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Report to Congressional Requesters

May 2014

DEPARTMENT OF ENERGY

Enhanced Transparency Could Clarify Costs, Market Impact, Risk, and Legal Authority to Conduct Future Uranium Transactions

GAO-14-291

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GAO Highlights

Highlights of GAO-14-291, a report to congressional requesters

Why GAO Did This Study

USEC is the only company that uses U.S.-developed technology to enrich uranium. According to DOE, under international agreements the U.S. must use uranium enriched with domestic technology to meet national security needs, such as for nuclear weapons. In 2012 and 2013, DOE transferred uranium to USEC to support the development of next generation enrichment technology and for other national security purposes. In May 2013, USEC ceased enrichment operations and, in March 2014, filed for Chapter 11 bankruptcy protection. In April 2014, DOE announced it would assume managerial responsibility for continued development of the next generation technology.

GAO was asked to review recent DOE transactions involving USEC. This report examines (1) the uranium transactions DOE undertook in 2012 and 2013 involving USEC, (2) legal concerns regarding the transactions, (3) other issues the transactions raise, and (4) the extent to which DOE assessed impacts of the transactions on the domestic uranium market. To address these issues, GAO analyzed relevant laws and key documents and interviewed DOE, USEC, and uranium industry officials, among other steps.

What GAO Recommends

GAO recommends six actions to DOE to improve the transparency of its uranium transactions, including developing a consistent method for valuing depleted uranium tails and conducting quality assurance on future market impact studies. DOE generally disagreed with GAO's legal analysis and recommendations. GAO maintains that its recommendations are valid.

View GAO-14-291. For more information, contact David C. Trimble at (202) 512-3841 or trimbled@gao.gov.

What GAO Found

The Department of Energy (DOE) undertook four uranium transactions involving USEC Inc. (USEC) in 2012 and 2013. These transactions served to provide the company with operating cash. According to DOE, the department benefited from these transactions in two ways: (1) by ensuring availability of domestic low-enriched uranium (LEU) for the production of tritium, a key radioactive isotope used to enhance the power of nuclear weapons, and (2) by supporting USEC's development of next generation enrichment technology. Three of the four transactions involved transferring ownership of depleted uranium tails (tails), a product of the enrichment process. Tails are generally considered to be an environmental liability, but can have value as an asset when uranium market conditions make tails re-enrichment economical in lieu of enriching natural uranium. In two transactions, DOE accepted ownership of tails, along with liability for disposal costs, in exchange for other benefits. In another transaction, DOE transferred ownership of tails to a third party to be re-enriched by USEC. The fourth transaction involved the transfer of uranium material other than tails.

GAO identified legal concerns with all four of DOE's uranium transactions. For the largest transaction—DOE's transfer of tails to a third party for re-enrichment—GAO believes that DOE likely did not have authority to transfer tails under restrictions imposed by the USEC Privatization Act. DOE disagreed, citing its authority to conduct this transaction under the Atomic Energy Act. Even if DOE had such authority, GAO found that it did not meet the Act's requirement to charge a price for the tails because it transferred them without charging any price at all. In another transaction, DOE transferred ownership of uranium material that it previously obtained to meet national security needs, without obtaining a presidential determination that the uranium material was no longer necessary for national security needs, as GAO found is required by the USEC Privatization Act.

GAO identified issues concerning DOE's methods for valuing tails and whether DOE received reasonable compensation with respect to its largest transaction. DOE does not have guidance for determining the value of tails when they are treated as an asset in a transaction, and as a result, the estimated value of the tails ranged from $0 to $300 million. DOE decided that the tails had no value in this transaction, and therefore, the transaction had no cost to the department. But, in other instances, DOE has determined that tails have value and has sought to sell its tails. Without consistent guidance for how to value its tails for transactions, DOE cannot ensure the government will be reasonably compensated, as required if, as DOE asserts, the Atomic Energy Act applies.

DOE contracted for two studies in 2012 and 2013 to support required determinations by the Secretary of Energy that certain uranium transfers would not have an adverse material impact on the domestic uranium market and posted these studies on its website. However, DOE did not take steps outlined in its contracts or in departmental quality assurance guidance to ensure the quality of these studies. For example, the studies provided only limited detail about their methodology and data sources; however, DOE's quality assurance guidance states that DOE information disseminated to the public should contain such information. GAO also identified shortcomings in the studies that raise questions about the definitiveness of the studies' conclusions.

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Abbreviations

AEA	Atomic Energy Act
DOE	Department of Energy
EA	Environmental Assessment
EIS	Environmental Impact Statement
ERI	Energy Resources International, Inc.
FONSI	Finding of No Significant Impact
GDP	Gaseous Diffusion Plant
HEU	highly enriched uranium
kg	kilogram
LEU	low enriched uranium
MAP	Mitigation Action Plan
MTU	metric tons of uranium
NEPA	National Environmental Policy Act
NNSA	National Nuclear Security Administration
NRC	Nuclear Regulatory Commission
NWSP	Nuclear Weapons Stockpile Plan
RD&D	Research, Development, and Demonstration
SWU	separative work unit
TVA	Tennessee Valley Authority

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May 9, 2014

The Honorable Edward J. Markey
United States Senate

The Honorable Michael C. Burgess
House of Representatives

Uranium is a naturally occurring radioactive element that is enriched to fuel nuclear power plants, which provide about 20 percent of U.S. electricity, and to meet certain national security requirements.[1] The Department of Energy (DOE) considers nuclear power a viable source of clean energy, and as such, is committed to the maintenance of a strong domestic nuclear industry. Beginning in the 1940s, the federal government, through DOE and its predecessor agencies, provided the nation's domestic uranium enrichment services for both commercial power and national security needs using government-owned plants. In 1992, USEC Inc. (USEC) was established as a government corporation[2] to provide uranium enrichment services for the U.S. government and utilities that operate nuclear power plants and to take over operations of DOE's enrichment facilities. USEC was then privatized in 1998 under the USEC Privatization Act.[3] Since then, shares of USEC have been publicly traded on the New York Stock Exchange.

USEC's financial condition has been negatively affected by external business pressures, among other factors. One such factor was the March 2011 tsunami caused by a major earthquake off the coast of Japan that resulted in irreparable damage to four nuclear reactors at the Fukushima Daiichi power plant. The events in Japan triggered broader concerns about the risks associated with nuclear power, and more than 50 nuclear

[1]To transform uranium ore into a form that can be used to fuel nuclear reactors, uranium goes through a number of steps including mining, conversion, and enrichment. Enrichment is the process of separating uranium-235—the form, or isotope, that undergoes fission to release enormous amounts of energy in nuclear reactors and weapons—from uranium-238 to increase the concentration of uranium-235.

[2]The corporation was initially established as the United States Enrichment Corporation. Upon privatization, the corporation was renamed USEC Inc.

[3]USEC Privatization Act, Pub. L. No. 104-134 tit. III, ch. 1, subch. A, 110 Stat. 1321–335 (1996), codified as amended at 42 U.S.C. §§ 2297h-2297h-13 (2014).

reactors in Japan and Germany were subsequently taken off-line, affecting the global market for uranium enrichment services and resulting in significant downward pressure on market prices for low-enriched uranium (LEU).[4] Another such factor has been the advancement of enrichment technology used by USEC's competitors. To date, all of the uranium USEC has enriched for sale has been enriched using 60-year old gaseous diffusion technology at plants the company leased from DOE. Since 2001, USEC has operated one such Gaseous Diffusion Plant (GDP) in Paducah, Kentucky.[5] In December 2013, USEC announced that it intended to restructure its debt through a Chapter 11 bankruptcy petition, which it filed in March 2014.[6] Specifically, USEC plans to replace over $600 million in previously held debt with new debt and equity in USEC.

In December 2011, USEC informed DOE that it was considering ceasing enrichment operations at the Paducah GDP because of decreased demand for LEU and high production costs associated with the plant's older, energy inefficient technology, which required about as much electricity per year to operate as the city of Memphis, Tennessee.[7] Building on technology originally developed by DOE from the 1960s to the 1980s, USEC has been working to deploy next-generation American Centrifuge technology for uranium enrichment, near the site of another DOE GDP it operated in Ohio until 2001. If successfully deployed, the American Centrifuge Plant—the facility where the American Centrifuge technology will be operated—would establish a commercial domestic

[4]Uranium is categorized by concentration of uranium-235, expressed as a percentage "assay." Natural uranium has an assay of about 0.7 percent uranium-235. For use in a nuclear power reactor or weapon, natural uranium must be enriched to increase its assay to a level required for its ultimate use. For example, LEU, which is used in commercial nuclear power reactors, typically, has an assay of between 3 and 5 percent uranium-235.

[5]The gaseous diffusion process involves the passage of uranium hexafluoride in a gaseous form through a series of filters. Because uranium-235 is lighter, it passes through the filters more readily than uranium-238, resulting in gaseous uranium that is enriched in uranium-235—the fissionable isotope.

[6]USEC Inc. is the entity that filed for Chapter 11 bankruptcy protection. However, its primary operating subsidiary, the United States Enrichment Corporation is not filing for such protection and, according to USEC, will conduct ongoing development of next generation uranium enrichment technology.

[7]According to USEC, the cost of electricity at the Paducah GDP accounted for approximately 70 percent of the plant's operating costs in 2012.

uranium enrichment capability that could meet the demand for U.S. national security needs.[8] In April 2014, the Secretary of Energy stated that DOE's Oak Ridge National Laboratory would assume responsibility for managing the American Centrifuge Plant and technology with a focus on meeting national security needs. According to a filing submitted by USEC as part of its bankruptcy proceedings on May 1, 2014, the contractor for Oak Ridge National Laboratory intends to utilize USEC as a subcontractor to carry out the program. The subcontract at about $117 million, including all options and is scheduled to last no longer than January 31, 2015.

Since its privatization, USEC has been the only domestically owned supplier of uranium enrichment services that uses domestically developed enrichment technology, conditions DOE has posited are necessary to meet national security needs for LEU while complying with international agreements to which the United States is a party. DOE has identified two principal national security needs for enriched uranium: (1) LEU is needed for the production of tritium, a key radioactive isotope used to enhance the power of nuclear weapons in the U.S. stockpile, and (2) highly enriched uranium (HEU) is needed to fuel the reactors that power the U.S. Navy's aircraft carriers and submarines.[9] The U.S. government has entered into international agreements that govern how uranium and uranium enrichment technologies may be used. These agreements carry "peaceful use restrictions" or "obligations" that may preclude uranium originating in another country or uranium that is enriched using another country's technology from being used for U.S. national security or military

[8]Gas centrifuge technology employs rapidly spinning cylinders containing uranium hexafluoride to separate the fissionable uranium-235 from the nonfissionable uranium-238. The centrifuge is significantly less power intensive than the gaseous diffusion process, and centrifuge technologies have already been commercialized by USEC's competitors. All of USEC's competitors are foreign owned and use foreign-developed technology. Its three primary competitors are (1) URENCO, a consortium of companies owned or controlled by the British and Dutch governments and by two German utilities; (2) a multinational consortium controlled by AREVA, a company that is 90 percent owned by the French government; and (3) the Russian government's State Atomic Energy Corporation ("Rosatom"), which sells LEU through Techsenabexport (TENEX), a Russian government-owned entity.

[9]USEC has never enriched uranium to HEU levels. The United States has not had a domestic capability to produce HEU since 1992 and instead meets national security needs using an inventory of HEU that was enriched prior to 1992. According to DOE, the department's current HEU allocations are sufficient to meet national security demands through 2064.

purposes. DOE asserts that the government's obligations under these agreements require it to use unobligated LEU[10]—domestically sourced uranium that is enriched using domestic technology—to meet national security needs.[11] Since USEC ceased enrichment activities at the Paducah GDP in May 2013, there is no longer an operating U.S. domestic enrichment facility that uses domestic technology. According to USEC officials, if financing became immediately available, enrichment operations could begin at the American Centrifuge Plant as early as 2017.

Under the Atomic Energy Act of 1954, as amended by the USEC Privatization Act,[12] DOE has certain authorities to sell or transfer natural uranium and LEU subject to applicable conditions, such as a determination by the President it is not needed for national security and a determination by the Secretary of Energy that the transfer will not have an adverse material effect on the domestic uranium market. We have previously reported on DOE's authority to sell or transfer depleted uranium tails (tails)—a product of the enrichment process—as well as uranium transactions that DOE has conducted to fund environmental cleanup activities by selling part of its uranium inventory to avoid having to use appropriated funds to support those activities. Specifically, in a report in 2008, we found that DOE likely lacks authority to sell depleted uranium tails.[13] In 2011, we also reported on the legal bases for and market analyses of certain DOE uranium transactions involving USEC and concluded that DOE had violated federal fiscal law because DOE

[10]By unobligated, we mean that neither the uranium nor the technology used to enrich it carry an "obligation" from the source country that they will only be used for peaceful purposes.

[11]We are conducting a separate review for congressional requesters on the extent to which international agreements to which the United States is a party affect the commercial supply base for unobligated LEU available to DOE for national security or military purposes, among other things, and we expect to publish a report in 2014.

[12]See Atomic Energy Act of 1954 §§ 53, 63, codified as amended at 42 U.S.C. §§ 2073, 2093 (2014); USEC Privatization Act § 3112(d), codified as amended at 42 U.S.C. § 2297h-10 (2014).

