Section II. New Plans for Supersite INL

A. ICPP/INTEC Spent Reactor Fuel Plan

DOE's 1992 *Draft ICPP Spent Fuel and Waste Management Technology Development Plan* (SFP) presented to then Governor Andrus by DOE Undersecretary Leo Duffy generated considerable public concern because it showed DOE's long-term intent to continue spent fuel reprocessing. Processing spent fuel generates large quantities of high-level liquid wastes. These wastes are then incinerated in the ICPP Calcine Facility. This plan outlines an elaborate program for expanding the ICPP into a mass incinerator for foreign, domestic commercial, Navy, and DOE's complex wide spent reactor fuel. [SFP @16&53] Research and development costs, not including any construction, were projected in 1992 to be $467.7 million over six years. [SFP @4] That turned out to be grossly under estimated. DOE's Budget just for FY2017 "Waste Stabilization" dropped $16.8 million from $202.3 in 2016 to $185.5 million that shows dramatic reduction in funds needed to appropriately manage the growing inventory of 267 MT of SNF with projections for additional 22 MT through 2027. [1]

Ostensibly, a primary driver for the ICPP Spent Fuel Plan is the Nuclear Waste Policy Act's Land Disposal Restrictions listed in 40 CFR 268. As of May 8, 1992, DOE was violating the law by continued production of high-level radioactive liquid waste and calcine (residuals after incineration). DOE received an extension of the deadline by demonstrating that they are processing waste for ultimate disposal. Between 15,000 and 20,000 metric tons of foreign and domestic spent fuel is slated for the program. The timing of the shipments is controlled by the 1995 Settlement Agreement between Governor Batt and DOE.

Another driver for the Plan is waste volume reduction to minimize the high cost of future permanent repository space. DOE claims that calcine/incineration offers a volume reduction of seven times [SFP@7], but Jim Werner, former Senior Engineer for the Natural Resources Defense Council disputes that claim. Werner states that:

> "DOE operating records indicate that the ICPP produced 132 gallons of high-level liquid waste per kilogram of [spent fuel] uranium feed. Operating the [ICPP] Fuel Processing Facility, now under construction, to replace the current facility [CPP-601], will generate approximately 380 gal. of high-level liquid radioactive waste for each kilogram of U-235 processed - almost three times the rate documented in 1963. Based on specific gravity of the U-235 of 10.96, approximately 5,000 cubic meters of high-level waste is produced from each cubic meter of U-235 processed. If the calcining process reduces the volume of this high-level waste by a factor of six, then the increase in volume of the U-235 before reprocessing in the ICPP is still more than 900 times. Processing INL's current inventory of 109,198 kilograms of uranium in spent fuel will generate 41,495,350 gallons of high-level liquid waste." [Werner, NRDC Memo, 1/21/92]

EDI concurs with former Governor Andrus that the most appropriate management of DOE, Navy, and foreign spent fuel is to keep it at its current location in dry storage. At some future time if/when a safe permanent high-level nuclear waste repository is developed, the spent fuel could then be shipped directly to that site. EDI considers the new Spent Fuel Plan for processing huge amounts of reactor spent fuel an unacceptable hazard for the residents of Idaho and neighboring states. Andrus's comments on the Plan bring up other important and unaddressed issues.

"The Plan proposes to process the spent nuclear fuels and high-level radioactive wastes into forms that are acceptable for permanent disposal in a geological repository. However, the criteria for determining what forms of waste are acceptable for such disposal have not been established pursuant to the Nuclear Waste Policy Act of 1982."... "The absence of those criteria means that neither the Department [DOE] nor the state of Idaho can be assured at this juncture that the technologies to be developed and applied will process the spent nuclear fuels and high-level radioactive wastes into forms that are acceptable for permanent disposal in a geological repository." [Andrus(b) 6/10/92]

Andrus further challenges that should the acceptance criteria allow spent fuel in "as-is" condition, it makes little sense to process it. "I believe the Department has more than enough graphite spent fuels in storage at INL to develop technologies for processing them for disposal. The Plan does not establish

[1] FY 2017 DOE EM Budget Request to Congress, pg. 121

that the Department requires additional spent fuels from [Ft. St. Vrain] FSV or any other source to conduct this program." [Andrus(b) 6/10/92 @3] "The Department also must provide binding assurances that the Plan will not be used to turn INL into either an interim or permanent nuclear waste repository. Idaho already has assumed its share of nuclear wastes; hence, it should not be required to accept any additional wastes." [Andrus(b) 6/10/92.@5]

A possible explanation for what appears on the surface as an illogical Plan, is that DOE's hidden agenda in this Plan is to rebuild its nuclear weapons materials production capacity under the guise of waste processing. Currently, DOE's old production facilities including the ICPP are violating environmental laws and must be either shut-down or extensively upgraded. Congressional funding and public acceptance will be radically different if DOE was candid about its true mission for the ICPP. Therefore, DOE's subterfuge might be a well-planned ploy to build new nuclear materials production capacity while publicly they claim it is a waste management project.

A clear indication of DOE's hidden agenda can be seen in the Spent Fuel Plan's replacement of high-level waste storage tanks. Four new 500,000 gallon tanks are planned to replace five existing 300,000 gallon tanks. Current storage capacity with eleven 300,000 gallon tanks is 3,300,000 gallons. Removing five old tanks yields a net old tank capacity of 1,800,000 gallons. Four new tanks (2,000,000 gallons) will generate a new capacity of 3,800,000 gallons. This gives a net increase of 500,000 gallon capacity over existing capacity. Existing capacity was adequate for full scale ICPP fuel reprocessing and facility decontamination for nearly fifty years. As of 1997, DOE has put this plan on hold, however the Department retains this option for future production capacity. The fact that as of 2020, INL still has not been able to developed a high-level liquid waste treatment facility. See Guide Section I.E.C for more detail on high-level waste management at INTEC. This means the >67 year old HL waste tanks still have ~1 million gallons with the accompanying leak issue. So the new tanks are a good back-stop if, like Hanford, the HL waste tank leaks are now a critical hazard with not treatment facility in view.

Former Governor Andrus, seeing no other options, filed a suit in US District Court against DOE in June 1993. The safety of spent nuclear fuel storage facilities at INL was seriously undermined by DOE documents that surfaced during litigation between the agency and the State. IT Corp's Spent Fuel Background report [Ryan citing][Sept. 18, 1992 @3-24] cited the Underwater Fuel Storage Facility went into service in 1951 with a design life of 30 years and is not in compliance with current DOE Orders. Its design life has already been exceeded by 12 years. Consequently, pools are not an appropriate location for the long-term storage of spent fuel while a high-level repository is being developed. Another report [Ryan citing][WINCO Oct. 1992 @ 100-01] ,Nuclear Fuel Reprocessing Phase-out Plan for the ICPP, cites that the Underwater Fuel Storage Facility at INL lacks an impermeable liner underneath the storage basins, has no leak detection systems, nor any ventilation of air conditioning systems in the basin area. This report also expresses concern over potential leakage through the basin walls into the environment. [Ryan, Ex. B @ 101] Additionally, the report cites that "recent inspections have revealed gross corrosion of the fuel, baskets, and yokes. The potential for a severe seismic event to cause a criticality has not been fully evaluated yet but is a concern." [Ryan @ 50] In his summary judgment against DOE, Judge Ryan cites a March 4, 1993 letter from John Conway, Chairman of the Defense Nuclear Facilities Safety Board that cites the following concerns:

> "1.) several unusual occurrence reports issued in 1992 arising from improper fuel storage configurations and degradation of a criticality safety barrier; 2.) safety standards at INL are set too low; 3.) ineffective and/or inadequate inspection practices; 4.) existing detection equipment in some storage pools is inadequate and probably would not recognize a criticality if one were to occur; 5.) independent validation of criticality safety evaluations are not being done; and 6.) the ability of the existing storage facilities to withstand seismic events." [Ryan @ 51]

Judge Ryan also cites that DOE recently discovered in one of the storage areas 25 highly radioactive fuel elements being stored adjacent to each other, and in the same area, corrosion caused a carbon steel hanger to fail that resulted in a bucket containing spent fuel to drop to the floor in CPP-603 now closed. These events occurring in the same area violated the "double contingency" rule (two independent, unlikely and concurrent changes must occur before an accidental criticality is possible). In other words, these events came dangerously close to causing an accidental criticality or nuclear chain reaction at the facility. [Ryan @ 54]

> "The Office of Nuclear Safety also expressed significant concern over the Underwater Fuel Storage Basin at the ICPP. In particular, the Office noted that conditions at the facility have degraded to

> such an extent that the potential for a criticality accident has increased significantly. Particular problems cited in the report included corrosion of fuel storage devices, non-functioning safety devices, storage of spent fuel in unapproved locations, inadequate safety analyses based on inappropriate standards, and failure to follow facility operations procedures." [Ryan @ 53]

DOE's plan to shift spent fuel to the Underground Storage Facility (CPP-749) in order to make room for the Fort St. Vrain spent fuel was challenged by the court because the Environmental Assessment failed to address the fact that the dry wells in the underground facility are nearing the end of their 20-year design life. Furthermore, the most recent annual dry well atmosphere samples from the underground facility showed corrosion occurring in the dry wells, and Westinghouse had expressed concerns about its ability to continue to store spent fuel there safely. [Ryan @ 29]

Judge Ryan concluded that "despite DOE's desire to characterize serious safety concerns as irrelevant, the court finds that the documents are in fact relevant in light of the court's holding that DOE must thoroughly study all of the cumulative effects of the receipt and storage of spent nuclear fuel at INL in a single site-wide EIS. Furthermore, this latest affidavit shows DOE's persistence in down-playing risks and promoting corrective action. The record reveals that significant safety problems have arisen and continue to arise at INL; that DOE has been advised of these problems; and that DOE has failed to take adequate remedial measures. In addition, the record shows that the risks of serious environmental contamination and loss of life increase as additional spent nuclear fuel is brought to INL under these conditions." [Ryan @ 55] Phil Batt succeeded Cecil Andrus as Governor of Idaho in 1994 and, like Andrus, he was forced to continue the legal battle with DOE over INL waste.

In May 1995, DOE released its Record of Decision (ROD) on its Programmatic Spent Nuclear Fuel Management and INEL Environmental Restoration and Waste Management Programs Environmental Impact Statement ordered by Judge Ryan. This ROD articulates DOE's plan to consolidate its inventory of spent nuclear fuel by fuel type. Aluminum clad fuel goes to the Savannah River Site and non-aluminum fuel goes to INL. This allows "the Department to efficiently stabilize spent fuel for safe interim storage if necessary, or initiate new research and development for stabilization and ultimate disposition." [ROD(1995)@30] Stabilizing fuel is a euphemism for processing. Future spent nuclear fuel disposal scenarios in the ROD include "direct geologic repository disposal (in suitable containers) or processing followed by disposal." [ROD(1995)@30]

DOE, for the time being, appears to have backed away from building new high-level waste tanks described in the EIS, however processing startup will mandate it unless the State and EPA give DOE more extensions on the non-compliant existing tanks. The ROD leaves no doubt that DOE remains committed to rebuilding its nuclear fuel processing capability and that INL is one of its two designated supersites.

Section II. B. 1995 INL State/DOE Nuclear Waste Agreement

On October 17,1995 the long legal struggle between the State of Idaho and the Departments of Energy and Navy came to an end. However, the agreement on nuclear waste shipments to the Idaho National Laboratory (INL) and the removal of accumulated nuclear waste lacks the substance that most Idahoans hoped Governor Batt would have held out for.

Even former Governor Cecil Andrus weighed in with the critics, because the final agreement was significantly different from Batt's original offer that Andrus supported. Andrus' main concern was in the area of enforcement. He expressed serious reservations about whether those provisions in the Agreement would actually be enough to make the government keep its word after a generation of breaking it. The $60,000/day penalties stipulated in the agreement are "subject to the availability of the [Congressional] appropriations." [Batt(b)] Idahoans must remember that it is the present Congress that is trying to reinstate sovereign immunity back into the laws. The Republicans in Congress are writing language into the Superfund Reauthorization Act that exempt federal officials from fines and penalties for violating the law.

Andrus' main criticism was directed at Idaho's Congressional delegation, more specifically its senior Senator Larry Craig who left Batt with no choice but to cut what Andrus indicated was an unacceptable deal for the resumption of radioactive dumping in Idaho.

According to an Associated Press interview, Andrus stated that "I'm not going to second guess

Governor Batt." ... "But, I think what we have to do is look at how he found himself in the position of having to negotiate; and that was because Larry Craig did not give Idaho the support he should have." Andrus went so far as to say he believed Craig conspired with others wanting shipments to resume to make sure they did.

The most troubling part of the agreement is the State's requirement that, "DOE designate INL as the Department's lead laboratory for spent nuclear fuel." [Batt(b)] The agreement encourages and places no limits on the amount of spent fuel that can be sent to Idaho for processing. Specific expansion projects at the Naval Reactor Facility at INL are mandated " . . . to accommodate the removal of excess material and examination of Naval spent fuel in a dry condition." These "excess materials" are spent fuel parts that are removed to reduce the volume prior to storage/disposal. The Navy alone has dumped more than eight million curies of this excess material at the INL's Radioactive Waste Management Complex in shallow pits and trenches that would not meet municipal garbage landfill requirements. Since this material is part of the spent fuel element, it is extremely radioactive and requires remote handling and special shielded bottom dump shipping containers that allow the waste to be dropped into the burial ground without direct contact with workers. The recent agreement signed by Governor Batt will in fact increase INL's spent fuel processing volumes and proportionally the fuel element parts that are buried above the Snake River Aquifer. Nuclear Regulatory Commission regulations should be imposed on DOE and the Navy and require the entire spent fuel assembly to go to the repository.

In true pork-barrel style, the INL Agreement mandates " . . . for the fiscal 1997 no less than $7 million for the Navy to construct a Ships Model Engineering and Support Facility at the Naval Surface Warfare Center, Acoustic Research Detachment at Bayview, Idaho." Lake Pend Oreille residents have long fought that facility because of the restricted access to the lake. This appears to be a trade between a military instillation in the north and nuclear waste dump in the south of Idaho.

An equally troubling part of the Agreement is the statement that, "In any administrative or judicial proceeding, Idaho shall support the adequacy of the INL Environmental Impact Statement (EIS) and Record of Decision against any challenges by third parties." The State's previous success in court during the litigation phase was because it demonstrated that the EIS was fundamentally flawed. Yet there is no mention in the agreement to correcting those flaws. In fact, the State is now prepared to defend DOE against the Snake River Alliance suit that challenges the adequacy of the EIS. The Land and Water Fund of the Rockies is representing the Alliance in their suit.

The importance of the EIS cannot be overstated, because it is the only detailed plan that lays out what the government is going to do with its nuclear waste and how it is going to do it. The EIS is also an open process that allows for public participation and comment on its adequacy.

The waste agreement calls for DOE to "ship **ALL** Transuranic waste now located at INL, currently estimated at 65,000 cubic meters in volume to the Waste Isolation Pilot Plant no later than 2018." [emphasis added] The stated waste volume suggests that the state is only requiring DOE to ship Transuranic waste that is in storage and not the transuranic waste in the burial grounds. This is a serious shortcoming because it is the buried waste that is migrating into the aquifer and should be prioritized for being exhumed and prepared for shipment. The TRU waste buried and stored at INL's RWMC prior to 1984 that falls between the 10 and 99 curies per gram is currently and technically not TRU waste and therefore falls through a huge crack in the Governor's Agreement. DOE has taken full advantage of this loophole and rebury this former TRU waste at a new dump site at INL or simply put it back into the pit as in the Advanced Mixed Waste Treatment remediation where only 10% of the high-level/TRU waste is removed for shipment to WIPP. See Section IV.F below for more information on Radioactive Waste Management Complex Subsurface Disposal Area cleanup where the Advanced Mixed Waste Treatment Project (AMWTP) is located.

DOE is allowed under the agreement to ship foreign reactor fuel to INL under a national security and non-proliferation policy. On the surface, it is logical to keep this material out of the hands of rogue countries that have a history of terrorist activities. However, closer analysis of the countries shipping spent fuel to the US under this non-proliferation policy shows quite another picture. In descending order based on volume of spent fuel shipped, Canada, France, Japan, Netherlands, and Sweden rank as the top five. These top five countries represent nearly 75% of the total foreign shipment volumes. [AR-RF-1158] Idaho is faced with very serious problems just dealing with the waste already on the INL site. As a state, Idaho has shouldered more than its share of the Cold War legacy. Therefore, it is reasonable to expect that the above listed countries take responsibility for resolving their own nuclear

waste problems.

The waste agreement also allows DOE to bring off-site nuclear waste to INL for treatment prior to shipment to a non-Idaho waste repository. The same fundamental principles apply to off-site waste treatment as to accepting foreign waste. Generically speaking, waste treatment plants are incinerators that by definition will release volatilized radionuclides and chemicals out the stack. This may be unavoidable to get the on-site waste into a stable form that will not continue to migrate into the environment. However, Idahoans should not have to bear the burden of process emissions from other states or foreign country's waste. INL released more than 18.5 million curies of radioactivity into Idaho's air over the past 50 years. There are limits to the amount of a radioactive biological burden a given population can endure. On October 24, 1995 the Shoshone-Bannock Tribes blocked a shipment of Navy nuclear waste to the INL when they attempted to cross Indian lands. Tribal Chairman Dealbert Farmer stated:

"The State of Idaho and Governor Batt do not represent nor speak for the Shoshone-Bannock Tribes." "The State of Idaho had no authority to agree that any nuclear waste shipments would cross the Fort Hall Indian Reservation." "The Navy and the Department of Energy have never communicated with the Tribes to obtain permission to cross the Reservation." "The Shoshone-Bannock Tribes are very concerned about the stockpiling of nuclear waste at the INL, the aboriginal lands of the Shoshone-Bannock Tribes, and the 40-year period that the federal government has to remove the high-level waste from Idaho." "All of the waste, in and out of INL, will cross the Fort Hall Reservation." "When our ancestors signed the Fort Bridger Treaty of 1868, they reserved the Fort Hall Reservation as the permanent homeland of the Shoshone and Bannock people." "We are entrusted with the continuing obligation to uphold the Treaty and protect and preserve our lands and people." "The federal government, which has an Indian policy, must understand that we are here to stay and our concerns must be addressed." [Shoshone]

On October 26, 1995 the Tribes agreed to ten shipments crossing the reservation while negotiations proceed with DOE, Nuclear Navy, Department of Transportation, and Department of Justice.

The waste Agreement also gives DOE another 17 years to complete calcining (solidifying) the high-level liquid wastes at INL's INTEC/Idaho Chemical Processing Plant tank farm. This is an unnecessary and unsupportable delay. These single wall tanks are over 63 years old and pose the most serious health and safety hazard on the site. The previous volume of over two million gallons in eleven tanks represent a potential radioactivity content of 155.8 million curies. Extensive calcination and evaporator concentration of the Tank Farm has brought down the volume to 3 tanks containing a volume of ~900,000 gallons. INL's tank waste problem is similar to DOE's Hanford Nuclear Reservation tank problem. By State imposed DOE deadline of 2012 the tanks will be sixty years old. Their original design life of these single wall tanks was less than 30 years. If DOE was forced to prioritize the high-level liquid waste processing, the job could be completed in less than five years.

Also giving DOE forty years to remove all high-level waste only shifts these burdens on to future generations. The federal government broke every promise and contract it has ever made with the State of Idaho on nuclear waste. This includes the contract with the commercial nuclear utilities to take possession of their spent reactor fuel by 1998.

