Environmental Defense Institute

News on Environmental Health and Safety Issues

October 2017 **Volume 28 Number 10**

U.S. Nuclear Industry Events Leave Boosters Scrambling to Argue for Nuclear Energy

Let's look at what has happened in the U.S. nuclear energy sector over the last half year and why it's left nuclear boosters scrambling. [1] [2]

In August, Duke Energy Florida announced it would spend $6 billion to expand solar power while abandoning plans for a nuclear plant in Levy County. [3]

The financial fallout has continued from the construction cost overruns and subsequent bankruptcy last March of the AP1000 nuclear reactor designer and builder, Westinghouse. Of the four AP1000 nuclear units under construction in the U.S. that began around 2013, construction has halted on two South Carolina AP1000 units while the decision to abandon construction is reviewed. [4] [5]

Of the two units in Georgia, Georgia Power is determined to march on. Georgia Power, with a larger customer base to spread costs to ratepayers than South Carolina, hopes to take over construction of the two AP1000 units that were to cost $14 billion and be operating by 2016. Costs are now projected at $25 billion and completion of the two units projected as 2022. [6] [7] [8]

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[1] Marc Spitzer and John Hanger, Editorial, *The Idaho Falls Post Register*, "Keep nuclear in the mix," September 14, 2017.

[2] Steven Piet, Editorial, *The Idaho Falls Post Register*, "No energy source 100% renewable," September 9, 2017.

[3] Russell Grantham, *The Atlanta Journal-Constitution*, "'Go' recommendation for Plant Vogtle nuke plant heats up debate," September 1, 2017. The current cost estimate for the two AP1000 units at Vogtle are now estimated at $25 billion and are not predicted to be completed before 2020.

[4] Russell Grantham and Johnny Edwards, *The Atlanta Journal-Constitution*, "Plant Vogtle: Georgia's nuclear 'renaissance' now a financial quagmire," May 19, 2017. http://www.myajc.com/business/plant-vogtle-georgia-nuclear-renaissance-now-financial-quagmire/5l16IFMFICknSCeI7RXG6J/ The two 1100 Megawatt reactors were to have powered 1.5 million homes, cost $14 billion, and been running in 2016.

[5] *World Nuclear News*, "US governor releases report on VC Summer flaws," September 6, 2017. (The VC Summer site includes two partially constructed AP1000 nuclear units.) http://www.world-nuclear-news.org/C-US-governor-releases-report-on-VC-Summer-flaws-06091701.html

[6] Russell Grantham, *The Atlanta Journal-Constitution*, "Regulators: Georgia's Vogtle not like S.C. nuke plant," August 1, 2017. http://www.myajc.com/business/regulators-georgia-vogtle-not-like-nuke-plant/G6wwM4Zd7jzOeEn8fOFSMM/

[7] Russell Grantham, *The Atlanta Journal-Constitution*, "'Go' recommendation for Plant Vogtle nuke plant heats up debate," September 1, 2017

Westinghouse was bought by Japan's Toshiba in 2006 when a nuclear renaissance in the U.S. was thought to be on the horizon largely because Westinghouse claimed to be able to control construction costs. [9] It hasn't panned out, in the U.S. at least.

China is in the lead to complete construction of its four AP1000 nuclear reactors, expecting to be the first operator of AP1000 reactors as soon as 2018. [10]

Arguments about US energy leadership are made by those who seem unaware of Toshiba's ownership of the Westinghouse nuclear division or Hitachi's ownership of GE's nuclear division. [11] [12]

And in 2015, Bill Gates' Terra Power partnered with China. [13]

But even for existing nuclear reactors that have already written down the construction costs, utilities in New York and Illinois have obtained state bailouts for their uneconomical nuclear reactors. The operating costs of some of these plants are so high that fossil replacement power could be purchased and still have money left over to invest in renewables according the renewable energy leader Amory Lovins. [14]

The nuclear energy industry remains uneconomical today despite decades of large taxpayer funded subsidies in research, uranium mining, milling and enrichment, financing and loan guarantees, and attempts to solve the nuclear waste problem. [15]

It has gotten so difficult to make claims that nuclear energy would provide affordable electric energy that many promoters are now making rather tortured arguments about energy diversity and national security. [16] [17]

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[8] Jim Galloway, *The Atlanta Journal-Constitution*, "Staffer: PSC [Public Service Commission] could stand pat, let Ga. Power absorb new Plant Vogtle costs," April 27, 2017. http://politics.blog.ajc.com/2017/04/27/staffer-psc-could-stand-pat-on-plant-vogtle-let-georgia-power-absorb-new-costs/

[9] Westinghouse Nuclear http://www.westinghousenuclear.com/New-Plants/AP1000-PWR/Economic-Benefits

[10] *World Nuclear News*, "Three Chinese reactors approach commissioning," July 24, 2017 http://www.world-nuclear-news.org/NN-Three-Chinese-reactors-approach-commissioning-2407174.html . There are four AP1000 nuclear reactors under construction in China.

[11] Daniel Hurst, *The Guardian*, "Victory for Japanese nuclear industry as high court quashes injunction," March 28, 2017. ". . .just two of Japan's 42 usable reactors are running. . ." as of March 2017 following the 2011 Fukushima accident.

[12] US Department of Energy, *Nuclear Power Summary – News & Notes,* August 2017. https://www.energy.gov/sites/prod/files/2017/08/f35/Nuclear-Power-Summary-August-2017_0.pdf

[13] James Conca, *Forbes*, "Bill Gates making Progress On Next Generation Of Nuclear Power – In China," October 2, 2015. https://www.forbes.com/sites/jamesconca/2015/10/02/bill-gates-forges-nuclear-deal-with-china/#78c791f72c12

[14] Amory B. Lovins, Cofounder and Chief Scientist, Rocky Mountain Institute, "Do Coal and Nuclear Generation Deserve Above-Market Prices?" Electricity Journal, July 2017, doi:10.1016/j.tej..2017.06.002 https://www.rmi.org/wp-content/uploads/2017/07/ElJ6May2017_preprint.pdf

[15] Doug Koplow, Earth Track, Inc., Union of concerned Scientists, "Nuclear Power: Still Not Viable without Subsidies," February 2011. http://www.ucsusa.org/sites/default/files/legacy/assets/documents/nuclear_power/nuclear_subsidies_report.pdf

[16] Marc Spitzer and John Hanger, Editorial, *The Idaho Falls Post Register*, "Keep nuclear in the mix," September 14, 2017.

