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Update on DOE's Problem-Plagued Plutonium Disposition Program

Stumbling to Termination: Mixed Oxide Fuel Plant Construction at Savannah River Site - NNSA Admits MOX Plant Construction Problems & NRC Dodges Full Inspection of MOX Plant

As we await a new Department of Energy (DOE) report on the cost of two disposition options for surplus plutonium, more news of concern is coming out regarding problems with the plutonium fuel (MOX) MOX program. Topping the list of new problems that have been revealed is a surprising confirmation by the National Nuclear Security Administration (NNSA) that there have been problems with installation of hardware in the Mixed Oxide Fuel Fabrication Facility (MFFF) plant now under construction by CB&I AREVA MOX Services at the DOE's Savannah River Site (SRS) in South Carolina. As the fate of MOX continues to hang in the balance, how many more cost overruns, schedule delays, management problems, design issues and construction problems can the tax payer endure until the Congress cancels the failed project and gets serious investigating why the MOX boondoggle was allowed to develop?



Photo: MOX plant under construction at SRS; note side of building facing left (south) – rusted rebar can be seen sticking out of top of unfinished gabion security wall, confirming that outside of MOX plant is not finished; October 25, 2014, by High Flyer, exclusive to Savannah River Site Watch

Plutonium Disposition Cost Report Due Soon

During the week of April 13, 2015, the Department of Energy is required to deliver to Congress a report on the lifecycle cost estimates of the cost of the MOX option and the option to downblend surplus weapon-grade plutonium with an inert material (the secret “stardust” material) and dispose of it in a repository (supposedly the now-closed Waste Isolation Pilot Plant in New Mexico). The Omnibus spending legislation for Energy & Water projects, which funded the MOX plant at survival level of \$345 million for Fiscal Year 2015, states - in “[DIVISION D--ENERGY AND WATER DEVELOPMENT AND RELATED AGENCIES APPROPRIATIONS ACT, 2015, EXPLANATORY STATEMENT](#),” page 49 (94 pdf):

“...the NNSA is directed to submit to the Committees on Appropriations of the House of Representatives and the Senate not later than 120 days after enactment of this Act an independently-verified lifecycle cost estimate for the option to complete construction and operate the MOX facility and the option to downblend and dispose of the material in a repository.”

The report, prepared by Aerospace Corporation, a federally funded research and development center, is anticipated to show that the life-cycle cost of MOX is far above the downblend option. The report is also anticipated to demonstrate that the current \$345 million annual funding level for the MOX program is far below the amount needed annually to carry out the program even if reluctant utilities offer their reactors for use of the experimental weapon-grade MOX fuel (which has never been used anywhere in the world on a commercial scale). It is unknown what the report will say about costs of the MOX program, but the Fiscal Year 2016 request includes a cost of \$12.7 billion for the MOX plant construction (including an estimated \$1.8 billion for MOX plant start-up) and a jump from \$543 million/year to \$670 million/year for the annual operating cost for the MOX plant.

A second report to be delivered to Congress in September 2015 was required in the [National Defense Authorization Act of FY 2015](#) - see pages 1540 to 1544 - and is to address MOX and other alternatives, including the still-promising option of immobilizing plutonium in vitrified high-level nuclear waste. The report is to assess the funding profile for MOX if it is continued as well as “identification of steps the Secretary would have to take to close out all activities related to the MOX facility, as well as the associated cost.”

NNSA Admits that Rumors about MOX Plant Construction Problems are True

For the past 8 months, SRS Watch has received oral rumors concerning construction problems inside the MOX plant being built in F-Area at SRS. Those rumors by a former MOX quality control inspector (but not confirmed via documentation), consistently indicate improper installation of key hardware, including cable trays, piping, switch gears and improperly tagged wiring and that management is aware of the problems.

The rumors are that cable trays and piping were installed at incorrect elevations inside the MOX plant and will have to be torn out when other components were needed to be installed. Additionally, the rumor is that the MOX contractor urged inspectors to sign off on jobs improperly done in order to meet production incentive milestones. The name of a supervisor who urged improper work certification was given. The rumor was reported to various governmental entities for follow through.

On a tour of SRS on March 25, 2015, in front of the MOX plant construction site and with representatives present from several public interest organizations - Savannah River Site Watch, Georgia Women's Action for New Directions, Southwest Research and Information Service and the Snake River Alliance - an NNSA official confirmed at least some of the rumored construction problems.

Perhaps in anticipation of questions about construction problems, Mr. Kevin Buchanan, an engineer with NNSA based at SRS, confirmed that cable trays and piping had been improperly installed. Mr. Buchanan indicated that such hardware more recently installed had been removed and correctly installed but that "legacy" installations were yet to be addressed.

