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What Congress Needs to Know About Pending Nuclear Waste Legislation

Friday, November 13, 2020

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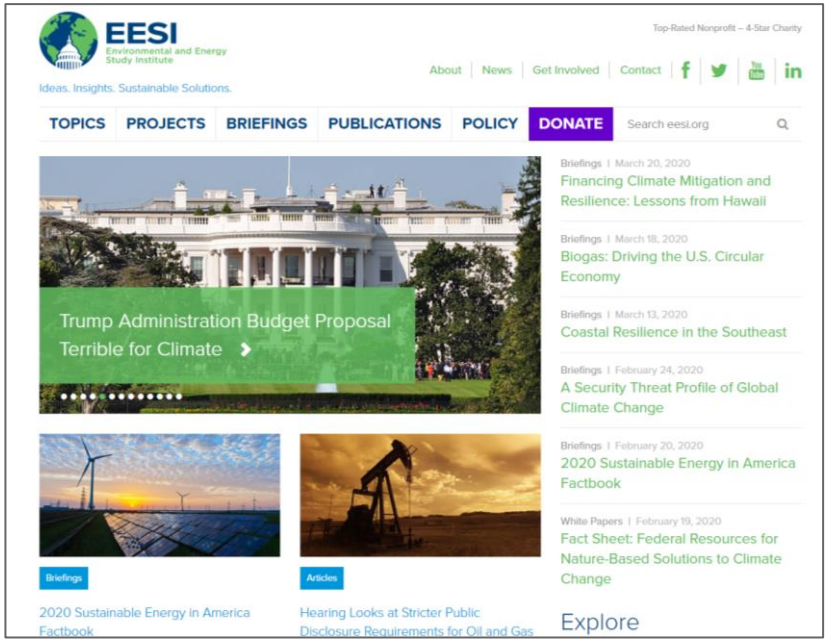

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Spent Power Reactor Fuel: Storage and disposal Issues

Robert Alvarez
Associate Fellow
Institute for Policy Studies
November 13, 2020

After 60 years (1960-2020), U.S. nuclear power reactors have generated the single largest inventory of spent nuclear fuel (SNF) in the world (roughly 20 percent). SNF is bound up in more than 285,900 long rectangular assemblies containing tens of millions of fuel rods. The rods, in turn, contain trillions of irradiated uranium pellets- the size of a fingertip.

After bombardment with neutrons in the reactor core, about 5 to 6 percent of the pellets are converted to a myriad of radioactive elements with half-lives ranging from seconds to millions of years. Standing within a meter of a typical spent nuclear fuel assembly guarantees a lethal radiation dose in minutes.

Pressurized Water Reactor
Fuel assembly.

Why we should be concerned about spent power reactor fuel.

The U.S. Government Accountability Office informed the U.S. Congress in April 2017 that "spent nuclear fuel can pose serious risks to humans and the environment ..and is a source of billions of dollars of financial liabilities for the U.S. government. According to the National Research Council and others, if not handled and stored properly, this material can spread contamination and cause long-term health concerns in humans or even death."

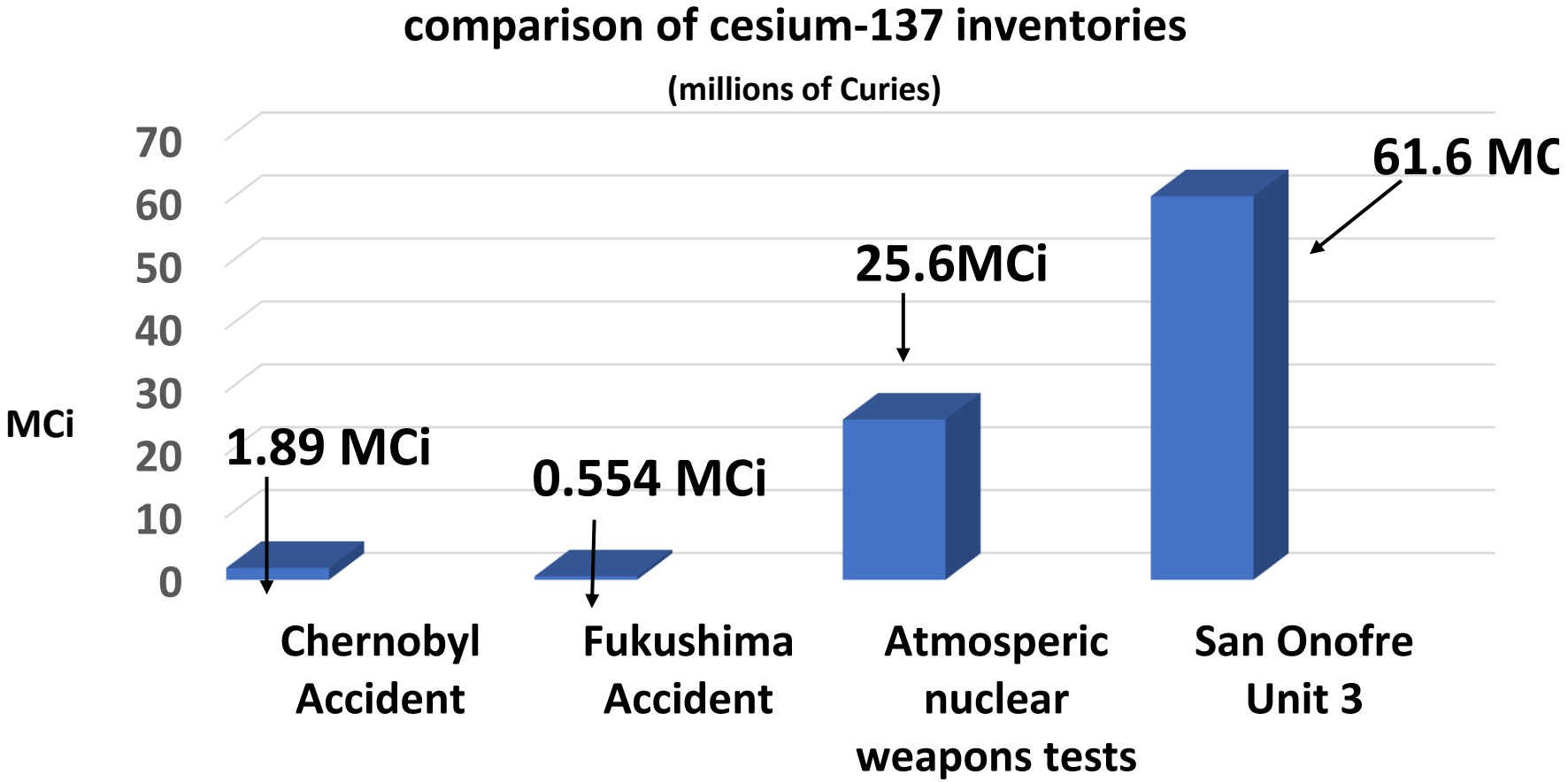
Because of these extraordinary hazards spent nuclear fuel is required under federal law (the Nuclear Waste Policy Act) to be disposed in a geological repository to prevent it from escaping into the human environment up to one million years.

U.S Spent power reactor fuel contains some of the world's largest concentrations of artificial radioactivity.