But the high costs of construction turn to high costs of operating the reactors, followed by high costs of decommissioning, and then the high costs of spent nuclear fuel storage and disposal. Not figured in are the costs of an occasional multi-billion dollar accident or the human cost to radiation workers and the exposed public who will experience increased cancers, other illnesses and pass on genetic damage to their children.

It's unlikely that the Department of Energy will somehow meet the 2035 Idaho Settlement Agreement milestones, [18] perhaps by securing a defense-only disposal facility to send the high level waste and spent nuclear fuel at the Idaho National Laboratory to. [19] [20]

But building commercial nuclear reactors in Idaho, such as the proposed NuScale reactors could leave the state with stranded spent nuclear fuel waiting at the back of the line behind other commercial nuclear reactors that wait to ship to a commercial nuclear fuel disposal facility that so far does not exist. [21] [22]

This year's proposed funding for continuing to seek a license to construct the disposal facility at Yucca Mountain didn't happen. There has been no progress on securing either a defense-only or a commercial spent nuclear fuel disposal facility. [23]

The accident risks from nuclear reactor plants pose a real threat to national security. And importantly, it is unsustainable environmentally due to the vast quantity of long-lived radioactive materials it creates.

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[17] Ernst Moniz, *Energy Futures Initiative*, "Moniz: Robust Nuclear Industry Needed for National Security," August 17, 2017. https://www.nei.org/News-Media/News/News-Archives/2017/Moniz-Robust-Nuclear-Industry-Needed-for-National

[18] See more about Idaho's Settlement Agreement at https://www.deq.idaho.gov/inl-oversight/oversight-agreements/1995-settlement-agreement.aspx Section D(1)(e) stipulates that naval fuel be among the early shipments to the first permanent repository or interim storage facility.

[19] Department of Energy, *Report on Separate Disposal of Defense High-Level Radioactive Waste*, March 2015. http://www.yuccamountain.org/pdf/defense_repository_repor-2015t.pdf See also *Strategy for the Management and Disposal of Used Nuclear Fuel and High-Level Waste*, January 2013 at https://energy.gov/em/downloads/strategy-management-and-disposal-used-nuclear-fuel-and-high-level-radioactive-waste and factsheet https://energy.gov/sites/prod/files/2015/03/f20/Defense%20Repository%20Fact%20Sheet.pdf and speech by Ernst Moniz at http://energy.gov/articles/secretary-monizs-remarks-look-back-blue-ribbon-commission-america-s-nuclear-future

[20] US Government Accountability Office, "Nuclear Waste: Benefits and Costs Should Be Better Understood Before DOE Commits to a Separate Repository for Defense Waste," GAO-17-174, January 31, 2017. http://www.gao.gov/products/GAO-17-174

[21] Robert Alvarez, *The Bulletin of the Atomic Scientists*, "Pushing the Storage Horse with a Nuclear Waste Cart: The Spent Fuel Pool Problem," August 9, 2017. http://thebulletin.org/pushing-storage-horse-nuclear-waste-cart-spent-fuel-pool-problem11002 or http://www.environmental-defense-institute.org/publications/AlvarezSNFpool.pdf

[22] Steven P. Nesbit and Lara S. Nichols, Duke Energy Corporation, *IHLRWM 2015, Charleston, SC, April 12-16, 2015,* "A Proposed Waste Acceptance Queue for Shutdown Nuclear Power Reactors."

[23] Peter Maloney, *Utility Dive*, "Yucca Mountain: High stakes and high hurdles," July 21, 2017. http://www.utilitydive.com/news/yucca-mountain-high-stakes-and-high-hurdles/447573/

The public usually prefers to trusts its industry experts despite their obvious bias and their long history of understating or ignoring the harm of the nuclear industry's adverse health impacts.

The renewable industry of solar and wind makes economic sense and does not harm our DNA.

It will be up to citizens to learn the truth on their own about the adverse health impacts from routine and inevitable radiation exposures from accidents, storage and disposal. The question is, will they study the epidemiology of the harm to others or learn it the hard way from the health harm to their own families.

A condensed version of this article appeared as an editorial on the Idaho Falls Post Register commentary page September 20, 2017.

INL's Proposed Outdoor Radioactive Waste Storage at MFC Hazardous and RCRA Permit Modification Should Be Denied

The typical change to a Resource Conservation and Recovery Act (RCRA permit for the Idaho National Laboratory is about as interesting as watching paint dry. But a recent request by the Department of Energy and its contractor Battelle Energy Alliance (BEA) for greatly expanded outdoor radioactive and hazardous waste storage should not have stayed under the radar. Its public comment opportunity closed September 30 after a public meeting last August where I was the only member of the public in attendance. [24]

The public meeting offered no presentation of the many proposed changes to the INL's RCRA permit but provided experts to answer questions about the proposed RCRA permit modification.

Here's where it started to get interesting—at the meeting and during a couple phone calls for clarification. I asked whether the waste contained chemical solvents. I was told no. I asked about fire prevention at the outdoor storage area and asked for specific standoff distances for allowing vegetation to grow. I was given a large distance in yards — which was a complete fiction, dispelled by photos of the existing asphalt pad and fence. I was told that the maximum time limit for storage of the waste was one year. But there is no maximum time limit for storage stated in the permit. I was later told that the RCRA regulations limit the storage time to one year based on 40 CFR 268.50 (c) but this regulation allows waste storage to be stored beyond one year if

[24] See EDI's comment submittal to the Idaho Department of Environmental Quality September 29, 2017 for EPA Permit Number 4890008952 at http://www.environmental-defense-institute.org/publications/EDIRCRAcomments2017.pdf

the waste is being accumulated for waste treatment or disposal. [25] In communication after the meeting, I asked if the concrete overpacks had vents. I was told no. But later INL admitted the mistake and said that the concrete overpacks did have vents.

