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Idaho Cleanup Project Citizens Advisory Board Votes to Request More Information from the Department of Energy Work Regarding Details of Possible Continued Missions of the AMWTP

On March 28, a phone-in meeting of the Idaho Cleanup Project Citizens Advisory Board was held that some members hoped would result in a consensus endorsement of continued missions at the Idaho National Laboratory's Advanced Mixed Waste Treatment Facility (AMWTP).

While the CAB has long endorsed continuing missions for the AMWTP that involve compacting transuranic radioactive waste from other Department of Energy sites, there were differing views regarding whether the CAB had enough information to give an unconditional endorsement. There was no consensus regarding which of three proposed letters should be sent to the Department of Energy.

Because there was no consensus, a vote was taken and the majority of the CAB voted to send letter #2 that requested more information about the details of transuranic waste that would be shipped to Idaho for treatment. Cooler heads on the CAB were reluctant to give unconditional support for continued missions given the large array of new issues DOE presented for the first time at the previous CAB meeting held February 21. [1]

When asked by a CAB member, "Whatever happened to Freedom of Information?" the Department of Energy responded that the DOE's study of finding continued missions for the AMWTP was not finished, so it was not available. There was concern by some CAB members that the CAB should not go on record supporting bringing more radioactive waste to Idaho without understanding the issues.

The Post Register covered the phone-in meeting in an article on March 29, 2018. [2] The article included public comment from Marc Johnson, chief of staff for former Gov. Cecil Andrus, who said keeping the leverage provided by the settlement agreement is needed to compel the Department of Energy to keep its word.

Several CAB members were unable to attend the phone-in meeting. The meeting allowed a 30-minute public comment session prior to the meeting. Typically, speakers are allowed 5

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[1] Idaho Cleanup Project Citizens Advisory Board (formerly the Idaho National Laboratory Citizens Advisory Board) meeting schedules and presentations at https://energy.gov/em/icpcab/idaho-cleanup-project-citizens-advisory-board-icp-cab

[2] Nathan Brown, *The Idaho Falls Post Register*, "Nuclear cleanup board wants more info on out-of-state waste – No recommendation on whether east Idaho plant should stay open," March 29, 2018.

minutes. Four members of the public signed up and at the meeting were told they were limited to only 4 minutes of comment. People providing public comment included Beatrice Brailsford of Snake River Alliance, Marc Johnson, Dana Kirkham (Regional Economic Development for Eastern Idaho), and myself, Tami Thatcher.

The Post Register printed an editorial by Dana Kirkham, "Clock ticking on AMWTP mission," [3] and an editorial by Tami Thatcher submitted prior to the phone-in meeting but published after the meeting. [4] [5]

Because I had to shorten my public comments on the fly, I'm not sure exactly what I left out, but here are my more complete comments prepared for the meeting:

There is a Department of Energy Environmental Impact Statement from ten years ago, 2008, (DOE/EIS-0200-SA03) for TRU waste treatment at INL's Advanced Mixed Waste Treatment Facility states that: [6]

- *NRC transportation requirements will be met and describes the packaging TRUPACT-II, TRUPACT-III packaging*
- *Idaho Settlement Agreement requirements will be met.*
- *[It expects no problem relying on process knowledge to know what is being shipped to INL]*
- *It says that there would be no new construction of facilities needed and no excavation needed at any DOE facility.*

So, at the February CAB meeting, DOE does an about face and informs the CAB that —and all without ever mentioning previous EIS promises — that:

- *NRC transportation requirements CANNOT be met for lion's share of shipments from Hanford (and DOE will try to finagle something and finagle it good to argue "equivalency")*
- ***DOE Asserts that The Idaho Settlement Agreement requirements for 6-month-in/6-month out MUST be exempted or have blanket removal.***
- *Buried waste from LANL is now a from "below grade" waste stream. I think this waste stream may be notoriously poorly characterized given LANL problems with loading characterized barrels with forbidden materials and with far more transuranics than the WIPP safety analysis ever anticipated. Also, note that digging up the LANL waste is not likely to be anytime soon.*

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[3] *The Idaho Falls Post Register*, Dana Kirkham, guest editorial, "Clock ticking on AMWTP mission," February 25, 2018.

[4] *The Idaho Falls Post Register*, Tami Thatcher, guest editorial, "More details needed from DOE – The devil is in the details of the DOE's proposal to bring in more waste to be cleanup up by AMWTP," March 30, 2018.

[5] Read more about the Advanced Mixed Waste Treatment Project in the Environmental Defense Institute, March 2018 Newsletter, article by Tami Thatcher.

[6] Department of Energy, "Supplement Analysis for the Treatment of Transuranic Waste at the Idaho National Laboratory," February 2008. https://www.energy.gov/sites/prod/files/nepapub/nepa_documents/RedDont/EIS-0200-SA-03-2008.pdf

- *Hanford waste stream involves large containers with large items that the AMWTP is not designed to handle. Just how are the large items going to be dealt with?*

I have to wonder whether the reason DOE is emphasizing eliminating the Idaho Settlement Agreement 6month-in/6-month-out requirement cannot be met is that (and I only wonder this) …is …. the DOE is planning to bury part of the Hanford waste in Idaho?

