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NuScale estimated costs just doubled and costs can be expected to continue to rise as the NRC and ACRS poised to approve general design, leaving much of the site-specific design work for later

The Idaho Falls Post Register recently reported that NuScale's cost estimate has doubled from $3 billion last year, to $6.1 billion this July. [1] The Utah Taxpayers Association (UTA) was reported as criticizing the NuScale small modular reactor project slated for build at the Idaho National Laboratory, warning that past failed or delayed nuclear project costs have fallen on taxpayers. **Construction costs can be expected to continue to rise because approval of the general design by the US Nuclear Regulatory Commission (NRC) and the Advisory Committee on Reactor Safeguards (ACRS) must approve the design and leave much of the detailed design work for later.**

The NRC and ACRS are such a part of the nuclear machinery that if they were to find against NuScale, they would probably face retribution, especially those ACRS members who work at the Idaho National Laboratory. **There appears to be a huge conflict of interest in how the U.S. NRC is using the INL for analysis of the adequacy of the NuScale design and also for approval of the NuScale design.**

In searching for a basic description of the NuScale design, one finds less use of the word "passive" safety these days and more ambiguity on how many megawatts-electric (MWe) power will be generated by one module.

One NuScale facility can house up to twelve reactor modules. Each reactor module has been estimated to generate something between 40 to 60 MWe. NuScale's statement in 2019 [2] regarding how much power each module would generate is the "Each module produces ***up to*** 60

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[1] Nathan Brown, *The Idaho Falls Post Register*, "Utah group, former NRC member blast reactor plan – Say could leave taxpayers hung out to dry," August 7, 2020.

[2] Dale Atkinson, Chief Operating Officer, Chief Nuclear Officer, NuScale Update for NASEO, May 22, 2019. https://naseo.org/Data/Sites/1/atkinson_naseo-may-22,-2019.pdf This presentation includes many nice photographs unrelated to the NuScale reactor and the disclaimer: "This presentation was prepared as an account of work sponsored by an agency of the United States (U.S.) Government. Neither the U.S. Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the U.S. Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the U.S. Government or any agency thereof."

MWe" And for up to 12 modules, "the total output is **up to** 720 MWe gross (684 MWe net)." [Emphasis added.]

The unique feature of each reactor module is that the reactor vessel, like a Russian doll, is tightly enclosed inside an individual containment vessel. That reactor vessel — in a slightly larger containment vessel — sits in a water-filled pool, along with eleven other modules.

NuScale Nuclear Module Load Drops Dominate Core Melt Risks

The risk of a reactor meltdown due to dropping a NuScale reactor module dominates the risk.

The NuScale nuclear module load handling drop hazards far outweigh the benefits of the reduced reliance on pumps. But you would not know that from NuScale's promotion material. To learn this, you need to read through the U.S. NRC reports on the NuScale design.

Uniquely higher nuclear reactor core melt risks arise from the installing new modules and periodic required installation and removal of NuScale reactor modules for maintenance and refueling. A load handling or building crane mishap can affect nearby operating reactor module(s) and can result in a large fission product release, affecting people and the environment far beyond the boundary of the NuScale facility.

Reactor building crane load drop of a NuScale reactor module, affecting operating reactor modules, overshadows any benefit from the reduced reliance on pumps. **The NuScale design risk is completely over shallowed by the dominating high risk of causing a NuScale reactor module load drop that causes reactor meltdown.** The modules don't recirculate and cool the core if the core isn't vertical. (This is for what are termed "internal events" and excludes the seismic risk.) (ML20036D471)

The U.S. NRC is being asked to reduce the emergency planning zone size around future NuScale reactor facilities, despite the fact that more than one NuScale reactor core may melt during accident conditions.

A NuScale Facility Poses High Risks, Especially at the Idaho National Laboratory

NuScale promotors discuss how a module (at something akin to 40 MWe in early 2015 documents) is a small fraction of a 1000 MWe nuclear reactor. Yet, the entire NuScale facility, NuScale now says, would be close to 720 MWe. And the fission product inventory in the spent fuel pool can far overshadow the fission products in a reactor.

NuScale claims that spent nuclear fuel will be put in dry storage and that it is none of NuScale's concern where the spent nuclear fuel goes in the future — because that is the Department of Energy's responsibility. So far, the Department of Energy does not have any place to dispose of the spent nuclear fuel. So, all NuScale can do is emphasize that it is not NuScale's responsibility to worry about it. Convenient, but not ethical. And more certain to result in destruction and death to humanity for untold generations than the benefit of a few dozen megawatts of electricity for a few years, at enormous cost to taxpayers and naïve Utah Associated Municipal Power Systems (UAMPS), which Idaho Falls, Idaho is a part. UAMPS board members were conned into contracting with NuScale. No investor-owned electric utilities in the region are willing to risk their assets on the financially risky NuScale venture.

In southeast Idaho, dry spent fuel storage from the failed Three Mile Island nuclear reactor is poisoning our air, soil and thyroids with iodine-129, due to airborne releases from the leaking dry nuclear spent fuel storage facilities (see the rare, candid idahoeser.com annual report on Idaho National Laboratory releases).

At the Idaho National Laboratory, new unproven reactor fuels and testing without NRC review will be conducted by the Department of Energy in the NuScale facility. Funding shortfalls and lack of rigor routinely result in unsafe reactor conditions approved by the Department of Energy, now as in 1961 when the lax Department of Energy oversight resulted in prompt criticality of the Stationary Low-Power Reactor (SL-1) in 1961. The Department of Energy's reactor oversight has and continues to operate by "oversight" and omission of needed safety features. It took decades for the Department of Energy to begin to require any resemblance of thorough seismic safety design or nuclear safety system testing at the INL's Advanced Test Reactor.

The Idaho National Laboratory spews so much airborne tritium, americium-241, cesium-137, strontium-90, cerium-144, zirconium-95 and other radionuclides, that it will be virtually impossible to know what the NuScale reactor at the INL is releasing. Likewise, the NuScale reactor source of reactor and secondary cooling water will already be radiologically and chemically contaminated INL aquifer water. Distinguishing INL past and ongoing radiological contamination in the aquifer and air from NuScale radiological contamination may be difficult or impossible.

NuScale's Design Certification Application

NuScale's Design Certification Application is being reviewed by the U.S. Nuclear Regulatory Commission (NRC) and the Advisory Committee on Reactor Safeguards (ACRS). The application is not specific to any particular location and many, many specific design details don't exist yet and many issues remain to be resolved only later during location-specific and actual design of the plant, probably during plant construction.

The detailed design work does not get done during the NRC license approval but is delayed until more site-specific and actual design details are hashed out. It hasn't gone well at other nuclear plants like the huge cost overruns that forced the cancellation of two AP1000 plants in South Carolina, a $9 billion dollar boondoggle. [3]

The NRC and the ACRS have been taking a look at the general commitments for the NuScale design. There is a lot of devil in the details that the ACRS well understands cannot be resolved until more detailed design work is completed and tested in an actual plant. NuScale's unique, untested components, like its unique helical steam generators, can be expected to result in unforeseen problems. [ML20043D049]

[3] Peter Fairley, *IEEE Spectrum*, "South Carolina's $9 Billion Nuclear Boondoggle Fits a Global Pattern of Troubles," August 2, 2017. https://spectrum.ieee.org/energywise/energy/nuclear/abandoned-nuclear-reactors-fit-a-global-pattern-of-new-build-troubles

NuScale's Hype Often Overstating the Reality

The basic storyline for the NuScale reactor is that each reactor module "operates using the principles of natural circulation; hence, no pumps are needed to circulate water through the reactor. Instead, the system uses convection, conduction and gravity to drive the flow of coolant inside the reactor vessel." [4] But these passive features depend on the vertical orientation of the reactor module. If the reactor module tips over, reactor fuel melt can result because of inadequate cooling.

