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Another UAMPS City Withdraws from Proposed NuScale Small Modular Reactor Project Proposed to be built at the INL

The Idaho Falls Post Register reported on September 29 that the city of Kaysville, Utah, has withdrawn from the NuScale small modular reactor (SMR) project slated to be built at the Idaho National Laboratory. [1] It was reported on September 20 that the cities of Logan and Lehi, Utah, had also withdrawn.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

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." [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 720 MW 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 options assumed previously.

With regard to the boron dilution problem identified during NuScale's licensing review, at just 50 MW per module, NuScale sought exemptions to the safety requirement of the reactor to

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[1] Nathan Brown, *The Idaho Falls Post Register*, "Kaysville withdraws from nuke project," September 29, 2020.
[2] The Editorial Board, *The Idaho Falls Post Register*, "Editorial - City Council should remain committed to SMR project," September 20, 2020.
[3] Nathan Brown, *The Idaho Falls Post Register*, "Kaysville withdraws from nuke project," September 29, 2020.

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 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. [4]

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. [5] 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.

NuScale's Unresolved Safety Problems Point to Climbing Costs – UAMPS is a Boondoggle in the Making

This opinion editorial by Tami Thatcher was printed in The Idaho Falls Post Register *on September 29, 2020.*

The U.S. Nuclear Regulatory Commission (NRC) and the NRC Advisory Committee on Reactor Safeguards found several serious safety problems that the NuScale designers had missed and have yet to remedy. [6] [7] [8]

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[4] 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.pdf

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

[6] U.S. Advisory Committee on Reactor Safeguards approving NuScale despite unresolved safety problems, see ML20149K596, ML20211M386 and others.

[7] See the NRC's website for the difficulty in attaining any meager assurance that the issues raised during the review will actually be solved. See Official Transcript of Proceedings, Nuclear Regulatory Commission, Advisory Committee on Reactor Safeguards, NuScale Subcommittee. Open Session, February 4, 2020. NRC.gov Adams accession number ML20043D049.

[8] The basic storyline for the NuScale reactor is that each reactor module "operates using the principles of natural circulation; hence, no pumps are needed to circulate water through the reactor. Instead, the system uses convection, conduction and gravity to drive the flow of coolant inside the reactor vessel." See *Modern Power Systems*, "Preferred site identified for first NuScale SMR plant," September 2016 at https://www.energy-northwest.com/energyprojects/smr/Documents/NUSCALE%20UPDATE_Modern%20Power%20Systems_Sep2016.pdf

Despite recent NRC approval, [9] which was not unanimous, of the NuScale Design Certification Application, the devil is in the details. [10] The NRC has taken the approach that the details of several serious safety issues raised during the review can wait to be worked out later.

This apparently shifts the funding to resolve design and safety problems so that it will be coming out of the Utah Associated Municipal Power Systems (UAMPS) combined license holder, like city of Idaho Falls electricity rate payers. [11]

This is good for NuScale and its financially tapped out investors like Fluor Corporation but bad for citizens in the cities associated with UAMPS. [12]

There are several documents on the NRC's website that describe the serious reactor accident issues remaining unresolved despite NRC's approval. The documents can be accessed on the NRC's website and I would be glad to provide information to anyone wanting detailed citations.

The NuScale design problems include the accident risk of boron dilution events that can cause core failure; the potential for rapid degradation of the unique steam generators [13] [14] (which can be a safety problem or simply an economic disaster); performance degradation associated with the emergency core cooling valves; the accident risk dominance of the reactor building crane and load handling accidents uniquely associated with NuScale; [15] the large uncertainty

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

[10] U.S. NRC Staff Shanlai Lu Non-concurrence with NuScale design certificate approval because of boron dilution issues, see ML20230A245: (ML20232D074, ML20232D079, ML20232D086) at nrc.gov ADAMS document center.

[11] Paul Ciampoli, *American Public Power Association*, UAMPS members execute power sales contracts for SMR project," July 24, 2019. https://www.publicpower.org/periodical/article/uamps-members-execute-power-sales-contracts-smr-project According to this article, UAMPS members have executed power sales contracts totaling more than 150 megawatts from the proposed NuScale small modular reactor project. The article says that the project will include 12 individual 60-megawatt modules, producing a gross output of 720 MW of electricity.