The agreement mandates [Section F(1)] the designation of "INL as the DOE's lead laboratory for spent fuel." This lays the policy/ infrastructure ground work that initially will be research and development but later will be a national nuclear waste processing center. This designation is also consistent with the Spent Nuclear Fuel Programmatic Environmental Impact Statement Record of Decision, which the agreement also specifically supports. [Section J(1)]

The Materials Fuels Complex formerly the Argonne-West (ANL-W) Electrometallurgical / Pyroprocessing Technology project, currently funded by Congress, is the first step in the direction in establishing this spent nuclear fuel processing capacity. Despite its official designation as a demonstration project, the pyro-processor is being built to full production scale. [See Section VI(L)]

The agreement [Section II.B)] sets no limits on importing spent nuclear fuel (SNF) to Idaho "after a permanent repository or interim storage facility is operating and accepting shipments of spent nuclear fuel from INL." Legislation introduced in Congress [HR-1020; S-1271][Craig's bill] promises to overrule regulatory requirements and State of Nevada objections in order to open the Yucca Mt. high-level repository and Monitored Retrievable Storage (MRS) facilities. This legislation mandates an MRS at

Yucca Mt. by the end of 1998. Therefore, if these bills pass, there will be no impediments to waste shipments to INL.

The need to process spent nuclear fuel to prepare it to meet yet to be determined waste repository acceptance criteria has no credible policy or technical basis. Former Governor Andrus was correct when he stated that spent fuel could be sent directly from the generator to the repository and it required no processing. Spent fuel processing also includes the removal of excess materials to reduce the volume prior to storage/disposal. The agreement, because it encourages increased spent fuel processing, will increase the volume of these spent fuel parts to be dumped in Idaho as is currently the case.

Unlimited processing of off-site Transuranic waste is also provided for in the Agreement [E(2)(a)]. "Any Transuranic waste received from another site for treatment at the INL shall be shipped outside of Idaho for storage or disposal within six months following treatment." The Agreement only mandates the removal/off-site disposal of **stored** Transuranic (TRU) waste at INL. The State and DOE are quick to say that the **buried** TRU waste is covered by the Federal Facility Agreement/ Consent Order (FFA/CO). This is true however, the FFA/CO only specifies that the burial grounds will be evaluated for re-mediation. There is nothing in the FFA/CO that requires that the buried waste be exhumed and shipped to a repository despite the fact that it is the buried waste that is contaminating the soil and groundwater. Recent Superfund Record of Decisions (SL-1 and BORAX-1 burial sites at INL) stipulate no re-mediation except for a thin soil/rock radiation shielding cover. This is indicative of DOE's unwillingness to dig up buried waste and the State/EPA's unwillingness to press for real cleanup. Notwithstanding the Pit-9 demonstration project that exhumed some of the contents of this one pit, there is no certainty that other pits, trenches and waste holes will be dug up. Indeed, the Congressional cuts to DOE's environmental restoration budget strongly indicate that no money will be available to fully remediate this dump site. The Pit-9 treatment facility will likely only be used later to treat off-site waste for future disposal in a repository if/when one is ever opened.

An even more troubling problem is the complete reliance by our public officials on the Waste Isolation Pilot Plant (WIPP) to solve all of the TRU waste disposal needs. The WIPP Land Withdrawal Act (Public Law 102-579-Oct. 30, 1992) and the subsequent 1998 Record of Decision specifically limits WIPP capacity to 6.2 million cubic feet (175,637 cm). DOE's 1994 Integrated Data Base Report [DOE/RW-0006.Rev.11] shows the following TRU waste inventories.

Commercial & DOE Complex TRU totals	141,000 cm	Buried
	104,000 cm	Stored
	137 cm	Stored remote handled
	245,137 cm	
WIPP Capacity	175,637 cm	
	69,500 cm	WIPP Capacity Short fall
INL TRU totals	57,100 cm	Buried
	64,800 cm	Stored Contact Handled
	80 cm	Stored Remote Handled
	690,000 cm	TRU Contaminated Soil*
	811,980 cm	INL TRU Total Inventory
WIPP Capacity	175,637 cm	
	636,343 cm	WIPP Capacity Short fall
DOE Complex TRU Estimate Inventories in the year 2020		
	105,000 cm	Current Stored Inventory
	154,000 cm	Newly Generated
	259,000 cm	TRU total in 2020

The above figures show that even with WIPP, there is not adequate capacity to take INL's TRU waste let alone the rest of the DOE complex volumes. If the contaminated soil is not included INL's TRU waste would dominate 70% of WIPP's capacity. The situation is even more serious when the estimated TRU inventories in the year 2020 are compared to the WIPP legally mandated capacity. Moreover, there is no national discussion to initiate the siting process

for another TRU waste repository. Due to accidents at WIPP in 2016, the site currently remains closed. The same capacity issues would have existed if the Yucca Mt. high-level waste repository in Nevada had ever opened where the total commercial and DOE inventories are far greater than the original design capacity.

Section II. C. Proposed New Reactors (By Tami Thatcher)

Small Modular Reactors

There are numerous Small Modular Reactors being designed; so far none have been licensed or built. DOE has "approved" of building one at INL called NuScale. SMRs are less than 300 megawatts and the hope is to offer shorter construction time tables, less up front financial risk, and economies from manufacturing in one location then transporting to the build site for final assembly. However, even Idaho's Line commission progress report in 2012 noted that SMRs economic viability is currently uncertain.

The Department of Energy has provided research money for SMRs and in 2012 began a program to provide licensing support. SMRs will be licensed by the US Nuclear Regulatory Commission.

Of numerous designs, the improved safety of a single SMR is unlikely to compensate for the higher risk of multiple units, each capable of meltdown. SMRs will be susceptible to accidents, terrorist acts, and do not address the problem spent fuel storage problem.

Tami Thatcher reports in EDI's newsletter [2] that: "The Idaho Falls Post Register reported on September 29, 2020 that the city of Kaysville, Utah, has withdrawn from the NuScale small modular reactor (SMR) project slated to be built at the Idaho National Laboratory.1It was reported on September 20 that the cities of Logan and Lehi, Utah, had also withdrawn. [3]

"The city of Kaysville, Utah is one of many member cities that are in the Utah Associated Municipal Power Systems (UAMPS). UAMPS's "Carbon Free Power Project" would put about 30 various member cities in Utah, California, Idaho, Nevada, New Mexico and Wyoming on the hook for the NuScale nuclear reactor rising estimated construction costs. UAMPS cities have until October 31 to exit the NuScale project.

"The Idaho Falls Post Register reported that the "Portland-based NuScale Power is designing the small modular reactors, which will produce 720 megawatts and which UAMPS plans to build at the DOE desert site west of Idaho Falls. The plant is expected to be operational in 2029." [4] 3

"The 720 megawatts (MW) figure assumes the facility has installed all twelve reactor modules and the modules are all running at full capacity of 60 MW. But the reality is that far less than 720MW would be generated. Initially only a few modules will be constructed—either that or NuScale will have to manufacture heat exchangers for all twelve modules, test them and hope the unique design for the heat exchangers was acceptable. So, while the NuScale facility could ultimately house twelve reactor modules, it would seem that only a few modules will be constructed and tested, perhaps redesigned and retested... for many years after the promised 2029 date.

"Another issue is that the NuScale's license application is only for 50 MW per module. A reactor license change would be required to uprate from 50 to 60 MW per module. And the newly proposed cooling tower fans are going to use more energy than more water intensive stay shutdown after inserting control rods. This and other NuScale safety problems indicate that uprating to 60 MW may not be a simple or inexpensive matter. The estimated benefits of assuming 60 MW per module seem to already be factored into electricity cost estimates. In addition, the NuScale design certification application was for conventional pressurized water reactor nuclear fuel of low enrichment, perhaps 3 or 4 percent. Promoters envision using 20

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[2] Tami Thatcher, Another UAMPS City Withdraws from Proposed NuScale Small Modular Reactor Project Proposed to be built at the INL, EDI newsletter October 2020, http://www.environmental-defense-institute.org/publications/News.20.Oct.pdf

[3] The Editorial Board, The Idaho Falls Post Register, "Editorial -City Council should remain committed to SMR project," September 20, 2020

[4] Nathan Brown, The Idaho Falls Post Register, "Kaysville withdraws from nuke project," September 29, 2020.

percent uranium-235 enriched fuel. What is now considered "high burnup fuel" in the commercial reactor industry is near 6 percent. The Idaho National Laboratory is making High Enriched Low Assay Uranium (HALEU) of roughly 20 percent enrichment from higher enriched fuel at the Materials and Fuels Complex and increasing the INL's annual radiological air emissions 170-fold in doing so. [5] It is likely that the many changes to the original NuScale design certification are going to be costly as well as time consuming. UAMPS signed on to purchase 150 MW. The Department of Energy signed on to purchase power from one module and lease another module for a research and testing. [6] When NuScale writes that the full twelve module facility would be capable of generating 720 MW, it unlikely that even half of 720 MW would be generated for many years after 2029 and until many design issues are resolved."

Traveling Wave Reactor

Research is being conducted for Bill Gates Terrapower Traveling wave reactor. The hype is impressive. The realities are that this fast reactor concept is unlikely to overcome the huge hurdles that billions of dollars spent worldwide have not.

TREAT Reactor Restart

The transient reactor test facility (TREAT) reactor is being refurbished for resumption of nuclear fuels testing at INL. The reactor's design allows testing materials to mimic accident conditions involving sodium-cooled systems. TREAT was first operated in 1959 and last operated in 1994. [7] [8]

Versatile Test Reactor (VTR)

The Department of Energy has announced a public scoping period for DOE/EIS-0542, which evaluates the potential environmental impacts of alternatives for a versatile reactor-based fast-neutron source facility (VTR) and associated facilities for preparation, irradiation, and post-irradiation examination of test and experimental fuels and materials. The DOE/EIS-0542: Notice of Intent is at https://www.energy.gov/nepa/downloads/doeeis-0542-notice-intent

The VTR would be a small (approximately 300 megawatt thermal), sodium-cooled, pool-type, metal-fueled reactor based on the GE Hitachi PRISM power reactor. DOE projects approval for the start of operations to occur as early as the end of 2026.

Under the INL VTR Alternative, DOE would site the VTR at the Materials and Fuels Complex (MFC) at INL and use existing hot-cell and other facilities at the MFC for post-irradiation examination. This area of INL is the location of the Hot Fuel Examination Facility (HFEF), the Irradiated Materials Characterization Laboratory (IMCL), the Experimental Fuels Facility (EFF), the Fuel Conditioning Facility (FCF), and the decommissioned Zero Power Physics Reactor (ZPPR).

The Department of Energy's Environmental Impact Statement (EIS) must evaluate its alternatives for a versatile reactor-based fast-neutron source facility and associated facilities with more realistic assumptions regarding the continued buildup of radionuclides in our food, water and air. The EIS must evaluate not only the least severe accidents that are considered "credible" but also the severe accidents that it may deem in theory to be "incredible." And the EIS cannot continue to poison workers and the public, and especially our children but deny the harm by using outdated and wrong radiation health models. The Department of Energy must address the existing buried waste at the INL as well as the high-level waste that DOE intends to "reclassify" so that it never leaves Idaho. The DOE must address its unsolved spent nuclear fuel and radioactive waste problems in the EIS as well as the creation of more spent fuel and radioactive waste by the VTR.

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[5] See the Environmental Defense Institute newsletter for January 2020 article "Idaho National Laboratory on Track to Escalate Airborne Radiological Releases by a Factor of 170," at http://www.environmental-defense-institute.org/publications/News.20.Jan.pd

[6] NuScalepower.com website https://www.nuscalepower.com/newsletter/nucleus-spring-2019/powering-the-next-generation-of-nuclear

[7] Thatcher, Tami see; http://www.environmental-defense-institute.org/inlrisk.html Comments on Draft Environmental Assessment for Resumption of Transient Testing of Nuclear Fuels and Materials, Tami Thatcher, 1/10/2014

[8] http://environmental-defense-institute.org/publications/TREATcommentsFINAL.pdf

See Tami Thatcher's Public Comment Submittal on the Department of Energy Scope of an Environmental Impact Statement for a Versatile Test Reactor, ID: DOE-HQ-2019-0029-0001 Comment submittal by Tami Thatcher, September 2, 2019. [9]

The Department of Energy includes as "Potential Environmental Issues for Analysis" the following (this is a partial list):

* Item 1: "Potential effects on public health from exposure to radionuclides under routine and credible accident scenarios including natural disasters: Floods, hurricanes, tornadoes, and seismic events."
* Item 2: "Potential impacts on surface and groundwater, floodplains and wetlands, and on water use and quality."
* Item 3: "Potential impacts on air quality (including global climate change) and noise."
* Item 4: "Potential impacts on waste management practices and activities." [10]

Tami Thatcher's comments [11] (items) above for adding necessary depth and realism for each of these are provided below:

Item 1: "Potential effects on public health from exposure to radionuclides under routine and credible accident scenarios including natural disasters

"For Item 1, first of all, many of the reactor meltdowns that have occurred worldwide have been deemed "incredible." Three Mile Island Unit 2's meltdown in 1979 was incredible. The Chernobyl nuclear power plant accident in the Ukraine was incredible. The Fukushima Daiichi Nuclear Power Plant meltdowns in Japan were incredible. So, for the Department of Energy to address only those reactor accidents that it deems "credible" is to leave out the most important severe reactor accidents and their horrendous consequences. The assessment of which accidents are "credible" has all too often been indefensibly overly optimistic because of the many ways that an accident can be caused.

"The EIS must include severe accident consequences even if DOE considers the accidents to be incredible. And while the VTR is characterized as a "small" reactor (approximately 300 megawatt thermal), other DOE materials testing reactors have posed high hazards because of the high enrichment and high burnup, the lack of a containment, lack of filtered release, the lack of well-designed and well-tested safety systems, and the uniqueness of the design that makes design and computational errors harder to detect. The EIS must also include the very lax regulatory environment of the Department of Energy which is even worse than the U.S. Nuclear Regulatory Commission. If this reactor was designed to proper seismic design standards for a reactor, it would be the first time in the history of the INL that this would be the case. Even when adequate seismic design hazards are identified, it requires more diligence than the DOE can muster to actually ensure that all safety equipment and structures are actually adequately designed to meet the designated seismic criteria. The EIS cannot simply assume that all equipment will be adequately designed.

"Second, when the severe reactor accidents for the VTR are considered, the economic consequences must also be included. In the past, the DOE has left out consideration of economic consequences of an accident because they knew how unpopular their projects would be if the public understood that they were literally risking the farm, their property and their livelihoods as well as their lives and health and the health of their children. And it is not acceptable to simply assume that people evacuate and don't eat contaminated food, drink contaminated water and breath contaminated air after the accident.

"Third, the radiation health models that ignore non-cancer health effects, that underestimate the cancer and non-cancer health effects are known to underestimate the health harm of routine and accident ionizing radiation exposure. The inadequacy of the health modeling could have been improved by conducting epidemiology at U.S. nuclear power plants, but no funding for the study was provided.

"**While the penetrating power of an alpha particle is low, the energy imparted to tissue when in the body is very high.** Many alpha emitters such as plutonium and uranium decay not only by alpha decay but also by beta and gamma emission. Beta particle monitoring is often particularly inaccurate.

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[9] http://www.environmental-defense-institute.org/publications/ScopeEISVTR.pdf

[10] Tami Thatcher comments on; ID: DOE-HQ-2019-0029-0001. Department of Energy: Notice of Intent To Prepare an Environmental Impact Statement for a Versatile Test Reactor. https://www.regulations.gov/docket?D=DOE-HQ-2019-0029

[11] Ibid.

Gamma ray monitoring is based on badges worn on the collar but the source of radiation may be beneath the workers feet as is the case when workers work over spent nuclear fuel pools. Workers at INL have also had neutron dose from the Materials Test Reactor neutron beam ad from concentrated fissile materials. Historical monitoring of neutron dose was inadequate.

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

- The cancer risk is not reduced when radiation doses are received in small increments, as the nuclear industry has long assumed. [12]
- Despite the repeated refrain that the harm from doses below 10 rem cannot be discerned, multiple and diverse studies from human epidemiology continue to find elevated cancer risks below 10 rem and from low-dose-rate exposure. [13]
- The adverse health effects of ionizing radiation are not limited to the increased risk of cancer and leukemia. Ionizing radiation is also a contributor to a wide range of chronic illnesses including heart disease and brain or neurological diseases.

"The public and radiation workers take cues from their management that they should not be concerned about the tiny and easily shielded beta and alpha particles. DOE-funded fact sheets often spend more verbiage discussing natural sources of radiation than admitting the vast amounts of radioactive waste created by the DOE. The tone and the meta-message from the DOE, the nuclear industry, is that if you are educated about the risks, then you'll understand that the risks are low. Yet, these agencies continue to deny the continuing accumulation of compelling and diverse human epidemiological evidence that the harm of ingesting radionuclides is greater than they've been claiming.

"The biological harm that ionizing radiation may cause to DNA is mentioned sometimes but it is emphasized that usually the DNA simply are repaired by the body. And the training to radiation workers will mention that fruit flies exposed to radiation passed genetic mutations to their offspring but workers are told that this phenomenon has never been seen in humans even though, sadly, the human evidence of genetic effects has continued to accumulate. Birth defects and children more susceptible to cancer are the result." [14]

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

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

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

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

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

[14] 2016 newsletter for Ian Goddard's summary and listing of important human epidemiology concerning low dose radiation exposure.

"The volatile or gaseous radionuclides, some of which can't be contained even with air filters — include technetium-99, tritium, carbon-14, iodine-129, argon-39, krypton-85, and radon-222 as the volatile radionuclides dominating the proposed Greater-Than-Class C radioactive waste disposal for the Andrews County, Texas facility. Often radionuclides with low curie levels dominate the disposal harm. **So, when DOE states an overall curie level without stating which radionuclides and their specific curie levels, neither the radiotoxicity nor the longevity of the radioactive waste has been indicated.**

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

"Plutonium-238, plutonium-239, and other transuranic radionuclides in radioactive waste in what appear to be low curie amounts can pose health harm and often dominant radionuclide ingestion doses from migration of the waste to groundwater. GTCC waste includes large amounts of transuranic waste. Only defense-generated transuranic waste approved for acceptance at WIPP can be shipped to WIPP for disposal.

"Cancer rates for uranium are typically based on natural forms for uranium and not chemically altered forms that may be more soluble in the human body. The internal radiation cancer harm is not based on solid epidemiological evidence and there are experts from Karl Z. Morgan to Chris Busby to Jack Valentine that understand that the accepted models may understate the cancer harm by a factor of 10, 100 or more. The nuclear industry continues to ignore the epidemiological evidence that implies tighter restrictions are needed. As you see the cancer mortality risk per picocurie in Table 9, you have to wonder why the disposal of uranium was unregulated and later inadequately regulated for many decades. Uranium dispersal from reactor accidents is typically ignored.

"Table 9. Survey of selected radionuclide inhalation and ingestion lifetime cancer mortality risk.

Radionuclide	**Lifetime Cancer Mortality Risk per pCi Inhalation**	**Lifetime Cancer Mortality Risk per pCi Ingestion**	**Notes**
Cesium-137	8.1E-12	2.5E-11	Strong gamma emission used in aerial surveys. Mimics potassium in the body. Studies of the Chernobyl accident indicate that it is associated with increased risk of blood disorders, cardiac arrhythmias, autoimmune diseases, neuromuscular diseases, reproductive problems and cancer.
Stronium-90	1.0E-10	7.5E-11	Mimics calcium in the body and is a tooth and bone seeker.
Iodine-129	6.2E-12	3.3E-11	Long-lived and mobile fission product found to dominate long-term harm when inhaled or ingested. Collects in thyroid
Technetium-99	1.3E-11	2.3E-12	Long-lived and mobile fission product found to dominate long-term harm when inhaled or ingested. Tc-99 collects in thyroid

Radionuclide	**Lifetime Cancer Mortality Risk per pCi Inhalation**	**Lifetime Cancer Mortality Risk per pCi Ingestion**	**Notes**
Americium-241	2.4E-8	9.5E-11	Bone seeker, see plutonium-239. Don't be misled by the 432 year half- life because it has many longer lived decay progeny.
Curium-242	1.4E-8	3.2E-11	See plutonium-239
Curium-242	2.3E-8	7.5E-11	See plutonium-239
Neptunium-237	1.5E-8	5.8E-11	See plutonium-239
Plutonium-238	3.0E-8	1.3E-10	See plutonium-239
Plutonium-239	2.9E-8	1.3E-10	ANL fact sheet says laboratory studies with experimental animals exposed to high levels of plutonium can cause decreased life spans, diseases of the respiratory tract, and cancer. Once in the blood stream, plutonium is highly retained in the body, especially in bone and the liver. Plutonium is associated with cardiovascular disease, leukemia, lung cancer, breast cancer, childhood cancers, infant mortality and transgenerational mutations. Uranium, plutonium, americium decay progeny ultimately result in an isotope of lead.
Uranium-234	1.1E-8	6.1E-11	See uranium-238. Uranium-234 is a decay product of uranium-238 and has a much higher specific activity, in curie per gram, than either U-235 or U-238.
Uranium-235	9.5E-9	6.2E-11	See uranium-238
Uranium-236	9.9E-9	5.8E-11	See uranium-238
Uranium-238	8.8E-9	7.5-E-11	Bone, kidney.

