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Gallagher, Carol

From: Ace Hoffman <rhoffman@animatedsoftware.com>
Sent: Friday, July 31, 2015 8:02 AM
To: Gallagher, Carol
Subject: [External_Sender] Written comments for Docket ID NRC–2015–0106 (Including the Spent Fuel meeting earlier this week)

Greetings,

I would like the enclosed comment to be submitted to the NRC's staff working on the revision of NUREG-1927 (NUCLEAR REGULATORY COMMISSION [NRC-2015-0106] Standard Review Plan for Renewal of Specific Licenses and Certificates of Compliance for Dry Storage of Spent Nuclear Fuel) (ML15209A568 contains presentations by the staff). The most recent (informal) public meeting of the project was July 29, 2015, 9:00 a.m. - 12:00 p.m. (Eastern Daylight Time), which I attended by phone in "listen only" mode.

According to the notification for the event (FR Doc. 2015-16540 Filed 7-6-15; 8:45 am), comments may be submitted in written form and are preferred, but not required, to be specifically about the "Aging Management Program." These comments are about that, and a bit more.

I would appreciate knowing if any NRC staff are actually required to read this submission in its entirety, and if so, at what expertise level are they?

The enclosed document is also available online here:

http://acehoffman.blogspot.com/2015/07/the-most-dangerous-quap-on-planet-is.html

If you are not the correct person to contact in this matter, please forward this email to the correct person on the NRC staff.

Thank you in advance for your attention in this matter, which is of some urgency for the citizens of southern California.

Ace Hoffman
Carlsbad, CA

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The most dangerous "quap" on the planet is the quap that's being produced right now...

It's time for all good activists to come to a realization about so-called "interim storage" plans for used nuclear reactor core assemblies, aka "spent fuel" or "used fuel" -- there's been a lot of terms for it over the years. What it is, is the most dangerous "quap" on the planet. And an intractable problem. ("Quap" is a term for radioactive waste coined by H. G. Wells more than 100 years ago.)

A news item in today's World Nuclear News (7/30/2015), the propaganda publication of the World Nuclear Society (publishing only the brightest spin on the news of the nuclear business globally) says that "soon," Holtec International plans to start the regulatory process for its proposed New Mexico "used fuel store." This is an interim fuel repository to hold the fuel until something replaces the proposed -- and currently abandoned -- Yucca Mountain permanent repository in Nevada, or until Yucca Mountain is restarted (it's hard to see how that could happen: It was leaking water, it was in a volcanic and earthquake-prone area, and in some places, parts of the ceiling and walls were degrading already, to name just a few of the many problems Yucca Mountain had when it was abandoned (for those who thought it was just "politics" that stopped Yucca Mountain)).

Around San Onofre, and probably around other closed nuclear power plant sites around the country, there is a strong push for one or more interim spent fuel waste storage facilities. Every obstacle to moving the fuel has been lifted in the local activist's minds, from highway and rail line infrastructure problems, to the will of the people around the proposed waste dump, the danger to the populations the waste will pass through, the thinness of the canisters which hold the waste, the inadequacies of the standard tests which each cask is supposed to pass... you name it, the activists have forgotten it.

And why?

Because leaving the waste around millions of people is ludicrous. In San Onofre's case, more than 10 million people live within 50 miles of the San Onofre waste dump, known as the Darrell Issa Nuclear Waste Dump by many citizens, and the San Onofre Nuclear Waste Generating Station by others. SONWGS is pronounced "SONGS" because the "waste" in the acronym was ignored for more than half a century, so the W was silent (and not even printed) the whole time the waste was being generated. Congressman Darrell Issa has been a strong supporter of the power plant, especially when, about 12 years ago, two vital decisions were being made.

One bad decision was to allow dry cask storage on site at all. The spent fuel pools were dangerously overfilled and Yucca Mountain wasn't moving forward fast enough, and eventually was stopped completely. We were assured the casks would be temporary, only until Yucca Mountain was opened.

