Beyond Nuclear

February 25, 2022

VIA U.S. MAIL AND EMAIL

The Honorable Pete Buttigieg
Secretary of the U.S. Department of Transportation
1200 New Jersey Avenue, S. E.
Washington, DC 20590

Dear Mr. Secretary:

We're writing to you about a vital issue that the recently enacted infrastructure bill doesn't address, but over which the U.S. Department of Transportation (USDOT) has critical jurisdiction, and about which you've expressed serious concern: the proposed transportation of nuclear wastes, including highly radioactive irradiated nuclear fuel, often euphemistically called "spent" fuel (SNF).

As aging commercial reactors increasingly shut down, the U.S. increasingly confronts the question of what to do with radioactive wastes generated by nuclear plant operations and decommissioning. The mandate of the Pipeline and Hazardous Materials Safety Administration (PHMSA) to "establish national policy, set and enforce standards, educate, and conduct research to prevent incidents" applies to shipping Greater than Class C (GTCC) waste and High Level Waste (HLW) including SNF.

While no money for Yucca Mountain is currently in the federal budget, current licensing of consolidated interim storage facilities (CISFs) would trigger thousands of shipments of SNF and GTCC through 44 states and 75% of Congressional districts to CISF sites in Texas and/or New Mexico.

Below we summarize aspects of transportation of nuclear wastes, especially SNF, over which USDOT, its constituent commissions, offices and agencies have jurisdiction, including under the terms of its 1979 memorandum of understanding (MOU) with the Nuclear

Regulatory Commission (NRC). The letter discusses USDOT's role in conducting studies, determining policy, and assuring safety regarding transportation of nuclear waste, whether to CISFs or a geologic repository.

It takes account of the dangers that SNF/HLW/GTCC transportation poses to populations along transportation routes, as well as to transportation infrastructure itself. And it points out how transportation of nuclear wastes to CISFs violates federal and state law, as well as key principles of environmental justice and consent-based siting.

The letter makes the following recommendations for how USDOT can help further its mission to protect public health and safety in the transportation of hazardous materials:

- USDOT should allow no shipment of SNF or other HLW to CISFs or a permanent repository, unless and until adequate studies are conducted and evidence-based, enforceable policies and standards are in place that will protect the public, the nation's transportation infrastructure and transportation workers, and the environment from negative impacts from transportation, which are potentially severe.

- USDOT should immediately prohibit the importation of commercial high-level nuclear waste, especially SNF, from other nations for transportation and storage in the United States.

- Pursuant to Executive Order 12866, USDOT (specifically PHMSA) should immediately conduct or commission an analysis of the relative costs, benefits, and risks of off-site transportation of SNF to CISFs, versus the feasible alternative of hardened on-site storage at reactor sites.

- In general, USDOT should frame its own standards and policies for appropriately managing the risks, cost, and impacts of nuclear waste transportation. Under the terms of its 1979 MOU with the NRC, not only does USDOT have discretion over whether to rely on NRC analysis and policies concerning transportation safety of nuclear waste, it has an obligation to frame its own analysis and policy pursuant to its mission of protecting the public and the environment, especially since NRC analysis and policies are inadequate.

- USDOT standards and policies concerning nuclear waste transportation and CISFs should conform to federal law, including the Nuclear Waste Policy Act, and stated principles of environmental justice and consent-based siting.

At your confirmation hearing last year, Senator Rosen said:

> "This is a major transportation crisis waiting to happen, putting major metropolitan areas in 44 states, their freeways and their railways at risk along with millions of Americans. It would require at least 300 miles of new railroad, and take over 50 years – at three loads per week by truck or by train -- to move all this nuclear waste. It's a huge expense, it's a huge risk, and we have an aging rail system, and consistent shipments of these heavy casks are going to cause wear and tear. Let alone the safety [issues] and some of the bottlenecks….As Secretary of Transportation, you will have jurisdiction over the rail lines, and jurisdiction on the transportation of hazardous materials by rail via your Department's Pipeline and

> Hazardous Materials Safety Administration and its Office of Hazardous Materials Safety. So, with that in mind, given the safety concerns, the economic concerns, and the fact that the state of Nevada has never consented to the project, will you commit to opposing the dangerous shipments [of nuclear waste] to Yucca Mountain?"

Your reply to Senator Rosen was encouraging to the hundreds of citizens' groups and thousands of communities all along the proposed transport routes concerned about unsafe SNF shipments. You said, "I share the concerns that you've raised, not just from the Nevada perspective but all across the route."

We've now entered a situation that will require USDOT to take concrete actions on these concerns. While SNF shipment to Yucca Mountain in Nevada is an unlikely and distant prospect that won't happen for decades, if ever, SNF shipment to planned consolidated interim storage facilities (CISFs) in New Mexico and/or Texas is a highly likely and immediate prospect, with CISF owners asserting they will start accepting CISF shipments as soon as 2023.

I. Excluding Transportation of Foreign Commercial Nuclear Wastes

As you know, in September the U.S. Nuclear Regulatory Commission (NRC) granted license approval for Interim Storage Partners' (ISP) controversial CISF in Andrews County in West Texas, on the New Mexico border. The facility would store high-level radioactive waste from nuclear power plants across the U.S. It proposes to store up to 40,000 metric tons of highly radioactive, lethal SNF in dry storage canisters on surface concrete pads. If the facility opens, it would be the first private CISF in the U.S. A second CISF some 40 miles away in New Mexico, proposed by Holtec International, is also expected to be licensed sometime this year. It would have the capacity to store an additional 173,600 metric tons of irradiated fuel in shallowly buried canisters.

Since the entire SNF inventory at U.S. civilian reactors is only about 90,000 metric tons, experts have questioned why the Texas and New Mexico facilities would need a combined capacity of 213,600 metric tons. While the difference might be capacity for military nuclear waste, there is also precedent for shipping irradiated fuel from other countries to the U.S. for storage at Idaho National Lab. For example, under the "Atoms for Peace" program, high-level waste from foreign research reactors was shipped to Idaho National Lab, where it remains today, but by 2035 it is supposed to be removed, under penalty of $10,000 per day in fines. And in the 1979 Memorandum of Understanding between the NRC and USDOT on nuclear waste transport, there are provisions pertaining to shipping nuclear waste packages with "foreign certificates," and packages "used for export or import," and "USDOT has the responsibility for exercising discretion as to whether it requests NRC review of such packages."