Radionuclide	Lifetime Cancer Mortality Risk per pCi Inhalation	Lifetime Cancer Mortality Risk per pCi Ingestion	Notes
			ANL Fact Sheet states: "reproductive effects in laboratory animals and developmental effects in young animals…" Uranium is associated with cancer, miscarriage, still births, childhood cancers, birth defects, infertility, brain disorders, kidney disease and trans-generational mutations. Spent nuclear fuel is usually over 90 percent unfissioned uranium. Uranium is released in reactor accidents and nuclear weapons testing, yet is rarely mentioned or monitored.
Radium-226	2.4E-8	2.9E-9	Radium-226 is a decay product of uranium-238 or plutonium-238 or uranium-234 or thorium-230. Mimics calcium in the body and is stored in bone and teeth
Table source of information: Argonne National Laboratory, EVS, Human Health Fact Sheet, August 2005 at https://www.remm.nlm.gov/ANL-ContaminationFactSheets-All-070418.pdf Source used by ANL was Federal Guidance Report 13, U.S. Environmental Protection Agency, 402-R-99-001, September 1999. Picocurie is 1.0E-12 curies. Lifetime cancer mortality risk ignores cancers that were caused but not the cause of death, ignores non-cancer illnesses such as increased risk of heart disease, and ignores genetic effects. Alpha emitters (from most uranium, plutonium and curium radionuclides) are more able to cause double-strand DNA breaks that are mis-repaired.			

"Item 2: "Potential impacts on surface and groundwater, floodplains and wetlands, and on water use and quality"

"The DOE along with the Idaho Department of Environmental Quality are pretending they don't know the source of radiological contamination — even when they do know. The public drinking water laws require periodically monitoring for gross alpha levels in drinking water. If the levels of gross alpha are high enough, often even, then the evaluation of uranium and radium levels are required. But often, in Idaho's public drinking water, the intermittently elevated levels of gross alpha are not explained by naturally occurring uranium and thorium. The regulations actually make it impossible to answer what radionuclides are in the water because methods to use gamma spec analysis have not been delineated for public drinking water use. Public water drinking municipals lose profits when laboratory sampling requirements are increased.

"The intermittently elevated levels of gross alpha in the southwestern portion of the state have been identified in public drinking water sampling and some studies have been conducted. But from what I see, no analysis has seriously tried to answer what the source of the radioactivity is. I say this because no trending over time of radionuclides has been conducted. No identification of all radionuclides in soil and water has been published. No assessment of the potential sources of the radioactivity have been identified. Basically, the Idaho DEQ actively fails to be curious about and seek the answers. Is it the airborne FUSRAP radionuclides? Is it from historical INL aquifer injection wells and percolation ponds that disposed of large amounts of "low-level" waste?

"After contacting the Idaho Department of Environmental Quality to ask why the drinking water on the southwestern side of the state is so radioactive, the Idaho DEQ could not identify anyone at the agency who understood the issue. But the Idaho DEQ did say that there was a report on its website that

looked at the issue. It was implied that the report solved the mystery.

"The report 'Isotopic and Geochemical Investigation into the Source of Elevated Uranium Concentrations in the Treasure Valley Aquifer, Idaho,' in 2011 [15] does look at the issue — but does not identify the source of the elevated radioactivity. The report confirms the widespread occurrence of sometimes very high uranium concentrations, up to 100 micrograms/liter. The report does conclude that the source is not from agricultural fertilizer. The report suggests that the source is a near-surface source of contamination.

"The mystery is not solved by the report and the report does not conclude that the source of the elevated uranium is natural. The report simply concluded that more work was needed — and there is no evidence that any work has continued since 2011.

"There is another effort afoot to study the issue by Boise State University but so far it has not provided any answers. [16] It states that "The Treasure Valley Aquifer System (TVAS) in western Idaho contains documented uranium and arsenic concentrations, up to 110 microgram/liter and 120 micrograms/liter, respectively…" And "The contaminants historically show elevated concentrations with high spatial variability throughout the region."

"See also our Environmental Defense Institute February newsletter article "What's Up With The Radionuclides in Drinking Water Around Boise, Idaho?" [17]

"The CERCLA cleanup at the Idaho National Laboratory is leaving behind roughly 55 "forever" radioactively contaminated sites of various sizes, and about 30 "forever" asbestos, mercury or military ordnance sites. [18] The areas contaminated with long-lived radioisotopes that are not being cleaned up will require institutional controls in order to claim that the "remediation" is protective of human health. People must be prevented from coming into contact with subsurface soil or drinking water near some of these sites — forever.

"The Department of Energy downplays the mess and usually doesn't specify how long the controls are required when the time frame is over thousands of years: they just say "indefinite." In some cases, the DOE earlier had claimed that these sites would be available for human contact in a hundred or so years.[19] [20] You can find a summary that includes the "forever" sites at https://cleanup.icp.doe.gov/ics/ic_report.pdf

"Institutional control of "forever" contamination means they put up a sign, maybe a fence or a soil cap — and assume it will be maintained for millennia. "Don't worry about the cost. And besides," they always add, "you and I won't be here." The DOE acknowledges that the soil cap they plan to put over the RWMC will require maintenance, basically annually, for millennia.

"DOE continues to find more contaminated sites and expectations are not always met by

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[15] Brian Hanson, Dr. Shawn Benner, Dr. Mark Schmitz, Dr. Spencer Wood, Department of Geosciences, Boise State University., "Isotopic and Geochemical Investigation into the Source of Elevated Uranium Concentrations in the Treasure Valley Aquifer, Idaho," Submitted to the Idaho Department of Environmental Quality, April 2011. http://www.deq.idaho.gov/media/563327-uranium_treasure_valley_0411.pdf listed at http://www.deq.idaho.gov/regional-offices-issues/boise/water-quality-plans-reports/

[16] Gus Womeldorph and Shawn Benner, Boise State University, "A Study of Uranium and Arsenic in the Treasure Valley Aquifer System, Southwestern Idaho, Year 1, 2017-2018," 2018 at https://www.idwr.idaho.gov/files/publications/201807-GWQ-GW-Study-of-Uranium-in-TV-Aquifer-System.pdf

[17] Gus Womeldorph and Shawn Benner, Boise State University, "A Study of Uranium and Arsenic in the Treasure Valley Aquifer System, Southwestern Idaho, Year 1, 2017-2018," 2018 at https://www.idwr.idaho.gov/files/publications/201807-GWQ-GW-Study-of-Uranium-in-TV-Aquifer-System.pdf

[18] Gus Womeldorph and Shawn Benner, Boise State University, "A Study of Uranium and Arsenic in the Treasure Valley Aquifer System, Southwestern Idaho, Year 1, 2017-2018," 2018 at https://www.idwr.idaho.gov/files/publications/201807-GWQ-GW-Study-of-Uranium-in-TV-Aquifer-System.pdf

[19] Department of Energy Idaho Operations Office, *Five-Year Review of CERCLA Response Actions at the Idaho National Laboratory Site,* Fiscal Years 2010-2014, DOE/ID-11513, December 2015.

[20] Federal Facility Agreement and Consent Order New Site Identification (NSI), "TRA-04: TRA-712 Warm Waste Retention Basin System (TRA-712 and TRA-612), NSI-26002. Signed by the Department of Energy in August of 2015. See Idaho National Laboratory Federal CERCLA Cleanup documents at www.ar.icp.doe.gov

remediation. [21] And the DOE has never stopped burying long-lived radioactive waste over the Snake River Plain aquifer.

"Frequently cited stringent EPA standards such as 4 rem/yr. in drinking water are emphasized. But cleanup efforts often won't come close to achieving the advertised standards.

"Item 3: "Potential impacts on air quality (including global climate change) and noise."

"For Items 2 and 3, we here in Idaho have been experiencing the continuing pollution of our water and air with long-lived radionuclides resulting from the Idaho National Laboratory and other waste disposal operations. The monitoring of both water and air has been inadequate. Even so, there are unacknowledged buildups of radionuclides in our water and air that are not the result of historical nuclear weapons testing.

"The State of Idaho made this law change, effective spring of 2019 after the adjournment of the Idaho Legislature, to IDAPA 58 – Department of Environmental Quality, 58.01.01 – Rules for the Control of Air Pollution in Idaho, Docket No. 58-0101-1801. [22]

"The law had included since 1995 a provision for radionuclides. But this section of the clean air law **has now deleted** the following text:

> *xvi. Radionuclides, a quantity of emissions, from source categories regulated by 40 CFR Part 61,Subpart H, that have been determined in accordance with 40 CFR Part 61, Appendix D and by Department approved methods, that would cause any member of the public to receive an annual effective dose equivalent of at least one tenth (0.1) mrem per year, if total facility- wide emissions contribute an effective dose equivalent of less than three (3)mrem per year; or any radionuclide emission rate, if total facility-wide radionuclide emissions contribute an effective dose equivalent of greater than or equal to three (3) mrem per year.(5-1-95)*

"Given the increasing levels of airborne radiological contamination occurring on the lower west Boise-side and the lower east Idaho National Engineering-side of Idaho, this law change certainly is not about protecting human health and the environment.

"The source of increasing radioactive contamination on the Boise side of the state is not being investigated by the Idaho Department of Environmental Quality. The ongoing importation of radioactive waste from around the country to the US Ecology Idaho Grandview site appears to have a role in the increasing airborne radiological contamination. Some of this radioactive waste is from Formerly Utilized Sites Remedial Action Program (FUSRAP) sites around the United States contaminated from the early years of nuclear weapons production and the atomic energy program.

"The last 20 plus years the gyrating levels of gross alpha and gross beta (when sampled) in Boise area drinking water, from Kuna to Boise, and Murphy to Marsing, are not from naturally occurring uranium and thorium in the soil. [23] The report "Isotopic and Geochemical Investigation into the Source of Elevated Uranium Concentrations in the Treasure Valley Aquifer, Idaho," in 2011 [24] does look at the issue — but does not identify the source of the elevated

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[21] US Department of Energy, "Environmental Assessment for the Replacement Capability for Disposal of Remote- Handled Low-Level Radioactive Waste Generated at the Department of Energy's Idaho Site," Final, DOE/EA- 1793, December 2011. http://energy.gov/sites/prod/files/EA-1793-FEA-2011.pdf

[22] 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

[23] Environmental Defense Institute newsletter article for October 2018, "Idaho DEQ Reports Concerning the Elevated Radioactivity in Drinking Water in the Boise Area Don't Identify the Source of the Radioactivity."

[24] Brian Hanson, Dr. Shawn Benner, Dr. Mark Schmitz, Dr. Spencer Wood, Department of Geosciences, Boise State University., "Isotopic and Geochemical Investigation into the Source of Elevated Uranium Concentrations in the Treasure Valley Aquifer, Idaho," Submitted to the Idaho Department of Environmental Quality, April 2011. http://www.deq.idaho.gov/media/563327-uranium_treasure_valley_0411.pdf listed at http://www.deq.idaho.gov/regional-offices-issues/boise/water-quality-plans-reports/

radioactivity.

"The report confirms the widespread occurrence of sometimes very high uranium concentrations, up to 100 micrograms/liter.

"Item 4: 'Potential impacts on waste management practices and activities.'

"Item 4: The nation faces huge unresolved problems of storage and disposal of its spent nuclear fuel, of its high-level waste, of its Greater-Than-Class C low-level radioactive waste, of its depleted uranium waste, of plutonium waste, of low-level waste, of its below regulatory concern radioactive waste that is clouding the Idaho skies from disposal at the U.S. Ecology Grandview RCRA facility, as well as from past uranium mining, milling, and other uranium fuel production activities, and from uranium enrichment plants. To propose making more radioactive waste when the existing radioactive waste problems remain unsolved is foolish. The U.S. Nuclear Regulatory Commission also knows that any reactor accident produces enormous amounts of radioactive waste. After Fukushima, bags of ordinary substances like leaves were radioactive waste that lacked a disposal site. The U.S. NRC's desire is to make ordinary municipal landfills welcoming to radioactive waste disposal.

"To continue to point to the Yucca Mountain EIS as the disposal solution is unacceptable, as other Department EIS documents continue to rely on a non-existent facility.

"To fail to address the aging management issues and safety issues of pool storage and/or dry storage of spent nuclear fuel over the extended time periods that we may lack a disposal solution is also unacceptable.

"The Department of Energy, in addition to not having a spent fuel disposal facility has made a practice of shallow burial of radioactive waste over the Snake River aquifer **and using deceptive public relations statements to create the illusion of a satisfactory cleanup of buried waste.**

"I submitted a question to the Idaho Cleanup Project Citizens Advisory Board meeting asking how many curies of americium-241 would remain buried after the final exhumation of the Accelerated Retrieval Projects end. There are many other radionuclides that will remain buried, but I wanted to make the question manageable. The Department of Energy responded with stunning obfuscation.

"Question submitted to ICP CAB: Now that the Idaho Cleanup (Project) is on the last Accelerated Retrieval Project (ARP IX) to exhume buried waste, how many curies of Americium-241 are remaining buried at the Subsurface Disposal Area (SDA)?

"Answer from the Department of Energy*: The performance objective for targeted waste retrieval was established in a record of decision agreed to by the regulators that states: "Completion of targeted waste retrieval will be measured by the volume of targeted waste retrieved. A minimum volume of targeted waste of 6,238 m3 will be retrieved from a minimum of 5.69 acres…, with the need for additional retrievals, if necessary, determined pursuant to CERCLA." Therefore, the performance objective is based on the volume of targeted waste removed, not the removal of Am-241 curies from the SDA. (*DOE's response are posted on the CAB website: https://www.energy.gov/em/icpcab/recently-asked-questions)

"The actual answer is, according to DOE's own documents, 215,000 curies of americium-241 will remain buried over the Snake River Plain Aquifer. This would take 6 Snake River Plain aquifers to dilute to drinking water standards, assuming 2.44E15 liters in the aquifer and the federal drinking water standard of 15 picocuries/liter.

"In fact, over 90 percent of the americium-241 is remaining buried, of 230,000 curies of americium-241, after completing buried waste exhumation, an estimated 215,000 curies will remain buried

according to composite analysis calculations. [25] [26] [27]

"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. A partial inventory of the radionuclides in the buried waste at the Radioactive Waste Management Complex, what will be buried at its replacement facility, in high-level calcine and liquid sodium-bearing waste from reprocessing stored at the INL is provided in Table 2.

"Table 2. Calcine bin set and Sodium-Bearing waste radionuclide partial inventory comparison to the waste that will remain buried at RWMC and at the replacement for RWMC.

Radionuclide (half-life)	**Calcine Inventory (curies)**	**Sodium-Bearing Waste Inventory (curies)**	**Buried (existing) RWMC Inventory (curies)**	**Buried (future) Replacement RH-LLW Inventory (curies)**
Carbon-14 (5730 year)	0.038	5.7E-4	731	432
Chlorine-36 (301,000 year)	0	?	1.66	260
Iodine-129 (17,000,000 year)	**1.6**	0.01	0.188	0.133
Technetium-99 (213,000 year)	**4600**	94.6	42.3	16.7
Neptunium-237 (2,144,000 year)	**470**	1.74	0.141	0.003
Uranium-232 (68.9 year)	1.6	?	10.6	0.00036

[15] 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

[16] 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/

[17] 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

Uranium-233 (159,000 year) Product bred from U- 235 and thorium, also decay of Np-237	0.057	0.036	2.12	0.0001
Uranium-234 (245,500 year) Pu-238 decay product	**130**	5.33	63.9	0.0012
Uranium-235 (703,800,000 year)	**3.2**	0.127	4.92	0.005
Uranium-236	**11**	2.23E-5	1.45	0.0001

Radionuclide (half-life)	**Calcine Inventory (curies)**	**Sodium-Bearing Waste Inventory (curies)**	**Buried (existing) RWMC** **Inventory (curies)**	**Buried (future) Replacement RH-LLW Inventory (curies)**
(23,400,000 year) Pu-240 decay product				
Uranium-237 (0.0185 year to Np- 237)	**1.5**		-	-
Uranium-238 (4,470,000,000 year)	3.1	0.125	148	16.2
Thorium-228 (1.92 year to radium- 224) Natural thorium decay and Pu-240 decay product	1.6	?	10.5	-
Americium-241 (423 y decays to Np- 237)	12,000	316	**215,000**	0.38
Plutonium-238 (87.7 year)	**110,000**	3900	2080	-
Plutonum-239 (24,000 year)	**48,000**	410	64,100	-
Curium-244	?	1.36	?	?

"* Calcine inventory from DOE/EIS-0287; RWMC buried waste inventory from DOE/NE-ID-11243/11244 (figures cited may not be the latest estimates) and RPT-1267; replacement remote-handled facility INL-EXT-11-23102.

"**__Bold__ highlighting of calcine inventory indicates a similar or larger inventory than the buried RWMC waste. The RWMC buried waste is estimated by the DOE to yield 100 mrem/yr. doses in drinking water for millennia unless a perfect soil cap limits the estimated doses to be 30 mrem/yr. Importantly, the inevitable spikes in contamination due to flooding have not been accounted for despite RWMC flooding in 1963 and 1969. The dose estimates are not conservative. The assumed dilution factors are not consistent with past INL aquifer contamination migration.

"Calcine migration Kd coefficients may be different than used for RWMC and may worsen the effect of calcine in the soil.

"Notes continued from above table
*** Sodium-Bearing Waste inventory decayed to 2012 from Sandia National Laboratories, "Evaluation of Options for Permanent Geologic Disposal of Used Nuclear Fuel and High-Level Radioactive Waste Inventory in Support of a Comprehensive National Nuclear Fuel Cycle Strategy," FCRD-UFD-2013-000371, SAND2014-0187P; SAND2014-0189P. Revision 1. 2014. For Sodium-Bearing Waste radionuclides not listed in FCRD-UFD-2013-000371, EDF-6495 values from 2007 are provided for C-14, Tc-99, and I-129. Other radionuclides in the Sodium-Bearing Waste, typically of shorter half-life, are not listed in this table.

"In addition to this refusal to state the amount of radioactive waste that is remaining buried is **the promotion of untrue claims at the April 25, 2019 Idaho Cleanup Project Citizens Advisory Board meeting in Twin Falls by the Department of Energy and the U.S. Geological Survey that the inter-sedimentary beds of soil beneath the buried waste will stop the contaminants from entering the aquifer.** This simply is not true, or why would the aquifer already have exceeded the federal drinking water standard for carbon tetrachloride?

"It is also important to note that the buried waste is heavily laden with chemical solvents of various types and this decreases the sorbing properties of radionuclides like plutonium. [28] The ability of radionuclides such as plutonium-239 to sorb to soil rather than migrate to the aquifer is already overly optimistically modeled in DOE's estimates of contaminant migration, but does not assume the waste is stopped from reaching the aquifer by inter-sedimentary beds.

"The EIS must address the continued failure to solve the existing spent nuclear fuel nationwide. At the INL, the buried waste that is not planned to be exhumed and the Department of Energy's modeling of the migration of this waste is not technically sound. Furthermore, the DOE has no plans to remove from Idaho the calcine and sodium bearing waste, following its upcoming "reclassification."