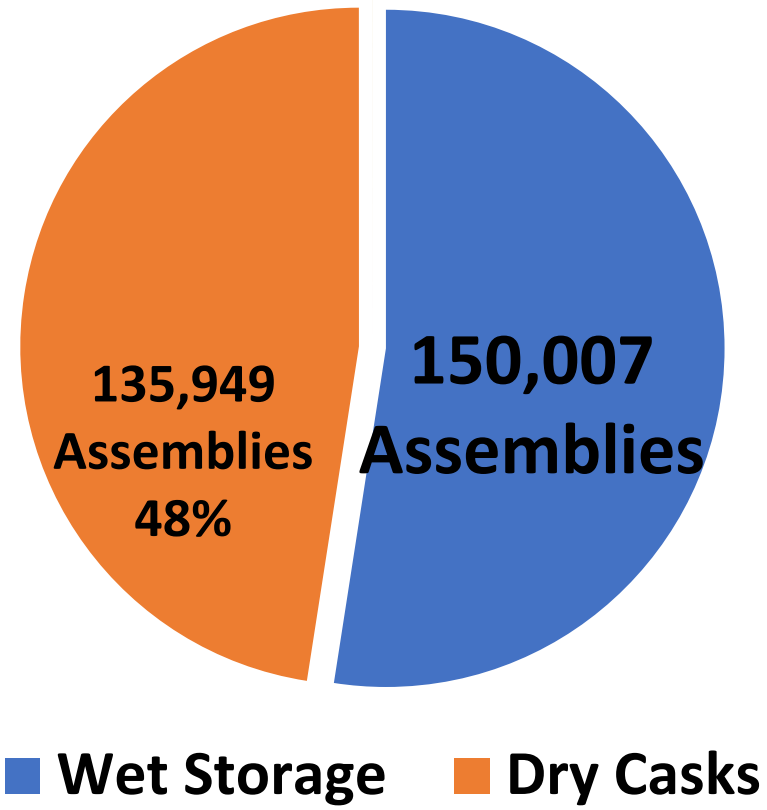
(1) 23 billion curies (8.51E+20 Bq) of long-lived radioactivity (>20 times more than generated by the U.S. nuclear weapons program).

(2) About 9.2 billion curies (3.4E+20Bq) of cesium-137(350 times more than released by all atmospheric nuclear weapons tests); and

(3) About 700 metric tons of plutonium (about 3 times more than used for weapons throughout the world).



Sources: NCRP -154, WNA 2016, DOE-GC 859 (2013), DOE EIS-0250, Appendix A, Table A-9.



As of the end of 2018, about 82,358 metric tons of spent nuclear fuel is stored at 119 sites.

Currently, there are 95 operating nuclear power reactors in 29 states, which generate about 2,200 metric tons of SNF each year. There are 38 closed nuclear power reactors in the United States at 30 sites in various stages of decommissioning.

About 48% of U.S. power reactor spent fuel is stored in > 3,200 storage casks, of which 600 are at permanently closes sites.

Sources: DOE (2019), NWTRB (2016)

35 States with Commercial SNF from Nuclear Power Reactors

4 States with Research Reactors Only

Approximate Amounts in Metric Tons Heavy Metal (Estimated 12/31/18)

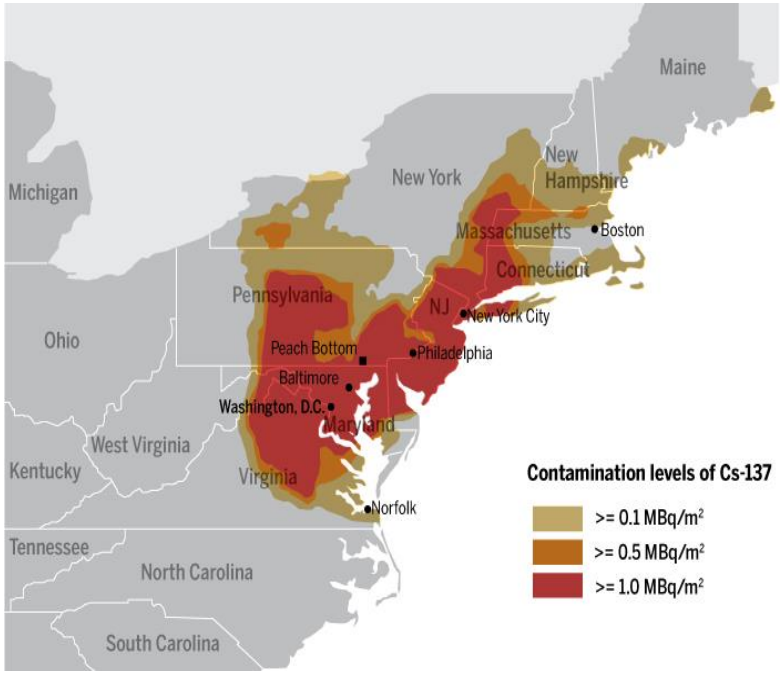
SNF at DOE-Managed, NRC Regulated Facilities (CO, ID)

Research reactors only (IN, NM, RI, UT)

Note: Quantities of SNF from research and defense programs and additional commercial-origin SNF stored under DOE authority are not included.

Heat from the radioactive decay in spent nuclear fuel is also a principal safety concern. A few hours after a full reactor core is offloaded, it can initially give off enough heat from radioactive decay to match the energy capacity of a steel mill furnace. This is hot enough to melt and ignite the fuel's reactive zirconium cladding and destabilize a geological disposal site it is placed in. By 100 years, decay heat and radioactivity drop substantially but still remains dangerous.

If the water in a reactor spent fuel pool is drained by and earthquake or an act of malice, decay heat can cause a catastrophic fire that could release enough radioactive material to contaminate an area twice the size of New Jersey. On average, radioactivity from such an accident, if it would occur at the Limmerick nuclear station in Pennsylvania, could force approximately 8 million people to relocate and result in $2 trillion in damages.



Source: Science&Global Security (2016)

The dangers of spent fuel fires can be greatly reduced by ending high density pool storage and expanded dry casks storage.

High Burnup Spent Nuclear Fuel Problems

US commercial nuclear power plants use uranium fuel that has had the percentage of its key fissionable isotope—uranium 235—increased, or enriched, from what is found in most natural uranium ore deposits. In the early decades of commercial operation, the level of enrichment allowed US nuclear power plants to operate for approximately 12 months between refueling. In recent years, however, US utilities have begun using what is called high-burnup fuel. This fuel generally contains a higher percentage of uranium 235, allowing reactor operators to effectively double the amount of time the fuel can be used, reducing the frequency of costly refueling outages.

High-burnup waste reduces the fuel cladding thickness and a hydrogen-based rust forms on the zirconium metal used for the cladding, which can cause the cladding to become brittle and fail. High burnup fuel temperatures make the used fuel more vulnerable to damage from handling .

High-Burnup SNF remains thermally hot for longer periods – lengthening at reactor storage possibly into the next century.

U.S. Government liabilities

Reactor operators have filed 40 lawsuits seeking compensation for storage expenses from the U.S. government's failure to open a disposal site on the January 31, 1998 date stipulated in the Nuclear Waste Policy Act.

As of FY 2019, $8 billion in settlements have been made with an estimated total liability to the USG of $36,5 billion.

Source : ***U.S. Department of Energy, Agency Financial Report for FY 2019. https://www.energy.gov/sites/prod/files/2019/11/f68/fy-2019-doe-agency-financial-report.pdf***