In 2018, Sandia National Laboratory conducted a test shipment of a mock SNF cask from Spain to Pueblo, Colorado and back again. The cask arrived unbroken, but the test was somewhat contrived. It did not contain actual SNF and did not simulate what would happen when 10,000 heavy, loaded canisters are transported on railroad tracks with a gross weight limit of 286,000 pounds. Loaded Holtec UMAX containers weigh roughly 400,000 pounds or more. Nevertheless, Sandia's transportation projects manager Sylvia Saltzstein said, "We hope this will provide more assurances that the transportation of spent nuclear fuel is very safe." Saltzstein also said each of the countries participating in the mock shipment was most interested in a particular leg of the journey: Spain in the truck transport, South Korea in the sea portion and the U.S. in rail.

This implies an intention to import to the U.S. commercial spent fuel from foreign countries such as Spain, which has seven commercial reactors, and South Korea, which has 24. Research reactor waste from 41 foreign countries is re-imported to the U.S. per established non-proliferation policy, and we realize this will continue. But we also see a distinct possibility that CISF licensees may try to use their large capacity to store SNF from commercial reactors abroad, asserting without an appropriate evidence basis that transporting commercial waste from overseas is safe, when shipping and storing foreign commercial SNF in the U.S. would involve unacceptably high risks.

Therefore, the first thing that USDOT should make clear to CISF licensees and the NRC is that U.S. transportation infrastructure should not be used to import high-level nuclear waste from commercial reactors abroad and ship it through American communities for storage in the U.S. The Interstate Commerce Clause must not be misinterpreted to allow for such waste to be imported into the U.S. for storage, regardless of whether some state or tribal officials say they want it. At a minimum, as USDOT frames its decisions on SNF, HLW, and GTCC transport, transporting foreign commercial nuclear waste through U.S. territory for storage at CISFs should at least be ruled out starting now.

So, ultimately, should transport of domestic SNF and other HLW or GTCC waste to CISFs. For a host of reasons discussed below, transporting such wastes to CISFs would be unsafe and fall afoul of USDOT's safety mandate, including the Pipeline and Hazardous Materials Safety Administration's (PHMSA's) mission "to protect people and the environment by advancing the safe transportation of energy and other hazardous materials." PHMSA's mandate to "establish national policy, set and enforce standards, educate, and conduct research to prevent incidents" applies to shipping SNF, HLW, and GTCC waste.

II. Upholding Consent-Based Siting and Environmental Justice Principles

USDOT's environmental justice policy to "actively prevent disproportionately high and adverse effects of transportation projects on minority and low-income communities" should also be applied to decisions regarding transportation of nuclear waste, especially since as currently planned it certainly would disproportionately impact these communities.

In its 2012 report, the top recommendation of the Blue Ribbon Commission on America's Nuclear Future was to establish "a consent-based approach to siting future nuclear waste management facilities." Secretary Granholm and other federal officials have repeatedly affirmed they will follow the consent-based siting principle for nuclear waste storage facilities. Yet opening CISFs and shipping SNF to them fundamentally violates the principle of consent-based siting. As Senator Rosen mentioned in your confirmation hearing, Nevadans do not consent to Yucca Mountain. By the same token, neither do the people of Texas and New Mexico consent to CISFs.

The Biden administration has expressed its commitment to environmental justice, notably by empaneling the White House Environmental Justice Advisory Council. Yet opening CISFs and shipping SNF to them would fundamentally violate the principle of environmental justice. CISFs are opposed by state and tribal governments, and by the indigenous communities and communities of color located near CISF sites. Deciding the transport routes raises fundamental environmental justice issues. We assume the proposed routes will substantially overlap with those DOE has proposed for SNF shipments to Yucca Mountain (see attached map), passing through thousands of communities and 75% of Congressional districts. We also know from experience that more powerful, wealthier states and municipalities will use their influence to deflect the transport routes to less powerful and well-resourced areas, just as the siting of proposed CISFs has focused on

communities of color already disproportionately burdened with radioactive waste and pollution from the fossil fuel industry.

In September, days before the proposed ISP CISF in Texas was licensed by the NRC, the Texas legislature overwhelmingly approved a bill banning storage and/or disposal of high-level radioactive waste, including SNF, in the state, and directed the Texas Commission on Environmental Quality to deny state permits the project needs. The measure passed the Texas Senate by unanimous vote and passed the Texas House 119-3. Before the Texas Legislature passed the law, opposition to the ISP project in Texas was widespread and vocal. Governor Abbott and a bipartisan group of U.S. Congressional Representatives from Texas wrote strong letters to the NRC opposing the project. Resolutions opposing importing highly radioactive nuclear waste from other states to Texas were also passed by Andrews County and five other counties and three cities, representing 5.4 million Texans. School districts, the Midland Chamber of Commerce and oil and gas companies joined environmental and faith-based groups in opposing the ISP project.

In New Mexico, Governor Lujan Grisham, the All-Pueblo Council of Governors, and many other New Mexico state and municipal officials oppose Holtec's proposed CISF near the eastern border of the state, which is expected to be licensed by the NRC within months. They also oppose transportation of SNF to it. "Transporting material of this nature requires both well-maintained infrastructure and highly specialized emergency response equipment and personnel that can respond to an incident at the facility or on transit routes," wrote New Mexico Governor Michelle Lujan Grisham in a letter to the NRC and DOE. "The state of New Mexico cannot be expected to support these activities." The New Mexico State Legislature is currently working on a statewide ban on high-level nuclear waste similar to the one Texas enacted.

III. Nuclear Waste Policy Act Violations

In addition to violating state law, shipping SNF to CISFs also violates federal law. CISFs are predicated on the idea that the U.S. Department of Energy (DOE) will enable SNF transportation by taking title to the waste as it leaves the reactor site, thus relieving the licensees of their liability for it. But transferring responsibility for nuclear waste from private businesses to the federal government is specifically prohibited by the Nuclear Waste Policy Act of 1982, as Amended (NWPA) -- unless and until a geologic repository is open and operating. An operating geologic repository remains many decades away. The provision was included in the law to guard against "interim" storage sites becoming *de facto* permanent surface dumps, for lack of anywhere else to export the waste. But contrary to the NWPA, the NRC pushed the CISF schemes forward anyway, on the objectionable (and legally actionable) assumption that the law will change.