The rest of the story on NuScale's natural circulation is that, depending on the transient that causes the need for a reactor shutdown, numerous valves must correctly align to achieve reactor cooling. And despite the emphasis on the design having passive safety features, the valves are **active**, not passive components. Beyond safety relief valves and reactor vessel vent valves, the NuScale design requires numerous valves that must perform an active function to align (and must open or close) in response in a mymarid ways, depending on the particular accident scenario.

The containment vessel that the reactor vessel fits in, is designed to normally operate without water inside the containment, insulating the reactor from the pool during normal operation. Valves between the pool and containment vessel have to open in order for heat transfer to the pool to occur. There are many other valves and needed alignments, depending on the scenario. Common cause valve failures are significant reactor core damage contributors.

Normal makeup to the reactor module is rarely discussed but is provided by the Chemical and Volume Control System (CVCS). A pipe break in the CVCS can cause one of the larger fission product releases from a NuScale reactor module and cause reactor meltdown and a large release of fission products. The fission products are released to the environment, bypassing the containment vessel and without the "scrubbing" of fission products by the reactor pool. Scrubbing of fission products by the pool is part of the argument for reducing the size of the Emergency Planning Zone size.

According to NuScale's website, "The … design safely shuts down and self-cools, indefinitely with no operator action, no AC or DC power, and no additional water. It is the first self-protecting reactor." [5]

Let's examine this statement.

1. Many nuclear reactors have automatic reactor shutdown capability, so that's nothing new. In addition to control rods, NuScale, like other pressurized water reactors (PWRs) uses borated water to control reactivity. NuScale is planning to use half height but otherwise standard, 17x17 pressurized water reactor (PWR) fuel assemblies, with average 3.8 percent enrichment. (See Modern Power Systems, September 2016) There are plant upsets that can result in diluting the boron and rendering a serious reduction in plant

[4] *Modern Power Systems*, "Preferred site identified for first NuScale SMR plant," September 2016 at https://www.energy-northwest.com/energyprojects/smr/Documents/NUSCALE%20UPDATE_Modern%20Power%20Systems_Sep2016.pdf

[5] https://www.nuscalepower.com/benefits/safety-features, accessed August 13, 2020.

shutdown margins. It appears that operator ability to know the status of boron dilution may be limited and it will be typical of nuclear reactor accidents like Three Mile Island and U.S.-designed Fukushima — operators and regulators really won't have much clue as to how the accident is unfolding.

2. Perhaps if absolutely nothing else goes wrong, the reactor self-cools, for many hours or even 3 days with no operator action. But in many scenarios, operator action is going to be needed and within 3 days (despite some NuScale claims), so assuring the proper valve alignments did occur, boron levels are not too diluted and cooling is being achieved is going to require human operators — who are shortening their lives and damaging their reproductive health with every hour of normal or accident condition assignment that they work there.
3. There are many scenarios that do require operator action to achieve safety shutdown of the NuScale reactor, including loss of reactor makeup via the Chemical and Volume Control System (CVCS).

Novel, unproven internal steam-on-tube-side Steam Generators inside the reactor vessel for NuScale May Result in a Large Fission Product Release

The novel internal Steam Generator inside a NuScale module puts steam in the tube-side of the Steam Generator heat exchanger, rather than the shell-side. A Steam Generator tube failure in the NuScale module can result in serious core melt and a large release of fission products to the environment, according to NuScale's own analysis. (ML20036D471 [6] and ML20043D049 [7])

NuScale Design Has Seismic Design Vulnerabilities Inherent in the Design

The tall tippy NuScale modules are 65 ft tall and 9 ft in diameter, and then are inside another vessel called the containment vessel. The design is seismically vulnerable; so much so that the initial proposed location at the Idaho National Laboratory had to be scrapped because of seismic design issues in what the Department of Energy calls a relatively "aseismic" region or a region having low seismic risk.

NuScale's own assessment of its resilience states: "Upon loss of all AC and DC power, the nuclear reactors will shut down without operator or computer actions, and remain cooled for an unlimited period (i.e. no coping time limit) without the need to add water. In addition, cooling of the spent fuel pool can be achieved for 5 months without adding water." [8]

In many scenarios, operator actions are needed far sooner and it's going to be a confusing circus with 12 reactor modules. Did the valves open as needed? Did the boron concentration remain adequate? What you actually learn is that operator actions are needed for NuScale's reactor modules in order to provide additional makeup to the reactor pool.

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[6] NuScale Standard Plant Design Certification Application, Applicant's Environmental Standard Design Certification, Part 3, Revision 4, January 2020. NRC.gov Adams Accession Number ML20036D471.

[7] Official Transcript of Proceedings, Nuclear Regulatory Commission, Advisory Committee on Reactor Safeguards, NuScale Subcommittee. Open Session, February 4, 2020. NRC.gov Adams accession number ML20043D049.

[8] Dr. Jose Reyes, Jr. and Dr. Daniel Ingersoll, *Trans. Am Nucl. Soc. 118, Philadelphia, PA, June 18-21, 2018*, "NuScale Power Plant Resilience Studies," at www.nuscalepower.com

It is not just that the site-specific seismic and flooding hazards and hazards posed by neighboring nuclear facilities won't be considered by the NRC and ACRS — it's that many basic components of the unique design, like the steam generators, won't be fully designed or proven by the time the NRC and ACRS approve the "design certification." The requirements for designing, testing and approving the unique helical steam generators, likely won't exist when the design certification is approved.

This situation means that many design challenges won't be resolved until later and will be left for far fewer NRC personnel to determine that the final details are satisfactory.

The design certification submittal by NuScale is being reviewed by the NRC and the ACRS. The NRC staff and the ACRS members have strong credentials in nuclear safety and design. But the answers to important questions offered by NuScale are often that the component is not yet designed — but when it is, trust us, we'll design it to some appropriate but as of yet undetermined standard and it will be tested and inspected to see if it's got problems.

Lessons learned by the nuclear power industry can take a dozen similar nuclear plants, many years to work through. It can take many years to understand all the problems with a single piece of equipment and how to redesign it and how to properly maintain and inspect it.

Yet, as time runs out to answer how the unresolved design issues should be addressed, given the uniqueness of various equipment, NuScale can be confident that the NRC and the ACRS will sign off on the NuScale design rather than cost the project any additional dollars or further delay its schedule.

The U.S. NRC and the ACRS are expected to promote the nuclear industry — and no doubt, they will rubberstamp the NuScale design submittal which are a collection of unproven high-level aspirations.

There are also conflicts of interest, when ACRS members work for the Idaho National Laboratory and when both NuScale and the NRC use the national laboratory for determining whether a solution to a design problem is adequate.

The transcript of the publicly available portion of the February 4, 2020 ACRS meeting discusses problems with the unique helical steam generator design — and that part of the problem is that the NuScale Final Safety Analysis is full of unproven statements. [9] For a multitude of systems and components, the design details don't exist and won't exist when the US NRC and the ACRS rubberstamp their approval of the NuScale design. The technical requirements for analyzing the various components are not even delineated and may not even exist because of the unique design.

The unique steam generators will have steam flowing in the tube-side, rather than the typical U-tube steam generators in other pressurized water reactors which have the steam on the shell-side.

[9] Official Transcript of Proceedings, Nuclear Regulatory Commission, Advisory Committee on Reactor Safeguards, NuScale Subcommittee. Open Session, February 4, 2020. NRC.gov Adams accession number ML20043D049.

The analysis of the hazard posed by the blades of the turbine generators that will receive steam from the NuScale reactor modules were evaluated as acceptable because the missile created by the blade would penetrate but not continue through the 5-ft thick reactor walls. Typically, designs call for additional mitigation, but not the NuScale design.

It is a huge safety problem that while the NuScale design is said to greatly improve safety because of its passive features, the design created a new dominating risk creating by the frequent use of a reactor crane to lift each module.

If NuScale is built at the INL, the additional testing of unproven fuels in the DOE's NuScale module will create additional risks at the facility.

