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Office of Inspector General
Office of Audits and Inspections

AUDIT REPORT

Enriched Uranium Operations at the Y-12
National Security Complex

DOE-OIG-16-13

July 2016



Department of Energy
Washington, DC 20585

July 14, 2016

MEMORANDUM FOR THE SECRETARY

A handwritten signature in blue ink, appearing to read "Rickey R. Hass".

FROM: Rickey R. Hass
Acting Inspector General

SUBJECT: INFORMATION: Audit Report on "Enriched Uranium Operations at the Y-12 National Security Complex"

BACKGROUND

The Y-12 National Security Complex (Y-12) performs critical elements of the National Nuclear Security Administration (NNSA) mission to ensure the safety, reliability, and performance of the Nation's nuclear weapons deterrent. Specifically, Y-12 processes enriched uranium for NNSA's defense programs, such as weapons life extension programs, and maintains the Nation's strategic reserve of enriched uranium. Y-12's enriched uranium processing capability is housed in multiple facilities: building 9212 and its related facilities, collectively known as the 9212 complex, and building 9215 and its associated facilities, known as the 9215 complex. The structures were built decades ago and do not meet modern nuclear facility design requirements. Production equipment is also aged and has experienced maintenance and reliability issues. Enriched uranium analytical operations rely on capabilities within building 9995 to execute programmatic mission work. Additional enriched uranium operations (EUO) are performed in building 9204-2E, which is newer and in better condition than the 9212 and 9215 complexes.

Due to the condition of the buildings and equipment, serious concerns about the future reliability of the facilities have been raised by NNSA and the Defense Nuclear Facilities Safety Board. As a result, NNSA originally planned to construct the Uranium Processing Facility (UPF) to house all EUO at Y-12. The UPF was planned to be operational in 2018; however, Y-12 reported that full operations are now not likely to occur until 2025, and UPF will not replace all of the capabilities currently housed in the 9212 complex. The remaining needed operational capability is planned to be located in existing facilities designated as bridging or enduring facilities. Given the concerns regarding Y-12's current enriched uranium capability, we performed this audit to determine whether current EUO facilities at Y-12 will meet NNSA mission needs until new facilities are available. In particular, we focused our audit on the 9212 and 9215 facilities.

RESULTS OF AUDIT

We found that Y-12 may not be able to continue to meet NNSA mission needs in its existing, aging facilities. For example:

- At 70 years old, the 9212 complex has reached the end of its life. Although Y-12 recently completed critical upgrades to the 9212 complex to reduce risk through 2021, critical operations at the facility are now projected to continue through 2025. Y-12 performed a Facility Risk Review, which identified the risks of continued operations in the 9212 complex through 2021. Using this review, Y-12 implemented the Nuclear Facility Risk Reduction Project, which included several facility upgrades, and conducted other maintenance tasks. While these actions addressed potential risks through 2021, a Y-12 official told us that no additional upgrades were planned to ensure continued operations after that date. Y-12 also developed a strategy for EUO that included monitoring operations and taking further action as necessary.
- Y-12 plans to move some 9212 complex operations into the 9215 complex, which is also old and in need of upgrades. Y-12 initially planned to conduct EUO in the 9215 complex through 2030, but a recent long-term strategy identified continued operations into the 2030s; however, this strategy has not been planned or funded. Y-12 performed a Facility Risk Review to determine upgrades necessary to ensure operations through 2030. Although a major project was proposed as a result of the review, it was replaced with a series of smaller projects.
- Both the 9212 and 9215 complexes have significant and steadily increasing deferred maintenance. In fact, during the most recent Facility Condition Assessment, an activity which provides facility condition and deferred maintenance information to NNSA, Y-12 identified deferred maintenance totaling more than \$39.4 million for the 9212 and 9215 complexes. We also noted that not all maintenance items were included in this amount. In particular, we noted that complete maintenance data was not available because it was tracked in multiple information systems that were not integrated. Thus, we could not determine, and Y-12 could not tell us, the full extent of maintenance required to sustain continued EUO.

NNSA and Y-12 learned that UPF's completion date was delayed in 2010, and NNSA adjusted UPF's projected completion date at that time. However, plans for the overall EUO strategy were not adjusted until 2014, 4 years later. NNSA expected to continue operations in the current facilities until UPF's planned completion. However, UPF milestones began slipping as early as 2010. To address schedule and funding constraints, NNSA reduced the scope of UPF, which is now planned to be operational in 2025. In 2014, NNSA developed a strategy to continue EUO in the 9212 complex until UPF is completed. Transition of EUO from the 9215 complex and other facilities is not currently planned or funded.

Regarding maintenance, the deferred amounts continued to increase due to competing budget priorities and because Y-12 did not request funding for all identified maintenance work. Y-12 told us that it had prioritized funding so that resources were only requested for tasks deemed necessary to continue operations. We recognize this approach was prudent given current budget realities. However, as noted previously, the total amount of deferred maintenance reported to NNSA was not fully accurate due to the various maintenance tracking systems not being integrated. According to Y-12, the maintenance tracking systems were not integrated due to a lack of resources.

In April 2014, an NNSA-directed review team issued a report identifying potential alternatives to UPF that would replace the 9212 complex critical capabilities by 2025. The report noted that the delays with UPF necessitated the ongoing use of the 9215 complex for up to 25 years. To enable this strategy, the team stated that a number of actions were necessary, including reinvestment in the aging equipment, which had significant deferred maintenance and unacceptable downtime. Further, the report noted that it would be “extraordinarily difficult” to complete the alternatives to UPF by 2025. In May 2015, a peer review of NNSA’s Uranium Program found that good progress had been made in implementing the 2014 review’s recommendations. Specifically, investment in the 9215 complex had increased to help address long-term needs. However, the report also noted that in spite of positive indications, significant threats exist regarding funding availability, changing design and safety requirements, and evolving program requirements.