This is now the subject of two sets of lawsuits that seek to block the CISF projects in Texas and New Mexico on the grounds that they violate federal law, currently pending at U.S. Court of Appeals for the District of Columbia Circuit, the second highest court in the land after the U.S. Supreme Court. Parties to the suits include the NGOs Beyond Nuclear, the Sierra Club, the Austin-based Sustainable Energy and Economic Development (SEED) Coalition, the Don't Waste Michigan, et al. national coalition of watchdog groups, and the oil and gas company Fasken Land and Minerals, Ltd., and Permian Basin Land and Royalty Owners Association which advocates for ranching and mineral rights. In addition, the State of New Mexico raised the NWPA violation in its federal appeal to the Tenth Circuit Court to rescind licensing of the Holtec CISF. And when NRC moved to dismiss a similar appeal to the Fifth Circuit Court by the State of Texas, which seeks to block licensing of the

ISP CISF, the State argued that the NRC acted unlawfully and exceeded its authority, citing NWPA statutes and calling the ISP CISF a *de facto* permanent facility.

We believe it is prejudicial for NRC licensing of CISFs to go forward while these lawsuits pointing out their illegality are pending, and while the NWPA remains the law of the land. But however the legal issues play out, the underlying facts remain: transport of SNF and high-level nuclear waste is not safe, lacks adequate standards, is unaddressed in key ways by federal policy, and is grossly inadequately studied. Since USDOT and PHMSA have an obligation to set policies, enforce standards, and conduct research to guarantee safety, they have a duty to rectify these failings concerning nuclear waste transport.

IV. Jurisdictional Issues

While NRC has jurisdiction over SNF casks and canisters, it has downplayed and failed to rectify their many safety problems, including some it admits and some it does not admit. This directly implicates USDOT's and PHMSA's mission to guarantee safety.

Nuclear waste is clearly under USDOT's jurisdiction while it is being transported. The 1979 MOU between the NRC and USDOT defines the agencies' respective roles. It states that "Generally, the USDOT is responsible for regulating safety in transportation of all hazardous materials, including radioactive material, and the NRC is responsible for regulating safety in receipt, possession, use, and transfer of byproducts, source, and special nuclear materials."

USDOT has broad authority over the design, specifications, and performance not only of the vehicles, but also of the containers in which nuclear waste is shipped. The 1979 MOU states: "The USDOT (in consultation with the NRC) will develop safety standards…for the design specifications and performance requirements of packages for quantities of radioactive materials (other than fissile materials) not exceeding Type A limits…; for the external radiation fields; for the procedures for loading, unloading, handling, and storage in transit; for any special transport controls (excluding safeguards) necessary for radiation safety during carriage…."

In general, transporting nuclear waste, whether by barge, truck, or rail, is fraught with unsolved safety and practical problems, and entails risks of radiological release to the public. In particular, transporting SNF to CISFs, whether by land or water, poses a host of risks and threats -- from road and rail infrastructure that can't handle the weight and port facilities that aren't equipped for SNF barge shipments, to unsafe transport casks and canisters and spent fuel which are more likely to become damaged and fail when laid on their side for transport.

Transportation infrastructure upgrades funded by new federal spending won't do much to reduce or resolve such risks and threats. The converse, however, is not true: radiological releases from SNF, HLW, and GTCC transport accidents could do much to harm transportation infrastructure. They pose a threat to massive infrastructure upgrades Congress just authorized, as well as to public health and safety.

For example, if a radiological release occurred on a new or renovated bridge or in a new or renovated tunnel, it would be a total loss -- too unsafe to use, and too expensive to clean up. Even a very small amount of highly radioactive waste escaping into the environment could result in billions or tens of billions of dollars of lost property and/or cleanup costs, not to mention the public health impacts, from acute radiation poisoning deaths to latent cancer fatalities and non-fatal but significant radiogenic diseases, with transportation workers on the front lines of a radiological

accident suffering the worst health effects. That's another reason it's appropriate and necessary for USDOT to assert and exercise its authority over nuclear waste transport safety.

V. Overview of Nuclear Waste Transportation Safety Issues

Listed below are a few of the unresolved safety problems with SNF transportation *per se* which fall directly within USDOT's jurisdiction:

i. **Canister failure risks in transport** -- Canisters used in the U.S. rely on convection (passive) cooling. For convection cooling to work, canisters must be upright. But in transport, canisters are laid down horizontally, which reduces convection, causing the canister to overheat. Higher heat loads exacerbate canister failure risks, including higher pressurization and radiation leaks. A 2019 gap analysis on extended storage and transport of SNF, prepared for DOE by Sandia and Pacific Northwest National Laboratories admitted we need to learn more about the horizontal orientation on temperature profiles inside dry casks, and proposed using a dry cask simulator for more study, as well as more modeling and new methodologies to predict temperatures inside real casks "without excess conservatism." There is no technology in place to fully inspect canisters for damage. Horizontal orientation of spent fuel assemblies for transport is the weakest orientation, leaving SNF more vulnerable to becoming damaged as it absorbs bumps, jolts and shocks *en route*. The impacts of shaking and bumping of radioactive materials on railways, during Heavy-Haul or Legal Weight Truck transport, or in ports during barge shipment operations are not known. In 2019 the U.S. Nuclear Waste Technical Review Board (NWTRB) identified 30 unresolved technical issues in transporting SNF and other high-level radioactive waste that still need to be addressed, and recommended DOE "allow for a minimum of a decade to develop new cask and canister designs for SNF and HLW storage and transportation." Yet decommissioning companies and the NRC are pushing ahead with licensing proposed consolidated interim storage facilities in New Mexico and Texas now which could accept highly irradiated SNF shipped from around the country starting in the next few years – possibly as soon as next year -- before these remaining technical issues can be adequately studied, let alone resolved. Meanwhile, no new technology for transporting SNF canisters is on the horizon, and none is likely to materialize before CISFs start accepting SNF shipments. It's much more likely that when CISFs are ready to open, as soon as 2023, the NRC will adjust its methodologies to downplay the risks and approve current cask technology for transport.