There is no explanation why the 2008 EIS is wrong on so many items…nor why DOE waited so long to mention these issues.

And while there is a real backlog for shipping to WIPP that could require some extension of the 6-month out requirement (by 1 or 2 years) perhaps the CAB should be wondering why the State of New Mexico strictly limits the amount of above ground outdoor storage of TRU waste, limits the time it can be stored and has strict safety requirements, maybe the CAB should be wondering why the State of Idaho allows any pretense of safety for above ground outdoor storage of TRU waste at INL's Materials and Fuels Complex (MFC) for example.

DOE has been very tardy in these disclosures. DOE has worked hard to suppress information from the CAB. DOE has not worked toward progress that would prevent the loss of AMWTP jobs.

But DOE has aggressively and diligently worked to dismantle the Idaho Settlement Agreement.

The CAB must not participate...not even unwittingly…. in unraveling the Idaho Settlement Agreement and failing to protect Idaho citizens and environment. End of my public comment.

Less than 5.69 acres of the 97-acre unlined burial ground are being dug up. But of these roughly 6 acres, only the chemically-laden waste is targeted and the rest is put back and buried again. There is no way to know with confidence how much transuranic waste was actually buried and where. And there is no way to know with confidence how much has been exhumed because of way alpha emitters are easily shielded and difficult to detect. The initial estimate of the amount of buried americium-241 was reduced by about 6 percent by the exhumation of buried waste in the buried waste performance assessment. No other reductions of the amount of buried waste have been taken as cleanup has progressed. Unless every milligram of material is assessed, the amount of transuranic material exhumed is only a guess. The amount of transuranic material, plutonium and americium, in the single barrel of waste that exploded at the Waste Isolation Pilot Plant (WIPP) in New Mexico in 2014 was found to have far exceeded the amount that would ever be in a single barrel of waste and despite volumes of paper that estimate the barrels contents.

The digging up of buried radioactive waste at the Radioactive Waste Management Complex at the INL was limited based on the phony argument that no DOE radiation workers would be harmed but an unmonitored state employee inspecting shipments would receive an excessive but

unmonitored radiation dose.[7] This was coupled with the phony argument for limited benefit to the public based on ignoring the migration of contaminants downgradient in fast paths and after 1000 years. [8] [9] [10]

The fact is that the soil cap the DOE is planning to install over the buried waste will require maintenance forever or it will be ineffective. The doses to people drinking this water will be significant and health harming, and the aquifer dilution modeling, soil sorption modeling and radiation health models have in fact been a sham. All the meanwhile, the Department of Energy buries more long-lived and highly mobile radioactive waste over the Snake River Plain aquifer.

An Editorial About The 1961 SL-1 Accident History in Response to a February Guest Editorial in the Post Register [11]

I want to respond to Stanton Anderson's novel assertions in his February 18 editorial regarding the Army's Stationary Low Power reactor, the SL-1; that "at the time experts dubbed the SL-1 as the safest reactor" and his assertion that Navy Admiral Rickover had any role in overseeing this army reactor.

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[7] An often-repeated contrived excuse for limiting RWMC cleanup comes from the Record of Decision fuzzy artwork of "worker" risk per acre of waste dug up. It references administrative record report RPT-188 at ar.inel.gov. or ar.icp.doe.gov. It is used to defend digging around in only about 6 acres and not the entire 35 acres of buried waste at RWMC. Radiation worker risks are higher than DOE acknowledges, but they claim that radiation protections for DOE contractor radiation workers limit health risks. But the case was not actually based on a monitored radiation worker. It was based on an unmonitored state employee who receives an unmonitored 47 rem dose throughout his career if the cleanup extends from 6 years to 25 years. This argument, however, is immediately forgotten when discussing extending operations at the AMWTP to outside waste. There is no estimate of the number of people who will be dosed from the polluted aquifer. The gross conservatism of this unmonitored "worker" dose estimate was used to argue that cleaning up the entire mess would yield incrementally high worker doses for each additional acre cleaned up.

[8] Tami Thatcher, Environmental Defense Institute Special Report, "The "Forever" Contamination Sites at the Idaho National Laboratory," 2017. www.environmental-defense-institute.org/publications/EarthDayINLreport.pdf

[9] U.S. Department of Energy, 2008. Composite Analysis for the RWMC Active Low-Level Waste Disposal Facility at the Idaho National Laboratory Site. DOE/NE-ID-11244. Idaho National Laboratory, Idaho Falls, ID and U.S. Department of Energy, 2007. Performance Assessment for the RWMC Active Low-Level Waste Disposal Facility at the Idaho National Laboratory Site. DOE/NE-ID-11243. Idaho National Laboratory, Idaho Falls, ID. Available at INL's DOE-ID Public Reading room electronic collection. (Newly released because of Environmental Defense Institute's Freedom of Information Act request.) See https://www.inl.gov/about-inl/general-information/doe-public-reading-room/