It is unknown the size of the job to correct the legacy problems, how much it will be cost, what length of delays the installation problems have caused to the overall project and if anyone will be held responsible for the improper installation. It is believed that Chicago Bridge and Iron (CB&I), in charge of construction with the CB&I AREVA MOX Services contractor, is conducting its own investigation but it is unknown what action DOE management, NNSA's Office of Acquisition and Project Management (OAPM) or Congress is taking to address the situation. It is also unknown if the DOE's Office of Inspector General, which is aware of the problems, is actively investigating the matter.

Mr. Buchanan also stated that staff turnover at the MOX project had risen from 20% per year to a whopping 50% per year. Staff evidently are going to the MOX project to be trained, work a while, and then jump to other nuclear projects, such as nearby Plant Vogtle (where two AP1000 nuclear reactors are under construction by Southern Company), where wages are higher. The hemorrhaging of workers is undoubtedly rendering a serious blow to the ability of the construction of the MOX plant to continue in a safe manner.

An NNSA official also confirmed that the MOX construction funding, at \$345 million for FY2015 and with that same amount requested for FY 2016, is \$200 million lower than is needed to more efficiently continue with the construction of the MOX plant. (At the \$345 million/year funding level, it could take five years or more to finish the structure. Likewise, at the \$345 million/year level, and accepting DOE's estimate for the MOX plant start-up cost of \$1.8 billion, it would take five years to make the plant operational even if there were no major glitches. AREVA would start the plant up as part of the construction contract and is hoping to get the contract for \$670 million/year operating cost for the life of the MOX plant. Annual funding needed for all aspects of the MOX project over the next 20 years is estimated by SRS Watch to be around \$800 million/year, more than twice the current funding level. There is no indication that Congress would consider such a funding level for such a troubled project.)

Outside of MOX Plant Not Finished, Contrary to what has been Claimed and Reported

On the SRS tour of March 25, 2015, it was evident from the stop in front of the MOX construction site that the south side of the MOX plant was still under construction. It has been claimed that the external structure of the plant was finished but such is not the case.

The south-facing outer security wall, called a gabion wall, is far from complete and only goes up to about half its finished height. In the photo below, taken on March 25, rusting rebar (“above” and behind the heads of the participants of the tour) can be seen sticking out of the top of the part of the gabion wall that has been completed. It was indicated to the tour group the height to which the wall would go when completed - to the row of marks that can be seen in the photo above the rusting rebar. When finished, the space between the inner and outer wall will be filled with rocks, as a way to deter rocket attack.

Aerial photos provided to SRS Watch during October 2014 also confirm that the security wall is not finished.



Photo: Participants on SRS tour of March 25, 2015; public interest groups on tour include Georgia Women’s Action for New Directions, Southwest Research and Information Center (New Mexico), Snake River Alliance (Idaho) and Savannah River Site Watch; note rebar sticking out of unfinished gabion wall; photo by NNSA

Likewise, the many openings into the facility from the outside are not complete, as can be seen in the above photo. NNSA officials could not give an estimate of how much it would cost to finish the openings in order to protect the structure in the event construction was stopped.

Waste Solidification Building (WSB) - for Nuclear Waste from MOX Plant - to Go on Standby

The manager of construction of the Waste Solidification Building (WSB), a facility that would solidify liquid nuclear waste coming from processes in the MOX building, informed the March 25 tour group that the goal was to place the facility in “lay-up mode” this summer. As the MOX plant, if ever finished, would not be operational for many years there is no need for the WSB and it will be placed on “lay-up until such time as NNSA says it’s needed.”

The WSB is designed to handle two waste streams. The facility would handle 10,000 gallons/year of transuranic waste with high americium content, enough to make 1500 barrels destined for the WIPP facility. It would also process 50,000 gallons/year of a depleted uranium waste stream, also making 1500 barrels, which would be “stored” at SRS or taken to the Nevada National Security Site (NNSS) for disposal via burial in trenches.

The \$414-million WSB would employ 100 staff when operating, at a cost of \$50 million/year, and only 12 staff at a cost of \$7 million/year when in lay-up mode. If MOX is terminated, the cost of this project will have been wasted unless a new mission for the WSB is found.

The waste lines from the WSB to the MOX plant are not in place but are stubbed out just outside the WSB, according to the WSB construction manager.

Plutonium Oxide Production for MOX Facility Halted at SRS

The HB-Line, a process facility that sits atop the H-Canyon reprocessing plant has been designated to produce plutonium oxide to feed the MOX plant. That oxide, dubbed “Alternate Feed Stock (AFS-2),” would be processed by the SRS Office of Environmental Management (EM) for the NNSA from so-called “3013” cans of plutonium oxide now stored in the K-Area at SRS. SRS has told SRS Watch that NNSA is paying EM about \$20 million/year for this service.