ii. **Accident risks in transport** -- In addition to the risk of canisters leaking and failing in transport, there is also significant risk of transportation accidents. Transporting highly irradiated SNF by rail long distances, through major cities, via out-of-date or weakening infrastructure, would subject large numbers of people to accident risks. Roads, rails, bridges, and other infrastructure are not designed for the 180-metric ton weight of loaded SNF canisters plus transport casks plus vehicles. The Heavy-Haul Trucks needed to carry them are massive and travel at very low speeds on secondary roads, with communities and neighborhoods all along the way running risks of accidents and exposure to leaking canisters. In 2002, DOE proposed barge routes for shipping SNF from reactors without direct rail access. That plan has been echoed recently by decommissioning companies, including in Holtec's Post Shutdown Decommissioning Activities Report (PSDAR) for New York's Indian Point, which contemplates shipping SNF down the Hudson River on barges. It is also echoed in plans for shipping radioactive components and eventually high-level

radioactive waste from Michigan's Palisades plant. Barge shipment raises the prospect of potentially catastrophic maritime accidents involving spent fuel. Planned DOE barge routes from Indian Point and the New York metropolitan area would go down the Hudson River past Manhattan. From Palisades, Holtec's planned barge route crosses Lake Michigan, the source of drinking water for 40 million people. From the Oyster Creek plant in New Jersey, which Holtec is now decommissioning, the DOE barge route crosses Barnegat Bay, where past barge shipments to Oyster Creek ran aground in bad weather, and in which other barges have sunk. Other threat multipliers such as terrorism, cyberattacks and extreme weather events due to climate change exacerbate these risks, though the NRC consistently dismisses them as "not credible." Yet credible threats, like SNF shipments themselves, aren't hard to identify. For example, cyberattacks can derail trains or disrupt cranes. Climate models currently in use underestimate how fast extreme weather will occur and how large the impacts will be. Last year Colorado's Interstate 70 which goes through a flood-prone canyon was inundated by sudden mudslides. Such extreme incidents will increasingly impact U.S. transportation infrastructure, and once the process of shipping massive amounts of SNF to CISFs starts, shipments will be vulnerable to such threat multipliers as climate change, terrorism, and cyberattacks. In fact, dismissing these threats as not credible and doing nothing about them is a threat multiplier in itself.

iii. **CISFs rejecting "damaged fuel"** -- Holtec recently stated that its CISF in New Mexico would reject "damaged fuel," which is a tacit acknowledgement of canister handling and transport risks that could result in damage to SNF containers and the fuel itself. Flawed container design, routine gouging of containers when they are lowered into storage pits and again when they are lifted out, shaking and bumping in transport, and other factors create potential risks -- as yet unmitigated by law or regulation -- that damaged fuel canisters could develop leaks, through-wall cracks, or holes, that the fuel inside may disintegrate so fragments of it gather in the bottom of the canister, and that these fragments, impacted by infiltrating water, could inadvertently interact and go critical. Since canisters aren't effectively monitored or inspectable, this sort of damage is hard to detect. Holtec has adopted a policy of reserving the right to reject any shipment of SNF it decides is "damaged," and to send it back to the point of origin. In its CISF licensing application, ISP also flagged it intended to adopt a similar "return to sender" policy. Shipping damaged fuel back to the point of origin would redouble the transportation risks described above.

While it may not be within USDOT's jurisdiction, it's worth noting that when damaged fuel arrives back at the point of origin, there will be no way to properly contain or repackage it, since almost all decommissioning licensees propose to demolish the fuel pools as soon as SNF is removed from them, and no licensee has chosen to spend the money to construct a hot cell in which SNF could safely be repackaged. The NRC has refused to require hot cells or fuel pools for decommissioned nuclear plants.

VI. SNF Container Problems Relevant to Transportation Safety

There are many unresolved problems with SNF containers which are not formally within USDOT's jurisdiction, but which are nonetheless relevant to transportation safety. The 1979 MOU says the NRC is responsible for setting standards for containers' structural integrity, criticality control, containment of radioactive material, shielding, generation of internal pressure, protection against internal overheating, and quality assurance. But it also says that USDOT is responsible for

regulating the safety of radioactive material during transportation, so it may have some relevant authority in the following areas while the containers are being transported:

i. **Uncertain canister performance/lifespan and lack of monitoring** -- The NRC approved thin-wall dry storage canisters for relatively short-term storage of spent fuel, and they are being widely used in Independent Spent Fuel Storage Installations (ISFSIs) and proposed for CISFs, which will store spent fuel for decades or centuries. Electric Power Research Institute (EPRI) claims it would take at least 80 years for thin-walled canisters to develop through-wall cracks and leak radioactivity, but this is in dispute, and there is reason to believe that dry storage canisters could fail much sooner. In a 2014 public meeting on stress corrosion cracking, the NRC acknowledged that once cracks start, they can grow through the thin wall and cause component failure in as little as 16 years. There are over 3200 thin-walled canisters loaded with spent fuel in the U.S. Most are about a decade or two old, while some are more than three decades old, and more such casks are being loaded all the time. In fact, under the oldest-fuel-first policy, three-decade-old SNF containers are in line to be transported to CISFs soon. But shipping the oldest containers first aggravates the risk that old containers may fail during transport. High heat loads can also accelerate component failure. The NRC now approves more than doubling previously permitted heat loads for each storage canister, in order to accommodate faster transfer from fuel pools in fast decommissioning. It also stopped requiring verification of heat loads. When it approved the Holtec UMAX system of thin-walled, convection-cooled canisters in 2020, it did away with the requirement that licensees verify that the cooling is working. Today, as long as the utilities assert that heat load in each canister is under 30 kilowatts, the NRC doesn't require any proof. Monitoring canisters is obviously necessary for safe extended storage or transportation of spent fuel, but the NRC has refused to require it.