[12] Dr. M.V. Ramana, "Eyes Wide Shut – Problems with the Utah Associated Municipal Power Systems Proposal to Construct NuScale Small Modular Nuclear Reactors" Report supported by Physicians for Social Responsibility, September 2020. https://www.oregonpsr.org/report-uamps-nuscale-smrs Ramana is the Simons Chair in Disarmament, Global and Human Security and Director of the Liu Institute for Global Issues at the School of Public Policy and Global Affairs, University of British Columbia in Vancouver, Canada. He is the author of several reports, articles and peer-reviewed papers on small modular nuclear reactors in journals such as Nuclear Technology, Energy, Science, Technology, & Human Values, Energy Policy, IEEE Spectrum, and Energy Research and Social Science. Dr. Ramana is a member of the International Panel on Fissile Materials, the International Nuclear Risk Assessment Group, and the team that produces the annual World Nuclear Industry Status Report.

[13] NuScale's unique, untested components, like its unique helical steam generators, can be expected to result in unforeseen problems. A Steam Generator tube failure in the NuScale module can result in serious core melt and a large release of fission products to the environment. See Official Transcript of Proceedings, Nuclear Regulatory Commission, Advisory Committee on Reactor Safeguards, NuScale Subcommittee. Open Session, February 4, 2020. NRC.gov Adams accession number ML20043D049.

[14] A Steam Generator tube failure in the NuScale module can result in serious core melt and a large release of fission products to the environment, according to NuScale's own analysis. See NuScale Standard Plant Design Certification Application, Applicant's Environmental Standard Design Certification, Part 3, Revision 4, January 2020. NRC.gov Adams Accession Number ML20036D471.

[15] For NuScale assessment of load drop of a reactor module, see ML20036D471 at nrc.gov.

associated with the existing rosy accident risk estimates; and accident risks associated with having the circus of twelve operating reactors in one facility. [16]

The estimated NuScale construction costs doubled back in July. [17] As to how much the NuScale reactor's will actually cost to construct, it's anyone's guess but keep in mind that in the U.S. two AP1000 reactors in South Carolina were finally cancelled, leaving rate payers on the hook for billions of dollars that will never generate any electricity. [18] The cost of construction continues climbing for the two AP1000 reactors at Plant Vogtle in Georgia that are still under construction, currenting exceeding four times the original estimate.

Premature closures of nuclear power plants in the US continue, as maintaining and repairing these nuclear plants is not economical. Unprofitable nuclear plants beg for large state financial bailouts.

NuScale's past optimistic construction cost estimates appear to have relied on very favorable financing. [19] Typical assumptions regarding financing costs made the project uneconomic even before the estimated cost of construction doubled. Small modular reactors cost more per mega-watt than the larger nuclear reactors which are the most uneconomical energy source there is.

The NRC's putting off safety issue resolution until construction begins virtually assures major cost overruns in the future will be paid from your monthly electricity bill.

For those people concerned about climate change, NuScale's estimated operating date has now slid 10 years into the future, to 2029, and given the hurdles to be overcome, that is likely to be optimistic. New nuclear build is simply too expensive and too slow to install to play a role in climate change.

In 2019, the State of Idaho gutted longstanding laws on the release of radionuclides to the air. [20] [21] Releasing radionuclides to the skies of Idaho may be virtually unenforceable and it will be

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[16] U.S. Nuclear Regulatory Commission, Advisory Committee on Reactor Safeguards, Letter to U.S. Nuclear Regulatory Commission, Kristine L. Svinicki, Chairman, Subject: Report on the Safety Aspects of the NuScale Small Modular Reactor, July 29, 2020, ML20211M386 at nrc.gov.

[17] The Idaho Falls Post Register reported that NuScale's cost estimate has doubled from $3 billion last year, to $6.1 billion this July. See Nathan Brown, *The Idaho Falls Post Register*, "Utah group, former NRC member blast reactor plan – Say could leave taxpayers hung out to dry," August 7, 2020.

