

**Background:**

The NAC Chairman determined that a visit to review the MOX project was warranted as part of our charter in response to the recent proposal by the Department of Energy National Nuclear Security Administration (DOE NNSA) to terminate the MOX project. The NNSA is the organization within the DOE responsible for the MOX project. The purpose of this visit was to ascertain the condition of the project because of its importance to the State of South Carolina's interest in achieving progress in removing weapons grade plutonium stored in the state as well as ensuring that no adverse actions affect our economic opportunities and employment. This visit was followed by a later conference call with DOE NNSA to review the status of the DOE plutonium disposition program and the rationale for the consideration of a proposed alternative currently known as "dilute and dispose". The results from the MOX site visit and the conference call are detailed below.

**Visit to Savannah River MOX Facility**

Accompanying Mr. Lee on the visit on August 29, 2017 were two additional members of the NAC: Mr. Jim Little, the industry representative on the Council and South Carolina Representative Sylleste Davis, the House representative. The series of meetings lasted six hours and included discussions with the DOE NNSA and the project contractor, CBI-Areva. Mr. Lee had requested an agenda comprised of three activities: separate status reviews of the project by NNSA and the contractor, CBI-Areva, and a tour of the facility. In recognition of the potential for conflicting opinions between the NNSA and CBI-Areva, we requested to interview the NNSA and CBI-Areva separately to assure candid responses to questions without the risk of disputes during the interviews. The first activity was a briefing by the NNSA without the presence of CBI Areva MOX Services (CBI-Areva). This was followed by a walking inspection of the MOX building with the NNSA and CBI-Areva. The final portion of the tour was a briefing by CBI-Areva without the presence of the NNSA.

All parties were very generous with their time and attempted to answer any and all questions put forth by members of the NAC. We attempted to ask the same questions of the NNSA and CBI-Areva for the purpose of gathering information and views of both parties for comparison and evaluation. There are clear limitations as to what can be ascertained in only a 6-hour discussion. However, we applied the many years of nuclear industry, construction and utility experience of the three members who attended the tour collectively to evaluate the information we were provided.

## Observations:

1. The MOX project is currently significantly behind schedule and over budget with little clarity as to causes or interrelationships in either category. To-date, the American Taxpayer has invested \$5B in the MOX facility. The NNSA and CBI-Areva positions regarding cost and schedule for the MOX project are so far apart that it is unlikely that any agreement on cost and schedule will occur without outside intervention. This impasse currently leaves the State of South Carolina without a timely solution for the disposition of plutonium stored in the state and the potential for serious economic impact to the state's economy arising from the potential termination of the project.
2. A true evaluation of the MOX project cost and schedule is hampered by a mixture of political objectives, reduced congressional appropriations, disagreements at the site, conflicting claims, inconsistent methods of evaluation and a lack of agreed upon performance data.
3. There is a significant issue that has emerged as a result of a DOE NNSA decision to change an accounting assumption for the project. This accounting change is the major contributing cost factor in DOE NNSA's assertion that an additional \$12 billion and a total of 31 years would be required to complete the project ending in 2048.

In 2012, the DOE NNSA for the first time, mandated that the lifecycle cost analysis for MOX must include a 4% inflation rate each year of operation as part of the calculations to determine the re-baselining costs and schedule. This new accounting method coincided with the decision by DOE NNSA to seek alternatives to the MOX project using other methods of treatment or disposal. In the 2012 partial re-baselining of the MOX project there were actually three estimates produced. The required 4% inflation rate model was named the "Boundary Estimate". The Corps of Engineers performed their re-baselining estimate using varying industry rates of inflation by category such as labor, equipment, materials and the likes. According to CBI-Areva, they performed a re-baselining using a 2.3% inflation rate relying on industry indices often used in capital projects of a similar size and nature.