According to SRS, in a [November 2014 presentation](#) to the SRS Citizens Advisory Board, the goal is to ramp up to production of 1 metric ton per year of oxide. Plutonium for oxide production was first introduced into H-Canyon on August 8, 2014 and HB-Line produced the first can of oxide on August 27. After a small number of cans of oxide were produced H-Canyon evidently was shut down for routine maintenance.



Photo: Aging H-Canyon reprocessing plant, built in the early 1950s; DOE’s last such reprocessing facility. A number of equipment and operational issues have recently plagued the facility, raising concern that it should be closed before a serious accident takes place.

After becoming operable after the short shutdown, HB-Line suffered a power outage on January 7, 2015 and it was not until February 3 that the contractor, Savannah River Nuclear Solutions, noticed that power had not been restored to an “agitator” that mixes plutonium solution in a tank in the facility. This caused a violation, according to a [Defense Nuclear Facilities Safety Board \(DNFSB\) weekly report of February 20, 2014](#) “the HB-Line Nuclear Criticality Safety Evaluation (NCSE).” Though it appears that the contractor was tardy in notifying DOE about the problem, HB-Line was taken out of service and the

contractor began development of a “recovery plan.” SRS has called the shutdown of HB-Line as a “safety pause of operations.”

SRS Watch was informed via email from SRS on April 8 that “Savannah River Nuclear Solutions completed development of the HB-Line Recovery Plan during this safety pause at HB Line and DOE-Savannah River is evaluating this as well.” The recovery plan is aimed at restoring HB-Line oxide production operations and will include “corrective actions are being developed to evaluate the Nuclear Criticality Safety Evaluation and Double Contingency Analysis to prevent recurrence.”

The email went on to say that DOE-Savannah River is reviewing the recovery plan and estimates that “HB-Line operations will resume in early summer,” which would mean that six months of oxide production would be lost in Fiscal Year 2015 in the aging HB-Line.

NRC’s Annual Meeting on April 16 on MOX Plant Construction Could Produce Fireworks as there may not be Proper Oversight of Construction by the NRC, NNSA or CB&I AREVA MOX Services

On April 16, according to a, April 7, 2015 [news release by the U.S. Nuclear Regulatory Commission \(NRC\)](#), the NRC is set to hold its annual meeting near Aiken, South Carolina on performance of CB&I AREVA MOX Services in its construction of the MOX plant. The MOX plant at SRS, as it would possibly provide commercial experimental MOX fuel, is the only NRC-licensed project in the entire DOE complex.

The meeting could well be controversial as the NRC claims that the contractor performed well but the NNSA’s admission of problems with the MOX plant construction raises questions if the NRC’s inspections are adequate or even designed to inspect for and find problems.

The NRC claims that its review to be discussed at the meeting “covered calendar year 2014 and concluded that construction activities were consistent with NRC rules and regulations as well as the conditions of the MOX construction authorization. No areas were identified as needing improvement and the NRC plans to continue to conduct its extensive inspection of construction activities at the site.”

Yet, the NRC’s claim runs directly counter to the NNSAs confirmation of problems in installation of cable trays and piping.

At a similar NRC meeting on the MOX plant construction on January 15, 2015, the NRC was informed by SRS Watch about rumors concerning problems with installation of hardware. In a phone conversation of January 22, more details of the allegations concerning “incorrectly installed cable trays, piping, switch gears and the tagging of wiring” were provided to NRC staff. It was believed that inspection of the areas of concern inside the MOX plant would follow.

Yet, it appears the NRC did nothing.

On March 27, SRS Watch requested copies of NRC reports of the inspection of NNSA-identified construction problems. On April 1, the NRC responded in a letter attached to an email message labeled

“Warning Sensitive Material” and dodged any obligation to inspect the areas of concern, which the NRC noted in an attachment as being “incorrectly installed cable trays, piping, switch gears and the tagging of wiring.” The NRC stated in the letter that

“We have reviewed your concern and determined that your concern and the associated activities are not under NRC regulatory jurisdiction. As of the date you raised your concern, the issue referred to in Enclosure 1 referred to non-Quality Level 1 (QL-1) activities. QL-1 systems, structures and components (SSCs) as defined in the MOX Project Quality Assurance Plan, include all Items Relied on for Safety (IROFS) including Principal SSCs (PSSCs) identified during the design phase prior to the completion of the Integrated Safety Analysis. On the basis of the foregoing, NRC intervention on this issue is not warranted at this time.”

The NRC made no attempt to explain how cable trays, piping, switch gears and mistagged wiring were not related to the safe functioning of the MOX plant.

Perhaps unaware of the problems with installed hardware, the NRC wrote to CB&I MOX Services in a [March 12 letter on its construction assessment](#) that

“...our inspections indicated that your construction program was sufficiently implemented to support ongoing construction activities. CB&I AREVA MOX Services (MOX Services) management and quality assurance oversight adequately monitored and assessed onsite construction activities. The corrective action program implementation activities, including initiation, classification, disposition, adequacy in the documentation, and trending were deemed satisfactory.”