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

[19] Dr. M.V. Ramana, "Eyes Wide Shut – Problems with the Utah Associated Municipal Power Systems Proposal to Construct NuScale Small Modular Nuclear Reactors" Report supported by Physicians for Social Responsibility, September 2020. https://www.oregonpsr.org/report-uamps-nuscale-smrs

[20] Our Idaho legislature removed a decades old law restricting airborne radiological emissions, solely in order to prevent any legal challenge to radiological polluters in our state. See 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

[21] And also see the Environmental Defense Institute August 2019 newsletter article "Idaho Gutting Radiological Contamination Protection from Environmental Clean Air Law."

difficult to tell how much of it comes from the proposed NuScale reactors as opposed to coming from other Idaho National Laboratory operations.

And Idaho can expect to store NuScale spent nuclear fuel for the years to come, as after decades of trying, there is still no permanent disposal solution for disposal of spent nuclear fuel. This technology is in no way a clean technology.

Wiser utilities in the region refused to entertain the NuScale project risks. Naïve UAMPS board members persuaded by smooth power point presentations full of half-truths and falsehoods no longer have any excuse. Get the facts. Pull out now from the misguided UAMPS project to build NuScale small modular reactors before it's too late to withdraw from this expensive boondoggle in the making.

Nuclear Plant Shutdowns and Bailouts

The U.S. Nuclear Regulatory Commission currently lists 95 operational commercial nuclear power plants in the U.S., down from 104 reactors in 2012. But Indian Point Unit 2 was permanently shut down in April although the NRC website still lists it as an operating reactor. And Indian Point Unit 3 reactor is slated to be permanently shut down next year.

Since the beginning of 2013, ten nuclear power plants have been permanently shut down, see Table 1. The U.S. Nuclear Regulatory lists nine plants since 2013 (as they omitted Indian Point Unit 2) and about a dozen other nuclear plants that were shutdown prior to 2013 on its website. (I added to Table 1 the Indian Point Unit 2.) The reasons for the commercial power plant shutdowns are not usually given in the NRC's website description of sites undergoing decommissioning, but appear to be due to economics because the NRC seems to always approve license extensions no matter what plant degradation is occurring. [22]

Two nuclear reactors under construction at Plant Vogtle in Georgia that are currently scheduled to bring one unit online in in 2021 and the second unit in 2022.

Taxpayer-funded nuclear bailouts have been sought in the states of Ohio ($150 million), New York ($585 million, New Jersey ($300 million) and Pennsylvania ($500 million), according to the Citizens Against Nuclear Bailouts website. [23]

The Ohio nuke bailout has been mired in a multi-million-dollar bribery scandal involving the Republican Ohio House speaker. [24] [25] First Energy then announced it would simply plan to shut down its two plants in Ohio, Perry Unit 1 and the Davis-Besse nuclear reactor.

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[22] U.S. Nuclear Regulatory Commission, webpage "Sites Undergoing Decommissioning (by Location or Name) at https://www.nrc.gov/info-finder/decommissioning/

[23] Citizens Against Nuclear Bailouts (CANB) at https://nonukebailoutpa.com/about-canb

[24] John Seewer, *AP News*, "Nuclear bailout tied to bribery scandal was years in making," August 3, 2020. https://apnews.com/article/toledo-ohio-bills-u-s-news-91ba582c11e9c773b18ffaf30bba63b1

[25] *The Blade*, "Five arrested, including Ohio House speaker, over corruption allegations from nuke plant bailout," https://www.toledoblade.com/local/politics/2020/07/21/FBI-launches-raids-related-to-nuclear-bailout-law-source-says/stories/20200721079

Table 1. Commercial nuclear reactors in permanent shutdown since 2013.

Nuclear Reactor	Location and Reason for Permanent Shutdown	Year Permanently Shutdown
Crystal River Unit 3	Florida. When attempting to restore the containment structure following steam generator replacement in 2009, damage to the containment was observed that they attempted to repair, but later decided to decommission the reactor.	2013
Kewaunee	Wisconsin.	2013
San Onofre Unit 2	California. Reason not stated by the NRC but it is well known that the botched steam generator replacement was causing rapid failure of SG tubes. The NRC was bending over backwards to find it acceptable but many people in California were not.	2013
San Onofre Unit 3	California. See Unit 2.	2013
Vermont Yankee	Vermont	2014
Fort Calhoun	Nebraska	2016
Oyster Creek	New Jersey	2018
Pilgrim Nuclear Power Station	Massachusetts	2019
Three Mile Island Unit 1	Pennsylvania	2019
Indian Point Unit 2	New York	2020