Late-breaking: U.S. Nuclear Regulatory Commission issued approval of NuScale Small Modular Reactor Design

The design certification for NuScale has approval from the U.S. Nuclear Regulatory Commission. Now customers can proceed with plans to develop NuScale power plants. [10] NuScale had submitted its design certification application in December 2016. Utah Associated Municipal Power Systems is working with NuScale Power to build 12 reactors at the Idaho National Laboratory. The Idaho Falls Post Register also noted that NuScale has signed agreements with entities in the U.S., Canada, Romania, the Czech Republic, and Jordan.

As I noted above, the significant design flaws in the NuScale design render the design seismically vulnerable as well as vulnerable to human error, especially during load handling of modules during installation, maintenance and fuel changes. The real design work has yet to be done as many one-of-a-kind and unique design problems, such as with the heat exchangers, have yet to be solved.

As noted by one member of the NRC's safety board, the Advisory Committee on Reactor Safeguards (ACRS), in meeting transcripts in February 2020, there is no assurance that the problems raised during the safety review will be addressed once the pressure is on to approve the design. See the NRC's website for the difficulty in attaining any meager assurance that the issues raised during the review will actually be solved. [11] It was also noted that as the specific details of various design aspects emerge, very few low-level NRC staff will have the role of approving the final as-built design.

Degrading TMI-2 Spent Fuel Storage at the Idaho National Laboratory, Releasing Radionuclides

The Three Mile Island Unit 2 fuel debris storage modules are located at the Idaho National Laboratory site. These dry spent nuclear fuel storage modules are licensed by the NRC to maintain the commercial nuclear spent fuel of the crippled TMI unit 2 reactor, site of the nation's worst commercial nuclear accident in March 1979.

[10] *The Idaho Falls Post Register*, "Nuclear Regulatory Commission gives design approval to NuScale SMRs," August 30, 2020.

[11] Official Transcript of Proceedings, Nuclear Regulatory Commission, Advisory Committee on Reactor Safeguards, NuScale Subcommittee. Open Session, February 4, 2020. NRC.gov Adams accession number ML20043D049.

The annual estimated airborne release of radionuclides from the Three Mile Island Unit 2 core debris stored at the Idaho National Laboratory are significant, especially the release of iodine-129. [12]

The airborne releases from many operations at the Idaho National Laboratory vary each year. The estimated releases are reported in annual environmental monitoring reports by the Department of Energy's environmental monitoring contractor and some reports can be found at idahoeser.com.

The horizontal storage modules (HSMs) provide a structure to protect the canisters containing the TMI-2 spent fuel debris. The first dry shielded canister containing Unit 2 core debris was moved to the Idaho facility in March 1999. Three Mile Island Unit 2 core debris canisters for Independent Spent Fuel Installation were loaded and placed at the Idaho National Laboratory between 1999 to 2001.

The estimated airborne releases from the Three Mile Island Unit 2 fuel debris stored in unseals canisters at the INL's CPP-1774 are shown in Table 1 and are compared to the total INL releases for 1997 and 2005.

The TMI-2 fuel debris is not sealed due to potential hydrogen off-gassing but the airborne release of radionuclides is not related to the extensive concrete degradation that began shortly after the fuel debris storage was constructed.

By 2000, concrete cracks were reported in the spent nuclear fuel storage system that consists of rectangular reinforced concrete vaults with the fuel debris storage canister resting horizontally on internal rails inside the NUHOMS-12T horizontal storage modules. [13] [14]

In 2000, the licensee concluded that the cracks in the concrete were cosmetic and insignificant. However, in 2007, the licensee observed continued cracking, crazing and spalling as well as increased efflorescence on the HSM surfaces. The licensee performed an evaluation in 2007, during which it determined that the HSMs were capable of performing their design basis functions.

But in 2008, the licensee noted that 28 of the 30 HSMs had cracks, mostly emanating from the anchor bolt blockout holes with widths up to 0.95 centimeters (0.38 inches). At that time, the licensee determined that the HSMs appeared to be prematurely deteriorating and that continued crack growth could impact the ability of the HSMs to fulfill their originally planned 50-year design service life.

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[12] G. G. Hall, CHP, Idaho National Laboratory, Annual Radiological Environmental Monitoring Program Report for the Three Mile Island, Unit 2 Independent Spent Fuel Storage Installation, February 2012. ML12066A171. Table 4, based on the 1998 TMI Environmental Impact Statement.

[13] NRC Information Notice 2013-07: Premature Degradation of Spent Fuel Storage Cask Structures and Components from Environmental Moisture, April 16, 2013, at NRC.gov Adams ML12320A697. Three Mile Island, Unit 2 ISFSI at the Idaho National Laboratory Site.

[14] Additional information is available in "Three Mile Island, Unit 2, ISFSI—NRC Inspection of the Independent Spent Fuel Storage Installation—Inspection Report 07200020/2012-001," dated August 14, 2012 (ADAMS Accession No. ML12228A457).

Subsequent evaluations were initiated and repairs were made to address the concrete degradation. These examples show that concrete degradation can occur rapidly and that aging issues are important for dry spend nuclear fuel storage.

In another INL dry spent fuel storage facility, for Peach Bottom SNF, water intrusion at CPP-749 generation 1 vaults occurred. The fuel is being transferred to generation 2 vaults. [15]

Table. 1. Three Mile Island Unit 2 (TMI-2) ISFSI Estimated Airborne Radioactive Material Releases (Ci/y).

Radionuclide	TMI-2 canister releases, curies each year	Total 1997 INL airborne releases (before TMI canisters)	Total 2005 INL airborne releases, (includes TMI-2 canisters)
Am-241	4.1E-5	unspecified	2.12E-3
Co-60	7.1E-5	unspecified	6.35E-2
Cs-134	2.8E-7	unspecified	5.37E-4
Cs-137	**1.5E-2**	7.1E-3	1.95E-1
Eu-154	4.4E-5	unspecified	2.21E-1
Eu-155	1.5E-5	unspecified	2.20E-2
H-3	**200**	426	802
I-129	**3.0E-2 (High contributor to radiation dose)**	5.8E-2	5.97E-2
Kr-85	**1,400**	3,579	5,190
Ni-63	1.4E-4	unspecified	1.31E-3
Pm-147	2.3E-5	unspecified	1.04E-3
Pu-238	**7.4E-5**	5.1E-6	5.55E-4
Pu-239	**3.2E-4**	1.6E-6	2.68E-3
Pu-240	1.6E-4	unspecified	5.94E-6
Pu-241	6.1E-3	unspecified	1.51E-2
Sb-125	2.1E-6	2.7E-5	6.04E-3
Sm-151	**2.4E-4**	unspecified	4.51E-4
Sr-90	**1.2E-2**	7.0E-4	1.66E-1

Table notes: Shown in bold, the curie release estimate for TMI-2 dry storage canisters at the INL are roughly double, or more, of the total estimated INL release in 1997. Source: G. G. Hall, CHP, Idaho National Laboratory, Annual Radiological Environmental Monitoring Program Report for the Three Mile Island, Unit 2 Independent Spent Fuel

[15] Idaho Cleanup Project Citizens Advisory Board August 27, 2020 meeting presentations (see ICP Overview) at https://www.energy.gov/em/icpcab/downloads/icp-cab-meeting-materials-august-2020

Storage Installation, February 2012. ML12066A171. Table 4, based on the 1998 TMI Environmental Impact Statement.

Medical-Use Cesium-137 Source Contamination Caused by Unsafe Practices by an Idaho Falls, INL spin-off company

On May 2, 2019, an unplanned contamination event occurred in Washington state that was caused when International Isotopes, Inc. cut into a cesium-137 source. The work was intended to reduce the risk posed by medial and research use of cesium-137. Instead, the workers cut into the cesium-137 source and its powdery contents were not in a sealed confinement.

The accident occurred at the Harborview Research and Training Facility at the University of Washington in Seattle, WA. International Isotopes, Inc. was a U.S. Nuclear Regulatory Commission (NRC) licensee working under reciprocity in the State of Washington (an agreement state).

