U.S. Government Accountability Office Reviews of Domestic Uranium Management

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Ad Hoc Committee on the Merits and Viability of Different Nuclear Fuel Cycles and Technology Options and the Waste Aspects of Advanced Nuclear Reactors

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Introduction

- Brief overview of GAO and GAO's nuclear issues group
- Over the past decade, GAO has produced numerous reports on uranium management issues—particularly on management of uranium for national security purposes—including the following:
  - GAO-15-123, *Department of Energy: Interagency Review Needed to Update U.S. Position on Enriched Uranium That Can Be Used for Tritium Production*, October 2014;
  - GAO-18-126, *Nuclear Weapons: NNSA Should Clarify Long-Term Uranium Enrichment Mission Needs and Improve Technology Cost Estimates*, February 2018; and
  - GAO-21-28, *Uranium Management: Actions to Mitigate Risks to Domestic Supply Chain Could Be Better Planned and Coordinated*, December 2020.
- After discussing the findings in these reports, I would be happy to answer your questions on issues related to high-assay low-enriched uranium (HALEU) or other uranium-related topics.

GAO

U.S. and International Nuclear Security and Cleanup

Selected GAO Work on U.S. and International Nuclear Security and Cleanup

Environmental Cleanup

- Department of Energy: Environmental Liability Continues to Grow, but Opportunities May Exist to Reduce Costs and Risks (GAO-21-585R)
- Nuclear Waste: Congressional Action Needed to Clarify a Disposal Option at West Valley Site in New York (GAO-21-115)
- Nuclear Waste Disposal: Better Planning Needed to Avoid Potential Disruptions at Waste Isolation Pilot Plant (GAO-21-48)
- Environmental Liabilities: DOE Needs to Better Plan for Post-Cleanup Challenges Facing Sites (GAO-20-373)

U.S. Nuclear Weapons Stockpile

- Nuclear Weapons: Actions Needed to Improve Management of NNSA's Lithium Activities (GAO-21-244)
- Nuclear Security Enterprise: NNSA Should Use Portfolio Management Leading Practices to Support Modernization Efforts (GAO-21-398)
- Nuclear Triad: DOD and DOE Face Challenges Mitigating Risks to U.S. Deterrence Efforts (GAO-21-210)
- High-Performance Computing: NNSA Could Improve Program Management Processes for System Acquisitions (GAO-21-194)