Table notes: Main source of information is the U.S. Nuclear Regulatory Commission webpage at https://www.nrc.gov/info-finder/decommissioning/power-reactor/cr3.html

The New Jersey nuke bailout and others, were apparently needed because the nuclear plants, while profitable, simply were not profitable enough due to their high operating costs when gas prices for operating gas-fired plants is low. The New Jersey nuke bailout has been faced with legal challenges. [26] The $500 million Pennsylvania nuke bailout has received criticism because it will raise consumers electric rates and constrains competitive markets. [27]

[26] Talia Buford, *ProPublica*, "New Jersey's $300 Million Nuclear Power Bailout Is Facing a Court Challenge. Does It Have a Chance? – The state's utility advocate said regulators should not have approved the subsidies for the

The continued early retirement of nuclear plants is expected to cause an increasing level of carbon emissions as the electricity generating capacity is shifted to gas-fired electricity generating plants. [28]

State and federal policies that have taken away subsidies for wind and solar have been short-sighted. [29]

Technically Inadequate Processes Used by NRC to Grant 30 Year Life Extension to Seabrook Nuclear Power Plant with Alkali Silica Reaction (ASR) Concrete Degradation Issue

A serious concrete degradation phenomenon known as alkali-silica reaction (ASR) was found in the containment concrete at the Seabrook Nuclear Power Plant in 2009. This was the first time ASR had been found in a nuclear plant. The condition can cause the concrete to turn to gel, basically, and may cause the concrete to delaminate from steel rebar. The seismic strength of the concrete structure can be greatly degraded and in a concrete containment structure for a nuclear reactor, it can increase the consequences of a nuclear accident because damage to the concrete containment allows fission products to be released to the environment.

Alkali-silica reaction has been found in dams and bridges. It involves humidity and the particular sand or aggregate of the concrete. Radiation exposure can also weaken concrete but is not necessary for ASR to occur. With ASR, the concrete can be degrading internally without showing cracks on the surface of the concrete.

The U.S. Nuclear Regulatory Commission approved the technically inadequate plan submitted by the utility to infrequently monitor the concrete degradation at Seabrook and extended its operating license 30 years to 2050. [30] Seabrook began operating in 1990. [31]

The concrete degradation problem was recently highlighted by a Nuclear Hotseat podcast. [32] Work by non-profit C-10 and concrete expert Victor Saouma showed that the NRC's evaluation

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energy company PSEG," May 16, 2019. https://www.propublica.org/article/new-jerseys-300-million-nuclear-power-bailout-is-facing-a-court-challenge-does-it-have-a-chance

[27] Andrew Maykuth, The Philadelphia Inquirer, "$500 million Pennsylvania nuclear rescue plan triggers fierce battle from rival power producers," March 11, 2019. https://www.inquirer.com/business/energy/pennsylvania-nuclear-rescue-package-million-20190311.html

[28] Zeke Hausfather, *Carbon Brief*, "How much nuclear power is at risk of retirement?" July 24, 2018. https://www.toledoblade.com/local/politics/2020/07/21/FBI-launches-raids-related-to-nuclear-bailout-law-source-says/stories/20200721079 This 2018 article provides a useful map of U.S. nuclear plants operating and at risk of early closure.

[29] Emma Foehringer Merchant, Green Tech Media, "US Lawmakers Stiff Solar, Wind Gets Modest Victory in Tax Deal," December 17, 2019. https://www.greentechmedia.com/articles/read/u-s-lawmakers-hand-clean-energy-tax-credits-a-loss-though-wind-gets-a-win

[30] Prof. Victor E. Saouma, University of Colorado, Boulder, For C-10 Research and Education Foundation, Newburyport, MA, Compilation of Testimony Regarding the Assessment of Alkali Silica Reaction and Proposed Monitoring Program at Seabrook Nuclear Power Plant, September 23, 2019. https://irp-cdn.multiscreensite.com/1cc0687d/files/uploaded/Consolidated-Report%20VS%20for%20C-10%209.24.pdf

[31] See U.S. Nuclear Regulatory Commission website for Seabrook at https://www.nrc.gov/reactors/operating/ops-experience/concrete-degradation.html

of the ASR problem at Seabrook was technically inadequate and the NRC had not understood how to properly assess or monitor the concrete degradation. [33] The Atomic Safety and Licensing Board agreed with C-10 and Saouma and required the NRC to improve its concrete monitoring program. [34]

The technical program for Seabrook and NRC's assessment and approval of its ASR concrete issue is just one more example of using a technically inadequate basis for approval by the U.S. Nuclear Regulatory Commission in its regulation of commercial nuclear power plants in the U.S.

