San Onofre Dry Cask Storage Recommendations

Summary

Problem: Southern California Edison plans to select a nuclear waste dry cask storage system in September for San Onofre's tons of nuclear waste. **The two options they are considering have thin (1/2" to 5/8") stainless steel canisters that may crack within 30 years, according to the Nuclear Regulatory Commission (NRC), and there is no current technology in place to inspect, repair or replace cracked canisters.** And with limited monitoring, we'll only know after they leak radiation. Areva NUHOMS 32PTH2 and Holtec UMAX. are the two systems they are considering.

Recommendation: Edison should be required by the California Public Utility Commission (CPUC) to fully evaluate other dry cask storage and transport solutions used internationally before making a procurement decision. They should provide a long term Cost/Benefit Analysis to both the CPUC and Edison's Community Engagement Panel (CEP). The $400 million Edison is requesting should not be approved until the best solution is chosen.

Background: On August 26, 2014, the NRC decided tons of nuclear waste can be stored at nuclear plants for 60 years (short-term), 100 years (long-term) and indefinitely.[1] The NRC currently only certifies dry cask storage systems for 20 years, so we cannot depend on the NRC for assurances these cask systems will last long term. Ratepayers must pay for these dry casks systems and we should not have to buy them more than once. The Nuclear Regulatory Commission (NRC), the Electric Power Research Institute (EPRI), and numerous government and scientific sources report these problems with the current steel/concrete U.S. spent nuclear fuel dry storage systems:

- **The thin 1/2" to 5/8" welded stainless steel canisters may have premature stress corrosion cracking within 30 years,** caused by our marine environment.[2] This could result in major radiation releases to Southern California and beyond. Cracks in similar materials at nuclear power plants caused component failures in less than 30 years, including at San Onofre.[3] Other cask systems, such as the German CASTOR V/19 (~20" thick) ductile cast iron casks, do not have this problem.
- **There is no technology to inspect even the outside of the stainless steel canisters for cracks** once they are loaded with nuclear waste (spent nuclear fuel).[4] The NRC is giving the nuclear industry five years to develop a method to inspect the outside of the canisters. Cask systems, such as the German CASTOR, can be inspected, since they do not need concrete overpacks for gamma ray and neutron protection.
- **There is no technology to repair cracks in these canisters**. Technology used for other stainless steel components cannot be used to repair canisters containing nuclear fuel waste.[5] The NRC is *optimistic* there will be a solution before it is needed. However, they do not know what that might be.
- **There is no current method to replace failing canisters** . *The only fuel-handling method currently available to the commercial nuclear generating industry is to bring a cask [or canister] back into a spent fuel pool for reopening. However, dry handling of the cask and fuel is important to avoid disturbing the properties of the cask, cladding, fuel, and related hardware that would occur if the materials were rewetted and rapidly cooled. However, there is no dry handling facility available in the nation that is large enough to handle these canisters. …and removal of a welded storage cask lid is problematic*.[6] There is also no dry handling (hot cell) mobile facility designed for this purpose and one may not even be feasible.[7]

Recommendation: Edison wants to destroy the spent fuel pools at San Onofre. They should not be allowed to remove the spent fuel pools until they have another system in place, which doesn't exist today.[8] Costs for this should be included in the decommissioning plan submitted to the CPUC. The CASTOR type casks have bolted lids, designed for easier removal of fuel compared to other casks.[9] However, there still needs to be a pool at the site to replace the casks. *California decommissioned plants, Humboldt Bay and Rancho Seco were allowed to destroy their pools, so now have no method to replace failing canisters.*

Another option suggested by the nuclear industry is to put the defective canister inside a transportation cask, such as the NUHOMS-MP197,[10] and deal with the problem later. However, transportation casks are approved by the NRC for transport only -- not for long term storage. And they are not approved for use with cracked canisters. In addition, once a crack starts, it will continue. Putting a cracked canister in another cask is just kicking the "can" down the road. The MP197 is designed to be reusable. The cost to use this in lieu of a better cask means we will be paying twice for storage and then be left without a transport solution.

Recommendation: Putting a failed canister in a transport cask should not be considered an acceptable solution.

- **Hardened buildings are not required for protection against the environment and other external hazards.** Germany, Japan and other countries house their casks in reinforced concrete buildings.