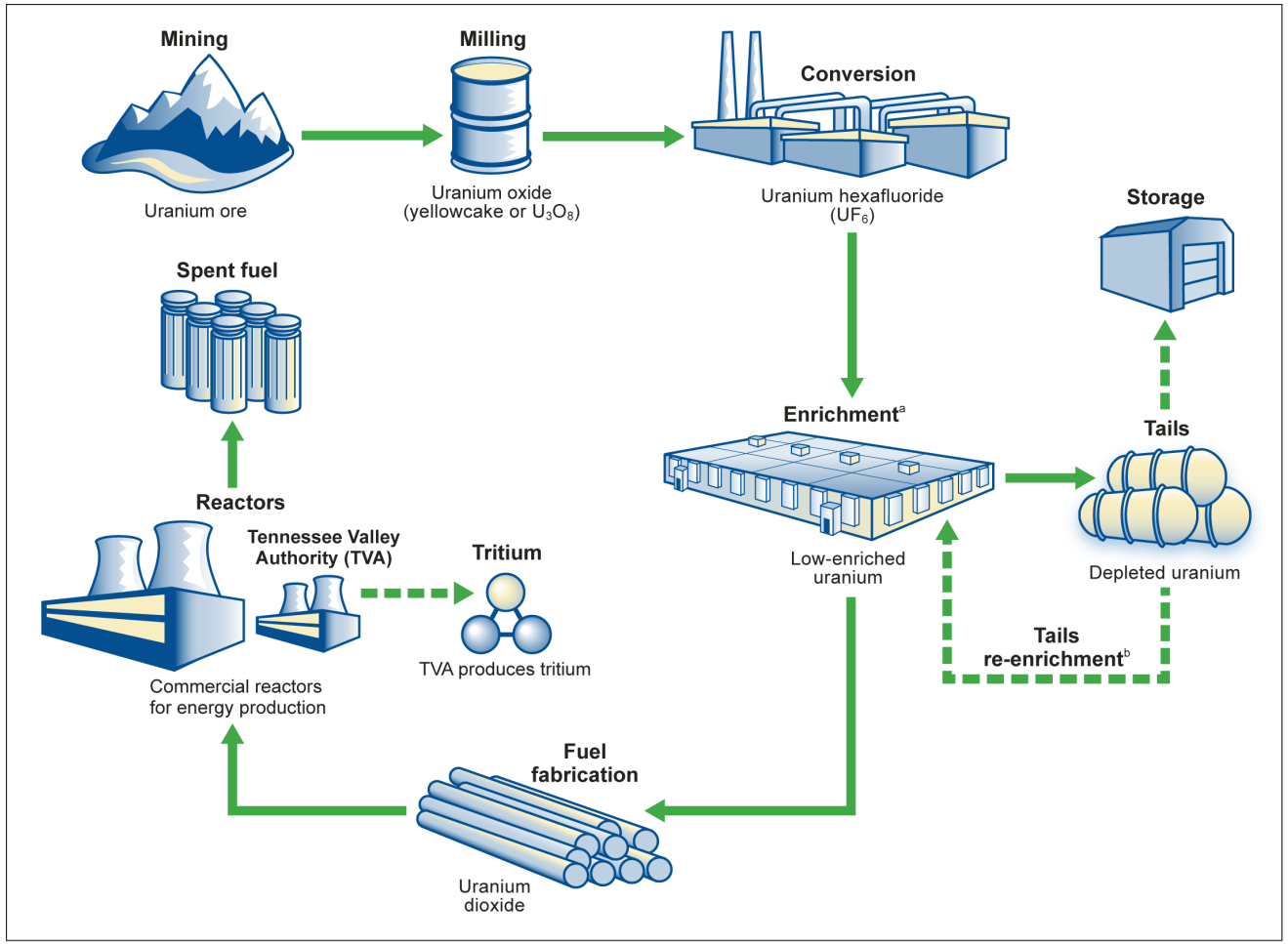
DOE Management and Contracting

- Department of Energy Contracting: Improvements Needed to Ensure DOE Assesses Its Full Range of Contracting Fraud Risks (GAO-21-44)
- National Nuclear Security Administration: Analyzing Cost Savings Program Could Result in Wider Use and Additional Contractor Efficiencies (GAO-20-451)
- Improper Payments: Improvements Needed to Ensure Reliability and Accuracy in DOE's Risk Assessments and Reporting (GAO-20-442)
- Support Service Contracts: NNSA Could Better Manage Potential Risks of Contractors Performing Inherently Governmental Functions (GAO-19-608)

Nonproliferation and Radiological Smuggling

- U.S.-Saudi Nuclear Cooperation: Progress Is Stalled over Nonproliferation Conditions and Agency Management of Negotiations Is Unclear (GAO-20-343)
- Nuclear Nonproliferation: Past U.S. Involvement Improved Russian Nuclear Material Security, but Little Is Known about Current Conditions (GAO-20-392)
- Combating Nuclear Terrorism: DHS Should Address Limitations to Its Program to Secure Key Cities (GAO-19-327)
- Combating Nuclear Terrorism: NRC Needs to Take Additional Actions to Ensure the Security of High-Risk Radioactive Material (GAO-19-468)

The Nuclear Fuel Cycle



Sources: GAO analysis of International Atomic Energy Agency, Nuclear Regulatory Commission, Congressional Research Service, Department of Energy, and TVA documents. | GAO-15-123

[a]The enrichment process results in two principal products: (1) enriched uranium hexafluoride and (2) leftover "tails" of uranium hexafluoride, also called depleted uranium because the material is depleted in uranium-235 compared with natural uranium.

[b]Tails can only be re-enriched once, if at all, after which their uranium content is too depleted to make further re-enrichment economically feasible using current centrifuge and gaseous diffusion technology.

GAO-15-123

- This report sought to establish the basis for DOE's practice to use only "unobligated" low enriched uranium (LEU) to meet national security needs for tritium.
  - LEU is considered unobligated when neither the uranium nor the technology used to enrich the uranium carries an "obligation" from a foreign country requiring that the material only be used for peaceful purposes.
- We found that DOE's practice considers both law and policy.
- We also found that DOE had been consistent in its practice, including in its agreements with TVA for tritium production.
- In addition, we identified that a key assumption underlying this practice had changed: that the U.S. had a capability to produce unobligated LEU.
  - As a result, we recommended that DOE work through an interagency working group to assess its practice of using only unobligated LEU for the production of tritium, and either affirm the current practice or commit to study alternative sources of LEU consistent with international agreements and U.S. nonproliferation goals.
  - Subsequently, an interagency review concluded the policy of using unobligated uranium should continue and that the U.S. should reestablish a domestic uranium enrichment capability.