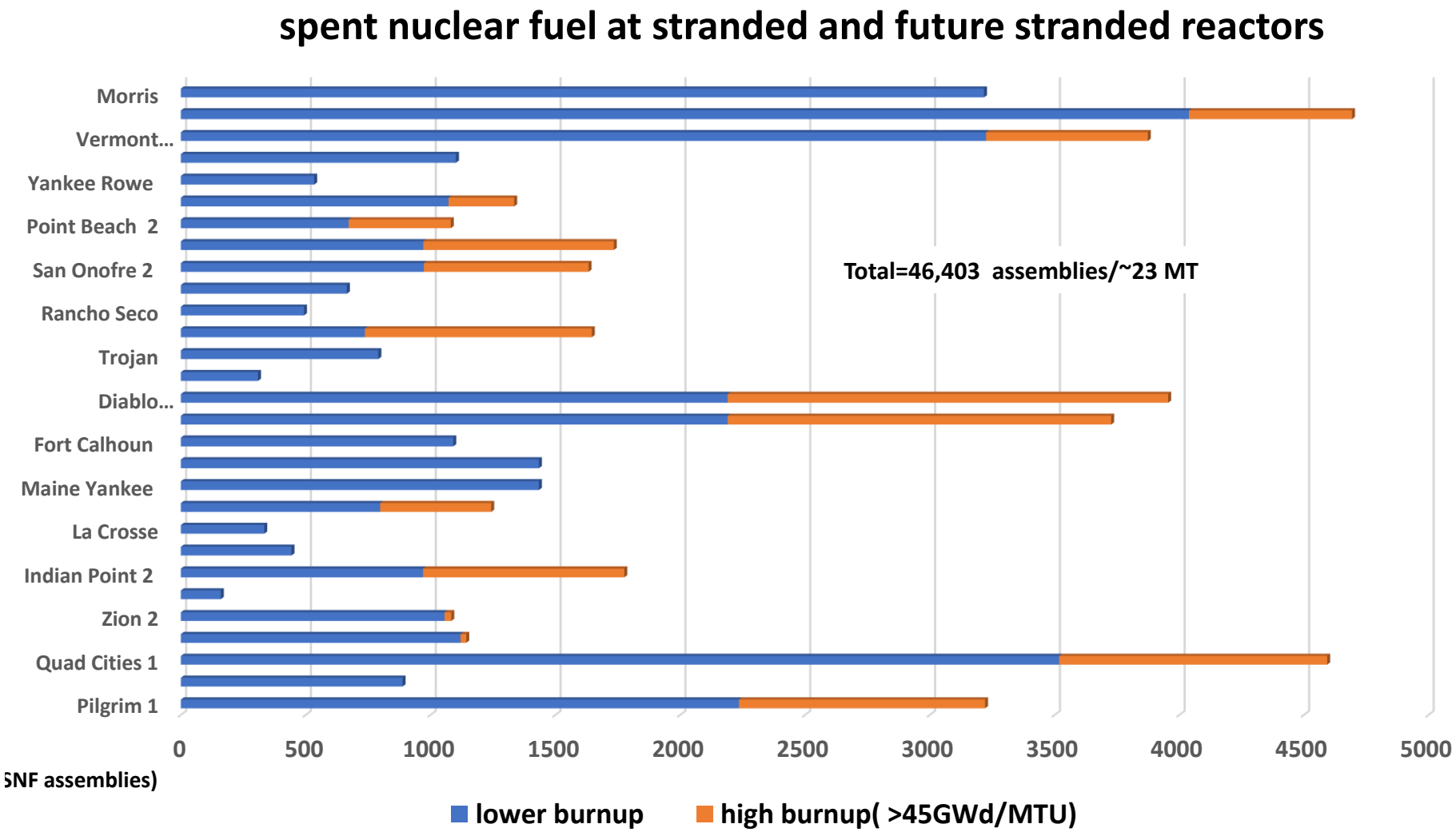
Current Reactor Operator Liabilities

- **Under the Nuclear Waste Policy Act, which sets forth the process for disposal of high-level radioactive wastes, the U.S. Government cannot accept title to spent nuclear fuel until it is received at an open repository site. This process is paid by the collection of a user fee from nuclear power generators to be no more the one mill per kilowatt-hour. Payments were stopped by a Federal Court in January 2014. The Nuclear Waste Fund balance as of 2019 is approximately $40.9 billion. Congress has not approved resumption of fund collection for the Yucca Mt site.**

- **Costs for a consolidated interim storage site <u>are not</u> born by the U.S. government, <u>unless title is transferred by amending the Nuclear Waste Policy Act.</u>**

- **Efforts are underway to have the DOE assume title of spent Nuclear Fuel for a "pilot" storage site for "stranded" wastes.**

- **The U.S. Government Accountability Office reported in 2014: "per DOE, under provisions of the standard contract, the agency does not consider spent nuclear fuel in canisters to be an acceptable form for waste it will receive. This may require utilities to remove the spent nuclear fuel already packaged in dry storage canisters"**


spent nuclear fuel at stranded and future stranded reactors
Morris
Vermont...
Yankee Rowe
Point Beach 2
San Onofre 2
Rancho Seco
Trojan
Diablo...
Fort Calhoun
Maine Yankee
La Crosse
Indian Point 2
Zion 2
Quad Cities 1
Pilgrim 1
Total=46,403 assemblies/~23 MT
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
SNF assemblies)
lower burnup
high burnup(>45GWd/MTU)

Spent Nuclear Fuel Repackaging

The current generation of dry casks was intended for short-term onsite storage, and not for direct disposal in a geological repository. NRC has licensed 51 different designs for dry cask storage, 13 which are for storage only. None of the dry casks storing spent nuclear fuel are licensed for disposal.

By the time, DOE expects to open a repository in 2048, the number of large dry casks currently deployed is expected to increase from 1,900 to 12,000. Repackaging for disposal may require approximately 80,000 ”small” canisters.

Existing large canisters can place a major burden on a geological repository –such as: handling, emplacement and post closure of cumbersome packages with higher heat loads, radioactivity and fissile materials.

Repackaging expenses rely of the transportability of the canisters, but more importantly on the compatibility of the canister with heat loading requirement for disposal. In terms of geologic disposal, decay heat, over thousands of years, can cause waste containers to corrode, negatively impact the geological stability of the disposal site and enhance the migration of the wastes. Peak temperatures in the repository of 100 degrees C (212F) can extend beyond 300 years after centuries of decay and active ventilation.

Robert H. Jones Jr., Dry Storage Cask Inventory Assessment, U.S Department of Energy, Nuclear Fuel Storage and Transportation Planning Project, FCRD-NFST-2014-000602, Rev. 1, August 2015, P. 55. http://energy.gov/sites/prod/files/2016/10/f33/FCRD-NFST-2014-000602,%20Dry%20Cask%20Assessment,%20Rev%201.pdf
R. Wigeland, T.Taiwo, M. Todosow, W. Halsey, J. Gehin, Options Study – Phase II, Department of Energy, Idaho National Laboratory, INL/EXT-10-20439, September 2010.

Repackaging Costs

The costs of repackaging at centralized storage site are large. The estimates are based on a small (9 assemblies), medium (32 assemblies) and large (44 assemblies) standardized transportation and disposal canister (STAD) for a boiling water reactor. When applied to the Columbia Generating Station, in Washington - it could involve cutting open 120 dry casks and repacking approximately 8,160 spent fuel assemblies into casks suitable for disposal. The additional costs for this single reactor range from $272 million to $915 million. A decision on the type of geologic repository will determine the size of the repackaged canisters.

Based on the Energy Department's strategic plan to open a repository by the year 2048, the per assembly cost would be approximately $33,400 (large STAD) to $112,000 (small STAD) in 2015 dollars. The estimated cost of managing low-level radioactive waste from removing spent fuel to new canisters is estimated by the DOE at $9,500 per assembly and could be more than the cost to load the assembly in any canister.

U.S. Department of Energy, Office of Nuclear Energy, Task Order 21: Operational Requirements for Standardized Dry Fuel Canister Systems Updated Final Report, June 19, 2015. http://energy.gov/sites/prod/files/2016/10/f33/energysolutions-task-order-21-updated-final-report-61915_1.pdf

Pre-disposal costs for the Columbia Generating Station (CGS) 2017 dollars

Dry Cask Procurement (a)	$960,521 per cask
Dry Cask Loading (a)	$277,000 per cask
Storage Pads (b)	$5,660,000 each
Planning and Preparations (c)	$23,727,000
Dormancy w/Wet Fuel Storage (c)	$149,000,000
Annual ISFSI M&O (d)	$1,850,000
Consolidated SNF Storage Opens in 2026 (100,000 Mt) (e)	$74,000 -$223,000 per metric ton
Large Standardized Aging and Disposal(STAD) Canister (44 assemblies) (f) (g)	$33,690 per assembly
Medium Standardized Aging and Disposal (STAD) Canister (32 assemblies) (f) (g)	$30,737 per assembly
Small Standardized Aging and Disposal (STAD) Canister (9 assemblies) (f) (g)	$51,994 per assembly

Total cost for consolidated interim storage and repackaging for the CGS ranges from $384 Million to $1.25 billion.

