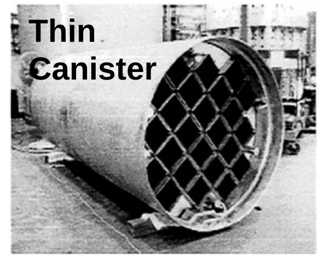
Reasons to buy thick nuclear waste dry storage casks

Safety Features	Thin Canisters	Thick Casks
1. Thick walls	1/2” to 5/8”	up to 20”
2. Won’t crack		√
3. Ability to repair		√
4. Ability to inspect exterior		√
5. Early warning monitor		√
6. ASME canister or cask quality certification		√
7. Defense in depth (redundant systems)		√
8. Stored in concrete building		√
9. Licensed in U.S.	*	*
10. Market leader	U.S.	World



CASTOR® - Type V/19 cask

On August 26, 2014 the Nuclear Regulatory Commission (NRC) decided tons of nuclear waste may stay at San Onofre and all other nuclear power facilities indefinitely, since no permanent or interim storage sites are on the horizon (*http://www.nrc.gov/waste/spent-fuel-storage/wcd/documents.html)*.

The NRC and California Public Utilities Commission (CPUC) should *not* approve Edison’s decommissioning plan (PDSAR), should *not* approve use of thin canisters, and should *not* approve releasing any of the over $3 billion of ratepayer money in the decommissioning fund until nuclear waste storage issues are adequately addressed, including a cost/benefit analysis to the CPUC.

Southern California Edison refuses to allow thick dry storage cask vendors to bid, based mainly on meeting their artificial fuel loading deadline of 2019, rather than on selecting the best available technology. The fuel still needs to cool years in the pool, especially the high burnup fuel.

The NRC, the CPUC and Edison have not adequately addressed the safety and cost impacts of the new NRC indefinite storage decision. This radiation remains lethal for thousands of years.

Comments are due to the NRC December 22, 2014 on Edison’s San Onofre Nuclear Post-Shutdown Decommissioning Activities Report (PSDAR). *http://www.regulations.gov/#!docketDetail;D=NRC-2014-0223.*

Go to **SanOnofreSafety.org** for additional action items, sources and details.

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1. Thick walls: Edison is only considering thin walled (1/2” to 5/8”) welded canister systems (Holtec UMAX and Areva NUHOMS 32PTH2).

Thick casks are about 9” to 20” thick. The French Areva TN series forged steel thick casks are use by the French and others, including Japan at Fukushima. The thicker German ductile cast iron casks are up to 20” thick and are the leading international cask. All thick casks use double bolted sealed lids.

2. Cracks: The thin stainless steel canisters may crack within 30 years or less in marine environments due to stress corrosion cracking. A 2-year old Diablo Canyon canister showed all the environmental conditions for cracking. The NRC in August said they did not think conditions for cracking would exist for at least 30 years – they said the temperature of the canister would be too high for salts and humidity to accumulate on the canister. They were wrong.

The thick German seamless ductile cast iron casks do not have crack issues and include a maintainable epoxy exterior and a galvanized nickel-plated interior for additional corrosion protection. More information is needed about the French TN thick steel casks.

3. Repair: Thin canister cracks cannot be repaired. Thick cask seals and lids are replaceable.

A fuel pool is required to replace canisters and casks. Edison plans to destroy the fuel pools with no other adequate plan in place. Pools have already been destroyed at Rancho Seco in Sacramento and at Humboldt Bay. Transporting cracked canisters to another facility with a pool presents numerous safety risks.

No "hot cells" (dry transfer systems) exist in the U.S. that are large enough to transfer fuel between canisters.

4. Inspect: No technology exists to adequately inspect even the exterior of thin welded canisters for cracks or other corrosion. The NRC is allowing vendors 5 years to develop something, but it will be limited. There is **no seismic rating** for cracked canisters yet the NRC plans to allow **up to a 75% crack** in these canisters. They plan to require inspection of only one canister **per plant** after 25 years and then the same canister at 5 year intervals.

The NRC plans to modify their dry storage and transportation standards (**NUREG-1927**) in 2015 with these inadequate guidelines.

5. Early warning: Thin canisters remotely monitor canister temperature. This does not provide early warning before a radiation leak. The NRC requires canister radiation monitoring only a few times a year by an employee with a "monitor on a pole."

Once fuel pools are empty, the NRC has allowed all other radiation monitoring at plants to be shut down (e.g., Humboldt Bay).

Thick casks have pressure monitoring in the lid. A pressure change is an early warning of potential helium leaks. And thick casks have continuous remote radiation monitoring.

6. ASME certification: Thin canisters do not have American Society of Mechanical Engineer (ASME) certification (N3-stamp) and do not meet ASME standards. Thick casks have ASME certification and international quality certifications.

7. Defense in Depth. Zirconium fuel cladding is one of two levels of radiation protection. Damaged fuel assemblies lose this protection. Unless damaged fuel assemblies are sealed, this level of protection is lost. The thick ductile iron casks store damaged fuel rods and assemblies in individual sealed containers prior to loading them into the cask. Holtec uses unsealed cans. Areva does not even use cans -- only unsealed caps. San Onofre has 31 damaged fuel assemblies in the pools and 95 damaged fuel assemblies in canisters.

Thin canisters provide only partial radiation protection and require thick concrete overpacks or casks. The concrete overpacks/casks are unsealed, vented and provide only gamma and neutron shielding. Thick casks do not require concrete overpacks/casks.

Note: no vendor has addressed how to handle **high burnup fuel** cladding that may degrade shortly after dry storage. High burnup fuel burns longer in the reactor, resulting in fuel over twice as radioactive, hotter and unpredictable in storage and transport. It requires more years to cool in the fuel pools for storage and even more years to cool before it can be transported. No U.S. geological repository designs address high burnup fuel.

