THE NUCLEAR Nexus

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Downblending, Disposal Best Way to Honor Treaty

Several of our nation's political leaders involved in the 2000 Plutonium Management and Disposition Agreement (PMDA) agreement with Russia, including Senator Richard Lugar and Governor Bill Richardson, have publicly spoken out in favor of continuing with the Mixed Oxide (MOX) Fuel Fabrication Facility.

While these political leaders understandably have a vested interest in the continuation of their treaty, the Carlsbad Mayor's Nuclear Task Force strongly encourages them to rethink their stated opinions. A cost assessment, the lack of commercial interest in MOX, and information from several recent studies have all demonstrated that the intent of the treaty (removing weapons-grade plutonium) can best be achieved through down-blending and disposal.

When the original Plutonium Management and Disposition Agreement (PMDA) plan was put together in in 2000, the goal was to formulate an agreement that resulted in Russia (in addition to the United States) removing 34 tons of weapons-grade plutonium. That goal hasn't changed. What has changed is the unbelievable rising cost of the MOX plant, some of it from documented mismanagement – it is substantially over budget and significantly behind schedule. What is also new is the expanding evidence that down-blending and burial is the best way to honor our side of the commitment.

The congressionally-mandated study from Aerospace that was released in May predicts the lifecycle cost of MOX Fuel Fabrication Facility project to be around $51 billion dollars, substantially more than what was originally anticipated, and also significantly more than the estimated $17 billion cost for the down-blending option. Breaking out the upcoming costs, the remaining expenses for the MOX plant would cost the taxpayers about $1 billion a year over the next 30 years, so it is certainly responsible for the DOE to look into alternatives.

It is also probably unsurprising that those who stand to profit from that $1 billion a year expense are circling the wagons to attempt to defend this costly project. The Areva-commissioned High Bridge Associations Inc. study and a supporting public relations campaign haven't done anything to counter the fact that none of our nation's utility companies are willing to accept the MOX fuel. High Bridge's attempt to claim a different economic comparison than the one outlined above just doesn't add up.

Commercial power plants are loathe to add MOX fuel to their reactor feed because of the high cost of retraining their operators to run a reactor fueled with MOX, restructuring their procedures, and obtaining a license amendment from their regulator to approve using that more reactive type of fuel in their existing reactor. Since the 2000 PMDA, the only potential U.S. "customer" originally identified to accept MOX fuel has changed its mind.

There's no way to justify a $1 billion a year expense to produce a fuel that nobody is willing to buy. Instead, the Red Team's suggestion of a permanent disposal solution through down-blending and disposal in WIPP guarantees non-proliferation, forever. The materials would be down-blended to put them in compliance with transportation standards, and for security reasons.

High Bridge's report, commissioned by Areva, also attempted to go on the offensive by attacking the capacity at WIPP, which is presently about half full. The report claimed that the legal limit on waste volume would have to be changed to accept the entire inventory, but the report ignores multiple options for addressing WIPP's capacity. Most significantly, less than 5% of the legislated land withdrawn for the repository will be used when the repository reaches the current volume limit set by law. The space beneath WIPP is ultimately limitless.

Furthermore, the report's claim that the design basis at WIPP would somehow be exceeded is also misleading and false. There is no upper limit on the plutonium that can be placed in WIPP, as long as certain compliance standards are met.

The report also makes an unsubstantiated claim that the added fissile inventory to WIPP, should the waste go there, could increase the likelihood of a future criticality event underground. However, the idea of anything going "critical" is ludicrous and physically impossible, an obvious scare tactic used by the authors to deceive the average reader.

Regarding the political side of this discussion, the concern has been expressed that switching to down-blending would violate the conditions of our treaty. However, at least according to media reports, Russia has already recently indicated a willingness to discuss the option of us down-blending and burying weapons-grade plutonium. Given that their primary interest is in expeditiously removing the plutonium from potential use, why wouldn't they? WIPP will be ready to begin receiving this waste almost as soon as the facility opens. Down-blending and disposal would happen years, maybe even decades, before MOX completion.

In fact, the only gain in nonproliferation from burning MOX fuel is that the plutonium content of the used MOX fuel is an unattractive blend of isotopes, not unlike the plutonium isotope mix in used light-water reactor fuel. Like the existence of commercial used fuel, MOX used fuel still requires resource-intensive active safeguards and security to prevent unauthorized access and use.