  Recommendation: Hardened buildings should be required.

- **The current monitoring for radiation only notifies us AFTER the canisters leak radiation**. Temperature monitoring alerts us that the fuel inside the canisters is over heating, but without a remediation plan in place, that is not acceptable. There is no monitoring for helium leaks. This is critical in order to have early warning before a radiation leak. Bolted lid casks, such as the CASTOR, indirectly monitor helium leaks.[11]

  Recommendation: Require helium leak monitoring.

- **The unsealed concrete overpack structures may develop degradation that could affect their seismic rating.**[12] The CASTOR type casks do not require concrete overpacks.

- **Damaged fuel assemblies are not sealed.** There is no replacement for the "defense in depth" protective fuel cladding lost from damaged fuel assemblies. San Onofre has a record 95 damaged (failed) fuel assemblies in storage and an additional 31 in the spent fuel pools**.** In addition, high burnup fuel may damage the fuel cladding after dry storage. The German cask technology encloses damaged fuel in retrievable sealed containers prior to loading into the casks. The Holtec canister[13] uses retrievable damaged fuel assembly containers, but they are not sealed. The new Areva NUHOMS 32PTH2[14] does not even use retrievable damaged fuel assembly containers. The issue of high burnup fuel that may be damaged after storage has not been addressed.[15]

The NRC has no solutions to these issues. However, they have *unsubstantiated hope* that the nuclear industry will develop a solution before there is a radiation leak into the environment, even though they do not know what those solutions might be.

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Recommendation: Southern California Edison should compare existing technologies used in the U.S. and internationally to ensure Southern California communities are provided the best solution available. The steel/concrete canister technology has many short and long term unresolved issues,[16,17] so the "everybody else in the U.S. is doing it" is not a good reason to procure inferior technology, now that we know the waste may be stored on our coastline for 60 to 100 or more years -- longer than the original design life of these canisters.

Recommendation: Any decisions about dry cask storage and transportation for San Onofre must include requirements for short term storage (60+ years) and long term storage (100+ years). Storage and transport requirements, including aging management, mitigation, and related costs should be included in a Cost/Benefit analysis submitted to the California Public Utilities Commission (CPUC) and the Community Engagement Panel (CEP).

Recommendation: The Department of Energy (DOE), the Nuclear Regulatory Commission (NRC) and the nuclear industry have identified 94 technology gaps[18] in storage and transport of nuclear waste. These technology gaps should be evaluated against the current dry storage and transport technologies used in the U.S. and internationally to determine if the major issues can be eliminated or at least adequately managed and mitigated prior to any radiation leak.

Recommendation: Edison should allow vendors of the German ductile cast iron technology and other cask technology to bid and provide the technical information needed to compare their cask technology with the current U.S. steel/concrete technology. Any potential issues with these technologies should also be identified and documented in the Cost/Benefit analysis. The NRC will not evaluate the German technology unless a vendor requests a license and no vendor will request a license unless they have a customer, such as Edison. The NRC states the licensing process is 18 to 30 months, including for the German technology.[19] The spent fuel needs to cool for years in the spent fuel pool, so there is sufficient time to consider another technology.

The German ductile cast iron casks are the most widely used for both storage and transportation internationally. Many of the limitations of the steel/concrete technology are eliminated with the ductile cast iron technology, although there is no proven safe long term storage solution. That's why the ability to monitor, inspect, and mitigate problems is critical. Edison has outdated information[20] on German technology and only a technical meeting with the vendor will help alleviate this.

Recommendation: There should be documentation available to the public about how the dry storage system will be monitored, inspected, repaired and how fuel can be moved to another canister, overpack or cask, if and when needed. A system should be in place for all this and the costs included in the decommissioning plan. It is unacceptable to say, "we're optimistic we will have a solution when and if it's needed." We've had too many broken promises about safe nuclear waste storage.

We cannot rely on NRC, DOE or nuclear industry promises that they will have a solution in the future. We don't want to be the next leaking nuclear waste dump like Hanford, Washington[21] or New Mexico's "flagship" Waste Isolation Pilot Project (WIPP)[22]. It is prudent to take a conservative view about this and other aging issues, rather than make a decision based on *unsubstantiated hope* that there will be a solution in the future or that there will be no problems.

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