[13]GAO, *Nuclear Material: DOE Has Several Options for Dealing with Depleted Uranium Tails, Each of Which Could Benefit the Government*, GAO-08-606R (Washington, D.C.: Mar. 31, 2008); see also: GAO, *Nuclear Material: DOE's Depleted Uranium Tails Could Be a Source of Revenue for the Government,* GAO-11-752T (Washington, D.C.: June 13, 2011).

should have deposited the net proceeds of certain transactions into the Treasury but did not.[14]

Since our 2011 report, DOE has conducted four uranium transactions directly or indirectly involving USEC.[15] In contrast to prior uranium transactions DOE has conducted, the four transactions reviewed in this report were not associated with ongoing cleanup activities, but rather focused on either ensuring availability of LEU for national security purposes or on supporting continued development of the American Centrifuge technology. DOE signed a $350 million cooperative agreement with USEC in June 2012 to financially support a Research, Development, and Demonstration (RD&D) program for American Centrifuge technology in furtherance of national security purposes and potential commercialization. The cooperative agreement required the completion of a number of milestones and performance indicators. The terms of the cooperative agreement which covered work performed from June 1, 2012, through April 30, 2014, committed DOE to providing up to $280 million, or 80 percent, of the costs for the program, with USEC committing to fund the remaining 20 percent.[16] As of April 30, 2014, DOE had contributed about $280 million in funding under the cooperative agreement, which included $148 million in transfers of appropriated funds and $132 million in credited value associated with two of the four uranium transactions.[17] See appendix I for a timeline and additional information about the four uranium transactions and eight transfers of appropriated funds.

In this context, you asked us to review the financial relationship between DOE and USEC with a focus on any legal, economic, or other concerns

[14]GAO, *Excess Uranium Inventories: Clarifying DOE's Disposition Options Could Help Avoid Further Legal Violations*, GAO-11-846 (Washington, D.C.: Sept. 26, 2011).

[15]For the purposes of our review, uranium transfers or "transactions" involve the exchange of natural, enriched, or depleted uranium, or uranium enrichment services between DOE and another party. DOE and USEC discussed carrying out a fifth uranium transaction in May 2013, but it was not ultimately completed.

[16]Under the agreement, DOE commits to incremental funding through amendments, to be made subject to appropriations and other conditions.

[17]DOE transferred appropriated funds to support the RD&D program for the American Centrifuge technology on eight separate occasions. Specifically, DOE agreed to transfer the funds on: November 30, 2012; June 13, 2013; July 24, 2013; October 25, 2013; November 20, 2013; January 28, 2014; February 12, 2014; and April 1, 2014.

that may be raised by DOE's recent uranium transactions involving the company.[18] Accordingly, this report examines (1) the details of the uranium transactions that DOE undertook in 2012 and 2013 involving USEC; (2) any legal concerns that may exist with respect to these uranium transactions; (3) any other issues that may be raised by these uranium transactions; and (4) the extent to which DOE assessed the market impact of these uranium transactions.

To describe the uranium transactions DOE undertook in 2012 and 2013 involving USEC, we first identified that four uranium transactions took place over this time period: a multiparty transaction that included DOE and USEC, as well as three direct transactions between DOE and USEC in which enriched uranium and other goods were exchanged. We also reviewed and analyzed agency documents pertaining to the type and estimates for the value of uranium or enrichment services transferred,[19] including the purposes for those transactions; reviewed USEC's corporate financial filings with the U.S. Securities and Exchange Commission; and interviewed key USEC and Energy Northwest executives and officials from DOE, the Nuclear Regulatory Commission (NRC), and the Tennessee Valley Authority (TVA).[20] To identify any legal concerns related to these four transactions, we assessed DOE's compliance with key provisions of applicable statutes; reviewed our previous related work; reviewed contracts associated with these transactions as well as key internal agency memoranda; and interviewed DOE, the Department of State, TVA, and Energy Northwest officials. To identify any other issues related to these four transactions, we analyzed agency documents and interviewed DOE and contractor officials at the Y-12 National Security Complex. We also reviewed the *Standards for Internal Control in the*

[18]This request was originally made by the Ranking Member of the House Committee on Natural Resources, Representative Edward J. Markey, who is now a member of the Senate, and Representative Michael C. Burgess.

[19]We did not did not attempt to independently verify the reliability of DOE's estimates for the value of goods transferred between the agency and other parties because the amount and quality of data on how estimated costs and benefits were determined varied so greatly between the transactions. As a result, data on DOE's reported estimated costs and benefits are of undetermined reliability.

[20]Energy Northwest is a membership organization of public utilities in the northwestern United States that includes the Columbia Generating Station—a nuclear power plant that provides all of its output at cost to the Bonneville Power Administration, a federal nonprofit agency.

Federal Government regarding practices for risk assessment.[21] To identify the extent to which DOE has assessed the market impact of uranium transactions that involved USEC occurring in 2012 and 2013, we analyzed two market impact studies that DOE contracted from Energy Resources International (ERI)—a nuclear fuel consulting firm. The ERI studies assessed two of the four uranium transfers involving USEC, as well as additional uranium transfers that did not involve USEC. In addition, we examined the methodology underlying these studies, interviewed the principal author of the studies, and discussed the studies with DOE officials, as well as with representatives from the uranium industry and a consulting firm that specializes in nuclear fuel markets. We also reviewed DOE's contract with ERI, as well as DOE's *Information Quality Guidelines*, which set forth quality assurance steps and procedures to ensure the quality of information that DOE makes publicly available. Appendix II describes our scope and methodology in more detail.

We conducted this performance audit from January 2013 to May 2014 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 objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Background

This section describes nuclear fuel production and pricing; DOE's excess uranium inventory and comprehensive excess uranium management plan; DOE's and USEC's involvement in uranium enrichment; and DOE's legal authorities regarding sales and transfers of enriched uranium.

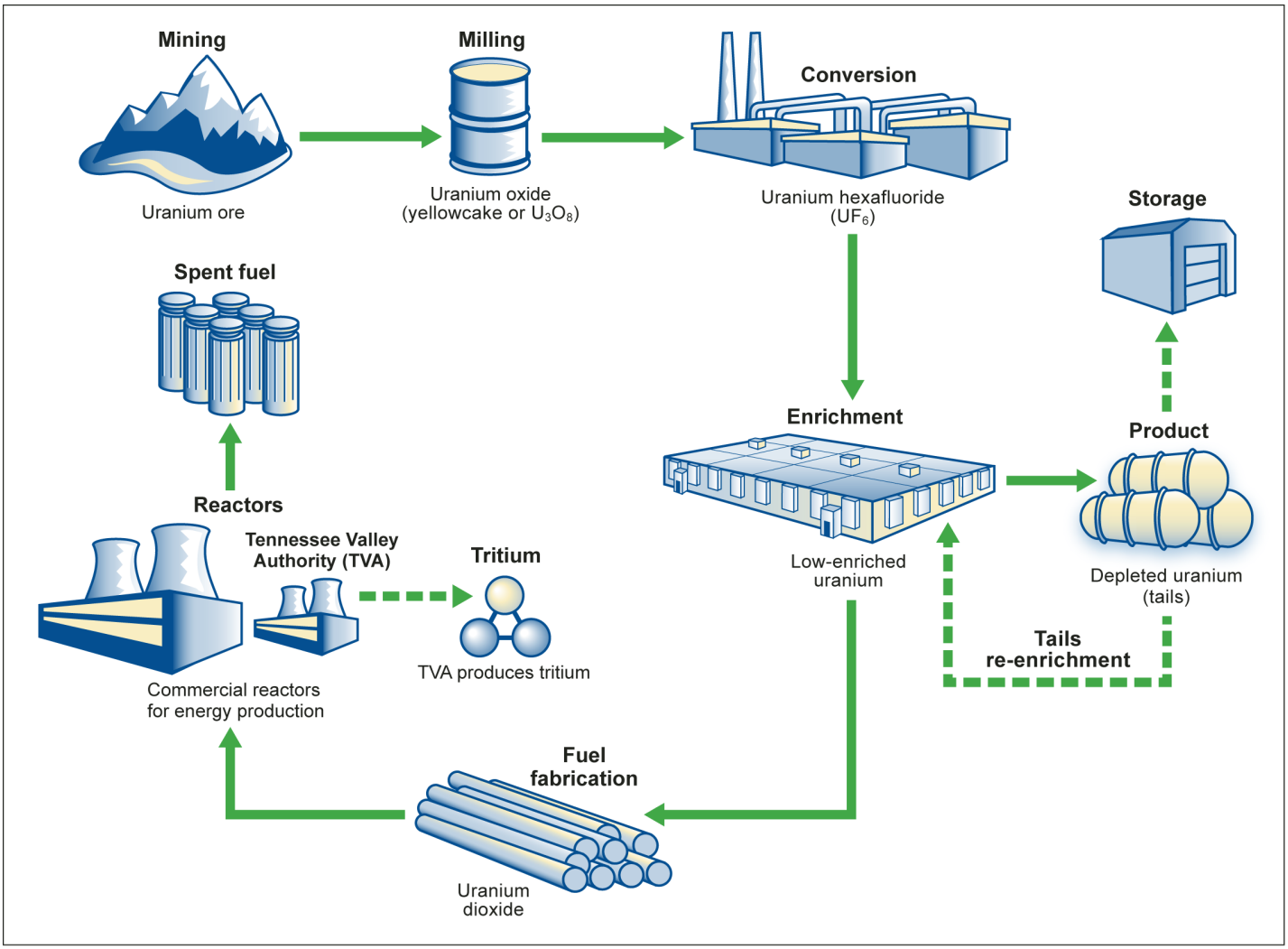
Nuclear Fuel Production and Pricing

Uranium undergoes a number of processing steps to produce LEU nuclear fuel, beginning with the mining of uranium ore and ending with the fabrication of LEU fuel for nuclear reactors (see fig. 1). The uranium

[21]GAO, *Standards for Internal Control in the Federal Government*, GAO/AIMD-00-21.3.1 (Washington, D.C.: Nov. 1999). These standards provide an overall framework for establishing and maintaining internal control and for identifying and addressing major performance and management challenges and areas at greatest risk of fraud, waste and abuse, and mismanagement.

enrichment stage falls approximately in the middle of the nuclear fuel cycle.

Figure 1: Nuclear Fuel Cycle



Sources: GAO analysis of International Atomic Energy Agency, Nuclear Regulatory Commission, Congressional Research Service, DOE, and Tennessee Valley Authority documents.

The enrichment process entails concentrating uranium-235, which is the isotope of uranium that undergoes fission to release enormous amounts of energy. Uranium is categorized by its concentration of uranium-235, expressed as a percentage of weight or “assay” level. DOE categorizes

uranium in five general types, each of which is characterized by a different assay level and has different uses (see table 1).

Table 1: Types of and Uses for Uranium

Type	Assay level of uranium-235	Examples of uses
Low-assay depleted uranium tails	Less than 0.34%	Tails are a product of the enrichment process. Tails consist of uranium hexafluoride containing fewer isotopes of uranium-235 than occur in natural uranium. Some low-assay tails are not considered economical to re-enrich.
High-assay depleted uranium tails	0.34% - 0.7%	In some cases, it may be profitable to re-enrich "high-assay" tails with assays greater than 0.34%. All tails regardless of assay are radioactive and hazardous to human health and the environment. Tails may be safely stored for years but eventually require stabilization and disposal.
Natural uranium	0.7%	Natural uranium is mined from the earth and contains 0.7% of the uranium-235 isotope. The remaining 99.3% is mostly the uranium-238 isotope. Natural uranium may be used for fuel in certain foreign nuclear reactor designs; otherwise, it is enriched for the uses described for LEU and HEU.
Low-enriched uranium (LEU)	More than 0.7% - 20%	LEU is used in commercial reactors at assay levels generally between 3% and 5%. Research, isotope production, and test reactors may use LEU at assay levels between 12% and 19.75%.
Highly enriched uranium (HEU)	More than 20%	HEU is used in the construction of nuclear weapons, for naval reactors, and for some research reactors. Weapons grade HEU generally has an assay level of at least 90%. HEU can be downblended by mixing it with either depleted or natural uranium, or LEU to convert it into a new product that is less than 20 percent uranium-235.

Sources: GAO analysis of DOE, NRC, USEC Inc., and other documents.

In the 1950s, the United States had a large uranium mining industry that was supported by federal subsidies. Production of mined uranium peaked in 1980 when there were over 250 domestic mines in operation. Between the early 1980s and 2003, the number of domestic mines declined as the nation met most of its uranium demand through imports. By 2012, 11 U.S. mines operated in the United States, according to the U.S. Energy Information Administration. In 2012, the U.S. produced about 2.7 percent of the world's mined uranium, compared with other countries, such as

Kazakhstan (36.5 percent), Canada (15 percent), and Australia (12 percent), according to the World Nuclear Association.[22] At present, the U.S. nuclear fuel supply is highly dependent on imports of mined uranium concentrates, uranium conversion, and enrichment.[23] There is only one uranium hexafluoride conversion facility in the United States, which is located in Illinois.

LEU is generally composed of two components that determine its price: (1) the feed component, which is natural uranium in the form of uranium hexafluoride; and (2) the enrichment component, or separative work units (SWU), which is both the industry standard for the measure of effort needed to transform a given amount of natural uranium into LEU and the basis for pricing these services. Uranium buyers, such as power utilities, can purchase uranium and the services to convert it into nuclear fuel in two different types of markets. In the "term" market, buyers contract with sellers for the delivery of a quantity of material or services over a period of years. In the "spot" market, quantities of uranium are generally sold for more immediate delivery, such as within several months after a sales contract is signed. When tails are re-enriched and used as the feed component in lieu of converted natural uranium, the mining, milling, and conversion stages of the nuclear fuel cycle (see fig. 1 above) are bypassed. In some cases, it may be profitable to re-enrich tails with assays greater than 0.34% such as when either the price of natural uranium is high or the price of enrichment services (SWU) is low.

