Griffith, Andrew

From: Donna Gilmore <donnagilmore@gmail.com>
Sent: Thursday, January 26, 2017 1:18 PM
To: Griffith, Andrew
Subject: DOE Pilot comments & Response to RFI on Private Initiatives to Develop Consolidated SNF Storage Facilities

Hi Andy,
Have the comments submitted to you on the DOE Consent been addressed? The last time we spoke you said you had assigned staff to research the issues and the responses would be specifically addressed in a report.

Also, since these comments are relevant to the "RFI on Private Initiatives to Develop Consolidated SNF Storage Facilities", please consider them as comments to this as well.

https://sanonofresafety.files.wordpress.com/2015/10/commentstodoe-ipc-consentsiting2016-07-31.pdf

Please give me a call when you have a few minutes.

Thanks,

Donna Gilmore
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July 31, 2016

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RE: Response to IPC – DOE's CIS Nuclear Waste Plan Risks Major Radioactive Leaks

It is premature to focus on "consent" criteria until urgent critical legal and safety issues are resolved. No "informed" community would accept DOE's current Consolidated Interim Storage (CIS) pilot plan if they knew the plan included unsafe transport and storage of highly irradiated spent nuclear fuel in canisters that do not meet current Nuclear Waste Policy Act (NWPA) requirements.

U.S. dry storage thin steel canister systems cannot be inspected, maintained, repaired, adequately monitored to avoid radioactive leaks, and the DOE pilot plan has no plan for replacing failing canisters or retrieval of fuel, as required by NWPA.

The DOE consent meetings did not disclose the major safety flaws in their proposed CIS plan and there are no public hearings scheduled regarding the pilot plan in spite of numerous public concerns about storage and transport issues. Instead, the DOE booklet distributed at these meetings and on the DOE website implies all U.S. nuclear waste is safely stored.

The DOE should advocate for and demand utility licensees comply with NWPA safety requirements and should not accept lower safety standards. Any proposed legislation that reduces safety requirements should be actively opposed by the DOE. The Nuclear Regulatory Commission (NRC) has approved canisters for short-term storage that do not to meet many NWPA DOE requirements. The following are examples of NWPA legal and safety requirements that the NRC and DOE CIS pilot plan do not comply with:

- provide continuous monitoring, management, and maintenance of spent fuel and waste for the foreseeable future [including short-term storage];
- minimize the impacts of transportation and handling of such fuel and waste;
- provide for public confidence in the ability of such system to safely dispose of the fuel and waste;
- impose minimal adverse effects on the local community and the local environment;
- provide a high probability that the facility will meet applicable environmental, health, and safety requirements in a timely fashion.

NWPA Subtitle C Monitored Retrievable Storage, Section 141(b)(1) and Section 144
http://energy.gov/sites/prod/files/edg/media/nwpa_2004.pdf

It is an unnecessary major safety risk to transport and store waste at a consolidated interim storage site, especially with the heavy U.S. use of high burnup fuel that can cause the Zirconium cladding to become brittle and shatter like glass. The issue of whether just train vibrations can cause this is still being studied. Interim storage can best be accomplished through the safest dry storage of spent fuel at the site of generation, except that when there is a clear and present danger, spent fuel should be transferred to a nearby more stable site, possibly another reactor site, for storage. This complies with the NWPA requirement to *minimize the impacts of transportation and handling of such fuel and waste*.

The NRC approves high burnup fuel based on how it performs in the reactor without considering the impacts of how it performs in storage or transport. The DOE should take an active role in finding a way to prevent this practice. Since the DOE and the public pay the consequences for NRC action, it's up to both of us to advocate for improved safety standards at the NRC that comply with NWPA.

All dry storage systems must provide storage in a manner and location that is as safe as possible to prevent radioactive leaks in both short and long term storage. This requires a system that provides defense in depth, is fully inspectable, maintainable, repairable and not subject to critical degradation (such as corrosion and cracking). It must provide a continuous early warning monitoring system that warns prior to a radiation release and have a plan in place for safely retrieving and monitoring spent fuel without destroying the containers. Emergency Planning should be provided and funded, including public access to continuous radiation monitoring. The proposed DOE pilot system does not meet any of these requirements. The NRC only requires quarterly radiation monitoring. The DOE must do better to meet NWPA requirements.