Additionally, about 3 metric tons of down-blended weapons grade plutonium has already been disposed of at WIPP. Weapons-grade plutonium, when properly down-blended with inert materials and when safeguards are terminated, is a bona-fide contact-handled transuranic waste. The down-blended excess plutonium would meet WIPP's Waste Acceptance Criteria and, most importantly, would be safely, securely and permanently removed from both the stockpile and the biosphere. Plutonium buried in WIPP is permanently isolated – that's the purpose of deep geologic disposal.

On behalf of the Carlsbad Mayor's Nuclear Task Force, we appreciate Senator Lugar and Governor Richardson's extensive efforts on our nation's behalf and continued service. We hope they will come to realize that the down-blending option for excess plutonium is by far the most responsible course of action.

UT Research Has No Connection to WIPP Salt

Several incorrect conclusions were contained in a recent study, "Deformation-Assisted Fluid Percolation in Rock Salt," highlighted in a November 2015 edition of *Science.* The University of Texas research effectively concluded that, under certain temperatures, pressures and circumstances, the deformities in salt domes can be porous for some liquids. Other past research has reached the same conclusion, and some parameters concerning this process have been refined by this research.

Less objectively, the article itself, and then follow-up media coverage about the article, took the conclusions, based on very deep, high-pressure and temperature regimes, and misleadingly extrapolated from them to lower pressures and temperatures when they suggested their findings called into question the viability of radioactive waste repositories in stable salt formations at modest depths.

Salt serves as an optimal repository location for radioactive waste because of salt's ability to "heal" openings made by inserting a repository in compressed salt. Under pressure at depth salt flows. This allows Mother Nature to carry much of the isolation workload by encapsulating the waste material and not letting anything in or out for millions of years.

The results from the University of Texas research do not, in any way, relate to the salt beds that host the Department of Energy's Waste Isolation Pilot Plant near Carlsbad. The UT research specifically involved the stress-mediated permeability increase process in very deep salt domes. WIPP is in a salt bed, not a salt dome, and the structural differences between the two can be substantial depending on geologic setting. More specifically, the UT research was related to geologic deformities that occur deep within actively deforming salt domes, not stable salt formations.

The depth and stability of the formation studied is crucial to the conclusions reached. The process outlined by the UT researchers is only active at depths of between ~6,500 to ~13,000 feet. WIPP and other salt repositories are located ~1,640 to ~2,620 feet beneath the surface. This is not merely a cosmetic difference – the pressures and temperatures in the study were significant contributing variables, and do not exist either at WIPP or in the salt domes being used or considered for use as radioactive waste repositories or oil or gas storage sites either in the US or elsewhere.

There is substantial experience in using stable salt domes along the rim of the Gulf of Mexico at significant depth for the reliable storage of petroleum. The US Strategic Petroleum Reserve is in caverns mined into salt domes from ~2,000 to ~4,000 feet in depth and the natural temperature variations between those depths keeps the crude oil naturally mixing, which is a good thing. There has been no loss from oil entering into the salt in these stable formations. In Russia, several large caverns in domes are being used for natural gas storage, and there are now several decades of experience with storing helium, a hard to contain gas, about 4,500 feet deep in a salt dome at Orenburg. New salt dome storage facilities for natural gas, and helium, are being constructed in Siberia.

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It is worth mentioning that continued studies into the suitability of salt for disposal of high-level waste are warranted and supported by the Carlsbad Mayor's Nuclear Task Force. This testing, which involves adding a spectrum of heat to the underground, should be conducted at WIPP – in bedded salt at the actual depth being considered for a potential repository for heat-emitting waste.

The UT study takes a subjective political turn when it claims a link between its research and radioactive waste repositories in salt. This link does not exist. Unsurprisingly, media outlets pounced on this inference, and the inference quickly became the headline of articles covering the topic. The public was ultimately presented with a misinterpretation that incorrectly speculated that WIPP and other repositories could be more porous than we thought.

The UT study recommends some specific research to be done on the repository salt. The recommended work has already been done. It was a part of the site characterization phase of the WIPP repository, and showed that the host rock at WIPP has been in their current configuration for hundreds of millions of years. The WIPP salt beds are not likely to ever be deformed by the conditions described in this experiment. WIPP's salt beds are as immobile into the distant future as they've been in the distant past.