The other bad decision was to force ratepayers to pay for four new steam generators (two per reactor), among the largest steam generators in the world, of a new design, to produce more power than before in the same space where the previous steam generators had been carefully fit by the original design engineers. Numerous changes were hidden from the public (and the regulators) by claiming it was a "like-for-like" replacement, when in fact it wasn't.

This second decision proved fatal to the plant and could have resulted in a meltdown when one of the steam generators failed on January 31, 2012. Extremely hazardous radioactive primary coolant was released to the secondary side through a tiny hole in one of nearly 20,000 stainless steel tubes inside the replacement steam generators (there were nearly 10,000 U-shaped tubes in each steam generator).

Subsequent inspection revealed another tube with 99% wall thickness worn away, and thousands of tubes with lesser wear and tear -- after only 11 months of operation. The public had been told these tubes would last 60 to 80 years with only "minimal" degradation. There would be leaks, but they would be few and far between (not like the old steam generators, which leaked extensively). It was claimed it would be a long time before so many of the tubes would have to be plugged (about 20%), that the plant would not have sufficient cooling capability to prevent a meltdown in the event of a "main steam line break," which is considered a credible (meaning possible) accident scenario by the Nuclear Regulatory Commission. Only if enough tubes are available, can the reactor be properly cooled down.

But what happened on January 31, 2012 at San Onofre wasn't just regular wear-and-tear at an accelerated pace, usually caused years later as parts start to fall apart and the tubes start to rattle more and more. This was something different. This wear was not random: Tubes were banging into each other at the U-shaped portion of the tubes at the top of the steam generator, and then those tubes would bang into the tubes next to them, which would bang into the next tube over...

Had the operators continued to run the reactor much longer (for example, if a control rod jammed or if they didn't start the shut-down procedures soon enough), the tubes would have started to break away -- one, two... another... and another...

Primary coolant would have been spewing from the 2200 psi reactor side, to the 1200 psi steam (secondary) side, through two or more finger-sized holes. From both ends of the broken-off tube, primary coolant would be flowing so fast that a meltdown would inevitably follow, because makeup water could not be added to the system fast enough. If only one tube were to completely break off, the two broken ends of the tube would be flinging around wildly, perhaps breaking off other tubes.

The complete separation of even one tube would arguably be a "beyond design basis" accident (i.e., unthinkable, and the operators would not be trained to handle it, if it were even possible to handle). The complete "guillotining" of more than one tube would probably be catastrophic (resulting in a meltdown) and definitely would be a "beyond design basis" event.

But southern California was lucky that day. Federal regulations for how fast a leak is allowed to grow, and for how long, were apparently followed, and those regulations were tight enough (as chance would have it) that there was only a pinhole leak, not a complete breakaway of one or more tubes inside one or more steam generators.

In case you're wondering why the regulations don't simply call for immediate shutdown when a leak is discovered, it's because emergency shut-downs (called "SCRAMS") are highly damaging events and only a few dozen -- at most -- are allowed at any one reactor site over the entire life of the reactor. Normal shutdowns for refueling and periodic inspections are much more gentle. Additionally, some leaks fill with "crud" and block themselves up almost entirely after a while. During the next outage, if they can figure out (with pressure testing) which tubes were leaking, those tubes are plugged at both ends and taken out of service.

The problem that shut down the reactor on 1/31/2012 was called Fluid Elastic Instability (FEI) and was well-known to the steam generator industry, but had (as far as we know) never happened in an operating reactor before, at least, not in America (it's not known if it might have happened elsewhere, because reactor companies are notoriously secretive about their problems, to the detriment of the entire industry and the public).

As it turned out, the tube swinging was caused in part by excessively "dry" hot steam, so dry that it removed the thin film of water that was supposed to be coating the outside of the tubes, which made the banging of one tube into another all the more damaging. The tops of the tubes were supposed to be covered in very wet steam mixed with water, but the tubes in the new design were nearly six feet taller than the previous design before the 180 degree bend around to the downstream leg. There was less room above the tubes for mixing of the steam and water before it went into the dryers, which are cyclonic devices that spin the steam/water mixture and fling the water out and back around to cycle again, and perhaps become steam the next time through the steam generator. Too much water in the steam slows the system down (water doesn't go around bends nearly as well as steam does), and damages the spinning turbine blades that produce electricity.