Most U.S. commercial independent spent fuel storage installations (ISFSI) do **not** meet the above safety requirements. The NRC acknowledges the over 2000 U.S. thin-walled (mostly ½" thick) steel spent nuclear fuel dry storage canisters cannot be inspected (even on the outside), so no one knows the condition of the canisters, fuel or internal critical parts (such as the fuel storage baskets). They cannot be repaired and maintained and have no continuous or other early-warning monitoring system prior to radioactive leaks.

According to DOE inventory data, most of these thin-walled canisters have been in use less than 10 years. The NRC states leaks can happen 16 years after cracks start. They state the Koeberg nuclear plant had a similar component (a waste water tank) leak in only 17 years. The Koeberg tank cracks were deeper than the thickness of most U.S. thin-wall canisters (0.61" vs. 0.50"). Holtec president, Dr. Kris Singh, one of the major manufacturers of these thin-wall canister systems, admits even if you could find the cracks, even a microscopic through-wall crack will releases millions of curies of radioactivity into the environment, and even if it was possible to repair them, this would introduce a rough area for future cracking.

The Nuclear Regulatory Commission (NRC) approved most of these facilities and containers for 20 years by ignoring aging management issues that may occur after 20 years and by ignoring NWPA DOE Monitored Retrievable Storage requirements. The NRC has approved a few license renewals in spite of the following unresolved critical problems in the thin-walled (mostly ½" thick) welded stainless steel canister systems.

- **CANNOT BE MAINTAINED:** canisters cannot be inspected (inside or out), repaired or maintained. Fuel and interior critical structures (such as fuel assembly storage baskets) cannot be inspected without destroying the canister, so it is not feasible to inspect them. No current on-site capabilities for replacing failing canisters or resolving problems with canisters or fuel. Canisters have been misloaded, but the NRC has not required inspection of contents.
- **SHORT-TERM RADIATION RISKS:** The NRC states canisters may leak after 16 years once a crack starts. The Koeberg waste water tank leaked in 17 years. A Sandia Lab analysis shows cracks can grow faster in hotter canisters (Attachment B). A Diablo Canyon canister has all the conditions for cracking in a 2-year old canister. No seismic evaluations are required for cracked canisters or degraded concrete storage overpacks. Each canister contains more radioactive Cesium-137 than released from Chernobyl.
- **UNSAFE FOR TRANSPORT:** Canisters are susceptible to undetected cracks that can continue to grow through the wall of the canister. Even partially cracked canisters are not approved for transport (NRC 10 CFR § 71.85). Zirconium clad fuel allowed to burned longer in reactors (high burnup fuel) is subject to embrittlement even after dry storage and may shatter like glass, especially during transport (with or without an accident).
- **NO CONTINUOUS MONITORING:** Canisters cannot be continuously monitored to prevent radioactive releases. Radiation monitoring is only required quarterly.

- **NO EMERGENCY PLANNING:** No off-site emergency planning required for nuclear waste storage installations. No publicly accessible, timely, or continuous radiation monitoring in spite of the above problems.

It is the DOE's responsibility to advocate for and enforce NWPA safety requirements, as required by the DOE Standard Contract. Most other countries have standardized on dry storage systems that meet NWPA and other safety requirements, so there is no good reason the U.S. cannot do the same. However, we need the DOE to play an active role to make this happen.

The DOE must demonstrate that the federal government can fund, transport, and manage nuclear waste without significant short-term or long-term radioactive leaks and demonstrate that the federal government can comply with existing nuclear waste laws, contracts and agreements. This is currently not the case. At the DOE consent-based meetings, the issue of lack of public trust of the DOE was a major issue acknowledged by the DOE. Enforcing instead of ignoring NWPA requirements may help the DOE build public trust.

The DOE *Integrated Waste Management Consent-Based Siting* booklet distributed at the DOE Consent-Based Siting meetings and on the DOE website implies the current U.S. dry storage systems are safe (page 21). Correcting this misinformation would be a good first step in improving public trust. *http://www.energy.gov/sites/prod/files/2016/05/f31/Booklet_16_05_17.pdf*

Other issues related to consent.