We noted that not all of the potential significant risks were fully addressed by NNSA and Y-12. In particular, if the gap between Y-12’s mitigating actions and transition of operations from the 9212 complex to UPF is not addressed, there is a potential risk that a maintenance event may significantly affect production or that a safety event could endanger personnel. Further, these risks also exist while operations continue in the 9215 complex. Thus, failure to take action could affect Y-12’s ability to meet mission requirements. Also, if maintenance needs are not accurately reported, NNSA’s decisions regarding prioritization of tasks and allocation of resources will be based on inaccurate assumptions.

As previously noted, Y-12 completed the Nuclear Facility Risk Reduction Project in January 2015, which included several upgrades to the 9212 complex. Also, NNSA told us that it would discontinue operating the facilities if it was determined that they were unsafe. We recognize that actions have been taken, and we acknowledge management’s assertion. However, given that circumstances have changed since NNSA developed its initial plans and UPF’s history of schedule slippages, in our opinion, it would be prudent to perform further analyses to determine whether additional actions are warranted to address the timeframe until EUO are transitioned out of the current facilities. As such, we made several recommendations designed to strengthen Y-12’s planning for future EUO.

MANAGEMENT RESPONSE

NNSA management agreed with our recommendations and stated that action already had been taken to fully address three of the four recommendations and corrective action for the fourth was already well underway. Management noted that because the audit activities largely concluded 1 year ago, they did not think the information presented in the draft report adequately reflected the depth and breadth of steps NNSA had taken in the last 2 years. In particular, management stated that NNSA had increased maintenance and recapitalization funding to halt the growth of deferred maintenance. For example, management stated that during fiscal years (FYs) 2018–2020, an additional \$27 million of recapitalization and \$11 million in maintenance funds will be devoted to building 9215 as part of the Nuclear Facilities Electrical Modernization Project. Further, management stated that it was taking action to significantly reduce uranium inventories and associated risks in buildings 9212 and 9215. Management stated that it was enhancing maintenance on key building 9212 systems, upgrading equipment to increase reliability, and relocating several building 9212 capabilities into existing facilities. Finally, management stated

that it acted to ensure complete, accurate, and consistent reporting of maintenance data by Y-12 and all NNSA sites through standardized definitions for preventative, corrective, and deferred maintenance and, beginning in FY 2016, requiring sites to report direct and indirect maintenance spending on a monthly basis.

We did not verify the effectiveness of management's reported actions, which were beyond the scope of our audit.

We acknowledge that management has taken actions to address many of the issues identified in our report since the completion of our fieldwork. During the 5 months it took management to provide a formal response to our draft report, we updated the report as management provided additional information. Further actions taken by management are noted in its formal comments, which are included in their entirety in Appendix 3. We considered NNSA's response and planned actions to be responsive to our recommendations.

Attachments

cc: Deputy Secretary
Administrator, National Nuclear Security Administration
Chief of Staff

ENRICHED URANIUM OPERATIONS AT THE Y-12 NATIONAL SECURITY COMPLEX

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ENRICHED URANIUM OPERATIONS AT THE Y-12 NATIONAL SECURITY COMPLEX

BACKGROUND

The Y-12 National Security Complex (Y-12) processes enriched uranium for the National Nuclear Security Administration (NNSA) defense programs, such as weapons life extension programs, and maintains the Nation's strategic reserve of enriched uranium. Y-12's enriched uranium processing capability is housed in multiple facilities: building 9212 and its related facilities, collectively known as the 9212 complex, and building 9215 and its associated facilities, known as the 9215 complex. The structures were built decades ago and do not meet modern nuclear facilities design requirements. Production equipment is also aged and has experienced maintenance and reliability issues. Enriched uranium analytical operations rely on capabilities within building 9995 to execute programmatic mission work. Additional enriched uranium operations (EUO) are performed in building 9204-2E, which is newer and in better condition than the 9212 and 9215 complexes.

Due to the condition of the buildings and equipment, serious concerns about the future reliability of the facilities have been raised by NNSA and the Defense Nuclear Facilities Safety Board. As a result, Y-12 performed Facility Risk Reviews (FRRs), which identified the risks of continued operation in the 9212 and 9215 complexes and actions necessary to address these risks. Using the results of the FRRs, Y-12 planned several improvements to extend safe operations.

In addition, NNSA planned to construct the Uranium Processing Facility (UPF) to house all EUO at Y-12. In 2007, NNSA projected UPF would be operational by 2018, but the project experienced delays. As a result, due to high cost and schedule concerns, NNSA reduced the scope of UPF and now plans to move many of the EUO performed in the 9212 complex to UPF by 2025. The remaining EUO in the 9215 complex and other facilities have been removed from UPF plans, and no plans or funding exist to address the transition of operations out of these facilities.

ENRICHED URANIUM OPERATIONS

The current EUO facilities at Y-12 may not be able to reliably meet long-term NNSA mission needs. For example, Y-12 implemented the Nuclear Facility Risk Reduction (NFRR) Project, which included several upgrades to the 9212 complex. However, NNSA plans to continue EUO in the 9212 complex for 4 years beyond the intended life of some of the upgrades made to ensure continued operations. Y-12 also plans to move some EUO into the 9215 complex and continue operations into the late 2030s, but this facility is also aged and in need of upgrades. Further, management told us that both the 9212 and 9215 complexes have significant amounts of deferred maintenance, which has steadily increased. We noted that complete maintenance data was not available because it was tracked in multiple information systems that were not integrated.

Although NNSA adjusted UPF's projected completion date in 2010, NNSA and Y-12 did not adjust plans for the overall EUO strategy until 2014. This delay contributed to the EUO transition issues identified above. While a plan developed in 2014 calls for EUO to transition

from the 9212 complex into UPF by 2025, we noted that operations in the 9215 complex and other facilities will not transition to UPF, and there is currently no plan to end operations in these facilities.

Regarding maintenance, the amounts of deferred maintenance continued to increase due to competing budget priorities and because Y-12 did not request funding for all identified maintenance work. Also, according to Y-12, the maintenance tracking systems were not integrated due to a lack of resources. Thus, if the gap between Y-12's mitigating actions and transition of operations from the 9212 and 9215 complexes is not addressed, there is a potential risk that a maintenance event may significantly affect production or that a safety event could endanger personnel and the public. Finally, if maintenance needs are not accurately reported, NNSA's decisions regarding prioritization of tasks and allocation of resources may be based on inaccurate assumptions.

