



U.S. DEPARTMENT OF  
**ENERGY**

# MOX Fuel Fabrication Facility Construction and Operations

Report to Congress  
November 2017

United States Department of Energy  
Washington, DC 20585

## Message from the Secretary

This report for 2016 and 2017 provides information on the Department of Energy's plans concerning the Mixed Oxide Fuel Fabrication Facility in South Carolina, consistent with section 4306 of the *Atomic Energy Defense Act* (50 U.S.C. § 2566).

This report is being provided to the following Members of Congress:

- **The Honorable Paul Ryan**  
Speaker, House of Representatives
- **The Honorable Michael Pence**  
President of the Senate
- **The Honorable Thad Cochran**  
Chairman, Senate Committee on Appropriations
- **The Honorable Patrick Leahy**  
Vice Chairman, Senate Committee on Appropriations
- **The Honorable Lamar Alexander**  
Chairman, Subcommittee on Energy and Water Development  
Senate Committee on Appropriations
- **The Honorable Dianne Feinstein**  
Ranking Member, Subcommittee on Energy and Water Development  
Senate Committee on Appropriations
- **The Honorable John McCain**  
Chairman, Senate Committee on Armed Services
- **The Honorable Jack Reed**  
Ranking Member, Senate Committee on Armed Services
- **The Honorable Deb Fischer**  
Chairman, Subcommittee on Strategic Forces  
Senate Committee on Armed Services
- **The Honorable Joe Donnelly**  
Ranking Member, Subcommittee on Strategic Forces  
Senate Committee on Armed Services
- **The Honorable Rodney Frelinghuysen**  
Chairman, House Committee on Appropriations
- **The Honorable Nita M. Lowey**  
Ranking Member, House Committee on Appropriations

- **The Honorable Michael K. Simpson**  
Chairman, Subcommittee on Energy and Water Development  
House Committee on Appropriations
- **The Honorable Marcy Kaptur**  
Ranking Member, Subcommittee on Energy and Water Development  
House Committee on Appropriations
- **The Honorable William "Mac" Thornberry**  
Chairman, House Committee on Armed Services
- **The Honorable Adam Smith**  
Ranking Member, House Committee on Armed Services
- **The Honorable Mike Rogers**  
Chairman, Subcommittee on Strategic Forces  
House Committee on Armed Services
- **The Honorable Jim Cooper**  
Ranking Member, Subcommittee on Strategic Forces  
House Committee on Armed Services

If you have any questions or need additional information, please contact Jennifer Loraine, Deputy Assistant Secretary for Senate Affairs, Marty Dannenfelser, Deputy Assistant Secretary for House Affairs at (202)-586-5450, or Mr. Joseph Levin, Associate Director of External Coordination in the Office of the Chief Financial Officer, at (202) 586-3098.

Sincerely,



Rick Perry

## Executive Summary

Construction has continued on the Mixed Oxide (MOX) Fuel Fabrication Facility at the Department of Energy's Savannah River Site near Aiken, South Carolina. Construction remains significantly over budget and behind schedule. The MOX production objective was not met in 2015 or 2016 and will not be met in 2017.

The Department of Energy continues to support the mission to dispose of excess weapon-grade plutonium, withdrawn from nuclear weapon programs, so that the plutonium can never again be readily used in nuclear weapons. However, due to the increasing costs of constructing and operating the MOX facility, both the Department's analysis and independent analyses of U.S. plutonium disposition strategies have consistently and repeatedly concluded that the MOX fuel strategy is more costly and requires more annual funding than the dilute and dispose approach. As described in the Fiscal Year 2018 President's Budget, the Administration proposed terminating the MOX project and pursuing the dilute and dispose approach.<sup>1</sup> The dilute and dispose approach refers to the proven methodology of mixing surplus plutonium with an inhibitor prior to disposal, to ensure that the plutonium is not readily recoverable without extensive processing.<sup>2</sup> Consistent with the proposal in the President's Budget and the Explanatory Statement for the *Consolidated Appropriations Act, 2016*, the Department has initiated pre-conceptual design and begun developing a lifecycle estimate for the dilute and dispose approach. In the *Consolidated Appropriations Act, 2017* (P.L.115-31), Congress appropriated construction funding for the MOX Facility and did not authorize transition to the dilute and dispose approach for plutonium previously slated for fabrication into MOX fuel.