- **The federal government must guarantee sufficient funds** will be allocated for as long as the waste needs be transported and needs be stored -- up to 120 years for short-term storage (per NRC definition of short-term) and for long-term storage, which is basically forever. Communities impacted by a radioactive release need to be adequately financially compensated.
- **States and Tribal Nations must have legal authority** to set higher standards for such things as storage and transport containers, aging management and radiation exposure levels. States must have enforcement authority for nuclear waste stored in or near their communities based on potential radioactive contamination zones. They also must have adequate funding to administer and enforce these requirements.
- **The DOE must adequately address major transport infrastructure issues** affecting the safe transport of spent fuel through our communities.
- **Each state and locality must be legally authorized to establish its own criteria for standing and volunteer status**, and no further requirements may be set by the federal government except that any expression of interest must affirm that it is consistent with the requirements of Executive Order 12898 regarding Environmental Justice.

Until such time as these issues are resolved, no informed communities would agree to host spent nuclear fuel waste. The Governor of New Mexico April 10, 2015 letter to Energy Secretary Moniz supported consent. However, the letter stated the CIS site would use proven technology and a safe system, which is not true. This is not informed consent.

The DOE should discontinue expending resources on "consent". Instead, it is urgent the DOE take a leadership role in resolving the issues addressed in these comments. If you don't, who will? Each thin-walled steel canister contains about as much Cesium-137 as was released from Chernobyl and some of the existing canisters could start leaking in the near future with no plan in place to mitigate leaks.

See Attachments and SanOnofreSafety.org for references and additional information.

ATTACHMENT A – REFERENCES AND ADDITIONAL SUBSTANTIATION

REFERENCES AND ADDITIONAL SUBSTANTIATION

- **Thin-walled spent fuel canisters cannot be inspected and may leak 16 years after loaded.**

  The majority of current U.S. irradiated spent fuel storage facilities use thin-walled (mostly 1/2" thick) stainless steel canisters that the NRC acknowledges cannot currently be inspected or repaired and are vulnerable to cracking and leaking 16 years after a crack starts.

  Summary of August 5, 2014 Public Meeting with the Nuclear Energy Institute on Chloride-Induced Stress Corrosion Cracking Regulatory Issue Resolution Protocol.
  http://pbadupws.nrc.gov/docs/ML1425/ML14258A081.pdf

- **Partially cracked canisters are not approved for transport and cannot be repaired**

  Partially cracked canisters are not approved for transport (NRC regulation 10 CFR § 71.85). DOE inventory records show most of the U.S. thin-wall canisters have been in use less than 10 years. It is unknown if any of them have partial cracks, since they cannot be inspected.
  https://sanonofresafety.files.wordpress.com/2015/10/d32-caskinventoryisfsichartandtable2016-06-26.pdf

- **Storage containers must meet these requirements**

  Storage containers must be designed to be inspectable (inside and out), repairable, maintainable, not subject to structural cracks, and have continuous early-warning monitoring prior to radiation leaks. Sites must have provisions for replacing failing fuel or failing canisters, such as empty spent fuel pools.

  Storage container requirements must be based on meeting short and long term needs, rather than on how much money Congress is willing to allocate each year. The DOE's current recommendation is the latter (partially due to Congress redirecting existing funds that were designated for a permanent repository).

  Most other countries use thick-walled (about 10" to 20" thick) irradiated spent fuel storage casks that meet or exceed NWPA monitored retrievable storage requirements, such as Germany and Japan (including at Fukushima). Those countries also store their irradiated spent fuel containers in reinforced structures for additional environmental protection.

- **Radiation monitoring must be required**

  Near real-time radiation monitoring with public access should be required.

- **DOE must improve its performance**

  The DOE must demonstrate that the federal government can fund, transport, and manage nuclear waste without significant radioactive leaks and demonstrate that the federal government can comply with existing nuclear waste laws, contracts and agreements. They have not done this.

- **Funding inadequate**

  The federal government must guarantee sufficient funds will be allocated for as long as the waste needs be transported and needs be stored -- up to 120 years for short-term storage (per NRC definition of short-term) and for long-term storage, which is basically forever. Communities impacted by a radioactive release need to be adequately financially compensated.