9212 Complex

Y-12 plans to continue EUO in the 9212 complex beyond the intended life of some of the upgrades made to ensure continued operations. Specifically, current plans require critical EUO to continue in the 9212 complex until 2025 even though the facilities were upgraded to ensure continued operations only through 2021. A Y-12 official told us that Y-12 conducts activities in the 9212 complex, including material accountability, recovery, and recycling of enriched uranium materials (including solutions, oxides, and metal); production of purified metal; and the interim storage of enriched uranium. The 9212 complex includes 15 various support and storage facilities. All of the facilities are hazard category 2; as such, they contain sufficient quantities of radioactive and chemical materials that an unmitigated release would result in significant consequences. However, they do not meet current safety requirements for such facilities in that they could not withstand a seismic event, high wind event, or aircraft crash.

Primarily due to the 9212 complex's age and condition, Y-12 planned to consolidate EUO into UPF by 2018. However, UPF's anticipated completion date slipped, and the Defense Nuclear Facilities Safety Board raised concerns about the safety of continued operations in the 9212 complex. In response, Y-12 conducted an FRR of the 9212 complex in fiscal year (FY) 2006, which identified upgrades necessary to maintain operations until EUO could be fully transitioned to UPF by 2021. Based on the results of the FRR, Y-12 planned the NFRR Project, which was completed in January 2015, and other maintenance tasks to reduce the risk of failure of infrastructure utility systems, structures, and components in Y-12 facilities by implementing capital modifications necessary to ensure continued safe operations in the 9212 complex and other facilities.

While the NFRR Project addressed potential risks through 2021, a Y-12 official told us that no additional upgrades were planned to ensure continued operations after that date. Instead, Y-12 planned to continue monitoring operations and taking further action as necessary. For example, Y-12 established the Continued Safe Operating Oversight Team to provide independent safe oversight of the 9212 complex and inform management if the risk for continued safe operations was no longer acceptable. If such a condition materialized, NNSA told us that it would be corrected or operations would be discontinued. In addition, to address the risks associated with a

potential seismic event, high wind event, or aircraft crash, which management considered to be unlikely, Y-12 implemented controls to mitigate consequences of such occurrences. Specifically, Y-12's Emergency Management Program and training procedures identify appropriate actions for personnel to take to provide the safest possible environment during such an event. Further, Y-12's documentation stated that the inventory of hazardous materials in the 9212 complex was controlled to reduce the consequences of such incidents and that maintenance on the facility and its equipment would continue to be performed.

In addition, a Y-12 official stated that to reduce operational risk in 9212, a series of integrated measures are underway. Management asserts these measures reduce material at risk in 9212 while reducing the operational demand upon aging systems within the process building. There is a project that focuses on reducing the inventory of enriched uranium materials in 9212 and prioritizes removal of those that most significantly affect the material at risk. We were informed installation of a calciner in 9212 would provide an alternate disposition path for low equity enriched uranium materials reducing demand upon many of the aging downstream processes while complementing the installation of an electrorefiner in 9215. These two actions, to be completed by 2021, enable suspension of some of the higher hazard operations in 9212. Relocation of the radiography process from 9212 to 9204-2E would reduce the operational footprint in the 9212 complex. Relocation of chip cleaning would further reduce the operational footprint. These actions comprise significant parts of an integrated strategy to successfully transition mission critical capabilities into existing facilities and the new UPF.

We recognize the actions management has taken to address the risks to continued operations in the 9212 complex; however, given the history of UPF schedule slippages, in our opinion, it would be prudent to perform further analyses to determine whether additional upgrades are warranted.

9215 Complex

Due to issues with the continued use of the 9212 complex, Y-12 planned to move some EUO into the 9215 complex in 2019, although this facility is also aged and in need of upgrades. The 9215 complex includes four buildings, and its operations primarily support various weapons life extension programs. Specific activities include metal forming and machining operations for highly enriched uranium, low enriched uranium, and depleted uranium. Even though the 9215 complex is similar to the 9212 complex in hazard category and construction type, Y-12 management told us that the 9215 complex is not as degraded as the 9212 complex because its operations were less damaging. Although we agree that is the case, we noted that the 9215 complex is anticipated to continue operations longer than expected due to the reduction in UPF's scope. In fact, Y-12 now anticipates EUO in the 9215 complex will likely continue into the late 2030s, including some operations currently performed in the 9212 complex. In 2039, the facility will be approximately 11 years older than the 9212 complex's current age and may face issues with maintenance and reliability. NNSA directed the formation of a review team to evaluate options for future EUO, and the team recommended that the 9215 complex be used for EUO up to the next 25 years, or until 2039, and noted that investments need to be made in the infrastructure and programmatic equipment in the facility.

Despite its age and condition, Y-12 has conducted very few upgrades to the 9215 complex. Y-12 performed an FRR in 2012 to identify the modifications necessary to ensure safe operations through 2030. Based on the FRR, Y-12 proposed an \$80 million major upgrade project that included electrical improvements and other potential tasks. However, NNSA directed Y-12 to cease work on the project and complete a series of smaller projects that require funding of less than \$10 million per building at a given time. NNSA told us the projects received funding of \$5 million in FY 2016. Further, even if all identified modifications were completed, they were only intended to ensure continued operations through 2030, while current EUO are required until at least the late 2030s.

Finally, the FRR identified several additional processes that may be implemented in the 9215 complex. For example, processes for packaging enriched uranium chips and vacuum sealing, and the enriched uranium material necessary for these processes, are planned to be added to the 9215 complex. While the FRR noted that these anticipated changes will drive some new risks in the facility, it did not evaluate the impact of these new risks to the facility or personnel.

Accordingly, even though Y-12 reported that the 9215 complex is in better condition than the 9212 complex, if EUO continue in this facility for the next 25 years without significant upgrades, the 9215 complex may be unable to meet NNSA mission needs.