Public Comment Submittals on NRC's draft Environmental Impact Statement on Holtec's proposed spent nuclear fuel storage facility in New Mexico

The U.S. Nuclear Regulatory commission held listen-in meetings on its draft Environmental Impact Statement for the dry spent nuclear fuel storage facility proposed by Holtec in New Mexico and its public comment period closed September 22. [35]

Comment submittals by the Environmental Defense Institute and also by Citizen Action New Mexico on the NRC's draft EIS are on our website. [36] [37]

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

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[32] Nuclear Hotseat, "Degrading Concrete Safety Issue at Seabrook Nuclear in NH near Boston – Episode #483," September 23, 2020, with featured interview with Natalie Hildt Treat, Executive Director of the C-10 Foundation, keeping a sharp and critical eye on concrete degradation issues at the Seabrook Station nuclear power facility in New Hampshire, now licensed to operate through 2050. http://nuclearhotseat.com/2020/09/23/483-seabrook-nuclear-concrete-containment-degradation-natalie-hildt-treat-ian-zabarte-message-from-the-most-bombed-nation-in-the-world/

[33] C-10 Research and Education Foundation, C-10 Brings Legal Challenge to Seabrook's Concrete Testing and Monitoring webpage at https://www.c-10.org/challenge-to-seabrooks-concrete-monitoring and https://www.c-10.org/c-10-calls-out-nrc-and-nexteras-lack-of-expertise-in-seabrook-concrete-case

[34] U.S. Nuclear Regulatory Commission Atomic Safety and Licensing Board, NEXTERA ENERGY SEABROOK, LLC, LBP-20-09, August 21, 2020, Initial Decision, at https://www.nrc.gov/docs/ML2025/ML20254A339.pd

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

[36] Tami Thatcher comment submittal for Environmental Defense Institute for the NRC's draft Environmental Impact Statement for the Holtec Consolidated Interim Storage Facility Project, Docket NRC-2018-0052, September 2002 at http://www.environmental-defense-institute.org/publications/CommentNRCdEISHoltecT.pdf

[37] David B. McCoy, Citizen Action New Mexico, comment submittal for the NRC's draft Environmental Impact Statement for the Holtec Consolidated Interim Storage Facility Project, Docket NRC-2018-0052, September 2002 at http://www.environmental-defense-institute.org/publications/CommentNRCdEISHoltecM.pdf

Holtec's Proposed Interim Storage in New Mexico May Be Forever

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

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

The NRC recognizes that there is tremendous concern about the proposed Holtec CISF becoming defacto storage because a permanent repository is not secured and over the safety of canisters that cannot be adequately inspected or repaired. The NRC stipulated that these topics were outside the scope of allowed comments.

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

The Holtec facility in New Mexico is proposed to hold 100,000 metric tons of spent nuclear fuel, including high burn-up SNF, in 10,000 canisters. Each canister would hold roughly 10 metric tons of spent fuel. One Yucca Mountain repository designed to hold 70,000 metric tons of spent nuclear fuel won't even hold all the spent nuclear fuel the Holtec facility is envisioned to hold. This EIS does not identify whether one, two or more permanent repositories will need to be constructed.

The Radiological Consequences of Transporting 10,000 Canisters Were Wished Away by Technically Unsupportable Assumptions by the NRC

It is unacceptable that the draft EIS (Section 4.3 and elsewhere) assumes that there are no radiological releases resulting from the transportation of 10,000 canisters of spent nuclear fuel based on NUREG-2125 because NUREG-2125 deliberately omits realistic accident scenarios such as impact with a surface that isn't flat. NUREG-2125 also fails to address the increased vulnerability and fission product inventory of high burnup fuel. [38]

Many surfaces along the transportation routes are not flat, and this means that accident impacts are greater than assumed in NUREG-2125. Fires involving longer duration fires or hotter temperatures can occur and are more severe that assumed by the NRC for cask design. [39] [40] Wishfully and willfully assuming away the devastating radiological releases that may occur as the result of a severe transportation accident does not make it so. The EIS must not be based on