(a) The United States Court of Federal Claims, No 0410C, Energy Northwest v the United States, February 26, 2010. http://www.uscfc.uscourts.gov/sites/default/files/opinions/DAMICH.ENERGY022610.pdf

(b) United States Government Accountability Office, Outreach Needed to Help Gain Public Acceptance for Federal Activities That Address Liability, GAO-15-141, October 2014. http://www.gao.gov/assets/670/666454.pdf

(c) Entergy Corporation, Post Shutdown Decommissioning Activities Report, Vermont Yankee Nuclear Power Station, December 19, 2014. https://www.nrc.gov/docs/ML1435/ML14357A110.pdf

(d) Energy Northwest, 2015 Annual Report. https://www.energy-northwest.com/whoweare/finance/Documents/2015%20Energy%20Northwest%20Annual%20Report.pdf

(e) U.S. Department of Energy, Office of Nuclear Energy, Task Order 11: Development of Consolidated Fuel Storage Facility Concepts Report, February 12, 2013. https://curie.ornl.gov/system/files/documents/not%20yet%20assigned/AREVA%20-%20TO11%20-%20FINAL%20REPORT_0.pdf

(f) DOE: Task Order 21: Operational Requirements for Standardized Dry Fuel Canister Systems, (2015) Tables 7-5 and 7-6.

(g) DOE: J. Jarrell, Standardized Transportation, Aging, and Disposal (STAD) Canister Design, presentation to the Nuclear Waste Technical Review Board June 24, 2015. http://www.nwtrb.gov/meetings/2015/june/jarrell.pdf

Conclusion

The basic approach undertaken in this country for the storage and disposal of spent nuclear fuel needs to be fundamentally revamped to address vulnerabilities of spent fuel storage in pools, high burnup SNF, and dry cask integrity risks.

Instead of waiting for problems to arise, the NRC and the Energy Department need to develop a transparent and comprehensive road map identifying the key elements of—and especially the unknowns associated with—interim storage, transportation, repackaging, and final disposal of all nuclear fuel, including the high-burnup variety.

Otherwise, the United States will remain dependent on leaps of faith relative to nuclear waste storage—leaps that are setting the stage for large, unfunded radioactive waste "balloon mortgage" payments in the future.

Nuclear Waste Legislation: More than 33 years of failure

Don Hancock
Southwest Research and Information Center

What Congress Needs to Know about Pending Nuclear Waste Legislation
November 13, 2020

Nuclear Waste Policy Act of 1982

- SNF & HLW are a national problem that require “safe and environmentally acceptable methods of disposal”
- Federal government is responsible for SNF & HLW disposal in geologic repositories
- Generators are responsible for interim storage and paying for SNF disposal (Nuclear Waste Fund)

Nuclear Waste Policy Act of 1982

1/1/1985 – DOE Nominate 5 repository sites; recommend 3 sites for characterization

6/1/1985 – MRS proposal; at least 3 sites

3/31/1987 – President recommends 1st site

7/1/1989 – DOE Nominate 5 2nd repository sites; 3 “additional” sites not in 1st round

3/31/1990 – President recommends 2nd site

1/31/1998 – First repository operating

Nuclear Waste Policy Act of 1982

Sections 116-118 –

- State/Tribal Notification
- State/Tribal Participation
- Financial Assistance to States/Tribes
- Notice of Disapproval from State Governor or Legislature; Congress can override
- Notice of Disapproval from Tribal governing body; Congress can override

Earlier “Consent” Process

- 1971 – Kansas Opposes first repository
- March 1979 – Interagency Review Group on Nuclear Waste Management – “State veto” or “consultation and concurrence”
- December 1979 – NM “Consultation & Cooperation” Agreement for Waste Isolation Pilot Plant (WIPP) in New Mexico

1987 – NWPA Amendments Act

- Yucca Mountain only – stop Hanford, Deaf Smith
- Prohibit site-specific second repository activities
- Annul and revoke Tennessee MRS proposal

- Benefits agreement with Nevada or for MRS
- Establish Office of Nuclear Waste Negotiator
  - To negotiate with Governor or Indian tribe an MRS or repository site
  - Consult with affected states, tribes, local governments
  - Agreement must be federal law

1990-1995 - Nuclear Waste Negotiators

- No states or tribes volunteered for consideration as a repository
- Grants were given to some tribes and counties to study MRS-type facilities

Private Consolidated Storage

- 1997-2006 – NRC licenses Private Fuel Storage (PFS) in Utah, despite citizen, state, congressional opposition.
- 2006 - BLM denies Right-of-Way; BIA refuses lease. PFS is never constructed.
- 2016 to present – ISP/WCS and Holtec applications to NRC. Citizen, State opposition.

Congressional Appropriations

- Congress has appropriated ~$13 billion for NWPA & Yucca Mountain (FY1983-2010); $0 since 2010
- House Energy & Water (E&W) Appropriations has included Yucca Mountain funding until FY2020; Senate E&W has not
- Senate E&W from FY2013-2020 includes funding for pilot private consolidated storage, and amending NWPA

CR and FY 21 Appropriations

- FY 2020 – $0 for Yucca Mountain and $0 for Consolidated Storage – Same in CR (HR 8337)
- FY 21 House Energy & Water Appropriations (HR 7617, Division C) – $0 for Yucca Mountain; $0 for Consolidated Storage; $7.5 million for NWF Oversight & $20 million for Federal interim storage with consent-based approach.

  Senate bill: $0 for Yucca Mountain; $10 million for private consolidated storage, $17.5 million for plans.

Some conclusions

- Administrations, Congresses, Nuclear Industry have not implemented the 1982 NWPA.
- Since 1987 NWPAA, Congress has not adopted new legislation.
- Commercial SNF has increased from 16,000 MT to 85,000 MT, stored on site.
- No state or tribe will consent to host the only repository or consolidated storage site.
- Legislation for publicly accepted, technically sound waste storage/disposal has not been introduced.

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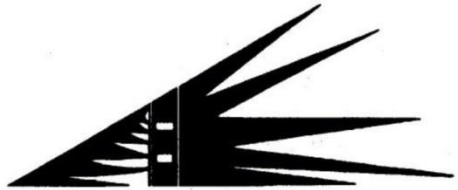


What Congress Needs to Know About Pending Nuclear Waste Legislation

Environmental and Energy Study Institute

November 13, 2020

Diane D'Arrigo

Radioactive Waste Project Director

Nuclear Information and Resource Service

Irradiated ("Spent") Nuclear Power Fuel - deadly and long-lasting

Irradiated Nuclear Power Fuel is **the most radioactive part of the nuclear power and weapons fuel chain* comprising over 90 % of all the radioactivity from nuclear power and weapons.**

Fuel Chain* is not a 'fuel cycle' and includes all steps to make nuclear power and weapons from mining and milling uranium through conversion, enrichment, fuel fabrication, reactors, reprocessing and high and "low-level" waste management.

References: US DOE/RW-0006, Integrated Data Base IDB 1994 p. 15 and 1996 p. 137; Linking Legacies DOE 1997 p. 51