Deferred Maintenance Status

Even though spending on maintenance for EUO facilities increased by 71 percent from 2009 to 2014, management told us that the amount of deferred maintenance in both the 9212 and 9215 complexes has steadily increased. According to Y-12 documentation, maintenance is defined as the act of keeping fixed assets in acceptable condition, while deferred maintenance is maintenance that was not performed when it should have been or was scheduled to be. In addition to the \$70 million Y-12 spent on the NFRR Project, it spent almost \$188 million on maintenance for the 9212 and 9215 complexes since FY 2006. However, more than \$39.4 million in additional funding was required to complete identified deferred maintenance for these facilities. In December 2013, the most recent Facility Condition Assessment report, 361 required maintenance tasks for the 9212 complex were reported to NNSA as deferred that would cost more than \$28.7 million to complete. Deferred tasks included fire suppression system repairs, identification, and remediation for potential asbestos, electrical safety switch replacement, water and steam leaks, and numerous repairs to walls, doors, and floors. The 9215 complex also faced numerous age-related maintenance issues. In particular, in December 2013, Y-12 reported to NNSA that there were 161 deferred maintenance items for the 9215 complex, which were estimated to cost approximately \$10.6 million to complete. Of these, 100 items (62 percent) were more than 5 years overdue and would cost more than \$3.5 million. Deferred tasks included electrical, mechanical, and structural repairs.

In fact, Y-12 officials recognized that deferred maintenance was an issue and stated that the maintenance backlog in the facilities continued to grow at a concerning rate. Y-12 officials further clarified that while higher priority work orders were processed, lower priority work orders were accumulating. Y-12 management told us that the decision to complete maintenance

tasks was made by building operations or production managers based on available resources. NNSA told us that actions were planned in future years that would address some of the deferred maintenance and facility issues we identified.

Maintenance Tracking

Although Y-12 reported \$39.4 million in deferred maintenance, we found that this amount did not reflect the total maintenance required. Specifically, Y-12 employed more than one system for tracking maintenance, and the systems were not integrated; thus, we could not determine, and Y-12 could not tell us, the full extent of maintenance required to sustain continued EUO. The Condition Assessment Information System (CAIS) was used to report deferred maintenance tasks to NNSA, and items were entered based on the results of facility condition reviews. Maintenance requirements identified by those working in and managing the facilities were entered into Y-12’s Systems, Applications, and Products in Data Applications database (SAP), which did not include cost data for all tasks. Y-12 personnel told us that some CAIS items were included in SAP, while some were not. For example, SAP listed 2,120 maintenance tasks for the 9212 complex, while CAIS listed 361 tasks. Some of the discrepancy was due to SAP’s inclusion of requirements for equipment, while CAIS provided only those tasks necessary to maintain the facility. However, we noted that continued EUO requires that both the facility and equipment be maintained.

Planning and Priorities

NNSA and Y-12 learned that UPF’s completion date was delayed in 2010, and NNSA adjusted UPF’s projected completion date at that time. However, overall plans for the EUO strategy were not adjusted until 2014, 4 years later. In particular, officials expected to continue operations in the current facilities until UPF was operational. However, as noted in the chart that follows, UPF milestones began slipping as early as 2010 and its scope has been significantly reduced. In 2014, the UPF project was reassessed, and NNSA decided it will replace only a portion of operations conducted in the 9212 complex in the UPF, with other capabilities being relocated into 9215 and 9204-2E.

Date of Estimate	Completion Date Basis	Estimated Completion Date
2007	NNSA – Approach and Cost	2018
2010	NNSA – 2010 Progress Report on the Uranium Processing Facility Project	2022
2010	U.S. Army Corps of Engineers Estimate	As late as 2026
2013	Stockpile Stewardship and Management Plan – 9212 Complex operations will transition in 2025 and 9215 Complex operations will transition as late as 2038	2025–2038
2014	NNSA – Uranium Mission Requirements – 9212 Complex Operations Only	2025

While expected completion dates for the stages were not defined in 2012, NNSA documentation released since then stated that Y-12 will conduct some EUO in the 9212 complex through 2025, and a recent long-term strategy identified continued operations in the 9215 complex into the late 2030s; however, this strategy has not been planned or funded. Even so, as mentioned previously, a Y-12 official told us that no additional upgrades to the 9212 complex were planned to ensure continued operations after 2021. Instead, Y-12 intended to monitor operations and take further action as necessary. For example, Y-12 established the Continued Safe Operating Oversight Team to provide independent safe oversight and inform management if the risk for continued safe operations was no longer acceptable. As for the 9215 complex, as described earlier, Y-12 proposed a major upgrade project to address the majority of the items identified in its FRR. NNSA recently directed Y-12 to cease work on the major project and to develop a new plan to accomplish the upgrades with a series of smaller projects. However, the proposed upgrades may not be sufficient to address the risks to continued operations because the FRR it was based on did not include risks related to the new processes expected to be introduced into the 9215 complex or the timeframe after 2030. In our opinion, given that circumstances have changed since NNSA developed its initial plans and UPF's history of schedule slippages, it would be prudent to perform further analyses to determine whether additional actions are warranted to address the timeframe until EUO are transitioned out of the current facilities.

Regarding deferred maintenance, the amounts continued to increase due to competing budget priorities and because Y-12 did not request funding for all identified maintenance work. Specifically, the percentage of Y-12's site-wide maintenance funding spent on EUO facilities had grown significantly; despite this, Y-12's requested funding from NNSA did not increase each year. In addition, Y-12 received less than it requested as shown in the chart below:

Y-12 Facilities Maintenance Funding						
	FY09	FY10	FY11	FY12	FY13	FY14
Requested	286,986	286,135	277,562	301,014	311,796	375,300
Received	235,134	228,226	211,671	244,127	208,814	236,000
Difference	51,852	57,909	65,891	56,887	102,982	139,300
% Not Received	18	20	24	19	33	37
EUO Actual	12,952	15,130	15,916	21,963	21,607	22,191
EUO %	6	7	8	9	10	9
Notes:						
Dollar amounts are in thousands.						
EUO Actual = actual amount of funding that was spent on EUO facilities.						
EUO % = percentage of total maintenance funding received by Y-12 that was spent on EUO facilities.						