A Joint Investigation report for the University of Washington Harborview releases of cesium-137 on May 2, 2019 found the cause of the accident to be due to the lack of precautions by the Idaho Falls company contracted to remove the medical-use sealed cesium-137 source. [16]

The accident occurred despite the oversight of the NRC, the Department of Energy, and Washington state agreement state regulators.

Millions of dollars of research were reported to be at risk because of the HVAC system being turned off and freezers beginning to fail. University of Washington officials worked to avoid the loss of research samples and the contaminated building was closed because of the release of cesium-137 cutting operation conducted without radiological confinement or monitoring by the Idaho Falls company. [17]

After discovery of the breach, the immediate area was isolated, the building was ordered evacuated, and the ventilation was secured. Indications are that the seven members of the source retrieval team were externally and potentially internally contaminated. The source was reported to be 2800 Ci.

"University of Washington (UW) was having their research irradiator (Mark-1 SERIES / Cs-137) disposed of by International Isotopes (NRC License 11-27680-01MD). The Agreement state regulators were present to verify dose measurements and observe ALARA practices. During the source removal and transfer into the transport shielded cask, there was a breach of the

[16] Joint Investigation Report, National Nuclear Security Administration (NNSA) and TRIAD National Security, LLC (the Los Alamos National Laboratory contractor for the Department of Energy), *Sealed Source Recovery at the University of Washington Harborview Research and Training Facility Results in Release of Cesium-137 on May 2, 2019*, March 30, 2020. https://www.energy.gov/sites/prod/files/2020/04/f73/JIT-Seattle-Cesium-Event-2019-05-02.pdf

[17] Conor Coutney, UW News Lab/Special to CHS, *Capitol Hill Seattle Blog*, "Months after radiation leak, researchers getting back to work but First Hill building remains closed," March 2, 2020. https://www.capitolhillseattle.com/2020/03/months-after-radiation-leak-researchers-getting-back-to-work-but-first-hill-building-remains-closed/

sealed source and a small portion of the source was released into the working area. The working area was comprised of the irradiator unit, the shielded containment rig, the loading dock, a 100 feet radius around the loading dock, and the Harborview Research and Technology Center floors 1-3 and stair well. The source was encapsulated with International Isotopes' source housing capsule. A breach was identified during the precursor wipe survey performed prior to putting it into the source housing unit. Once contamination was identified, all personnel performed area contamination surveys and secured and taped off the work space area. All personnel who were present at some point during the transfer were notified of the potential contamination and were given special instructions to return to the Harborview Medical Center area for decontamination.[18]

"Simultaneously the NRC, Washington Radiation Emergency Hotline, and the [National Materials Event Database] NMED were notified of the situation by International Isotopes immediately after the incident occurred. Seattle Fire and Seattle Hazmat units were dispatched to the scene to assess the situation and begin decontamination protocols. The International Isotope workers, UW RSO, FBI agent, and other present workers were decontaminated and placed in a contained area of the Harborview Medical Center Emergency Room. Bioassay samples were collected from urine and blood from the contaminated individuals."

According to its assessment, the licensee indicated that the highest whole-body exposure to any one individual was 55 mrem. The majority of surveys taken at the loading dock level indicated that surfaces were contaminated in the 50,000 - 300,000 counts per minute range.

International Isotopes hired a contractor to perform decontamination and remediation of the affected areas. The Department of Energy, Region 8, Radiological Assistance Program team surveyed the building floors. International Isotopes employees surveyed the parking lot area where emergency response operations took place reducing the size of the controlled area, marking spots with identified levels. The loading dock area was further isolated from the building by covering outdoor louvers and double door between corridor and loading dock with heavy plastic. International Isotopes remains on-site to support the contractor and the University of Washington by performing assessment surveys and development of the decontamination and recovery plan.

"International Isotopes Inc. (INIS) performed dose estimates based on 24-hour urine samples collected from the INIS employees that were involved in the incident." There were seven people contaminated by the event.

International Isotopes provided a detailed update on internal and whole-body doses, skin contamination and decontaminated results for the affected seven individuals. The highest internal dose was 57.1 mrem for individual 1, the highest whole-body dose was 55 mrem for individual 7, and the highest dose to the skin from skin contamination was 36 mrem to individuals 3 and 4. Blood sampling of the individuals showed no changes due to radiation.

[18] U.S. Nuclear Regulatory Commission, Event Notification Report for May 13, 2019, see Licensee: International Isotopes, Inc., License #: 11-27680-01MD, Event Number: 54042; Notification Date: 05/03/2019 at https://www.nrc.gov/reading-rm/doc-collections/event-status/event/2019/20190513en.html

Facility decontamination continues. International Isotope management is in the process of conducting a detailed investigation in order to determine the direct, contributing, and root causes of this event. International Isotopes (INIS) has completed their portions of the facility decontamination, which is now being run by the Department of Energy (DOE) and Los Alamos National Laboratory. INIS continues to support the DOE accident investigation. INIS investigation report will be delayed until after the DOE Accident Investigation Board report.

International Isotopes no longer has a contract to perform cesium-137 medical source disposal work and its licenses with the NRC no longer include such work.

The Idaho National Laboratory is involved with production of an alternative to cesium-137 sources and the INL resumed production of cobalt-60 used in medical devices, with initial shipments expected in early 2019. [19]

Idaho Cleanup Project Citizens Advisory Board August Meeting on Status of IWTU Redesign and Testing

There was little discernable progress on the Integrated Waste Treatment Unit (IWTU) in 2020 as the project continues to redesign and test the process gas filter (PGF) and other equipment. The IWTU was supposed to have finished treating 850,000 gallons of highly radioactive liquid tank waste from spent nuclear fuel reprocessing by the end of 2012. The liquid waste is stored in three aging stainless-steel tanks at the INL. Presentations from the Idaho Cleanup Project (ICP) Citizens Advisory Board (CAB) meeting on August 27 held via Zoom can be found online. [20]

The failure to meet tank emptying commitments to the State of Idaho under the Hazardous Waste Management Act is resulting in continuing fines of the Department of Energy, that is rarely reported. [21] The use or proposed use of these funds is not being reported, either.

This high-level waste (HLW) known as “sodium bearing waste (SBW)” is not deemed high level waste by the Department of Energy by virtue of “dilution as the solution” and wishful thinking for years that the Waste Isolation Pilot Plant (WIPP) in New Mexico might be more willing to accept the waste if it isn’t called high-level waste.

The IWTU’s fluidized bed steam reforming process has been in the redesign mode since 2012, consuming millions of dollars every month.

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[19] U.S. Department of Homeland Security, Non-Isotopic Alternative Technologies Working Group, Cybersecurity and Infrastructure Security Agency, *Non-Radioisotopic Alternative Technologies White Paper,* September 2019. https://www.cisa.gov/sites/default/files/publications/19_1211_cisa_non_radioisotopic_alternative_technologies-white_paper.pdf

[20] Idaho Cleanup Project Citizens Advisory Board August 27, 2020 meeting presentations at https://www.energy.gov/em/icpcab/downloads/icp-cab-meeting-materials-august-2020

[21] Idaho Department of Environmental Quality web page at https://www.deq.idaho.gov/news-archives/2015/march/waste-inl-doe-deq-negotiated-agreement-resolve-notice-of-violation-030415/

In 2012, we were told that the testing at the Hazen facility in Colorado had not identified problems that precluded treatment of the waste. Testing of mock-up equipment at the Hazen facility continues.

Virtually the same presentation of the IWTU status has now been given at every CAB meeting for several years. The IWTU has never reached the stage where radioactive material is tested in the facility, but has been 6 months away now for several years.

It had been claimed that once operating, the IWTU would treat all of the liquid waste within a few months. Now, testing using non-radioactive "simulant" material, clogging of the process gas filters is expected to require frequent shutdowns to unclog the equipment, every 80 days or 160,000 gallons of waste treated and the treatment of the sodium-bearing waste is expected to take several years.