Fuel Chain Waste

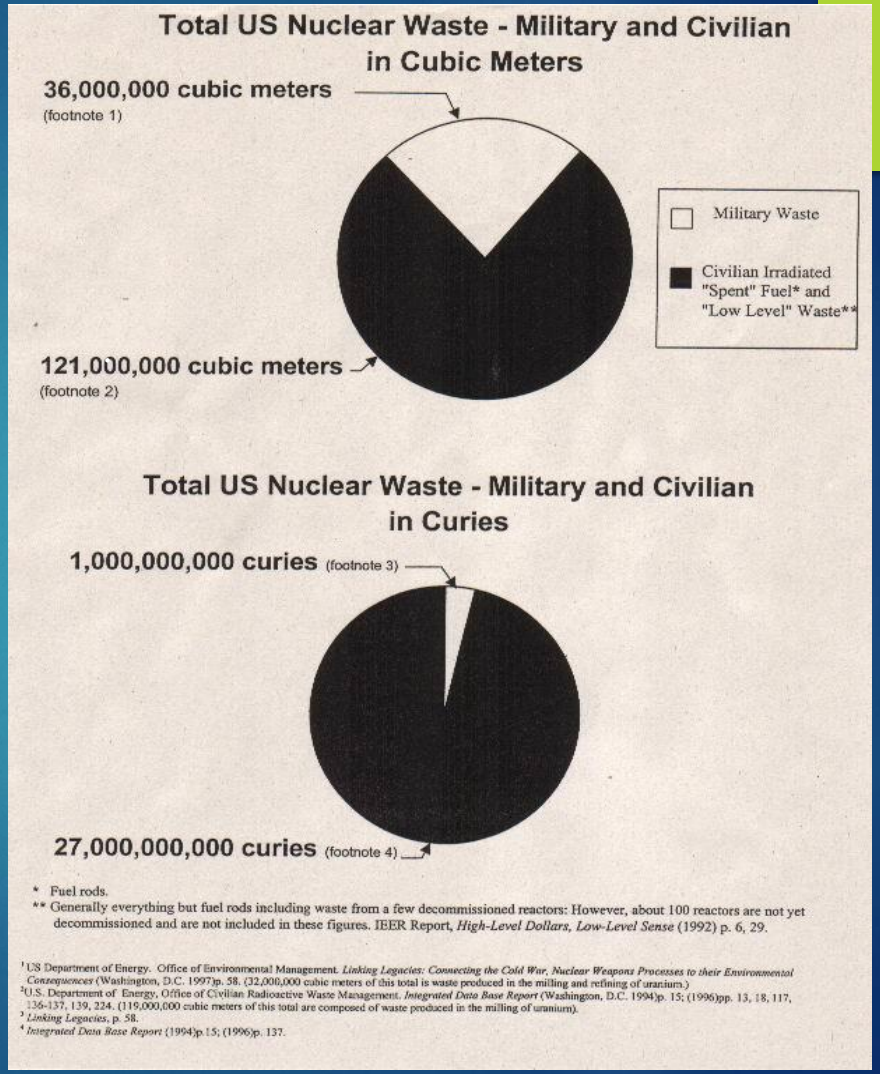
Black--Nuclear Power

White--Nuclear Weapons

Top--by Volume

Bottom circle - by Radioactivity (in curies)

Refs: DOE Linking Legacies 1997; DOE Integrated DataBase IDB 1994, 1996



Yucca Mountain Won't Work

- Chosen politically in 1987 in the 'Screw Nevada' Bill when Nevada was the weakest state in Congress with a candidate site for permanent repository
- Yucca Mountain Canceled administratively in 2009 as non-workable

- **Technically** - volcanoes, earthquakes, water, fractures and cracks, need for expensive titanium drip shields over every container (estimated cost $9 Billion), required multiple rule-changes to prevent technical disqualification

- **Politically, Legally, Time-wise** – Nevada + Western Shoshone oppose it; NV + Native American Action Council have over 200 legal contentions against licensing which, if resumed, will take many years to litigate

- **Sovereignty and Environmental Justice-** Violates the Ruby Valley Treaty of 1863; Sacred Land for Western Shoshone

- **Economically** - throwing good money after bad; estimated cost would be $100 Billion more than spent already, and requiring $2-3 billion per year to resume licensing

Consolidated "Interim" Storage - CIS

- Previously called **MRS** - Monitored Retrievable Storage and **AFR** – Away From Reactor Storage, Consolidated "Interim" Storage **CIS** would be a centralized location to which irradiated fuel would be taken to store before going to a permanent site.
- IF truly "Interim, " CIS will require **twice as many risky shipments** as moving the waste once to a permanent location.
- IF NOT "Interim" the sites will become ***de facto* permanent** without meeting any of the requirements for permanent isolation.
- Shipments would be enormous, heavy and intensely radioactive. Each shipment has more plutonium than the Nagasaki bomb and more radioactive cesium than the Chernobyl disaster is releasing.
- Consolidating waste is a big step toward dangerous, dirty and expensive **reprocessing** which makes the **waste problem worse** and enables **proliferation** of nuclear weapons materials.
- All attempts at opening such sites have been stopped since first proposed in 1979.

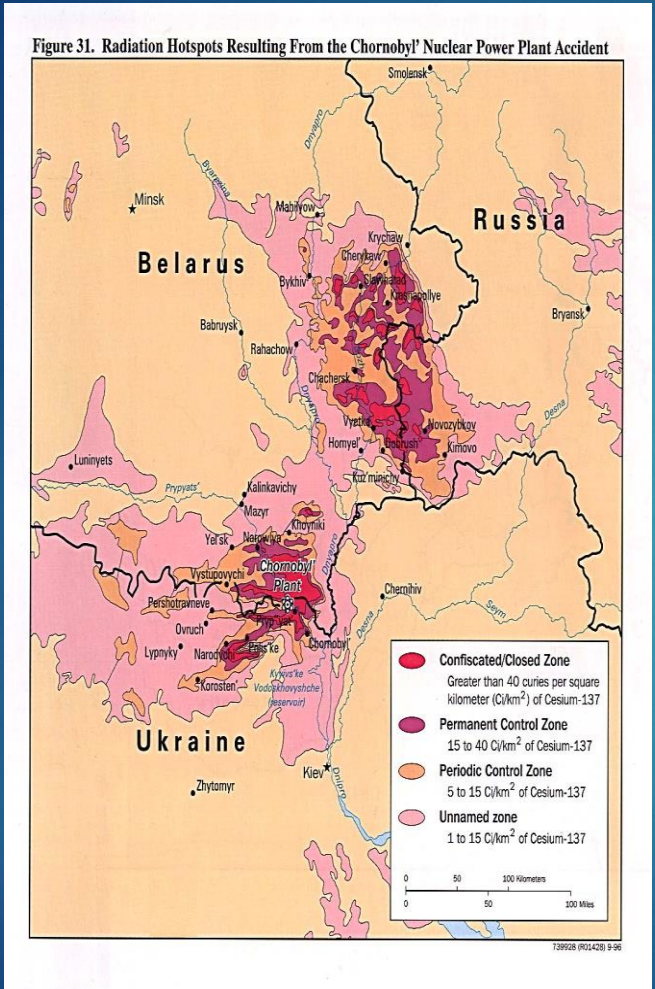
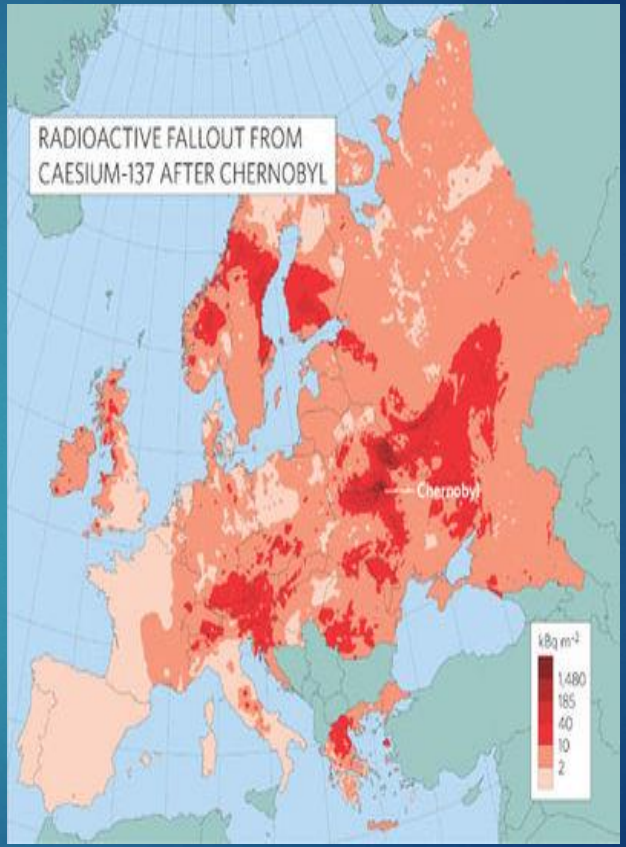


Figure 31. Radiation Hotspots Resulting From the Chornobyl' Nuclear Power Plant Accident
Smolensk
Minsk
Mahilyow
Russia
Belarus
Krychaw
Cherykaw
Bykhiv
Slavgorod
Klimavichy
Bryansk
Babruysk
Rahachow
Chachersk
Vyetka
Novozybkov
Homyel'
Dobrush
Kimovo
Luninyets
Kalinkavichy
Mazyr
Khoyniki
Yel'sk
Narowlya
Chornobyl' Plant
Vystupovychi
Pershotravneve
Ovruch
Lypnyky
Narodychi
Polis'ke
Chornobyl'
Korosten'
Kyivs'ke Vodoskhovyshche (reservoir)
Ukraine
Chernihiv
Kiev
Zhytomyr
Confiscated/Closed Zone
Greater than 40 curies per square kilometer (Ci/km2) of Cesium-137
Permanent Control Zone
15 to 40 Ci/km2 of Cesium-137
Periodic Control Zone
5 to 15 Ci/km2 of Cesium-137
Unnamed zone
1 to 15 Ci/km2 of Cesium-137
0 50 100 Kilometers
0 50 100 Miles
739928 (R01428) 9-96


RADIOACTIVE FALLOUT FROM
CAESIUM-137 AFTER CHERNOBYL
Chernobyl
kBq m-2
1,480
185
40
10
2

Risks of Consolidated "Interim" Storage

Consolidated "Interim" Storage would slow the transfer of waste to permanent isolation and inhibit efforts for safer on-site and near site storage, by taking resources intended for permanent isolation.