"Existing radiological waste problems as well as newly created radiological waste issues at any proposed VTR site alternative need to be addressed. Failing to solve the waste storage and disposal issues ought to be enough reason to **stop making more radioactive waste**, which is the only sure outcome of the VTR project." [29]

Statement of Peter A. Bradford At Utah Taxpayers Association News Conference Warning of Likelihood of Extreme Electric Rate Increases Resulting from Premature and Risk-riddled Commitments to Secretive and Unproven NuScale Reactor Project.

"Fifty years dealing with nuclear cost overruns and mismanagement, have familiarized me with the basic characteristics of troubled projects, of which the nuclear industry has all too many. Let's start by reviewing the most recent example, the expensive dog on which UAMPS is the tail.

"That would be the "nuclear construction renaissance", or "nuclear renaissance" launched twenty years ago on a tidal wave of press releases as well as state and federal subsidies – all that the industry asked for in fact. The promise of that time was that innovative new designs with modular features coupled with a streamlined federal licensing process would reduce costs and enable nuclear power to fulfill its oft deferred promise to become the nation's most economical nonpolluting electrical source, essentially the vision that Nuscale offers to UAMPS today.

"Several southeastern states signed up enthusiastically, entering into arrangements that locked their customers into long term nuclear commitments and froze out opportunity to take advantage of other cheaper technologies that might become available. That renaissance is now an expensive ruin. Twenty-nine of the thirty-one applications that were pending or scheduled at the NRC in 2009 are cancelled or indefinitely deferred. The two units staggering toward a much- delayed completion are hitting exasperated Georgia customers with cost overruns exceeding $10 billion. The greatest fiasco is in South Carolina, where the bankruptcy of nuclear industry mainstay Westinghouse left the state with a $9 billion hole in the ground mostly to be paid for by the customers who will get no electricity on return.

"Other cancelled projects also ran up billion-dollar tabs without adequate or clear-cut customer and

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[28] *A Global Guide to Nuclear Weapons Production and its Health and Environmental Effects*, By a Special Commission of International Physicians for the Prevention of Nuclear War and The Institute for Energy and Environmental Research, The MIT Press, 1995. P. 253 Scientists found the migration of plutonium at the Savannah River Site had migrated to groundwater within 20 years, not the predicted migration time of hundreds of thousands of years. The presence of solvents is thought to have contributed to the rapid migration of contaminants.

[29] Tami Thatcher comments, ID: DOE-HQ-2019-0029-0001. Department of Energy: Notice of Intent To Prepare an Environmental Impact Statement for a Versatile Test Reactor. https://www.regulations.gov/docket?D=DOE-HQ-2019-0029

taxpayer safeguards. We are 20 years into the nuclear renaissance now, and not one single molecule of carbon in the U.S. has been displaced by a new reactor. That's twenty lost years and more than 20 billion lost dollars in the fight against climate change. Had that money and time been allocated among renewable options, energy efficiency, load management and storage options according to competitive procurement and resource planning processes that we know how to run, the savings would have been large, the electricity cheap and the new jobs plentiful.

"In an era of reexamined monuments nuclear history too has many lessons beyond the nuclear renaissance to offer – the Washington Public Power Supply System led an entity not unlike UAMPS to precipitate the largest municipal bond default in U.S. history; Shoreham in New York cost $5billion and never generated a single kilowatt hour; the "stranded costs" in nuclear plants paid off by customers in the 1990s exceeded $50 billion dollars; among the prototypes dependent on federal subsidy, Fort St. Vrain in Colorado, Clinch River in Tennessee and West Valley in New York all collapsed when federal priorities changed and the support dried up.

"Throughout my 50 years of regulating and teaching about the nuclear industry, another constant is that each period of abject failure is followed by an array of new design proposals said to be very different from the wreckage lying in plain sight around us. All 31 of the renaissance reactors were new designs, some of them modular. The new features were indeed improvements, but they caused problems of their own, both in construction and in licensing.

"We have already seen some new designs – including Bill Gates's much ballyhooed original Traveling Wave" and the Transatomic Power molten salt design embraced at MIT – drop out. There will be more. The development of untried new designs is no place for small utilities with no nuclear construction experience to risk their customers' money, especially with money for essential commodities as tight as it is right now and demand for electricity likely to fall well below past projections for at least several years.

"To make matters worse, serious issues of candor and transparency are arising with the NuScale project and throughout the nuclear industry. In Utah, UAMPS uses a freedom of information act exemption to prevent public scrutiny of its ever-changing cost and schedule projections. Across the country, nuclear executives and their legislative and other governmental allies are doing embarrassing perp walks as a result of proceedings where nuclear licensees apparently sought approvals through secrecy and bribes that they could not obtain through open and honest processes.

"The root cause, as long as we are not talking about safety, is always the same. Nuclear power is far more expensive than competitive technologies, even competitive low carbon technologies. If state and local governments accept that their power procurement decisions have vital, tax-like impacts on electricity prices, they will make their policy reviews – including the prices and impacts of alternatives - subject open and honest review. But experience shows that nuclear power doesn't prevail in open and honest competition, so it avoids it wherever possible, and by any means necessary.

"Companies, officials, and nuclear consortia that won't accept open and honest review can't be trusted. Their record of blending incompetence, arrogance, corruption and economic ruin stretches back more than half a century. Their record is too clear and too consistent for Utah to walk down the same woeful and expensive path." [30]

See Tami Thatcher's NuScale Small Modular Reactor Site at the INL Announced Environmental Defense Institute Newsletter September 2016 and January 2020 for more details. [31]

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[30] Peter Bradford is a former member of the U.S. Nuclear Regulatory Commission who served as chair of both the New York Public Service Commission and the Maine Public Utilities Commission. He has been an expert witness in many cases involving nuclear power economics, and he has taught Nuclear Power and Public Policy at the Vermont Law School as well as Energy Policy and Environmental Protection at the Yale School of the Environment.

[31] http://www.environmental-defense-institute.org/publications/News.20.Jan.pdf

Section II.D. Pyro-processing of Spent Reactor Fuel

The report by *A Global Guide to Nuclear Weapons Production and its Health and Environmental Effects States:*

> "The development of a head-end processing step for spent oxide fuel that applies to both aqueous and pyrometallurgical technologies is being performed by the Idaho National Laboratory, the Oak Ridge National Laboratory, and the Korean Atomic Energy Research Institute through a joint International Nuclear Energy Research Initiative. The processing step employs high temperatures and oxidative gases to promote the oxidation of UO2 to U3O8. Potential benefits of the head-end step include the removal or reduction of fission products as well as separation of the fuel from cladding. The effects of temperature, pressure, oxidative gas, and cladding have been studied with irradiated spent oxide fuel to determine the optimum conditions for process control. Experiments with temperatures ranging from 500oC to 1250oC have been performed on spent fuel using either air or oxygen gas for the oxidative reaction. Various flowrates and applications have been tested with the oxidative gases to discern the effects on the process. Tests have also been performed under vacuum conditions, following the oxidation cycle, at high temperatures to improve the removal of fission products. The effects of cladding on fission product removal have also been investigated with released fuel under vacuum and high temperature conditions. Results from these experiments will be presented as well as operating conditions based on particle size and decladding characteristics." [32]

There are three blanket treatment alternatives that are still feasible, but they all have technical and/or implementation risks. Since no one alternative is clearly preferable, it would be prudent to fund activities related to each alternative to reduce the risks as follows:

- "Reduce the risks associated with Electrometallurgical Treatment EMT by completing the treatment of driver fuel as quickly as possible and concurrently supporting the development of process improvements to increase blanket throughput.
- "Reduce the risks associated with Melt, Drain, Evaporate, Calcine (or Carbonate) MEDEC by additional testing on whole blanket elements and by determining the bounding radiation source strengths of the two generations of EBR-II blanket materials.
- "Reduce the risks associated with direct disposal without sodium removal by engaging the DOE program responsible for evaluating potential SNF and high-level waste repositories, to encourage them to include bond sodium reactivity as part of their repository safety evaluations and performance assessments."[33] [EBR-II Blanket Disposition Alternatives, Pg. 9, TEV-2200]

According to Materials and Fuels Operators Correspondence:

"**We received 1240 elements of sodium bonded [Fast Flux Test Facility] FFTF fuel, having a mass of approximately 300 kg, heavy metal. 250 of the 300 kgs was irradiated, the remaining 50 kgs were never placed in the reactor.** The fuel was sent here in 11 shipments commencing in October 2007 and concluding in May 2008. The majority of the fuel received was arranged as intact assemblies requiring disassembly prior to processing. Processing of the irradiated material via the Electrometallurgical Treatment (EMT) process set up in [Fuel Cycle Facility] FCF commenced September 2010 and completed in September 2011. Nearly 220 kgs of the 250 kgs received were processed in 24 batches. The remaining 30 kgs have been set aside to support further research and examination. Uranium from the process has been recovered, down blended and placed into interim storage pending future disposition. Disposition opportunities for this material include use as potential feedstock for Light Water Reactor fuel, or as fuel feedstock for advanced reactor designs that may incorporate uranium fuel designs having increased enrichment. [emphasis added] [34]

[Materials and Fuels Complex, Nuclear Material Management Status, Data on Fast Flux Test Facility (FFTF) SNF brought to INL, January 17, 2013 FFTF Press Release 10-24-11.pdf]

"The effects of temperature, pressure, oxidative gas, and cladding have been studied with irradiated spent oxide fuel to determine the optimum conditions for process control.

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[32] K.J. Bateman, et.al., Effect of Process Variables During the Head-End Treatment of Spent Oxide Fuel, International Pyroprocessing Research Conference, 2006, INL/CON-06-11605

[33] EBR-II Blanket Disposition Alternatives, Pg. 9, TEV-2200

[34] Materials and Fuels Complex, Nuclear Material Management Status, Data on Fast Flux Test Facility (FFTF) SNF brought to INL, January 17, 2013 FFTF Press Release 10-24-11.pdf

Experiments with temperatures ranging from 500oC to 1250oC have been performed on spent fuel using either air or oxygen gas for the oxidative reaction.

"The equipment utilized for testing consists of a fuel containment vessel, a cylindrical furnace capable of operation to 1050oC, and a gas delivery/collection system, see Fig 1. The containment vessel has been specifically adapted for this program so that both a vacuum can be applied and oxidative gas can be regulated during a run. A more detailed description of this equipment can be found elsewhere.

"Irradiated testing with spent oxide fuel is performed in the Hot Fuel Examination Facility (HFEF) located at the INL. The HFEF is an inert shielded hot cell requiring remote-handled operations. With the exception of the oxidative gas cylinder, all the components of the equipment are located in the HFEF argon cell.

"The spent oxide fuel used for testing originated from the Belgium Reactor-3 (BR-3), a pressurized water reactor located in Mol, Belgium. The BR-3 fuel tested has a typical burnup of ~37 GWd/t with a 25 year decay time and zircaloy-4 type cladding." [35]

Section II. E. Environmental Assessment on Materials and Fuels Complex (MFC) Pyroprocessing

DOE released a Draft Environmental Assessment Electrometallurgical Treatment Research and Demonstration Project in Fuel Conditioning Facility at MFC (formerly called Argonne National Laboratory-West (ANL-W)) in January 1996. DOE is continuing to violate the National Environmental Policy Act (NEPA) by not conducting the required Environmental Impact Statement (EIS). The Environmental Assessment (EA) does not legally fulfill NEPA requirements. Without prejudicing the Environmental Defense Institute's (EDI) finding the EA inadequate, EDI supports the third alternative; "taking no action, placing all the EBR-II SNF in interim storage, and not demonstrating the electrometallurgical treatment technology".

Idahoans are outraged at DOE's subterfuge of using waste management as a guise to rebuild its special nuclear materials production capacity. No credible scientific analysis has been offered by DOE to show that EBR-II spent nuclear fuel (SNF) cannot be safely stored in interim monitored storage facilities or in long-term repositories.

DOE's own Spent Nuclear Fuel Vulnerability study shows no hazards related to EBR-II fuel storage other than decrepit facilities that are operating beyond their design life. Long-term underwater storage of **any** SNF will result in cladding failure. Even after DOE knew that a geologic repository was not going to be available for decades, the Department failed to move SNF from the wet storage to dry storage. Fuel cladding failure in inadequate storage facilities like CPP-603 was not unique to EBR-II fuel. SNF cladding failures are an indictment of DOE's own mismanagement of its wastes.

MFCR has a twenty-year history of safe dry storage of EBR-II fuel at Hot Fuel Examination Facility (HFEF). MFCR claims that "only a few" elements are stored at HFEF and that they do **not** represent a "statistically significant sample". DOE's Spent Fuel Working Group Report cites 90 EBR-II assemblies in storage at HFEF which **is** a statistically significant sample. This same report states that EBR-II stainless steel clad fuel stored at the Radioactive Scrap and Waste Facility (RSWF) "are not breached". Vulnerabilities cited in the report were related to inadequate storage areas including the RSWF. Idaho Division of Environmental Quality issued a Notice of Violation on the RSWF October 20, 1995. MFCR has cut corners with its underground fuel storage. The RSWF is a crude soil vault that lacks the corrosion control and essential monitoring features of above ground dry casks. Therefore, DOE's claims of EBR-II SNF vulnerabilities that are greater than many other fuel types is unsubstantiated. The EA claims an inventory of only 330 blanket assemblies whereas the Spent Nuclear Fuel Working Group Report acknowledges 500 currently being stored. This is a significant discrepancy.

The EA fails to fully characterize the ongoing project's waste streams. With decades of operating experience and presumably continuous data collection and record keeping, MFCR is remiss in not fully

[35] Pyro-Processing, 8/10/2006, **INL/CON-06-11605**

disclosing this information. The EA acknowledges reprocessing over 570 EBR-II assemblies since 1964 [DOE/EA-1148@36]. For instance, a breakdown of air emissions would show significant volatilized radionuclides that HEPA filters are not designed to control. MFCR's unwillingness to provide wet caustic scrubbers to reduce volatilized nuclide releases is unacceptable. With the potential of 203,000 curies available for release in any single process batch this represents a significant hazard.

MFCR deserves due credit for initiating for the first time in the history of the AEC/ERDA/DOE the classification of SNF parts and assemblies as Greater Than Class C waste requiring final disposal in a geologic repository. Unfortunately, this change follows EDI's exposing DOE's practice of shallow land burial and showing the public DOE's own shocking data gained through a Freedom of Information Act request. This policy represents a significant move toward responsible waste management that hopefully will be adopted throughout the DOE Complex.

The EA inadequately addresses the non-proliferation compliance issues. Indeed, MFCR's comparison of PUREX type SNF reprocessing "footprints" (600,000 sq. ft.) with the Pyroprocessing (16,000 sq. ft.) "small footprint" literally clinches the argument. This proliferation prone technology is so compact that it would be extremely difficult if not impossible to detect in a non-compliant country. Moreover, diversion of throughput after the "cathode processing" stage would be undetectable even in this country. Therefore, even the American public would have no assurance that DOE itself was not producing weapons grade material at this facility.

The EA's environmental impact calculations assumed a low 10% burnup. [DOE/EA-1148@73] Yet when trying to justify EBR-II SNF vulnerabilities, the EA characterizes EBR-II SNF as high burnup [DOE/EA-1148@122] which means high quantities of fission products that will be released during reprocessing. If the high burnup characterization is correct then the source term assumptions are wrong and the environmental releases may be grossly understated.

This EA further violates NEPA by its own admittance because it is retrospective. The Department has committed funds for many years (acknowledged in the EA) toward construction of the Pyroprocessing facility at MFCR.

The whole thrust of NEPA is to force agencies to conduct an EIS **prior to** committing resources so that expenditures will not prejudice the decision making process. The EA's proposal to defer any EIS until after the "demonstration project" technology is proven ignores NEPA's mandate that an EIS be prepared **in advance** of the stage where a program "has reached a stage of investment or commitment to implementation likely to determine subsequent development or restrict later alternatives".

The fact that MFCR's pyro processor is already complete only highlights the need for an immediate EIS, and does not provide a rationale for deferral of full NEPA compliance. The pattern of "phased" EA's improperly segments the NEPA process, and obfuscates the need to prepare an EIS prior to any irretrievable commitment of resources. The EA reflects that detailed planning and substantial federal resources have been advanced toward a full scale electrometallurgical processing facility.

In May 1996, DOE issued a Finding of No Significant Impact on the electrometallurgical plant which means that the Department believes that the Environmental Assessment was adequate and that no significant impacts were identified. The plant continues to receive full funding at $50 per year up through Fiscal Year 1998. **See Section IV.L for more information on MFC**.

Section II. F. Naval Reactors Facility Expansion Summary

The Environmental Defense Institute (EDI) comments on the Department of Energy (DOE) Draft Environmental Impact Statement DOE/EIS-0453-D, submitted previously for the record, are available on EDI's website. [36] EDI's comments on the draft have more background contamination and radioactive waste information needed to fully understand all the environmental impacts. EDI's comments on NRF CERCLA review is also available. [37] Tami Thatcher's DOE comments on DEIS that cover other crucial issues are available. [38] The comments below focus on the final FEIS issues that were not covered and therefore make it deficient for the following reasons:

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[36] http://www.environmental-defense-institute.org/publications/EDINRFcomments.pdf

[37] http://www.environmental-defense-institute.org/publications/NNPP-Report7A.pdf

[38] http://environmental-defense-institute.org/publications/CommentsECF.pdf

* The FEIS fails to comply with all National Environmental Policy Act (NEPA) requirements;
* The FEIS fails to fully evaluate keeping the existing Expanded Core Facility (ECF) spent (used) nuclear fuel (SNF) cooling pool in operation for "over 33 years" as an integral part of NRF operation;
* The FEIS incorrectly says NNPP will not generate high-level-waste, greater- than-class waste or transuranic waste;
* The FEIS failed to adequately assess the ECF's seismic vulnerabilities.

"The Naval Nuclear Propulsion Program (NNPP), also known as the Naval Reactors Program, is a joint United States (U.S.) Navy and Department of Energy (DOE) organization with responsibility for all matters pertaining to naval nuclear propulsion from design through disposal (cradle-to-grave)." [FEIS pg. Vol. I Abstract]

The Naval Reactors Facility (NRF) located on DOE's Idaho National Laboratory (INL) is the waste end of the used reactor fuel (spent nuclear fuel or SNF) from the NNPP's nuclear fleet. DOE's role is designated to manage the Navy's waste.

EDI finds this EIS a clever effort to slip in major expansion of the Navy's SNF waste management without acknowledging 50+ years of massive radioactive contamination at INL by claiming previous NRF environmental studies. [39]

DOE/NAVY claim these CERCLA reports are beyond the scope of this EIS. The Navy's previous radioactive contamination will remain for manila putting Idahoans at risk. This is an unconscionable and avoidable assault on Idaho's most valuable Snake River Aquifer that we depend on.

NRF NEPA Requirements Violated

A. The FEIS fails to comply with all NEPA requirements.

The FEIS correctly states: "NEPA, Sec. 1502.1 Purpose Environmental Impact Statement. The primary purpose of an environmental impact statement is to serve as an action-forcing device to insure that the policies and goals defined in the Act are infused into the ongoing programs and actions of the Federal Government. **It shall provide full and fair discussion of significant environmental impacts and shall inform decision makers and the public of the reasonable alternatives which would avoid or minimize adverse impacts or enhance the quality of the human environment… Statements shall be concise, clear, and to the point, and shall be supported by evidence that the agency has made the necessary environmental analyses. An environmental impact statement is more than a disclosure document.** It shall be used by Federal officials **in conjunction with other relevant material** to plan actions and make decisions." [40] [emphasis added]

FEIS states: "Per NEPA requirements (10 C.F.R. § 1021 and 40 C.F.R. § 1500–1508), consideration must be given to whether actions performed under the alternatives could result in a violation of any federal, state, or local law or requirements, or require a federal permit, license, or other entitlements. Federal environmental laws that affect environmental protection, health, safety, and compliance were considered in the EIS scope development. In addition, environmental requirements that have been delegated to the state of Idaho and local requirements were considered to ensure compliance." [FEIS pg. 1-13]

The Yale Law Journal Review notes: "To comply with existing law and achieve NEPA's normative goals, agencies should expand EIS discussions of how applicable regulatory regimes will shape project impacts. Impact discussions are not 'full and fair' without this information because they fail to allow the public and other agencies to comment on— and more importantly, to challenge—this

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[39] Remedial Investigation/Feasibility Study (RI/FS) studies required by CERCLA to characterize the nature and extent of contamination because of past releases of hazardous and radioactive substances to the environment, to assess risks to human health and the environment from potential exposure to contaminates, and to evaluate cleanup actions.

