files.wordpress.com/2013/06/usnwtrb-evaloftechbasisforextendeddrystorageandtransportofusednuclearfuel2010-dec-eds_rpt.pdf

[30] U.S. Department of Energy, Nuclear Fuels Storage and Transportation Planning Project, "A Historical Review of the Safe Transport of Spent Nuclear Fuel," FCRD-NFST-2016-000474, Rev. 1 or ORNL/SR-2016/261, Rev. 1, August 31, 2016. See p. 61 at https://www.energy.gov/sites/prod/files/2017/03/f34/Enhanced%20safety%20record%20report%20-%20final%20public%20release_0.pdf

[31] U.S. Nuclear Regulatory Commission brochure, NUREG/BR-0292 https://www.nrc.gov/docs/ML1703/ML17038A460.pdf Cites within

Damage to the neutron shielding is not going to be visible, and your radiation detection equipment may not include the capability of detecting neutron radiation.

On the NRC website, Office of Public Affairs, "Safety of Spent Fuel Transportation" February 2017 [33] t**hey state that the dose to the most affected individual would not cause immediate harm** which means what exactly? That you won't necessarily die right away? **They state that there is less than 1 in 1 billion chance that radioactive material would be released in an accident** unless, of course, any of their many unvalidated assumptions turns out to be wrong.

Read more about neutron exposure and your health in the Environmental Defense Institute's August 2018 newsletter article "Neutron exposure during glovebox work and other handling of fissile material at the Idaho National Laboratory and Idaho Cleanup Project."

Polycythemia Vera, Recognized for Decades as being Caused by Radiation, is a Bone Cancer Covered in Energy Worker Illness Compensation

If you've never heard of polycythemia vera, it would be understandable — it is supposed to be rare, perhaps one in 100,000 people. So, it seems odd that I know two people with polycythemia vera and that a brochure for the condition was available in a local medical office.

When I started to learn about polycythemia vera, I stumbled across information saying that it was included as a qualifying bone cancer for energy employee compensation. [34]

Polycythemia vera, also called polycythemia rubra vera or primary polycythemia vera is a bone cancer that causes an abnormally high increase in the number of red blood cells. As I searched among various websites describing the disease, the genetic cause of the disease was described but often there was no description of its cause including ionizing radiation exposure. [35]

When I tried to see that rate of polycythemia cases in national cancer statistic reports, I found it was not possible to determine the rate of polycythemia cases because of how they were either

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http://pbadupws.nrc.gov/docs/ML1219/ML12192A283.pdf, http://www.nrc.gov/reading-rm/doc-collections/nuregs/contract/cr4829/, http://pbadupws.nrc.gov/docs/ML0036/ML003698324.pdf, and http://pbadupws.nrc.gov/docs/ML1403/ML14031A323.pdf

[32] U.S. Nuclear Regulatory Commission, "Spent Fuel Transportation Risk Assessment – Final Report," NUREG-2125, January 2014. https://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr2125/

[33] NRC website, Office of Public Affairs, "Safety of Spent Fuel Transportation" February 2017 at https://www.nrc.gov/docs/ML1703/ML17038A460.pdf#page=6&zoom=auto,-265,619

[34] https://www.stephensstephens.com/areas-of-practice/eeoicpa/sec-covered-illnesses/covered-illnesses-bone-cancer/

[35] Leukemia and Lymphoma Society, Polycythemia Vera Facts, https://www.lls.org/sites/default/files/file_assets/FS13_PolycythemiaVera_FactSheet_final5.1.15.pdf I note that radiation is not identified as a cause of polycythemia vera in this fact sheet despite the cancer being added, in 2002, to the EEIOCPA list of cancers (bone cancer) eligible for radiation-induced cancer.

missing or lumped into an evolving category, ICD-O-3. National cancer statistics do not reveal the rate of occurrence by state in the main cancer statistic literature. [36]

Polycythemia is supposed to be rare, perhaps 1 to 3 people in 100,000 people. There is a gene mutation said to be found in more than 95 percent of people with polycythemia vera called the JAK2 mutation, particularly the V617F mutation. [37]