The net effect of using a 4% inflation rate and using the DOE stipulated fixed amount of \$350 million per year in project funding to calculate the cost and schedule to complete is very significant. Each year 4% of the \$350 million in fixed funding would be consumed by inflation. For illustration purposes consider that after 10 years nearly 48% (including compounding) of the \$350 million in funding is consumed by inflation leaving only about \$175 million to build the project in purchasing power using today's dollars. The loss of funding to the 4% accounting practice means there is less money to perform work. That in turn pushes out the schedule and makes the impact of the 4% inflation rate even

more significant as each year passes. There is presently a cost difference between the NNSA "Boundary Estimate" funding model and that of CBI-Areva of \$7B. \$5B of that difference is the effect of the 4% inflation rate DOE NNSA has chosen. The remaining \$2 billion is comprised of three items. First, a \$500 million charge for obsolescence necessitated by the extended completion end date created by the 4% inflation rate. Next a change in production rates for craft employees that the NNSA chose to apply without input from the contractor. Finally, the NNSA only gave the contractor credit for \$296 million of discreet construction work for the years from 2012 to 2016 in spite of the fact that funding for that period was \$1.4 billion. One other effect of the 4% decision mandated by DOE NNSA is to extend the "hotel" costs of CBI-Areva. Hotel costs are those costs that are required to keep CBI-Areva in business such as overheads, fees, administrative support, procurement and other activities. The project Hotel costs also include the cost of the DOE NNSA operations on the project.

These factors have been incorporated into the project's cost estimates rather than being analyzed in a traditional risk analysis and sensitivity study. It is the unusual and new accounting requirement by the DOE NNSA to use the 4% assumption that significantly pushes the schedule for the project towards an additional 31 years – not the execution or performance of the work. This one assumption alone could drive a decision terminate the MOX project.

4. The NNSA is asking Congress to jettison all of the work performed to date on MOX in favor of a new method for plutonium treatment, referred to as dilute-and-dispose. Recommended alternatives to the MOX process for disposing of the plutonium are not yet fully vetted, are not being compared to the MOX process using the same evaluation criteria and may pose risk of failure unless they are evaluated and addressed prior to the termination of the current MOX project. The proposed "dilute and dispose" alternative presents a much slower process (decades). To date the DOE has "down-blended" and shipped a total of only 134 pounds of plutonium using the facilities at Savannah River. DOE NNSA has indicated that they would add additional processing capability (several gloveboxes and multiple shifts) yet these additions do not offer an appreciable improvement and would still require many years of effort to complete.

Adopting the "dilute and dispose" method represents a new scenario with significant exposure to uncertainties such as facility infrastructure, funding sources and availability of disposal venues. Additionally, it will require significant congressional appropriations in the out years and imposes significant additional hotel costs (maintenance, surveillance and security) on the current sites possessing plutonium in addition to Savannah River.

5. The issues with the MOX project itself are primarily related to project execution rather than technology. The MOX process represents a proven commercialized method of converting plutonium into energy for commercial use and represents an economic value potential of greater than \$50 billion. The potential for MOX production represents an important part of the United States nuclear infrastructure necessary for participation in the global market and to support the efforts for nonproliferation through reduction of the worldwide stockpile of plutonium.
6. Congress has previously mandated in Defense Authorization bills that a re-baselining be performed but the NNSA has yet to comply. An NNSA ordered re-baselining of the cost and time to complete the project has not been fully completed in 10 years or more.
7. Recent actions and interference by NNSA at the local level have hampered the contractor by imposing restrictions and requirements beyond those provided for in the congressional appropriations. Requirements for NNSA review of engineered equipment purchase orders in excess of \$150,000 and \$500,000 for consumables have been imposed. These limits are ones that can be used efficiently but only when there is a timely review by the DOE NNSA. Additionally, the effects of the Managing to Termination policy has driven the NNSA to delay or deny requisitions as a means of conserving funds in accordance with their present policy of expecting the MOX project to be terminated.
8. The MOX project offers significant employment and commerce to South Carolinians as well as citizens from other states. A stoppage of the MOX project will result in significant loss of jobs and uniquely qualified personnel and make restarting the project very difficult. A reprogramming of the NNSA proposed “dilute and dispose” approach to the surplus plutonium may take years and significant effort to define and secure Congressional approval while providing little assurance to South Carolina of progress towards the conversion and removal of plutonium from the State for many years.
9. The DOE NNSA asserts that only \$30 million of the \$340 million appropriated for MOX in FY17 is actually being used for construction. They state that the balance is used for non-direct construction activities. Our observations of the level of activity and work under installation does not support such a claim.
10. Following the policy decision by the DOE NNSA to work towards cancellation of the MOX facility, we see little evidence of efforts on their part to support the contractor and find solutions to schedule or cost issues.