The Department will continue to suspend transfers to the Savannah River Site of surplus defense plutonium and defense plutonium materials to be processed at the MOX Fuel Fabrication Facility. The Department is preparing over six metric tons of other plutonium for disposal at the Waste Isolation Pilot Plant (WIPP) in New Mexico, which will remove that plutonium from South Carolina.<sup>3</sup>

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<sup>1</sup> *Budget of the United States Government, Fiscal Year 2018*, Appendix at 374. See also, *Department of Energy FY 2018 Congressional Budget Request, Vol. 1*.

<sup>2</sup> The dilute and dispose approach is referred to by several terms, including "down-blending," "dilute," "dilution," or the "WIPP disposal option."

<sup>3</sup> This plutonium was not previously slated for fabrication into MOX fuel. The Department has already shipped some of this weapons-usable plutonium to the Waste Isolation Pilot Plant for disposal.



# MOX FUEL FABRICATION FACILITY CONSTRUCTION AND OPERATIONS

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## I. Legislative Language

The Department of Energy is submitting a report for 2016 and 2017, consistent with section 4306 (a)(3)(A) of the *Atomic Energy Defense Act*, as amended (50 U.S.C. § 2566), concerning the Mixed Oxide (MOX) facility being constructed at the Department's Savannah River Site near Aiken, South Carolina.

Section 4306 (a)(3)(A) states:

*"(a) Plan for construction and operation of MOX facility*

*(3)(A) Not later than February 15 each year, beginning in 2004 and continuing for as long as the MOX facility is in use, the Secretary shall submit to Congress a report on the implementation of the plan [for construction and operation of the MOX facility]."*

Section 4306 (a)(3)(C) states:

*"(C) Each report under subparagraph (A) for years after 2014 shall-*

*(i) address whether the MOX production objective has been met; and*

*(ii) assess progress toward meeting the obligations of the United States under the Plutonium Management and Disposition Agreement."*

Subsections 4306(b)(5) and (6) require the Secretary to undertake certain actions if the MOX production objective has not been achieved under certain specified circumstances. Subsection 4306(b)(5) states:

*"(5) If, after January 1, 2014, the Secretary determines that the MOX production objective has not been achieved because of a failure to achieve milestones set forth in the most recent corrective action plan under this subsection, the Secretary shall suspend further transfers of defense plutonium and defense plutonium materials to be processed by the MOX facility until the Secretary certifies that the MOX production objective can be met."*

Subsection 4306(b)(6) states:

*"(6)(A) Upon making a determination under paragraph (4) or (5), the Secretary shall submit to Congress a report on the options for removing from the State of South Carolina an amount of defense plutonium or defense plutonium materials equal to the amount of defense plutonium or defense plutonium materials transferred to the State of South Carolina after April 15, 2002."*

*(B) Each report under subparagraph (A) shall include an analysis of each option set forth in the report, including the cost and schedule for implementation of such option, and any requirements under the National Environmental Policy Act of 1969 (42 U.S.C.4321 et seq.) relating to consideration or selection of such option.*

*(C) Upon submittal of a report under paragraph (A), the Secretary shall commence any analysis that may be required under the National Environmental Policy Act of 1969 in order to select among the options set forth in the report.”*

Subsection 4306 (h)(1) states:

*“(1) MOX production objective*

*The term ‘MOX production objective’ means production at the MOX facility of mixed-oxide fuel from defense plutonium and defense plutonium materials at an average rate equivalent to not less than one metric ton of mixed-oxide fuel per year. The average rate shall be determined by measuring production at the MOX facility from the date the facility is declared operational to the Nuclear Regulatory Commission through the date of assessment.”*

## II. Status of the MOX Fuel Fabrication Facility, MOX Production Objective

The Department of Energy continued construction of the MOX Fuel Fabrication Facility at the Savannah River Site in South Carolina in 2016 and 2017, as specified in the Explanatory Statements for the *Consolidated Appropriations Act, 2016* and the *Consolidated Appropriations Act, 2017*, and consistent with section 3119 of the *National Defense Authorization Act for Fiscal Year 2016* and section 3116 of the *National Defense Authorization Act for Fiscal Year 2017*.<sup>4</sup> Construction of the MOX Fuel Fabrication Facility remains behind schedule, and the Department did not meet the MOX production objective in 2015 or 2016, and will not meet the MOX production objective in 2017.<sup>5</sup> The Department will continue to suspend transfers of surplus defense plutonium and defense plutonium materials to the Savannah River Site to be processed at the MOX facility.

The Department also plans to submit a report to Congress on options for removing from the State of South Carolina those amounts of defense plutonium or defense plutonium materials transferred to South Carolina after April 15, 2002. In this regard, the Department has decided to prepare over six metric tons of weapons-usable plutonium for disposal at the Waste Isolation Pilot Plant (WIPP) near Carlsbad, New Mexico and has begun shipments of this material to WIPP.<sup>6</sup> This process will remove surplus plutonium from South Carolina and ensure that the surplus plutonium is never again readily used in a nuclear weapon.<sup>7</sup>

The Department has been analyzing alternative options to the MOX fuel approach due to the increasing cost of constructing and operating the MOX facility. The Department's preliminary analysis of alternative U.S. plutonium disposition strategies, the Plutonium Working Group (PWG) *Report on the Analysis of Surplus Plutonium Disposition Options* published in 2014, documented that the current MOX fuel approach is significantly more expensive than anticipated and that options exist that are far more cost efficient.

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<sup>4</sup> 161 CONG. REC. 184, H 9693 *et seq.* at H 10106 (Dec. 17, 2015, 114<sup>th</sup> Cong. 1<sup>st</sup> Sess.), 163 CONG. REC. 76, Book II, H3327 *et seq.* at H3753 (May 3, 2017, 115<sup>th</sup> Cong. 1<sup>st</sup> Sess., P.L. 114-92 (Nov. 25, 2015), and P.L. 114-328 (Dec. 23, 2016), respectively.

<sup>5</sup> Construction of the MOX facility is behind the schedule previously submitted to Congress under section 4306(g) of the *Atomic Energy Defense Act*.

<sup>6</sup> This plutonium was not previously slated for fabrication into MOX fuel. To date, DOE has down-blended 71 kilograms (kgs) — .071 metric tons — of surplus, weapons-usable plutonium, shipped 61 kgs (.061 metric tons) of down-blended plutonium to WIPP, and shipped approximately 10 kgs (.010 metric tons) to other sites outside of South Carolina for use in other DOE programs.

<sup>7</sup> In addition to a series of "Interim Action" decisions to prepare certain plutonium for disposal at WIPP, the Department issued a Record of Decision in March 2016 to prepare six metric tons of surplus plutonium for disposal at WIPP. That plutonium will be placed in the appropriate queue of waste to be shipped to WIPP for disposal. 81 F.R.19588 (Apr. 5, 2016).