Y-12 officials told us that due to competing budget priorities, it limited its funding requests to those tasks deemed necessary to continue operations. We recognize this approach was prudent given current budget realities. However, as noted previously, the total amount of deferred maintenance reported to NNSA was questionable due to the various maintenance tracking systems not being integrated. We noted that competing budget priorities also contributed to the lack of accurate maintenance data. According to Y-12 officials, efforts to include information from the CAIS in the SAP database were begun several years ago, but sufficient resources were not available to complete the integration.

In April 2014, an NNSA-directed review team issued a report that identified potential alternatives to UPF that would replace 9212 complex capabilities by 2025. The report recognized the need for near-term action to reduce safety and operational risk in existing facilities while UPF, or the alternative, proceeds. However, the report also noted that it would be “extraordinarily difficult” to complete the alternatives by 2025, and the review did not fully address the risks of continuing to operate in the existing facilities. For example, it did not find that additional upgrades to the 9212 complex should be evaluated for the period from 2021 to 2025. Additionally, it addressed the need to complete modifications in the 9215 complex that provide safe operations through 2030, but according to the report, EUO may continue in the 9215 complex beyond that date.

In May 2015, a peer review of NNSA’s Uranium Program found that good progress had been made in implementing the 2014 review’s recommendations. Specifically, investment in the 9215 complex had increased to help address long-term mission needs. However, the report also noted that in spite of positive indications, significant threats existed regarding funding availability, changing design and safety requirements, and evolving program requirements. Management officials also told us they had recently taken several actions including establishing a Uranium Program Manager and implementing initiatives at Y-12. The Uranium Program Manager recently approved Y-12’s strategy to continue EUO in the 9212 complex until UPF is completed, which includes monitoring operations and taking necessary actions as well as starting up new equipment and building new facilities. While management has continued to develop plans to address the concerns identified in the report, we believe that the risks have not been fully addressed. For example, other than UPF, which was addressed previously, construction of new EUO facilities has not been approved or funded.

Future Operations

Although NNSA and Y-12 have made progress in addressing the risks to continued EUO, including completing the NFRR Project in January 2015, not all of the potential risks were fully resolved. In particular, if the gap between Y-12’s mitigating actions and transition of operations from the 9212 complex to UPF is not addressed, there is a potential risk that a maintenance event could significantly affect production or that a safety event could endanger personnel and the public. Further, the same risks will continue until at least the late 2030s for the 9215 complex, because there is currently no plan to transition its operations into a new facility. Thus, failure to take action could affect Y-12’s ability to meet mission requirements.

In addition, malfunctions of facilities or equipment may also potentially affect personnel and public safety. To illustrate, per Y-12’s *Safety Analysis Report for the 9212 Complex*, there is a risk that the 9212 complex’s roof capacity could be exceeded from intense precipitation or snow, which may cause areas of the roof to sag or collapse. The Safety Analysis Report further stated that, if such a situation occurred, it could result in a loss of criticality safety controls; thus, there would be a potential risk of a criticality accident that could affect personnel and public safety. Also, according to the Defense Nuclear Facilities Safety Board, a major earthquake or tornado could potentially lead to failure of the 9212 complex or its systems, which may lead to unacceptable consequences for facility workers. As mentioned previously, Y-12 considered the risks of natural phenomena to be unlikely and instituted procedures that identify appropriate

actions for personnel to take to provide the safest possible environment during such an event. Further, Y-12 documentation stated that the inventory of hazardous materials in the 9212 complex was controlled to reduce the consequences of such incidents. Finally, if maintenance needs are not accurately reported, NNSA's decisions regarding prioritization of tasks and allocation of resources will be based on inaccurate assumptions.

RECOMMENDATIONS

To reduce risks in Y-12 EUO, we recommend that the Administrator, National Nuclear Security Administration ensure that:

1. Y-12 appropriately plans for continued operations in the 9212 complex through 2025 or until no longer needed, to include identifying required upgrades and budgeting for those requirements;
2. Y-12 appropriately plans for continued operations in the 9215 complex to support EUO through transition to a new facility and depleted uranium indefinitely, to include identifying required upgrades and budgeting for those requirements;
3. Y-12 reports complete and accurate maintenance data to NNSA; and
4. NNSA reassesses budgeting priorities to include deferred maintenance.

MANAGEMENT RESPONSE

NNSA management agreed with our recommendations to ensure safe EUO in buildings 9212 and 9215 until such time as these facilities are replaced, recapitalized, or no longer needed. Management stated that action already had been taken to fully address three of the four recommendations and corrective action for the fourth was already well underway. Management noted that because the audit activities largely concluded 1 year ago, they did not think the information presented in the draft report adequately reflected the depth and breadth of steps NNSA had taken in the last 2 years.

In particular, management stated that NNSA had increased maintenance and recapitalization funding to halt the growth of deferred maintenance. For example, management stated that during FYs 2018–2020, an additional \$27 million of recapitalization and \$11 million in maintenance funds will be devoted to building 9215 as part of the Nuclear Facilities Electrical Modernization Project. Further, management stated that it was taking action to significantly reduce uranium inventories and associated risks in buildings 9212 and 9215. Management stated that it was enhancing maintenance on key building 9212 systems, upgrading equipment to increase reliability, and relocating several building 9212 capabilities into existing facilities. Finally, management stated that it acted to ensure complete, accurate, and consistent reporting of maintenance data by Y-12 and all NNSA sites through standardized definitions for preventative, corrective, and deferred maintenance and, beginning in FY 2016, to require sites to report direct and indirect maintenance spending on a monthly basis.

We did not verify the effectiveness of management’s reported actions, which were beyond the scope of our audit.

Management’s formal comments are included in Appendix 3.