Transport casks full of waste are heavy and intensely radioactive and cannot completely shield the radiation coming from the waste.

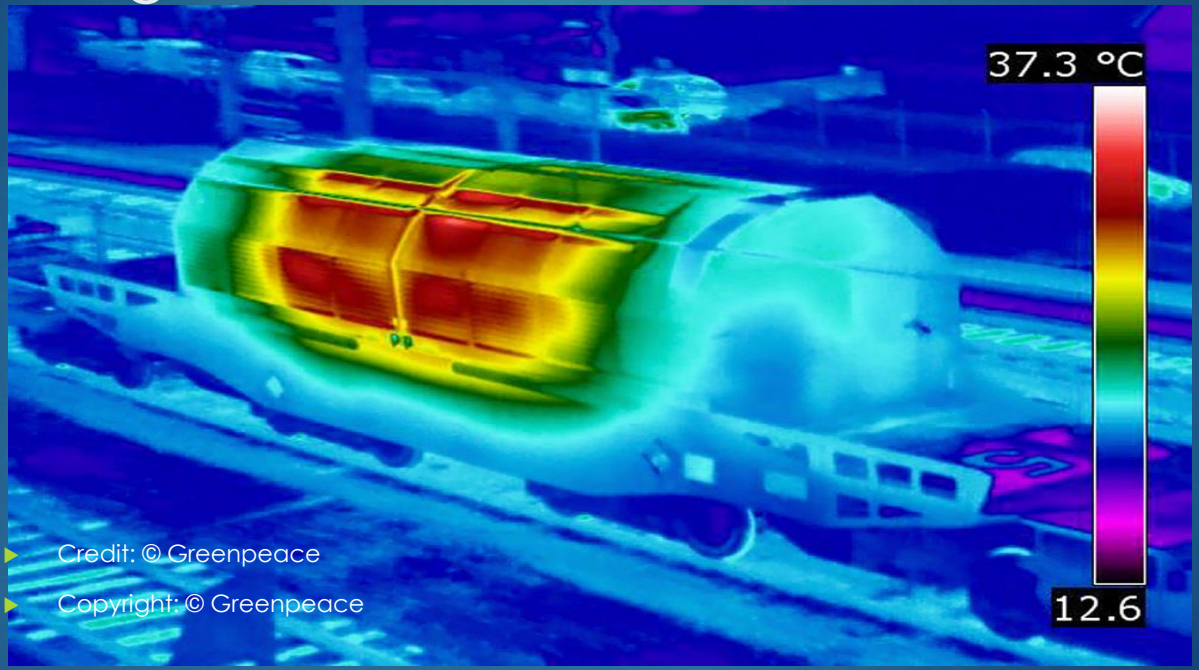
Even without an accident people will be exposed routinely along the routes…similar to multiple x-rays per hour.

The 100 to 250 ton loads can damage roads, bridges, rails and basic infrastructure, causing derailments and accidents for subsequent travelers.

Accidents will happen. With thousands of shipments statistics project accidents--some with radioactive releases; some without. Casks are not designed for real world conditions.

There is NO insurance for nuclear contamination from accidents-check your policy for express exclusion.

Irradiated Fuel is Thermally and Radioactively HOT–infrared (heat) image of train cask



- Credit: © Greenpeace
- Copyright: © Greenpeace

Consolidated "Interim" Storage Means Massive Transport For DECADES Through MOST Congressional Districts

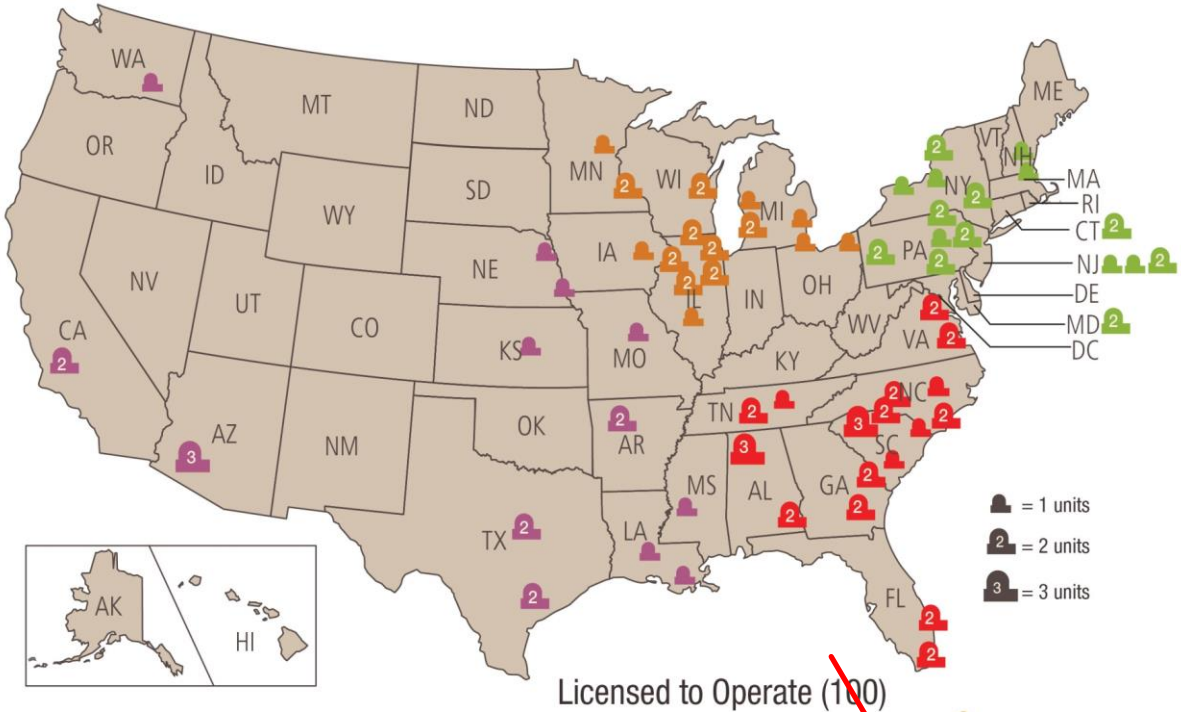
Regular shipments would move waste on roads, rails and waterways

TO the "Interim" site(s) and again

FROM the "Interim" site(s) to Permanent Sites

Better storage is needed at and/or near the reactors that generate the waste

U.S. Operating Commercial Nuclear Power Reactors



Licensed to Operate (~~100~~)