Once the liquid waste is treated and in granular form, this waste will be stored above ground at the INL and will be waiting for a deep geologic repository to open and accept the waste, see Table 2.

Regarding a similar waste, the high-level waste (HLW) calcine, the ICP CAB meeting did note that the testing continued for retrieving the calcine. Calcine is a granular waste resulting from calcining of liquid radioactive waste. The calcine is stored partially below grade in flooding and seismically vulnerable bin sets of various vintages and designs.

There was a plan to repackage the calcine but the Department of Energy does not know where the treated sodium-bearing waste or the calcine will ultimately be disposed of or what container requirements would apply. The Department of Energy had hoped Yucca Mountain would accept the waste and also has hoped that the Waste Isolation Pilot Plant (WIPP) in New Mexico would accept the waste, despite WIPP's prohibiting HLW.

Table 2. Status of sodium-bearing waste and calcine waste, August 2020.

Waste Type	Origin	Volume Remaining	Amount Shipped	Ultimate Destination	Applicable Agreements
High-Level Waste - calcine	Spent nuclear fuel reprocessing	4,400 cubic meters	None	Unknown geologic repository	Idaho Settlement Agreement, Site Treatment Plan
High-Level Waste – sodium bearing waste	Spent nuclear fuel reprocessing	850,000 to 900,000 gallons	None	Unknown geologic repository	Idaho Settlement Agreement, Site Treatment Plan, Notice of Non-Compliance/Consent Order

Sources: Idaho Cleanup Project Overview presentation to ICP CAB, August 27, 2020 at https://www.energy.gov/em/icpcab/downloads/icp-cab-meeting-materials-august-2020

Idaho Cleanup Project Citizens Advisory Board August Meeting on Status of Transuranic Waste Cleanup

The Department of Energy continues to give misleadingly rosy descriptions of the transuranic waste cleanup, stating that the DOE has successfully cleaned up its nuclear waste sites. [22] Presentations from the Idaho Cleanup Project (ICP) Citizens Advisory Board (CAB) meeting on August 27 held via Zoom can be found online. [23]

For decades, the DOE buried transuranic waste at the burial ground known as the Radioactive Waste Management Complex. After the State of Idaho protested, the DOE exhumed a portion of the waste and stored this waste from Rocky Flats above ground. The DOE continued to ship transuranic waste to Idaho, storing this waste above ground at the RWMC.

The Department of Energy, years ago, had estimated that it had about 65,000 cubic meters of above ground "stored" transuranic waste. For a summary of the exhumed buried waste and the above-ground stored transuranic waste, see Table 3. The 1995 Idaho Settlement Agreement [24] promised to remove all the transuranic waste "stored" in Idaho, about 65,000 cubic meters. The State of Idaho thought that all of the buried and above-ground stored transuranic waste would be leaving the state. But the Department of Energy had no intention of exhuming any more transuranic waste that it had buried. A lawsuit brought by the State of Idaho found that "all means all." But while the Department of Energy agreed to exhume further buried transuranic waste, the State of Idaho allowed DOE to limit the exhumation to the most chemically-laden transuranic waste which was already contaminating the Snake River Plain Aquifer with carbon tetrachloride. Of the 97-acre burial ground, waste was buried in 35 acres. Only the partial contents of less than 6 acres was deemed "targeted waste." Any radioactive waste not deemed "targeted waste" is not exhumed or is returned to the pit. Of the americium-241 estimated to be buried at the RWMC, most of it is not being exhumed.

All of the above-ground stored transuranic waste will be shipped to WIPP. But the buried transuranic waste is an entirely different story.

Despite the Department of Energy's repeated and misleading claims, most of the buried transuranic waste will remain buried and all of the non-transuranic waste will remain buried. Only "targeted waste" is being exhumed from the burial ground at the Radioactive Waste Management Complex.

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[22] Paul Dabbar, Under Secretary for Science, Department of Energy, guest columnist, *The Idaho Falls Post Register*, "The successful cleanup of nuclear waste sites: Past, present and future," August 11, 2020.

[23] Idaho Cleanup Project Citizens Advisory Board August 27, 2020 meeting presentations at https://www.energy.gov/em/icpcab/downloads/icp-cab-meeting-materials-august-2020

[24] See the Idaho Settlement Agreement and memorandums at https://www.deq.idaho.gov/inl-oversight/oversight-agreements/1995-settlement-agreement/ and cleanup progress at https://www.deq.idaho.gov/inl-oversight/oversight-agreements/cleanup-progress-at-inl/

Table 3. Status of buried transuranic waste exhumation and above-ground stored transuranic waste, August 2020.

Waste Type	Origin	Volume Remaining	Amount Shipped	Ultimate Destination	Applicable Agreements
Buried waste exhumed from accelerated retrieval projects (ARPs) which is limited to "targeted waste" in 5.69 acres of 35 acres of buried waste	Site operations, Rocky Flats Plant, other DOE facilities	3,222.9 cubic meters awaiting shipment Over 430 cubic meters left to exhume (as of August 2020)	6,337.8 cubic meters	Waste Isolation Pilot Plant Note: The "targeted waste" will remove less than 10 percent of the buried TRU waste and none of the other long-lived and mobile contaminants poised to pollute the aquifer.	FFA/CO (CERCLA), Agreement to Implement Note: The amount of buried radioactive waste that will leach into the aquifer will be 100 mrem/yr for millennia (or 30 mrem/yr if the soil cap works perfectly for millennia). The soil cap installation required and will require maintenance for millennia to limit water infiltration.
Above-ground stored transuranic waste (and mixed low-level waste)	Site operations, Rocky Flats Plant, other DOE facilities	5,313 cubic meters (CH-TRU) 296 (MLW)	45,525 cubic meters (CH-TRU) 14,638 cubic meters (MLLW) (total 60,163 cubic meters)	WIPP Licensed off-site disposal site	Idaho Settlement Agreement, Site Treatment Plan

Sources: Idaho Cleanup Project Overview presentation to ICP CAB, August 27, 2020 at https://www.energy.gov/em/icpcab/downloads/icp-cab-meeting-materials-august-2020

Of decades of waste buried at the Radioactive Waste Management Complex Subsurface Disposal Area, a few years of Rocky Flats waste disposal was exhumed prior to the 1980s as shipments continued from Rocky Flats. The exhumed drums and transuranic waste drums from Rocky Flats that continued to arrive in Idaho were stored above ground at what is now the Advanced Mixed Waste Treatment Project. These legacy drums exhumed from the burial ground include the waste that had been repackaged at the Accelerated Retrieval Project (ARP) V when four drums exploded in April 2018.

Most of the buried waste remains buried and is planned to remain buried. Of the 97-acre burial ground, waste was buried in 35 acres. Of the 35 acres of buried waste, only 5.69 acres are designated to be sifted through to exhume "targeted" waste. The "targeted" waste was the most chemically laden waste that was already exceeding federal drinking water standards in the aquifer because of the buried waste. The "targeted" waste includes: [25]

- 741 Sludge: Fairly homogenous solid of salt precipitate containing plutonium and americium oxides, and organic constituents
- 742 Sludge: Fairly homogenous solid of salt precipitate containing plutonium and americium oxides, metal oxides, and organic constituents
- 743 Sludge: Paste or grease-like solidified organic liquid containing hazardous solvents and calcium silicate
- Graphite Waste: Broken graphite mold chunks and poly bottles of fine particles (e.g., graphite scarfings) containing residual plutonium

The targeted waste includes discarded filters and pre-filters, high-efficiency particulate air (HEPA) filters contaminated with transuranic and uranium radionuclides. It includes uranium roaster oxides, "with some uranium metal possible." The Idaho Department of Environmental Quality knew this, yet didn't worry about whether the treatment facilities and processes were designed to safely treat the unroasted uranium. **And the Idaho DEQ, complicit with the Department of Energy, does not discuss that the majority of buried transuranic waste is staying buried, nor that all of the non-transuranic radioactive waste and most of the chemical waste is staying buried.**

Of nine Accelerated Retrieval Project (ARP) exhumations, the first eight have been completed. Only ARP IX remains to be completed. Of the targeted waste, 88 percent of the targeted waste has been exhumed. **But unfortunately, removing all of the targeted waste will leave over 90 percent of the buried transuranic waste remaining buried.**

The remaining americium-241 dominates the estimated threat to the aquifer. The important metric is how much of the americium-241 that was buried (after a few initial or early retrievals) and how much will remain buried after the "targeted waste" is exhumed.