[10] See the CERCLA administrative record at www.ar.icp.doe.gov (previously at ar.inel.gov) and see also Parsons, Alva M., James M. McCarthy, M. Kay Adler Flitton, Renee Y. Bowser, and Dale A. Cresap, Annual Performance Assessment and Composite Analysis Review for the Active Low-Level Waste Disposal Facility at the RWMC FY 2013, RPT-1267, 2014, Idaho Cleanup Project. And see Prepared for Department of Energy Idaho Operations Office, Phase 1 Interim Remedial Action Report for Operable Unit 7-13/14 Targeted Waste Retrievals, DOE/ID-11396, Revision 3, October 2014 https://ar.inl.gov/images/pdf/201411/20141103009608RU.pdf

[11] *The Idaho Falls Post Register*, Tami Thatcher, guest editorial, "Problematic SL-1 history," March 18, 2018.

The prototype reactor was not a safe design, had not been fabricated well, and was experiencing multiple material problems.

Examination of the core materials after the accident revealed many areas of faulty welds and excessive corrosion. [12] But many problems were evident prior to the accident because of sticking rods and progressively deteriorating shutdown margin.

Such a combination should have merited caution in how it was being operated but it's contractor was allowed by the Atomic Energy Commission (the predecessor to the Department of Energy) to conduct testing outside its officially allowed power limits. [13] Tests were being conducted that were swinging recorder pens off the charts and relying on automatic scrams. Control rods were sticking and not inserting as quickly as needed.

In addition to poor design and material condition of the SL-1 reactor, the safety analysis documentation did not even address accidents involving fuel melting, let alone an accident commencing during shutdown from withdrawal of a single control rod. [14]

The January 3, 1961 accident occurred at the SL-1 as the reactor was being prepared for startup. A congressionally appointed review board not only absolved the crew but stated that "the condition of the reactor core and the reactor control system had deteriorated to such an extent that a prudent operator [the AEC] would not have allowed operation of the reactor to continue without a thorough analysis and review, and subsequent appropriate corrective action…"

The Congressional view board pointed to sticking being the likely cause and the local AEC and its contractors actively sought to downplay to role of rod sticking. The SL-1 had an extensive history of safety rod sticking. [15] [16]

That during shutdown, a crewman, bending over to lift an 84-lb rod structure that was stuck due to material swelling or welds that were faulty, might overlift a single rod by 16 inches is quite understandable to nuclear personnel who have worked over a reactor top during shutdown at naval or Department of Energy reactors.

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[12] Atomic Energy Commission report, Idaho Field Office, IDO-19313, "Additional Analysis of the Sl-1 Excursion" Final Report of Progress July through October 1962." Flight Propulsion Laboratory Department, General Electric Co., November 1962, p. 147

[13] Atomic Energy Commission report, Idaho Field Office IDO-19300, "SL-1 Reactor Accident on January 3, 1961: Interim Report." Combustion Engineering, May 15, 1961. p. 72. http://www.id.doe.gov/foia/PDF/IDO-19300a.pdf and http://www.id.doe.gov/foia/PDF/IDO-19300bfigs.pdf

[14] IDO-19300, p. 170 and IDO-19311 Table III-I.

[15] Tami Thatcher, Environmental Defense Institute Special Report, "The Truth about the SL-1 Accident – Understanding the Reactor Excursion and Safety Problems at SL-1," at http://www.environmental-defense-institute.org/inlrisk.html In addition to control rod sticking during scram and rod drop tests, the rods had a history of sticking during rod withdrawal: a total of 10 rod withdrawal sticking incidents—four of them had occurred during the last month of operation. The specific rods that stuck during withdrawal were not identified but would likely have been identified in the logbook records. See IDO-19300.Table V, p. 62. Half of the sticking events were missing from the online report as of December 2014 because every other page was missing.

[16] Tami Thatcher, Environmental Defense Institute newsletter article "America's Only Nuclear Reactor Operator Deaths," January 2015. http://www.environmental-defense-institute.org/publications/News.15.Jan.Final.pdf

The popular book about the Idaho National Laboratory history "Proving the Principle" by Susan M. Stacy incorrectly states the lift height of the center rod as 26 ¼ inches on page 148. This distance was mistakenly thought by some to be the lift height. But IDO-19311 states the rod was withdrawn 20 inches. [17] The actual lift height is 16 to 18 inches because the rod was in a partially raised position when the lift commenced.

The small distance that a single rod would need to be lifted for the reactor to go prompt critical in the tank of cold water was not known even to experts until analyzed after the accident. [18] [19] [20] The prompt critical event with steam explosion that resulted from the accidental rod overlift killed three men.

That such a powerful explosion could be caused by "an inherently safe" boiling water reactor by accidental movement of a single control rod clearly points to the unsafe design of the SL-1 reactor.