GAO-18-126

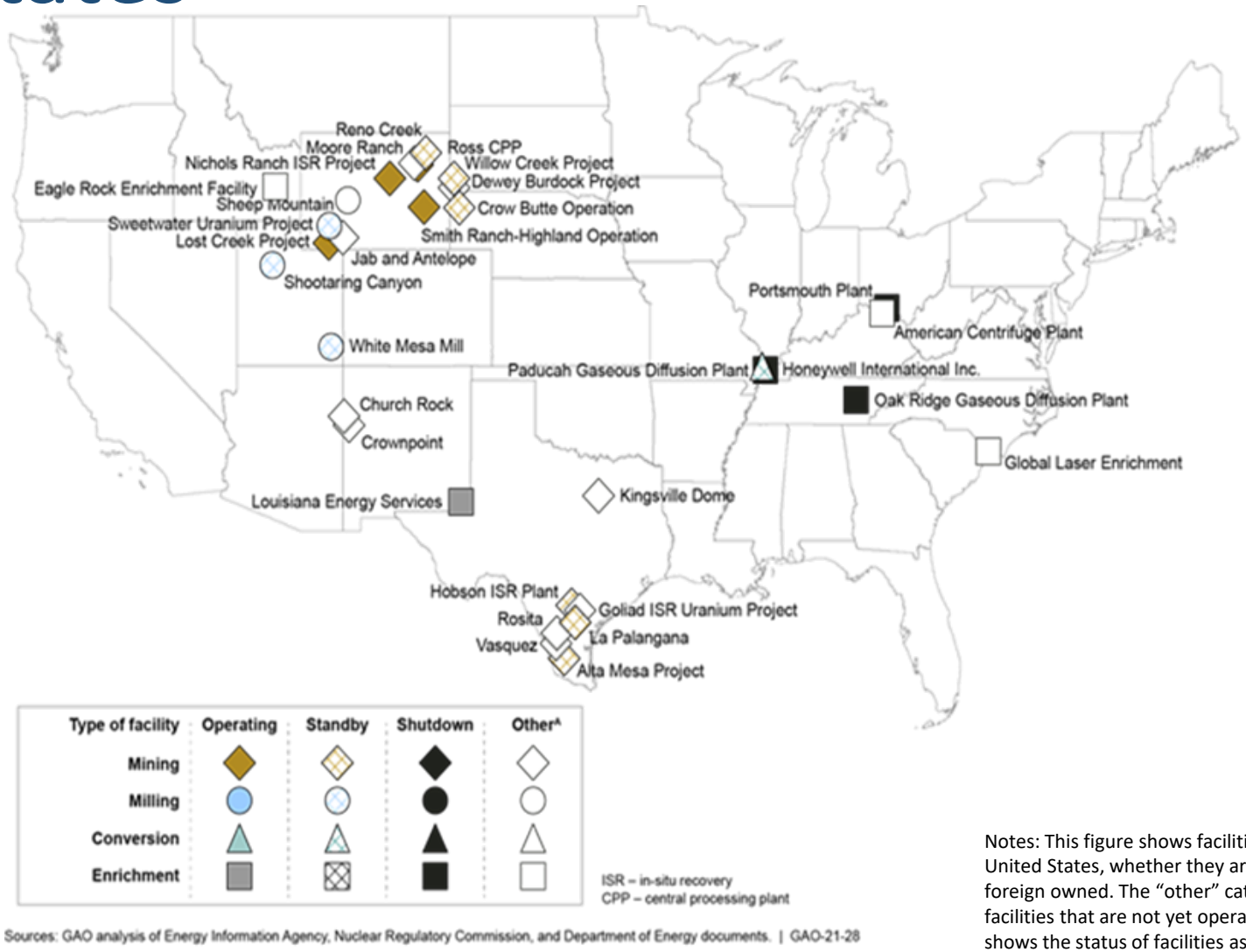
- Because the U.S. had lost its only source of unobligated LEU production in 2013, the National Nuclear Security Administration's (NNSA) supply of unobligated LEU was finite and becoming increasingly scarce. GAO was asked to assess NNSA's plan and actions to manage enriched uranium, and we reported on (1) the actions NNSA was taking to extend existing LEU inventories to address near-term needs, (2) the extent to which NNSA was analyzing long-term supply options, and (3) the preliminary cost estimates associated with options under study.
- We found that NNSA was taking or planned to take steps to address near-term needs for unobligated LEU, including downblending.