Phrases like "the waste may have come in contact with" chemical solvents betray the Department of Energy's use of words to misinform the public about the hazards associated with the waste. It would be like an unwed pregnant teen saying she "may have come in contact" with a sexual partner.

Typically a Class 2 permit modification is not all that big of a change. But this enormous expansion in outdoor radioactive waste storage is deemed small because it is less than 25 percent of INL entire radiation waste storage capacity including waste from Rocky Flats weapons production plant. Spent fuel and calcine waste are not included. But the storage capacity increase is very large for the Materials and Fuels Complex (MFC) and for the INL if the large amount of Rocky Flats weapons production waste at INL were excluded.

The radioactive waste at a partially underground metal containers store 201 cubic meters of waste at a 4-acre waste storage area at the MFC's Radioactive Scrap and Waste facility results from spent nuclear fuel reprocessing by pyroprocessing would actually be high-level waste. But it is stated in a 2005 EIS to include transuranic waste, [26] [27] low-level waste, mixed waste which contains both radioactive waste and hazardous chemical waste, and hazardous chemical waste. [28] It isn't clear whether the high-level waste is included in the 201 cubic meter capacity.

The new storage capacity is 666 cubic meters, split between two asphalt pads at MFC. The asphalt pads already exist but the increased capacity has not yet been approved.

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[25] Code of Federal Regulations, 40 CFR 268.50 where part 50(c) applies: (c) An owner/operator of a treatment, storage or disposal facility may store such wastes beyond one year; however, the owner/operator bears the burden of proving that such storage was solely for the purpose of accumulation of such quantities of hazardous waste as are necessary to facilitate proper recovery, treatment, or disposal. (Emphasis added)

[26] Transuranics are radionuclides with atomic number greater than uranium in the periodic table of elements. The definition of transuranic waste evolves but typically is called transuranic waste if the concentration of TRU is at or greater than 100 nanocuries of alpha activity per gram of transuranic radionuclides. Waste containing between 10 and 100 nanocuries of alpha activity per gram of transuranic radionuclides may be called alpha low-level radioactive waste and may be handled and managed together with the waste that is 100 nanocuries or greater. Transuranic radionuclides include neptunium, plutonium, americium, and curium. These radionuclides are extremely long-lived alpha emitters that pose significant health risks if inhaled or in the blood stream. Beta and gamma radiation can also be emitted by transuranic radionuclides. Plutonium-238, for example, has

[27] Transuranics are radionuclides often having extremely long half lifes. Many decay progeny may be created before reaching a stable, non-radioactive state. They are alpha emitters that pose significant health risks if inhaled or in the blood stream. Beta and gamma radiation can also be emitted by transuranic radionuclides. See our factsheet at http://www.environmental-defense-institute.org/publications/decayfact.pdf. See also an ANL factsheet at https://www.remm.nlm.gov/ANL-ContaminationFactSheets-All-070418.pdf

[28] *Draft EIS for the Proposed Consolidation of Nuclear Operations Related to Production of Radioisotope Power Systems*, EIS-0373, 2005. Table 3-19 Waste Management Facilities at Idaho National Laboratory. Radioactive Scrap and Waste Facility (RSWF) capacity was 201 cubic meters. The remainder of MFC was 439.7 cubic meters. The proposed storage area is 666 cubic meters. The same EIS, p. 3-47 states that while some transuranic waste is stored at the RSWF "virtually no transuranic waste is generated at INL.""

Some of the waste to be stored on the asphalt pads is destined for the Waste Isolation Pilot Plant (WIPP) in New Mexico that disposes of transuranic defense waste. Some of the waste is remote-handled transuranic waste that would be stored in containers inside concrete overpacks. Remote-handled waste is 200 mrem/hr on contact or greater and thus requires shielding to protect workers from direct gamma radiation levels.

For transuranic waste to be shipped to WIPP, it typically must exceed a specific concentration and must have been generated in support of defense weapons production. But some exceptions may apply if waste generation also included non-defense operations that can't be separated from the defense waste. Some of the waste is destined for burial at DOE's Nevada Test Site. Some of the waste is sent to non-federal low-level radioactive waste burial facilities like the one in Clive, Utah. And some of the waste is probably buried at INL over the Snake River Plain aquifer.

In 2016, at WIPP in New Mexico, the state environmental agency granted a RCRA permit for an above ground outdoor storage facility for transuranic waste. [29] **The WIPP above ground outdoor permit request documentation included considerable detail and comprehensive coverage of safety mitigations to provide a basis upon which to grant the permit.** This included design of an engineered steel reinforced concrete pad, a drainage system, limiting the allowed containers to only the analyzed concrete overpacks, fire protection features, barriers to protect the containers from vehicle collision, and they imposed a one year time limit on storage.

The DOE Idaho Operations office in conjunction with BEA submitted to our Idaho Department of Environmental Quality a permit modification request that was lacking in a multitude of ways and does not ensure containment of the waste. Lacking were basic mitigations such as fire barrier analysis or combustible loading limits to protect the integrity of the assorted allowed container types. Cargo containers with wooden floors were to be allowed as storage containers. Vented concrete overpacks included numerous penetrations and no analysis was presented as to weather impacts on the vents and drains. No evidence of container characteristics such as impact resistance, fire resistance, sealing or closure mechanism was presented. No analysis of seismic fragility or resistance to other natural phenomena hazards was presented.

In other words, a RCRA permit modification for an enormous increase in the outdoor above ground storage of radioactive and hazardous waste at INL's MFC was submitted with basically a request for 666 cubic meters of storage for virtually any container type, no time limit on storage and no basis for concluding that the containers will protect the waste from being released due to neglect or an incident.