The deceased men were absolved by a Congressional review board [21] and all the wives of the men achieved legal settlements against the government. The negligence of the oversight from DOE's predecessor, the AEC, has largely been obscured by its propaganda. [22] And the extent to which the propaganda about the SL-1 accident continues is shameful.

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[17] Atomic Energy Commission report, Idaho Field Office, IDO-19311, "Final Report of the SL-1 Recovery Operation, General Electric Co., June 27, 1962. [=This report, the later part B portion is of particular importance concerning the particular sticking of control rods as they were raised from their lower-most region up into the shroud and for revised required center rod withdrawal distance to achieve a prompt critical condition. The center rod withdrawal of 20 inches on p. 146 does not account for the height already withdrawn prior to the overlift, of at least 2 inches, and perhaps 4 inches.

[18] Various DOE reports released by Freedom of Information Act request about SL-1 are at http://www.id.doe.gov/foia/archive.htm

[19] Atomic Energy Commission report, Idaho Field Office, IDO-19311, "Final Report of the SL-1 Recovery Operation, General Electric Co., June 27, 1962. [This report, the later part B portion is of particular importance concerning the particular sticking of control rods as they were raised from their lower-most region up into the shroud and for revised required center rod withdrawal distance to achieve a prompt critical condition.]

[20] Atomic Energy Commission report, Idaho Field Office IDO-19300, "SL-1 Reactor Accident on January 3, 1961: Interim Report." Combustion Engineering, May 15, 1961. [The calculations for rod withdrawal distance would later be revised, but the description of the control rod drives, and page 53 and also Figure 39 showing the various rod initial positions are useful.] http://www.id.doe.gov/foia/PDF/IDO-19300a.pdf and http://www.id.doe.gov/foia/PDF/IDO-19300bfigs.pdf

[21] Joint Committee on Atomic Energy, Congress of the United States, "SL-1 Accident – Atomic Energy Commission Investigation Board Report," June 1961. (In section 2, "Responsibility for the incident" the report states "We specifically absolve the military cadre, as such, from any responsibility." Also, on page v "before the incident occurred, the condition of the reactor core and the reactor control system had deteriorated to such an extent that a prudent operator [the AEC] would not have allowed operation of the reactor to continue without a thorough analysis and review, and subsequent appropriate corrective action…"

[22] Susan Stacy, "Proving the Principle – A History of the Idaho National Engineering and Environmental laboratory, 1949-1999," Washington, D.D.: US Department of Energy. p. 148. http://www.inl.gov/publications/ and http://www.inl.gov/proving-the-principle/introduction.pdf This book contains a lot of great photos and information but often without fact checking. Page 149 states that the SL-1 rod was withdrawn 26 and ¼ inches which is incorrect. You have to understand the original position the rod was in when the operator lifted it and the additional movement of the rod caused by the accident (See IDO-19311 p. III-14). The distance lifted was less than 18 inches, as little as 16 inches. Another example of factually incorrect information from the book is

Stephen D. Hall Writes in the Post Register that "NRF civilian employees excluded from EEOCIPA"

In Stephen D. Hall's "It's the Law" column in The Idaho Falls Post Register, Hall responds to a question about whether Naval Reactor Facility (NRF) civilian employees are covered under the Energy Employee Occupational Illness Compensation Program Act like workers at other Idaho National Laboratory facilities. [23] He writes that the EEOICPA exempts all Naval nuclear propulsion facilities from illness compensation coverage.

He pointed out that in 2008, INL union members were told by the National Institute for Occupational Safety and Health that NRF employees are exempt because there are other programs to cover illness resulting from NRF exposure. That might be true, but other than state worker's compensation laws, I have not discovered any such program, writes Hall.

He writes of an explanation that has been given for the exclusion of NRF workers, that they do not need coverage because "of the [NRF's] program's long-standing record of effectiveness at measuring, recording and reporting radiation exposures and program exposures have been minimal compared to other DOE facilities."

I have lived in Idaho Falls a several decades. Far too many people have died young of cancer after working at NRF. Certain job classifications appear to be at higher risk, such as health physics personnel and for other workers who work near the spent fuel pool activities. If there were ever epidemiology based on job classification so that the worker's cancer deaths were not diluted by workers with not working with nuclear fuel and not diluted by workers who quickly transfer out of NRF, I think NRF would actually have very chilling cancer death statistics.

The navy is very good at pencil whipping radiation doses to keep published doses below published standards. But that does not mean the doses were not actually higher than recorded. And we continue to learn that worker illness actually increases at doses of about 400 mrem annually, while the annual dose limit is 5,000 mrem annually. [24] And I suspect that internal dose from inhalation and ingestion of radioactive particles is simply not monitored at NRF.

At the Naval Reactors Facility, reactor operation, hot cell operation, irradiated sample dissolving, fuel end cap removal by sawing off end caps, and spent fuel unloading and storage

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that it states that the EBR-II generated 62.5 megawatts (page 165). It could generate 62.5 thermal megawatts and 19 MW of electrical power.