Polycythemia vera was added as an additional cancer considered as a primary cancer in energy employee compensation EEOICPA Bulletin No. 03-11 issued in November 19, 2002. "One of the functions of bone is to manufacture blood cells in the bone marrow. Accordingly, myelofibrosis with myeloid metaplasia, polycythemia rubra vera and its variant polycythemia vera with leukocytosis and thrombocytosis, and myelodysplastic syndrome(s) should be considered as bone cancer for the purposes of having a "specified cancer" as a member of the Special Exposure Cohort, since all are malignancies of the bone marrow." [38] The National Institute of Occupational Safety and Health (NIOSH) conducts the radiation dose reconstruction for energy workers to determine eligibility for illness compensation. The Energy Employee Occupational Illness Compensation Act (EEOICPA) lists twenty-two specified cancers, including bone cancer, that are recognized to potentially be caused by ionizing radiation.

In a 2006 report of Health Risks of Ionizing Radiation, several studies from the 1980s found increased occurrence of polycythemia vera in the study of veterans exposed to nuclear weapons fallout. [39] So, I have to wonder why medical websites for polycythemia vera pretend not to know that ionizing radiation is recognized as a potential cause of polycythemia vera.

A recent study in Japan found increased polycythemia cases in the evacuees from their homes near the Fukushima nuclear reactor meltdown. The Japan study attributed the cases to stress and made no mention of radiation exposure as a potential case. [40]

I found a report issued in 2008 for many states, but not all, that included occurrence rate for polycythemia vera. [41] The report included data from 2001 to 2004. **And guess what state had the highest occurrence rate of polycythemia? Idaho.**

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[36] One example is the *United States Cancer Statistics 2003 Incidence and Mortality* report at https://www.cdc.gov/cancer/npcr/npcrpdfs/US_Cancer_Statistics_2003_Incidence_and_Mortality.pdf It discusses polycythemia vera being grouped with several unrelated cancers in the ICD-O-3 group but does not provide any information on how to find the occurrences of the disease.

[37] Leukaemia Foundation website https://www.leukaemia.org.au/disease-information/myeloproliferative-disorders/types-of-mpn/polycythemia-rubra-vera/

[38] Can be found on the NIOSH website or here: http://radiationexposure.org/areas-of-practice/eeoicpa/sec-covered-illnesses/pancreatic-cancer/

[39] Abel Russ, Casey Burns, Seth Tuler, and Octavia Taylor, Community-Based Hazard Management, The George Perkins Marsh Institute, Clark University, Health Risks of Ionizing Radiation: An Overview of Epidemiological Studies, March 2006. http://www2.clarku.edu/mtafund/prodlib/clark/round6/Ionizing_Radiation.pdf

[40] Akira Sakai et al., *Persistent prevalence of polycythemia among evacuees 4 years after the Great East Japan Earthquake: A follow-up study*, PMID: 28127528, Published January 12, 2017. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5257186/

[41] Dana E. Rollison et al., Blood, "Epidemiology of myelodysplastic syndromes and chronic myeloproliferative disorders in the United State, 2001-2004, using data from the NAACCR and SEER programs," 2008. Doi:

The Idaho Cancer Registry does not post online any polycythemia incident rate data for Idaho, although this data has been collected for Idaho since 2001. The data is also screened to remove cases that don't meet the criteria for polycythemia. So, this data was collected and reviewed — but inexplicably it has not been made available online in any format and has not been added to the Idaho Cancer Registry reports. This is 2018!

The NIOSH website for dose reconstruction and compensation does not make it easy to determine that polycythemia is included as a covered bone cancer. However, an undated training course on their website includes EEOICPA Bulletin No.03-11 issued November 19, 2002 which identifies polycythemia vera as being an accepted bone cancer for compensation. [42]

Diagnosis of polycythemia vera may be detected from blood tests. A complete blood count (CBC) may demonstrate elevated numbers of red blood cells and sometimes platelets and white blood cells. **The levels of erythropoietin (EPO), a hormone that causes the bone marrow to produce red blood cells, distinguish primary polycythemia vera from secondary polycythemia. In individuals with primary polycythemia vera, EPO levels are abnormally low.** But in secondary polycythemia, EPO levels are not affected, according the website rarediseases.org. [43] Primary polycythemia vera is covered by EEOICPA, but secondary PV is not.