At some point the designers of the replacement steam generators miscalculated the recirculation ratio of the steam/water mixture. Approximately 3/4s of the water is supposed to go around the system each time -- i.e., not turn to steam. Instead, far less water was being recirculated. They were getting lots of steam and it was nice and dry. Profits were going to be good. The operators of San Onofre were very happy with the steam they were getting, until the leak occurred.

Nobody seemed to notice that something had to be wrong. Too much energy (steam) was being released compared to how much water was being pumped back around. And there were reports of workers hearing strange vibrations, a classic symptom of FEI. Nobody could go in the domes to check until the reactors were shut down, but the clues were there.

As it turned out, one of the reactors was already shut down at the time of the accident, but the operators didn't think to check for wear of the new tubes in the new steam generators. Or more precisely, weren't required to check, so they didn't. It was instead simply down for a regular refueling outage, except they were also replacing the Reactor Pressure Vessel Head (RPVH), which was rusting out prematurely. In 2002, one RPVH in Ohio had rusted completely through to the stainless steel inner lining, prompting closer inspections and eventual replacements of RPVHs at dozens of other reactor sites. RPVHs weigh about 20,000 pounds each, with as many as a hundred or more holes drilled through them for the control rods and instrumentation. In Ohio in 2002, the stainless steel liner, about 1/8 inch thick, was already bulging outwards at the point were the "hole in the head" wear occurred. We almost lost Ohio.

At San Onofre, from late 2011 when the first unit to have its steam generators replaced shut down for its first post-replacement refueling and for an RPVH replacement, until January 2012 when the leak occurred in the other unit, the operators had plenty of time to inspect their new steam generators in the shut-down reactor but didn't do so. Doing so would have revealed an astonishing amount of wear to the tubes.

After the leak in the other reactor, a close inspection of the suddenly-not-operating reactor revealed thousands of wear spots besides where the leak occurred. Finally the already-shut-down reactor was inspected and although no FEI damage was found to have occurred, nevertheless thousands of tubes were also severely worn in that reactor's steam generators too.

One thing was clear: The new steam generator design was seriously flawed. And, it wasn't "like-for-like" in any reasonable sense of the term. The public, and the regulators, had been hoodwinked. (Actually, the NRC probably knew they were being hoodwinked and looked the other way. After all, San Onofre's owners actually bragged about how they had avoided public scrutiny (and NRC scrutiny along with it) in a trade journal! That would have been hard to miss.)

Both reactors were permanently defueled and the site is now beginning to be decommissioned. Decommissioning means hauling away the other highly radioactive reactor components besides the spent fuel (such as the RPV and the RPVH, probably together), grinding the rest of the site up into small enough chunks to haul that away too, and washing most of the "slightly radioactive grinding dust" into the ocean. Except for the used reactor assemblies, aka, spent fuel. No one knows what to do with those in either the long term OR the short term. They will not leave the site, at least for now. The decision to allow dry cask storage on site could still prove to be catastrophic for humanity, and especially for southern California.

The Nuclear Regulatory Commission (NRC) is currently holding hearings and information sessions with "top" NRC officials (who know only one core concept: full faith in nuclear power).

These hearings cover spent fuel storage regulations for the coming era, expected to last up to 60 years -- but possibly much longer (300 years has been mentioned several times).

In other words, the NRC is concluding (as we speak) that enormous, round, welded-shut, permanently sealed (except for a pressure gauge or two) casks, made of 1/2-inch thin stainless steel, surrounded by a three to five feet of reinforced concrete, will be adequate for spent fuel storage near population centers. These storage casks (approximately 150 will be needed at San Onofre) will never be inspected or moved until and unless the license runs out, or a permanent or consolidated interim storage facility opens somewhere in the country.