[23] *The Idaho Falls Post Register*, Stephen D. Hall, It's the Law Q&A Column: "NRF civilian employees excluded from EEOICAP," March 258, 2018.

[24] 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.

has all taken place over the years. There is no reason to think that radiation monitoring and control practices at NRF were any better than at other Department of Energy facilities at the INL.

Here is an example of how NRF does things. In 1975, NRF reported "NA" (representing "Not Available") for January air monitoring results. NIOSH investigators in 2014 found that the unreported but elevated air sample result appeared to have been due to a single hot particle of ruthenium-106. [25] There is reason to expect that that some workers were working in a pig pen of hot particles of fission products and transuranic radionuclides that they inhaled or ingested.

From US Geological Survey reports, americium-241 flows in the aquifer to the ATR Complex from the Naval Reactors Facility. This means that transuranic separations processes have been conducted at NRF and why would NRF have had adequate programs to monitor the transuranic ingestion and inhalation when NIOSH continues to find that the rest of the INL did not? Special Exposure Cohorts for the INL have been added because of inadequate programs to monitor and control internal doses from transuranic radionuclides. Investigations conducted of historical INL operations for energy worker illness compensation during the last two years have found shattering revelations about inadequate worker protections at the INL especially regarding inhalation of alpha emitters such as americium and plutonium and the inability to estimate what doses these workers had received. The investigations partially include the early decades of INL operation until the 1980s but have not investigated all years of operation. [26] [27] [28] [29] [30] [31] [32] [33] Yet, as these studies for the National Institute for Occupational Safety and Health have begun to allow more workers to obtain compensation, many more studies need to be completed for various INL facilities and various years of operation. Roughly two thirds of INL illness compensation claims have been denied and these workers or their eligible survivors may die before the studies are complete. And of course, NRF workers are excluded from compensation.

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[25] National Institute for Occupational Safety and Health, "NIOSH Investigation into the Issues Raised in Comment 1 from SCA-TR-TASK1-005," March 5, 2014. p. 19.

[26] See the EDI September 2017 newsletter and the Advisory Board on Radiation and Worker health meetings webpage for August 2017 at https://www.cdc.gov/niosh/ocas/pubmtgs.html See the NIOSH/DCAS: Idaho Laboratory SEC Evaluation Report SEC-00238 from that page at https://www.cdc.gov/niosh/ocas/pdfs/abrwh/pres/2017/dc-inlsec238-082317.pdf

[27] See the July 20, 2017 presentation to the NIOSH radiation board (See August 14, 2017 board meeting) describing various problems at the Idaho National Laboratory's INTEC prior to 1981 at https://www.cdc.gov/niosh/ocas/pdfs/sec/inl/inler-238-r0.pdf

[28] INL May 2, 2016 NIOSH Radiation Advisory board recommended Special Exposure Cohort: https://www.cdc.gov/niosh/ocas/pdfs/abrwh/secrecs/bdrecinl-219.pdf

[29] ANL-West May 2, 2016 NIOSH Radiation Advisory board recommended Special Exposure Cohort: https://www.cdc.gov/niosh/ocas/pdfs/abrwh/secrecs/bdrecanlw-224.pdf

[30] See p. 19 of "INL SEC Proposed Class – Update SEC00219" at https://www.cdc.gov/niosh/ocas/pdfs/abrwh/pres/2015/dc-inlsec219-111015.pdf

[31] See EDI's June 2017 newsletter article "Why so wrong for so long?" at http://www.environmental-defense-institute.org/publications/News.17.June.pdf

[32] SC&A, Inc., "Draft Review of NIOSH's Evaluation Report for Petition SEC-00219, Idaho National Laboratory: Burial Ground, 1952-1970," SCA-TR-2017-SEC007, May 2017.

[33] Department of Labor presentation August 2017 https://www.cdc.gov/niosh/ocas/pdfs/abrwh/pres/2017/dol-update-082317.pdf p. 10-12.

Among INL radiation workers, I remember some workers referring to NRF as a "meat shop." Radiation doses to workers are maximized to get jobs done.

There is an additional problem: NRF workers, as a condition of employment, must waive all whistle-blower rights, as meager as they are for Department of Energy contractor employees. NRF workers know they must stay silent about problems.

My limited knowledge of a few workers indicates to me that the speed at which some workers from NRF faced cancer and usually death, points to practices that are actually worse for certain jobs at NRF than at other INL facilities.

Atomic Homefront, a documentary about uranium waste dumped in a landfill in St. Louis, presented in Idaho Falls, points out that this nuclear FUSRAP waste is sent to Idaho

Critical Nurse Staffing, LLC presented "Atomic Homefront," a documentary about the uranium processing waste dumped into the West Lake Landfill. The documentary includes footage of Environmental Protection Agency officials downplaying the health problems associated with the radioactive waste. The absence of federal, state and legislative government officials willing to acknowledge the problems let alone to help people living with exposures to the waste is sobering.