[38] Office of Nuclear Materials Safety and Safeguards, Nuclear Regulatory Commission, *Spent Fuel Transportation Risk Assessment*, NUREG-2125, May 2012. http://pbadupws.nrc.gov/docs/ML1212/ML12125A218.pdf

[39] Memo from Marvin Resnikoff to Bob Halstead, "NUREG-2125 Review," July 18, 2013, https://sanonofresafety.files.wordpress.com/2013/06/nureg-2125-review.pdf

[40] U.S. Nuclear Waste Technical Review Board (NWTRB) Evaluation of the Technical Basis for Extended Dry Storage and Transportation of Used Nuclear Fuel, December 2010

unsubstantiated wishful thinking. The consequences of a severe transportation accident must be included in the EIS. The public must not accept the unrealistic and overly rosy assumption that no transportation accident will release radionuclides and the EIS must include realistic radionuclide releases from transportation 10,000 canisters of spent nuclear fuel across the nation's crumbling bridges, roads and railways.

High temperature fires burning longer than 30-minutes are more severe than spent fuel transportation casks were designed to withstand. There is currently no way to avoid sending spent fuel casks along with any number of oil tankers connected in route.

The U.S. Nuclear Regulatory Commission has refused to conduct more rigorous testing of spent nuclear fuel transportation containers. After a National Academy of Sciences study strongly endorsed full-scale tests be conducted on spent nuclear fuel transportation casks in 2006 [41] and the U.S. Nuclear Regulatory Commission Package Performance Study suggested full-scale transportation accident tests in 2003, [42] so far as of 2018 there has been no testing performed to verify that shipping containers will perform as predicted by computerized analysis.

The NRC decided that full scale testing of severe accident conditions would be expensive and that Yucca Mountain is not happening anytime soon. The Blue Ribbon Commission report told the NRC that the status of the Yucca Mountain repository should not drive NRC's decision to not perform transportation accident testing because of their opinion that an interim storage site needed to be developed. [43]

Don't let the title of the 2014 report by Sandia Laboratory for the Department of Energy fool you. Absolutely no testing has been conducted. **In its report "Full-Scale Accident Testing in Support of Spent Nuclear Fuel Transportation," the Department of Energy spins a gibberish excuse that all they really need to do is convince themselves that the public perception of spent nuclear fuel transportation is satisfactory and therefore no full-scale transportation accident testing is needed.** [44]

Other countries don't just pretend to care about citizen safety — other countries have conducted more rigorous testing of spent nuclear fuel shipping containers and they impose far more restrictive speed limits and so forth for their transportation by truck or rail. See the U.S. Nuclear Waste Technical Review Board meeting presentation at the June meeting by the nuclear power program in Switzerland. [45]

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[41] National Academy of Sciences, *Going the Distance: The Safe Transport of Spent Nuclear Fuel and High-Level Radioactive Waste in the United States*, National Academies Press, 2006.
[42] U.S. Nuclear Regulatory Commission, *Package Performance Study Test Protocols*, NUREG-1768, 2003.
[43] Blue Ribbon Commission on America's Nuclear Future, Report to the Secretary of Energy, 2012.
[44] U.S. Department of Energy, *Full-Scale Accident Testing in Support of Spent Nuclear Fuel Transportation*, Fuel Cycle Research & Development, Sandia National Laboratories, FCRD-NFST-2014-000375, September 2014. http://large.stanford.edu/courses/2017/ph241/watson2/docs/sand2014-17831r.pdf
[45] Mark Whitmill, Kernkraftwerk Gosgen Daniken AG (KKG), Switzerland, U.S. Nuclear Waste Technical Review Board Summer Board Meeting in Idaho Falls, June 13, 2018. See www.nwtrb.gov The government of Switzerland makes exacting requirements for cask design and requires that they "demonstrate that the casks will

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

The number of spent nuclear fuel shipments in the U.S. for commercial spent nuclear fuel from 1964 to 1989 is 2623 casks shipments. [46] [47] Of these, 223 shipments were between 3.1 and 3.3 MTU with the remaining 2400 shipments less than 2 MTU per cask, usually far less.