Thank you Holtec and thank you New Mexico? Not so fast.

First of all: Thousands of citizens in New Mexico don't want the waste, even if they're told it's "temporary" (which they don't believe, having seen what happened to Yucca Mountain). Thousands more citizens along the roads and rail lines that will lead to the facility from the nuclear waste dumps like SONWGS don't want the waste traveling through their neighborhood.

What these citizens fear is very real: Any leak would be a serious problem, but the worst problems would be a fire igniting the contents. Inside are highly radioactive ceramic pellets of uranium dioxide, as well as plutonium and other transuranics and fission products. Many of the fuel pellets are likely to already be damaged: Cracked like an old piece of china. In any case, the ceramic pellets are highly embrittled, with chipped-off bits, and radioactive dust particles that have flaked off, which would burn very easily if brought to the right temperature by some external heat source or by a criticality event (described in more detail below).

Gamma radiation is the immediate danger for anyone working with spent nuclear fuel. It will take many generations for that not to be a problem. Gamma rays get through the 1/2-inch thin stainless steel cask with little reduction in strength. That's why there is also three to five feet of concrete overpack surrounding the dry fuel canisters.

During transport, there is an additional overpack, but it is not as thick as the concrete overpack. Instead, there are special rules about how long the fuel can remain in one place on the highway, such as when a driver stops for dinner at the same diner everyone else (including babies and pregnant women) is also stopping at.

It is utter fallacy to think the rules for safe transport of nuclear waste are safe enough, especially concerning exposures to woman (more than men), to children, to infants, and most of all, to the fetus of a pregnant woman, and to the eggs that fetus could be carrying.

Hopefully some day, the absolute risk to the most at-risk segment of our society will determine legal dose rates for radioactive substances. But for now, the rules are based on the least-sensitive person to radiation: An adult male in good health to begin with.

Ludicrous?

Everything about the nuclear business is ludicrous!

Holtec plans to open their Interim nuclear waste storage facility in 2020. That's certainly optimistic, but it helps sell the idea to keep the date in the near future. The Yucca Mountain plan was promoted for nearly 30 years and was never more than ten years in the future at any one time! And not once would any NRC or utility spokesperson at any public hearing respond to the request to stop making unmanageable nuclear waste with anything other than "Yucca Mountain!" for the entire 30 years!

Yet here we are, and Holtec is screaming "New Mexico will take it!"

I don't think so, but if it does happen, it will be a disaster for everyone, because it will falsely enable the entire industry to claim there is a "solution" to the nuclear waste problem.

But moving spent fuel nuclear waste from one place to another does little for the general population in the case of a spent fuel nuclear fire, criticality event, or cladding fire (three separate types of events which I'll go into in detail below). The radioactive debris from such events would travel hundreds of miles in the first few hours, and spread globally for thousands of generations.

Catastrophic events can occur during transport, through accidents which are known to happen from time to time on the nations roads and rail lines: Bridges collapse, sometimes onto other roads or rail lines. There have been unreachable train fires in tunnels which lasted for days. The spent fuel canisters are only expected to last about 20 minutes in a typical fire. No dry cask storage system anywhere in the world is capable of withstanding a jumbo jet impact, although probably the German ductile steel dry casks, which are nearly 20 inches thick, are orders-of-magnitude safer than the 1/2 inch thin American/French stainless steel dry cask system. But none are adequate to resist a jumbo jet and ensuing fire.

So even if Holtec's spent fuel facility is built in New Mexico, and even if it is only made available to "closed" facilities, it will be a disaster globally not just because of the risk of a transport accident as fuel is moved to the site, and not just because a jumbo jet could crash into the site in New Mexico, but also because having such a facility will enable dozens of reactor sites to remain open. They'll be able to claim that some day their fuel will either go to the Holtec site, or to some other "interim facility" (mind the gap between an "interim" facility and a "permanent" repository) .