- **More State and Tribal Nation legal authority**

  States and Tribal Nations must have legal authority to set higher standards for such things as storage and transport containers, aging management and radiation exposure levels. States must have enforcement authority for nuclear waste stored in or near their communities based on potential radioactive contamination zones. They also must have adequate funding to administer and enforce these requirements.

  Each state and locality must be legally authorized to establish its own criteria for standing and volunteer status, and no further requirements may be set by the federal government except that any expression of interest must affirm that it is consistent with the requirements of Executive Order 12898 regarding Environmental Justice.

  States and communities currently have no legal rights to set higher standards for storage and transport and have no legal recourse for DOE mismanaged facilities or for DOE broken promises. The State of Idaho is one of the few states with a legal agreement, yet the DOE has not met the conditions of that contract. DOE's promise to remove nuclear waste from Idaho by 2035 appears to be a goal rather than a commitment.
  https://www.deq.idaho.gov/inl-oversight/oversight-agreements/1995-settlement-agreement/

- **Transport safety and funding issues unresolved**

  The DOE must address major transport infrastructure issues and the safety of transporting irradiated spent fuel through our communities. Communities must have on-line access to transport accident records and status of transport infrastructure for any potential routes used for transport. Some canisters may require up to 45 years of cooling before they meet Department of Transportation radiation limits (Attachment C – Transport).

- **Current DOE sites have radioactive leaks**

  Current DOE managed sites consistently have radioactive leaks into the environment from leaking or exploding inferior storage containers, such as Hanford in Washington, Savannah River Site in South Carolina, the Waste Isolation Pilot Project (WIPP) in New Mexico, Idaho National Lab and other sites.

  There is a pattern of selecting inferior containers that are not even sufficient for short-term storage – containers that cannot be inspected, monitored, repaired and maintained. In essence, these storage containers as designed will inevitably fail and leak radiation. The DOE must demonstrate they can resolve these issues before moving forward with any consent-based siting process.

- **DOE pilot project will inevitably fail with radioactive leaks**

  The proposed DOE irradiated spent fuel nuclear waste storage plan as designed will inevitably fail with highly radioactive leaks. It proposes transporting and storing existing thin-walled stainless steel canisters (1/2" to 5/8" thick) that cannot be inspected, repaired, maintained, have no early warning system prior to radioactive leaks, can corrode and crack, and can start leaking millions of curies of radioactivity after 20 years of storage, possibly sooner. A 2015 Sandia Lab report shows that once cracks start in hotter thin-walled stainless steel canisters, they can grow through the wall of the canister in less than 5 years (Attachment B - Sandia Chart).

  A failure of even one of these "Chernobyl" canisters could be catastrophic. There is potential for explosions, due to the unstable and pyrophoric nature of these materials when exposed to air. (*Damaged Spent Nuclear Fuel at U.S. DOE Facilities*, *Experience and Lessons Learned*, *INL,* Nov 2005 INL/EXT-05-00760, Page 4 & 5). *https://inldigitallibrary.inl.gov/sti/3396549.pdf*

The DOE pilot design has no provisions to address these issues and provides no remediation for failing canisters. Most of the over 2000 U.S. thin-walled canisters have been in use less than 20 years, so we have not seen through-wall cracks yet. However, the DOE must address this issue in their plans. The NRC's initial 20-year dry storage container certification considers "out of scope" any problems that may occur after 20 years. In their relicensing the NRC aging management plan (NUREG-1927 Rev 1 Draft) requires canisters with 75% through-wall cracks be taken out of service. However, the method to accomplish this or even inspect and measure cracks does not exist for canisters filled with irradiated spent fuel.
http://pbadupws.nrc.gov/docs/ML1605/ML16053A199.html
NRC regulations do not allow the transportation of canisters with even partial cracks (10 CFR § 71.85 *Packaging and Transportation of Radioactive Materials*).

Neither the outside or inside structure of these thin-walled welded canisters can be inspected, let alone repaired. Other countries use thick-walled casks that do not have these problems.