AUDITOR COMMENTS

We acknowledge that management has taken actions to address many of the issues identified in our report since the completion of our fieldwork. During the 5 months it took management to provide a formal response to our draft report, we updated the report as management provided additional information. Further actions taken by management are noted in management’s formal comments, which, as mentioned above, are included in their entirety in Appendix 3. We considered NNSA’s response and planned actions to be responsive to our recommendations.

OBJECTIVE, SCOPE, AND METHODOLOGY

Objective

To determine whether current enriched uranium operations (EUO) facilities at the Y-12 National Security Complex (Y-12) will meet National Nuclear Security Administration (NNSA) mission needs until new facilities are available.

Scope

This audit was conducted between March 2013 and July 2016, at Y-12 in Oak Ridge, Tennessee, and NNSA Headquarters in Washington, DC. The audit was conducted under Office of Inspector General project number A13YT025.

Methodology

To accomplish our audit we:

- Reviewed applicable laws and regulations pertaining to nuclear operations;
- Reviewed prior reports issued by the Office of Inspector General, Government Accountability Office, and the Defense Nuclear Facilities Safety Board;
- Analyzed historical mission data and future demand for EUO;
- Evaluated EUO transition plans to the Uranium Processing Facility;
- Reviewed the Nuclear Facility Risk Reduction Project;
- Analyzed maintenance data for current EUO facilities;
- Attended hearings, meetings, and conferences on current and future EUO; and
- Interviewed NNSA and contractor personnel to gain an understanding of EUO.

We conducted this performance audit in accordance with generally accepted Government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objective. Accordingly, the audit included tests of controls and compliance with laws and regulations necessary to satisfy the audit objective. In particular, we assessed compliance with the *GPR Modernization Act of 2010* and found that NNSA had established performance measures for EUO capabilities. Because our review was limited, it would not necessarily have disclosed all internal control deficiencies that may have existed at the time of our audit. We relied on computer-processed information to a limited extent to accomplish our

audit objective. Based on a recent review of Y-12's information technology controls performed by KPMG LLP on behalf of the Office of the Inspector General, we determined that the data was sufficiently reliable for the purpose of the review.

We held an exit conference with NNSA and Y-12 management on July 7, 2016.

PRIOR REPORTS

- Audit Report on [*Reestablishment of Enriched Uranium Operations at the Y-12 National Security Complex*](#) (DOE/IG-0640, February 2004). This audit found that there had been significant delays in aspects of the project to reestablish enriched uranium processes at the Y-12 National Security Complex. It also noted that the overall cost of the project had grown dramatically. While Y-12 had successfully reestablished three enriched uranium components, several of the remaining processes were not expected to be operational for more than 5 years later than originally planned. Finally, the audit determined that the Department of Energy had not made full use of available project management controls.
- Audit Report on [*Nuclear Material Availability*](#) (DOE/IG-0714, January 2006). This audit found that NNSA's ability to meet mission requirements for highly enriched uranium at needed purity levels may be at risk after fiscal year (FY) 2008. Specifically, the report stated that if new metal production continued to be delayed or was disrupted in the future; planned dismantlements fell behind schedule, or samplings failed to provide the metals expected, there was a risk that sufficient quantities and qualities of highly enriched uranium metal may not be available when required after FY 2008. Finally, the report noted that NNSA is at risk of not being able to meet future programmatic needs because the strategic reserve, which was designed to support production, was not properly established.

MANAGEMENT COMMENTS



Department of Energy
Under Secretary for Nuclear Security
Administrator, National Nuclear Security Administration
Washington, DC 20585



May 20, 2016

MEMORANDUM FOR RICKEY R. HASS
ACTING INSPECTOR GENERAL

FROM: FRANK G. KLOTZ *FK 5/20/2016*

SUBJECT: Comments on the Office of Inspector General Draft Report
Titled *Enriched Uranium Operations at the Y-12 National
Security Complex* (A13YT025)

Thank you for the opportunity to review and comment on the subject draft report. The National Nuclear Security Administration (NNSA) agrees with the Office of Inspector General's four recommendations to ensure continued safe enriched uranium (EU) operations in Buildings 9212 and 9215 until such time as these facilities are replaced, recapitalized, or no longer needed. Action has already been taken to fully address three of the four recommendations and corrective action for the fourth is already well underway. NNSA also strongly agrees that consistent, predictable funding is absolutely essential to improving the material condition of the aging buildings and equipment in both the 9212 and 9215 complex, and to sustaining enriched uranium operations in those facilities.

We note, however, the audit activities largely concluded a year ago, and therefore the information presented in the draft report does not adequately reflect the depth and breadth of steps NNSA has taken in the last two years. Under the leadership of the Secretary and consistent with DOE's new Project Management Policy, NNSA has improved the lines of responsibility and the peer review process for all major system acquisitions, including the Uranium Processing Facility (UPF); revised and strengthened the UPF program requirements; fully implemented the 2014 Red Team recommendations; and developed an overall strategy to responsibly transition enriched uranium operations out of Building 9212 while reducing risk in existing plant operations. All actions have been appropriately planned to steadily and continually reduce safety and mission risk.

In July 2014, NNSA created a dedicated Uranium Program Office to execute the requirements of the overall uranium mission and subsequently developed the *Uranium Mission Strategy (October 2015)* and *Uranium Mission Requirements Document (January 2016)*, which describe NNSA's overall plans to cease EU operations in Building 9212 by 2025, transition enriched uranium operations to new and existing facilities, modernize existing capabilities, reduce safety and mission risk, and improve the physical infrastructure of existing facilities. NNSA provides dedicated funding to these efforts through several budget lines including Uranium Sustainment, Process Technology Development, Infrastructure and Operations, and the UPF construction project data sheet



in the NNSA budget request. With the support of Congress, over the past two years funding for the Uranium mission has increased.

As the Department identified cost and growth issues on the UPF Project, NNSA developed an alternative plan to replace a subset of 9212 capabilities that was independently reviewed, verified, and implemented. Consistent with the Secretary's Improving Project Management policies and DOE Order 413.3B, NNSA has been executing the UPF Project as a series of seven subprojects segregated by safety and security requirements. In February 2015, NNSA successfully completed the first UPF Subproject under budget and on schedule; the second subproject is delivering on budget and on schedule as well. NNSA remains committed to delivering 9212 capabilities by 2025 for a cost not to exceed \$6.5B.