The uranium wastes have a distinct signature because of decay progeny without the parent nuclide. "The spread of these wastes from open air storage and spills during transport resulted in the contamination of approximately 626,000 m^3 of soil with uranium and its daughter products at levels exceeding DOE soil cleanup guidelines," wrote the Department of Energy in 1992.[34]

The waste in homes around St. Louis has been monitored — but not by the EPA or the Department of Energy. Monitoring efforts are documented in several reports by Marco Kaltofen and others. [35] [36]

From 1942 to 1957, the Mallnckrodt Chemical Plant extracted uranium and radium from ore in St. Louis, Missouri. The radioactive byproducts were dumped near the airport and then some of the wastes were trucked to different sites. There are five major contamination sites. A program

[34] U.S. Department of Energy, letter to Ron Kucera, Acting Director, Department of Natural Resources, State of Missouri from Leo P. Duffey, Assistant Secretary for Environmental Management, U.S. Department of Energy. 1 December 1992.

[35] Marco P.J.Kaltofen, RobertAlvarez, and LucasHixson, "Tracking legacy radionuclides in St. Louis, Missouri, via unsupported ^{210}Pb," Science Direct, 2015. https://doi.org/10.1016/j.jenvrad.2015.12.007 or https://www.sciencedirect.com/science/article/pii/S0265931X15301685?via%3Dihub

[36] Marco Kaltofen, Robert Alvarez, and Lucas W. Hixson, " Forensic microanalysis of Manhattan Project legacy radioactive wastes in St. Louis, MO," Science Direct, 2018. https://doi.org/10.1016/j.apradiso.2018.02.020 and https://www.sciencedirect.com/science/article/pii/S0969804317305481

called the "Formerly Utilized Sites Remedial Action Program" (FUSRAP) is involved with "remediation." [37]

People living with the contamination have been dying of cancer, and they know by their own tracking of illnesses in their neighborhoods that there's a problem. But the severity of the health problems has been denied by government officials.

Some of the radioactively contaminated soils have been trucked to a new home in Idaho. Disposal of FUSRAP uranium byproduct waste has been trucked to Idaho for disposal at the western Idaho U.S. Ecology site in Owyhee County, near Grand View.[38]

A Revised Low Dose and Low Dose Rate Factor Would Raise the Probability of Causation and Result in Fewer Illness Claim Denials by NIOSH

A meeting of the Radiation Advisory Board for the National Institute for Occupational Safety and Health was held January 19 to discuss a new report that may require redoing previous "probability of causation" calculations that denied illness compensation to workers.

The meeting about the underestimating the cancer risk from ionizing radiation at low doses or low dose rates for low-linear energy transfer ionizing radiation (low-LET radiation) was innocuously called a meeting about "science issues." [39]

The discussion applies only to low-LET ionizing radiation and does not apply to high-LET alpha emitting radiation or neutron exposure.

The review of the "Dose and Dose-rate Effectiveness Factors for Low-LET Radiation for Application to NIOSH-IREP" by Trabalka et al. (Oak Ridge Center for Risk Analysis Inc.) has now been completed.

The Dose and Dose-rate Effectiveness Factor (DDREF) is known as a factor, but is the value that the dose is actually divided by. So, a DDREF of 2 would is used to divide the dose in half and therefore reduces the cancer risk by one half. A DDREF of 1 would not adjust the cancer risk.

The dose reduction factor (DDREF) previously applied to doses under 20 rem. The new approach would apply the DDREF for doses below 1 rem rather than doses below 20 rem.

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[37] FUSRAP "Formerly Utilized Sites Remedial Action Program" by the U.S. Army Corps of Engineers at http://www.mvs.usace.army.mil/Missions/FUSRAP/What-is-FUSRAP/

[38] Hazardous Waste Management in Idaho, 2016 includes FUSRAP waste, see http://www.deq.idaho.gov/media/60179710/hw-management-idaho-2016.pdf

[39] Radiation Advisory Board meeting January 19, 2018 "Teleconference Meeting of the Advisory Board's Work Group on Science Issues." https://www.cdc.gov/niosh/ocas/pubmtgs.html and https://www.cdc.gov/niosh/ocas/pdfs/abrwh/2018/wgtr011918-508.pdf

By 1980, many experts, including John Gofman, M.D. [40] and the committee members of the Biological Effects of Ionizing Radiation (BEIR) had found that there was no human evidence to support the previous DDREF that has now been wrongfully underestimating radiation health harm for over 40 years. In fact, the human epidemiology evidence showed linear or supralinear harm. Supralinear harm means that it would appear that there is more harm, not less, at low doses or low dose rate.

Will NIOSH actually embrace a more correct, more scientifically defensible DDREF? There are folks around who are skeptical that NIOSH will actually embrace scientific integrity when it means the recalculation of radiation doses and an increase in compensation payout.

What Went Out the Stack During Radioactive Waste Calcining at the Idaho National Laboratory?

The question was asked at the February Idaho Cleanup Project Citizens Advisory Board, "What was released out of the stack from calcining at the Idaho National Laboratory?"

The Department of Energy's answer acknowledged the nitrogen oxides. But there was no mention of the radionuclides that went out the stack.