In 2015, consistent with congressional direction, the Department tasked Aerospace Corporation, a federally funded research and development center, to conduct an independent assessment of the PWG report.<sup>8</sup> Also, on June 25, 2015, the prior Secretary of Energy commissioned a Red Team, led by Dr. Thomas Mason, then Director of the Oak Ridge National Laboratory, to assess options that would enable the Department to accomplish the mission of surplus plutonium disposition. These reviews have consistently concluded that the projected lifecycle costs of the MOX fuel approach will be in the range of \$50 billion or more, and would require congressional appropriations of \$800 million to \$1 billion annually, which is far in excess of the recent congressional funding profile. This level of funding would be needed for decades through the life of the MOX fuel program and would not result in the disposition of any plutonium until the late 2040s. Even that assumption is at risk, given that no utility has yet made a commitment to use MOX fuel. In August 2016, the Department's Office of Project Management Oversight and Assessments (PM), partnering with U.S. Army Corps of Engineers, developed and submitted an updated performance baseline estimate for the project. Assuming a \$350 million annual funding profile, PM estimated a total project cost of \$17.2 billion and a construction completion date of 2048.

The results of these analyses have showed that the dilute and dispose approach is far more cost efficient and holds lower technical risk than the MOX fuel method for the disposition of surplus weapons-usable plutonium. The proposed dilute and dispose approach would use proven methodologies to mix surplus plutonium with an inhibitor prior to disposal, to ensure that the plutonium is not readily recoverable without extensive processing.<sup>9</sup>

In the fiscal year (FY) 2018 President's Budget, the Administration proposed terminating the MOX project and pursuing the dilute and dispose approach.<sup>10</sup> The Explanatory Statements for the *Consolidated Appropriations Act, 2016* and the *Consolidated Appropriations Act, 2017* specified certain appropriated funds for the Department to advance further planning, complete conceptual design activities for the dilute and dispose alternative, and to develop and submit to Congress a report that includes an evaluation of program risks and a lifecycle cost estimate and schedule for the alternative. The Department has initiated the pre-conceptual design and begun developing a lifecycle estimate that, under the Department's plans, will be independently validated in FY 2019 for the dilute and dispose approach. At this time, Congress has appropriated construction funding for the MOX facility and has not authorized transition to the dilute and dispose approach. Therefore, the Department has not terminated the MOX program. Any decision to terminate the MOX program will be made in accordance with statutory requirements.

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<sup>8</sup> This direction was included in the *Carl Levin and Howard P. "Buck" McKeon National Defense Authorization Act for Fiscal Year 2015* (P.L. 113-291 (Dec. 19, 2014)).

<sup>9</sup> The dilute and dispose approach is the approach referred to by several terms, including "down-blending," "dilute," "dilution," or the "WIPP disposal option."

<sup>10</sup> *Budget of the United States Government, Fiscal Year 2018*, Appendix at 374. See also, *Department of Energy FY 2018 Congressional Budget Request, Vol. 1*.

### III. Conclusion

Construction of the MOX Fuel Fabrication Facility has continued in FY 2016 and FY 2017, as specified by the Explanatory Statements for the *Consolidated Appropriations Act, 2016*, and the *Consolidated Appropriations Act, 2017*, and consistent with section 3119 of the *National Defense Authorization Act for FY 2016* and section 3116 of the *National Defense Authorization Act for FY 2017*. The MOX production objective was not met in 2015 or 2016, and will not be met in 2017. Construction of the MOX Facility remains behind schedule.

The Department will continue to suspend transfers of defense plutonium and defense plutonium materials to be processed at the MOX Facility. The Department also plans to submit a report to Congress on options for removing from the State of South Carolina those amounts of defense plutonium or defense plutonium materials transferred to South Carolina after April 15, 2002, and has begun removing plutonium (not slated for MOX fuel) from South Carolina for disposal at WIPP.

Regarding the surplus plutonium intended for disposition under the MOX fuel approach, the Department has undertaken several efforts to analyze and independently assess options for surplus plutonium disposition. These analyses confirm that the MOX approach is significantly more costly and complex than the dilute and dispose approach. As described in the FY 2018 President's Budget, the Administration proposed terminating the MOX project and pursuing the dilute and dispose approach. Consistent with that proposal and the Explanatory Statements for the *Consolidated Appropriations Act, 2016*, and the *Consolidated Appropriations Act, 2017*, the Department has initiated the pre-conceptual design and begun developing a lifecycle estimate for the dilute and dispose approach. At this time, Congress has appropriated construction funding for the MOX Facility and has not authorized transition to the dilute and dispose approach for plutonium that the Department previously decided to fabricate into MOX fuel.