[40] Authority: NEPA, the Environmental Quality Improvement Act of 1970, as amended (42 U.S.C. 4371 et seq.), sec. 309 of the Clean Air Act, as amended (42 U.S.C. 7609), and E.O. 11514 (Mar. 5, 1970, as amended by E.O. 11991, May 24, 1977). Source: 43 FR 55994, Nov. 29, 1978, unless otherwise noted.

crucial aspect of project planning. Such an approach would further NEPA's aim to '[r]igorously explore and objectively evaluate' the full scope of project impacts that 'significantly affect the quality of the human environment.'" [41]

Due to public and Federal court pressure, DOE has in the recent past conducted numerous "Programmatic" EISs that comprehensively analyze all relevant aspects of a project's environmental impact. DOE/NNPP must be pressured to fulfill NEPA requirements by reissuing this FEIS as a comprehensive "Programmatic EIS."

The DOE/Navy is trying to avoid NEPA requirements to provide a comprehensive environmental impact statement of the proposed actions. Failure to provide NRF past- present-future waste characterization/disposition means the DEIS/FEIS are deficient. Absent this crucial waste data, Commenters' must rely on previous reports to ascertain how these operations effect the environment. The public cannot rely on this document to provide the information needed to make an informed decision.

B. DOE/Navy fails to issue a Comprehensive Programmatic EIS The FEIS inadequately evaluates keeping the Expanded Core Facility (ECF) in operation; for "over 33 years" as an integral part of NNPP operation.

FEIS states: "**Overhaul Alternative time period. The first 33 years of the 45 years (i.e., the [ECF] refurbishment period), refurbishment and operations activities would be conducted in parallel.**" [Pg. S-8] [emphasis added]

"[T]he NNPP will continue to operate ECF during new facility construction, during a transition period, and **after the new facility is operational for examination work**. **To keep the ECF infrastructure in safe working order during these time periods, some limited upgrades and refurbishments may be necessary. Details are not currently available regarding which specific actions will be taken; therefore, they are not explicitly analyzed as part of the New Facility Alternative.**" [42] [emphasis added]

The above FEIS statement: "Details are not currently available regarding which specific actions will be taken." **This documents the fundamental inadequacy of the FEIS.** DOE/Navy cannot legitimately claim compliance with NEPA when the most degraded part of this operation is not fully evaluated in explicit detail. More troubling is the Environmental Protection Agency (EPA) and Idaho Department of Environmental Quality's defining silence as regulators. This is a crucial issue given that the public's environmental defenders are politically compromised on enforcement of laws they have authority over.

The FEIS correctly states: "Per NEPA requirements (10 C.F.R. § 1021 and 40 C.F.R. § 1500–1508), consideration must be given to whether actions performed under the alternatives could result in a violation of any federal, state, or local law or requirements, or require a federal permit, license, or other entitlements. Federal environmental laws that affect environmental protection, health, safety, and compliance were considered in the EIS scope development." [FEIS Pg. 1-13]

Yes, environmental laws were considered but never acknowledged to be violated. In addition the FEIS fails to include soil and ground water contamination from ECF leaks and discharges that **do** violate environmental laws. [43] These issues will be discussed later.

1. ECF Degraded Condition

DOE/NRF's statements confirm the degraded condition of the ECF. Again documents the fundamental inadequacy of the FEIS to exclude specific actions required to mitigate continued significant ECF leaks. "Not a matter of urgency" discloses the Navy's previous decades of disregard for environmental degradation.

"Major portions of the ECF infrastructure have been in service for over 50 years. **The ECF water**

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41 *A 'Full and Fair' Discussion of Environmental Impacts in NEPA EISs: The Case for Addressing the Impact of Substantive Regulatory Regimes*, Sarah Langberg, foot notes 178 & 179 citing 40 C.F.R. § 1502.14(a) (2014). U.S.C. § 4332(C) (2012). http://www.yalelawjournal.org/note/nepa-eiss-and-substantive-regulatory-regimes.

42 Final Environmental Impact Statement for the Recapitalization of Infrastructure Supporting Naval Spent Nuclear Fuel Handling, October 2016, DOE/EIS-0453-F, Pg. S-9, herein after referred to as FEIS.

43 See EDI's NNPP Report that offers a Review of NRF CERCLA issues not addressed in this EIS. And Final NRF Comprehensive Feasibility Study Waste Group 8 Naval reactor Facility. And "Supplement to Evaluation of Naval Reactors Facility Radioactive Waste Disposed of at the Radioactive Waste Management Complex from 1953 to 1999", J. Giles et.al., April 2005, ICP/EXT-05-00833, pg. 18.

pools have never undergone a complete refurbishment and have not been upgraded to current seismic standards. Although water pool surfaces are covered with a fiberglass or epoxy coating, the water pool does not have a liner, creating the potential for water infiltration into the reinforced concrete structure and the potential for corrosion damage of the reinforcing bar within the structure. The capability to detect and collect small leaks, a common feature in modern water pools, is not present for the ECF water pool. Consequently, while the replacement or overhaul of the current water pool is not a matter of urgency that must be done in a very short period, it is something that needs to be planned and started soon." [FEIS Pg. S-6][emphasis added]

2. ECF Leaks

"**Alternative methods would be to discharge the water from leak testing the pools (up to 18,927,000 liters (5 million gallons)) to the sewage lagoons or to the [Industrial Waste Ditch] IWD during the last year of construction.** This discharge would occur over a short period of time (about 6 days) but is not expected to exceed the infiltration capacity or the maximum flow distance (2.9 kilometers (1.8 miles)) previously recorded for the IWD. **The permitted annual discharge rate for the IWD of 113,600,000 liters (30,000,000 gallons) would not be exceeded. Section 4.4.3 reflects this potential discharge of water for pool leak testing."** [FEIS Pg. 1-21]

Table 4.4-5: Discharge to the IWD for the Construction Period of the New Facility Alternative [FEIS Pg. 4-44]

Source	Volume[1]	
	liters per year	gallons per year
Construction Period Increase **(leak test water)**	18,927,000	5,000,000
NRF Baseline [including ECF] [2]	43,190,000	11,410,000
Total[3]	62,117,000	16,410,000
Wastewater Reuse Permit Discharge Limit[4]	113,600,000	30,000,000
Percent Increase Over the NRF Baseline[5]	**43.8**	
Percent of Discharge Limit[6]	**54.7**	

[1]Numbers have been rounded; therefore, unit conversions are not exact.

[2]Total volume of discharge to the IWD from all NRF sources **(including ECF) for 2009.**

[3]Total of Construction Period Increase and NRF Baseline.

[4]Based on the Industrial Reuse Permit Renewal Application for the Naval Reactors Facility pending approval, dated January 26, 2012. [5]Percent increase from construction period over the NRF Baseline.

5 Percent increase from construction period over the NRF Baseline.

[6]Percentage of total discharges for NRF (62,115,000 liters) compared to the wastewater reuse permit discharge limit.

The NRF Industrial Waste Ditch (IWD) is just that; an open ditch where huge volumes of radioactive liquid process waste from the ECF is allowed to sink down into the aquifer below flushing previous contaminates down further into groundwater. DOE/Navy claims "CERCLA remedial action plan are outside the scope of this EIS" and thereby attempts to censure NRF groundwater and soil reports showing significant contamination above EPA/MCL limits. This FEIS facilitates continued contamination of Idaho's most precious resource that thousands of INL workers and all Idahoans rely on for drinking and crop irrigation.

Again, leak testing (in the above 4.4-5 table) is not defined, however the reader is left to assume that this represents the volume of water that continues to leak into concrete structure surrounding the ECF and that must be pumped out and discharged to the Industrial Waste Ditch (IWD) or other unlined percolation ponds at the NRF. These radioactive waste discharges eventually migrate to the aquifer and the Snake River via Thousand Springs near Hagerman, ID.

The above ECF "water tight" is not possible with planned epoxy/fiberglass coatings as previous use demonstrates, but only with the NRC required stainless liner which is not planned. FEIS fails to characterize/quantify what the above waste discharges will be and how these additional discharges will

add to existing NRF soil/groundwater contamination described in CERCLA RI/FS. [44]

FEIS states: "The ECF water pool does not leak 16,000 gallons per day as alleged by the [EDI] commenter, and there is no known leak to the environment**." "Appendix F,** Section F.5.4.12 states that additions to the water pool are about 150 gallons of water per day to compensate for evaporation. The 150 gallons per day of make-up water is consistent with expected losses due to evaporation based on the surface area of the pool and facility humidity levels." [FEIS Pg. G-102]

The above statement is misleading at best. The Navy's own earlier CERCLA report states: "The ECF water level is monitored frequently and recorded in water level logs. Water is routinely added to the pits to compensate for evaporation loss. **For the past four years, the average water loss has been 3500 gallons per month.** To determine if any leakage has occurred, the actual water loss per month is compared to theoretical and experimental evaporation data. **Between December 8, 1991 and February 6, 1992, significantly more water was added to the water pits than anticipated. The detailed investigation of this event identified that an unexplained water loss of 62,500 gallons occurred between December 8, 1991 and February 21, 1992.** A leak from one water pit was the expected cause of the water loss." [45]

The above documented ECF 62,500 gal. 30-day leak = 2,083 gal. /day. Obviously, the DOE/Navy is not offering true or credible information in this FEIS. The above cited document was obtained through an EDI FOIA request and not radially available to public. Clearly, this is why the DOE/Navy does not include NRF CERCLA data in this FEIS. [46]

ECF leaks and discharges to the Industrial Waste Ditch (IWD) are not fully evaluated in the FEIS especially when ECF projects will be heavily regulated under substantive environmental law regimes such as the Clean Air Act (CAA) [47] or Clean Water Act (CWA). [48]

C. The FEIS fails to include the Advanced Test Reactor as an integral part of NNPP operation

Currently, the Advanced Test Reactor at INL that tests NRF fuel is a crucial part of NRF operations and itself produces SNF. This sleight of hand that the ATR is not an integral part of the NNPP/NRF is ridiculous and challenges the credibility of this FEIS.

D. The FEIS fails to include Idaho Nuclear Technology and Environmental Center (INTEC) as an integral part of NNPP operation

"In addition to DOE owned fuel INL/INTEC CPP-666 stores spent fuel from the Naval Reactors Program." [49] "The Idaho [CPP-666] inventory includes SNF from the Naval Nuclear Propulsion Program (i.e., submarines and aircraft carriers), which is different from commercial SNF in many ways, including enrichment level and design. From about 1952 to 1992 this Navy SNF was reprocessed in Idaho to extract high-enriched uranium for use in driver fuel rods at weapons material production reactors elsewhere." [50]

Chemical reprocessing at INL/INTEC generated millions of gallons of high-level waste – 900,000 gallons of which remains in underground tanks today. Leaks from this INTEC high- level waste tank farm and aquifer waste injection wells continue to contaminate the soil and groundwater. [51]

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[44] Remedial Investigation/Feasibility Study (RI/FS) studies required by CERCLA to characterize the nature and extent of contamination because of past releases of hazardous and radioactive substances to the environment, to assess risks to human health and the environment from potential exposure to contaminates, and to evaluate cleanup actions.

[45] Final NRF Comprehensive Feasibility Study Report Waste Area group 8 Naval Reactors Facility, Idaho Falls Idaho, Pittsburgh Naval Reactors Office, and pg. 5-1.

[46] FEIS, Pg. G-102

[47] Clean Air Act (CAA)[10] Yale citing 42 U.S.C. ss 7401q(2012)

[48] Clean Water Act (CWA) Yale citing 33 U.S.C. ss 1251-1387

[49] Energy and Environment, Storage of DOE SNF at the Idaho National Laboratory, U.S. DOE.

[50] U.S. Spent Nuclear Fuel Storage, James Warner, Section Research Manager, Pg. 27, Citing T. Cochran, et.al., Nuclear Weapons Databook, Vol. II, May 24, 2012, Congressional Research Service, 7-5700, R42513, www.crs.gov

[51] Engineering Design File, Groundwater Pathway Risk Assessment for CPP-601, CPP-602, CPP-627, and CPP-640 Fuel

The FEIS states: "The Naval Nuclear Propulsion Program (NNPP), also known as the Naval Reactors Program, is a joint United States (U.S.) Navy and Department of Energy (DOE) organization with responsibility for **all matters pertaining to naval nuclear propulsion from design through disposal (cradle-to-grave)."** [FEIS pg. Vol. I Abstract] [emphasis added]

Incomplete Environmental Impacts; The FEIS fails to include previous environmental contamination identified in CERCLA investigations in cumulative environmental impact;

DOE/Navy use a classical bait and switch ostensibly initially appearing to follow the legal requirements of NEPA, while later buried in the FEIS claim's the NRF has no obligation to include the full waste stream disposition and environmental contamination resulting from NRF/ECF operations. What is critical in any EIS is to review all environmental the impacts of any subject operation. That literally means the past, present and anticipated impacts as NEPA requires. By ignoring history, we are bound to repeat it.

FEIS states: "Comments on the NRF Waste Area Group 8 CERCLA remedial action plan are outside the scope of this EIS." [52] [FEIS Pg.G-104]

Again, it is essential to review previous CERCLA analysis to get an accurate assessment of what current and future operations will be since the basic operations have not changed.
Moreover, new waste discharges MUST be added to previous contamination to fully assess environmental impacts. An earlier NRF Environmental Report states: "Overall, less than an estimated 1500 curies of radioactivity have been released to the atmosphere during the period of 1953 through 1991, with the majority of the releases occurring in the 1950s.
During the past 10 years, releases have been less than 10 curies per year…. In Addition to the annual releases, a single release occurred in 1955 during the performance of an engineering test to obtain information on the effects of boiling conditions in naval reactors. A conservative estimate of the amount of radioactivity released from the site was 870 curies. [53]

Review of the historical deep well sampling data at NRF does not support the Navy's conclusion of no impact. NRF CERCLA report shows Table III Deep Well Sample Results for Wells # 1, # 2, and # 3 at 60, 69, and 44 pico curies per liter respectively for gross beta.[54] The federal drinking water standard for gross beta is 8 pico curies per liter. This deep well sample data confirm that contaminates in fact migrate, contrary to the Navy's claims that contaminates are bound up in the soil.

Vegetation at NRF CERCLA Unit 8-08-14 radioactivity (pCi/gm) Sampling Results (Pre- 1971) Sample # 68-1 was 144,522; Sample 6-82 was 687,447 pCi/gm. [55] DOE/NRF understandability is blocking this shocking data. Like a used house salesman showing a prospective buyer a fancy color brochure that does not show the failing foundation, leaking heating oil tank and water leaks, DOE fits perfectly by vehemently objecting to independent environmental review.

E. The FEIS Inadequately Characterize Groundwater Contamination

FEIS states: "Groundwater monitoring has generally shown long-term trends of decreasing concentrations for radionuclides, and **current concentrations are near or below EPA MCLs for drinking water and the sites where there is historic contamination are not used as sources for drinking water.**" [Pg. G-99][emphasis added]

Reprocessing Complex Non-Time-Critical Removal Action**,** Document ID: EDF-10195, Revision ID: 1, Effective Date: 02/08/12.

52 Proposed Plan Waste Area Group 8, and Removal Actions Considered for Naval Reactors Facility Idaho National Laboratory, issued by DOE, EPA, and Idaho Department of Environmental Quality.
Also: U.S. Spent Nuclear Fuel Storage, James Warner, Section Research Manager, Pg. 27, Citing T. Cochran, et.al., Nuclear Weapons Databook, Vol. II, May 24, 2012, Congressional Research Service, 7-5700, R42513, www.crs.gov
Engineering Design File, Groundwater Pathway Risk Assessment for CPP-601, CPP-602, CPP-627, and CPP-640 Fuel Reprocessing Complex Non-Time-Critical Removal Action**,** Document ID: EDF-10195, Revision ID: 1, Effective Date: 02/08/12.

53 Naval Reactors Facility Environmental Summary Report NRF-EC-1046, Pg.18. And Naval Reactors Facility Environmental Summary Report NRF-EC-1007, Calendar Year 1991, Pg. 18.

54 NRF October 1995 Remedial Investigation / Feasibility Study (RI/FS) Appendix K.

55 Final NRF Comprehensive Feasibility Study Waste Group 8 Naval Reactor Facility Appendix H, October 1995, Pg. H6-13, Table H6—5.

The above statement "**current concentrations are "near" EPA MCLs for drinking water and the sites where there is historic contamination are not used as sources for drinking water" completely disregards NRF staff, visitors and thousands of INL workers at other facilities who drink water drawn from facility wells.** What about adjacent Atomic City residents? What kind of credibility can the public put on the Navy's assurance that groundwater is "NEAR" regulatory EPA MCL limits? None! Every INL/NRF potable water source should have a notice DO NOT USE FOR DRINKING.

The FEIS states: "During the construction period of the New Facility Alternative, there would be **small impacts on the amount of water seeping into the perched water zone at the IWD outfall**." [4-44][emphasis added] "The increased water discharge volume at Location 3/4 or Location 6 during the transition period could result in **additional seepage of water to the perched water zone located beneath the IWD outfall. When the areal extent of this** perched water zone was greatest, annual discharge volume to the IWD was 650,000,000 liters (172,000,000 gallons) and was not regulated by a permit**.** [FEIS Pg. 5-40]

To characterize waste discharges as having "small impacts" to the ground water is ridiculous. Why? Because these huge contaminated waste water discharges will flush existing waste into the aquifer. Nuclear Regulatory Commission (NRC) would otherwise require leak-proof stainless steel liner in all commercial spent nuclear fuel (SNF) storage pools because leaks contaminate the groundwater. Epoxy/fiberglass coatings are not allowed at NRC regulated SNF facilities because they leak and the pool cannot be accurately leak tested. Moreover, applying more epoxy to acknowledged failing concrete pool walls adds to the absurdity. Below EDI discusses ECF significant leaks and what DOE/Navy euphemistically calls "Leak Testing" that is apparently when they measure the amount of ongoing ECF leaks into this pool substructure. Leaks to the soil cannot be measured except by water required to maintain pool water volume.

The FEIS states: "Water pool refurbishment would include correcting deteriorating conditions. These actions would be necessary to ensure that the water pools support long- term use by, to the extent practicable, **bringing the water pools up to current design and construction standards.** [Pg. S-8]

The "current design and construction standards" DOE/NRF refers to above are not the standards NRC requires of all regulated SNF storage pools. DOE/NRF makes no apparent reference what standards are being applied to this ECF. There is no intent to replace the degraded/leaking ECF SNF water storage pool. What will NRF do with the 400 SNF assemblies in the ECF while "The water pools [are] drained, decontaminated, and emptied of some equipment" with degraded pool gate seals? We discuss this major issue below in seismic vulnerabilities.

1. No NRF Discharge of Radioactive Liquid?

The FEIS states: "Liquid LLW: Refurbishment Period: There would be **no impact from liquid** LLW since waste generation volumes would not change. Post-Refurbishment Operational Period: There would be **no impact from liquid LLW** since waste generation volumes would not change." [Pg. S-69] [emphasis added]

"Groundwater: There would be **negligible impacts to groundwater** under the No Action Alternative and the refurbishment period of Overhaul Alternative from radiological constituents **if** preventive and corrective maintenance is not sufficient to prevent a **minor** water pool leak. There could be **small impacts to groundwater** during the transition period and new facility operational period under the New Facility Alternative from potential increases in non-hazardous salts in wastewater discharge." [Pg. S-73] [emphasis added]

No reasonable person can read these repeated statements of "no impact" "negligible impacts to groundwater" knowing the huge leak volumes in question and knowing this operation has been doing this for 50 years, without cringing. Again, the Navy intends to keep this leaking ECF in operation for decades. The FEIS offers no accurate characterization of the ECF water discharged/leaked. See below NRF CERCLA report EDI gained through FOIA that documents this crucial data.