If the site does open, transporting the spent fuel there requires several dangerous (risky) steps:

First: Opening the concrete door at the front of the overpack (depending on design) while the workers remain shielded from the gamma radiation that will be emitted.

Second: Pushing a thick overpack (larger than a school bus!) up to the opening. The overpack has lead, boron, polystyrene and/or other special radiation-absorbing elements and lots more stainless steel. The transport overpack is expected to be used over and over.

Third: After the fuel canister is moved into the transport overpack, the combined assembly is moved slightly away from the cement overpack, where the canister sat, unopened, for perhaps 60 years or more, and then a rear seal is put in place on the back end of the transport overpack.

The longer we wait to make this transfer, the lower the radiation doses received by the workers -- or by anyone near an accident. Maybe more of the procedure can be automated, too.

Once the cask is out of the concrete overpack, its journey has only just begun. By rail or by truck? This hasn't been decided, but the general feeling is it should go by rail, because rail lines tend to only go through less populated areas (pure coincidence that they are also usually the poorest communities), and they can carry more weight. That means thicker shielding can be used. Or bigger dry casks, which is what the industry supports (32 or more fuel assemblies, instead of the previous standard of about 24).

San Onofre shut down suddenly, and did so, thankfully, without melting down the reactor(s) and without causing the loss of some of the most expensive real estate in the world. When the decision was announced to permanently close the plant, suddenly the local activists could completely focus on the waste problem that had been silent for so long. And of course, all of them (myself included) want the spent fuel to be moved away. But to where? And whose rights will we have to violate to get the waste there? And what will moving it do to the perception that other nuclear power plants also have a solution to the waste problem because we managed to somehow get rid of ours?

One of the local activists, who desperately wants the waste moved, said he is willing to overlook every obstacle: The trains would move more slowly than other trains, so the casks would be less likely to fall off the tracks or be cracked open in an accident. Well, absolutely, those are benefits of the train or truck traveling relatively slowly. But by going slowly, they will also be under and on bridges longer, and they will be easier targets for an ambush by terrorists.

Nobody should forget about terrorists when thinking about what to do with nuclear waste. These days, enormous acts of violence impacting hundreds or even thousands of lives are being committed by seemingly-sane people, such as pilots and copilots of jumbo jet aircraft. GermanWings. MH370. But those are only the most recent examples. Plane hijackings (and crazed pilots) have been occurring for decades. One hijacked airplane in the 1970s overflew very close to Oak Ridge, Tennessee (the hijacker went on to Cuba, where he was promptly arrested). One military pilot hijacked a A-10 Warthog, and flew it into a mountain. His Depleted Uranium shells could easily have pierced any American/French dry cask storage system, and probably the German casks, as well.

Someone may be sick enough to aim for a dry cask some day. The best protection is to separate the fuel out into as small a bundle as possible (to reduce the potential for a criticality event) and place that package within enormous earth berms and a thick concrete overpack -- but yet, the containers have to be able to be inspected. They have to be retrievable. You can't just bury the stuff and forget about it. You have to be able to deal with "problems" such as:

Rust.

Embrittlement, stress corrosion cracking (SCC) , chloride-induced SCC, Wigner's disease, hardening of the arteries, aging... it's all basically the same thing, and happens to the stainless steel cask, the zirconium fuel rods, the fuel pellets inside the zirconium fuel rods, the steel assemblies holding the fuel rods in place, the steel panels which keep each fuel assembly separated from each other inside the cask (to prevent a criticality event)... every part. They'll all embrittle.

After 60 years, everything will be much more fragile than when it was removed from the reactor. The very fact that they will be a lot cooler temperature than they are now means they will be more brittle. It's even been proposed that "if necessary" the casks could be heated for the duration of the transfer to the "interim" storage facility -- though how they'll know which ones would need heating has not been determined, let alone how to be sure they are heated enough, but not so much that they can sag and break if put under too much stress. Moving spent fuel safely is not easy. In fact, it's impossible to be sure it can be done safely. That's why the

industry resorts to Probabilistic Risk Assessments (PRAs) which assume that accidents might happen, they just won't happen very often.