Large Centrifuges for Uranium Enrichment at the American Centrifuge Plant

Source: Centrus Energy Corp. | GAO-18-126

- We also found that NNSA had approved a mission needs statement—as a precursor to a formal analysis of alternatives (AOA) to meet the mission need—presenting options for a long-term unobligated uranium supply capability. This mission needs statement was not prepared in a manner consistent with DOE directives as it expressed a preference for a particular solution.
- Further, we found that the rough order of magnitude cost estimates NNSA prepared for the two technology options it considered to be most feasible were limited in scope and did not fully meet best practices for reliable cost estimates.
- We recommended that NNSA revise its mission needs statement to clarify the mission need NNSA seeks to achieve and improve its cost estimates. NNSA has not yet taken these actions, but the AOA is still ongoing.

Location and Status of Uranium Facilities in the United States



Sources: GAO analysis of Energy Information Agency, Nuclear Regulatory Commission, and Department of Energy documents. | GAO-21-28

Notes: This figure shows facilities located in the United States, whether they are U.S. owned or foreign owned. The "other" category includes facilities that are not yet operational. The figure shows the status of facilities as of May 2020.

GAO-21-28

- Our earlier work had demonstrated fragility in the supply chain for domestic enrichment services, but for this review, GAO was asked to examine risks in other parts of the unobligated LEU supply chain.
  - The Department of Commerce's Section 232 investigation report was completed during our review, but not released.
  - The Trump Administration created the Nuclear Fuel Working Group during our review, and we assessed the strategy as part of our review.
- We found that federal agencies and others had identified multiple risks to the uranium supply chain, and DOE and NNSA had taken some steps to address these risks.
  - Among these actions were NNSA's ongoing AOA assessing options to meet future demands for unobligated enriched uranium, and the DOE Office of Nuclear Energy's support for the Centrus HALEU demonstration.
  - We assessed these two actions as uncoordinated and potentially in conflict.
- We also found that the Nuclear Fuel Working Group's strategy did not fully incorporate all desirable characteristics of a national strategy and, in particular, did not identify needed resources for its implementation or how implementing actions would be coordinated.

Other Selected GAO Reports on Uranium Management Issues

- GAO-17-472T, *Department of Energy: Excess Uranium Transfers*, March 2017
  - Summarizes GAO's concerns with DOE's excess uranium transfers identified in prior GAO reports from July 2006 to September 2015.
- GAO-16-713, *Nuclear Material: Agencies Have Sound Procedures for Managing Exchanges but Could Improve Inventory Monitoring*, September 2016
  - Reviews how U.S. facilities track obligations on nuclear material and evaluates how facilities exchange their obligations without having to physically move any material.
- GAO-15-730, *Department of Energy: Transactions Involving USEC Inc. Since 1998*, September 2015
  - Identifies and describes the costs and benefits of 23 transactions between DOE and USEC since USEC was privatized in 1998 through July 1, 2015.
- GAO-14-291, *Department of Energy: Enhanced Transparency Could Clarify Costs, Market Impact, Risk, and Legal Authority to Conduct Future Uranium Transactions*, May 2014
  - Discusses GAO's legal and other concerns with four uranium transactions between DOE and USEC in 2012 and 2013.

Discussion of HALEU and Related Uranium Issues

- During our work on GAO-21-28, DOE took several HALEU-related actions:
  - In January 2019, DOE issued a notice of intent indicating a need for unobligated HALEU for use in any type of advanced reactor application, civilian or defense related. A later addition to the notice of intent clarified that it was not DOE's position that U.S.-origin HALEU would be required for civilian advanced reactor applications.
  - In October 2019, DOE "definitized" a sole source contract with Centrus for a 3-year period and a government cost share of up to $115 million for a demonstration project of its large centrifuge technology to produce HALEU, with the expectation that the technology would be commercialized following a successful demonstration.
- We addressed these developments in our report and raised concerns about the impact of the sole source contract with Centrus on the ongoing NNSA AOA. Notably:
  - If NNSA were to select and develop a different enrichment technology—such as the Oak Ridge small centrifuge technology—as a result of its AOA process, then the Department may be supporting the establishment of two different enrichment capabilities to produce unobligated enriched uranium; and
  - DOE's funding of the large centrifuge demonstration project has the potential to undermine the credibility of or prejudice the selection of a future option under NNSA's AOA process. If the AOA process results in the selection of the large centrifuge technology, concerns could be raised as to whether that technology was given an unfair advantage through the DOE HALEU demonstration project, to the detriment of other technologies and options under consideration in the AOA.
- In the course of our audit work, and through continued monitoring of uranium management related matters, we have learned more about HALEU and related uranium management issues and would be happy to respond to questions from the Committee members.

Contact Information

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