The FEIS states: "Radiological Effluent: There would be **no impact from radiological effluent since none** would be discharged to surface water or the Snake River Plain Aquifer (SRPA). "NRF does **not discharge radiological liquid effluent to the environment**." [FEIS Pg.S-16] [emphasis added]

However, FEIS states: "Radiological Liquid Effluent Parameters for NRF [Industrial Waste Ditch] IWD maximum discharge for Co-60, Cs-137, Sr-90, and tritium (H3) at 20, 20, 1.9 and 0.7 pCi/l respectively. "Actual minimums and maximums over 5-yr. **or** 2 yr. period are reported." [FEIS Pg. 3-32] [56]

These two above FEIS statements are contradictory and challenge the veracity of the document. Additionally, why 5 yr. **OR** 2yr. periods recorded? Is there data in 5-yr. monitoring data showing higher numbers that DOE/Navy is withholding like 10 yr. monitoring data? See below CERCLA data showing significant radioactive contamination intentionally excluded.

The above FEIS table 4.4-5 showing tens of millions of gallons of water used for direct contact cooling of extremely radioactive used reactor fuel (SNF) and dumped in the open IWD ditch, belies DOE/NRF's statement: "**NRF does not discharge radiological liquid effluent to the environment." The coolant water is radioactive and hazardous due to corrosive activated material on extremely radioactive used fuel surfaces and must be treated as such.**

NRF CERCLA reports prove FEIS false by showing S1W Leaching Bed Area Radioactivity Soil Sampling for Cs-137 at 310,000 pCi/g; Co-60 at 1,300,000 pCi/g. [57] The NRF Retention Basin where highly radioactive process waste water is sent to allow short-lived isotopes to decay before discharging it to IWD showed sludge samples of Cs-137 at 192,700 pCi/gm; [58] Strontium-90 at 5,118 pCi/gm. NRF Vegetation sampling results at location 68-1 and 68-2 at 144,522 and 687,447 pCi/gm respectively. [59]

These FEIS statements of "no impact" are categorically false. Absence of recent CERCLA Remedial Investigations/Feasibility (RIFS) showing significant environmental contamination documents how this FEIS attempts to ignore fundamental NEPA policy. For instance, NRF CERCLA Unit 8-08-12 sample results show chromium at 2,090 mg/kg (MCL= 50 mg/kg); Cesium-137 at 149,759 pCi/gm (risk-based soil level = 0.003). [60]

Below Table H6-6 lists the radioactive isotopes found in the ECF process water Leaching Bed sediments. This CERCLA data contradicts FEIS statement: "NRF does not discharge radiological liquid effluent to the environment." These sample results show extremely high radioactive mud that will eventually percolate into the aquifer.

1971 Samples NRF Leaching Bed Mud [61]

Table H6-6- Unit 8-08-14 Radioactivity (pc/gm) Sample Results (pre-1971)

Sample Number	Soil				
	Cs-137	Cs-134	Co-60	Hf-181	Sb-124
1	310,000	42,000	450,000	4,900	190,000
2	190,000	42,000	42,000	6,200	37,000
3	210,000	7,600	1,300,000	8,700	43,000
4	80,000	14,000	640,000	9,100	ND
5	95,000	20,000	1,000,000	15,000	55,000

[56] FEIS Pg. 3-32

[57] Final NRF Comprehensive Feasibility Study Report Waste Area group 8 Naval Reactors Facility, Idaho Falls Idaho, Pittsburgh Naval Reactors Office, Appendix I, October 1995, Table 1-3a, Pg. I-59.

[58] Ibid. Appendix H, Table H8-4, Unit 8-08-17, Pg. H8-8.

[59] Ibid. Appendix H, Table H8-5, Pg. H8-9.

[60] Ibid. Appendix H, Table H4-13, Unit 8-08-12, Pg. H4-22.

[61] Final NRF Comprehensive Feasibility Study Report Waste Area Group 8 Naval Reactors Facility, Prepared for the U.S. DOE Pittsburgh Naval Reactors Office, Pg.H-6-14.

6	140,000	42,000	1,000,000	19,000	ND
7	150,000	40,000	1,100,000	20,000	ND
8	140,000	31,000	440,000	8,200	33,000

NRF-RI/FS Table H6-6 Pg. H-6-14

NRF CERCLA report continues: "The release of 62,500 gallons is a conservative maximum estimate. Based on the results of periodic NRF Chemistry analyses of the low level of radio nuclides present in ECF water pool water, the estimated quantities of radionuclides released are as follows: 5.2 x 10-2 curies of tritium, 9.7 x 10-6 curies of carbon-14, 7.1 x 10-6 curies of manganese-54, 1.9 x 10-5 curies of cobalt-58, 4 x 10-4 curies of cobalt-60, 6.6 x 10-5 curies of nickel-63, 1.2 x 10-6 curies of strontium-90, 1.2 x 10-6 curies of yttrium, and 1.1 x 10-5 curies of cesium-137. Thus, a total of 5.25 X 10-2 curies of radioactivity were estimated to have been released. The estimate is considered to be conservative, because previous leaks from the water pit into observation rooms within the ECF building rarely indicated the presence of radioactive contamination. The release occurred about 30 feet below ground surface." [62] [5-1]

"Tritium is the only radionuclide expected to migrate with the water. The COPCs as identified in the Work Plan (WEC, 1995) were tritium, carbon-14, cobalt-60, manganese-54, nickel-63, strontium-90 and cesium-137. The concentration terms for each radionuclide are given in

[62] Final NRF Comprehensive Feasibility Study Report Waste Area Group 8 Naval Reactors Facility, Pg. 5-2

The below table 2-1 is found in a NRF CERCLA report and documents soil contamination.

Table 2-1 OU 8-08 COCs and Risk-based Soil Concentrations

COC	Exposure Route	Risk-based Soil Concentration[1] (pci/gm unless specified)	Max. Soil Concentration (pci/gm unless specified) Detected at OU 8-08
Lead	Direct Contact	400 ppm[2]	1,140 ppm
Americium-241	External Exposure	895	20
	Ingestion of Soil	283	–
	Food Crop Ingestion	301	–
Cesium-137	External Exposure	16.7	7,323
	Ingestion of Soil	24,860	–
	Food Crop Ingestion	164	–
Neptunium-237	Food Crop Ingestion	19.8	0.79
Nickel-63	Food Crop Ingestion	15,846	730
Plutonium-238	Ingestion of Soil	590	20
	Food Crop Ingestion	1,153	–
Plutonium-244	External Exposure	3.3	0.24
Strontium-90	Ingestion of Soil	15,418	750
	Food Crop Ingestion	45.6	–
Uranium-235	External Exposure	13.2	0.18

(1) Concentration which corresponds to a 1 x 10^{-4} carcinogenic risk.
(2) EPA recommended cleanup level (EPA, 1994)

Table 5-1. [63] [64] [Pg. 5-2] [65]

[63] Final NRF Comprehensive Feasibility Study Report Waste Area Group 8 Naval Reactors Facility, Pg. 5-2.

[64] Final NRF Comprehensive Feasibility Study Report Waste Area Group 8 Naval Reactors Facility, Prepared for the U.S. DOE Pittsburgh Naval Reactors Office, Pg. 7.

[65] Final NRF Comprehensive Feasibility Study Report Waste Area Group 8 Naval Reactors Facility, Prepared for the U.S. DOE Pittsburgh Naval Reactors Office, Pg. 7.

Summary of NRF Drinking Water Radioactivity Results [66]

Table 4 Well Number	Gross Alpha (based on Am-241) pCi/l	Gross Beta (Based on 137-Cs pCi/l)
#1 Maximum	5.0	2.0
#2 Maximum	3.0	2.0
#3 Maximum	1.0	3.0
#4 Maximum	1.5	2.0
EPA MCL	15	8

Summary of NRF Ground Water Radioactivity Results [67]

Maximum	Gross Alpha (based on Th-230) pCi/l	Gross Beta (Based on Sr-90 pCi/l)
Up Gradient	3.0	3.1
System	5.3	3.7
On site	3.1	3.9
Down Gradient	4.1	5.1
EPA MCL	15	8

EPA Maximum Concentration Level (MCL) for Drinking Water for Gross Alpha radioactivity is 15 pCi/L; Gross Beta is 8 pCi/L

Table 5-1 COPCs and Concentration Terms for Unit 8-08-79

Constituent	Estimated Amount Released (Curies)	Concentration (pci/l) of pit water (1992)	Concentration Term (pci/l) - Decay-Corrected to 1996
Carbon-14	9.7×10^{-6}	41	41
Cesium-137	1.1×10^{-5}	46.5	42.3
Cobalt-60	4×10^{-4}	1691	930
Manganese-54	7.1×10^{-6}	30	0.8
Nickel-63	6.6×10^{-5}	279	270
Strontium-90	1.2×10^{-6}	5.1	4.6
Tritium	5.2×10^{-2}	219791	170761

NRF CERCLA report: "5.5.2 Risk Characterization: Table 5-2 summarizes the risks associated with Unit 8-08-79. The carcinogenic risk for the 30 year future residential scenario is with cesium-137 being the risk driver through the groundwater ingestion pathway. The carcinogenic risk factor the 100 year future residential scenario is 7E-6 with cesium-137 and nickel-63 being the risk drivers through the groundwater ingestion pathway." [68]

"The specific activities of the water released are known, the volume of water can be accurately

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[66] Naval Reactors Facility, Environmental Monitoring Report, Calendar Year 1991, NRFRC-EC-1007, Table 4, Pg. 21.

[67] Ibid, NRFRC-EC-1007, Table 5, Pg. 22. Derived concentration Guide 2 of 15E-9.
EPA Maximum Concentration Level (MCL) for Drinking Water for Gross Alpha radioactivity is 15 pCi/L; Gross Beta is 8 pCi/L

[68] Naval Reactors Facility, Environmental Monitoring Report, Calendar Year 1991, NRFRC-EC-1007, Table 4, Pg. 21.
Also: Ibid, NRFRC-EC-1007, Table 5, Pg. 22. Derived concentration Guide 2 of 15E-9.
EPA Maximum Concentration Level (MCL) for Drinking Water for Gross Alpha radioactivity is 15 pCi/L; Gross Beta is 8 pCi/L

calculated, and a conservative assumption is made that the specific activity of the water released remains the same until it reached the aquifer." [69]

Table 5-2 Summary of Risks Associated with Unit 8-08-79, Water Pit Release
Residential Groundwater Ingestion

	Concentration (pci/l)	30 Year Rad. Risk	100 Year Rad. Risk
Carbon-14	41	9E-07	9E-07
Cesium-137	42.3	1E-05	3E-06
Cobalt-60	930	7E-06	7E-10
Tritium	170761	5E-05	9E-07
Manganese-54	0.8	1E-18	3E-43
Nickel-63	270	3E-06	2E-06
Strontium-90	4.6	3E-06	5E-07
Total Risk		8E-05	8E-06

Source: Final NRF Comprehensive Feasibility Study Report Waste Area Group 8 Naval Reactors Facility, Pg. 5-4
EPA Maximum Concentration Level (MCL) for Drinking Water for Gross Alpha radioactivity is 15 pCi/L; Gross Beta is 8 pCi/L.
Final NRF Comprehensive Feasibility Study Report Waste Area Group 8 Naval Reactors Facility, Pg. 5-3.

NRF CERCLA report: "The release is estimated to have occurred approximately 30 feet below ground surface. The COPCs were identified as carbon-14, cesium-137, cobalt-60, manganese-54, nickel-63, strontium-90, and tritium." [70]

Why are these earlier NRF CERCLA reports important? The basic NRF operations are expanding but there is no commitment to stop contamination to the environment or even be honest about it. By reviewing previous CERCLA reports, we get clearer picture of what the current/future will do to Idaho's environment.

NRF FEIS fails to include Worker Exposures

NRF non-military employees are excluded from EEOICPA coverage with a faulty rationale and this egregious exclusion must be removed.

DEIS states: The Energy Employees Occupational Illness Compensation Program Act (EEOICPA) is outside the scope of this EIS. [DEIS Pg. G-117]

"The historically high allowable doses at NRF, the variety and complexity of operations at NRF, the

[69] Final NRF Comprehensive Feasibility Study Report Waste Area Group 8 Naval Reactors Facility, Pg. 5-3.

[70] Final NRF Comprehensive Feasibility Study Report Waste Area Group 8 Naval Reactors Facility, Pg. 5-4

problems of adequately monitoring internal dose and transient conditions, and the evolving science of radiation health [71] and epidemiology of radiation workers [72] showing elevated cancer risks at annual doses less than 2 rem per year point to the unsupportable rationale for excluding NRF workers from compensation. Although it would in many cases be decades late, and the compensation will never compensate for the early deaths of fine people, this exclusion must be removed. **By any measure of fairness and honest assessment, the exclusion of NRF workers from EEOICPA act compensation must be removed**." [73]

E. NRF Incomplete Waste Disposition

a. FEIS Fails to Include NEPA Requirements of Cumulative Radioactive Waste Disposition.

"Comments on the history of disposal at the RWMC are outside the scope of this EIS." [FEIS Pg. G-99]

Despite the above statutory statements the FEIS states: "Historic disposal at the RWMC including the subsurface disposal area of the RWMC were previously evaluated and addressed through the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process which included opportunities for public comment.

The FEIS fails to acknowledge the NRF's waste stream to INL burial landfill that would not qualify as a municipal dump under EPA Subtitle D regulations. Since the NRF/ECF basic operations will increase but not change the process and the nature of waste generation, inclusion of waste is crucial. Thus, it is essential to review previous years to get an accurate assessment of what current and future operations will be. The DOE/NRF makes their position clear as the above statement shows – waste deposition is absolutely not part of this EIS thus violating basin NEPA rules.

EDI is obliged to offer the Summary of Naval Reactors Facility best-estimate radionuclide inventories in waste sent to the INL RWMC Subsurface Disposal Area from 1953 through 1999. When added the total curie content is 952,986.86. [74]

NRF plans to ship its highly radioactive remote handled waste to R-H LLW Facility yet FEIS claims: **"Comments on the location of the new Remote-Handled Low-Level Radioactive Waste disposal facility at the INL are outside the scope of this EIS."** [FEIS Pg. G-99]

DOE/Navy use a classical bait and switch ostensibly initially appearing to follow the legal requirements of NEPA, while later buried in the FEIS claim's the NRF has no obligation to include the

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[71] Kohnlein,W, PhD., and Nussbaum, R. H., Ph.D., "False Alarm or Public Health Hazard?: Chronic Low-Dose External Radiation Exposure, Medicine & Global Survival, January 1998, Vol. 5, No. 1.

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

[73] Tami Thatcher http://environmental-defense-institute.org/publications/CommentsECF.pdf Pg. 1. Citing:
Naval Nuclear Propulsion Program, Office of Naval Reactors, "Occupational Radiation Exposure from Naval Reactors' Exposure from Naval Reactors' Department of Energy Facilities," Report NT- 113, Mary 2011. http://nnsa.energy.gov/sites/default/files/nnsa/02-12-multiplefiles/NT-11-3%20FINAL.pdf
Kohnlein,W, PhD., and Nussbaum, R. H., Ph.D., "False Alarm or Public Health Hazard?: Chronic Low-Dose External Radiation Exposure, Medicine & Global Survival, January 1998, Vol. 5, No. 1. http://www.ippnw.org/pdf/mgs/5-1-kohnlein-nussbaum.pdf
"An Epidemiology Study of Mortality and Radiation-Related Risk of Cancer Among Workers at the Idaho National Engineering and Environmental Laboratory, a U.S. Department of Energy Facility, January 2005. http://www.cdc.gov/niosh/docs/2005-131/pdfs/2005-131.pdf and http://www.cdc.gov/niosh/oerp/ineel.htm and Savannah River Site Mortality Study, 2007. http://www.cdc.gov/niosh/oerp/savannah-mortality/

[74] "Supplement to Evaluation of Naval Reactors Facility Radioactive Waste Disposed of at the Radioactive Waste Management Complex from 1953 to 1999", J. Giles. et.al, April 2005, ICP/EXT-05-00833, table 5 pg. 18.

full waste stream disposition and environmental contamination resulting from NRF/ECF operations. What is critical in any EIS is to review all environmental the impacts of any subject operation. That literally means the past, present and anticipated impacts as NEPA requires. By ignoring history, we are bound to repeat it.

b. FEIS says NNPP will not generate high-level-waste (HLW)

"High-Level Radioactive Waste: NRF **does not currently generate any high-level radioactive waste.** Transuranic Waste: NRF does **not currently generate any transuranic waste** from naval spent nuclear fuel handling operations." [Pg. S-19] [emphasis added]

Clearly NRF does not consider irradiated spent nuclear fuel (SNF) produced by NNPP as high-level waste as it is classified in statutes. In the recent past, the NRF had 5 propulsion prototype reactors several are defueled but operable. [75] Currently, the Advanced Test Reactor at INL that tests NRF fuel is a crucial part of NRF operations and itself produces SNF. This sleight of hand that the ATR is not an integral part of the NNPP/NRF is ridiculous and challenges the credibility of this FEIS. See EDI comments on Draft EIS for listing of NRF transuranic waste and GTCC waste dumped at RWMC. [76]

"In addition to DOE owned fuel INL/INTEC CPP-666 stores spent fuel from the Naval Reactors Program." [77] "The Idaho [CPP-666] inventory includes SNF from the Naval Nuclear Propulsion Program (i.e., submarines and aircraft carriers), which is different from commercial SNF in many ways, including enrichment level and design. From about 1952 to 1992 this Navy SNF was reprocessed in Idaho to extract high-enriched uranium for use in driver fuel rods at weapons material production reactors elsewhere." [78]

Chemical reprocessing at INL/INTEC generated millions of gallons of high-level waste – 900,000 gallons of which remains in underground tanks today. Leaks from this INTEC high- level waste tank farm and aquifer waste injection wells continue to contaminate the soil and groundwater. [79]

The FEIS states: "The Naval Nuclear Propulsion Program (NNPP), also known as the Naval Reactors Program, is a joint United States (U.S.) Navy and Department of Energy (DOE) organization with responsibility for **all matters pertaining to naval nuclear propulsion from design through disposal (cradle-to-grave)."** [FEIS pg. Vol. I Abstract] [emphasis added]

c. The FEIS inaccurately characterizes transuranic waste

EDI comments on the DEIS (Page 18): "Navy Waste Characterization Partial listing of isotopes found in Navy waste dumped at INL" table shows clearly how Navy waste dumped in the RWMC burial grounds contains Transuranic waste. [80] One of the reasons for this is the lack of precision in cutting off the structural parts of the fuel element in preparation for reprocessing or storage. Destructive tests of fuel assemblies additionally add to the fissile content of the waste stream. In recent DOE documents characterizing the Navy waste streams going to the RWMC they acknowledge presence of, "Irradiated fuel element end boxes that were cut off of the fuel plates in the hot cells. The end boxes may contain some fuel, but **generally** only activation products". [81] [emphasis added]

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[75] NRF Reactors: Large Ship Reactor A, Large Ship Reactor B, Natural Circulation Reactor, Submarine Thermal Reactor, High-Temperature Propulsion Reactor.

[76] NRF Reactors: Large Ship Reactor A, Large Ship Reactor B, Natural Circulation Reactor, Submarine Thermal Reactor, High-Temperature Propulsion Reactor.

[77] Energy and Environment, Storage of DOE SNF at the Idaho National Laboratory, U.S. DOE.

[78] http://www.environmental-defense-institute.org/publications/NNPP-Report7A.pdf Page 17 through 18

[79] Engineering Design File, Groundwater Pathway Risk Assessment for CPP-601, CPP-602, CPP-627, and CPP-640 Fuel Reprocessing Complex Non-Time-Critical Removal Action**,** Document ID: EDF-10195, Revision ID: 1, Effective Date: 02/08/12.