[25] Presentation to the Citizens Advisory Board, by Mark K. Clough, Idaho Department of Environmental Quality, "State Oversight of the Buried Targeted Waste CERCLA Exhumation Project," January 14, 2015.

In fact, over 90 percent of the americium-241 is remaining buried. An estimated 215,000 curies will remain buried after targeted waste is removed according to composite analysis calculations of 230,000 curies of americium-241 having been buried. [26] [27] [28]

The buried americium-241 is not the only radionuclide that contributes to contaminant migration, but it was the dominant contributor according to the buried waste performance assessment. For simplicity and due to the significance of the americium-241 to the estimated migration of radionuclides from the burial ground, the amount of americium-241 that is not being exhumed from the burial ground is explained but the lion's share of other transuranic radionuclides, like plutonium-239, are also remaining buried.

For this reason, the burial ground requires a soil cap to limit water infiltration to the buried waste. The proposed soil cap will require maintenance for millennia to prevent penetrations allowing water infiltration. The soil cap has to accommodate covering the 20 ft high stack of uranium nitrate laden drums that were stacked on an asphalt pad — so DOE could claim they didn't bury the waste — and this hill of barrels has to be covered by the soil cap. The many feet-thick soil cap may be expected to cause the heatup and underground oxidation process that will have the waste site smoking in underground fires that cannot be put out. The soil cap's designer has stated at last year's CAB meeting in Wyoming that the heat load from the buried waste has not been evaluated in the design.

Idaho Cleanup Project Citizens Advisory Board August Meeting on Status of Spent Nuclear Fuel Storage

Department of Energy Environmental Management (EM) has been continuing to empty the spent fuel underwater basin in the Chemical Processing Plant (CPP) facility CPP-666 at the Idaho Nuclear Technology and Engineering Center (INTEC). Recently more EBR-II fuel was removed from the basin and moved to the Materials and Fuels Complex and transported to the Radioactive Scrap and Waste Facility (RSWF). The RSWF is an outdoor underground retrievable burial ground at the Materials and Fuels Complex. Other EBR-II fuel has been transferred to MFC's Fuel Cycle Facility (FCF).

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[26] See the July 2017 EDI newsletter for a timeline for the burial ground at the Radioactive Waste Management Complex and other cleanup information at http://www.environmental-defense-institute.org/publications/News.17.July.pdf

[27] 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/

[28] 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/201411/20141103009 60BRU.pdf

Presentations from the Idaho Cleanup Project (ICP) Citizens Advisory Board (CAB) meeting on August 27 held via Zoom can be found online. [29] A status of the spent nuclear fuel at the INL, including both DOE-EM SNF presented by the DOE to the ICP CAB and also the naval SNF, see Table 4.

Advanced Test Reactor (ATR) spent fuel continues to be generated by reactor operations and stored at the reactor's fuel storage canal. Older ATR fuel remains in the CPP-666 basin and much has been transferred to dry storage at CPP-603. [30]

Table 4. Status of spent nuclear fuel at INL, both DOE-EM and Naval, August 2020.

Waste Type	Origin	Volume Remaining	Amount Shipped	Ultimate Destination	Applicable Agreements
Spent nuclear fuel – DOE EM	DOE, research and commercial reactors	243.57 metric tons heavy metal, EM	153 TRIGA elements 0.03 MTHM (for reuse)	Unknown geologic repository	Idaho Settlement Agreement
Spent nuclear fuel – Naval	Naval submarines and aircraft carriers	Roughly 28 MTHM as of 2012 and additional shipments to the INL, with unknown amount in aging Expended Core Facility pool and unknown amount in dry storage.		Unknown geologic repository	Idaho Settlement Agreement

Sources: Idaho Cleanup Project Overview presentation to ICP CAB, August 27, 2020 at https://www.energy.gov/em/icpcab/downloads/icp-cab-meeting-materials-august-2020 and U.S. Nuclear Waste Technical Review Board, December 2017 report stated 297 MTHM DOE and 28 MTHM Naval SNF, and I am not able to locate a current accounting of fuels for 2020.

[29] Idaho Cleanup Project Citizens Advisory Board August 27, 2020 meeting presentations at https://www.energy.gov/em/icpcab/downloads/icp-cab-meeting-materials-august-2020

[30] Fluor Idaho press release June 16, 2020 at https://www.energy.gov/em/articles/spent-nuclear-fuel-transfers-support-em-s-commitment-state-idaho

Summary of Idaho National Laboratory Cleanup Status as of August 2020

The cleanup work remaining at the Idaho National Laboratory includes the treatment of liquid sodium-bearing waste, the retrieval high level waste calcine and both the treated sodium-bearing waste and the calcine will require treatment and packaging into canisters for transportation and disposal in a geologic repository — that doesn't exist.

Work continues to store spent nuclear fuel and to transfer spent nuclear fuel in pools to dry storage. A facility to repackage the fuel for shipment out of the state remains to be built. Both the spent nuclear fuel and the sodium-bearing waste and calcine are supposed to be road ready to ship out of the state by December 31, 2035. [31]

The transuranic waste being shipped out of Idaho is from waste stored above ground at the Transuranic Storage Area and the ground in canisters at the Radioactive Scrap and Waste Facility at the Materials and Fuels Complex, as well as the limited amounts of transuranic waste being exhumed from the Radioactive Waste Management Complex burial ground in "targeted" chemically-laden waste. The exhumations are conducted in temporary structures called Accelerated Retrieval Projects I through IX.

In addition, the EPA and the State of Idaho are overseeing the Department of Energy CERCLA [32] cleanup of contaminated sites at the Idaho National Laboratory. The investigations of contamination at the INL began in 1989 and there are ten waste area groups (WAGs). There are records of decision for the remediation in these WAGs. The contamination that is not safe for unrestricted use is put under institutional controls. In some cases, due to the radioactive decay of the contamination, for example, the institutional controls may be lifted in 100 or 500 years. But in dozens of areas, the radioactive decay will not render the area safe after more than hundreds of thousands of years. In these cases, the institutional controls are said to continue "indefinitely." I call these sites forever contamination sites. [33] A status for the INL cleanup is provided in Table 5.

Table 5. INL cleanup status summary, August 2020.

DOE's To Do List	Milestone Date	Status	Comments
High Level Waste			
Treat liquid sodium bearing waste, 900,000 gallons of waste in	Treat by 12/31/12 (missed)	In 2020, the 2015 status is roughly the same: Re-design and testing of	Tank liquid would not be remediable if the tanks leak. As of June 2017, new cleanup contractor Fluor has offered no

[31] See the Idaho National Laboratory Citizens Advisory meeting presentations from the June 22, 2017 at www.inlcab.energy.gov And see the Idaho Department of Environmental Quality INL Settlement Agreement Oversight summary at http://www.deq.idaho.gov/inl-oversight/oversight-agreements/cleanup-progress-at-inl/

[32] Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) as amended by the Superfund Amendments and Reauthorization Act of 1986.