The attitude that there is no need to bother reporting to the public rare illnesses that are linked to ionizing radiation exposure is not just an Idaho phenomenon. In Tennessee, home of the Oak Ridge National Laboratory and many human radiation experiments conducted without consent, the cancer rates and cancer deaths exceed national averages. And when questions were asked about cancer incidence, the experts at ATDR put together a brochure that not only lacked any cancer rate information and any comparison to other states, they specifically left out rare cancers, cancers with five or fewer cases, "for reasons of confidentiality." [44] Ionizing radiation exposure is known to cause rare cancers. An example of internal radiation exposure linked to rare cancers in California was found near the former Santa Susana Field Lab where a partial nuclear reactor meltdown happened in 1959, but was not publicly disclosed until 1979. [45]

10.1182/blood-2008-01-134858 http://www.mpnresearchfoundation.org/images/files/Rollison%20et%20al%202008%20Epi%20of%20MDS%20and%20MPN%202001-2004%20Blood%202008(1).pdf

[42] Department of Labor, Division of Energy Employees Occupational Illness Compensation Claims Examiner Training Course, Developing Medical Conditions Cancer Claims Instructor's Guide at https://www.dol.gov/owcp/energy/regs/compliance/public_reading_room/Cancer%20IG.pdf

[43] https://rarediseases.org/rare-diseases/polycythemia-vera/

[44] https://www.atsdr.cdc.gov/hac/pha/OakRidgeReservationCancer/Assessment_of_Cancer_Incidence_factsheet_508.pdf This factsheet *demon*strates for how to lie about cancer statistics in this cancer-riddled state. It is filled with information that deliberately avoids revealing the truth about elevated cancer rates and deaths in Tennessee.

[45] Kathy Jean Schultz, Simi Valley, Ventura County, *VC Reporter*, "Kids and Cancer: Residents of nearby Rocketdyne Shine Light on Unusual Diagnoses," August 15, 2018. https://www.vcreporter.com/2018/08/kids-and-cancer-resident-of-nearby-rocketdyne-shines-light-on-unusual-diagnoses/

Proposed EPA Rule, "Strengthening Transparency in Regulatory Science" Actually Seeks to Protect Polluters

The proposed EPA rule Docket No. EPA-HQ-OA-2018-0259 "Strengthening Transparency in Regulatory Science" is not about transparency. It's about gutting existing protections of human life and about preventing future tough regulations to protect human life.

While the title of the proposed rule sounds reasonable, it will actually reduce transparency because valid studies will be tossed out. It would toss out information from past human tragedy in order to save polluters money.

Many, perhaps most, other organizations who care about public health oppose this proposed rule. The proposed rule will allow political pressure rather than sound science to prevail because many valid studies may be tossed out.

An important example is hexavalent chromium: polluter industry pressure has resulted in inadequate drinking water standards for this pollutant and I and many of my fellow workers have suffered because of inadequate EPA drinking water standards, as well as aquifer down-gradient members of the public, from the past hexavalent chromium from Department of Energy polluting in Idaho.

The proposed rule will allow even more delay in putting in place protections for human health. This means more illness and more lives lost. How does the EPA figure out those costs? The EPA already has too many delays in implementing regulations because of polluter pressure such as pressure from the U.S. Department of Energy.

As we know here in Idaho at the Idaho National Laboratory, the EPA already hides behind reasonable sounding EPA regulations for CERCLA superfund cleanup [46] because published cleanup standards are not met because the cost of adequate cleanup is so high or are impossible as a practical matter. Preventing the pollution in the first place is a far more cost-effective approach. And cost analyses tend to ignore this. Does the EPA figure out the costs of "forever" contamination sites? Does the EPA figure out the costs of future lost health and lost human lives?

Environmental Defense Institute (EDI) has been engaged with EPA regulatory oversight of Department of Energy operations at the Idaho National Laboratory (INL) near Idaho Falls, Idaho, since 1990. EPA's regulatory role at INL is through CERCLA (Superfund cleanup), the Resource Conservation Recovery Act (RCRA), and Clean Air Act monitoring along with the State of Idaho's Department of Environmental Quality (IDEQ) INL Oversight Program. Most of INL CERCLA/RCRA/Federal Facility Compliance Act (FFCA) regulatory policy decisions are

[46] Comprehensive Environmental Response, Compensation, and Liability Act (42 U.S.C. 9601 et seq.), often referred to as the "Superfund" act.

reached through EPA Region 10's administrative rulings that otherwise would be illegal under strict enforcement of applicable statures. [47] [48]

The EPA sets public drinking water standards that protect polluters more than people. This rule will only strengthen the leverage polluters have to weaken protections for human health and typically for short term profits.