ii. **Lack of evidence-based regulatory requirements for High Burnup Fuel** -- High burnup (HBU) fuel makes up a substantial and growing portion of the inventory of highly radioactive SNF in the U.S. Beginning in the 1990s, the NRC approved it for use in civilian reactors to lengthen the time between reactor refueling and cut owner's operating costs. It generally contains a higher percentage of uranium-235, allowing reactor operators to effectively double the time between refueling. Since it stays inside reactors about twice as long as low burnup fuel, once it comes out of the reactor, HBU SNF is significantly more radioactive, has much higher decay heat, and is more unstable than SNF from low burnup fuel. According to the NRC "there is limited data to show that the cladding of spent fuel with burnups greater than 45,000 MWd/MTU [megawatt-days per metric ton of uranium] will remain undamaged during the licensing period." But there is a body of research showing HBU SNF degrades the zirconium metal cladding around the fuel rods, causing it to thin, become embrittled, and potentially fail, even in the near term. The same research shows that high burnup fuel temperatures make HBU SNF more vulnerable to damage from handling and transport. Cladding can fail when HBU spent fuel assemblies are removed from cooling pools, vacuum dried, and placed in dry storage canisters. Failure limits for high burnup SNF in dry storage, or for newer zirconium cladding alloys (which can potentially degrade faster with high burnup SNF than older alloys) remain unknown, but the unknowns don't suggest high burnup SNF dry storage is safe -- on the contrary. There is currently no way to monitor HBU SNF in dry storage canisters to ensure it has not become damaged, and no way for damaged HBU SNF to be repacked in a new fuel can to contain its radioactivity. At a minimum, HBU SNF loaded into canisters is supposed to be surrounded by conventional low burnup fuel to serve as a buffer. But canisters are typically loaded the opposite way: high burnup SNF surrounds the low-burnup fuel which enables packing more

of it into the canister. The NRC has acknowledged that this is a mistake. Yet despite unknown failure limits and evidence it's unsafe, the NRC continues to allow high burnup SNF to be loaded into dry storage canisters. The NRC concedes that "data is not currently available" to support the claim that transportation of high burnup SNF is safe. In fact, in the absence of facilities that would enable repacking, the NWTRB points out some of the hottest canisters (i.e., canisters containing HBU SNF) won't be safe to ship in this century: "If no repackaging occurs, some of the largest SNF canisters storing the hottest SNF would not be cool enough to meet the transportation requirements until approximately 2100."

iii. **Inadequate standards for containers, ignoring NWTRB recommendations** -- For both short-term and long-term storage of irradiated nuclear fuel, the Nuclear Waste Technical Review Board recommended that SNF and its containment must be maintained, monitored, and retrievable in a manner that prevents radioactive leaks and hydrogen gas explosions. It also recommends canisters have pressure monitoring and pressure relief valves, since canisters are pressure vessels subject to gas buildup. The NRC has ignored these recommendations, for example refusing to require remote sensor monitoring systems. Managing pressure buildup inside canisters is admittedly complex, since pressure relief valves could also become pathways for radiation to escape the canister. But it's worth noting that the American Society of Mechanical Engineers (ASME) N3 standards don't just recommend, but *require* pressure vessels to have pressure monitors and/or pressure relief valves. ASME further requires them to be examined for surface defects and for defects to be eliminated. Most unwisely, given the risks, the NRC exempts SNF canisters from these requirements.

In general, while SNF disposition and containers are under NRC jurisdiction, they are also relevant to transport safety issues under USDOT jurisdiction. If the NRC ignores NWTRB recommendations, fails to frame or adhere to adequate standards for SNF handling and containment, and promotes SNF transport to CISFs in violation of federal and state law, how can USDOT fulfill its own mandate to assure the safety of nuclear waste transport, or even properly fulfill the terms of the MOU?

VII. USDOT's Obligation to Confront Fundamental SNF Transportation Safety Problems

The NRC's claim that SNF transport is safe as long as USDOT has inspected transport vehicles and procedures is unsubstantiated. Rather than keeping the agencies' roles strictly siloed and sign off on this unsubstantiated claim, we believe USDOT is obligated to use its regulatory authority to confront the fundamental safety issues, study them adequately, make its own determination about whether nuclear waste transport is safe, and frame its own policy on nuclear waste transport.

We also believe that you as a member of President Biden's cabinet should elevate these nuclear waste transport safety issues with the Administration, and not compromise USDOT's mandate to assure the safety of transporting hazardous materials in deference to the Administration's apparent decision to promote more reliance on nuclear energy as a climate strategy.

Without debating the merits of that policy (which we strongly dispute), it's worth pointing out that continuing and increasing reliance on nuclear power has a direct bearing on USDOT's mandate.

For example, the more existing commercial reactors are bailed out with federal taxpayers' money, the more the NRC grants extreme license extensions, and the longer these reactors run, the more waste they will create, the higher the proportion of HBU in the SNF inventory will grow, and the

more severe and intractable the waste problem will get. Policies that prolong or even increase generation of commercial SNF would mean more shipments of it to facilities off reactor sites, thereby compounding transport risks even while intensifying the pressure to start transporting SNF, without adequate study or standards, and in violation of federal and state laws and basic principles of consent-based siting and environmental justice.

Similarly, if proposed projects for so-called advanced reactors, which rely on higher burn-up fuel and have fewer safety standards than conventional reactors, come online, they will further compound SNF transport safety problems and further ratchet up the pressure to begin transporting before these problems can be resolved, or even adequately studied.
We believe USDOT has the authority and a duty to hold the line against this, and to insist on adequate study and framing and implement adequate policies and safeguards before permitting SNF transport.

The 1979 MOU states that the USDOT must consult with the NRC in framing safety standards for transportation of nuclear waste. But that doesn't mean that USDOT is required to rely on NRC data or studies (or lack thereof) when framing these standards. Nor should USDOT decisions rely on NRC data and studies when they are spotty or flawed, or conform to NRC decisions concerning transport which aren't evidence-based.

VIII. Lack of Adequate Studies or Evidence Basis for SNF Transport

The NRC has failed to collect key data to enable informed decisions on SNF transport and CISFs. For example, as mentioned above, in 2019 the NWTRB identified 30 unresolved technical issues in transporting SNF and other high-level radioactive waste that need to be addressed, but haven't been. The NWTRB holds the scientific and technical high ground on these matters, and federal agencies ignore their recommendations at the American public's peril.