The Department of Energy continues to support and make progress toward disposing of excess weapon-grade plutonium, withdrawn from nuclear weapon programs, so that the plutonium can never again be readily used in nuclear weapons.



Department of Energy  
National Nuclear Security Administration  
Office of the General Counsel  
P. O. Box 5400  
Albuquerque, NM 87185



JAN 14 2018

Mr. Steven Aftergood  
Federation of American Scientists  
1112 16<sup>th</sup> Street NW  
Suite 400  
Washington, DC 20036

Dear Mr. Aftergood:

This letter is the final response to your December 22, 2017 Freedom of Information Act (FOIA) request for the following:

A copy of a November 2017 DOE report to Congress entitled "MOX Fuel Fabrication Facility Construction and Operations."

Your request was initially sent to the Department of Energy Headquarters Office (DOE HQ). DOE HQ transferred the request to this office and was received on January 8, 2018.

We contacted the National Nuclear Security Administration's Office of Acquisition & Project Management (NA-APM) about your request. NA-APM searched and did not locate records responsive to your request.

We contacted the National Nuclear Security Administration's Office of Deputy Administrator for Defense Nuclear Nonproliferation (NA-20) about your request. NA-20 searched and located the enclosed document responsive to your request. The document has been reviewed and is being provided in its entirety.

- MOX Fuel Fabrication Facility Construction and Operations - Report to Congress November 2017

This decision, as well as the adequacy of the search, may be appealed within 90 calendar days from your receipt of this letter pursuant to 10 C.F.R. § 1004.8. Appeals should be addressed to Director, Office of Hearings and Appeals, HG-1, L'Enfant Plaza, U.S. Department of Energy, 1000 Independence Avenue, S.W., Washington, D.C. 20585-1615. The written appeal, including the envelope, must clearly indicate that a FOIA appeal is being made. You may also submit your appeal to [OHA.filings@hq.doe.gov](mailto:OHA.filings@hq.doe.gov), including the phrase "Freedom of Information Appeal" in the subject line. The appeal must contain all of the elements required by 10 C.F.R. § 1004.8, including a copy of the determination letter. Thereafter, judicial review will be available to you in the Federal District Court either: 1) in the district where you reside; 2) where you have your principal place of business; 3) where DOE's records are situated; or 4) in the District of Columbia.

You may contact DOE/NNSA's FOIA Public Liaison, Jane Summerson, Acting Director, Office of General Counsel, at 866-747-5994, or by mail at Department of Energy, National Nuclear Security Administration, Office of the General Counsel, P.O. Box 5400, Albuquerque, NM 87185 for any further

Mr. Steven Aftergood

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assistance and to discuss any aspect of your request. Additionally, you may contact the Office of Government Information Services (OGIS) at the National Archives and Records Administration to inquire about the FOIA mediation services they offer. The contact information for OGIS is as follows: Office of Government Information Services, National Archives and Records Administration, 8601 Adelphi Road-OGIS, College Park, Maryland 20740-6001, e-mail at [ogis@nara.gov](mailto:ogis@nara.gov); telephone at 202-741-5770; toll free at 1-877-684-6448; or facsimile at 202-741-5769.

There are no charges to you for processing your FOIA request.

If you have questions, please contact Ms. Kari Martinez by e-mail at [kari.martinez@nnsa.doe.gov](mailto:kari.martinez@nnsa.doe.gov) or write to the address at the top of the first page. Please reference Control Number FOIA 18-00076-KM.

Sincerely,



Jane Summerson  
Authorizing and Denying Official

Enclosures