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

Future spent nuclear fuel shipments of 10 MTU per cask involve much more fuel per cask and much more weight of the fuel and cask combination. In fact, should spent fuel shipping to a repository commence as planned, with 35,000 to 100,000 shipments over 25 years, there would be more spent nuclear fuel shipped in a single year than has been shipped in the U.S. since the first nuclear plants began operating. [48] And in that time, road, bridge, and rail infrastructure has been crumbling and rail accidents from human error and other causes increasing and have continued increasing since the NRC study reexamined accident frequencies in 2000. [49] The severity of transportation accidents in the United States has also has increased due to increased transportation of oil that sustains long burning high temperature fires, as well as due to crumbling roads and bridges. [50]

The Consequences of Breaching Holtec's Thin-Walled Spent Nuclear Fuel Canisters Still Have Not Been Documented by the NRC

The NRC's draft EIS includes the fact that it is expected that canisters at the proposed Holtec facility will be releasing radionuclides to the air due to weld failure. But it does not include evaluation of the consequences of breached canisters in terms of airborne radionuclide releases, hydrogen explosion, or water ingress and subsequence criticality.

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withstand all static and dynamic loads during normal operation and under hypothetical accident conditions." A double lid system is mandatory. They require sub-criticality for the most unfavorable cask arrangement and complete flooding. They require demonstrating adequate performance including resistance to aging effects during the planned usage period for all materials. They have far fewer cask shipments and far fewer miles to travel across their country than the U.S. Switzerland has voted to phase out nuclear energy.

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

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

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

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

[50] Environmental Defense Institute comment submittal by Tami Thatcher, Public Comment Regarding Interim Storage Partners LLC's Consolidated Interim Storage Facility, Docket NRC-2016-0231, November 19, 2018. See more discussion of transportation issues regarding spent nuclear fuel. http://www.environmental-defense-institute.org/publications/CommentNRC2018Texas.pdf

The consequences of canister failure must adequately address how much of the radionuclide inventory in a canister is released (see Table 2), which will be higher for higher burnup fuels.

Table 2. Spent fuel canister partial radionuclide inventory. (Source: NUREG-1864, 50,008 MWD/MTIHM (10-yr-cooled))

Nuclide	Bq	Ci	Nuclide	Bq	Ci
Co-60	1.61E14	3133	Pu-238	3.98E15	107440
Kr-85	2.77E15	74800	Pu-239	1.87E14	5060
Y-90	3.40E16	918000	Pu-240	3.47E14	9384
Sr-90	3.40E16	918000	Pu-241	5.23E16	1414400
Ru-106	2.72E14	7888	Am-241	1.20E15	32504
Cs-134	5.13E15	138720	Am-242m	1.97E13	532
Cs-137	5.54E16	1496000	Am-243	3.07E13	816
Ce-144	5.08E13	1374	Cm-243	3.02E13	816
Pm-147	3.37E15	91120	Cm-244	5.66E15	153000
Eu-154	4.15E15	112200			

Table notes: MWD is MegaWatt Days of reactor operation; MTIHM is metric tons initial heavy metal (uranium-238 and uranium-235); Bq is becquerel and is disintegration per second; Ci is curie; 1 curie is 3.7E10 bq. This is only a partial list of radionuclides in the spent fuel.

The canisters are stainless steel and are susceptible to chloride-induced stress corrosion cracking and can be expected to have been exposed to chlorides. The NRC knows that the canisters will experience through-wall cracks. The NRC's current approach is to say they will decide what to do when it happens, but we should all rest assured that radiation protection standards will not be exceeded. Therefore, it is the utmost dishonesty to exclude canister cracking from the draft EIS as well as from Holtec's risk assessment for the canisters.

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

The NRC knows that there is no effective inspection for canister break and no effective or licensed method of fixing a canister leak.

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

The likelihood and consequences of a spent fuel canister breach affect air quality, worker radiation dose and public radiation dose, even though the NRC deliberately avoids documenting either. Canister integrity issues, their likelihood and radiological release consequences must be included in the draft EIS and must be technically robust for all the various spent nuclear fuel to be shipped.

The radionuclides and curie amounts released from a cracked canister will depend on the original fuel burnup, how long the fuel has cooled, damage to the fuel during operation, storage and transport and many variables that will not be known about the fuel condition.