But with 10,000 dry casks needed for all the fuel that's been produced so far (and more than 2,000 dry casks in use at the moment), there is plenty of room for "rare" accidents. If something has a rarity of one in a million for one transfer of one dry cask, then the chance of it occurring is 1% if you are moving 10,000 casks. Nuclear waste accidents are far too severe to be allowed to happen that often. The industry claimed reactor meltdowns had less than a one in ten thousand year chance of occurrence. So far, there have been four meltdowns in just over half a century of nuclear operation. PRAs are fanciful, complicated, and misleading.

The nuclear industry says not to worry about rust, not even in coastal dry cask storage zones, even though salty air is highly capable of causing Chloride Induced SCC. In fact, the nuclear industry's own experience has been that cracks can develop all the way through a 1/2 inch stainless steel sheet of metal in less than two decades, and cracks can start to form within a few years. Yet the nuclear industry plans to let these thin storage canisters sit in a highly corrosive environment for up to six decades without a blush, and probably a lot longer.

Inspecting for SCC is virtually impossible, especially around the load-bearing points, the welds, or anything on the inside of the canister.

What could possibly go wrong?

A cladding fire would be very bad -- it's what happened at three reactors in Fukushima. The zirconium cladding surrounding the fuel pellets is pyrophoric (ignites easily in air). In Fukushima, as the water boiled away, the cladding was exposed to steam. When that happened, the zirconium split the hydrogen atom in the steam molecules away from the oxygen atoms. The hydrogen accumulated and then exploded. That happened at least twice at Fukushima and possibly three times, and nearly happened at Three Mile Island. At TMI, a large hydrogen "bubble" accumulated at the top of the reactor containment dome but did not explode. Fukushima's big boxes accumulated the hydrogen outside the reactors' "containment vessels," which are much smaller than the containment dome at Three Mile Island.

At Fukushima the accumulated hydrogen exploded, but one of the reactors apparently accumulated the hydrogen in a different building. There were apparently ventilation interconnects between the reactor buildings, and the released hydrogen from one of the reactors transferred over to a different reactor building before exploding. At least, that what TEPCO, the owners, claims happened. (It should be noted that TEPCO is perhaps the most dishonest company on the planet, although every nuclear corporation is a contender.)

A spent nuclear fuel fire would include a cladding fire but would be much worse. It is when the ceramic uranium dioxide fuel pellets themselves are burning. Fukushima, TMI and Chernobyl all experienced fuel melts, but not burning fuel pellets (as far as we know). Chernobyl had some fuel exploded into pieces or "chunks," as well as the melted fuel. The melted fuel at Chernobyl is known as an "elephant's foot" and has been photographed, but has been left to continue to smolder (i.e., produce fission products which are released). A new containment structure was recently built, but another and another will eventually be needed, for thousands of years, each one more expensive than the last.

If a criticality event occurs with spent fuel, the area around the site will be permanently contaminated. That area could stretch for hundreds of square miles downwind of the accident, with many other areas further away, or not predominately downwind, nearly as contaminated.

The "spark" needed to touch off a fuel pellet fire has to be very hot and/or last a long time -- but a terrorist would know this and plan accordingly, if that's what they wanted to do, and a jumbo jet accident could lead to a spent nuclear fuel fire if the fuel burns around the canisters long enough, or if the canisters have been breached. There would not be any possibility of fire fighters putting out the blaze: Unprotected spent fuel kills in seconds.

But besides that, putting water on a spent fuel fire might result in a criticality event, because water is a "moderator" which slows down neutrons. Slow neutrons can split additional uranium and plutonium atoms (fast neutrons, i.e., those not slowed down by a moderator, are incapable of sustaining a chain reaction in spent fuel). A criticality event could occur simply if the breach of the containment happens when its raining.