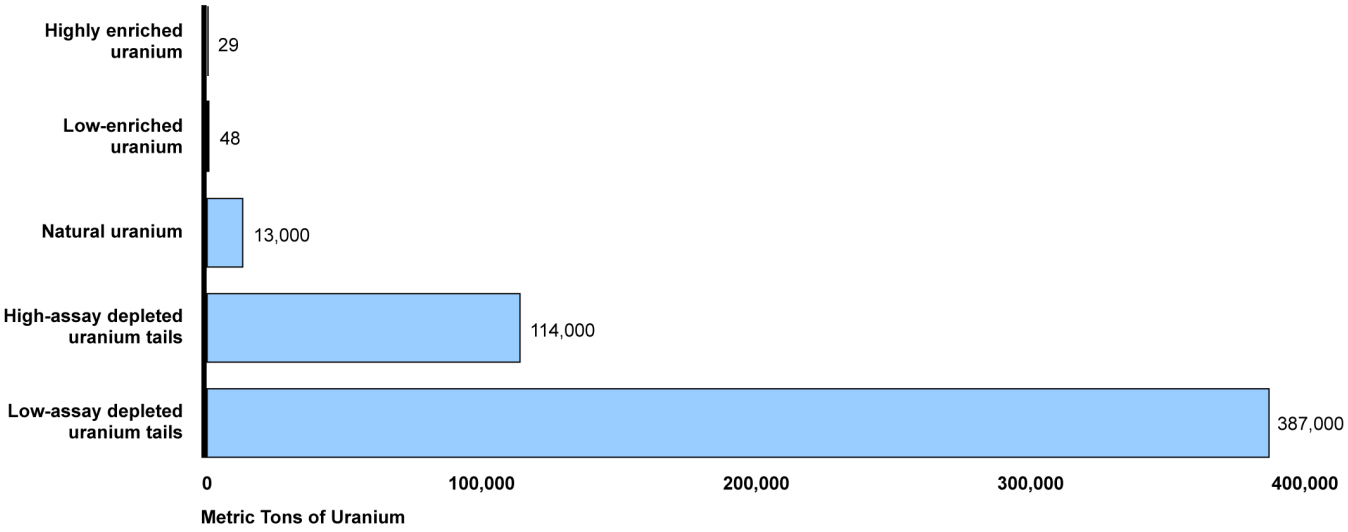
[22]The United States has a nuclear cooperation agreement with all three of these countries. A nuclear cooperation agreement is a bilateral agreement that establishes a framework for civilian nuclear cooperation, including the transfer of certain nuclear material and components of nuclear reactors between cooperating countries. Under these agreements, the natural uranium from these countries hold an obligation that it will be used only for peaceful purposes. See GAO, *Nuclear Commerce: Governmentwide Strategy Could Help Increase Commercial Benefits from U.S. Nuclear Cooperation Agreements with Other Countries*, GAO-11-36 (Washington, D.C.; Nov. 4, 2010).

[23]Conversion is the process of converting mined natural uranium to a gas that can be used for enrichment. Please see figure 1 on page 8.

DOE's Excess Uranium Inventory and Comprehensive Excess Uranium Management Plans

DOE maintains an extensive uranium inventory, generally measured in metric tons of uranium (MTU), which plays a role in achieving the department's current and future mission needs (see fig. 2). As discussed below, DOE periodically sells or transfers uranium that is in excess of those needs. DOE's inventory comes from a variety of sources, including the dismantlement of some of the nation's nuclear weapons, as well as uranium it enriched or purchased prior to USEC's privatization. DOE also stores depleted uranium tails that are contained in about 66,000 metal cylinders in storage yards on-site at its Kentucky and Ohio GDPs. The tails in DOE's inventory vary in assay levels, with about 22 percent of the inventory considered "high-assay" tails.

Figure 2: DOE's Excess Uranium Inventory[a] by Type, as of December 31, 2012



Source: GAO analysis of DOE documents.

[a]According to DOE, it defines its excess uranium inventory as the uranium currently held by DOE as excess and not dedicated to national security missions. For example, DOE also maintains an inventory of HEU for programmatic purposes that is not considered excess and therefore is not included in the data presented here.

Tails, are a product of the enrichment process and are generally considered an environmental liability. The NRC requires uranium enrichment facility operators to provide financial assurance that funds will be available when needed for the disposition of depleted uranium tails,

among other things.[24] To meet these NRC requirements, USEC has used surety bonds—which guarantee payment for the tails disposition costs by a third party, among other things, in the event that USEC defaults on such obligations—to guarantee the disposition of its depleted uranium and stored wastes.

To help manage its excess uranium inventory, and pursuant to a recommendation we made in 2008, DOE issued its *Excess Uranium Inventory Management Plan* in December 2008, which describes the amount and type of excess uranium in DOE's possession and its disposition strategy at the time. In addition, in 2008, DOE adopted a guideline to generally restrict its uranium sales and transfers to 10 percent of annual domestic nuclear fuel requirements—a percentage arrived at after consultation with the uranium industry. DOE noted that it may exceed 10 percent in any given year for certain special purposes.[25] The Secretary of Energy also issued a policy statement in 2008 on the management of DOE's excess uranium inventory, which committed DOE to generally undertake transactions involving non-U.S. government entities in a transparent and competitive manner that is supportive of a strong domestic nuclear industry. In order to ensure that its uranium transfers will not have an adverse material impact on the domestic uranium industry, as required by the USEC Privatization Act, DOE has commissioned studies on the potential market impact of some of its planned uranium transactions. In 2011, we found that DOE was poised to release uranium at a substantially faster rate than its 2008 plan stated, and we recommended that DOE update its plan to enhance its transparency.[26] Subsequently, under the Consolidated Appropriations Act, 2012, Congress required DOE to submit a revised plan for the period 2013 through 2018 by June 30, 2012.[27] DOE ultimately submitted its updated plan in July 2013, which discusses DOE's current excess inventory and general disposition plans for uranium through 2018. In this

Depleted Uranium Tails: Financial Liability or Asset?

Depleted uranium "tails" are a product of the uranium enrichment process and contain less of the fissionable isotope uranium-235 than natural uranium. Tails vary in the amount of remaining uranium-235 they contain. As of January 2013, DOE owns more than 542,000 metric tons of tails stored at its Kentucky and Ohio Gaseous Diffusion Plants, which have ceased operating. Worldwide, as of 2009, there were about 1.5 million metric tons of tails, and about 50,000 additional metric tons are generated annually.

Tails have historically been considered waste because the enrichment process required to extract the remaining useful quantities of uranium-235 is significant and can be costly. Tails may be dangerous to human health and the environment and can form extremely corrosive and potentially lethal compounds when in contact with water. The Nuclear Regulatory Commission designates tails as low-level radioactive waste when intended for disposal and requires entities possessing them to hold financial assurance to guarantee their future safe disposal. The required amount of financial assurance is based on the estimated disposal costs; for example, the cost for tails may be determined by multiplying the quantity of tails by the expected per kilogram cost for their disposal.

Under certain conditions, some tails may have economic value and therefore be considered an asset. For example, re-enrichment of tails could become profitable should the price of natural uranium increase or the cost of enrichment decrease. This is particularly the case when tails have a relatively high concentration—or assay level—of uranium-235.

Image source: GAO. Text source: GAO analysis of DOE and Nuclear Regulatory Commission documents..

[24]The financial assurance requirements applicable to USEC's operation of the gaseous diffusion uranium enrichment facilities are stated in 10 C.F.R. § 76.35(n) (2014).

[25]According to DOE's 2008 *Excess Uranium Inventory Management Plan*, an example of a special purpose for exceeding 10 percent of annual domestic nuclear fuel requirements in a given year is for initial core loads for new reactors.

[26]See GAO-11-846.

[27]Consolidated Appropriations Act, 2012, Pub. L. No. 112-74 § 312(c). 125 Stat. 786, 879 (Dec. 23, 2011).

plan, DOE announced that it would discontinue using its 10 percent guideline that it had established in 2008.

DOE's and USEC's Involvement in Uranium Enrichment

DOE and USEC have been closely linked for 20 years. Following enactment of the USEC Privatization Act in 1996, USEC was privatized through an initial public offering on July 28, 1998, which resulted in proceeds to the U.S. government of nearly $1.9 billion, consisting of nearly $1.4 billion from the sale of USEC stock, and $500 million borrowed by USEC and paid to the government. Congress authorized privatization of USEC under conditions reflecting concern with protecting the public interest in maintaining a reliable and economical domestic source of uranium enrichment services, among other things. We have previously reported that USEC has been the beneficiary of several favorable arrangements with the U.S. government, including: (1) an advantageous lease providing for nominal rent payments for the use of the Ohio and Kentucky GDPs with an open-ended renewal option, and (2) the U.S. government's retention of substantially all liabilities arising from the operation of the enrichment plants prior to privatization, including nearly all environmental cleanup and decommissioning.[28] These arrangements were entered into prior to the government's privatization of USEC, and the proceeds received by the government reflected these benefits. In addition, in June 2002, DOE and USEC signed an agreement that committed both parties to further develop gas centrifuge technology for uranium enrichment. For use in the completion of the milestones set out in the 2002 agreement, DOE licensed to USEC the gas centrifuge technology that DOE had spent $2.5 billion developing in the 1970s and 1980s. DOE abandoned this technology in 1985 in favor of a different enrichment process that would use lasers to separate natural uranium into enriched uranium and depleted uranium. The transferred centrifuge technology became the basis of the design that USEC and its partners have been working to commercialize as the American Centrifuge technology. According to USEC, cumulatively, the company has spent an additional $2.5 billion to update the technology and reestablish the manufacturing infrastructure that was lost when DOE abandoned the technology in the 1980s. DOE has also received some benefits under its arrangements with USEC, which it can exercise if USEC is unable or

[28]See GAO, *Nuclear Nonproliferation: Implications of the U.S. Purchase of Russian Highly Enriched Uranium*, GAO-01-148 (Washington, D.C.: Dec. 15, 2000).

unwilling to proceed with development of the American Centrifuge technology. For example, under a June 2012 modification to the June 2002 agreement, USEC granted to DOE (1) an irrevocable, nonexclusive, royalty-free license, for use by or on behalf of the United States, in all centrifuge intellectual property for government purposes,[29] and (2) an irrevocable, nonexclusive license in all centrifuge intellectual property, with the right to sublicense to other parties, for commercial purposes.

DOE, through its National Nuclear Security Administration's (NNSA)[30] Tritium Readiness Subprogram, supplies tritium to meet U.S. nuclear weapons stockpile demand. Tritium, a key radioactive isotope used to enhance the power of nuclear warheads and bombs, has a relatively short half-life of 12 years (it decays at a rate of about 5.5 percent per year), and tritium must be periodically replenished in existing weapons. Thus, an assured long-term source of tritium is necessary to maintain the U.S. nuclear weapons stockpile. Consistent with DOE's interpretation of U.S. commitments under international agreements, the Tritium Readiness Subprogram requires that only unobligated LEU be used in reactors to produce tritium, and the reactors licensed for use in producing tritium belong to TVA, a government entity.[31] To fulfill its agreement to produce tritium for NNSA, TVA entered into a long-term agreement to purchase unobligated LEU from USEC. According to DOE, unobligated LEU has a premium—that is, it costs more than other LEU that may carry obligations from other countries. Under the interagency agreement between DOE and TVA, TVA must use the higher cost unobligated LEU in its reactors that are used to produce tritium for NNSA and, accordingly, NNSA pays

[29]As previously noted, the Secretary of Energy announced in April 2014 that Oak Ridge National Laboratory would assume responsibility for managing the American Centrifuge Plant and technology with a focus on meeting national security needs.

[30]Congress created NNSA as a semi-autonomous agency within DOE under the National Nuclear Security Administration Act. (Pub. L. No. 106-65 § 3211, 113 Stat. 957 (1999)). NNSA is responsible for the management and security of the nation's nuclear weapons, nonproliferation, and naval reactors programs.

[31]To produce tritium, stainless steel rods containing lithium aluminate and zirconium are irradiated in TVA's Watts Bar 1 commercial nuclear power reactor, which is fueled with LEU. For additional information describing the process for producing tritium from LEU, see GAO, *Nuclear Weapons: National Nuclear Security Administration Needs to Ensure Continued Availability of Tritium for the Weapons Stockpile*, GAO-11-100 (Washington, D.C.: Oct. 7, 2010).

Devastation in Japan: Earthquake and Tsunami at the Fukushima Daiichi Nuclear Power Plant

On March 11, 2011, a 9.0-magnitude earthquake struck near Honshu, Japan, generating an estimated 45-foot tsunami and resulting in the automatic shutdown of 11 nuclear power plants at four sites along the northeast coast of Japan. The Fukushima Daiichi nuclear power plant suffered extensive damage when a tsunami wave exceeded the plant's seawall by approximately 27 feet and flooded the site, causing a prolonged loss of electrical power at several of its reactors. As a result of the loss of power, plant operators were unable to keep some of the reactors cool, which led to fuel melting, hydrogen explosions, and the release of radioactive material into the environment. This resulted in the most extensive release of radioactive material at a nuclear power plant since the 1986 Chernobyl disaster.