Both the DOE and NRC have chosen to continue endorsing the inferior technology even though NRC Commissioners directed staff to "encourage the adoption of state of the art technology for storage and transportation". *Staff Requirements – COMDEK-09-0001 – Revisiting the Paradigm for Spent Fuel Storage and Transportation Regulatory Programs*, February 18, 2010
http://pbadupws.nrc.gov/docs/ML1004/ML100491511.pdf

NRC Director of Spent Fuel Management Division, Mark Lombard states **inspecting these canisters "is not a now thing"** *(https://youtu.be/QtFs9u5Z2CA).*

Dr. Kris Singh, Holtec thin-walled canister President, states that **even a microscopic crack will release millions of curies of radiation into the environment and that the canisters are not repairable**. *(https://youtu.be/euaFZt0YPi4).*

Canisters may need to stay on-site for up to 45 years before they are cool enough to meet Department of Transportation radiation dose requirements (Attachment – Transport).

- **Would you buy a car that could not be inspected?**

Would you buy a car for your family that could not be inspected, maintained, and repaired and provided no warning before the engine or brakes failed? That is basically what you are asking our families to do with these thin-walled irradiated spent fuel storage canisters. The Delorean cars looked good until the stainless steel 304 alloy panels began corroding. This is the same material used in most of the over 2000 U.S. thin-walled stainless steel canisters. NRC material engineers state that operating experience with both 304 and 316 stainless steel alloys demonstrate these problems. Numerous environmental and other factors can initiate corrosion and cracking (e.g., corrosive salt particles and from sulfites in air pollution and vehicle exhaust).

Additional resources and information at SanOnofreSafety.org

ATTACHMENT B – Sandia Chart

Thin-walled stainless steel U.S. irradiated spent fuel storage canisters at higher temperatures will have faster crack growth rate. The Sandia Chart below shows higher temperatures can cause canisters to penetrate the wall in less than 5 years. This chart assumes canister wall is 0.625” (5/8”) thick. The majority of the U.S. canisters are only 0.50” (1/2”) thick. It is unknown when a crack will start, but these canisters are subject to corrosion and cracking from environmental conditions such as chloride salts, air pollution (sulfides), pitting, and microscopic scratches. The report states that canisters such as those at Diablo Canyon have temperatures in these heat ranges.

Draft Geologic Disposal Requirements Basis for STAD Specification, A. Ilgen, C. Bryan, and E. Hardin, Sandia National Laboratories, March 25, 2015, FCRD-NFST-2013-000723 SAND2015-2175R, PDF Page 36 & 46 *http://prod.sandia.gov/techlib/access-control.cgi/2015/152175r.pdf*