NNSA, under the leadership of the Uranium Program Manager, reduced the total impact of all remaining material at risk (MAR) in 9212. This risk reduction initiative has yielded an offsite consequence of 3 REM, a level significantly below the current administrative limit, which itself was reduced by 40 percent in FY 2015. NNSA is also reducing safety risk in the existing plant and in FY 2015 transferred 12.3 metric tons of uranium from Area 5 to the Highly Enriched Uranium Materials Facility for secure storage.

NNSA is also taking action in Building 9215 to drastically reduce uranium inventories, upgrade machine tools to increase their reliability, and execute significant improvements to the facility's electrical distribution infrastructure and other safety systems. NNSA has implemented a project prioritization model to optimize infrastructure investments that balances safety, environment, and programmatic risk reduction to optimize value per dollar invested. This process is being used to prioritize life extension investments for buildings 9215 and 9204-2E as part of the overall Y-12 strategy. NNSA is reducing material inventories in building 9215 to near just-in-time levels, and the administrative limit for MAR has been reduced by more than 88 percent.

NNSA is implementing new systems that will ensure complete and accurate maintenance data at Y-12. NNSA sites will, by fourth quarter FY 16, begin reporting direct and indirect maintenance spending each month via NNSA's G2 Program Management System. This information will include priorities established from the recently completed EU Extended Life Program for buildings 9215 and 9204-2E. NNSA will use the data reported in G2 to monitor compliance with the Department's requirement to meet the National Academy of Science recommended Federal Sustainment Standard of spending of 2 percent to 4 percent of Replacement Plant Value.

NNSA has increased maintenance and recapitalization resources in order to halt the growth of deferred maintenance. The G2 system, along with other tools and interfaces, will allow NNSA and Y-12 to make informed decisions on maintenance investments. NNSA's Extended Life Program for 9215 and 9204-2E, which identifies and meticulously plans for future maintenance and recapitalization, funded at \$5M in FY 2016 and increasing to \$20M per year in FY 2017 to FY 2020. These investments are in addition to the approximate \$15M annually spent on maintenance at EU facilities. During FY 2018-2020, an additional \$27M of recapitalization and \$11M in maintenance

funds will be devoted to Building 9215 as part of the Nuclear Facilities Electrical Modernization project.

Overall, NNSA has developed a recapitalization plan that includes a new footprint for the highest hazard operations. NNSA has significantly reduced material at risk in one of the oldest facilities in the complex—9212—while taking measures to extend the life of 9215 and 9204-2E in a safe manner. The actions noted above represent only a handful of the major positive improvements that have occurred since the time of the audit. While the report acknowledges some of these items, the findings and conclusions presented are generally based on the prior state of operations and could therefore be misleading.

The attachment to this memorandum outlines the specific actions taken and planned to address the report recommendations. Technical comments have also been provided separately for your consideration to enhance the accuracy, balance, and clarity of the report. NNSA remains ready and willing to provide additional information and documentation to help bring the report in-line with our current efforts. If you have any questions regarding this response, please contact Mr. Dean Childs, Director, Audit Coordination and Internal Affairs, at (301) 903-1341.

Attachment

Attachment

NATIONAL NUCLEAR SECURITY ADMINISTRATION
Response to Report Recommendations

Enriched Uranium Operations at the Y-12 National Security Complex (A13YT025)

The IG recommended that the Under Secretary for Nuclear Security:

Recommendation 1: Ensure Y-12 appropriately plans for continued operations in the 9212 complex through 2025 or until no longer needed, to include identifying required upgrades and budgeting for those requirements.

Management Response: The National Nuclear Security Administration (NNSA) is taking action in Building 9212 to reduce uranium inventories, enhance maintenance on key systems, upgrade casting furnaces to increase their reliability, and relocate several capabilities into existing facilities. These actions have been appropriately planned to steadily and continually reduce safety and mission risk in 9212 until Enriched Uranium (EU) programmatic operations are no longer needed. Examples of actions taken and planned include:

- Immediate attention has been placed on the highest hazard materials (crystals, organics, solutions), which are being reprocessed into forms suitable for storage in, and movement to, the Highly Enriched Uranium Materials Facility (HEUMF) warehouse.
- The total impact of all remaining material at risk (MAR) in 9212 today has been reduced to an offsite consequence of only 3 REM. This level is significantly below the current administrative limit, which itself was reduced by 40 percent in fiscal year (FY) 2015.
- EU material movements are being reengineered to stop the flow of additional MAR into 9212. In FY 2015 a direct canning station was installed in building 9204-2E allowing small EU components from disassembly to be canned and shipped directly to HEUMF rather than moving through 9212 for consolidation casting.
- NNSA is funding a dedicated maintenance crew to improve the safety, reliability, and throughput of the wet chemistry production equipment used for purified metal production.
- NNSA is investing in the casting system in 9212 to promote reliability in our vacuum induction melt furnaces.
- By 2021, the capabilities for metal purification, radiography, and chip processing will be relocated out of 9212 and into existing facilities. NNSA will install an electro-refiner major item of equipment (MIE) in 9215 and a rotary calciner MIE in building 9212 to replace the current purification process. These projects are funded in the NNSA budget and underway. Radiography is being relocated out of 9212 and installed in 9204-2E. Chip cleaning is being relocated to 9215 where the chip turnings are produced, and the process will be simplified to a reduced number of total steps.
- By 2025 the remaining 9212 operations for casting, special oxides, and salvage and accountability, will start up in the Uranium Processing Facility.

Attachment

As demonstrated, NNSA has taken deliberate actions to steadily reduce the risk of continued EU programmatic operations in 9212. NNSA provides dedicated funding to these efforts through the Uranium Sustainment and Process Technology Development lines in the NNSA budget. Additional upgrades that improve the reliability of programmatic equipment will be evaluated and budgeted by the responsible program office on a case by case basis. NNSA considers this recommendation closed based on actions already taken and planned.