A lack of stack monitoring meant that it is difficult to know what was released. But there were intermittent test results that indicated that iodine-129, with a 16 million year half-life, was largely released during calcining rather than during fuel separations processes. The historical dose evaluation for the INL published in 1991 states that I-129 was not reported in the Radiation Waste Management Information System (RWMIS) reports until 1979. Approximately 80 percent of the I-129 is released as an airborne effluent and 20 percent is in liquid effluent. Most of the airborne I-129 was released in the calcination process. [41]

The releases from the chemical processing plant now known as the Idaho Nuclear Technology and Engineering Center (INTEC) as estimated in the historical dose evaluation and by the Center for Disease Control (CDC) have typically combined the release of fuel separations and of calcining. This makes it difficult to know the releases from calcining. But that does not excuse the DOE's incomplete answer to the question.

Nuclear fuel reprocessing for naval and government reactors was conducted at the INL (formerly the National Nuclear Testing Station) beginning in 1953 until 1991. Highly radioactive liquid wastes were then solidified into a powdery waste form by calcining with a fluidized bed. Calcining began in 1963 to 1981 in the Waste Calcining Facility (WCF). The New Waste

[40] John W. Gofman, M.D., Ph.D., "Radiation-Induced Cancer from Low-Dose Exposure: An Independent Analysis," 1990: First Edition, Committee for Nuclear Responsibility, Inc. Ch 22.

[41] 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 See page A-18 for iodine-129 from calcining.

Calcining Facility (NWCF) then operated from 1982 through May 2000. Calcining produced about 12.2 million pounds of powdery, highly soluble radioactive calcine material that is stored partially below grade in various vintages of calcine storage "bin sets."

The calciner had operated for years without a state permit for its stack emissions. In 1991 the Idaho Department of Environmental Quality issued a RCRA Part B Notice of Deficiency on the Department of Energy's submitted RCRA Part B application. The issues involved the lack of emission monitoring of radionuclide and chemical emissions and limited waste stream characterization. [42]

The IDEQ issues were never resolved and the Department of Energy restarted the calciner in 1997 and ran until 2000. The IDEQ admits that they met with the DOE at least quarterly to discuss compliance issues but chafed at the idea that it did not put adequate priority on resolving the permit issues.

If I read between the lines, it would appear that the DOE and IDEQ understood that the iodine-129 emissions from calcining could not met federal limits. So, it appears to me that they agreed to ignore the monitoring and emissions characterization issues. The extent to which the IDEQ is an enabler of Department of Energy polluting appears to have not diminished with time.

I say that because of the way elevated radionuclide levels in air monitoring are never attributed to the INL. I say this because of the removal of environmental monitoring reports paid for by taxpayers from the IDEQ's website. And I say this because of the way IDEQ actively helps DOE cover up its unpermitted releases to the ATR Complex Evaporation Pond when IDEQ should be removing the air permit for the pond until proof that design changes and monitoring will prevent the continued dumping of highly radioactive and long-lived material which the pond was not intended to receive.

In the fuzziness about the air emissions from calcining, it should be recognized that the air emissions from fuel reprocessing were large especially in the earlier years of operation. From 1957 to 1962, radiological airborne emissions from INL, excluding episodic releases, approached or exceeded 1 million curies per year. [43] The extensive radiological airborne emissions were accompanied by an appalling lack of adequate monitoring and reporting of the emissions, all while giving the impression of rigorously monitoring the emissions.

The reason that the calciner did not operate after 2000 was not because of air permitting issues. The remaining liquid waste was less acidic and could not be treated in the existing calciner unless the radioactive plant was modified. The DOE made the decision to build a new

[42] Office of Inspector General, United States Environmental Protection Agency, "Evaluation Report: Review of EPA's Response to Petition Seeking Withdrawal of Authorization for Idaho's Hazardous Waste Program," Report No. 2004-P-00006, February 5, 2004.

[43] 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 See page 12 but note that episodic releases were not included and these have been found by the Center for Disease Control to have been underestimated as much as a factor of ten, see https://www.cdc.gov/nceh/radiation/brochure/profile_ineel.htm

facility named the Integrated Waste Treatment Unit (IWTU) that missed its 2012 Idaho Settlement Agreement milestone date for treating the waste. Efforts to redesign and test the IWTU continue now in 2018.

The radiologically dose significant radionuclides for the processed fuels at the INL's chemical processing plant are provided in Table 1 for the three main types of fuel cladding: aluminum clad high enriched uranium fuel (from enrichments of 50 percent to 93 percent) from DOE reactors, the stainless steel-clad fuel from the Experimental Breeder Reactors, and zirconium-clad fuel from the Navy. Note that the high amount of dose contribution for zirconium-clad fuel resulting from plutonium-238 would apply to fuels at the Naval Reactors Facility.