In general, there is an egregious lack of reliable data and adequate studies on the potential health, safety, environmental, and economic consequences of radiological releases from nuclear power plant accidents, and an even greater dearth of data and federal studies of potential impacts from radiological releases from SNF and HLW transport accidents. One notable exception is independent analysis of SNF transport risks and impacts conducted by the State of Nevada Agency for Nuclear Projects, which can be found on anp.nv.gov. But federal studies of the issue are woefully lacking, apparently by design.

For example, Sandia National Laboratories studied the potential impacts of radiological accidents at commercial nuclear plants in its 1982 Calculation of Reactor Accident Consequences 2 (CRAC-2) report. CRAC-2 updated the 1975 CRAC-1 report, though no further updates were issued after 1982. CRAC-2 used probabilistic analysis and computer modeling to estimate the health, safety, and economic impacts of reactor accidents, and found that they could cause many thousands of deaths and billions in economic damage in each reactor community around the country. For example, CRAC-2 estimated a reactor accident at the Indian Point nuclear plant in downstate New York could cause (adding its two reactors together) up to 100,000 early deaths, over 300,000 early injuries, and close to $600 billion in economic damage (in 1982 dollars). Comparable cost and casualty estimates were given for each nuclear plant nationwide. When the U.S. General Accounting Office (GAO) reported on the financial consequences of a nuclear power plant accident in 1986, it drew on CRAC-2 data and concluded that the *average* financial consequences of a catastrophic radiological accident at a U.S. commercial nuclear plant would be lower, but still significant: up to $15 billion, which adverse weather could multiply tenfold.

The Union of Concerned Scientists repeatedly tried to obtain a copy of the CRAC-2 report but was resisted by the NRC. It was only due to Congressman Ed Markey's (D-MA) intervention that the report ever came to light.

Since CRAC-2 was finalized in 1982, populations living near nuclear reactors have soared, and economic development has continued. So beyond adjusting for inflation, the estimated casualties and property damage from a reactor accident would be much greater if such a study were conducted today.

In 2012 NRC issued a very different report, "State-of-the-Art Reactor Consequence Analyses" (SOARCA), last updated in 2020. Instead of commissioning a study from a national lab, NRC relied on its own internal modeling and methodology for the SOARCA project. Rather than estimate risks and costs at each nuclear plant, it studied just two: Peach Bottom Atomic Power Station in Pennsylvania, and Surry Power Station in Virginia. Applying its own model to data from those two plants, the NRC concluded that a reactor accident in the U.S. would have negligible impact on health, safety, and the economy: "essentially no risk of death during or shortly after the accident…longer term cancer fatality risks for the accident scenarios analyzed are millions of times lower than the general U.S. cancer fatality risk."

This conclusion is utterly different from CRAC-2's findings. No attempt was made to account for the huge discrepancies between the two studies. The tacit implication seems to be that the new finding was due to NRC's "improved" methodology. But put another way, the NRC devised an internal methodology which used similar data to the 1982 study, yet interpreted it in a way that reduced the alarming health and safety risks to essentially nothing.

This is part of a pattern. In 2014 NRC published an updated Spent Fuel Transportation Risk Assessment which reexamined previously assessed data, but this time the NRC used an internally devised methodology to reduce those risks to essentially zero. The previous report, "Final Environmental Statement on the Transportation of Radioactive Material by Air and Other Modes," issued in 1977, found that "Transportation accidents involving packages of radioactive material present potential for radiological exposure to transport workers and to members of the general public. The expected values of the annual radiological impact from such potential exposure are very small."

But the 2014 NRC assessment revised "very small" to vanishingly small, cutting the risks by *five orders of magnitude* (i.e., cutting the risks detected in the 1977 study by a factor of 100,000)*:* "Because there have been only minor changes to the radioactive material transportation regulations between NUREG-0170 and this risk assessment, the calculated dose caused by the external radiation from the cask under routine transport conditions is similar to what was found in earlier studies. The improved analysis tools and techniques, improved data availability, and a reduction in uncertainty has made the estimate of accident risk from the release of radioactive material in this study approximately five orders of magnitude less than what was estimated in NUREG-0170."

IX. Risk of SNF Transport Accidents Is Not Negligible and Requires Independent Assessment

Such "improved" NRC studies do not provide a sound or credible foundation for framing USDOT policy on transportation of spent nuclear fuel and high-level nuclear waste, especially regarding the risk of transport accidents, which is not negligible. Dismissing the risks of many thousands of

shipments of SNF, HLW, and GTCC as trivial would be a perilous basis for USDOT policy. Therefore USDOT should conduct and/or commission an independent assessment of SNF and HLW transport risks.

For example, USDOT should take risk of radiological release from SNF and HLW transport into account in the Federal Transit Administration's current rulemaking on Rail Transit Roadway Worker Protection (docket number FTA-2021-0012). In line with the NRC downplaying transport accident risks, the FTA process has not considered the danger to transit workers of radiological release in accidents or routine emissions from SNF or HLW shipments. But rail transit workers would be on the front lines of such releases and emissions, the risk of which is not negligible. Protecting transit workers is an additional reason why it's appropriate for USDOT to conduct and/or commission its own assessment of the risks and impacts of transporting radioactive waste.

In contrast to the NRC, heads of the Federal Railroad Administration (FRA), PHMSA, and the NTSB, serving both Republican and Democratic administrations, have said they believe the risk of an accident while transporting nuclear waste is real, and not negligible.

Former Senator Dean Heller (R-NV) posed this question to current NTSB chair Jennifer Homendy in her written confirmation proceeding: "Under the Nuclear Waste Policy Act, the federal government is looking at shipping 9,495 rail casks in 2,800 trains and 2,650 trucks hauling one cask each to Yucca Mountain over 50 years. These shipments would use 22,000 miles of railways and 7,000 miles of highways and cross over 44 states. Under previous questioning from me at this Committee, [now former] Federal Railroad Administrator Ronald Batory and [now former] Pipeline and Hazardous Materials Safety Administrator Howard Elliott confirmed that a transportation accident with an ensuing radiological release was possible. Ms. Homendy, you testified that even if all of the National Transportation Safety Board recommended safety measures were to be implemented, the risk of transporting nuclear waste would not be eliminated. Given your assessment that we cannot engineer out 100% of the risk and given the significant number of proposed shipments, the sheer distance to be traveled, and the 50-year duration of these shipments, do you agree with Mr. Batory and Mr. Elliott that there is a real risk of at least one transportation accident with an ensuing radiological release occurring?"