The accident led to a review of civilian nuclear power programs worldwide. For example, approximately 50 reactors in Japan that were not damaged by the earthquake were shut down and have remained off-line for extended governmental inspections and local government reviews. In addition, Germany shut down 8 of its reactors and announced that it will be phasing out all 17 of its nuclear reactors by 2022. These closures have decreased demand for low-enriched uranium (LEU), resulting in excess supply of LEU in the global market; in turn, this has created downward pressure on uranium prices.

Image source: U.S. Nuclear Regulatory Commission (NRC), *Recommendations for Enhancing Reactor Safety in the 21st Century* report (ML111861807). Text sources: GAO analysis of NRC and uranium industry documents.

TVA the difference in TVA's fuel costs.[32] As a result of this agreement, TVA must buy some enrichment services from USEC. According to USEC officials, TVA, however, makes up only a small percentage of USEC's annual sales. In its 2012 annual report, USEC reported that revenue from the U.S. government accounted for between 10 and 15 percent of gross revenue from the enrichment segment of its business, or between about $185 and $277 million. In addition to providing enrichment services to the government, USEC also provides enrichment services to domestic and international utilities that operate commercial nuclear power plants. Specifically, USEC supplies LEU to about 150 nuclear power plants worldwide and has averaged about a 25 percent share of the world's uranium enrichment market over the 5-year period ending in 2012.

USEC's financial condition has weakened over the past several years partly because of lower than anticipated demand for enrichment due in part to the Fukushima disaster's effect on the uranium market, the expense of continuing to operate the inefficient Paducah GDP especially with respect to electricity costs, spending on the American Centrifuge technology, and the company's lack of immediate financing for the American Centrifuge Plant. USEC applied for a $2 billion loan guarantee for U.S. government guaranteed debt financing both in 2008 and 2010 under DOE's Loan Guarantee Program.[33] DOE deferred USEC's applications in 2009 and 2011, citing financial and technical concerns. USEC has faced the threat of delisting from the New York Stock Exchange. In May 2012, USEC received a warning that the closing price of its stock had fallen below the $1 threshold criteria for continued listing on the New York Stock Exchange. Then, in April 2013, USEC received another warning as a result of its low market capitalization, or company value. In response, USEC shareholders approved a reverse stock split in

[32]The interagency agreement is intended to be at cost such that TVA neither loses money nor profits from it. NNSA agreed to pay TVA the cost difference—known as the enrichment price differential—for TVA's commercial nuclear power reactors that are part of the tritium program. To determine the differential, the cost of fuel in TVA's tritium program reactors is compared with the market price for LEU at a reference location (regardless of obligations). The reference location was selected as the best proxy for market prices TVA would have paid if it did not participate in the tritium program.

[33]For more information on DOE's Loan Guarantee Program, see GAO, *Department of Energy: Further Actions Are Needed to Improve DOE's Ability to Evaluate and Implement the Loan Guarantee Program,* GAO-10-627 (Washington, D.C.: July 12, 2010); and GAO, *DOE Loan Guarantees: Further Actions Are Needed to Improve Tracking and Review of Applications,* GAO-12-157 (Washington, D.C.: Mar. 12, 2012).

June 2013, which increased the stock price above the $1 threshold. Despite this effort, as of May 1, 2014, the company's market capitalization remains below the minimum $50 million level. On December 16, 2013, USEC announced that it had reached an agreement with a majority of the holders of its convertible notes on the terms of a financial restructuring plan that the company says will strengthen its balance sheet. USEC filed a Chapter 11 (reorganization) petition for relief, which, among other things, set forth the terms of the agreement, in the United States Bankruptcy Court for the District of Delaware in March 2014. At that time, USEC reported that it expected to continue its operations and would meet its obligations to its suppliers, customers, and other stakeholders. In addition, USEC reported that the filing would not have any effect on the American Centrifuge RD&D program or its transition activities at the Paducah GDP. However, because the RD&D program was set to end on April 15, 2014, the Secretary of Energy stated in April 2014 congressional testimony that the department's Oak Ridge National Laboratory would assume responsibility for managing the American Centrifuge Plant and technology with a focus on meeting national security needs. On April 15, 2014, USEC announced that DOE and USEC had agreed to extend the RD&D program through the end of April 2014 at no additional cost to the government.

DOE's Legal Authorities Regarding Uranium Sales and Transfers

DOE has several general authorities under the Atomic Energy Act of 1954 (AEA), as amended, to transfer uranium related to its nuclear energy functions. For example, DOE has authority to acquire natural uranium and LEU. The AEA also provides DOE with general authority to distribute natural uranium under certain conditions to qualified entities; and to sell, lease, grant, distribute, or otherwise make available enriched uranium under certain conditions. For example, with respect to certain entities such as commercial nuclear facilities, DOE is authorized to sell natural uranium subject to conditions, including the requirement to make a reasonable charge of the recipient based on a price for the material established on a nondiscriminatory basis that would provide reasonable compensation to the government.

As discussed above, in 1996, Congress enacted the USEC Privatization Act to amend the Atomic Energy Act. The USEC Privatization Act authorized the establishment of USEC as a private, for-profit corporation. Congress also restricted DOE's authority to engage in certain actions related to uranium, such as prohibiting DOE from providing commercial enrichment services and restricting certain transfers. Specifically, section 3112 of the USEC Privatization Act prohibits DOE from transferring or

selling "*any* uranium…to *any* person" except as consistent with the USEC Privatization Act's specific terms and conditions,[34] which include the following:

- Section 3112(d) authorizes DOE to sell natural uranium and LEU from its stockpile if (1) the President determines the material is not necessary for national security needs; (2) the Secretary of Energy determines the sale will not have an adverse material impact on the domestic uranium mining, conversion, or enrichment industry; and (3) the price paid will not be less than the fair market value of the material. Notably, two distinct determinations are required: one from the President as to the national security need for the particular material[35] and one from the Secretary of Energy concerning market impacts.
- Section 3112(b) provides for DOE to receive certain Russian-origin uranium hexafluoride and to sell it, generally subject to certain conditions.
- Section 3112(e) authorizes DOE to transfer or sell enriched uranium in several specific circumstances, including to any person for national security purposes, as determined by the Secretary.

Finally, in section 3113, the USEC Privatization Act also requires DOE to accept depleted uranium for disposal, in which case the entity that generated the uranium must reimburse DOE in an amount equal to DOE's disposal costs including a pro rata share of any capital costs.

In 2008 and 2011, we reported on DOE's authority to sell or transfer certain types of uranium as follows:

- In 2008, because we determined that the USEC Privatization Act likely prohibited DOE from selling or transferring depleted uranium, we suggested that Congress consider clarifying DOE's statutory authority to manage this material and provide explicit direction about whether and how DOE may sell or transfer it. DOE did not comment on our legal opinion or our suggestion to Congress.

[34]See USEC Privatization Act § 3112 (emphasis added), codified as amended at 42 U.S.C. § 2297h-10.

[35]DOE officials stated they are not aware of any documents by which the President has delegated this authority.

- In 2011, we concluded that DOE sold uranium to USEC, which USEC subsequently sold to a third party to fund DOE environmental cleanup activities. We found that DOE did not, as it contended, barter the uranium in exchange for USEC's cleanup services. Consequently, DOE was required to deposit the value of the net proceeds from the uranium sales into the Treasury, and by not doing so, and allowing USEC to keep the sale proceeds, we concluded that DOE violated federal fiscal law, specifically, the miscellaneous receipts statute.[36] Moreover, by arranging for USEC to be compensated for its cleanup services in this manner instead of using DOE's appropriated funds, DOE circumvented the congressional appropriations process. We suggested that Congress consider providing DOE with explicit authorities to retain the proceeds from barters, transfers, or sales of excess uranium. DOE disagreed with our legal opinion that its actions violated federal fiscal law.

DOE Engaged in Four Uranium Transactions Involving USEC in 2012 and 2013 to Obtain Tritium and Support the Development of New Enrichment Technology

DOE conducted four uranium transactions in 2012 and 2013 that involved USEC, primarily to ensure the availability of unobligated LEU for the production of tritium and to support USEC's development of the American Centrifuge technology. Three of these transactions involved direct uranium transfers with USEC; while, the fourth transaction involved a uranium transfer with a third party which then transferred the uranium to USEC for enrichment. For a complete description of DOE's uranium transactions and transfers of appropriated funds involving USEC since 2012, see appendix III. Table 2 provides a high-level overview of each uranium transaction including DOE-identified costs and benefits. Each uranium transaction is further summarized below.

[36]Miscellaneous receipts statute, 31 U.S.C. § 3302(b) (2014) ("an official or agent of the Government receiving money for the Government from any source shall deposit the money in the Treasury as soon as practicable without deduction for any charge or claim").

Table 2: Uranium Transactions Involving DOE and USEC Inc. in 2012 and 2013

		DOE-identified benefits	
Date and transaction name	**DOE-identified costs**	**Non-monetary**	**Monetary**
March 13, 2012 separative work units (SWU) procurement	$43.7 million[a]	Obtained unobligated low-enriched uranium (LEU) for 18 months of tritium production	$44.4 million[b]
May 15, 2012 tails transfer	$0[c]	• Assured source of unobligated LEU for up to 15 years of tritium production • Kept the Paducah Gaseous Diffusion Plant (GDP) open for an additional year and delayed the department's cleanup obligations	$759 million[d]
June 12, 2012 tails acceptance	$81.1 million[e]	Supported the development of the American Centrifuge technology as a long-term source of unobligated LEU[f]	n/a
March 15, 2013 SWU transfer	$44.4 million[g]	Supported the development of the American Centrifuge technology as a long-term source of unobligated LEU[h]	n/a

Source: GAO analysis of DOE documents.

[a]DOE assumed this cost by accepting title to and disposal liability for depleted uranium tails from USEC.

[b]DOE received this amount in SWU contained in the unobligated LEU.

[c]Upon review, we identified concerns with DOE's assessment of $0 cost to the department, which we discuss later in this report.

[d]DOE identified this amount in cost savings primarily from avoiding the costs of an alternative to using tails to obtain LEU and delaying the turnover of the facility.

[e]DOE assumed this cost by accepting title to and disposal liability for depleted uranium tails from USEC.

[f]DOE provided USEC $87.7 million for its portion of cost share for the American Centrifuge Research, Development, and Demonstration (RD&D) program.

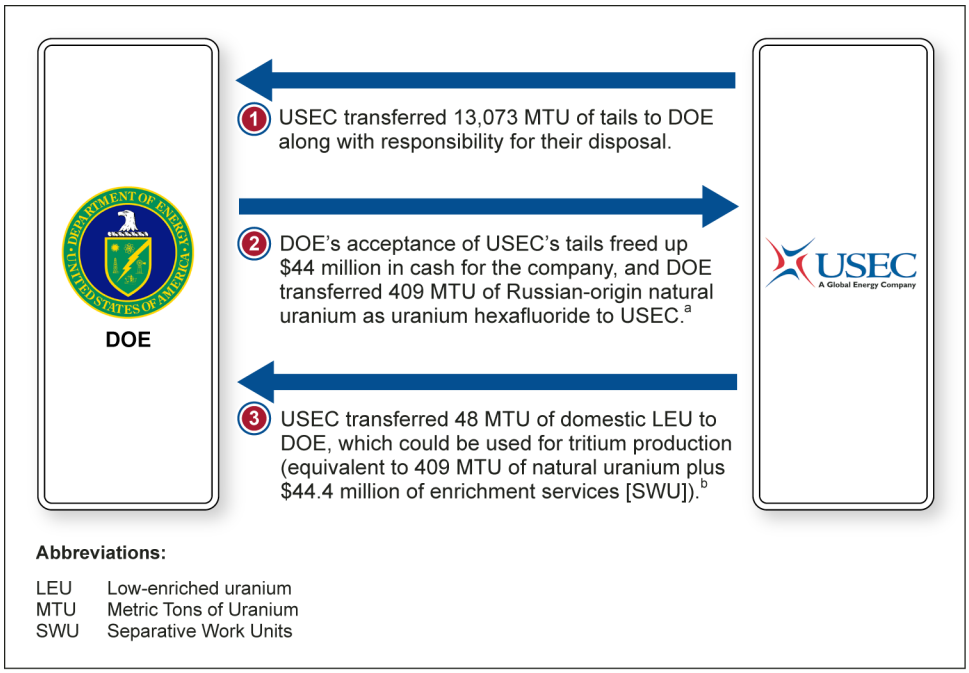
[g]DOE assumed this cost by not receiving payment for the enrichment component—or SWU—contained in unobligated LEU it provided to USEC.

[h]DOE provided USEC $44.4 million for its portion of cost share for the American Centrifuge RD&D program.

The March 2012 SWU Procurement

In March 2012, before DOE and USEC signed the June 2012 cooperative agreement to fund the American Centrifuge RD&D program, USEC's financial condition was deteriorating and, according to DOE officials, USEC was struggling to support the development of the American Centrifuge technology. Moreover, USEC had notified DOE in December 2011 that it might cease enrichment activities at the Paducah GDP as early as May 2012. Initially, DOE requested authority to transfer $150 million from existing funds in fiscal year 2012 to support USEC's development of the American Centrifuge technology. When Congress did not provide this authority, DOE entered into this transaction with USEC stating that the transaction was needed to support national security interests. Figure 3 describes the March 2012 SWU procurement.