[29] Class 3 Permit Modification Request Addition of a Concrete Overpack Container Storage Unit, Waste Isolation Pilot Plat, Carlsbad, New Mexico, WIPP Permit Number NM4890139088-TSDF, September 2016. http://www.wipp.energy.gov/rcradox/rfc/RES_16-167_Class_3_PMR_Above_Ground_Storage.pdf

While important, the process for the Idaho National Laboratory of the Site Treatment Plan [30] does not necessarily address container integrity or limit storage times should a disposal path become unavailable.

The Idaho DEQ must deny the permit modification request and ask DOE to conduct an alternative analysis that includes providing a building to protect the containers from rain, snow, blowing snow, and ice, limits the containers to analyzed robust containers that are fire resistant and take reasonable measures to ensure the waste remains contained while it is stored at INL.

Idaho Governor Otter Forms Leadership in Nuclear Energy Commission (LINE) 3.0

The Idaho Falls Post Register reported that on September 25, 2017, Idaho Governor C.L. "Butch" Otter created another Leadership in Nuclear Energy Commission called LINE 3.0. [31] The stated purpose of the LINE commission is to help sustain and enhance the Idaho National Laboratory's mission and its potential as an economic driver for Idaho for many years to come. [32]

Former lab director John Grossenbacher will remain on the commission but current director Mark Peters will become the co-chairman. Lt. Gov. Brad Little will continue to serve as the other co-chairman. The public should note that INL lab directors are hired by, evaluated by and paid by the Department of Energy. It is like having the Department of Energy give a vote on the commission. Inclusion of the lab director as a voting LINE commission member does not serve the citizens of Idaho.

The new commission is likely to be considering the issue of revisiting the 1995 Idaho Settlement Agreement. The continued inability for the Department of Energy to meet settlement agreement milestones has prevented the shipment of research quantities of spent fuel to the lab that would be allowed by a memorandum to the agreement if the milestones were being meet.

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[30] Here is one example of the "Site Treatment Plan" at https://www.deq.idaho.gov/media/60179380/inl-annual-site-treatment-plan-report-1116.pdf These plans appear to provide a status but do not appear to impose requirements on INL waste storage, such as time limitations. The document is difficult to understand and fails to identify naming schemes for various waste sources. The document is inscrutable. It is also very difficult to understand why such an enormous increase in mixed waste (hazardous chemical and radioactive waste) is required at the Materials and Fuels Complex, MFC.

[31] Bryan Clark, *The Idaho Falls Post Register*, "Otter forms LINE 3.0 – Horman replaces Rep. Jeff Thompson; Thompson cries foul," September 27, 2017.

[32] See https://line.idaho.gov and see also https://legislature.idaho.gov/wp-content/uploads/sessioninfo/2015/standingcommittees/150216_sr&e_0130PM_Attachment_3.pdf

One of the key milestones not being met is the treatment of liquid sodium-bearing waste by the Integrated Waste Treatment Unit. Current cleanup contractor Fluor has so far not been able to begin radioactive operations at the IWTU as it struggles to solve numerous design problems at the facility. Milestones for transuranic waste shipments to WIPP are also not being met because of the suspension of shipments to WIPP following two accidents there in 2014. WIPP has reopened but a large backlog of shipments is stalled as a small number of shipments are now being accepted at WIPP.

The first LINE 3.0 meeting was held October 4 in Twin Falls. [33] The Idaho National Laboratory gave a presentation on the Transient Reactor Test Facility (TREAT) that managed the restart of a test reactor that gives brief very high nuclear fluxes intended to challenge the test fuels. Commercial light water reactor fuels can be tested as well as fast neutron flux fuels.

As the Idaho National Laboratory lobbies for more resources to promote the small modular and already obsolete NuScale reactor and to build fast flux reactors and fast reactor testing capability, other states are struggling with stranded fuel and aiming for "fast reactor dismantling" of their slow neutron flux commercial light water reactors that are permanently shutdown. [34] [35]

The LINE commission has a subcommittee to promote NuScale and another to review some of the issues regarding the high-level waste (HLW) called calcine stored at the INL and the prospects of reclassifying the calcine and the impact of reclassifying the calcine to a lower category of nuclear waste.

The LINE commission plans to tweak former state legislation that greased acceptance of the proposed Areva Eagle Rock Enrichment plant [36] and is supporting federal legislation to grease the money for NuScale. [37]

[33] LINE meetings are open to the public but as of October, the minutes for the LINE 2.0 April meeting are not yet posted publically online. See https://line.idaho.gov/agendas-and-meetings/

[34] C. William M. Alley and Rosemarie Alley, *Environmental Science & Technology*, "The Growing problem of Stranded Used Nuclear Fuel," Published January 17, 2014. http://pubs.acs.org/doi/pdf/10.1021/es405114h

[35] Editor, *Nuclear Energy Insider*, "California utilities seek fast reactor dismantling, regulation to control costs." October 4, 2017. https://analysis.nuclearenergyinsider.com/content/california-utilities-seek-fast-reactor-dismantling-regulation-control-costs?utm_campaign=NEI%2004OCT17%20Newsletter&utm_medium=email&utm_source=Eloqua&elqTrackId=94b64a72666646d6b52a8119d89b2ff3&elq=aab941d36a12478fa94f5376ad0f3980&elqaid=31332&elqat=1&elqCampaignId=15375

[36] Wise Uranium Project, "Areva Eagle Rock Enrichment Facility project (Bonneville County, Idaho, USA) – Current Issues (last updated August 23, 2017. http://www.wise-uranium.org/epusarc.html

[37] Watch for recently introduced legislation such as H.R. 3970 "To assist communities affected by stranded nuclear waste and other purposes," text not yet available online, https://www.congress.gov/bill/115th-congress/house-bill/3970?q=%7B%22search%22%3A%5B%22nuclear%22%5D%7D&r=2

Issues Around Reclassifying INL's Calcine Waste

The Idaho LINE Commission has a subcommittee to review issues surrounding the Department of Energy's high level waste (HLW) classification of its HLW calcine stored at the Idaho National Laboratory. The radioactive powdery material called calcine is stored partially underground in different vintages of storage units called "bin sets."