Ms. Homendy wrote back, "An increase in rail traffic of SNF and HLRW could increase the risk of an accident with an ensuing radiological release. Even with the strongest safety measures in place, it would be impossible to say with 100 percent certainty that an accident could never occur."

The National Sierra Club Nuclear Waste Task force studied the problem of nuclear waste transportation dangers and found it posed a major risk: "Potential terrorism and national security measures have not been shared with the public. Many emergency responders are volunteers with little training for hazardous materials and even less for radiological incidents. The National Transportation Safety Board (NTSB) should be put in charge of radioactive shipments and require redundant safety measures that protect the public from potential disasters. It is not acceptable that only radioactive shipments escape the purview and expertise of the NTSB, which can call for improved inspections and reporting, conduct thorough investigations, make recommendations and produce reports. Given these and many other deficiencies, the absence of extensive information about the transportation of SNF poses a major risk with serious consequences."

USDOT should conduct or commission an assessment of the risks and impacts of SNF and HLW transport accidents, one whose methodology is not limited to internal assumptions and modeling that reduce risks and impacts to essentially zero. USDOT has an obligation and a redoubled

incentive to ascertain and guard against the negative impacts of transporting nuclear waste now that the new infrastructure bill has allocated hundreds of billions of dollars in new funding for roads, bridges, tunnels, rails, and ports. A transport accident resulting in even a small amount of irradiated, highly radioactive "spent" fuel being released could cost billions or tens of billions of dollars in lost property, clean-up, and other related costs. That's in addition to potentially severe health and safety impacts to transportation workers and communities along the transport routes.

X. Legally Required Studies Haven't Been Done

Some expert recommendations on nuclear waste transport are advisory, such as the NWTRB's recommendation in its 2019 report on Preparing for Nuclear Waste Transportation that we should "allow for a minimum of a decade to develop new cask and canister designs for SNF and HLW storage and transportation." We ignore such expert recommendations at our peril, but NRC isn't breaking or evading any laws by doing so. On the other hand, the obligation to assess SNF transport costs and risks, and to compare them to reasonable alternatives, is required under Executive Order 12866, which has the force of law.

Available risk data is outdated or unreliable, cost data is generally lacking, and the relative costs and risks of transporting SNF to CISFs versus robust onsite storage have yet to be adequately studied. There is no comprehensive study comparing the costs, benefits, and risks of transporting SNF to CISFs to any alternative approach, such as safeguarding it at the reactor sites until one or more geologic repositories is/are ready to receive it. Indeed, onsite storage until a geological repository opens is what the Nuclear Waste Policy Act requires, yet CISF licensing (improperly and allegedly illegally) in the absence of a geological repository assumes the law will change and that SNF shipments are imminent.

But despite the lack of data and studies, it's a safe assumption that the potential national economic impacts of this choice between safeguarding SNF on reactor sites versus transporting it to CISFs will easily exceed $100 million a year. If a transport accident can't be ruled out, neither can billions of dollars' worth of harmful impacts. That means the decision of whether or not to permit CISFs and transport of SNF across the country meets the definition of a "significant" regulatory action under Section 6 of Executive Order 12866. Therefore a cost-benefit analysis is required by law, yet has not been done.

Section 6(a)(3)(B) of Executive Order 12866 states that, for each "significant" regulatory action, covered agencies are to provide to the Office of Information and Regulatory Affairs (OIRA) within the Office of Management and Budget (OMB) a general "assessment of the potential costs and benefits of the regulatory action." Section 6(a)(3)(C) (iii) of the executive order also states that, for each "economically significant" regulatory action, agencies are required to provide OIRA with an assessment of a "potentially effective and reasonably feasible alternative."

A "potentially effective and reasonably feasible alternative" to transporting SNF to CISFs must therefore be assessed along with a cost-benefit analysis. Principles for Safeguarding Nuclear Waste at Reactors, widely accepted by reactor community groups in all 50 states, include minimizing vulnerable dense pool storage of SNF, and establishing Hardened On-site Storage (HOSS) where SNF is held in dry storage as safely and securely as possible, as close to the site of generation as possible. HOSS is the obvious "reasonably feasible" alternative to SNF transport. But to date, there has been no federal study of it. The Blue Ribbon Commission did mention in passing the potential for HOSS to be implemented at CISFs, but that of course would defeat the purpose of HOSS, which is to provide a safer alternative to transporting SNF to CISFs.

In addition to violating the Nuclear Waste Policy Act, which is the subject of federal lawsuits now underway, the fact the NRC has promoted and licensed CISFs without commissioning and submitting an analysis of SNF transport risks and costs to OIRA means it is out of compliance with Executive Order 12866. PHMSA is in a position to conduct and/or commission key parts of the missing analysis and thereby comply with the Order.

XI. Fill Research and Policy Gaps *Before* Permitting SNF Transport

Especially now that NRC is licensing CISFs, USDOT has an urgent duty to use its regulatory authority to fill current research and policy gaps by studying, setting, and enforcing adequate standards for transportation of SNF, other HLW, and GTCC waste, so as to prevent radiological accidents and advance safety.

A first step would be for PHMSA to provide a comprehensive assessment of the risks, costs, and impacts of SNF transportation, including a comparison with those of HOSS. The next step would be to apply the results to frame standards and policies, enforce them, and educate the public about them. No SNF shipments to CISFs should be permitted unless and until these functions are fulfilled, and adequate, evidence-based, enforceable standards and policies governing nuclear waste transportation are in place.

We recognize this is no small undertaking. To support it, we're happy to provide USDOT with briefings and consultations with recognized, independent experts on nuclear waste transport as well as representatives of concerned citizens' organizations and stakeholder groups. We are at your disposal for making informational presentations to USDOT staff on these issues, and fielding requests for further information or documentation. Nuclear waste transport is a critical -- and potentially existential -- safety issue, and we're eager to help however we can.