People in favor of this rule and who care about human life have been misinformed. This proposed rule change is deceptive, immoral, and will aid in the increase of future birth defects, lowered IQ, greater illness, and reduced life span of humans. This rule is being proposed in order to gut EPA protections. This rule is being promoted in order to aid chemical and radionuclide polluters in this country. The nuclear weapons industry in the U.S. wants to gut the EPA because once in a while, the EPA shows enough strength to tell the truth about the harm polluter industries are causing.

As proof of polluter influence over the EPA, what person would possibly offer to expose themselves or their child to the level of allowed radionuclide and chemical poisoning maximum contaminant standards for their lifetime, from the current EPA standards? The answer would be none, if they have any scientific understanding of biology.

See Environmental Defense Institute's full comments by Chuck Broscious on our website.

Just Two Problems with U.S. Radiation Protection: Radiation Dose Underestimated and the Harm Underestimated

In the U.S., the officialdom radiation protection models are wrong — and they underestimate the health harm of ionizing radiation. Differing vintages of International Commission on Radiological Protection (ICRP) methods are used by the Environmental Protection Agency, Nuclear Regulatory Commission, and Department of Energy to estimate the radiation doses to workers and the public. Internal radiation dose harm is underestimated more than external radiation dose harm. And the health harm from ionizing radiation is not limited to cancer incidence and mortality.

The foundation of U.S. radiation protection standards come from the ICRP. In ICRP 60, it is stated that "The primary aim of radiological protection is to provide an appropriate standard of protection of man without unduly limiting the beneficial practices giving rise to radiation exposure." **Their aim in not the protection of human health; their aim has been and continues to be the protection of the nuclear industry. This cannot be emphasized too**

[47] **LDR Mixed Waste:** Mixed waste that is restricted from one or more methods of land disposal or storage under IDAPA § 16.01.05.011 (RCRA, 42 U.S.C. § 6924; 40 C.F.R. Part 268).

[48] **HWMA:** The Idaho Hazardous Waste Management Act of 1983, as amended, Idaho Code 18 §§ 39-4401 to 4432 and its implementing rules in IDAPA 16.01.05.000 to .05.999.

strongly. The ICRP is populated by nuclear industry and radiologists [49] which may explain why evidence that strongly indicates that people are not adequately protected by existing radiation standards is often ignored.

The EPA's Federal Guidance Series reports, FGR 11, 12, and 13 are based on ICRP 26/30, 38 and ICRP 60. [50] [51] OSHA regulations use ICRP Publication 2 and the EPA and NRC still have regulations that require the use of ICRP 2. Along with differing methods, there is tremendous latitude in the selection of assumptions that dramatically alter the estimated radiation dose received, particularly by a worker. The Department of Energy has adopted an ICRP 60 approach for calculating the doses to workers, yet the methods allow tremendous latitude in the selection of assumptions. The U.S. DOE and NRC have never adopted the ICRP radiation dose limit for workers, of 2 rem/yr, preferring the 5 rem/yr limit. This is despite epidemiology that shows an elevated cancer risk from an average 0.4 rem/yr (400 millirem/yr) to radiation workers. [52]

Internal dose methods range from critical organ dose, as determined using ICRP Publication 2 published in 1959 to the most recent method for determining effective dose, based on ICRP Publication 103, published in 2008. [53] ICRP models are always evolving but not necessarily getting more accurate. Tissue weighting factors and the selection of tissues to include have gyrated up and down. The ICRP is always working on a revision that will come out in a few years. [54]

Once the radiation dose has been estimated, cancer risk is only focus for U.S. agencies and this is based on the 1990 ICRP Publication 60. Here, the risk coefficients, average the genders — which leave women less protected than men both leaves both genders inadequately protected. When cancer incidence or mortality dictate the radiation protection standard, the elevated illness

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[49] Thomas Dersee and Sebastian Pflugbeil, *A Foodwatch Report*, German Society for Radiation Protection in cooperation with the German Section of the International Physicians for the Prevention of Nuclear War (IPPNW), "Calculated Fatalities from Radiation: Officially Permissible Limits for Radioactively Contaminated Food in the European Union and Japan," September 2011. https://www.foodwatch.org/uploads/tx_abdownloads/files/fw_report_CalculatedFatalitiesfromRadiation11_2011.pdf p. 6.