Table 1. Radiologically significant for inhalation dose radionuclides for ICPP processed fuels.[44]

			Aluminum-clad fuel (decayed 1 yr)		Stainless steel-clad (decayed 3 yr)		Zirconium-clad fuel (decayed 5 yr)	
Nuclide	Half-life	Absorp-tion type	Relative activity	Percent inhalation dose	Relative activity	Percent inhalation dose	Relative activity	Percent inhalation dose
Sr-90	28.78 yr	F	2.4E-2	13.1	8.6E-2	14.1	2.0E-1	6.3
Y-91	58.51 d	S	2.6E-2	1.1	9.7E-6	0.0	8.0E-10	0.0
Zr-95	63.98 d	S	4.0E-2	1.2	3.3E-5	0.0	5.6E-9	0.0
Ru-106	368.2 d	S	2.3E-2	5.5	3.1E-2	5.7	4.5E-3	0.2
Cs-137	30.07 yr	F	2.5E-2	1.2	9.3E-2	3.2	2.1E-1	1.4
Ce-144	284.3 d	M	3.0E-1	47.4	1.6E-1	18.4	2.2E-2	0.5
Pm-147	2.623 yr	M	5.6E-2	1.3	1.8E-1	3.2	8.4E-2	0.3
U-234	245500 yr	S	2.9E-9	0.0	1.1E-4	4.0	7.2E-8	0.0
Pu-238	87.71 yr	M	1.3E-4	26.1	7.6E-6	1.2	3.0E-3	90.0
Pu-239	24110 yr	M	4.1E-7	0.1	3.0E-4	50.0	1.6E-6	0.1
Total				97.0		99.0		98.4
Mass fraction of U-234 to total U				3.4E-5		5.3E-5		1.4E-4

a. Assume exposure to aluminum-clad fuel activity from the 1953 through 1986, zirconium-clad fuel activity from 1972 to 1988, and stainless-steel-clad fuel activity (1977 through 1981) or when there is indication that the Pu-239 activity exceeds the Pu-238 activity. (Fuel reprocessing ceased by 1991, dates in ORAUT-TKBS-0007-5 conflicting p. 31 and 32.)

b. The total percent of the inhalation dose is less than 100% because other radionuclides not included in the table contribute small amounts of dose.

c. Nuclide symbols are Strontium (Sr); Yttrium (Y); Zirconium (Zr); Ruthenium (Ru); Cesium (Cs); Cerium (Ce); Promethium (Pm); Uranium (U); Plutonium (Pu).

[44] Oak Ridge Associated Universities, ORAU Team Dose Reconstruction Project for NIOSH, "Idaho National Engineering and Environmental Laboratory – Occupational Internal Dose," ORAUT-TKBS-0007-5, 2006. Pave 31 of Revision 1, Table 5-18.

Demolition of Hanford Plutonium Processing Plant Halted After 42 Workers Found to Have Inhaled or Ingested Radioactive Particles

The Department of Energy has halted the demolition of the plutonium finishing plant after the number of workers at Hanford with detected inhalation or ingestion of radioactive material has ballooned to 42 workers. [45] [46]

Hanford contractor CH2M Hill Plateau Remediation Company conducted the demolition. A review of what went wrong was prepared last March by CH2M/Jacobs Engineering with input from the Department of Energy. A total of 42 Hanford workers inhaled or ingested radioactive particles from demolition of the Plutonium Finishing Plant in June (31 workers) and December of last year (11 workers).

The report notes that air monitors did not signal the contamination. Problems were signaled by lapel monitors worn by workers that tested positive for contamination. But, the individual contamination instances were accepted as routine and the "normalization of deviance" resulted in assuming risk that was not "fully analyzed, documented or controlled." [47] The report also found that fixatives sprayed to control radioactive dust were diluted so they could be sprayed on higher reaches of the building and the ad hoc dilution may have reduced the effectiveness of the fixative.

State monitoring has found that plutonium and americium particles have spread as far as 10 miles from the open-air demolition site where debris was piled rather than put in containers.

The internal radiation doses are predicted to be low: 1 to 20 millirem during the next 50 years. But the workers and the public don't understand how uncertain these predictions are and how prone to bias the results to lower the estimated dose. Workers need to have repeated urine and fecal bioassay. Intakes that are low should not result in continued excretion for several months.

Articles by Tami Thatcher for April 2018.

[45] Nicholas K. Geranios, *Chicago Tribune*, "Workers' radiation exposure halts nuclear plant demolition," April 8, 2018. http://www.chicagotribune.com/news/nationworld/ct-hanford-nuclear-reservation-radiation-20180408-story.html

[46] Nicholas K. Geranios, *The Seattle Times*, "42 Hanford Workers contaminated with radiation," March 24, 2018, updated March 27, 2018. https://www.seattletimes.com/seattle-news/42-hanford-workers-contaminated-with-radiation/

[47] Hal Bernton, *The Seattle Times*, "What went wrong at Hanford cleanup, where radioactive contamination spread?" March 9, 2018. https://www.seattletimes.com/seattle-news/environment/normalization-of-deviance-what-went-wrong-at-hanford-where-radioactive-contamination-spread/