The calcine poses the risk of catastrophic release to the environment because the bin sets are seismically vulnerable to varying degrees depending of the particular bin set design, and external flooding which can cause breakage of the bin sets. The calcine storage is not as vulnerable to corrosion and subsequent leakage as the storage of liquid HLW like the leaking HLW tanks resulting from plutonium production at the DOE's Hanford site. See our comments 2016 on the INL's calcine [38] and past newsletters from June and July 2017.

Calcine retrieval must be performed regardless of the choice of repository or choice of canister packaging method such as Hot Isostatic Press (HIP) (see our June 2017 newsletter). The Department of Energy had formally announced in 2009 the decision to use HIP as the method of repackaging the calcine for shipping and disposal. [39] The 2009 decision was actually amending previous decisions. Now it appears that the 2009 decision may be changed again because the Department of Energy recently issued a report by an independent review panel describing the possible treatment options for the calcine. [40]

The calcine retrieval requires careful engineering and the INL Citizens Advisory Board and DOE-ID both agree that this project needs to continue uninterrupted, despite Idaho Line commission member, John Grossenbacher's pushing to ignore the calcine. [41]

As DOE manages its radioactive low level waste (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 except when it wants to send this waste to a state or NRC-licensed facility. NRC regulations are loose and getting looser regarding the amount of radioactivity that can leach from the disposal of the waste to area drinking water.

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[38] Calcined Solids Storage Comment Submittal (Docket No. 10W-1604), by Chuck Broscious and Tami Thatcher, July 11, 2016. http://www.environmental-defense-institute.org/publications/EDICalcineComments.pdf

[39] Department of Energy Press Release, Amended Record of Decision: Idaho high-Level Waste Facilities Disposition Final Environmental Impact Statement REVISED BY STATE 12/21/09. http://www.id.doe.gov/NEWS/PressReleases/PR100104-HIP/Calcine%20ROD%20final_SIGNED_PDF.pdf In 2009 DOE had decided to select hot isostatic pressing (HIP) to treat the calcine.

[40] US DOE-EM, "Independent Analysis of Alternatives for Disposition of the Idaho Calcined High-Level Waste Inventory, Volume 1 – Summary Report," April 2016. https://energy.gov/sites/prod/files/2016/05/f31/Volume%201%20Calcine%20AoA%20Final%2004-19-16%20w_signatures.pdf

[41] See the Idaho National Laboratory Citizens Advisory Board meeting presentations for June 22, 2017, for the Idaho Cleanup Project at www.inlcab.energy.gov

There is an advantage to Idaho if the calcine could be disposed of at the Waste Isolation Pilot Plant (WIPP) in New Mexico. WIPP currently accepts defense-generated transuranic waste. Transuranic waste is called TRU waste and contains high concentrations of plutonium and americium from weapons production. Federal law currently prohibits disposal of spent nuclear fuel and other HLW at WIPP because the citizens of New Mexico wanted that assurance.

"Transuranic" refers to elements that have atomic numbers greater than uranium. "Transuranic waste is defined in the WIPP Land Withdrawal Act of 1992 as waste containing more than 100 nanocuries of alpha-emitting transuranic isotopes per gram of waste, with half-lives greater than 20 years, except for — (A) high-level radioactive waste; (B) waste that the Secretary of Energy has determined, with the concurrence of the Administrator of the Environmental Protection Agency, does not need the degree of isolation required by the disposal regulations; or (C) waste that the Nuclear Regulatory Commission has approved for disposal on a case-by-case basis in accordance with 61 of title 10, Code of Federal Regulations. 102-579, [section] 2 (1992)." [42] [43]

TRU waste is further classified as contact-handled (CH) and remote-handled (RH). CH-TRU containers can be handled by workers with no special radioactive shielding. RH-TRU has a surface dose rate greater than 200 mrem/hr, and so requires heavy shielded containers which are handled remotely. The 2016 supplemental EIS for WIPP evaluated 168,500 m^3 of CH-TRU and 7,080 m^3 of RH-TRU waste.

The CH-TRU waste shipped to WIPP is handled in barrels. The barrels are stacked in caverns in the underground salt mine at WIPP. The RH-TRU waste is put into horizontal holes bored into the walls of the WIPP underground salt mine. But there appears to be concern that closure of some storage areas of WIPP will occur before RH-TRU has been placed in the panel, based on a Department of Energy Office of Inspector General report. [44]

Discussions of "mildly radioactive" and "hotter" radioactive material tend to focus on the decay heat generated by the radioactive waste. The heat generated by the waste can be important for repository design, especially in the first few hundred years as some of the higher activity radionuclides decay. The highest heat generation is from relatively shorter lived radionuclides such as cesium-137. Waste with higher gamma radiation requires extensive shielding for

[42] U.S. Department of Energy, Environmental Impact Statement Supplemental Analysis for the Waste Isolation Pilot Plant Site-wide Operations, EIS-0026-SA10-2016 https://energy.gov/sites/prod/files/2016/12/f34/EIS-0026-SA10-2016.pdf

[43] U.S. Government Accountability Office, "Nuclear Waste: Waste Isolation Pilot Plant Demonstrates Cost and Schedule Requirements Needed for DOE Cleanup Operations, GAO-16-608, August 4, 2017. https://www.gao.gov/products/GAO-16-608 This GAO report is focused on accounting practices but provides useful background information about WIPP and information about recent ventilation changes made to WIPP. See other GAO reports such as "Plutonium Disposition: Proposed Dilute and Dispose Approach Highlights Need for More Work at the Waste Isolation Pilot Plant," GAO-17-390, September 5, 2017. https://www.gao.gov/products/GAO-17-390

[44] Annette Cary, *Tri-City Herald*, "New Mexico plant may lack space for remote-handled Hanford waste," June 2, 2013. http://www.tri-cityherald.com/news/local/hanford/article32127933.html

handling the waste. But in the long term, the lower activity radionuclides like the plutonium can pose the greatest threat because these radionuclides have long half lives and may create many decay progeny that must also decay because a stable, nonradioactive isotope such as lead, results.