[50] EPA powerpoint presentation by Michael Boyd, "The Role of Federal Guidance in Radiation Protection," November 20, 2017. See llwforum.org

[51] This link describes the EPA's radiation modeling https://www.epa.gov/radiation/tools-calculating-radiation-dose-and-risk

[52] 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 epidemiology study that included a cohort of over 300,000 nuclear industry workers has found clear evidence of solid cancer risk increases despite the average exposure to workers being about 2 rem and the median exposure was just 410 millirem. Also see December 2015 EDI newsletter.

[53] Michael A. Boyd, U.S. EPA, "The Confusing World of Radiation Dosimetry," WM2009 Conference, March 1-5, Phoenix, AZ. http://www.wmsym.org/archives/2009/pdfs/9444.pdf

[54] Sora Kim et al., *Journal of Radiation Protection and Research*, "The System of Radiation Dose Assessment and Dose Conversion Coefficients in the ICRP and FGR**,"** 2016; 41(4): 424-435. Published online: December 31, 2016. DOI: https://doi.org/10.14407/jrpr.2016.41.4.424

and death statistics from the premature aging and the genetic and reproductive effects caused by ionizing radiation are not downplayed or ignored.

The exclusive focus on cancer incidence and mortality from ionizing radiation fails to protect adults and does not adequately protect the unborn or children.

"After the Chernobyl reactor catastrophe, not only were many people afflicted with cancer, but there was also a sharp increase in other somatic illnesses such as a weakening of the immune system, premature aging, cardiovascular disease even in younger patients, chronic diseases of the stomach, the thyroid gland and the pancreas (diabetes mellitus), as well as in neurological-psychiatric disorders and genetic or teratogenic disorders as a result of low-level doses of radiation." [55]

The ICRP models and hence U.S. regulations are based largely on the cancer and leukemia risk obtained from the Life Span Study of World War II Japan's bombing survivors. The problem is that this study has been manipulated by adjusting the estimated radiation dose of external gamma and neutron radiation to the survivors in order to reduce the estimated harm of ionizing radiation. [56] [57] [58] And the effects of internal radiation from inhalation and ingestion of radionuclides are canceled out of the study. [59] Japan's bomb survivors in the city during the bombing and the control group — people outside the city during the bombing but who returned soon after the bombing — were both exposed to the radioactive fallout and internal radioactivity from inhalation and ingestion of radionuclides. So, the Life Span Studies reflect only the gamma and neutron external dose and not the effects of radioactive fallout on internal dose. The dose estimates from the ICRP for external radiation may underestimate the dose by a factor of 2 to 5 or more. But the dose estimates from the ICRP for internal radiation dose from inhalation or ingestion by underestimate the dose by a factor of 100 or more because the simplistic emphasis on the imparted energy from the radionuclide decay does not consider the highly concentrated damage to cellular tissue where the radionuclide is concentrated.

The estimates of radiation dose for the Life Span Studies were made years following the bombing and manipulated after cancer results were available. An important aspect of the

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[55] Thomas Dersee and Sebastian Pflugbeil, *A Foodwatch Report*, German Society for Radiation Protection in cooperation with the German Section of the International Physicians for the Prevention of Nuclear War (IPPNW), "Calculated Fatalities from Radiation: Officially Permissible Limits for Radioactively Contaminated Food in the European Union and Japan," September 2011. https://www.foodwatch.org/uploads/tx_abdownloads/files/fw_report_CalculatedFatalitiesfromRadiation11_2011.pdf p. 9.

[56] John W. Gofman, M.D., Ph.D., Committee for Nuclear Responsibility, Inc., "Radiation-Induced Cancer from Low-Dose Exposure: An Independent Analysis," 1990.

[57] Other books by John W. Gofman, M.D., Ph.D.: *Radiation and Human Health*, Sierra Club Books, 1981; and *Preventing Breast Cancer: The Story of a Major, Proven, Preventable Cause of this Disease*, Committee for Nuclear Responsibility, Inc., 1996.

[58] Gayle Greene, "The Woman Who Knew Too Much – Alice Stewart and the Secrets of Radiation," The University of Michigan Press, 2003.