A lot can go wrong with spent nuclear fuel assemblies, and many of these dangers last for thousands of human generations. After roughly six centuries, the danger from a cladding fire is reduced to a tiny fraction of what it is currently, because the fission products that could be released today will have almost all decayed away after 600 years. Even after 60 years, the danger from fission product releases will be significantly reduced, but the plutonium and uranium risks will barely have changed.

The reduction in fission product inventory in spent fuel is probably the best argument for leaving the waste where it is for now, even though it's in an earthquake zone, a tsunami inundation zone, a large and growing population center, and just a few hundred feet from a major highway where more than 100,000 vehicles pass every day -- a terrorist's delight to have such close access.

But whatever is done with the waste, it had better not enable other nuclear power plants to remain open.

15 or so years ago, when dry casks were first being contemplated to "temporarily" store nuclear waste at San Onofre and other nuclear power sites across America, many activists endorsed dry cask storage. Surely those not around then must be asking why those activists didn't demand San Onofre shut down permanently instead of allowing an endless number of dry casks to be built and stored on site. The answer was that they believed dry cask storage was "safer" than overcrowded spent fuel pools.

And taken out of context, they were probably right. But that sort of thinking enabled San Onofre to replace its steam generators and try to keep operating for perhaps 60 more years -- that was the plan -- had the steam generators not failed that day in January, 2012, and caused the permanent shut-down of the facility.

The "interim" storage facility planned for New Mexico has no exit strategy -- and yet might become the first of several "interim" storage sites across the country.

Before any interim facility opens, Holtec plans to build for San Onofre -- if they get the contract, which seems almost inevitable at this point -- a "temporary" cement entombment system consisting of the 1/2 inch thin stainless steel canisters, placed vertically in several cement "islands" at the closed SONWGS site. Each dry cask will be placed in a separate hole in the cement with three to five feet of concrete between each cask. Adequately inspecting the casks after installation will be impossible.

At some point, the canisters will have to be pulled up into a temporary overpack, then the overpack will have to be tilted to the horizontal position in order to be placed on a transport vehicle. Catastrophic errors can occur at any stage of the operation.

Activists were wrong when they endorsed dry cask storage. They should have demanded permanent shutdown instead.

Activists now endorsing an interim storage facility are wrong as well. They should demand permanent shutdown instead. No one, no country, can sensibly decide what to do with nuclear waste until nuclear power has been abandoned permanently forever everywhere. Nuclear power -- and nuclear waste -- is not compatible with human life. It is not compatible with a small enclosed ecosystem (and if you still think the world is vast, remember you can circle it in 90 minutes from space and in about eight hours in a supersonic jet (not counting slowing down to refuel)).

And speaking of air transport, earth-bound vacuum tunnels are far safer not only for the passengers (they need no crew) but for everything that would otherwise be under the airline routes. Ukraine has nuclear power plants. MH17 could have crashed into one of them when it was shot down. The GermanWings copilot could have crashed into numerous reactors -- and no one could have stopped him.

This is not the world we want to leave our children. Solar and other renewables can replace all the coal, oil, nuclear and gas power sources. There is no reason for the madness of nuclear power to continue. Finding a safe place for the waste -- and getting it there -- is impossible. Permanent shut-down of all nuclear facilities is the most important thing to do right now. Stop making more waste because there will never be a safe solution.

Ace Hoffman
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Author of The Code Killers, a free ebook about nuclear power:
www.acehoffman.org
Steam generator animation (also by the author) www.acehoffman.blogspot.com Internet Glosary of Nuclear Terminology (ditto):
http://www.animatedsoftware.com/hotwords/noframes.htm

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News item from World Nuclear News:

WASTE & RECYCLING: Holtec to start regulatory process for New Mexico used fuel store soon

Holtec International has unveiled the schedule for its proposed consolidated interim storage facility for used nuclear fuel, with start-up slated for 2020. Holtec sees the facility, to be built in south-eastern New Mexico, as the only solution being put forward to deal with the USA's 70,000 tonnes of used nuclear fuel that is currently located in 35 states and at about 70 sites.

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