[80] Transuranic (TRU) waste is "radioactive waste that is not classified as high-level radioactive waste contains more than 100 nanocuries (3700 Becquerel's) per gram of alpha-emitting transuranic isotopes with half-lives greater than 20 years.

[81] EG&G-WM-10903; A Comprehensive Inventory of Radiological and Non Radiological Contaminates in Waste Buried In the Subsurface Disposal Area of the INEL RWMC During the Years 1952-1983,June 1994, Lockheed, Pg. 2-30.

Independent characterization of this waste must be made before more is dumped at the RWMC.

EDI's comments (Page 19) on DEIS table "Spent Reactor Fuel Dumped at INL's RWMC Subsurface Disposal Area Burial Grounds 1952 to 1980 [RWMIS] [82] shows:

Naval Reactors Facility (NRF)	27,707,700 Mass in grams or 27,707.7 kilograms

NRF Environmental Report states: "During 1991, approximately 776 cubic meters of solid radioactive waste containing 102, 706 curies of radioactivity were shipped to RWMC disposal facilities." [83]

DOE/NRF legitimately cannot deny its own waste data by claiming it is "beyond the scope of this FEIS. A legitimate assessment of any operation (absent FEIS disclosure or current publicly available data) is to look at past waste streams. The above preliminary numbers, compiled by the Environmental Defense Institute, are drawn from Freedom of Information Act from DOE's Radioactive Waste Management Information System Database (P61SH090, and P61SH070, Run Date 10/24/89) and represent about 57 shipments specifically identified as "irradiated fuel". Not included in the above listing are even more numerous shipments called "un-irradiated fuel", "fuel rods", "control rods", and other reactor fuel not identified specifically as "irradiated". The curie content of these shipments identified as "fuel rods" (>7,000 curies) suggests that they are also irradiated reactor fuel. The above listing also does not include 7 shipments of "irradiated fuel" during the same period to the RWMC Transuranic Storage Area amounting to 621.549 kilograms, and which also were not included in the Spent Nuclear Fuel EIS.

DOE/NAVY gets to call waste whatever they want – HLW should equal either SNF or chemically separated material from reactor fuel reprocessing. But the activated metals and the bits of SNF on the chopped off end caps of the fuel/ECF canal trash --- these are going to a "low level radiation waste facility --- specifically, RWMC and the remote handled LLW facility at INL that has no permit to accept HLW. They don't even like to admit when its greater-than-class C material, let alone that it should be considered HLW.

Proper comprehensive evaluation – required by NEPA- looks at all cumulative environmental impacts – past, present and future. DOE/NRF cannot legally exclude complete characterization of its entire waste stream.

The FEIS inaccurately characterizes greater-than-class C waste

FEIS states: "Solid Low-Level Radioactive Waste (LLW): Operations at ECF result in generation of solid LLW primarily consisting of filters, resin, contaminated components, pieces of insulation, rags, sheet plastic, paper, and filter paper and towels resulting from radiochemistry and radiation monitoring operations. The annual average of LLW waste generated at NRF is 740 cubic meters (960 cubic yards) from routine activities and 1200 cubic meters (1600 cubic yards) from decontamination and decommissioning (D&D) activities. There are 38 shipments of LLW from NRF annually." [pg. S-20]

No complete characterization (isotope content/activity rate) of this highly radioactive remote handled waste is offered in this FEIS. Again, a violation of NEPA.

EDI's comments on DEIS (Page 8) notes; "Since this NRF reactor core waste going to the RWMC burial grounds contains long-lived radioactive isotopes due to many years of exposure in the reactor core, it should be classified as high-level waste and treated according to Nuclear Regulatory Commission (NRC) disposal standards. At the very least this waste must be put in NRC Greater than Class C (GTCC)

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[82] Radioactive Waste Management Information Data Base Solid Master Data Base (P61SH090), List for 1954 to 1970, Run Date 3/29/89, pages 517, 518, 519 and 520 (RWMIS).

[83] Naval Reactors Facility, Environmental Monitoring Report, Calendar Year 1991, NRFRC-EC-1007, Pg. 37.

waste category. NRC disposal criteria require that "waste that will not decay to levels which present an acceptable hazard to an intruder within 100 years is designated as Class C waste." [10 CFR 61.7] Class C waste, must, for this reason, be disposed at a greater depth than other classes, or, if that is not possible, under an intruder barrier with an effective life of 500 years.

FEIS states: "Seismic Hazards Refurbishment Period: There would be **moderate** impacts from seismic hazards until refurbishment activities are complete. Activities during the refurbishment period would improve the building's ability to withstand vibratory ground motions from seismic activity. Post-Refurbishment Operational Period: There would be small impacts from seismic hazards since the refurbishment actions would improve the building's ability to withstand vibratory ground motions from seismic activity." [Pg. S-33]

FEIS further states: "Seismic Hazards: Differences in impacts from seismic hazards from the alternatives are related to the ability to withstand vibratory ground motions under each alternative. Since there would be no additional refurbishment or upgrades to ECF for the No Action Alternative, the facility and supporting infrastructure **would continue to degrade for a period of 45 years**. During the refurbishment period of the Overhaul Alternative, **to the extent practicable,** infrastructure and equipment would be refurbished or designed to the appropriate natural phenomena hazard category to withstand vibratory ground motions. "During the **construction and transition periods** of the New Facility Alternative, **there may be upgrades or refurbishments to ECF,** to ensure operations continue in a safe and environmentally responsible manner**.** [Pg.S-72]

What do the above statements: "to the extent **practicable**" and "there **may be** upgrades or refurbishments to ECF" mean? Obviously, this is slippery non-committal language that has no business in this FEIS and must raise RED flags to EPA/IDEQ regulators.

"At the end of the 500 year period," according to NRC regulations, "remaining radioactivity will be at a level that does not pose an unacceptable hazard to an intruder or public health and safety." [Ibid.] The adequacy of the EPA, NRC, IDEQ regulations is discussed more fully in the waste dumping in this paper, for instance there is considerable debate over these **regulators non- enforcement that allows greater than class-C waste to be dumped in shallow land burial at INL in a flood zone.**

FEIS states: "Mixed Low-Level Radioactive Waste (MLLW) and TSCA MLLW: NRF generates a **small** amount of MLLW and TSCA MLLW, primarily from D&D activities at ECF. The annual average of MLLW and TSCA MLLW generated at NRF is 20 cubic meters (26 cubic yards). There are 12 shipments of MLLW (including TSCA MLLW) from NRF annually." [Pg.S-20]

The above DOE/NRF statement is a grossly inadequate and inaccurate waste characterization that does not meet NEPA requirements.

NRF FEIS Incomplete Seismic Vulnerabilities

The EIS failed to adequately assess the ECF's seismic vulnerabilities.

The FEIS states: "The ECF water pools have never undergone a complete refurbishment and have not been upgraded to current seismic standards." [Pg. S-6]

Despite this statement, NRF intends to continued use of the ECF for decades and does not specify exactly what modifications will be made and what independent seismic assessment will be made to demonstrate compliance.

The above FEIS statement contradicts the fact that NRF intends to continue ECF operations for over 3 additional decades. Additionally, the FEIS fails to offer requisite detail on what exactly these ECF "upgrades" will be.

"During the **refurbishment period** of the Overhaul Alternative**, to the extent practicable**,

infrastructure and equipment would be refurbished or designed to the appropriate natural phenomena hazard category to withstand vibratory ground motions."

Again, What do the above statements: "to the extent **practicable**" and "there **may be** upgrades or refurbishments to ECF" mean? Obviously this is slippery non-committal language that has no business in this FEIS and must raise RED flags to regulators. Repeating a false statement over and over does not make it true.

FEIS states: "During the construction and transition periods of the New Facility Alternative, there may be upgrades or refurbishments to ECF, to ensure operations continue in a safe and environmentally responsible manner. During the transition and new facility operational periods, the structures, systems, and components in the new facility would be designed to the **appropriate natural phenomena hazard category to withstand vibratory ground motions."** [FEIS Pg. S-72]

Only careful reading reveals that only the NEW Facility portion covered in this EIS will be built to "appropriate natural phenomena hazard category to withstand vibratory ground motions" cleverly giving the impression that the ECF is included.

Seismic Vulnerability of Storing Highly Enriched SNF in ECF

The FEIS states: "Naval nuclear fuel is highly enriched (approximately 93 weight percent to 97 weight percent) in the isotope uranium-235 (235U). As a result of the high initial uranium enrichment, very small amounts of transuranic radionuclides are generated by end of life when compared to commercial spent nuclear fuel." [Pg.1-3]

This Navy high burnup SNF ECF is the most hazardous material in the world requiring deep geological disposal for hundreds of thousands of years due to the long-lived radio-isotopes produced in nuclear reactors. The current ECF inventory of ~400 assemblies constitutes a significant unregulated hazard in the event of accidental loss of canal coolant water.

"Since the 1990's, U.S. reactor operators are permitted by the U.S. Nuclear Regulatory Commission (NRC) to effectively double the amount of time nuclear fuel can be irradiated in a reactor, by approving an increase in the percentage of uranium-235, the key fissionable material that generates energy. In doing so, NRC has bowed to the wishes of nuclear reactor operators, motivated more by economics than spent nuclear fuel storage and disposal. Known as increased "burnup" this practice is described in terms of the amount of electricity in gigawatts (GW) produced per day with a ton of uranium." [84]

"Given these uncertainties the U.S. Department of Energy (DOE) and the NRC have provided general estimates of the radionuclide content of spent nuclear fuel based on current and previous burnup assumptions. According to DOE the estimated average long-lived radioactivity for a typical PWR and BWR assembly having lower burnup at the time of geological disposal are 88,173.69 curies and 30,181.63 curies respectively. For current burnups the NRC estimates that the post discharge radioactive inventory of spent fuel for a typical PWR and BWR assemblies are 270,348.26 curies and 127,056.67 curies respectively. [85] **Approximately 40 percent of the total estimated radioactivity for lower and high burnup is Cs-137**." [86] [emphasis added]

The FEIS ECF accident source terms do not list Cs-137. [87] This represents another significant deficiency in this FEIS. The Navy uses zirconium clad fuel that adds to storage hazards.

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[84] Robert Alvarez, Memorandum: High Burnup Spent Power Reactor Fuel, : December 17, 2013, citing : Foot Note 29: U.S. Department of Energy, Final Environmental Impact Statement, for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada, 2002, Appendix A, Tables A-7, A-8, A-9, A-10, (PWR/ Burn up = 41,200 MWd/MTHM, enrichment = 3.75 percent, decay time = 23 years. BWR/ Burn up = 36,600 MWd/MTHM, enrichment = 3.03 percent, decay time = 23 years.)

[85] Alvarez citing: U.S. Nuclear Regulatory Commission, Characteristics for the Representative Commercial Spent Fuel Assembly for Pre-closure Normal Operations, May 2007, Table 16, p.44-45. http://pbadupws.nrc.gov/docs/ML0907/ML090770390.pdf

[86] Robert Alvarez, Memorandum: High Burnup Spent Power Reactor Fuel, : December 17, 2013, Pg. 5

[87] FEIS Pg. F-35

> "Zirconium cladding of spent fuel is chemically very reactive in the presence of uncontrolled decay heat. According to the National Research Council of the National Academy of Sciences the buildup of decay heat in spent fuel in the presence of air and steam: " is strongly exothermic
> – that is, the reaction releases large quantities of heat, which can further raise cladding temperatures… if a supply of oxygen and or steam is available to sustain the reactions.. The result could be a runaway oxidation – referred to as *a zirconium cladding fire* – that proceeds as a burn front (e.g., as seen in a forest fire or fireworks sparkler)...As fuel rod temperatures increase, the gas pressure inside the fuel rod increases and eventually can cause the cladding to balloon out and rupture.[original emphasis]" [88]

The FEIS states: "Naval spent nuclear fuel consists of solid metal and metallic components that are nonflammable, highly corrosion-resistant, and neither pyrophoric, explosive, combustible, chemically reactive, nor subject to gas generation by chemical reaction or off- gassing. Naval spent nuclear fuel is primarily from pressurized water reactors (PWRs)." [FEIS Pg. 1-3]

1. Seismic Vulnerabilities of ECF Degraded Concrete Basin

There are some crucial unknowns the FEIS failed to assess.

1. Is the ECF basin concrete already to degraded to allow continued operation?
2. What radiation cumulative level has the ECF basin been exposed to now and in 10 years? 10 x E 10 rad? More? Less?
3. Will the fuel in the ECF (or some fraction of fuel) melt/burn if water is removed and the fuel is uncovered?
4. Will the concrete or structural materials above the ECF actually fail if temperatures rise because of fuel heat up? Interesting that it has not been brought up as an issue before, but perhaps that is because the fuel melting temperature of fresher fuel assured fuel melt before such structural damage.

Defense Nuclear Facility Safety Board conducted a review of the newer INL/INTEC CPP- 666 SNF Basin concrete foundation. This review is relevant because the Navy's ECF "refurbishment" will entail draining portions of the basin so epoxy leak-proofing can be applied potentially putting similar stresses on the ECF concrete foundation.

"The [Fuel Storage Area] FSA Pool Structures is a passive design feature of the FAST facility. **Additional calculations performed to increase the allowable floor loading to support the FSA Reracking Project indicated that the original design objective to allow** an empty pool to be adjacent to a water filled pool resulted in overstresses during the [Design Basis Earthquake] DBE." [89] **[DFNSB Pg. A-4]**

FEIS fails to fully analyze the ECF refurbishing part that includes emptying sections so epoxy leak prevention remediation can proceed. Calculations of shifting ECF SNF on the degraded concrete basin foundations ability to withstand the "overstress" concurrently with a DBE are absent.

1. Radiation degradation of concrete ECF SNF basin

For continuously wetted concrete (no stainless steel liner) an aggregate dose of 10 x E10 rad (10 x E8 gray) is the limit. For dry concrete the limit is not known. The few pieces of data available from the X10 reactor in Oak Ridge, Tennessee and the Temelin reactor in the Czech Republic suggest that the allowable dose to avoid structural degradation and failure is 500 to 2,000 times lower than for wetted concrete (i.e., 5 x 10E6 rad).

It is highly likely that the ECF concrete walls have received an aggregate gamma ray dosage far in excess of that necessary to severely degrade the concrete, thus increasing seismic vulnerabilities. Maintaining ECF water levels should a significant seismic event (earthquake) occur is problematic.

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[88] Robert Alvarez, Memorandum: High Burnup Spent Power Reactor Fuel, December 17, 2013, pg. 8.

[89] DNFSB Recommendation 2000-2 INEEL Priority Facility Phase I Safety Class, Ventilation and Fire Protection Systems Assessment Report, Pg. A-4.

The FEIS fails to fully analyze these fundamental issues in the Hypothetical Accident 4.13.2.2.

The catastrophe hazard from an ECF basin drain down event is more than extreme. Such an event must be prevented at any cost. Once a drain down begins it cannot be stopped. Once the fuel is exposed no human or robotic response is possible - of any kind. A current example is Japan's Fukushima reactor/SNF storage disaster.

The accident will then proceed to its ultimate termination independent of human intervention. Temperatures inside the ECF structure will likely rise to levels sufficient to cause the concrete to fail and the building to crumble in on itself. The human exclusion zone for direct radiation exposure will likely be 1-2 km in all directions. No access will be possible in this zone for decades. Once fuel fails and radioactive atmospheric releases that zone will be pushed farther out (likely much farther out). Access to respond to the event may not be possible in or through that zone for centuries.

FEIS must provide independent engineering assessments of ECF basin concrete. Alternatively, using civilian fuel (since Navy fuel details are classified) as a surrogate; what is the concrete heat profile and rad profile of used civilian fuel? How far is it from the walls and floors of the basin? Then do some estimates of shielding and you have estimates of dose. Doing that correctly requires details about the fuel, and a complex set of radiation calculations that have a lot in common with optics problems. Gamma rays are light after all. The fuel is opaque to it, as are the water and concrete. Some of it is absorbed and heats the fuel, water and concrete. Several different interactions occur that shift the energy spectrum and generate secondary radiation. The most accurate way to assess all of this is to actually measure it.

What the ECF review will likely find is the surface of the concrete probably exceeded 10 x E10 rad after 10-20 years. It is likely now that the concrete 6-10 inches in has exceeded that same dose. The concrete 'paste' likely has little to no strength in 6-10 inches from the surface.

The temperature issue is different. So long as there is some cooling and the fuel is over 20 years old, there is not much heat to remove. If the basin water is lost, during an earthquake or severe leak, the rad field can be extreme. That prevents human entry. Lacking human entry the systems fail. When ventilation is lost heat then builds up having only convective and radiative cooling to keep things under control. [90] With limited ventilation, the temperatures inside the structure will rise substantially. If newer fuel is present, this could get out of hand quite quickly creating a second barrier (after the lethal rad fields) to human entry. The potential then is that following a basin drain down that uncovers the fuel that the accident progresses of its own accord to complete loss of control of the basin and failure of the fuel. It is likely that no recovery will ever be possible at that point. The accident proceeds to final completion (whatever that is) entirely outside of human ability to influence it.

The concrete dose serves to heat the concrete failing it prematurely. This is well known. And it served to hide the insidious damage to the concrete, as that is waived away as being all thermal damage, and then assessing that the concrete in the basin hasn't seen high heat, so it will not fail. For instance, the rad dose damage gets ignored. There are also an equally large but still handful of data points for dry concrete exposed to radiation. That data was thrown out in developing the standards for what radiation dose concrete can withstand. The data was discarded on the presumption that the early weakening was attributable to heat. The experience at Temelin and X-10 show that to be wrong. The concrete wasn't heated.

At a microscopic scale, absorbed radiation heats the concrete at nearly the atomic level. The heat damage is then limited to a small volume. But continue doing this over 50 years in a large SNF ECF basin and the problem becomes a stochastic one of adding up all of the random little damages into one large

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[90] A DNFSB review of the newer INL/INTEC CPP-666 Fuel Storage Area (FAST) water basin found "[T]he Confinement Ventilation System is degrading due to facility aging. This degradation could result in future operational downtime, radiological contamination and personnel exposure." DNFSB Recommendation 2000-2 INEEL Priority Facility Phase I Safety Class, Ventilation and Fire Protection Systems Assessment Report, Executive Summary.

failure. This can lead to a large uncontrollable leak and extended loss-of-coolant.

Yet another way to consider it is that the radiation serves to boil out the water from the cement paste that forms the backbone of concrete. When the concrete is moist there is water immediately available to cool the local heating and/or to replace the lost water. When the concrete is dry (< about 11% water) these effects are not enough and waters of hydration are lost from the paste to migrate out of the concrete. The paste then chemically changes and falls apart as damage accumulates.

One of the papers on this considered two different dose rates and times to accumulate the same aggregate dose or different doses. What they observed was very interesting. The time until the concrete was weakened remained the same despite the differing dose rates. In other words, the effect seemed to be caused by some critical radiation insult and then the passage of time. This is hugely concerning as it brings into question the entire safety basis and the possibility that the damage is essentially done in the first few days. It then just takes time for the basin concrete to fail. The FEIS acknowledges ECF basin concrete degradation.

Congress' Role Exemptions from Environmental Laws

Consequent to over a half century of Congressional exemptions to the NNPP from nuclear operations and waste management, the largest contamination of the human environment has resulted.

The 1985 Low Level Waste amendments require DOE to take ownership of a NRC licensee of GTCC waste. But as DOE manages its own LLW it is not required to classify it according to the laws for NRC licensed facilities. DOE does not have to classify its waste as A, B, C or Greater-Than-Class C except when it wants to send this waste to another state or NRC- licensed facility. Below are exemptions to the Low-level waste law for NRC licensees like commercial power reactors.