Recommendation 2: Ensure Y-12 appropriately plans for continued operations in the 9215 complex to support EUO through transition to a new facility and depleted uranium indefinitely, to include identifying required upgrades and budgeting for those requirements.

Management Response: NNSA is currently taking action in Building 9215 to drastically reduce uranium inventories, upgrade machine tools to increase their reliability, and execute significant improvements to the facility's electrical distribution infrastructure and other safety systems. These actions have been appropriately planned to begin reducing the safety and mission risks associated with continued EU operations in 9215 through the late 2030's. Actions taken and planned include:

- NNSA is reducing material inventories in building 9215 to near just-in-time levels. The administrative limit for MAR has been reduced by more than 88 percent. Overall, more than 12.3 metric tons of uranium were removed from Area 5 in FY 2015.
- NNSA is investing in the machine center in 9215 to promote reliability in our machining capability. New machine lathes are being purchased and NNSA will replace several analogue machine controllers with new digital controllers.
- Improvements to the electrical distribution system in 9215 and 9204-2E are being planned in FY 2016 (\$5M), with a nominal \$20M/year budgeted through the Future Years Nuclear Security Plan.
- The Management and Operating contractor (M&O) at Y-12 has hosted a series of infrastructure technical evaluations and workshops which identified and prioritized needed infrastructure investments in both 9215 and 9204-2E. This effort is collectively known as the Extended Life Program (ELP), and a report was issued in January 2016. The ELP investments are intended to ensure reliability of 9215 and 9204-2E through 2050.
- Overall, the facility and infrastructure improvements to sustain EU operations in 9215 are well understood; the facility and infrastructure improvements to sustain depleted uranium (DU) operations in 9215 are less understood.

NNSA will work with the M&O to identify and analyze required upgrades to support continued DU operations. The estimated completion date for this action is December 30, 2017.

Attachment

Recommendation 3: Ensure Y-12 reports complete and accurate maintenance data to NNSA.

Management Response: NNSA has taken action to ensure complete, accurate, and consistent reporting of maintenance data by Y-12 and all NNSA sites. NNSA's Office of Safety, Infrastructure and Operations' Program Management Plan, issued in September 2015, contains standardized definitions for Preventive, Corrective and Deferred Maintenance to be used by Y-12 and all NNSA sites. In addition, beginning in FY 2016, NNSA sites will report direct and indirect maintenance spending each month via NNSA's G2 Program Management System.

The NNSA Production Office (NPO) staff located at Y-12 maintains day-to-day oversight of the Y-12 contractor partner's maintenance actions. Y-12 infrastructure (real property) and equipment maintenance activities are planned and executed within the contractor partner's Systems, Applications, and Products in Data Applications (SAP) database and are consistently monitored by the contractor's assurance system and NNSA Field office oversight. The SAP backlog is broken down into three areas (active, transitional, and deferred) in order to ensure maintenance backlog responsibility. Real property maintenance data is accurately reported within the NNSA Condition Assessment Information System (CAIS).

Equipment maintenance data is captured in the contractor's metrics reported to NPO. NPO is aware of the site's needs through report monitoring and daily interaction with the contractor partner. NPO consistently communicates with the respective NNSA Program Lead regarding plant infrastructure and equipment status. These tools and interfaces allow NNSA and Y-12 to make informed decisions on maintenance investments. NNSA considers this recommendation closed based on actions already taken and planned.

Recommendation 4: Ensure NNSA reassesses budgeting priorities to include deferred maintenance.

Management Response: NNSA is fully committed to supporting Secretary of Energy direction to arrest the growth of deferred maintenance while safely operating NNSA facilities to meet mission requirements. NNSA balances priorities within weapons, safety, infrastructure and operations, and other NNSA programs to accomplish the mission. As needs change, NNSA interfaces with our contracting partner and with the executive and legislative branch of government to balance needs and available resources. At Y-12, necessary maintenance and recapitalization projects of existing EU facilities are a high priority to continue safe operations until replacement facilities are completed and brought into service.

Initiatives are underway to monitor and reduce deferred maintenance while maintaining programmatic accomplishments. NNSA and Y-12 determine the highest priority recapitalization projects according to programmatic, safety and sustainability impacts, while considering the DM reduction element.

NNSA has increased maintenance and recapitalization resources in order to halt the growth of deferred maintenance. NNSA investments in the 9212 and 9215 complexes during FY 2015-2017 include:

Attachment

- Systematic replacement of 50-year old fire suppression system sprinkler heads (\$15.5M)
- Phased replacement of Motor Control Centers in Building 9215 (\$8M)
- Phased replacement of lighting panels (\$4M)

These investments are in addition to the approximate \$15M annually spent on maintenance at EU facilities. During FY 2018-2020, an additional \$27M of recapitalization and \$11M in maintenance funds will be devoted to Building 9215 as part of the Nuclear Facilities Electrical Modernization project.

In addition, NNSA sites conducted a planning and budget formulation review for FY 2018 and will report direct and indirect maintenance spending each month via NNSA's G2 Program Management System beginning in fourth quarter FY 2016. This includes priorities established from the recently completed EU Extended Life Program for buildings 9215 and 9204-2E. NNSA will use the data reported in G2 to monitor compliance with the Department's requirement to meet the National Academy of Science recommended Federal Sustainment Standard of spending of 2 percent to 4 percent of Replacement Plant Value. NNSA considers this recommendation closed based on actions already taken and planned.

FEEDBACK

The Office of Inspector General has a continuing interest in improving the usefulness of its products. We aim to make our reports as responsive as possible and ask you to consider sharing your thoughts with us.

Please send your comments, suggestions, and feedback to OIG.Reports@hq.doe.gov and include your name, contact information, and the report number. Comments may also be mailed to:

Office of Inspector General (IG-12)
Department of Energy
Washington, DC 20585

If you want to discuss this report or your comments with a member of the Office of Inspector General staff, please contact our office at (202) 253-2162.