Figure 3: March 2012 SWU Procurement



Sources: GAO analysis of DOE documents; USEC (USEC logo).

[a]As explained later in this report, according to DOE, the natural uranium as uranium hexafluoride in this transaction was Russian-origin stemming from a preexisting agreement with Russia to receive Russian LEU downblended from HEU.

[b]In this transaction, DOE did not provide monetary payment to USEC for the enrichment services (SWU) and, instead, DOE compensated USEC by accepting $44 million in liability for the future disposal of tails.

DOE accepted title to 13,073 MTU of low-assay tails, along with the responsibility for their disposal, from USEC. This enabled USEC to free up $44 million in previously encumbered funds that were being used as collateral for surety bonds to satisfy NRC's financial assurance requirements for the tails' future disposal. DOE officials told us they expected USEC to invest those funds in the development of the American Centrifuge technology. USEC reported that it did use the funds for this purpose. While USEC had reserved $44 million to secure bonds for the future disposal of these tails, DOE estimated that it would cost the department $43.7 million to dispose of the same tails.

According to DOE officials, in order to receive an asset in return for assuming USEC's liability, DOE received $44.4 million in SWU services from USEC for which it did not provide monetary compensation. To facilitate receipt of this SWU, DOE bartered with USEC, providing 409

MTU Russian-origin natural uranium as uranium hexafluoride for 48 MTU of unobligated LEU (equivalent to 409 MTU of natural uranium plus SWU).[37] According to DOE, the value of the SWU component DOE received ($44.4 million) was roughly equivalent to the value of the tails liability it assumed from USEC ($43.7 million). DOE officials considered this transaction to be only a procurement of SWU, and not a uranium transfer, but we found otherwise as discussed later in this report.

According to DOE, the department received a $700,000 benefit, which is the difference between the $44.4 million in SWU that it received from USEC and the $43.7 million in liability that it incurred from accepting responsibility for the disposal of the tails. The department also acquired unobligated LEU, which it intended to use for the production of tritium as a result of its barter of Russian-origin natural uranium as uranium hexafluoride, which DOE could not have used for tritium production.

The May 2012 Tails Transfer

According to DOE, by May 2012, it became clear that USEC was no longer in a financial position to continue enrichment activities at the Paducah GDP, and DOE sought to ensure availability of a supply of unobligated LEU from USEC for future tritium production before the plant's anticipated closure. The resulting May 2012 tails transfer was the most complex and largest of the four transactions in our review, both in terms of LEU transferred and estimated dollar value, and it involved four main parties: DOE, Energy Northwest, USEC, and TVA.[38] Five two-party contracts were executed within 1 day of each other, and each related to transfers, enrichment, or use of uranium. DOE was party to two of the five contracts, and its transfer of tails to Energy Northwest initiated the series of additional uranium transfers.[39] There was no overarching contract or agreement tying all of the transfers between the four entities together. Our analysis of the May 2012 tails transfer identified six key steps that must occur before DOE secures tritium from TVA. As of May 1, 2014, four

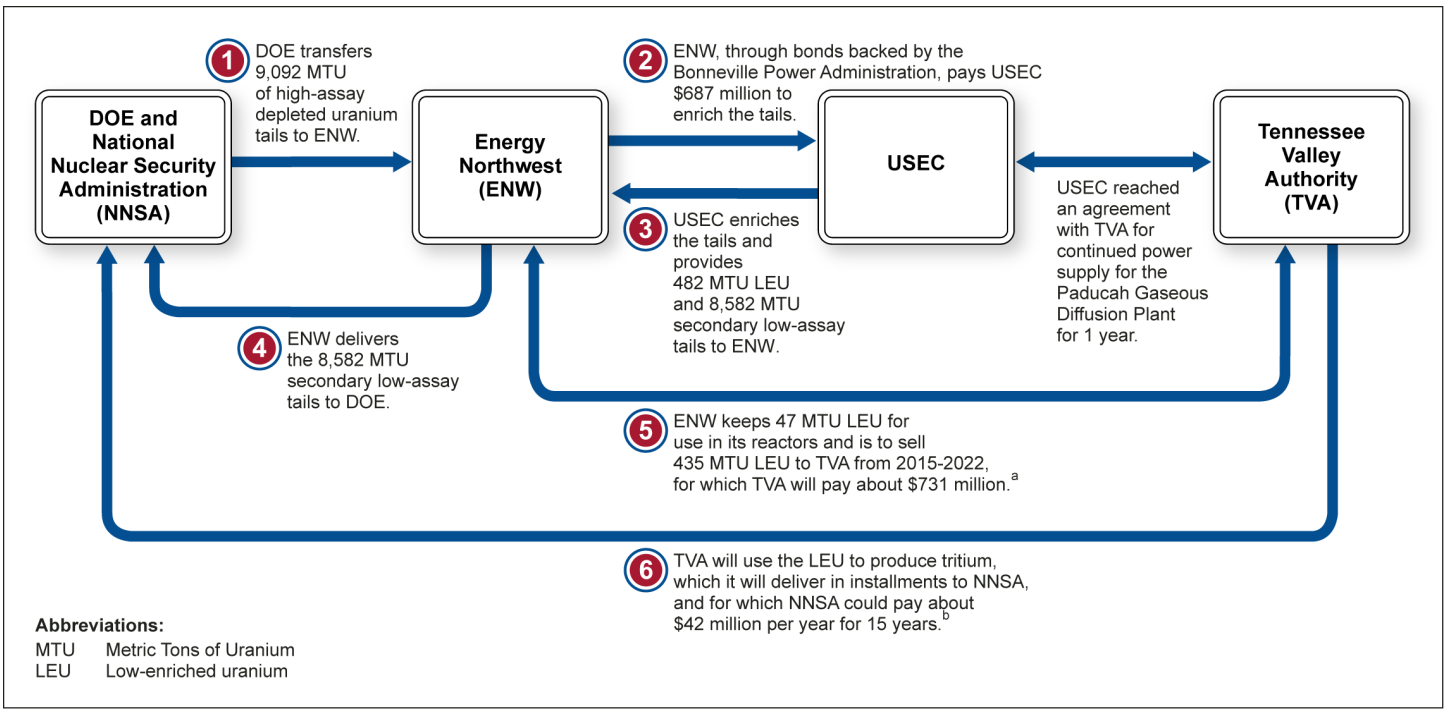
[37]According to DOE officials, 48 MTU of unobligated LEU is enough to produce tritium for up to 18 months.

[38]Generally, when we refer to the May 2012 tails transfer we refer to DOE's transfer of tails to Energy Northwest and the ensuing agreements and actions taken by the other parties.

[39]One of DOE's contracts was with Energy Northwest for the transfer of depleted uranium tails. The other was an amendment to DOE's (NNSA's) preexisting interagency agreement with TVA for the supply of tritium in support of NNSA's Tritium Readiness Subprogram.

of these steps are complete. Ultimately, DOE expects to benefit from this transaction by ensuring a source of unobligated LEU for TVA's use for up to a 15-year supply of tritium production from a single reactor. Figure 4 describes the May 2012 tails transfer.

Figure 4: May 2012 Tails Transfer



Sources: GAO analysis of DOE, USEC, Energy Northwest, and TVA documents.

[a]TVA will provide some natural uranium to Energy Northwest as part of its payment for the LEU. According to Energy Northwest, it will use the estimated 1,656 MTU of this natural uranium to support its facilities.

[b]NNSA will continue to reimburse TVA for any cost differential for using unobligated LEU based on market price at the time, consistent with the agreement in support of the Tritium Readiness Subprogram.

Specifically, the transaction involves the following six steps:

1. Beginning in May 2012, DOE transferred 9,092 MTU of U.S. origin high-assay depleted uranium tails to Energy Northwest. Energy Northwest did not provide payment to DOE for those tails.[40]
2. Energy Northwest delivered the tails to USEC for enrichment to LEU and according to Energy Northwest officials, it paid USEC $687 million—using bonds backed by the Bonneville Power Administration—for the enrichment services.
3. USEC then produced 482 MTU of LEU, which also resulted in secondary tails from the enrichment process, and it provided this amount of LEU to Energy Northwest over the next year, completing its work by May 2013. In order to enrich the tails, USEC extended its existing contract with TVA to provide power to the Paducah GDP through May 31, 2013.[41] Enrichment operations at the Paducah GDP ceased in May 2013, after USEC completed the tails enrichment.
4. The last step completed as of May 1, 2014, occurred when DOE accepted title to the secondary tails from Energy Northwest and also stored the LEU at the Paducah GDP on behalf of Energy Northwest.
5. Energy Northwest holds title to all of the resulting LEU; it plans to retain a small portion of the LEU for its future use, and it entered into an agreement with TVA to sell to TVA the remaining unobligated LEU that USEC enriched in installments from 2015 through 2022 under a long-term contract.
6. Finally, TVA plans to use the unobligated LEU for up to 15 years of tritium production under its agreement with NNSA,[42] and NNSA is to pay TVA the enrichment price differential plus additional incremental costs for obtaining and preserving unobligated fuel instead of

[40]In its agency comments, DOE reported that it transferred 9,075 MTU of U.S. origin high-assay depleted uranium tails. However, we are reporting that DOE transferred 9,092 MTU of these tails, which is information DOE provided to summarize its nuclear materials transactions documentation (DOE/NRC Form 741).

[41]USEC had been TVA's single largest industrial customer, having signed a contract with TVA in 1995.

[42]TVA is bound by its interagency agreement with NNSA to use unobligated LEU in its reactor used for tritium production. As modified in 2012, the agreement specifies "it shall be the responsibility of DOE to ensure that TVA can obtain unobligated fuel [LEU] to support tritium production, and DOE shall be responsible for reimbursing TVA any additional costs associated with this." The agreement does not require TVA to use the specific LEU that was enriched for Energy Northwest, but includes a provision for the additional costs DOE will pay if TVA purchases the Energy Northwest fuel.

obligated fuel. According to TVA, NNSA could pay TVA about $42 million for tritium per year over the 15-year period.[43]

Overall, DOE's role in this transaction is to transfer high-assay tails to Energy Northwest and take back the secondary low-assay tails, including their disposal liability, from Energy Northwest. Following completion of the first five steps, NNSA will be able to obtain tritium from TVA through the agencies' ongoing interagency agreement.

DOE determined that there was no cost to the department for the May 2012 tails transfer because, according to DOE, the tails it transferred had no value. We disagree that the tails had no value for reasons we discuss later in this report. However, DOE did value the collective benefit to the department of this transaction at about $759 million and identified several additional nonmonetized benefits. Specifically, in a financial analysis conducted by DOE's Office of the Chief Financial Officer, DOE estimated the benefit of the transaction by identifying two key cost savings realized by using tails as the source material for the resultant unobligated LEU: (1) a $654 million cost avoidance from not having to downblend HEU to LEU, DOE's identified alternative to enriching natural uranium or tails to obtain unobligated LEU;[44] and (2) a $105.3 million cost savings associated with reduced tails liability and deferred maintenance, since USEC would operate the GDP for another year.[45] DOE cited but did not quantify other benefits, which include the intangible benefits of ensuring the availability of unobligated LEU for up to a 15-year supply of tritium production and job retention for approximately 1 year at the Paducah GDP, among others.

[43]NNSA has a long-standing contract with TVA to produce tritium from 2000 to 2035 for which NNSA will pay TVA an estimated total of $1.5 billion. The $42 million is the average annual amount that NNSA will reimburse TVA for tritium production—including the cost differential for unobligated LEU, as well as administrative costs—over the 15-year period in which the LEU produced from the May 2012 tails transfer is planned to be used by TVA to produce tritium.

[44]HEU can be downblended by mixing it with either depleted, natural, or LEU to produce a new product that has a lower concentration of uranium-235.

[45]After the Paducah GDP is returned to DOE, DOE will incur first-year costs to place the facility in cold shutdown mode and then ongoing costs of surveillance and maintenance until the facility can be decontaminated and decommissioned. These costs were avoided for 1 year by keeping the Paducah GDP open to re-enrich the tails.

According to the financial analysis prepared by DOE's Office of the Chief Financial Officer, DOE had considered three alternatives to conducting this transaction before determining that the May 2012 tails transfer was, in its view, the best option: (1) using backup LEU from another DOE program's inventory, but DOE determined that this option would only provide up to 6 years of tritium production; (2) downblending HEU not currently deemed in excess to national security needs, but DOE determined that this option would require the HEU to be replaced at great cost at some point in the future and would accelerate the date by which the United States would have to acquire an HEU enrichment capability; and (3) contracting with USEC to enrich the depleted uranium, but DOE determined that this option would require a large supplemental appropriation, which it deemed unlikely.

The June 2012 Tails Acceptance

In June 2012, DOE accepted $87.7 million in disposal liability from USEC for depleted uranium tails to fulfill DOE's first installment of its financial commitment to the American Centrifuge RD&D program.[46] Specifically, DOE agreed to accept title to up to 39,200 metric tons of depleted uranium hexafluoride from USEC. This allowed USEC to free up $87.7 million in previously encumbered funds that were being used as collateral for surety bonds committed to the future disposal of these tails. USEC applied this funding toward DOE's financial commitment to supporting the development of the American Centrifuge RD&D program. USEC had cash reserves of $87.7 million to back bonds for the future disposal of these tails but, according to a DOE internal financial analysis, DOE estimated that it would cost the department $81.1 million to dispose of the same tails.