The risk of reclassifying the calcine, however, could be that the Department of Energy decides it is LLW and it can do whatever it wants with it, including provide a token assessment of the risk it poses to the aquifer biased to achieve a result that appears fairly benign and then leave it over the Snake River Plain aquifer to leach into the aquifer for the years to come.

Idaho Falls Power General Manager gives talk on "Disrupting the Grid"

The Idaho Falls Power General Manager Jackie Flowers gave a talk September 21 to the Idaho Falls City Club discussing "Disrupting the Grid." The Idaho Falls Post Register reported [45] that Flowers discussed her opinion that utilities must adjust to advancing technologies and customer control or risk being left behind. "Utilities need to evolve their service offerings, " Flowers said, "Connected customers are changing all types of industries, and customer platform providers are winning. Take a look around. What has Airbnb done to traditional hotels? Uber versus taxis? Social media versus traditional media? Netflix versus Blockbuster?"

Flowers said that although renewables are becoming increasingly popular, the need for reliable base power remains. Natural gas has become like "crack cocaine" to energy providers "addicted" to its cheapness, Flowers said.

Nuclear is on the decline, but Flowers believes NuScale's small modular reactor design, currently undergoing a lengthy certification process, can take some of the natural gas baseload market share as a financially feasible carbon-free generation source, reported the Post Register. **Flowers is chairwoman of Utah Associated Municipal Power Systems, a consortium of Western utilities seeking to build a small modular reactor west of Idaho Falls.**

Flowers is also involved with INL nuclear booster the Partnership for Science and Technology. She said that solar power for people in other countries living with "energy poverty" was not enough — and in my opinion one of her more bizarre statements was that she hoped for small modular nuclear reactors to be available to them. It demonstrates that she seems to understands little about the realities of the costs, risks and nuclear proliferation concerns of nuclear reactors.

In addition to modular reactors, an efficient energy storage method also would vastly alter grid operations, Flowers said. Renewables, customer energy production, greater public

[45] Kevin Trevellyan, *The Idaho Falls Post Register*, "I.F. Power General Manager gives City Club talk – Flowers discussed 'Disrupting the Grid' during presentation," September 22, 2017.

consciousness about energy consumption and a changing regulatory environment are all threatening to 'edge out perceived dinosaur monopolies know as the utilities," Flowers said.

Flowers pointed out the political nature of energy policy. And she pointed out that 77 corporations now have renewable energy goals. These include big companies like Microsoft and IKEA. [46] [47]

Flowers said that battery storage can lose 20 percent of the energy transmitted to the battery, but she is interested in battery storage coupling with hydro power to store some of the spring peak water runoff that generates a lot of energy.

I attended the presentation and Flowers spoke specifically about the problem of controversial extraction techniques for coal and fracking of natural gas. But she didn't mention the controversial extraction of uranium ore. [48] While she pointed out some interesting aspects of the electric generation industry, she seemed quick to point out disadvantages of various energy forms except for nuclear. **Flowers did not point out any—not one—of nuclear energy's disadvantages.**

The politics of the grid were mentioned in the talk, but not the extent to which Flowers was lobbying for nuclear power along with staying with large base load generation. Flowers pointed out the percentage of renewable power in the U.S., but not the fact that "grids with moderate to high (30-80 percent) shares of renewable energy, and commensurately lower shares of baseload capacity, work just as reliably and at least as resiliently as fossil fuel-based power systems, but with lower operating costs and risk." [49]

[46] Christina Nunez, *National Geographic*, "These Old-School Companies Are Going Big With Solar and Wind," March 7, 2016. http://news.nationalgeographic.com/energy/2016/03/160307-top-companies-buying-wind-and-solar-energy/ Businesses are acquiring their own renewable energy generating facilities.

[47] Sarah Gibbens, *National Geographic*, "Renewable energy record set in US," June 2017. http://news.nationalgeographic.com/2017/06/solar-wind-renewable-energy-record/ For the first time, wind and solar accounted for 10 percent of electricity generation in the US with wind at 8 percent and solar at 2 percent.

[48] Francies Diep, *Scientific American*, "Abandoned Uranium Mines, An 'Overwhelming Problem' in the Navajo Nation – A look at one uranium mine shows how difficult it will be to clean up the reservation's hundreds of abandoned Cold War-era mines," December 30, 2010. https://www.scientificamerican.com/article/abandoned-uranium-mines-a/

[49] Mark Dyson and Amory Lovins, *Rocky Mountain Institute,* "The Grid Needs a Symphony, Not a Shouting Match – We Cannot Afford to Stifle Innovation by Enforcing Outdated Notions of 'Baseload' Power," June 12, 2017. https://www.rmi.org/news/grid-needs-symphony-not-shouting-match/

Health Risks and Environmental Damage from Uranium Mining, Milling, Enrichment, and Reprocessing — Not Just From Nuclear Reactor Accidents

The State of Idaho has little uranium mining and only one mill tailings disposal site at Lowman, Idaho. [50] In Idaho, the real environmental damage from military spent nuclear fuel reprocessing at the Idaho National Laboratory isn't widely known because of inadequate environmental monitoring and because of inadequate human epidemiology.

Uranium is mined around the world and also in western states like Utah, Colorado, New Mexico, Arizona and Wyoming. After uranium is mined, it must be extracted from the ore. Less than 1 percent of the ore contains uranium and so the mill tailings left behind are extensive in volume that have nearly 80 percent of the original radioactivity that is no longer safely bound up in the rock. And instead of being below ground, it may be piled in heaps above ground.

Mined uranium ore is milled, usually treated by grinding and chemical leaching to extract the natural uranium called "yellowcake" or U_3O_8. Mill tailings concentrate radioactive material, leaving it to contaminate water and land. Adverse health effects such as cancer and increased birth defects result from mining and milling wastes that are not even called "low level" waste. The half-lives are thousands of years so the radioactive toxicity of the waste isn't going away.