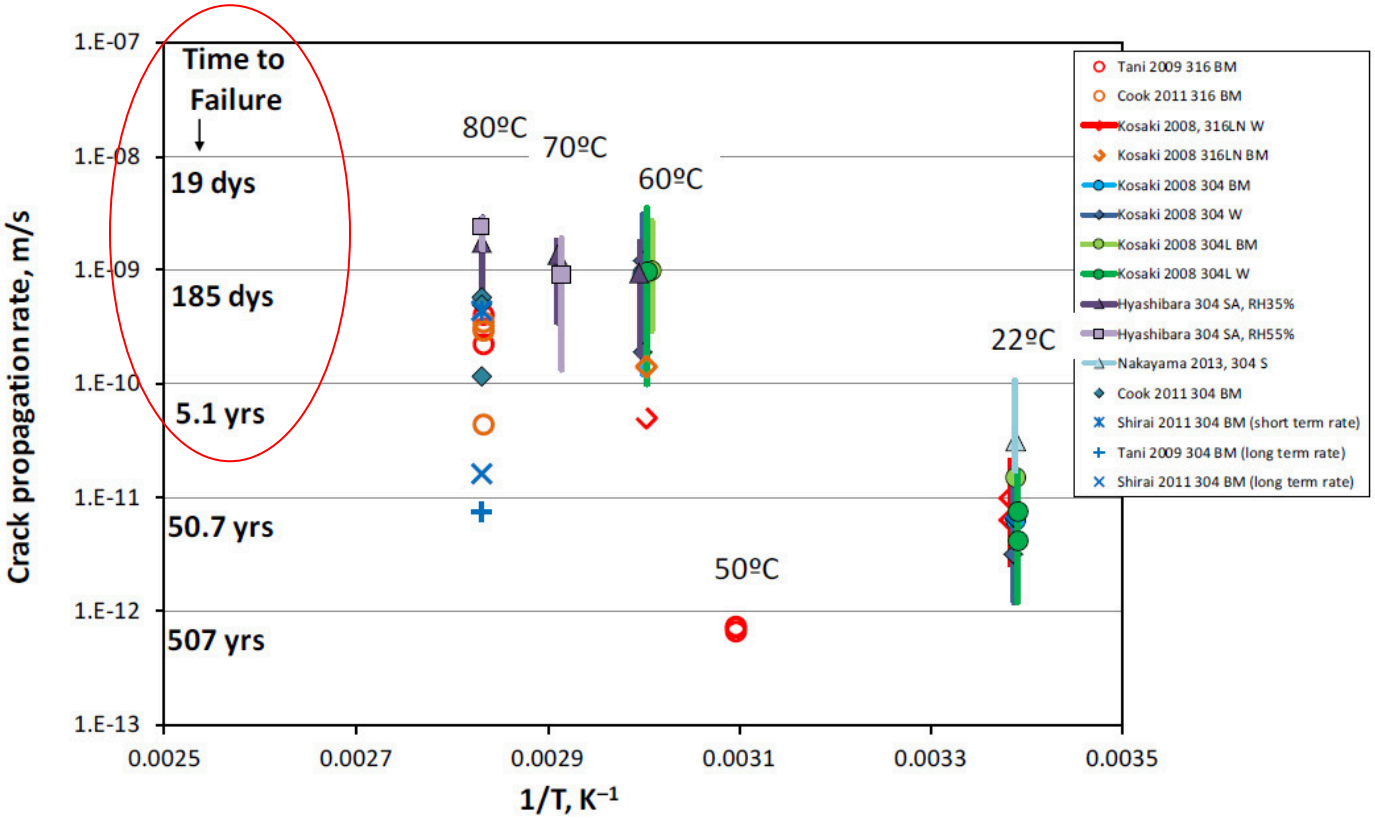

Figure E-5. SCC propagation rates for atmospheric corrosion of 304SS and 316SS. BM –base metal; W–weld sample; SA–solution annealed; S–sensitized. Bars represent reported ranges (if more than one), while symbols represent average values. Time to failure corresponds to the time required to penetrate a 0.625” thick canister wall.

ATTACHMENT C – Transport

Canisters with 37 spent fuel assemblies may require up to 45 years to cool (after removal from the reactor) before they are safe enough to transport (~20 kW) per Dept. of Transportation radiation limits.

Research and Development Activities Related to the Direct Disposal of Dual Purpose Canisters, William Boyle, Director, Office of Used Nuclear Fuel Disposition R&D (NE-53), U.S. Department of Energy, Nuclear Waste Technical Review Board Meeting, April 16, 2013 *http://www.nwtrb.gov/meetings/2013/april/boyle.pdf*

Safety Evaluation Report Docket No. 71-9302, NUHOMS-MP197HB, Certificate of Compliance No. 9302, Rev. 7, Page 14
http://pbadupws.nrc.gov/docs/ML1411/ML14114A132.pdf
Note: The only NRC approved high burnup transport cask is the NUHOMS MP197HB.

U.S. DEPARTMENT OF ENERGY
Nuclear Energy

Long-Term Performance Challenges

- **Thermal Load Management**
  - DPCs are now loaded at about 20 kW
  - Canister design storage limits are typically 24 kW, maximum currently available is rated to 40.8 kW for storage
  - Hottest waste packages considered for Yucca Mountain emplacement were 18 kW
  - Other repository design concepts call for much cooler waste packages (e.g., SKB calls for initial load per package ≤ 1.7 kW)
- **Other performance considerations**
  - Engineered barrier performance at elevated temperatures (e.g., clay-based backfill/buffer performance)
  - Criticality control

Estimated Cooling Time for PWR fuel to Reach Specified Thermal Power, as a Function of Canister Size and Burnup