[59] Chris Busby, *The Ecologist*, "The ICRP's radiation risk model is bogus science," October 2014. https://theecologist.org/2014/oct/22/icrps-radiation-risk-model-bogus-science

inadequacy of the current radiation model, ICRP 60, [60] is that it underestimates the human health harm, especially to the developing embryo or young child. The BEIR VII report [61] which acknowledges higher levels of vulnerability of women and children to radioactivity has not evaluated the growing evidence concerning elevated childhood leukemia from Chernobyl fallout and from other nuclear facilities. [62]

The European Committee on Radiation Risk (ECRR) 2010 report [63] discusses how in 2009, the Scientific Secretary of ICRP, resigned. He stated that the ICRP risk model could not be employed to predict or explain the health effects of exposures to human populations, largely because the underestimation of internal exposures, by a factor of 100.

I can hardly do justice to the topic of the multitude of ways that the U.S. radiation protection standards with their foundation from the ICRP fail to protect workers and the public, not to mention medical diagnostic treatments. I recommend the 2010 ECRR report for further reading on the shortcomings of the ICRP radiation risk model.

Department of Energy Ignoring the NEPA Process and Seeking to Undo the 1995 Idaho Settlement Agreement

Former Idaho Governor Cecil Andrus' daughter Tracy Andrus says that "Idaho should resist nuke waste shipments." [64] In the Department of Energy's and Fluor Idaho's push to bring Hanford transuranic waste to Idaho for treatment, the foundation of National Environmental Protection Act (NEPA) document conclusions are forgotten: (1) that any transuranic waste brought to Idaho would be shipped in NRC compliant Type B containers, (2) the waste would be reasonably characterized before shipping, and (3) that the waste would be treated within 6

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[60] International Commission on Radiological Protection, "Compendium of Dose Coefficients Based on ICRP Publication 60," ICRP Publication 119, Volume 41 Supplement 1 2012. http://www.icrp.org/docs/P%20119%20JAICRP%2041%28s%29%20Compendium%20of%20Dose%20Coefficients%20based%20on%20ICRP%20Publication%2060.pdf

[61] "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.

[62] C. C. Busby and A. V. Yablokov, European Committee on Radiation Risk (ECRR), "Chernobyl: 20 Years On. Health Effects of the Chernobyl Accident," 2006. p. 3 http://www.ratical.org/radiation/Chernobyl/chernobylebook.pdf

[63] European Committee on Radiation Risk, Edited by Chris Busby with Rosalie Bertell, Inge Schmitz-Feuerhake, Molly Scott Cato and Alexey Yablokov, *2010 Recommendations of the ECRR – Health Effects of Exposure to Low Dose of Ionizing Radiation*, Green Audit Press, 2010. p. 5. http://euradcom.eu/ordering-3/ Free available download of report.

[64] Kimberlee Kruesi, Associated Press, *The Idaho Falls Post Register*, "Andrus daughter: Idaho should resist nuke waste shipments," August 24, 2018.

months and then leave Idaho within 6 months of treatment in compliance with the 1995 Idaho Settlement Agreement. See our Environmental Defense Institute March, April and July 2018 newsletters for more information.

Transportation accident involving the release of powdery transuranic waste would be devastating, actually, to any community it happens in. The long-lived radioactive material could never be cleanup up, forever contaminating the environment.

DOE's "research" concerning transuranic waste isn't adequate to prevent unexpected hydrogen buildup in repackaged containers of chemically laden transuranic waste repackaged inside an Idaho Cleanup Project facility. The lids of four drums of transuranic waste drums popped off earlier this spring and no precautions had been taken for this contingency — it caught the Department of Energy and its cleanup contractor Fluor Idaho completely off guard. Workers could have inhaled life changing amounts of transuranic radionuclides. Years ago, the DOE defunded research that had found that certain long-stored transuranic waste produced an unexpectedly high amount of hydrogen gas when the containers were unsealed. See our Environmental Defense Institute August 2018 newsletter article "Potential Unreviewed Safety Question Affecting Department of Energy Complex Concerning Hydrogen Generation in TRU Waste Drums." The Idaho Cleanup Project has yet to determine the cause of the April drum explosions.