Bankrupt companies leave the mines and mill tailings waste behind even if the U.S. Nuclear Regulatory Commission licensed it and the new owner becomes the Department of Energy, funded by U.S. taxpayers. Remediation is an optimistic term applied to what will never return damaged landscape to a healthy environment. For example, the movement of uranium mill tailings away from the Colorado River near Moab, Utah required the Department of Energy to take ownership of the site and a nearly billion dollar effort to move the toxic tailings. [51]

"Mining and milling operations have disproportionately affected indigenous populations around the globe. For example, in the U.S. nearly one-third of all mill tailings from abandoned mill operations are on the lands of the Navajo nation alone." [52]

In the U.S., reprocessing of spent nuclear fuel was conducted at West Valley, New York. The result was uneconomical and environmentally damaging while creating weapons material proliferation risks.

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[50] Department of Energy, Office of Legacy Management, Lowman, Idaho Disposal Site Factsheet https://www.lm.doe.gov/Lowman/factsheet-lowman.pdf

[51] US Department of Energy, Factsheet "Overview of Moab [Uranium Mill Tailings Remedial Action] UMTRA Project," 2017. http://www.gjem.energy.gov/moab/documents/factsheets/20170316OVERVIEW.pdf See also *Citizens Monitoring and Technical Assessment Fund,* "A Short History of the Moab Project and The White Mesa Mill Alternative," http://www2.clarku.edu/mtafund/prodlib/dine/round5/Short_History.pdf

[52] Arjun Makhijani and Scott Sleska, *The Nuclear Power Deception – U.S. Nuclear Mythology from Eletricity "Too Cheap to meter" to "Inherently Safe" Reactors*, 1999, by the Institute for Energy and Environmental Research, The Apex Press, ISBN 0-945257-75-9. See p. 219 taken from Gilles, el al. 1990.

Uranium enrichment is the process of increasing the amount of U-235 to a higher proportion than is naturally present. Nuclear power plants typically use 3 to 5 percent enrichment. Weapons, some research reactors, and U.S. naval reactors use "highly enriched uranium" (HEU) with over 90 percent U-235. Most enrichment techniques require that uranium first be put in the chemical form uranium hexafluoride (UF_6).

A major hazard in uranium enrichment processes comes from the chemically toxic and radioactive uranium hexafluoride. The enrichment process creates waste in the form of depleted uranium that is still radioactive but has less U-235 than natural uranium. While there are some military uses for depleted uranium for tank armor plating and armor-piercing conventional weapons, the disposal of large amounts of depleted uranium pose a long-lived radioactive waste stream that requires isolation from groundwater and the environment. Regulations for depleted uranium disposal are not assuring protection of the environment. Future generations will likely face significant risks from uranium mining, milling, and processing activities. [53]

I didn't understand the environmental wastes and the hazards from the uranium enrichment facility proposed to be built near Idaho Falls as it was being strongly promoted as a jobs creator. The facility was licensed by the Nuclear Regulatory Commission but has not been built by Areva given to reduction in operating nuclear power plants in the U.S. The short term economic benefits may have turned into long term environmental above and below ground waste hazards had the facility been built. Other US enrichment plants have required costly government cleanup of radioactive contamination.

In the US, uranium enrichment was conducted at Oak Ridge, Tennessee and later at Portsmouth, Ohio and Paducah, Kentucky. The Paducah plant was privatized by US Enrichment Corporation which went bankrupt. That left the Department of Energy to take over the environmental cleanup at the Paducah plant. Fluor Federal Services was awarded the three year cleanup contract for the Paducah plant for $400 million a year. [54]

Uranium resources that remain mostly in Wyoming, New Mexico, Colorado, Utah, and Arizona were estimated at 539 million lbs of "yellowcake" U_3O_8 for $50 or less extraction ores. [55] This is considerably less than some earlier estimates which had projected enough uranium for 600 large reactors. In any event, with a 1000 Megawatt nuclear plant lifetime supply (33 years) would require 10 million lbs of "yellowcake" U_3O_8. Often forgotten is how limited uranium resources are, which make once-through reactors only able to provide from 80 to 200 years of fuel for light-water reactors. Breeder reactors that would extend the resource have yet to be economical or safe.

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[53] ibid. p. 221. .

[54] Krystle Callais, WPDS Local news, "Company chosen to clean up old uranium enrichment facility" July 22, 2014. http://www.wpsdlocal6.com/2014/07/22/company-chosen-to-clean-up-old-uranium-enrichment-facility/

[55] U.S. Energy Information Administration, Annual Energy Review, Uranium Reserves, https://www.eia.gov/totalenergy/data/annual/showtext.php?t=ptb0410

Radiation Dose Assessment With Automated Diagnostics Possible

The Bulletin of the Atomic Scientists recently issued an article about the new types of diagnostics to estimate the radiation dose to people exposed in an emergency such as nuclear weapon fallout, nuclear power plant accident or other radiation incident exposing the public. [56] The authors of the article recognize that large numbers of people may be exposed to ionizing radiation and advanced, field-deployable technologies could speed the medical management of radiation exposures by more rapidly and reliably estimating radiation exposure.

The field of radiation biodosimetry includes lymphocyte depletion kinetics but this requires taking and trending multiple samples. The first sample must be soon after exposure with comparison samples collected later.

The clinical evaluation such as time onset to vomiting can be useful but can also be confounded by other medical conditions and may be of little use.

"The most widely used biodosimetry diagnostic is a technique not available in a point-of-care setting known as the dicentric chromosome assay. This assay, or diagnostic test, measures the number of abnormal chromosomes caused by radiation exposure to estimate received radiation dose, and is one of many types of cytogenetic assays that measure changes in chromosome structure. (Cytogenetics is 'the branch of genetics that studies the structure of DNA within the cell nucleus.')"

Increasing the number of cytogenetics laboratories is one approach. "The United States has only two fully operational cytogenetic biodosimetry laboratories: the Energy Department's Radiation Emergency Assistance Center/Training Site in Oak Ridge, Tennessee and the Defense Department's Armed Forces Radiobiology Research Institute facility in Bethesda, Maryland. (Additional, auxiliary biodosimetry resources are housed at the Naval Dosimetry Center, also in Bethesda.)"