[33] See the list of "forever contamination" sites at INL Waste Area Group Institutional Controls Report. Dated February 16, 2016: https://cleanup.icp.doe.gov/ics/ic_report.pdf and from the EPA page: https://cleanup.icp.doe.gov/ics/

DOE's To Do List	Milestone Date	Status	Comments
underground tanks. Then treat and package for transportation and disposal.		IWTU ongoing and remains at high risk of failure	schedule for beginning to treat the radioactive sodium-bearing liquid waste. State waste management under state Resource Recovery and Conservation Act (RCRA) enforcement also applies and fines are being levied by the state to DOE for failure to empty the sodium-bearing tanks.
Retrieve and package high level waste calcine for transportation and disposal	Ready to ship by12/31/2035	In 2015, it appeared that DOE was pushing to delay calcine waste treatment. In 2020, DOE is proceeding with calcine retrieval research and plans to move calcine from bin set 1 to bin set 7.	Calcine treatment is held up by the tardy IWTU because it will use the same building. Calcine bin sets are vulnerable to flooding and seismic hazards and pose a huge radiological hazard in the event of an accident. The decision to use Hot Isostatic Press (HIP) is being revisited. In 2016, DOE's hopes to dispose of calcine in deep bore holes in North or South Dakota are dashed by refusal of these states to allow research. There is no named defense repository for the calcine high-level waste.
Transuranic Waste			
Complete removal of targeted buried waste, exhuming portions of 5.69 acres of the 97-acre burial ground	TRU waste to be removed from the state by 2018 (missed) 2017 buried waste exhumation 2017 budget is $ 21.6 million.	Continuing but must be stored above ground at INL, at greater release risk, because shipments to WIPP are backlogged. The Accelerated Retrieval Projects (ARPs) I through VIII are completed. ARP IX: Exhumation ongoing, 43 percent complete as of the end of July.	The amount of buried radioactive waste that will leach into the aquifer will be 100 mrem/yr for millennia (or 30 mrem/yr if the soil cap works perfectly for millennia). The "targeted waste" will remove less than 10 percent of the buried TRU waste and none of the other long-lived and mobile contaminants poised to pollute the aquifer. Organic vapors removed from the burial ground, and released to Idaho skies, as of July 19, 2020 total 257,613 lbs of organic vapors since 1996. The soil cap installation isn't due until 9/30/2027 to meet the Federal Facility Agreement and Compliance Order
Continue Shipping TRU waste to WIPP and status of above-ground stored waste from Rocky Flats	Ship at least 2000 cubic meters/yr through 2018, (missed)	Shipments stopped in 2014 because of WIPP accidents. Shipments resumed in April	WIPP resumed accepting shipments in April 2017 but at a limited rate due to the contaminated underground mine and limited ventilation system. Remote-handled TRU waste shipments remain on hold until WIPP

DOE's To Do List	Milestone Date	Status	Comments
		2017 but only a limited rate of shipments is allowed, not meeting this milestone.	accepts them.
Spent Nuclear Fuel			
Spent Nuclear Fuel transfer from wet to dry storage Total Navy and DOE fuel limit of 55 metric tons heavy metal (MTHM)	Move spent nuclear fuel from pools to dry storage by 12/31/2023. Remove spent nuclear fuel 1/1/2035	The 1995 Idaho Settlement Agreement stops shipments (except from the Navy) when milestones are not met. Continue EBR-II and ATR SNF out of wet storage.	No one is discussing when the facility for dry storage handling (also called a transshipment facility) will be built at INL.[34] If there is no repository, spent nuclear fuel will require re-packaging until a repository is available. According to IDEQ website, 23.8 MTHM Navy and 27.73 MTHM DOE SNF (totaling 51.53 MTHM) have been received of the total allowed 55 MTHM. Fuel received from Oak Ridge must balance aluminum clad (ATR) fuel shipped to Oak Ridge.
CERCLA Cleanup			
Idaho CERCLA Disposal Facility		Continues as needed.	The ICDF burial facility at INL continues to bury waste and expansion is expected.
INL Decontamination and Decommissioning			Decreased funding of D&D has slowed the filling of the Idaho CERCLA Disposal Facility. Resumed D&D will require expansion of the ICDF burial ground at INL.
INTEC Liquid Waste Treatment Facility (Tank Farm Closure)	WAG 3 Record of Decision		Tank farm closure delayed because of failure to treat liquid sodium-bearing waste. A low-permeability pavement cover to prevent water infiltration into the soils driving contaminants into the aquifer is planned, but is a temporary measure. Closed tanks have grouted radioactive material in tank heels.
Subsurface vapor extraction under CERCLA	At RWMC and at Test Area North, vapor extraction continues		The subsurface vapor extraction has removed volatile organic compounds but extraction becomes less effective as the concentrations decrease. The levels of aquifer contamination remain

[34] This September 2004 Idaho Department of Environmental Quality newsletter discusses a transshipment facility design that is expected to take two years to construct and three years to operate to transfer remaining INL spent nuclear fuel from wet to dry storage. http://deq.idaho.gov/media/552776-newsletter_0904.pdf

DOE's To Do List	Milestone Date	Status	Comments
			elevated.
CERCLA WAG 10 and WAG 1 TAN Groundwater		New waste sites continue to be found. In situ Bioremediation injections are continuing.	Aquifer remediation at TAN is not progressing well and the contaminant plume continues to spread.
Advanced Mixed Waste Treatment Project (AMWTP)	INL CAB has voiced the desire for DOE to find new missions for the AMWTP	Above-ground stored TRU waste and exhumed targeted waste continues to be treated at AMWTP.	Despite the argument that worker radiation doses risk versus benefit were the reason to limit RWMC buried waste exhumation, new missions are being sought to the Advanced Mixed Waste Treatment Project.
In situ grouting at RWMC under CERCLA	CERCLA record of decision	In situ grouting has been completed.	In the Record of Decision (DOE/ID-11359) it was considered prudent to perform in situ grouting because of the long wait before the soil cap would be installed. There was no assurance of effectiveness of the grouting. It was described as reducing mobility of contaminants in the short term. There was no estimate of how much it would reduce the mobility. Despite this, presenters often incorrectly describe the grouting as a fully effective prevention of mobile radionuclide migration from the buried waste.
Install CERCLA Soil Cap on RWMC	WAG 7 Record of Decision	Contractor has completed soil cap design to accommodate the 20 ft high stack of buried above ground waste at Pad A continue.	The soil cap is being acknowledged by the DOE as requiring inspection and maintenance forever.
CERCLA Institutional Controls	Inspect and monitor into perpetuity	Dozens of "forever contamination" sites officially termed unfit for unrestricted access for an "indefinite" period at the INL when CERCLA remediation is complete.	See the list of "forever contamination" sites at INL Waste Area Group Institutional Controls Report.

Public Comment on NRC's flawed and incomplete draft EIS on Holtec's proposed spent nuclear fuel storage facility in New Mexico

The U.S. Nuclear Regulatory commission is quietly holding public meetings via telephone to take public comment on the NRC's draft Environmental Impact Statement for the dry spend nuclear fuel storage facility proposed by Holtec in New Mexico. [35]

These meetings are not face to face — and do not show any of the NRC participants' faces. Transcripts of the meetings won't be available until most of the meetings are over. No recordings of the meetings oral comments are available. The public has been disenfranchised because of the difficulty in figuring out how to participate in these meetings and the way that very little of the meetings is recorded. And the NRC has decided that almost any issue relevant to the proposed project is "outside of scope."

One more public comment session is scheduled for Wednesday, September 2, 2020, at 9 am MT. To listen in or give oral comments, phone 888-566-6509, passcode: 1904459, and press *1 to get in the que to give comments. The online event address at https://usnrc.webex.com/ won't connect you to any audio of the meeting (Event number: 199 183 5099 and password Holtec.) Various downloads are required or seemingly required before you can perhaps see the meeting presentation slides, but there's little value from the online meeting which does not show any participants and does not provide audio of the public comment.

Public comment can be emailed to Holtec-CISFEIS@nrc.gov before September 22 for Docket ID NRC-2018-0052.