What could be worse than bringing more transuranic waste to Idaho? the proposed radioactive waste reclassification efforts going on to save money on promised waste treatment at the Idaho National Laboratory that could result in cleanup and waste commitments disappearing while long-lived radioactive waste stays over Idaho's Snake River Plain aquifer. See our EDI July 2018 newsletter article "Department of Energy's Effort to Reclassify Nuclear Waste May Leave High Level Waste in Idaho."

Workers involved with cleanup don't know it but they are inadequately protected in terms of reproductive health, passing genetic defects to their children, non-cancer illnesses and cancer risks because of inadequate radiation protection standards. Their medical doctors typically do not comprehend what these workers are inhaling, drinking in their water, or their neutron and gamma exposures. See our Environmental Defense Institute report "Radiological and Chemical Exposures at the Idaho National Laboratory that Workers May Not Have Known About" [65] and our EDI July 2108 newsletter article about neutron exposure.

[65] Tami Thatcher, Environmental Defense Institute report "Radiological and Chemical Exposures at the Idaho National Laboratory that Workers May Not Have Known About — How health is harmed by uranium, plutonium and other radiological and chemical exposures and possible nutritional support strategies," April 2017. http://environmental-defense-institute.org/publications/Radchemreport.pdf

Naval Reactors Facilities Known as "NRF" Reviewing Whether Workers Had Adequate Bioassay"

At my request, the Naval Reactors Facilities (NRF) in Idaho has agreed to review what type of workers radiation bioassay testing has been conducted historically at the Idaho site facility. Workers from NRF are civilian workers and are ineligible for illness compensation from the Energy Employee Occupational Illness Compensation Act. You can't live in Idaho Falls as long as I have and not know former NRF workers who had cancer at a young age.

NRF claims that they did a superior job of radiation protection compared to the rest if the INL and so no compensation is needed. But if the doses are so low, why not let them be eligible for compensation? A radiation dose estimate is needed in order to provide the illness was likely caused by their radiation exposure at work unless a Special Exposure Cohort deems that radiation dose reconstruction cannot be conducted because of unmonitored doses.

See our Environmental Defense Institute's April newsletter article "Stephan D. Hall Writes in the Post Register that "NRF civilian employees excluded from EEOCIPA," and June 2018 newsletter article "Naval Reactors Facilities Presentation to the Idaho LINE Commission."

See our Environmental Defense Institute's September 2017 newsletter article "NIOSH Found That INL's Chem Plant Failed to Provide Adequate Uranium and Plutonium Monitoring of Workers in 1975-1980 and Investigation of Other INL Radiation Workers Protection Issues Continues."

See also my comment submittal to NRF when I commented on the injustice of excluding NRF employees from Energy worker illness compensation [66] with excerpt below:

> **"NRF non-military employees are excluded from EEOICPA coverage with a faulty rationale and this egregious exclusion must be removed.**
>
> In 2000, Congress passed the Energy Employees Occupational Illness Compensation Program Act (EEOICPA) to provide an alternative Federal compensation program for workers whose health was impacted as a result of nuclear weapons related work for Department of Energy contractors. [67] The EEOICPA generally covers contractors and Department of Energy employees, as designated by the Secretary of Energy, who worked in facilities that processed or produced radioactive material for use in the production of atomic

[66] Tami Thatcher, "Comments on the Recapitalization of Infrastructure Supporting Naval Spent Nuclear Fuel Handling at the Idaho National Laboratory, draft DOE/EIS-0453D," August 2015. http://environmental-defense-institute.org/publications/CommentsECF.pdf

[67] 42 USC 7384, The Act--Energy Employees Occupational Illness Compensation Program Act of 2000 (EEOICPA), as Amended and see the website for the Center for Disease Control, National Institute of Occupational Safety and Health, Division of Compensation Analysis and Support at http://www.cdc.gov/niosh/ocas/ and U.S. Department of Labor, Office of Workers' Compensation Programs, EEIOCPA Program Statistics, http://www.dol.gov/owcp/energy/regs/compliance/weeklystats.htm

weapons. But NRF workers, predominantly non-military workers, have been excluded from this compensation.

Facilities at NRF had conducted diverse operations with the large potential for inadequately monitored overexposure. The operations have included reactor operation and fuel dissolution, and will still include spent fuel pool operation, transfers of spent fuel to pool and examination areas and airborne contamination from resizing or cutting of irradiation material. The potential for elevated airborne contamination or unplanned loss of shielding has created inadequately monitored and controlled radiation exposures at Department of Energy facilities including those at INL.