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

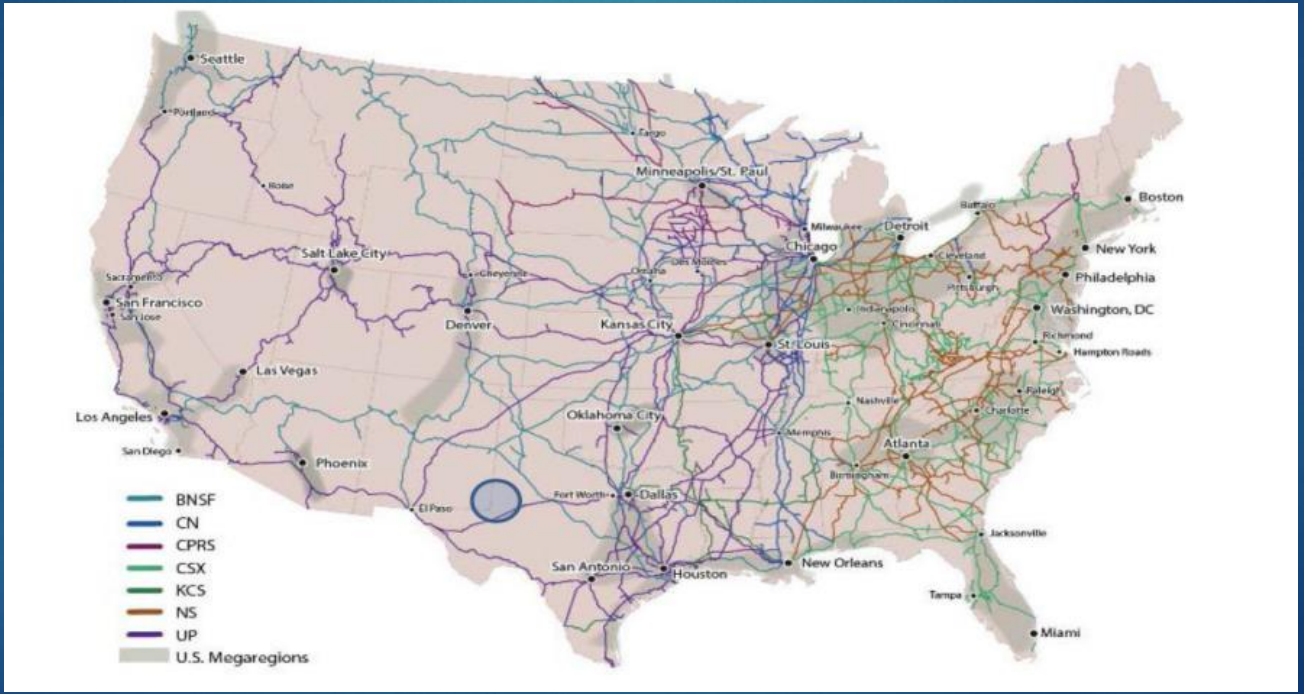
Texas and New Mexico are Targeted for Nuclear Reactor Waste - as are all routes from reactors, to and from these sites

- Two companies have applied to the Nuclear Regulatory Commission (NRC) for a Consolidated Interim Storage (CISF) License.

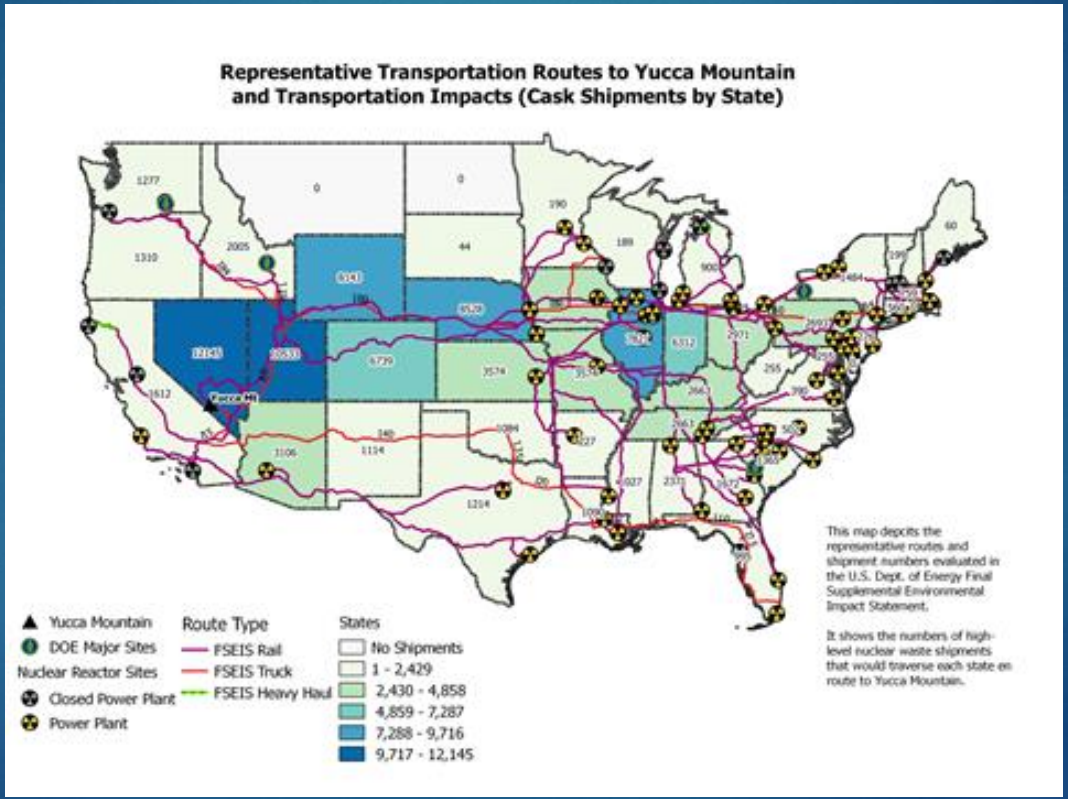
- **ISP-Interim Storage Partners has applied for a license** to store 40,000 metric tons (MTHM) of high-level radioactive waste above-ground in Andrews County, Texas for 40 years with plans to extend this timeframe. ISP, is the name for WCS-Waste Control Specialist together with their partner, Orano.

- **Holtec** wants to store over 173,000 metric tons (MTHM) of this deadly waste for up to 120 years at a site in between Hobbs and Carlsbad, New Mexico. The waste would be slightly below ground, with the tops of casks exposed.

Transport Routes to ISP/WCS TX site - similar to Holtec NM site (>3x more waste than to Yucca)



Shipment Routes to Yucca Mt; similar to proposed CIS sites (70,000 MTHM)



Transporting Radioactive Waste = High Level Risks

- Transport to the ISP and Holtec sites would require routine shipments every few days for decades.
- Even a small radiation release from a serious accident could contaminate 42 square miles of land.
- **Clean up costs could exceed $620 million in a rural area, in an urban area, it could cost up to $9.5 billion to raze and rebuild the most heavily contaminated square mile**.

(http://www.state.nv.us/nucwaste/yucca/trfact01.htm - section 4)

65 mph head-on train collision in Panhandle, TX – June 2016

Derailment in Oct. 2015 due to flooding in Corsicana

TCEQ Study – March 2014

This report warned about potential sabotage of high-level radioactive waste, especially in highly populated areas.

"…arguments against centralized interim storage are that

- **the risk** of transporting the irradiated fuel **is greater than the benefits** of centralized interim storage; the waste would be transported twice - from the reactor to the storage site and from the storage site to the disposal site - which would result in **greater risks, cost and worker exposures,**
- and **the interim storage may become a permanent** solution since pressure for a geological repository would diminish if the DOE takes title to all of the SNF while in storage."

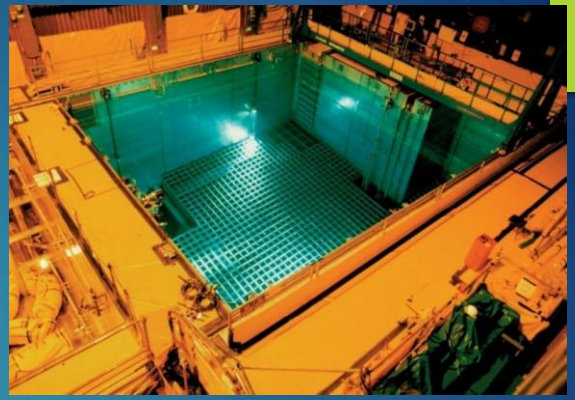
More Protective Cask Standards Needed

- **NRC requirements for Storage and Transport containers are INADEQUATE for real world conditions.**

  No matter where casks are, they need to be designed and built to last and to enable monitoring and inspection in advance of failure

- Criteria for certifying transport containers in 10 CFR 71 ignore the realities that:
  - fires can burn hotter and longer than half an hour at 1475 degrees F
  - bridges are higher than the 30-foot drop that containers are supposed to withstand
  - trains and trucks travel faster than 30 MPH
  - bodies of water in which casks could be submerged are deeper than 3 feet and often 65 feet and it would take longer than 1- 3 hours to locate and retrieve such heavy massive containers

No plan for cracking or leaking canisters



- License requires returning fuel to pool, but it has never been done with thin-walled canisters
- Hotter fuel cannot be unloaded back into pool
  - Results in "reflooding" problem, yet NRC is ignoring this
- Plan to destroy empty fuel pools
  - NRC falsely assumes nothing can go wrong in dry storage
  - Pool is the only on-site option currently available to replace defective canisters
- Hot cell (dry fuel handling/transfer facility) is only other option – there is none in the country large enough for irradiated fuel

Hardened On-Site Storage - (HOSS) plus More Protective Minimum Requirements for Storage are needed

Rather than weakening protections and granting exemptions at closed reactors, the NRC must refocus on storage, management, monitoring and isolating waste and on meaningfully including local, tribal and state input into decisions on storage, decommissioning and decommissioning plans.