Another approach is to automate cytogenetic biodosimetry with tools such as the Rapid Automated Biodosimetry Tool.

The authors of the article recognize the importance of integrating new technologies into emergency preparedness plans.

New biomarkers are also being considered such as using a combination of classic cytogenetic biodosimetry, analysis of lymphocyte counts, and measurement of new protein and metabolite biomarkers of radiation exposure.

There is no mention, however, of the politics of radiation exposure that seek to help government and nuclear power plant operators from being held accountable for radiation

[56] Mary Sproull, Kevin Camphausen, Gregory Koblentz, *The Bulletin of the Atomic Scientists*, "Measuring radiation doses in mass-casualty emergencies," October 4, 2017. http://thebulletin.org/measuring-radiation-doses-mass-casualty-emergencies11162

exposures. For this reason, don't be surprised if there are attempts to maintain government control such that radiation dose assessments can still be biased to avoid liability.

Radiation doses that mean you require immediate medical attention may likely bone marrow transplants and death. Radiation doses that don't necessarily require immediate medical attention may still mean you die from cancer because of the exposure within 10 to 15 years. Good luck with fertility and pregnancy advice. And it will be a long wait before the mainstream medical attention includes nutritional approaches of reducing the oxidative stress from radiation that promotes illness including cancer.

HR 3053 —
Once Again Nuclear Proponents Try to Ram a Nuclear Waste Bill through Congress to Solve the Decades Old Problem of Where to Permanently Dispose of this Most Dangerous Legacy of Nuclear Power and Bombs

H.R. 3053, the Nuclear Waste Policy Amendments Act of 2017, sponsored by U.S. Representative John Shimkus (Republican-Illinois), [57] *was poised for U.S. House floor action as early as late October. Below is the Text of letter to U.S. House of Representatives that nearly 100 organizations including the Environmental Defense Institute have already signed on to:*

"Dear Representative:

"On behalf of our millions of members, the undersigned organizations urge you to **oppose** H. R. 3053, the "Nuclear Waste Policy Amendments Act of 2017" (115th Congress, 1st Session). This bill will put our nation's nuclear waste storage policy on the wrong track yet again. It ignores environmental concerns, states' rights and consent to host the waste in the first instance, and attempts to truncate public review in order to force a "solution" – either Yucca Mountain or a new consolidated interim storage site – that have both proven to be unworkable. Rather than blindly charge forward at the cost of public safety and public resources, we urge Congress to reject this bill and start the important and necessary work on a comprehensive set of hearings to commence building a publicly accepted, consent based repository program.

"The bill you will vote on retains the flaws contained in its earlier forms. Some of these harms include unwise efforts to recommence the licensing process for proposed repository at Nevada's Yucca Mountain. This is a project certain to fail the NRC's licensing process due to the geology and hydrology of the site that make it unsuitable for isolating spent nuclear fuel for the required time. Next, the draft legislation suggests going forward with a consolidated storage proposal before working out the details of a comprehensive legislative path to solve the nuclear waste

[57] Congress.gov, H.R. 3053 – Nuclear Waste Policy Amendments Act of 2017, 115th Congress. https://www.congress.gov/bill/115th-congress/house-bill/3053

problem, entirely severing the link between storage and disposal, and thus creating, an overwhelming risk that an interim storage site will determine or function as de facto final resting place for nuclear waste. The draft provides no safety, environmental or public acceptance criteria, only speed of siting and expense. This is precisely the formula that produced the failure of the Yucca Mountain process and made it, as the previous administration noted, "unworkable."

"Other provisions conflict with the well-established and necessary requirements of the National Environmental Policy Act, 42 U.S.C. §4321, et seq. Doing so exacerbates the public interest community's (and that of Nevada) objection of the last two decades – that the process of developing, licensing, and setting environmental and oversight standards for the proposed repository has been, and continues to be, rigged or weakened to ensure that the site can be licensed, rather than provide for safety over the length of time that the waste remains dangerous to public health and the environment.

"This bill was largely changed for the worse in committee. The bill now sets us on path to go forward in the next few years with a consolidated storage proposal before working out the details of a comprehensive legislative path to solve the nuclear waste problem and, frankly, creates an overwhelming risk that an interim storage site in New Mexico, Utah, or even Texas (although the Texas site just requested that its license application be held in abeyance) will be the de facto final resting place for nuclear waste.

"This will not work. It is likely those states will, in some form or another, resist being selected as the dumping ground for the nation's nuclear waste without a meaningful consent based process and regulatory authority that garners both public acceptance and a scientifically defensible solution. Further, and also just as damning, it sets up yet another attempt to ship the waste to Yucca Mountain irrespective of its certain likelihood of failing the regulatory process, or seek to revive the licensed Private Fuel Storage site that has been strongly opposed in Utah or even open up New Mexico's Waste Isolation Pilot Plant (WIPP) facility for spent nuclear fuel disposal despite strong opposition and contrary to 25 years of federal law. The latter site also was designed and intended for nuclear waste with trace levels of plutonium, not spent fuel (and we note, a site that has already seen an accident dispersing plutonium throughout the underground and into the environment, contaminating 22 workers, and thus the site was functionally inoperable for years). All of this runs precisely counter to the core admonition of the previous administration's Blue Ribbon Commission on America's Nuclear Future ("BRC") that "consent" come first.

"The waste will not be going anywhere for years and it should be incumbent on Congress to fix problems in a meaningful fashion, not attempt an expedient solution that is destined to fail, again.

"Our concerns, many of which were detailed above or in earlier letters, remain. We would be pleased to work with any representative on a feasible, constructive path forward, but this

legislation would put the nation's nuclear waste storage policy on the wrong track yet again and we urge you to reject it. Thank you for your consideration of our views."

Sincerely, [99 groups currently signed on]

Note: This nuclear waste issue affects Idaho directly and is the subject of decades of litigation with the Department of Energy and its refusal to adhere to Federal Court Consent Orders and agreements and the real prospect of Idaho being a de facto permanent waste dump.

Articles are by Chuck Broscious for HR-3053 and by Tami Thatcher, for October 2017.