We reviewed key documents supporting this transaction and found that they contain different information on the quantity of tails that DOE could accept from USEC, which could result in DOE having to assume additional liability at a later date. As outlined in table 3, agency documents identify different amounts of tails that may be transferred under this transaction. In one document, DOE reported that relevant quantity in metric tons of uranium (MTU) and four other documents reported that relevant quantity in metric tons of depleted uranium hexafluoride. USEC also reported that relevant quantity in one document

[46]As previously discussed, DOE also provided USEC with a total of $148 million in appropriated funding to support the development of the American Centrifuge RD&D program from November 2012 to April 2014.

in metric tons of uranium hexafluoride. In order to facilitate a comparison among all five documents, table 3 provides the documented quantity of material that could be transferred in both units of measure. According to DOE, one MTU is equal to 1.4789 metric tons of depleted uranium hexafluoride.[47]

Table 3: Conflicting Amount of Tails Reported in Documents Supporting the June 2012 Tails Acceptance Transaction (equivalent amounts of material presented in two different units)

Document	Amount identified in Metric Tons Uranium (MTU)	Amount identified in Metric Tons of depleted uranium hexafluoride
Summary of DOE/NRC documentation used to report nuclear materials transactions[a]	**16,570**	24,505
DOE internal financial analysis[b]	Up to 17,648	**Up to 26,100**
DOE-USEC Inc. Cooperative Agreement[c]	Up to 26,506	**Up to 39,200**
USEC's 2012 annual filing with the U.S. Securities and Exchange Commission[d]	Up to 26,506	**Up to 39,200**
DOE's comments on GAO draft report[e]	25,909	**38,317**

Sources: GAO analysis of DOE, NRC, and USEC documents.

Note: Amounts listed in bold text are the units in which the document originally reported.

[a]DOE reported that it accepted this amount of tails in a summary of its NRC documentation. NRC regulations require licensees who ship, receive, or adjust their physical inventory of source or special nuclear material to document and report such activities. The reports are submitted using the DOE/NRC Form 741.

[b]DOE reported that it would accept this amount of tails in its cost analysis documentation in which DOE determined the department's liability cost for the tail's disposal. DOE, *Assessing the Tails Transfer Proposal*, May 31, 2012.

[c]DOE agreed to accept this amount of tails in its agreement with USEC. Cooperative Agreement between Department of Energy, USEC Inc., and American Centrifuge Demonstration, LLC (June 12, 2012).

[d]USEC reported that DOE agreed to accept this amount of tails in its 2012 annual U.S. Securities and Exchange Commission filing.

[e]In commenting on a draft of this report, DOE stated that it accepted 38,317 metric tons of depleted uranium hexafluoride from USEC for this transaction.

[47]DOE, *Assessing the Tails Transfer Proposal*, May 31, 2012.

As indicated above, the quantity of tails reported in a summary of its DOE/NRC documentation—which is required by NRC regulations to report nuclear materials transactions[48]—was less than the quantity DOE used to determine the department's liability cost for the tails' disposal. On this basis, it appears that the amount that USEC transferred is in line with the costs DOE assumed. However, the cooperative agreement between DOE and USEC states that, for the budget period from June 2012 through November 2012, USEC would transfer up to 39,200 metric tons of depleted uranium hexafluoride, which is 14,695 metric tons of depleted uranium hexafluoride more than the amount DOE reported in its summary of DOE/NRC documentation and 13,100 metric tons of depleted uranium hexafluoride more than used by DOE to estimate its disposal liability for the tails. USEC also reported the same amount that was identified in the cooperative agreement (up to 39,200 metric tons of depleted uranium hexafluoride) in its 2012 annual filing with the U.S. Securities and Exchange Commission. Because the cooperative agreement allows for USEC to transfer more tails than the summary of DOE/NRC documentation used to report the material transfer recorded, DOE could be required by its cooperative agreement with USEC to accept additional tails from USEC at a later date, resulting in DOE having to incur additional tails disposal liability.[49]

The March 2013 SWU Transfer

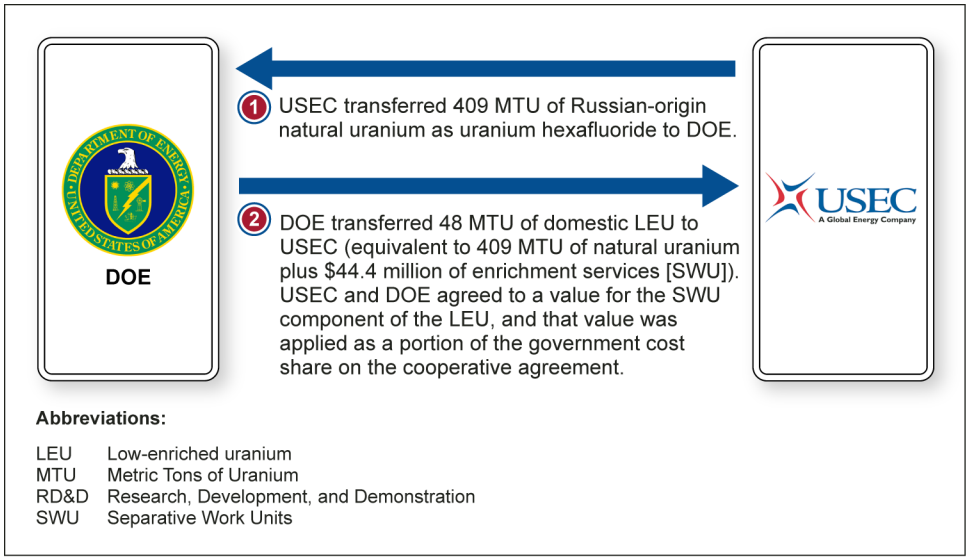
In March 2013, to fulfill part of its financial commitment to the American Centrifuge RD&D program, DOE agreed to provide SWU to USEC by transferring back the unobligated LEU that it received from USEC in the March 2012 SWU procurement. In effect, this transaction largely reversed the transfers of natural and enriched uranium material that occurred between DOE and USEC in the March 2012 SWU procurement (however, DOE retained the depleted uranium tails that it accepted from USEC in that transaction). Specifically, DOE provided USEC 48 MTU of unobligated LEU—the same unobligated LEU that it received from USEC in the March 2012 SWU procurement. In return, USEC provided DOE 409 MTU of Russian-origin natural uranium as uranium hexafluoride (the same Russian-origin natural uranium as uranium hexafluoride that DOE provided USEC in March 2012), which the parties view as equivalent to the natural uranium component in the transferred LEU. As a result, USEC

[48]See *e.g.,* 10 C.F.R. § 75.34 (2014).

[49]In January 2014, we asked DOE to explain the difference in the amount of transferred tails, but officials did not provide a response.

gained the value of the SWU component in the LEU, which DOE and USEC continued to value at $44.4 million. USEC applied the SWU value toward DOE's financial commitment to the American Centrifuge RD&D program. According to USEC officials, USEC could therefore sell the unobligated LEU on the market to generate operating cash. According to DOE officials, DOE returned the unobligated LEU that it had intended for about 18 months of tritium production and in return received obligated Russian-origin natural uranium as uranium hexafluoride. Officials told us that they believed this transaction would benefit DOE more in the long run, as they hope the American Centrifuge technology will provide a long-term, stable source of unobligated LEU to meet national security needs. Figure 5 describes the March 2013 SWU transfer.

Figure 5: March 2013 SWU Transfer



Sources: GAO analysis of DOE documents; USEC (USEC logo).

DOE Likely Lacked Authority for the Largest Uranium Transaction, and the Other Transactions Raise Additional Legal Concerns

We found several legal concerns related to DOE's conduct of all four of the uranium transactions. For example, for the transfer of LEU to USEC, in March 2013, we found that DOE did not obtain a presidential determination, which is one of the required conditions of the USEC Privatization Act. Our detailed legal analysis of these transactions is contained in appendix IV and is summarized below.

DOE Likely Did Not Have Authority to Transfer Tails as Part of the May 2012 Tails Transfer and Did Not Comply with Other Requirements

We found that DOE likely lacked authority to transfer the depleted uranium tails in May 2012 (see fig. 4 for an illustration of the May 2012 tails transfer) for the same reasons that we found, in 2008, that DOE likely lacked authority to transfer other depleted uranium.[50] As we explained then, section 3112(a) of the USEC Privatization Act prohibits DOE from "transfer[ing] or sell[ing] *any* uranium to *any* person except as consistent with this section."[51] The section authorizes and regulates DOE's sale and transfer of a number of types of uranium, but it specifies no conditions for the sale or transfer of depleted uranium tails. Under rules of statutory construction, DOE therefore likely lacks such authority.[52] Congress has not acted to date to clarify or enhance DOE's authority, although legislation has been introduced in the current Congress that would authorize DOE to sell or transfer depleted uranium subject to certain conditions.[53] DOE asserts that it does not need additional authority because it asserts that it may use general Atomic Energy Act

[50]See GAO-08-606R. No changes in law have occurred since 2008 that affect our prior legal opinion.

[51]USEC Privatization Act, Pub. L. No. 104-134 § 3112(a) (1996), codified at 42 U.S.C. § 2297h-10(a) (2014) (emphasis added).

[52]In 2008, we noted that Congress likely did not authorize and regulate the sale and transfer of depleted uranium in section 3112 because depleted uranium was not deemed valuable in 1996. Instead, assuming depleted uranium would be deemed a waste, it addressed the disposal of depleted uranium in section 3113. See GAO-08-606R.

[53]SAVE Act, H.R. 1999, § 204 (introduced May 15, 2013).

authority, which it believes is not restricted by the USEC Privatization Act, to transfer the depleted uranium tails as source material.[54]

Even assuming, as DOE believes, that DOE's Atomic Energy Act authority to transfer tails is not restricted by the USEC Privatization Act, which we disagree with, we found that DOE did not comply with all of the Atomic Energy Act requirements. Specifically, the Atomic Energy Act required DOE to establish and charge nondiscriminatory prices for source material transferred to commercial entities, such as Energy Northwest.[55] But rather than establish a price for the tails (the transferred source material), DOE officials developed an estimate of the intangible benefits of the transaction to the department, which it relied on to justify the transfer. DOE never determined a price and did not charge the recipient (Energy Northwest) a price for the depleted uranium tails.[56]

In addition to analyzing the May 2012 transaction under the Atomic Energy Act, as amended by the USEC Privatization Act, we reviewed DOE's actions under the National Environmental Policy Act (NEPA). NEPA requires federal agencies, among other things, to evaluate the likely environmental effects of projects they are proposing. In 2009, DOE prepared an Environmental Assessment (EA) under NEPA to evaluate its excess uranium disposition activities as a whole. The EA covered in a general sense DOE's intent to make future uranium sales and transfers—such as several of the uranium transfers we discuss in this report, including the May 2012 tails transfer—but does not identify any specific planned transfers. DOE then conducted additional analysis specifically for the May 2012 tails transfer. We describe DOE's NEPA analysis specific to the May 2012 transfer in appendix V.

[54]In 2008, DOE did not comment on our finding that DOE's legal authority to sell or transfer depleted uranium is doubtful. DOE declined to provide its formal legal position but noted it had conducted a previous transfer of depleted uranium tails under its Atomic Energy Act authority.

[55]Atomic Energy Act §§ 63(a)(3), (c), 161(m), codified at 42 U.S.C. §§ 2093(a)(3), (c), 2201(m) (2014).

[56]In contrast, in 2005, DOE transferred high-assay tails and established a price of $10,450 per cylinder.

DOE Did Not Apply the Proper Legal Requirement for Part of Its March 2012 SWU Procurement and as a Result, Did Not Assess Its Market Impact

For the March 2012 SWU procurement, we found that DOE failed to recognize one component of the transaction—its transfer of Russian-origin uranium, governed by the USEC Privatization Act—and consequently, a later market impact study that DOE obtained failed to account for it as required by the statute (see fig. 3 for an illustration of the March 2012 SWU procurement). DOE officials told us they viewed the transaction solely as a procurement of SWU (uranium enrichment services) with no potential impact on uranium markets, and as such, relied on the department's broad procurement authority under the Atomic Energy Act.[57] However, we found that the transaction also included a sale or transfer of Russian-origin natural uranium to USEC, based on facts such as that USEC subsequently owned and controlled the uranium. DOE's Atomic Energy Act authority to sell or transfer natural uranium falls squarely under the USEC Privatization Act's limitations on transactions involving this material. In particular, as noted above, USEC Privatization Act section 3112(a) prohibits DOE from transferring or selling any uranium except as consistent with the act's specific terms and conditions, and section 3112(b) specifies the detailed conditions under which DOE may sell Russian-origin uranium.[58] DOE officials told us they did not consider the natural uranium to have been "transferred," or sold, but rather "provided," a distinction which we do not find supported by the facts or relevant to the applicability of the USEC Privatization Act. Because DOE did not consider the natural uranium to have been transferred or sold, DOE did not include the March 2012 transfer in its subsequent analyses of the potential impact of all DOE's transfers of uranium on the domestic uranium market (which are discussed further below).[59] As a result, the market impact analyses that DOE obtained to assess the potential impact of certain other uranium transfers did not consider the potential impact of this natural uranium, as the statute requires, and DOE,

[57]Section 55 of the Atomic Energy Act authorizes DOE to obtain special nuclear material, which includes LEU, and section 161(g) of the Atomic Energy Act authorizes DOE to acquire and purchase personal property, among other things. 42 U.S.C. §§ 2075, 2201(g) (2014).

[58]USEC Privatization Act § 3112(b)(2)(D), codified at 42 U.S.C. § 2297h-10(b)(2)(D) (2014).