Supporting documents for this letter are posted at http://archive.beyondnuclear.org/waste-transportation/2022/2/9/landing-page-for-attachments-to-letter-to-secretary-buttigie.html We'll follow up with you soon. Meanwhile, if you have any questions, or for further communications, please contact Kevin Kamps at Beyond Nuclear at the coordinates below.

Respectfully,

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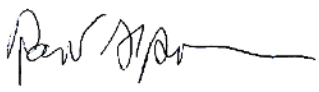

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The Honorable Doug Ducey, Governor of Arizona
The Honorable Asa Hutchinson, Governor of Arkansas
The Honorable Gavin Newsom, Governor of California
The Honorable Jared Polis, Governor of Colorado
The Honorable Ned Lamont, Governor of Connecticut
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The Honorable Bernie Sanders, United States Senate
The Honorable Deb Haaland, Secretary of the Interior
The Honorable Jennifer Granholm, Secretary of Energy
The Honorable Amit Bose, Administrator, Federal Railroad Administration
The Honorable Stephen Dickson, Administrator, Federal Aviation Administration

The Honorable Jennifer Homendy, Chair, National Transportation Safety Board
Mr. Tristan Brown, Acting Administrator, Pipeline and Hazardous Materials Safety Administration
Mr. Jack Van Steenburg, Executive Director, Federal Motor Carrier Safety Administration
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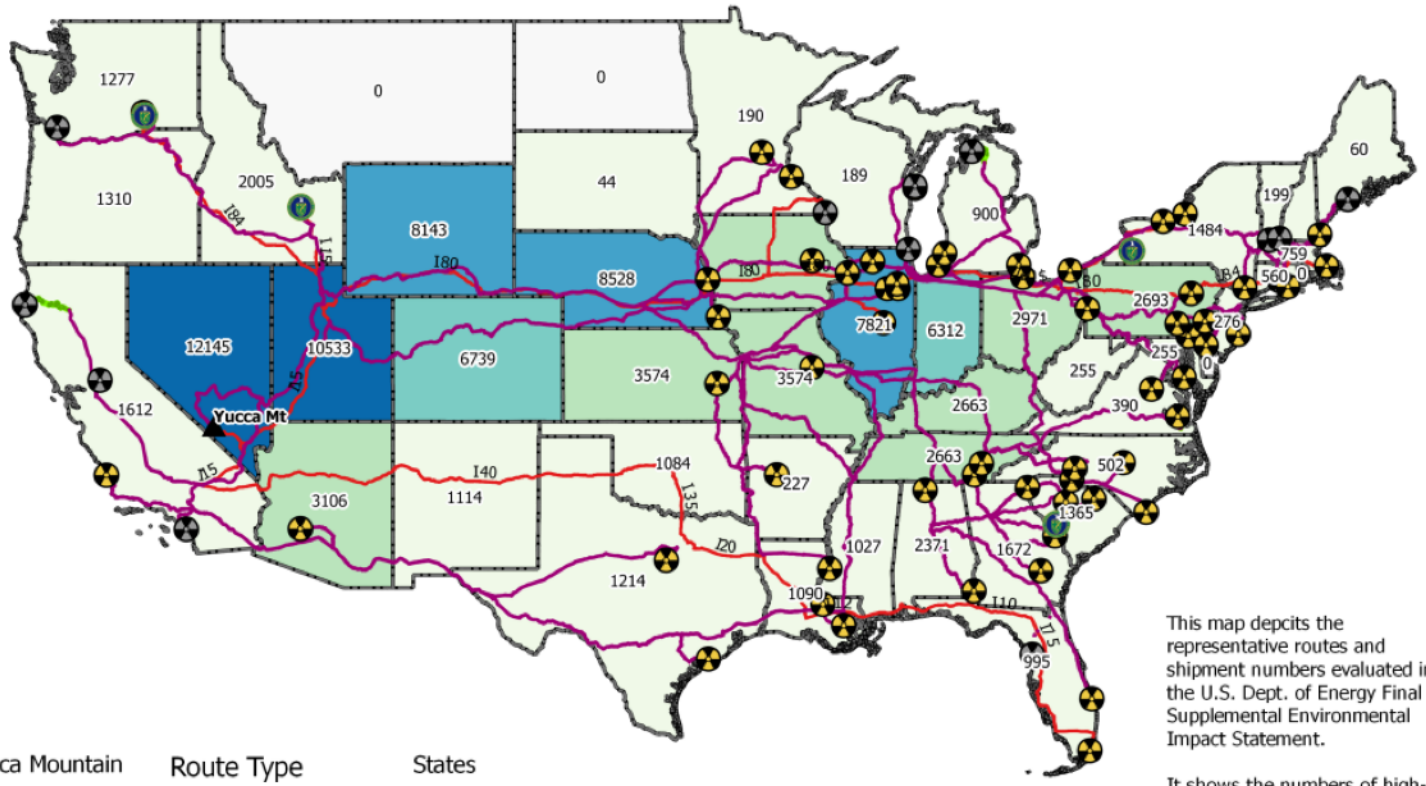
The Honorable Patrick Morrisey, Attorney General of West Virginia
The Honorable Josh Kaul, Attorney General of Wisconsin
The Honorable Bridget Hill, Attorney General of Wyoming
The Honorable Eric Adams, Mayor of New York City
The Honorable Ydanis Rodríguez, Transportation Commissioner of New York City

Representative Transportation Routes to Yucca Mountain and Transportation Impacts (Cask Shipments by State)



Yucca Mountain
DOE Major Sites
Nuclear Reactor Sites
Closed Power Plant
Power Plant

Route Type
FSEIS Rail
FSEIS Truck
FSEIS Heavy Haul

States
No Shipments
1 - 2,429
2,430 - 4,858
4,859 - 7,287
7,288 - 9,716
9,717 - 12,145

This map depcits the representative routes and shipment numbers evaluated in the U.S. Dept. of Energy Final Supplemental Environmental Impact Statement.

It shows the numbers of high-level nuclear waste shipments that would traverse each state en route to Yucca Mountain.

source: Nevada Agency for Nuclear Projects