8. Concrete buildings: Thick casks are stored in reinforced concrete buildings for additional environmental protection.

9. *NRC License: Areva and Holtec thin canister licenses are pending NRC approval for the models Edison is considering.

Thick cask system vendors do not have a current general license and will not request an NRC license without a customer, such as Edison. The expensive licensing process takes 18 to 30 months. If Edison wants the casks, the vendor will apply for a license. The NRC has never turned down a license. Edison thinks the process may take longer than 30 months, but the fuel needs to cool in the pools for many years. The thick casks have international storage and transport licenses and better manufacturing standards. The German vendor, Siempelkamp, is confident it can meet and exceed current NRC requirements.

The Areva TN thick casks have a site specific license at Prairie Island nuclear power plant.

The Castor V/21 German thick ductile cast iron cask was approved by the NRC for storage at the Surrey nuclear power plant years ago, but the license expired. U.S. utilities did not want to pay any increased price for a safer product. Ironically, a Castor V/21 was used to "demonstrate" all other canister designs are safe.

10. Market leader: The thin canisters are the market leader in the U.S. because utility companies based decisions on cost. The thick casks are the market leader in Europe and other countries because those countries will pay more for quality and safety. Prices for thick ductile cast iron casks are now lower than they were many years ago, but unless Edison allows them to bid, we will not know the cost. Steel costs have risen significantly. Cost for the thin systems is just under $4 million each. Prairie Island paid $5.96 million for each TN-40 steel cask.

Myths about nuclear waste dry storage

Myth 1. We are not aware of problems with any canisters. That's because they do not have technology to inspect them. Due to lack of gamma and neutron shielding, canisters must be inspected while inside concrete overpacks/casks. Existing technology for other stainless steel products is not directly transferable. The NRC is allowing vendors 5 years to solve this problem. However, solutions will be limited.

Myth 2. We have inspected some canisters. Visual inspection was limited to a small surface area of a few steel canisters, only for canister temperature, and surface dust and salts from a small area of the canisters. No crack or corrosion inspections. Even this limited inspection showed conditions exist for cracking at a 2-year old Holtec Diablo Canyon canister. [1] The NRC thought this would not happen for at least 30 years.[2]

Myth 3. We have technology to repair stainless steel. That technology does not work for nuclear waste canisters and no solution may be possible.

Myth 4. The public wants the fuel expedited out of fuel pools. Yes, but not into inferior dry storage systems and not without required cooling of high burnup fuel.

Myth 5. Thick cast iron casks are not designed for extended storage and are not designed for welded lids. Germany is using ductile cast iron casks for extended storage and is evaluating them for final disposal. Welded lids can be added to the ductile cast iron casks for final disposal. Japan is also considering them for final disposal.

Myth 6. We have plans for replacing failed canisters using hot cells [dry transfer systems] or fuel pools. There are no hot cells large enough to transfer fuel assemblies from one canister to another. Hot cells are extremely expensive to build and maintain. Also, there are no U.S. mobile hot cells. The French use a mobile hot cell that is too small for our needs. It may not be feasible to build a mobile hot cell for the size needed. Edison plans to destroy the fuel pools after fuel is unloaded to dry canisters. There are no pools at Rancho Seco in Sacramento or at Humboldt Bay. Also, repackaging in a pool could interfere with ongoing pool operations at active plants, could risk unacceptably contaminating the pool, or could challenge the fuel due to the additional stresses associated with rewetting and re-drying operations.[3]

Myth 7. All canisters and casks will eventually fail, so it doesn't matter which one we use. Thin canisters are not maintainable, may have early failure[1] and provide no warning before radiation (e.g., Cesium) leaks into the environment. Additional costs for thin canisters include transfer casks, transport casks, thick overpacks for final disposal (assuming they are even allowed for final disposal) and replacement canisters.

Myth 8. Thick ductile cast iron casks are not approved for transport by the NRC. The NRC has not evaluated the current ductile cast iron casks for transport. Ductile cast iron casks (manufactured by Siempelkamp) are certified for transport by American and international standard setting bodies. A Sandia Lab report shows ductile cast iron casks perform in an exemplary manner and exceed NRC's current standards for embrittlement. Studies cited show DI [ductile iron] has sufficient fracture toughness to produce a containment boundary for radioactive material transport packagings that will be **safe from brittle fracture.** Studies indicate that even with drop tests **exceeding the severity of those specified in [NRC regulation] 1 OCFR7 1 the DI packagings perform in an exemplary manner**. Low temperature brittle fracture is not an issue. The DCI casks were tested **at -29°C and -49°C exceeding NRC requirements**. Conclusions shared by **ASTM, ASME, and IAEA**.[4]

Myth 9. Fukushima dry storage casks were not damaged, so canisters are safe. These were Areva TN-24 thick steel casks stored in concrete buildings. Not thin canisters and none had high burnup fuel.

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[1] Diablo Canyon: conditions for stress corrosion cracking in 2 years, D. Gilmore, October 23, 2014 *https://sanonofresafety.files.wordpress.com/2011/11/diablocanyonscc-2014-10-23.pdf*

[2] NRC 8/5/2014 meeting summary *http://adamswebsearch2.nrc.gov/webSearch2/view?AccessionNumber=ML14258A081*

[3] Dry Transfer Systems for Used Nuclear Fuel, Brett Carlsen, et.al. May 2012, Idaho National Lab, INL/EXT-12-26218 *http://www.inl.gov/technicalpublications/Documents/5516346.pdf*

[4] Fracture Mechanics Based Design for Radioactive Material Transport Packagings Historical Review, Sandia Labs, SAND98-0764 UC-804, April 1998 *http://www.osti.gov/scitech/servlets/purl/654001*