[59]Under the USEC Privatization Act, DOE's sales of Russian-origin uranium do not trigger a market impact study. However, under the act, when other sales or transfers of uranium trigger a market impact study, the study is required to account for any sales of Russian-origin uranium in assessing impacts.

therefore, cannot be reasonably assured that DOE's cumulative transfers will not have an adverse material impact on the domestic uranium market.

DOE Did Not Recognize the Proper Legal Requirement to Accept Tails Liability in Its March 2012 and June 2012 Transactions and, as a Result, DOE Undercharged USEC

We found that DOE's acceptance of USEC's liability for disposing of depleted uranium tails in its March 2012[60] and June 2012[61] transactions is governed by the USEC Privatization Act, not the Atomic Energy Act, which DOE officials generally cited to us as their authority. Under section 3113(a)(3) of the USEC Privatization Act, DOE is required to accept depleted uranium for disposal upon request, and the generator is to reimburse DOE "an amount equal to [its] costs,"[62] including a proportional share of capital costs. As a result of failing to recognize section 3113 as governing, DOE used a lower unit cost than it should have in one of the transactions and undercharged USEC. Specifically, several private companies planning enrichment facilities had asked DOE what it would charge for disposing of their depleted uranium, and DOE developed a target unit cost of $4.15 per kilogram of tails, including a proportional share of capital costs. For the March 2012 transaction with USEC, however, DOE subtracted the capital cost component, to arrive at a unit cost of $3.43 per kilogram of tails for disposing of the depleted uranium tails, an estimated difference of about $9 million less than the cost if the capital component had been included.[63] Because DOE did not follow the requirements of the USEC Privatization Act section 3113, it did not ensure that it was reimbursed the proper amount for accepting depleted uranium tails for disposal.

Moreover, DOE lacked assurance that it acted in accordance with its policies in conducting the March 2012 and June 2012 transactions. The 2008 Secretary of Energy's *Policy Statement on Management of the*

[60]As noted above, DOE accepted depleted uranium disposal liability from USEC in a barter to procure SWU.

[61]As noted above, DOE accepted depleted uranium disposal liability from USEC to satisfy an installment of its cost-share commitment under its cooperative agreement with USEC for the American Centrifuge RD&D program.

[62]USEC Privatization Act §§ 3113(a)(1)(A), (a)(3), codified at 42 U.S.C. §§ 2297h-11(a)(1)(A), (a)(3) (2014).

[63]Conversely, DOE used a unit cost that included capital costs in the June 2012 transaction. Records provided by DOE did not explain why the June 2012 transaction reflected capital costs, and the March 2012 transaction did not.

Department of Energy's Excess Uranium Inventory commits DOE to manage its excess uranium inventories in a manner that, among other things, is both consistent with all applicable legal requirements and transparent. Because the internal memorandums supporting each of these transactions did not specify which legal authorities governed the DOE uranium transfers (*e.g.*, its acceptance of tails) DOE was not positioned to ensure the transaction satisfied all applicable legal conditions.

DOE Did Not Obtain a Required Presidential Determination for the Transfer of LEU to USEC in March 2013

Finally, we found that DOE did not meet one of the conditions of the USEC Privatization Act for the transfer of LEU to USEC in March 2013 (see fig. 5 for an illustration of the March 2013 SWU transfer). Section 3112(d) of the act authorizes DOE to sell LEU subject to several conditions, the first of which is that "the President determines that the material is not necessary for national security needs."[64] We found that DOE did not obtain a presidential determination.[65] DOE officials told us that it met the condition by reviewing whether the July 2011 *Nuclear Weapons Stockpile Plan* (NWSP) included this material as being necessary for national security.[66] DOE determined that the subject

[64]USEC Privatization Act § 3112(d)(2)(A), codified at 42 U.S.C. § 2297h-10 (d)(2)(A) (2014).

[65]As noted previously, section 3112(d) requires two distinct determinations, one by the President—which to our knowledge has not been delegated—and one by the Secretary of Energy.

[66]The NWSP is the overarching plan of the Departments of Energy and Defense that specifies the size and composition of the nuclear stockpile for a projected multi-year period. See 10 U.S.C. § 179 (2014), 42 U.S.C. § 2121(a)(2) (2014). The NWSP, which is classified, is based on the Nuclear Weapons Stockpile Memorandum submitted by the Department of Energy and the Department of Defense to the President, accompanied by a presidential directive. When the directive is signed, the Memorandum goes into effect as the NWSP. Thus the NWSP is approved by the President. See Office of the Assistant Secretary of Defense for Nuclear, Chemical, and Biological Defense Programs, *The Nuclear Matters Handbook* (c. 2011).

material was not included in the plan and, therefore, deemed the material as unnecessary for national security needs.[67]

DOE's reliance on the NWSP to satisfy the presidential determination requirement in this particular case is unfounded. The July 2011 NWSP relied on by DOE predated DOE's acquisition of the LEU in March 2012, meaning that the national security need for this material could not have been considered. We also note that the NWSP does not in fact identify any LEU as needed for national security and we question whether the lack of inclusion of specific uranium has the significance DOE ascribes to it. We observe that DOE has repeatedly linked unobligated LEU with national security, for example, by stating that the transfer of high-assay depleted uranium tails to Energy Northwest and its enrichment to LEU would "deliver important benefits to U.S. national security," "advance America's national security interests at a reduced cost to taxpayers," and "ensur[e] a supply of nuclear fuel essential for national security missions."[68] Similarly, DOE has justified its support of USEC's American Centrifuge technology as rooted in the need for LEU for national security.[69]

We are aware of no case law or legislative history interpreting the presidential determination requirement in USEC Privatization Act section 3112(d)(2)(A). When we asked DOE to explain the department's basis for using the NWSP—more precisely, the absence of inclusion of certain material in the plan—to satisfy the presidential determination requirement, DOE could not provide documentation.[70] We note that, in contrast to its

[67]DOE takes the same position as it did when we discussed this issue with DOE officials in 2011. See GAO-11-846. DOE officials told us, at that time, the Nuclear Weapons Stockpile Memorandum identifies inventories of uranium for national defense needs, and therefore if uranium is not included in the memorandum, the uranium has been determined to be unnecessary for national security purposes. The uranium at issue in our 2011 review had been in DOE's inventory for many years, however, and we did not review the memorandum or the NWSP at that time.

[68]See DOE, "DOE Announces Transfer of Depleted Uranium to Advance the U.S. National Security Interests, Extend Operations at Paducah Gaseous Diffusion Plant" (May 15, 2012; DOE, Office of Environmental Management, "Paducah Plant Begins Enrichment Operations after Five Parties Strike Agreement" (May 1, 2012).

[69]See, *e.g.*, Letter from Stephen Chu, Secretary of Energy, to Representative Whitfield (Jan. 13, 2012).

[70]DOE did, however, provide several documents showing that referencing the NWSP has been the department's long-standing approach to satisfying this condition.

approach to meeting the presidential determination under section 3112(d)(2)(A), DOE satisfies the parallel requirement for a secretarial determination under section 3112(d)(2)(B) with individual determinations signed by the Secretary of Energy for each transaction or group of transactions. Because DOE did not obtain the required presidential determination for the LEU transfer in March 2013, DOE decision makers did not have assurance that the material was not necessary for national security needs.

DOE's Methods for Valuing Tails and for Mitigating Risks for Its Largest Uranium Transaction Raise Issues About Whether the Government Received Reasonable Compensation

DOE does not have guidance for determining the value of depleted uranium tails in the context of a uranium transaction. As a result, DOE used multiple methods to calculate alternative values and ultimately decided that its tails were a liability, not an asset, and their transfer did not require payment in return. We disagree and believe that the high-assay tails that DOE transferred in May 2012 were as an asset. Moreover, for this transaction, DOE did not mitigate risks associated with its reliance on third-party contracts to better ensure that the expected benefit of the transaction—a future supply of tritium—would be achieved.

DOE Does Not Have Guidance for Valuing Tails and Inappropriately Treated the Tails It Transferred in May 2012 as a Liability Instead of an Asset

DOE does not have guidance for determining the value of tails to ensure that the government receives reasonable compensation when transferring tails as an asset, as it did in the May 2012 transaction. As discussed above, we found that DOE likely lacks authority to sell depleted uranium tails. Even assuming that DOE had authority to transfer the tails under the AEA, this act, as well as DOE's 2008 Secretary of Energy's *Policy Statement on Management of the Department of Energy's Excess Uranium Inventory* required DOE to ensure, respectively, that the department received reasonable compensation and value in return for the transferred uranium.[71] Accordingly, in this case, DOE would need to know

[71]As previously discussed, although we do not believe that DOE had authority to transfer the tails, DOE was nonetheless required by the Secretary's Policy Statement to ensure that it would receive reasonable value in return. Further, under the legal authority DOE cited for the May 2012 tails transfer, DOE would be required to establish a nondiscriminatory price for the tails that would provide reasonable compensation to the government.

the value of the tails it transferred, as the value represents the cost to the department for which it needs to be reasonably compensated. In the period when DOE operated the GDPs, it maintained a pricing policy for uranium that, at various times, specified standard prices or a market value standard to prices for depleted uranium.[72] Such a pricing policy had generally informed DOE decision makers in determining the value of tails. DOE officials characterized the previous pricing policy as being overtaken by the Energy Policy Act of 1992, as well as the USEC Privatization Act. That is, after USEC was formed and assumed operation of the GDPs from DOE, the department no longer relied on this uranium pricing policy.[73]

Lacking guidance for determining the value of tails, DOE evaluated two different methods for calculating the value of the tails it transferred in the May 2012 transaction. In addition, based on our analysis of a previous DOE transaction involving tails, DOE could have considered at least one other method for calculating the value of the tails. These three different methods produced disparate results for the value of the tails and, therefore, the cost to DOE, in this transaction.

- According to DOE officials and documents, including an analysis prepared by the Office of the Chief Financial Officer, there was no cost to the department for this transaction. DOE officials indicated that there was no cost because the tails that DOE supplied—that initiated the entire series of transfers—are considered to be a liability, not an

[72]See *e.g.*, DOE, Pricing Policy Change for Sale of Uranium Depleted in Isotope U-235, 47 Fed. Reg. 17,110 (1982). See also notices from DOE's predecessors in operating the enrichment facilities, Atomic Energy Commission, Uranium Heraflouride: Base Charges, Use Charges, Special Charges, Table of Enriching Services; Specifications, and Packaging, 32 Fed. Reg. 16,289 (1967); Energy Research And Development Administration, Uranium Heraflouride: Base Charges, Use Charges, Special Charges, Table of Enriching Services; Specifications, and Packaging: Revisions, 42 Fed. Reg. 51,635 (1977).

[73]In January 2014, DOE submitted to relevant committees an 11-page Report to Congress evaluating the economic feasibility of re-enriching depleted uranium located at federal sites, which under the Consolidated Appropriation Act, 2012, DOE was required to submit by December 31, 2011. In this report, DOE described a number of factors—including the market prices for natural or enriched uranium and SWU, as well as enrichment supplier capacity and availability—that would influence the economic and technical feasibility of re-enriching its tails inventory at federal sites. However, DOE did not provide information on how tails could be priced for re-enrichment purposes—a factor that would appear to affect the economic feasibility of re-enrichment.

asset, regardless of the value of the natural uranium equivalency contained in the tails. Further, because the department received nearly the same quantity of secondary depleted tails after USEC's re-enrichment activities were complete, as it initially transferred, the department perceived the transaction as a wash.[74]

- However, the same financial analysis that we reviewed conducted by the Office of the Chief Financial Officer indicated that the tails could be worth $300 million based on the value of the resultant LEU minus the costs to re-enrich the tails. As such, the cost to DOE for this transaction could have been determined to be $300 million, recognizing that the tails were an asset transferred to Energy Northwest. The same financial analysis also determined that the transaction resulted in $105.3 million in cost savings associated with deferred maintenance and a reduction in disposal liability for tails.[75] As such, DOE could have calculated that the cost of the transaction to the department was $195 million, using the $105 million in deferred maintenance and reduced liability cost savings to offset the $300 million value of the tails. DOE did not present this scenario in its internal financial analysis.
- In 2005—the only other time that DOE transferred high-assay tails—DOE charged a fixed fee of $10,450 per cylinder of tails. Using DOE's 2005 price point, DOE's May 2012 tails transfer could be valued at about $11.1 million. As we reported in 2008, changing market conditions can greatly affect the tails' value.[76] Thus, recognizing that market conditions have changed considerably since 2005, the $11.1 million estimate for the May 2012 tails transfer is offered as a rough estimate based on the only other time DOE transferred tails and to demonstrate that the tails in fact had value and not precisely what that value is. DOE also did not present this type of scenario in its internal financial analysis.

[74]Secondary tails are low-assay and, according to DOE, are not viable for further re-enrichment. Also according to DOE officials, the estimated disposal cost for tails does not differ based on the assay level of the tails.

[75]The $105.3 million includes cost savings associated with (1) maintaining the Paducah GDP for 1 fewer year than anticipated after USEC returns the facility to DOE—which DOE estimates will save the department about $100 million; (2) having reduced disposal liability because DOE will receive about 490 MTU less in secondary tails than it provided to start the transaction—which DOE estimates to save the department about $3.5 million; and (3) the time value of deferring costs associated with placing the Paducah GDP in cold shutdown status and the first year's surveillance and maintenance, which DOE estimates will save the department $1.8 million.

[76]See GAO-08-606R.

