U.S. DEPARTMENT OF ENERGY

National Nuclear Security Administration

Plutonium Disposition: Status of Options Studies

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MATERIAL MANAGEMENT AND MINIMIZATION

CONVERT, REMOVE, DISPOSE

Plutonium Disposition Overview

- The Administration remains firmly committed to the Plutonium Management and Disposition Agreement (PMDA) , the disposition of excess weapon-grade plutonium in both the United States and the Russian Federation, and the removal of plutonium from South Carolina

- With the challenging budget environment and with a lifecycle cost in excess of $30 billion, DOE must critically examine the current MOX approach alongside costs of other potential options to complete the plutonium disposition mission

- To that end, the Secretary established the Plutonium Working Group (PWG) and in April 2014, the PWG issued its preliminary analysis of plutonium disposition options, which included five options
  - Irradiation of MOX Fuel in Light Water Reactors (LWRs);
  - Irradiation of Plutonium Fuel in Fast Reactors;
  - Immobilization (Ceramic or Glass Form) with High-Level Waste;
  - Downblending and Disposal; and,
  - Deep Borehole Disposal.

Options Studies

- The FY 2015 Consolidated & Further Continuing Appropriations Act required DOE submit an independently verified lifecycle cost estimate of two of the five options: the MOX fuel option and the downblend and disposal option
- Due 120 days after enactment (April 15, 2015)
- The National Defense Authorization Act for FY 2015 (NDAA) also required assessment and validation of the Secretary's 2014 plutonium disposition options analysis for disposing of 34 metric tons of weapon-grade plutonium, due September 2015
- DOE tasked Aerospace Corporation, a Federally Funded Research and Development Center (FFRDC), to perform the assessment

Aerospace Study Charter

- Assess and validate the 2014 “Report of the Plutonium Disposition Working Group: Analysis of Surplus Weapon-Grade Plutonium Disposition Options” analysis and findings for the MOX Fuel Approach and Downblend Option

- Independently verify lifecycle cost estimates for both the construction and operation and provide a discussion on continuation of the MOX Fuel Approach and Downblend Option

- The assessment team examined all elements of the cost estimate through the detailed presentations and discussions, considering
  - Use of best practices and industry standard approaches to cost estimating, including cost-risk.
  - Assessment of quality and completeness of program element cost estimating products, for the defined scope of work, relative to other program experience.
  - Review of the data used in the grass-roots estimates, and prior independent cost assessments and analogy-based estimates for omissions and risks.

- The team then conducted a cost-risk assessment of the work scope

Aerospace – Summary of Findings

- MOX Fuel Option at $500 million annual capital funding cap :
  - $17.1 billion project to-go cost and $47.5 billion program to-go cost
  - MOX facility operations start ~2044; ends 2059 or later
  - Program would require $800 million – $1 billion annually during construction and $1 billion – $1.5 billion annually during operations

- Downblend Option at $500 million annual capital funding cap :
  - $17.2 billion program to-go cost
  - Operations start ~2020; ends 2049 or later
  - Program would require $500 – $700 million annually during pit disassembly and conversion operations, then $100 – $300 million annually thereafter through completion of downblending operations
  - MFFF termination costs are included in the life cycle to go estimate.

Aerospace – Summary of Findings, continued

- 2014 PWG cost estimates were done in a manner consistent with best practices and industry standards for cost estimating
- Program-level reserves are underestimated
- For the MOX Fuel Option, the majority of risk is related to the uncertainties in MOX Fuel production, feedstock production rate, MFFF construction, and temporary suspensions of plant operations during production
- The Downblend option is lower in risk than the MOX Fuel option. The largest risk is the uncertainty in the feedstock production rate

Red Team Review

- Given the recent analyses of options, the Department remains concerned about the cost increases associated with our plans to irradiate plutonium as mixed-oxide fuel in nuclear reactors
- The Secretary convened the Red Team to:
  - Evaluate and reconcile previous cost estimates of plutonium disposition options;
  - analyze ways to modify the MOX fuel approach, specifically the MOX facility, to reduce costs, if feasible;
  - and examine how different risk assumptions can impact the total lifecycle cost estimates.
- In addition, the Red Team assessment will analyze:
  - the schedule to begin disposition and complete the 34 metric ton mission;
  - technical viability;
  - the ability to meet international commitments;
  - and regulatory and other issues.
- The Red Team recommendation is due by August 10, 2015

Conclusion

- These studies and independent validation by Aerospace and the Red Team will inform the final policy decision on what disposition path the United States Government will adopt in compliance with the Plutonium Management and Disposition Agreement (PMDA)

- The lifecycle cost is one of the criteria which will be used to select an option

- Other criteria include whether the option is executable within a reasonable timeline and whether it allows the U.S. to meet its international commitments in disarmament and nonproliferation