HOSS Principles (1)

- Irradiated fuel must be stored as safely as possible as close to the site of generation as possible;
- HOSS facilities must not be regarded as a permanent waste solution, and thus should not be constructed underground and the waste must be retrievable;
- The facility must have real-time radiation and heat monitoring for early detection of problems with containers;
- The overall objective of HOSS should be that the amount of releases projected in even severe attacks should be low enough that the storage system would be unattractive as a terrorist target;
- Placement of individual canisters that makes detection difficult from outside the site boundary.

HOSS Principles (2)

- Hardened On-Site Storage (HOSS) is supported by organizations in all 50 states. It would provide better security at reactor sites with robust dry storage and community oversight, including real-time monitoring of heat and radiation. HOSS is rooted in values of community protection and environmental justice and will provide increased protection from human or natural disasters, like terrorist attacks and earthquakes

- HOSS facilities are **not permanent** waste solutions, and therefore should not be constructed deep underground as the waste must be retrievable. However, they are a workable solution that will allow us to explore scientifically sound, and socially and environmentally just long-term management systems.
- https://www.nirs.org/wp-content/uploads/radwaste/policy/hossprinciples3232010.pdf

NRC Must Improve Waste Management at and near the sites of generation

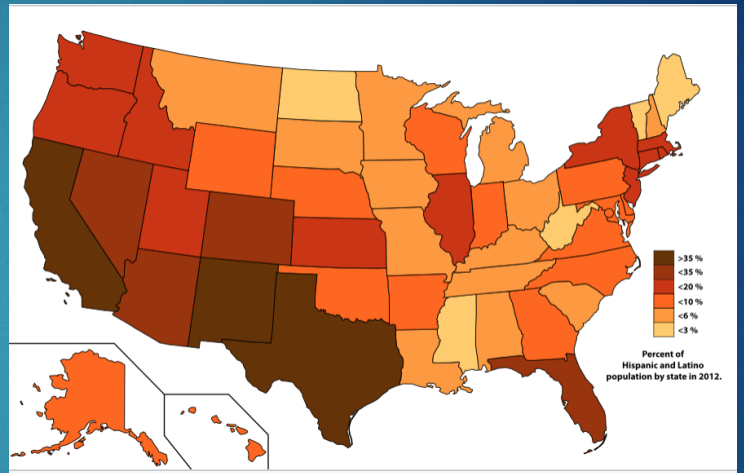
Common sense dictates that storage and transport casks be designed so that they:

Won't crack
Can be repaired, seals replaced and waste re-containerized
Are monitored in real time to **prevent** failure
Meet ASME NE pressure vessel code for nuclear vessels
Meet defense in depth standards (redundancy)
Have gamma/ neutron protection

We Must Prevent Massive Environmental Injustice

Environmental racism - **"the deliberate targeting of communities of color for toxic waste facilities, the official sanctioning of the life-threatening presence of poisons and pollutants in our communities…"**

Dumping the nation's deadliest of radioactive waste on communities in Nevada, West Texas and New Mexico would be massive environmental injustice.



Percent of Hispanic and Latino population by state in 2012.

This map shows Texas and New Mexico to be among the states with the highest LatinX populations. There are many indigenous people in the region as well.

Bills in the 2019-2020 Congress on CIS and / or Yucca Mountain

- HR 2699 / S 2917 Nuclear Waste Policy Amendments Act of 2019 (legalizes CIS and restarts the canceled Yucca Mountain licensing process)
- S1234 Nuclear Waste Administration Act of 2019 (major push for CIS)
- HR 3136 Storage and Transportation of Residual and Excess Nuclear Fuel Act of 2019 (legalizes and directs CIS)
- HR 8258 Spent Nuclear Fuel Solutions R&D Act (supports new reactors AKA more waste, reprocessing, CIS + more)

HR 2699/ S 2917

The Nuclear Waste Policy Amendments Act of 2019

HR 3136

Storage and Transport of Residual and Excess Nuclear Fuel Act of 2019

S 1234

Nuclear Waste Administration Act of 2019

Bills that could move in Lame Duck Session

Appropriations (see Hancock presentation)

Continuing Resolutions would not CIS beyond DOE Integrated Waste Management Plans, nor do they fund Yucca Mountain

S 903 HR 3306 **Nuclear Energy Leadership Act NELA** would lead to making more nuclear waste; subsidizes new nuclear power/waste production by reversing existing requirement for government agencies to get the best price for electricity (among other provisions) could be added to the must-pass National Defense Authorization Act HR 2500

Bills in the 2019-2020 Congress with Public Interest Support

- S 947 /HR 3783 Radiation Exposure Compensation Act of 2019***
- HR 1544 /S 649 Nuclear Waste Informed Consent Act
- HR 8277 /S ___ Nuclear Plant Decommissioning Act of 2020
- S 1985 /HR 5608 Stranded Act

[*the last 4 compensate communities with closed reactors and waste*]

S 947 / HR 3783 Radiation Exposure Compensation Act of 2019

The bill would extend compensation under the Radiation Exposure Compensation Act until 2045- It is due to expire in 2022.

It would extend this compensation to radiation victims and survivors in New Mexico, Idaho, Guam, and the Northern Mariana Islands, and to uranium miners/workers who started working in the uranium mining industry after 1971.

Proponents are calling on House Judiciary Chair Nadler to hold a hearing and VOTE before end of year and on Senate Judiciary Chair Graham to take a vote so it can pass this year.

This bill is necessary to compensate the victims of nuclear weapons tests and uranium workers for their medical costs and pain and suffering. Thousands of Americans have suffered for decades due to our Cold War nuclear weapons tests and programs, but have never been compensated.

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VLLW- Very Large Lies about Nuclear Waste

The NRC is considering allowing vast amounts of radioactive decommissioning and operations waste to go to regular waste landfills instead of the licensed nuclear sites.

Congress revoked NRC's efforts to do this—then called Below Regulatory Concern--in the Energy Policy Act of 1992. But NRC keeps trying.

Now NRC proposes even MORE and higher contaminated nuclear waste to go to unregulated places. Thousands commented against VLLW this year.

Nuclear waste other than the irradiated fuel – including contaminated and activated metal, concrete base mats and containment domes with radioactivity in the pores, plastics, wood, asphalt, equipment, soil, pipes and more could go to landfills that request it. Could get into recycling for consumer goods.

NRC would authorize the sites as "specific exempt" and let them release as much radiation as an operating nuclear power reactor! No one would ever even know.

Congress must stop this recurring threat.

BACKGROUND and RESOURCES

Nuclear Waste Transportation Routes

(based on Yucca Mountain – similar for CIS)

Estimated Shipments for Each State
State Transport Route Maps
City Transport Route Maps
List of Congressional Districts with Transport Routes

Backgrounders on Nuclear Waste

Nuclear Basics: High Level Radioactive Waste
Hot Cargo: Radioactive Waste Transportation
Yucca Mountain in Brief
Consolidated "Interim" Storage of High-Level Radioactive Waste

EESI
Environmental and Energy Study Institute

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Friday, November 13, 2020