## Review of NNSA DOE Plutonium Disposition Program

We subsequently held a detailed conference call with representatives of DOE NNSA to separately review the status of the proposed “dilute and dispose” program. From our detailed discussion we heard the following:

1. The decision to consider an alternative to the current MOX project is primarily related to competing needs for budget within NNSA. The NNSA states that after years of effort on the MOX project that the DOE NNSA can no longer afford the level of spending necessary to implement the plutonium disposition program as originally envisioned. The DOE states that the annual level of effort is approximated, for the entire DOE plutonium disposition program, at a level of \$ 800 million to \$1 billion per year of operation including both MOX and support operations. The DOE has competing mission requirements that require funding. The DOE is under pressure to repair/maintain the facilities in the DOE complex as well as upgrade the DOD nuclear warheads and bombs. The appropriations from Congress will not support all three enterprises.
2. It was stated that the current MOX project is technically feasible and a viable option for disposition of the plutonium.
3. The DOE NNSA indicated that the preparation of a detailed program was indeed necessary to proceed and is underway with completion and an independent review being forecasted by mid FY18.
4. The ‘dilute and dispose’ approach represents an alternative that, according to the DOE would require less annual levels of budget, and would utilize existing site infrastructure. Processing the plutonium materials as waste results in a simpler process than required to produce reactor fuel. It was noted that this reduction in required budget would cause a significant lengthy period of time (20 to 30 years) to complete. The program would be subject to the same programmatic risk currently affecting MOX such as change of administrations, amendments to regulatory requirements and agreements for disposition of the wastes at the WIPP repository and changing priorities within the DOE
5. With respect to the disposal of down-blended product as wastes at WIPP, the DOE NNSA indicated that there was a favorable regulatory climate within New Mexico; however there needed to be further effort to obtain agreement. In order to meet the disposal limitations within the Land Withdrawal Act, the DOE NNSA was seeking to meet the disposal volume limitations with an interpretation of the volume being the actual waste volumes rather than the volumes of the entire waste packages themselves as is the current practice. Obtaining the necessary approvals is expected to take several years.

6. WIPP is presently over committed for waste disposal and will require permit amendments to receive the material already committed from other DOE sites.

### **Summary of Observations:**

In general, we are concerned about the efforts of the DOE NNSA to cancel the MOX project for three reasons:

- The cancellation of MOX will have significant negative economic impacts on South Carolina
- There are yet many unanswered questions surrounding the DOE NNSA proposed Dilute and Dispose method for mitigating the surplus plutonium,
- The potential cancellation of MOX at this point in time with the undefined status and uncertain success of the proposed Dilute and Dispose methods could make South Carolina the permanent home of the surplus plutonium

DOE has for many years made and reinforced two commitments to South Carolina. The first was to remove the plutonium from our state by 2022 and second to provide near and long term employment for our citizens. On the heels of the loss of V.C. Summer, a shutdown of the MOX project will be a crippling blow to the state economy resulting in a loss of thousands of jobs. If the interests of South Carolina are not preserved, our state could become the permanent depository of weapons grade plutonium but without either the construction jobs for the MOX facility or the 800 - 1000 jobs required for operations of the MOX facility for 20 years to process the 34 tons of weapons grade plutonium.

### **Recommendations:**

Both the NNSA and contractor have vested interests in the positions they advocate. Identifying a method for clearly establishing the actual projected cost and schedule of the MOX project that is free of influence and special interests is the only path to establishing the facts upon which sound public policy decisions can be made.

1. Ensure that the proposed \$350 million level of congressional appropriation remains in place for FY18.
2. Instruct the NNSA to allow the contractor to prudently pursue construction of MOX with all FY18 appropriated funds.

3. Include in the Defense Authorization bill for FY18, a \$5M line item for the performance of a 12 month re-baselining of the MOX project with stipulated due date and associated penalties if not completed.
4. Require the contractor to complete a project baseline and have the Corps of Engineers critique the results. Stipulate the use of 2.3% inflation rate as has been the practice for MOX to date.
5. Ensure that the DOE completes a full life cycle cost analysis of the Dilute and Dispose proposed method including a review of legal or treaty obligations of the United States within the next 6 months. Require a peer group review for accuracy, completeness and inclusion of all relevant costs. Report the results to Congress for consideration during the FY19 budget deliberations.
6. In order to prevent any bias of the results of the studies, specifically exclude the NNSA from influencing the process or results and prohibit all communications other than those requested by the Corps of Engineers, MOX contractor or Dilute and Dispose consultant until the process is complete.
7. Use the information from the re-baselining and alternative method evaluation as the basis for a determination of funding decisions and public policy in FY19