Thus, it appears that neither the NRC nor the inspection program of CB&I AREVA MOX Services nor the NNSA are taking responsibility for the proper inspection of installation of certain hardware and components. The expectation that the NRC would inspect all aspects of the construction is evidently incorrect as it is now clear that the NRC’s believes its role to be is limited and does not want any responsibility to inspect any faulty construction that has just come to light.

Given the lack of action by the NRC, the question must be asked if the NRC is attempting to avoid any “intervention” as it wants the responsibility for construction problems and cost related to them to land at the feet of CB&I AREVA MOX Services and/or the NNSA.

Packaging of Plutonium as Waste Set to Resume at SRS

On October 17, 2011, SRS approved an Interim Action Determination entitled “[Disposition of Certain Plutonium Materials Stored at the Savannah River Site](#)” in which the downblending of approximately 500 kilograms of surplus non-MOXable plutonium for shipment to the Waste Isolation Pilot Plant was authorized.

Under that determination, SRS mixed about 100 kilograms of plutonium with an inert “termination of safeguards” material called “stardust” and packaged the plutonium into containers for shipment to the now-closed Waste Isolation Pilot Plant (WIPP) in New Mexico. Until now, the public has not been fully informed about how many containers this packaging entailed.

On the SRS tour on March 25, officials from both DOE and Savannah River Nuclear Solutions confirmed that the 100 kilograms on plutonium has been packaged into 700 containers, called “pipe overpack containers” (POCs). A POC, which contains about 150 grams of plutonium, is inserted in a 55-gallon drum for disposal in WIPP.

Of those 700 containers, 409 had been shipped to WIPP (and some still remain on the surface at the WIPP facility) and 291 are in storage in the E-Area at SRS, where other transuranic (TRU) waste is stored awaiting shipment to WIPP. The 291 drums are stored in large concrete culverts on a designated storage pad (containing no other TRU waste), with 14 drums per culvert stacked in two layers of 7 each.



Photo: concrete culverts stored on a special pad in E-Area, containing 291 “pipe overpack containers” of blended plutonium - shown to SRS tour participants on March 25, 2015; photo by GA WAND

The POCs are stored on a separate, covered pad than other TRU waste. Even though safeguards on the blended plutonium have been terminated, rendering the material to be simply transuranic waste (TRU), it was decided to isolate the drums in storage but it appeared that no special security is provided for them. (According to DOE in the [Draft Surplus Plutonium Disposition Supplemental Environmental Impact Statement](#), July 2012, page S-14, packaging efforts for the “WIPP Alternative, provide protection from theft, diversion, or future reuse in nuclear weapons akin to that afforded by the Spent Fuel Standard.”)

Members of the March 25 tour were allowed to see the stored POCs and were also shown a new drum containing a POC and were also shown a drum containing a “criticality overpack container” (CCO), which can hold around 300 grams of blended plutonium, thus requiring fewer such packages and lower cost in transport and dumping at WIPP (If WIPP ever reopens and receives the containers). The CCO has an NRC license but no permission to go into the WIPP facility.

SRS officials stated on the tour that about 100 POCs and 300 COCs are stockpiled for possible future use.



Photo: SRS tour participants are shown a new “pipe overpack container” and a “criticality control overpack” by DOE officials, March 25, 2015; photo by GA WAND

DOE officials have confirmed that SRS aims to start packaging of COCs around October 2015. The packaging would take place in the single glove box in the K-Area and would be of plutonium removed from 3013 cans that have destructively been analyzed for the status of both the container and the plutonium it contains.

SRS currently stores about 12.8 metric tons of plutonium, in 3013 cans placed inside a large 9975 shipping drum. SRS does not have the ability to weld closed new 3013 cans when the older 3013 containers are destructively analyzed, so the plutonium from the older cans provides a ready stock of material to be packaged into COCs.

Preparation of a “documented safety analysis” (DSA) on the CCO packaging proposal is under way. A single COC would contain two cans of plutonium blended with the mysterious “stardust” to less than 10% plutonium. As 485 kilograms remain that can be packaged under the “interim action determination,” that amount could be packaged this way in K-Area. If the COC does not gain approval to go into WIPP, the two cans could be removed and each placed in a POC.

With use of only one glovebox, it would take a lengthy period of time to package 4.2 metric tons of non-MOXable plutonium stored in K-Area, so the effort to package COCs is rather to demonstrate it can be done and to show that DOE is moving forward with plutonium disposition. Evidently no funds will be requested in Fiscal Year 2017 to expand plutonium-packaging glovebox capability at SRS and a decision on that will only be made after DOE delivers its plutonium disposition reports to Congress and after Congress decides on the fate of the failed MOX program and plutonium disposition in general.

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