TITLE 42 United States Code Annotated 6.427.§ 28.021c

" Disposal of low level radioactive waste; (a) State responsibilities, (1) Each State shall be responsible for providing, either by itself or in cooperation with other States, for the disposal of (A) low-level radioactive waste generated within the State (other than by the Federal government) that consists of or contains class A, B, or C radioactive waste as defined by section 61.55 of title 10, Code of Federal Regulations, as in effect on January 26, 1983;(B)low-level radioactive waste described in subparagraph (A) that is generated by the Federal Government **except** such waste that is (i) owned or generated by the Department of Energy; (ii) owned or generated by the United States Navy as a result of the decommissioning of vessels of the United States result of the decommissioning of vessels of the United States Navy; or (iii) owned or generated as a result of any research, development, testing, or production of any atomic weapons…." [91]

Exemptions from Regulatory Oversight

In the early 1990s Clinton Administration, Congress established the Defense Facility Nuclear Safety Board (DFNSB) to conduct safety assessments of DOE operations. Congress however did not grant the Board with enforcement authority similar to NRC.

Defense Facility Nuclear Safety Board enabling legislation states in pertinent part:

"SEC. 318. DEFINITION. [42 USC 2286g] "As used in this chapter, the term 'Department of Energy defense nuclear facility' means any of the following:

"(1) A production facility or utilization facility (as defined in section 11 of this Act) that is under the control or jurisdiction of the Secretary of Energy and that is operated for national security purposes, **but the term does not include**

"(A) any facility or activity covered by Executive Order No. 12344, dated February 1, 1982, pertaining to the Naval nuclear propulsion program;"

The bottom line is NNPP is unregulated by any federal agency – even the Nuclear Regulatory Commission charged with regulating commercial nuclear operations or Defense Nuclear Facility

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91 42 United States Code Annotated 6.427. § 28.021c.

Safety Board charged with monitoring DOE nuclear facilities. Attorney Mark Sullivan representing EDI petitioned the Defense Nuclear Facility Safety Board (DFNSB) to conduct a safety analysis of DOE's 60 year old Advanced Test Reactor at the INL. DFNSB chairman Winokur's reply states: "It is the Board's understanding that currently the primary defense-related mission of ATR is research and testing of components in support of naval nuclear propulsion program. **Navy nuclear propulsion activities are** excluded from the Board's jurisdiction by 42 U.S.C. ss 2286g(1)(A)." [92]

EDI's *Unacceptable Risk at INL's Advanced Test Reactor* details significant safety problems that neither DOE, the Navy or DFNSB are willing to address. As a fundamental part (as stated above) the ATR must be included in this FEIS but it is not!

NRF Comment Conclusion

EDI's comments are by no means a complete analysis of this lengthy 3 Volume document because the NRF operations are classified and there are no regulatory agency reports on it. For instance, the NNPP SNF coolant time, fuel cladding needed to properly determine ECF basin loss-of-coolant source terms are classified.

This DOE/NRF/NNPP FEIS is deficient and EPA and IDEQ are complicitous if they do not also reject its findings that contain innumerable fundamental false statements. This EIS should be detailing how NRF is going to completely replace the ECF basin as a SNF wet storage facility. Many casual EIS readers mistakenly assumed ECF replacement. Instead, DOE/Navy intends to keep this high-hazard heavily degraded ECF operating for 3-4 decades far beyond its design life that has already expired. The Navy is only willing to spend money to expand capacity for new large ship reactor SNF assemblies.

The DNFSB noted, in Recommendation 2000-2, (now 14 years back) that "[I]t was concerned with the fact that many of the DOE's nuclear facilities were constructed years ago and are approaching end-of-life. The DNFSB expressed concern that some degradation of reliability and operability of systems designed to ensure safety can reasonably be expected and recommended specific actions to assess system condition and apply system expertise in managing the configuration of vital safety systems." [93] Lacking enforcement authority, DNFSB can only advise.

EDI finds this EIS a clever effort to slip in a deliberately narrow major expansion of the Navy's SNF waste management without acknowledging 50+ years of massive radioactive contamination at INL by claiming previous NRF environmental studies. DOE/NAVY claim these CERCLA reports are beyond the scope of this EIS. The Navy's previous radioactive contamination will remain for manila putting Idahoans at risk. This is an unconscionable and avoidable assault on Idaho's most valuable Snake River Aquifer that we depend on.

Congress bears the most responsibility for NRF's unregulated willful contamination of Idaho's environment via nuclear waste mismanagement and exposure to catastrophic accidents by granting exemptions to these rogue agencies compliance with the same regulations imposed on commercial nuclear operations.

Even when federal (EPA) and state (IDEQ) regulators can enforce NEPA regulations, or mixed-hazardous RCRA regulations, Clean Water Act regulations, they remain largely silent. We the public are left with little alternative than the Courts for redress. Even this process is blocked by the courts. FOIA requests when approved are largely redacted and Appeals to DOE's office of Hearings and Appeals are denied.

It is unconscionable that 3-4 additional decades of continued operation of the ECF represents a significant unregulated hazard of the most deadly radioactive material in the world and that high-level waste ultimately must be interred in a deep geologic repository yet to be established by Congress. For more information on NRF see Section IV.K.-114

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[92] DNFSB Chair, Peter Winokur letter to Mark Sullivan, 9/23/10. Also see EDI's Unacceptable Risk at INL's Advanced Test Reactor.

[93] DNFSB Recommendation 2000-2 INEEL Priority Facility Phase I Safety Class, Ventilation and Fire Protection Systems Assessment Report, Pg.1.

Section II. G. What is INL Role with Space Travel?

In Section I.1., we discussed the Aircraft Nuclear Propulsion Program at INL during the 1950's when huge amounts of radiation was released testing various nuclear rockets. The US Air Force's Aircraft Nuclear Propulsion (ANP) program in the 1950's designed built, and flight tested a nuclear jet powered bomber which employed more than 10,000 workers. The plane was a modified B-36 (called NB-36) built by Convair and flight tested at Carswell Air Force Base in Fort Worth, Texas. That ANP program only went dormant for a while after the nuclear reactor propelled modified B-52N bomber Convair built and tested in Texas (see Section I.1.a).

In 1990 the Strategic Defense Initiative Organization (SDIO) revived the nuclear jet engine project for use in the space program. This new Black Budget program's (code name Timberwind) purpose is to develop the technology and demonstrate the feasibility of a high-temperature particle bed reactor propulsion system to be used to power an advanced nuclear rocket engine. The Strategic Defense Initiative involves orbiting space platforms that theoretically will have the capacity to shoot down missiles launched at the USA. To build these platforms, heavy payloads would have to be launched - requiring powerful rockets. SDIO believes that the nuclear rocket offers a greater thrust to weight ratio than conventional rocket designs. SDIO generated a secret Environmental Impact Statement (EIS) on Timberwind in 1990 but after environmentalists (including EDI) forced a declassified version of the EIS released (almost entirely blacked out) the project was canceled.

INL has continued to produce the plutonium-238 used in the Radioisotope Thermoelectric Generator at the Advanced Test Reactor. [94] INL's current role with space travel is described on DOE/INL website:

> "Idaho National Laboratory's Space Nuclear Power and Isotope Technologies Division fuels and tests Radioisotope Power Systems at the Materials and Fuels Complex, then delivers the systems for use in remote, harsh environments such as space. INL is working on the Multi-Mission Radioisotope Thermoelectric Generator (MMRTG) for NASA's upcoming Mars 2020 mission that will send a rover to the Red Planet. Generators fueled and tested at INL are currently powering the Mars Science Laboratory Curiosity rover (launched in 2011 and still going strong) and Pluto New Horizons (launched in 2006 and now more than 4.1 billion miles from earth, traveling at more than 30,000 mph). The power system on New Horizons was the first assembled and tested at INL.
>
> "What is an MMRTG, and How Does it Work?
>
> "Multi-Mission Radioisotope Thermoelectric Generators are ideal for space missions because they are compact, durable and reliable, providing continuous power over long periods of time. The Department of Energy (DOE) provides radioisotope power systems to NASA for civil space applications. The MMRTG for the Mars 2020 mission will be fueled and tested at the DOE's Idaho National Laboratory. It will later be shipped directly from INL to the launch site at Kennedy Space Center Florida, for integration into the rover. MMRTG's work by converting heat from the natural decay of radioisotope materials into electricity. Typically, the hot side of a general purpose heat source is 1800 degrees Fahrenheit while the cold side is approximately 570 degrees Fahrenheit. The generators consist of two major elements: a heat source that contains plutonium-238 (Pu-238) and thermocouples that convert the plutonium's decay heat energy and the cold of space to electricity. The MMRTG is designed to produce about 110 watts of electrical power to begin the mission. The system has a design life of 14 years (plus three years of pre-launch storage), but can be expected to produce power much longer than that. Additionally, the MMRTG provides a source of heat for the rover's instruments and on-board systems in the cold environment. Thermocouples have no moving parts and have proved an amazingly reliable source of energy for space missions. They have been used in RTGs for a combined total of 300 years, and not one thermocouple has failed." [95] [https://inl.gov/mars-2020/]

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[94] Final Environmental Impact Statement for the Proposed Consolidation of Nuclear Operations Related to Production of Radioisotopic Power Systems. DOE/EIS-0373F.

[95] [https://inl.gov/mars-2020/] Also see A History of Space Nuclear Power and Propulsion in the United States.

Section II.H. Mobile Nuclear Reactor Power Generation

The Department of Defense (DOD) acting through the Strategic Capabilities Office (SCO) and in close collaboration with the U.S. Department of Energy (DOE) plans on building a "warfighter mobile nuclear reactor power generation" unit at one of 3 Idaho National Laboratory (INL) sites operated by DOE. DOD wants to develop a "prototype advanced mobile nuclear microreactor to support DOD domestic energy demands, DOD operational and mission energy demands, and Defense Support to Civil Authorities mission capabilities." The 3/3/20 Notice of Intent [96] to prepare an Environmental Impact Statement is available for viewing online at: https://www.federalregister.gov/

The Environmental Defense Institute has been monitoring DOE's INL operations for over 20 years and can categorically say the US Army and DOE's record of mismanagement of INL nuclear projects has resulted in extensive radiation contamination to the Idaho region. Therefore, we are opposed to this prototype advanced mobile nuclear microreactor for reasons we layout below.

Because of the existential threat of climate disaster, these DOD/DOE nuclear addicts have ignored, they must add to the scope of this EIS alternative renewable energy and offer a demonstration for these energy applications. These renewable energy sources will not – as our below discussion demonstrates – add to the radiation contamination of Idaho's air and water.

DOD Plan for INL

According to DOD, three INL locations are currently under consideration; Idaho Nuclear Technology Center (INTEC) ICPP-691, Materials and Fuels Complex (MFC) ERB-II, and the Power Burst Facility (PBF) Critical Infrastructure Test Range. Initially, DOD will build a prototype inside an existing structure and after hot run testing move the reactor to an INL outside location for additional hot tests. We discuss each of these sites more below.

Idahoans remember when DOD built the Army's SL-1 small mobile reactor at the Idaho National Laboratory back in the 1960's because it exploded marking the first nuclear reactor accident that killed 3 operators. Operational mismanagement by the Army and contractor (Combustion Engineering) caused the explosion spreading significant radiation around the region. A crucial element that his new mobile reactor will share with the SL-1 design is there will be little to no radiation containment structure required for Nuclear Regulatory Commission (NRC) licensed reactors. Since the cause of the SL-1 explosion was gross materials/oversight/management problems, DOD appears to be ready to repeat the same old mistakes by stating in the NOI:

> "The microreactor must keep radiation exposure during power operation, abnormal operations, or upset conditions, as low as reasonably achievable. SCO seeks to produce a prototype that will minimize consequences to the nearby environment and population in case of kinetic or non-kinetic action affecting structural integrity or release of contamination Further, [Strategic Capabilities Office] SCO seeks to utilize nuclear materials in the construction of a prototype microreactor that, if damaged, do not generate and impose excessive training and equipping burdens on forward area first responders, site medical facilities, or supported military personnel and the civilian population." [97]

INL is desperate for a new mission to justify its existence other than cleaning-up its' huge legacy nuclear waste. DOD knows that the nuclear power option is the most expensive compared to renewables – plus and more importantly - there is no permanent deep geological disposal site for the high-level waste these reactors will generate. Tragically, nuclear waste production has never been an issue DOD/DOE have ever been concerned about. It's fine to continue to use Idaho as their nuclear waste dump. DOE/DOE 70+ year history of INL mismanagement and total disregard of the health and environmental

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[96] 12274 Federal Register / Vol. 85, No. 41 / Monday, March 2, 2020 / Notice of Intent to Prepare an Environmental Impact Statement for Construction and Demonstration of a Prototype Advanced Mobile Nuclear Microreactor

[97] Ibid.,12274 Federal Register / Vol. 85, No. 41 / Monday, March 2, 2020 / Notice of Intent

effects of their operations is prima-facia evidence that they can **NOT** be trusted for anything other than cleanup of the mess they've already made. [98]

Since DOE is self-regulated, its nuclear facilities do not come under the full regulatory authority of the Nuclear Regulatory Commission (NRC). Consequently, this new mobile nuclear microreactor will also not be required to meet NRC design/operation/safety specifications; though DOE claims to seek NRC consultation, it "does not require a NRC license."

DOD claims to need a prototype advanced mobile nuclear microreactor to support DOD domestic energy demands capable of producing 1–10 megawatts of electrical power, DOD operational and mission energy demands, and Defense Support to Civil Authorities mission capabilities. Given DOD/DOE track record their claim below sounds ridiculous:

"The microreactor must keep radiation exposure during power operation, abnormal operations, or upset conditions, as low as reasonably achievable. SCO seeks to produce a prototype that will minimize consequences to the nearby environment and population in case of kinetic or non-kinetic action affecting structural integrity or release of contamination. Further, [Strategic Capabilities Office] SCO seeks to utilize nuclear materials in the construction of a prototype microreactor that, if damaged, do not generate and impose excessive training and equipping burdens on forward area first responders, site medical facilities, or supported military personnel and the civilian population."

Each of the INL locations DOD/DOE are considering have their own major contamination issues from previous operations. EDI's extensive contamination reports on each site in the following indoor/outdoor locations at INL must be considered in the EIS scoping process before making the decision to select INL.

(a) Chemical Processing Plant 691 (CPP–691) situated within the Idaho Nuclear Technology and Engineering Center (INTEC); [99]

(b) Experimental Breeder Reactor II (EBR II) situated within the Materials and Fuels Complex (MFC); [100] [101]

(c) Power Burst Facility 613, situated within the Critical Infrastructure Test Range Complex (CITRC); [102] [103] or

(d) Alternate facilities and infrastructure identified during the scoping process.

Tami Thatcher's comprehensive comments on DOD/DOE microreactor are crucial to consider:

> **"DOE's allowable radiation level of 100 mrem/yr. would devastate public health**
>
> The EIS must not embrace the DOE's unscientific allowable radiation level of 100 mrem/yr. and implies that reaching such high levels would not be a devastation to the health of people in our communities.
>
> "Department of Energy "regulatory radiological dose limits for member of the public" is 100 mrem/yr. for onsite controlled areas and offsite or onsite outsider of controlled areas, no matter the age and gender of the member of the public.

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[98] See 1995 Settlement Agreement and Consent Order against DOE/INL for mismanagement of nuclear waste.

[99] EDI Review of Idaho Nuclear Technology and Engineering Center CERLCA Cleanup, 2016 http://environmental-defense-institute.org/publications/CERCLA.INTEC.pdf

[100] Public Comment for Class 2 RCRA Permit Modification for Materials and Fuels Complex at Idaho National Laboratory, EPA Number ID4890008952 by Tami Thatcher and Chuck Broscious, September 29, 2017 http://environmental-defense-institute.org/publications/EDIRCRAcomments2017.pdf

[101] EDI Review of ANL-W (Materials and Fuels Complex) CERCLA Cleanup, 12/10/15 http://environmental-defense-institute.org/publications/y2016ANLWcleanup.pdf

[102] EDI Review of Auxilliary Reactor Area (ARA) CERLCA Cleanup http://environmental-defense-institute.org/publications/EDICERCLAARARev9.pdf

[103] Public Comment Submittal for Department of Energy Draft Environmental Statement for Expanding Capabilities at the National Security Test Range and the Radiological Response Training Range at Idaho National Laboratory, DOE/EA-2068, by Chuck Broscious, October 12, 2019 and Public Comment Submittal on DOE/EA-2068 also by Tami Thatcher, October 12, 2019 http://environmental-defense-institute.org/publications/EDINSTR.pdf

"Even now, with air emissions releases supposedly below 1 mrem/yr., communities near the Idaho National Laboratory have elevated levels of certain cancers, sometimes five times the state average, according to the Idaho Cancer Registry. The DOE's unique Derived Concentration Guidelines (DCGs) 3 allow about 100 times more radiological contamination than other federal standards. With federal drinking water standards, scientific study has shown that even the federal standards for radionuclides are not protective of human health.

"To get some perspective on how permissive the DOE's DCGs are, see the federal limits and public health goals for drinking water in Table 1. Compare the DOE's DCGs to federal Maximum Contaminant Levels (MCLs) and the public health goals. (To convert the DOE's DCGs as they are typically presented in microcurie/milliliter, you would multiply by 1,000,000,000 to obtain picocurie/liter.) The DOE DCGs are much higher than the federal Maximum Contaminant Level and even farther above the level would be protective of health by scientifically evaluated recommended health goals.

"For example, the federal limit for tritium in drinking water is 20,000 picocuries/liter, the DOE's derived concentration guide (DCG) is 1,900,000 picocuries/liter, but the level that isn't proven to cause harm is no higher than 400 picocuries/liter.

"The Department of Energy cites its "derived concentration guide" in defending the DOE's expansion of test range activities at the Idaho National Laboratory's National Security Test Range and Radiological Response Training Range. This will, for at least the next 15 years, will be releasing to the winds various long-lived and short-lived radionuclides to further the contaminate the INL and to blow to nearby communities at far higher levels than recent in recent decades.

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

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

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

- "The cancer risk is not reduced when radiation doses are received in small increments, as the nuclear industry has long assumed. U.S. Department of Energy Draft Environmental Assessment for Expanding Capabilities at the National Security Test Range and the Radiological Response Training Range at Idaho National Laboratory (DOE/EA-2063) at https://www.energy.gov/sites/prod/files/2019/09/f66/draft-ea-2063-expanding-capabilities-nstr-rrtr-inl-2019-09.pdf

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

- "Despite the repeated refrain that the harm from doses below 10 rem cannot be discerned, multiple and diverse studies from human epidemiology continue to find elevated cancer risks below 10 rem and from low-dose-rate exposure.
- "The adverse health effects of ionizing radiation are not limited to the increased risk of cancer and leukemia. Ionizing radiation is also a contributor to a wide range of chronic illnesses including heart disease and brain or neurological diseases. The public and radiation workers take cues from their management that they should not be concerned about the tiny and easily shielded beta and alpha particles.

"DOE-funded fact sheets often spend more verbiage discussing natural sources of radiation than admitting the vast amounts of radioactive waste created by the DOE. The tone and the metamessage from the DOE, the nuclear industry, is that if you are educated about the risks, then you'll understand that the risks are low. Yet, these agencies continue to deny the continuing accumulation of compelling and diverse human epidemiological evidence that the harm of ingesting radionuclides is greater than they've been claiming. The EIS must not be based on unscientific claims of low harm to the public from radiation, particularly the inhalation and ingestion risks." [104]

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[104] Tami Thatcher, Public Comment Submittal for the Department of Defense Prototype Microreactor EIS Comments regarding the scope of an Environmental Impact Statement for Construction and Demonstration of a Prototype Advanced Mobile Public Comment Submittal for the Department of Defense Prototype Microreactor EIS Comments regarding

the scope of an Environmental Impact Statement for Construction and Demonstration of a Prototype Advanced Mobile Nuclear Microreactor, Docket Number DOD-2020-OS-0002, March 30, 2020, by Tami Thatcher.
http://environmental-defense-institute.org/
Nuclear Microreactor, Docket Number DOD-2020-OS-0002, March 30, 2020, by Tami Thatcher.
http://environmental-defense-institute.org/