Draft EIS Section 4.13 "Public and Occupational Health" cannot properly be written and commented on without scientifically valid treatment of canister cracking likelihood and consequences. Underestimating the likelihood and consequences of canister cracking, omitting age-related or corrosion-related canister cracking from the EIS, despite the known fact that such events are expected and the proposed facility has no approved way to deal with a breached canister is unacceptable and appears to be deliberate denial of the routinely expected radiological harm of the proposed Holtec facility, which would make the proposed project unacceptable.

A study updated in 2019 by the Department of Energy confirms that the NRC had no documented evaluation of the consequences of spent nuclear fuel canister failure. The NRC has prepared the draft EIS for the Holtec facility without having any documented basis for the consequences of an expected event, leakage of a spent nuclear fuel canister. [51]

Carbon-14 created by unbreached canisters must also be included in the EIS as well as unisolated breached canisters, accumulating over 40 years and longer. Neutrons passing through canister walls create carbon-14 outside the canister. Carbon-14 inside the canisters and various other radionuclides that will be released as canisters are breached must be included in the EIS. As there is no designated or approved means for isolating the breached canister, releases from canisters will continue to increase each year. Ignoring these airborne radiological releases, that are expected to be annual occurrences is an example of the inadequacy of the draft EIS.

The current plan for the Holtec facility in New Mexico is to return any defective spent nuclear fuel storage canisters back to the nuclear plant it came from. But there won't be any capability at the stranded fuel sites to address the defective Holtec spent fuel canister. This could mean that the stated reason for removing the spent fuel from stranded fuel sites so the land can be repurposed may not be possible.

Instead of using thin-walled welded canisters that cannot be adequately inspected or repaired, the Swiss required the use of bolted thick-walled casks. They store them in a building, away from ocean salt spray air, for example. They have a hot cell for repackaging a cask if needed. Read more at SanOnofreSafety.org. [52]

The entire proposed plan to create an interim spent fuel storage facility in New Mexico (or Texas) before a permanent repository has been granted a license to construct, is against current law, the Nuclear Waste Policy Act. Consolidated interim storage creates the illusion of a solution

[51] U.S. Department of Energy, Spent Fuel and Waste Science and Technology, Gap Analysis to Guide DOE R&D in Supporting Extended Storage and Transportation of Spent Nuclear Fuel: An FY2019 Assessment, SAND2019-15479R, December 23, 2019. https://www.osti.gov/servlets/purl/1592862

[52] SanOnofreSafety.org webpage "Swiss Solution – Swiss nuclear waste storage systems exceed US safety standards" at https://sanonofresafety.org/swiss/

and allows states to move their radioactive waste to New Mexico, weakening the resolve to obtain a permanent solution, which is why the Nuclear Waste Policy Act does not allow creating a consolidated interim storage facility until a permanent repository is secured. With the problem isolated to New Mexico, there will be even more difficulty appropriating the federal resources needed to address the intractable problem of confining the radionuclides for millennia.

Nuclear Research Bill Sponsored by Idaho Lawmakers

The Next Generation Nuclear Advancement Act of 2020 introduced by U.S. Reps. Mike Simpson and Russ Fulcher [53] seeks to advance all things nuclear. It includes the "Integrated Energy Systems Program" to integrate nuclear with renewables and fossil fuels. As of October 1, the Congress.gov website had no text available concerning the introduced bill, which appears to be H.R. 8355.

According to the news article, the goals of the bill are to increase energy production and efficiency, develop systems integrating nuclear energy with renewables and fossil fuels, and expand the use of emissions-reducing technologies into nonelectric sectors to achieve significant reductions in environmental emissions.

And in related news, the Energy Department has issued a Notice of Intent to prepare the Environmental Impact Statement for the Versatile Test Reactor project and the Department has approved the conceptual design and will progress now to the engineering design phase as soon as Congress appropriates funding. DOE has requested $295 million for FY 2021 for the project. [54]

Articles by Tami Thatcher for October 2020. Minor editing changes were made October 2, 2020.

[53] Nathan Brown, *The Idaho Falls Post Register*, "Idaho lawmakers sponsor nuclear research bill," September 27, 2020.

[54] News release on behalf of the U.S. Department of Energy, Office of Nuclear Energy, Energy Department Green Lights Critical Decision 1 for Versatile Test Reactor Project, September 23, 2020.