The intent to protect workers has not always coincided with effective radiological protection of workers or adequate understanding of health effects. Experience at similar INL facilities, often with management personnel having extensive naval nuclear background, has shown a multitude of issues and new issues continue to arise. Transient conditions within hot cells and transfers of material to and from hot cells, undetected penetrations of hot cells or casks, inadequate lineup of shielding during transfers, and inadequately shielded filters have occurred at INL Department of Energy facilities: why would they not have occurred at NRF through its historical operations?

Inadequate internal monitoring programs at INL historically have been found in 2015 by investigations conducted by the National Institute of Occupational Safety and Health because of the most recent INL Special Exposure Cohort petition. Inadequate radiological protection has been found from 1963 to 1975 at the Chemical Processing Plant (now INTEC) and other facilities are being reviewed.

Section 4.13.2.1 of the EIS states: “No one in the NNPP [includes NRF] has exceeded 0.02 Sievert (2 rem) of radiation exposure in 1 year (less than half the annual limit of 5 rem) since 1979.” That the radiation levels prior to 1979 exceeded this, and the fact that Department of Energy employee studies have found increased levels of certain cancers for workers exposures generally below 2 rem per year is relevant. The Energy worker compensation act (EEOICPA) points out that "studies indicate than 98 percent of radiation-induced cancers within the nuclear weapons complex have occurred at dose levels below existing maximum safe thresholds." (See 42 USC 7384, The Act-Energy Employees Occupational Illness Compensation Program Act of 2000 (EEOICPA), as Amended.)

NRF workers are excluded from EEOICPA compensation “because of the effectiveness of Naval Reactors’ worker protection, worker training, and workplace monitoring programs, employees who performed Naval Reactors’ related work at Naval Reactors’ Department of Energy facilities . . . As discussed earlier, the GAO reported to Congress in 1991 that ‘Naval Reactors Laboratories are accurately measuring, recording, and reporting radiation exposures,’ and ‘exposures have been minimal and overall are lower than commercial

nuclear facilities and other Department of Energy facilities.' This longstanding record of effectiveness supports the conclusion by Congress that workers at Naval Reactors' Department of Energy facilities did not need the compensation alternatives created for workers in the nuclear weapons complex by the EEOICPA." [68]

The historically high allowable doses at NRF, the variety and complexity of operations at NRF, the problems of adequately monitoring internal dose and transient conditions, and the evolving science of radiation health [69] and epidemiology of radiation workers [70] showing elevated cancer risks at annual doses less than 2 rem per year point to the unsupportable rationale for excluding NRF workers from compensation. Although it would in many cases be decades late, and the compensation will never compensate for the early deaths of fine people, this exclusion must be removed. **By any measure of fairness and honest assessment, the exclusion of NRF workers from EEOICPA act compensation must be removed."**

Any honest assessment of the radiation exposure and inhalation and ingestion of radionuclides at NRF would result in compensation to many former NRF workers or their eligible survivors. These former workers are denied compensation because NRF claims that it adequately protected workers for all decades of its operation during which it had no spent nuclear fuel pool or reactor water cleanup systems and it conducted fuel separations processes and other radiological operations. I believe that epidemiology of NRF workers considering their age of cancer incidence would expose the sham excuse by NRF for excluding workers from being eligible for compensation when focused on specific jobs likely to have higher exposure at NRF.

Articles by Tami Thatcher for September 2018.

[68] Naval Nuclear Propulsion Program, Office of Naval Reactors, "Occupational Radiation Exposure from Naval Reactors' Exposure from Naval Reactors' Department of Energy Facilities," Report NT-113, Mary 2011. http://nnsa.energy.gov/sites/default/files/nnsa/02-12-multiplefiles/NT-11-3%20FINAL.pdf

[69] Kohnlein,W, PhD., and Nussbaum, R. H., Ph.D., "False Alarm or Public Health Hazard?: Chronic Low-Dose External Radiation Exposure, Medicine & Global Survival, January 1998, Vol. 5, No. 1. http://www.ippnw.org/pdf/mgs/5-1-kohnlein-nussbaum.pdf

[70] "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/