For background, in 2017 Holtec submitted an application to the NRC to construct and operate a Consolidated Interim Storage Facility (CISF) for spent nuclear fuel (SNF) and greater than class C waste (GTCC), as well as a small quantity of mixed oxide fuel (fuel blending uranium with plutonium to use in a reactor), in Lea County, New Mexico. The proposed Holtec CISF would provide an option for storing SNF from nuclear power reactors for a period of 40 years, that is away from the location where the often now-closed reactors operated.

Holtec proposed initially storing up to 8,680 metric tons of uranium in 500 canisters and plans to have 19 expansion phases so that ultimately the facility will store up to 10,000 canisters of spent nuclear fuel or roughly 100,000 metric tons of initial uranium or blended fuel.

The NRC is assuming that two additional renewals of 40 years each, for a total of 120 years may be granted by the NRC. The NRC is assuming that a permanent repository will become available within that time.

The NRC recognizes that there is tremendous concern about the proposed Holtec CISF becoming defacto storage because a permanent repository is not secured. And over the safety of

[35] Federal Register, Docket NRC-2018-0052 https://www.federalregister.gov/documents/2020/04/27/2020-08826/holtec-international-hi-store-consolidated-interim-storage-facility-project

canisters that cannot be adequately inspected or repaired. The NRC's fix for the problem is to decree that any comments on these vital topics are outside the scope of the EIS for the facility.

The fact is that every canister of spent nuclear fuel that comes into the state of New Mexico is unlikely to ever leave New Mexico. The EIS must include the consequences of not securing a permanent repository for the spent nuclear fuel.

The NRC tries to hide the fact that there is no economic benefit for building the Holtec facility in New Mexico, based on the draft EIS. The NRC continues to falsely claim that the dry spent fuel storage near populated regions of the country is safe and only reason to move the spent fuel from more populated areas to New Mexico is to repurpose the land where spent nuclear fuel is stored around the country.

This EIS must include the consequences of bringing the spent nuclear fuel to New Mexico and having no repository to send these canisters to.

This EIS must acknowledge that bringing the spent nuclear fuel to New Mexico will weaken, not strengthen, the nation's resolve for securing a permanent disposal facility.

This EIS must acknowledge that the prospects of Yucca Mountain opening are dimmer than they were 30 years ago. This EIS must acknowledge what will happen as these canisters are no longer safe to transport.

The proposed Yucca Mountain repository in Nevada still does not have a "License to Construct" and despite a portion of a tunnel existing, the facility has not been built, nor have railways to Yucca Mountain been built. Most troubling is that the proposed Yucca Mountain repository will not safely confine the waste. The NRC is assuming the existence of a repository that cannot be constructed with the promised titanium drip shields – yet the NRC rules out consideration of other options, on the basis of the lack of information. This draft EIS is typical of U.S. NRC dedication to promote a false narrative every step of the way.

One Yucca Mountain repository won't even hold all the spent nuclear fuel the Holtec facility is envisioned to hold. This EIS does not identify whether one, two or more permanent repositories will need to be constructed.

The Holtec facility in New Mexico is proposed to hold 100,000 metric tons of spent nuclear fuel, including high burn-up SNF, in 10,000 canisters. Each canister would hold roughly 10 metric tons of spent fuel.

This draft EIS tossed out some safer options based on the flimsy excuse of not having enough information available, all while promoting the Holtec facility despite lacking adequate information about canister safety, actually transportation container testing, or realistic repository design details. The NRC's selected assumptions in this EIS are that no transportation accidents will cause a radiological release, even though it knows that is untrue, that canister accidents won't happen and that is untrue.

Despite misleading statements in the draft EIS, the EIS does include the fact that it is expected that canisters at the proposed Holtec facility will be releasing radionuclides to the air. The canisters are stainless steel and are susceptible to chloride-induced stress corrosion cracking and can be expected to have been exposed to chlorides. The NRC knows that the canisters will experience through-wall cracks. The consequences of the cracks will depend on the original fuel burnup, how long the fuel has cooled, and many variables that will not be known about the fuel condition.

Based on other NRC-licensed facilities, at best, the public can expect to be lied to about the actual extent of the radiological contamination from the expected leaking canisters or other accidents at the Holtec facility.

The EIS admits that breach of a canister is an expected, greater than one event per year, event. The EIS admits that the soon-to-be-leaking radionuclides Holtec spent nuclear fuel facility is allowed to annually cause the following radiological dose to the public: 25 millirem whole body; 75 mrem thyroid; and 25 mrem to any other organ per 10 CFR 20.

The NRC says this is a small impact.

Let me tell you about our experience in Idaho. We have Three Mile Island fuel debris in dry storage. The dry fuel storage leaks radionuclides to blow around in the air. Now, Idaho is a very radioactively contaminated state, from one end to the other. We received radioactive fallout from the Department of Energy's nuclear weapons testing in Nevada. Idaho has privately owned hazardous waste dumps on the Boise-side of the state, one closed and one still operating by US Ecology in Grandview. These dumps accepted for years and the Grandview dump still accepts radioactive waste, despite not being a licensed radioactive waste dump. We have radioactive waste going airborne from this activity, and leaking into groundwater and the Snake River. And only perhaps one dozen jobs in the state from it. But our political leaders silence has been bought. Our state Idaho Department of Environmental Quality does everything in its power to avoid monitoring the radionuclide emissions from the radioactive waste dumping at Grandview and from the Idaho National Laboratory. Our Idaho legislature removed a decades old law restricting airborne radiological emissions, solely in order to prevent any legal challenge to radiological polluters in our state. [36] [37]

At the INL, the Three Mile Island dry cask storage releases a very large amount of radioactive material airborne to our state, including iodine-129, radioactive for 16 million years.

Despite the fact that the entire state had radioactive fallout from Nevada weapons testing, only the counties near the INL and that includes near the NRC-licensed Three Mile Island dry

[36] Office of the Administrative Rules Coordinator, Department of Administration, Pending Rules, Committee Rules Review Book, Submitted for Review Before House Environment, Energy & Technology Committee, 65th Idaho Legislature, First Regular Session – 2019. January 2019 at https://adminrules.idaho.gov/legislative_books/2019/pending/19H_EnvEnergyTech.pdf

[37] See the Environmental Defense Institute August 2019 newsletter article "Idaho Gutting Radiological Contamination Protection from Environmental Clean Air Law."

fuel storage have twice the thyroid cancer incidence compared to the rest of the state of Idaho and the country.

What are the radiation doses claimed to be from the airborne release of radionuclides from the TMI casks? Less than a tenth of a millirem, whole body. Every county surrounding the INL's TMI casks, including Bonneville, Bingham, Madison, Jefferson, and Butte has double the thyroid cancer rate of the rest of the state and the rest of the country.

The total whole-body dose from the INL, including the TMI dry storage, is stated to be less than a tenth of a millirem, annually. What will happen in New Mexico when the NRC allows 25 mrem/yr to be released to the air (not shine, but radionuclide particulates) from the Holtec facility?

First, the radiological monitoring will understate what is actually being released. Second, no matter how is being released, the NRC will conclude that it is less than 10 CFR 20 requirements would allow. Third, any increases in illness, cancer, oxidative-stress-induced heart disease, birth defects and infant mortality will be denied as having been caused by Holtec's inevitable airborne radionuclide releases – these are the releases that can reasonably be expected, and could be far higher should any sort of mishap occur, such as a heavy rain so that non-borated water enters a breached canister, resulting in a criticality.

The Holtec license application stated that canister leakage would not occur and this was the underpinning of its criticality safety argument. The spent fuel in these canisters will go critical is water is introduced into the canisters, unless the water is borated.

The NRC knows that there is no effective inspection for canister break and no effective or licensed method of fixing a canister leak. The Nuclear Energy Institute (NEI) speaker on August 25 was not truthful about the ability to inspect and remedy a crack in a spent fuel canister.

There is no way to fix a cracked canister and no hot cell in the Holtec design to possibly unload fuel from a compromised canister.

Articles by Tami Thatcher for September 2020.