In the absence of guidance providing a consistent method for determining the value of tails when transferred, the department ultimately determined in its financial analysis prepared by the Office of the Chief Financial Officer that the tails transferred to Energy Northwest were a liability and without economic value. As such, the department did not request or receive payment for the tails from Energy Northwest. Moreover, Energy Northwest expected to benefit from taking the tails, also showing that the tails were not a liability. However, we find that the tails were an asset in the context of this transaction and, therefore, the Atomic Energy Act and DOE's own policy required it to receive, respectively, reasonable compensation and value in return for sold or transferred uranium. Specifically, the Atomic Energy Act provision DOE relied upon required the department to impose a reasonable charge on and receive reasonable compensation from Energy Northwest, as discussed in appendix IV. Moreover, DOE's 2008 Secretary of Energy's *Policy Statement on Management of the Department of Energy's Excess Uranium Inventory* commits DOE to ensuring that all transactions involving excess uranium transfers or sales to non-U.S. government entities result in the department's receipt of a reasonable value for the sold or transferred uranium. The two reasons that DOE officials cited for treating the tails as a liability are not consistent with DOE's treatment of tails in other comparable circumstances where DOE clearly treated tails as an asset.

- First, according to DOE officials, depleted uranium tails are always considered a liability because DOE must report its estimated liability for the future disposal of the tails per federal accounting standards. However, DOE has recognized that depleted uranium tails may have economic value. For instance, as noted above, in 2005, DOE charged a fixed fee of $10,450 per cylinder of tails in the context of a transaction with Energy Northwest. In addition, in February and July 2013, DOE treated its inventory of tails as an asset when it sought industry interest in purchasing a portion of its tails inventory (see fig. 6 for photograph of depleted uranium tails at the Paducah GDP). DOE received expressions of commercial interest and in November 2013, announced that it would begin sales negotiations with GE-Hitachi's Global Laser Enrichment for

the sale of a portion of its tails inventory.[77] The fact that DOE received commercial interest in its tails underscores the point that tails can be viewed as an asset and that DOE should have a consistent method for determining the value of its tails before proceeding with this sale.

- Second, according to DOE's financial analysis, the tails transferred in May 2012 were a liability and were not suitable for enrichment in a commercial facility. Specifically, DOE stated that the material had some impurities that could contaminate commercial equipment and that DOE could incur liability as a result. However, officials from Energy Northwest told us that only a small percentage of the tails were contaminated. Furthermore, as discussed above, in the summer of 2013, DOE received commercial interest for its tails which, according to DOE's request, also contained some trace contaminants.

In 2012, we included a discussion of DOE's excess uranium inventories in our annual duplication, overlap, and fragmentation report as an opportunity to enhance government revenue because, as we reported in 2008 and 2011, DOE's tails inventory could potentially be worth billions of dollars.[78] We suggested that Congress clarify DOE's authority to transfer or sell tails and to retain the proceeds from these sales. We continue to maintain that these legal authorities require clarification, particularly in light of DOE's plans to conduct further tails transactions and, as noted above, legislation has been introduced in the current Congress that would achieve that.

[77]Specifically, in February 2013, DOE requested expressions of interest from industry related to the purchase or exchange of DOE's inventory of tails. According to DOE's request, the purpose of this initiative was to identify opportunities to create value for the U.S. government, while also lowering DOE's overall maintenance or disposal costs. DOE received several responses and announced in November 2013 that it would open negotiations with GE-Hitachi's Global Laser Enrichment for the sale of a portion of its tails. Global Laser Enrichment has proposed licensing, constructing, and operating a new facility in the United States based on the Australian laser enrichment technology known as Separation of Isotopes by Laser Excitation (SILEX) that has yet to be commercialized.

[78]See GAO, *2012 Annual Report: Opportunities to Reduce Duplication, Overlap and Fragmentation, Achieve Savings, and Enhance Revenue*, GAO-12-342SP (Washington, D.C.: Feb. 28, 2012). See GAO-08-606R, GAO-11-752T, and GAO-11-846.

Figure 6: Cylinders of Depleted Uranium Tails at the Paducah Gaseous Diffusion Plant

Source: USEC.

DOE Did Not Take Steps to Mitigate Risks Associated with Its May 2012 Tails Transfer and Did Not Obtain Reasonable Assurance That It Will Receive Expected Benefits

DOE did not take steps to mitigate risks associated with its reliance on third-party contracts for the May 2012 tails transfer to ensure that the expected benefit of the transfer would be achieved. Specifically, DOE transferred tails to Energy Northwest, with the goal of eventually ensuring the availability of unobligated LEU sufficient for up to 15 years of tritium production. However, as noted above, this was a large and complex transaction that involved four main parties and five two-party contracts. There was no overriding contract or memorandum of agreement linking these transactions, and DOE was not a party to three of the five agreements. Moreover, DOE officials told us that they had not seen or otherwise reviewed any of the three third-party contracts, even though the benefits to DOE would be compromised if any of these third-party

contracts were not fully performed.[79] As such, this raises issues about whether DOE could ultimately fail to receive the expected benefit of the availability of unobligated LEU for up to 15 years of tritium production.

One of the federal standards for internal control—risk assessment—states that management should comprehensively identify risks and consider all significant interactions between the entity and other parties.[80] Specifically, risks should be assessed at the activity level, from both external and internal sources, and once risks have been identified, management should decide what actions should be taken to mitigate them. We have recently reported on widely recognized principles for effective risk management and the overarching need to generate a comprehensive list of risks—regardless, of whether those risks are under the control of the organization—based on events that could significantly affect the achievement of objectives.[81]

DOE identified general risks associated with the May 2012 tails transfer. For example, in two separate May 2012 internal memorandums to the Secretary recommending approval of the transfer, DOE acknowledged that a general risk to receiving the expected benefit of the transaction is DOE's reliance on third-party contracts. It did not elaborate on what specific risks could lead to a negative outcome. In another document DOE officials provided to us, six other risks were identified, but they did not demonstrate how the risks might prevent DOE from eventually receiving the expected benefit of the transaction. Four of the six risks focused on possible criticism from external parties, such as potential criticism from congressional offices about providing support for USEC and possible criticism regarding whether DOE will receive adequate value for transferring its high-assay tails to Energy Northwest. The two other risks DOE identified included the possibility that USEC may transfer the

[79]DOE's agreement with Energy Northwest included several termination clauses whereby DOE could terminate the agreement. For example, DOE could terminate if Energy Northwest terminated its enrichment services agreement with USEC, or if Energy Northwest terminated its agreement with TVA. However, where DOE transferred title to the depleted uranium within a year of the agreement, DOE's sole remedy would be to be paid any costs due under the agreement—which are none, with respect to the transferred depleted uranium.

[80]GAO/AIMD-00-21.3.1 ("Green Book").

[81]GAO, *DOD Financial Management: Ineffective Risk Management Could Impair Progress toward Audit-Ready Financial Statements*, GAO-13-123 (Washington, D.C.: Aug. 2, 2013).

Paducah GDP back to DOE before it has sufficient funds to accept the return of the facilities, and that the transfer had not yet been subject to a market impact analysis. In the latter case, had the market impact analysis resulted in negative findings, it is unlikely that the transaction would have proceeded.

We found that DOE did not take steps to mitigate risks it did identify that may prevent DOE from eventually receiving the expected benefit of the transaction. For example, while DOE identified reliance on third-party contracts as a general risk to the success of the transaction, it did not take steps to mitigate this risk—such as by including a right of first refusal to purchase the unobligated LEU in its agreement with Energy Northwest—in the event that Energy Northwest does not deliver unobligated LEU to TVA.[82] In fact, Energy Northwest representatives told us they could theoretically loan or sell the LEU to other entities, but they do not have plans to do so. Similarly, DOE did not enter into a memorandum of agreement with the three other parties, a mechanism that could have been used to tie all the contracts among the four parties together, such as by describing, among other things, the purpose, each party's actions, and the intended outcome of the transaction. By not taking steps such as these to mitigate risks, DOE has accepted the possibility that, over the course of a decade, any one of the three two-party contracts that do not involve the department may not be fully performed. Consequently, DOE may not have put itself in the best position to ensure that the expected supply of unobligated LEU needed for national security purposes is available, despite having transferred the most valuable tails in its inventory.

[82]A right of first refusal is generally a potential buyer's contractual right to meet the terms of a third party's higher offer. In this context, a right of first refusal would give DOE the right to purchase the unobligated LEU before Energy Northwest could sell it to a third party, and hence protect DOE from the risk that the unobligated LEU would not be available for use in tritium production.

DOE Did Not Assess the Quality of Studies It Obtained to Determine the Market Impact of Its Uranium Transfers and Will No Longer Use a Guideline to Limit Its Annual Uranium Sales or Transfers

The Secretary of Energy is generally required by the USEC Privatization Act to determine that any DOE sale or transfer of natural or LEU will not have an adverse material impact on the domestic uranium mining, conversion, or enrichment industries.[83] In part to fulfill this requirement, DOE obtained two studies assessing the potential market impact of certain planned uranium transfers. Based on study findings, the Secretary of Energy determined these uranium transfers would have no adverse material impact on the domestic uranium industry. However, we found that DOE did not take sufficient steps to ensure the quality of the market impact studies, and the studies provided limited detail about their methodology, assumptions, and data sources. Moreover, we have concerns about the transparency to industry of DOE's planned future uranium transfers given that DOE recently discontinued its guideline to limit its annual uranium sales and transfers. According to DOE, this guideline had been established with industry consultation to generally ensure that such transfers would not have an adverse material impact on the domestic uranium industry.[84]

[83]The act provides several limited exceptions; for example, DOE may transfer or sell enriched uranium to any person for national security purposes, as determined by the Secretary. USEC Privatization Act § 3112(b), (c), (e), codified at 42 U.S.C. § 2297h-10(b), (c), (e) (2014).

[84]In 2011, we referred to the guideline as a 10 percent target. However, DOE officials requested that we refer to this as a guideline. In this case, the guideline refers to a ceiling that DOE may approach or exceed in certain circumstances, such as initial fuel loads in new nuclear reactor cores.

Based on Studies' Findings, the Secretary of Energy Determined Certain DOE Uranium Transfers Would Have No Material Market Impact on the Domestic Uranium Industry

In 2012 and 2013, the Secretary of Energy determined that certain of DOE's uranium transfers will not have an adverse material impact on the domestic uranium industry. To help inform the Secretary's determination, DOE contracted with Energy Resources International, Inc. (ERI), a nuclear fuel consulting firm, to develop two studies analyzing the potential impact of planned uranium transfers on the market.[85] The Secretary of Energy made determinations in May 2012 and March 2013 that DOE's uranium transfers would not have an adverse material impact on the domestic uranium market. The two determinations specifically reference the results of the two ERI studies and the state of the uranium industry as the basis for these decisions. These determinations were made public on DOE's website. The two ERI studies were also made public on DOE's website, but one of them was removed during the course of our review.

The two ERI studies assessed the May 2012 tails transfer and March 2013 SWU transfer, as well as additional uranium transfers that did not involve USEC.[86] ERI did not assess DOE's March 2012 SWU procurement because, as described above, DOE considered the March 2012 transaction to be a procurement of enrichment services (SWU) only and that, therefore, would not have affected the uranium market. As explained above, DOE provided Russian-origin natural uranium as uranium hexafluoride to USEC as part of the transaction, and we believe this transfer should have been considered in its market impact study. ERI also did not assess DOE's June 2012 tails acceptance because it did not involve a DOE transfer of uranium into the market; instead, DOE received depleted uranium tails from USEC. We agree that it was not necessary to include this transaction in the ERI studies.

The first study, dated April 2012, projected the potential market effects during calendar years 2012 through 2033 for three DOE uranium transfers as follows:

[85]Energy Resources International, Inc., *Quantification of the Potential Impact on Commercial Markets of Introduction of DOE Excess Uranium Inventory in Various Forms and Quantities During Calendar Years 2012 through 2033* (Washington, D.C.: Apr. 23, 2012). Also see: Energy Resources International, Inc., *Quantification of the Potential Impact on Commercial Markets of Introduction of the Enrichment Services Component of DOE Low Enriched Uranium Inventory During Calendar Year 2013* (Washington, D.C.: Jan. 28, 2013).

[86]For example, DOE has transferred natural uranium to contractors in exchange for environmental cleanup services at the Ohio plant, a practice we reported on in 2011. See GAO-11-846.

1. DOE's May 2012 tails transfer—accounting for about 16 percent of the material studied by ERI
2. ongoing quarterly transfers of natural uranium to contractors in exchange for environmental cleanup services at the Ohio plant—accounting for 72 percent of the material studied by ERI
3. transfers of downblended highly enriched uranium—accounting for 12 percent of the material studied by ERI

The study assumed that DOE would transfer the material for these three transfers—totaling 20,639 MTU—over the period of 2012 through 2033. ERI considered 12 different scenarios resulting from different combinations of how this material would be introduced into the market over this time frame. ERI ultimately concluded that the three DOE transfers would not constitute an adverse material impact on the domestic uranium industry. In addition, the studies' principal author told us that, based on its estimation of price impacts, ERI determined that DOE's transfers would not have an adverse material impact on the uranium industry collectively, but the impact on individual companies could differ based on other factors, such as their production costs and realized prices.

ERI's second study, dated January 2013, projected the market impact during calendar year 2013 for one transaction: DOE's March 2013 transfer of the enrichment services component of LEU to USEC. As discussed previously, in exchange for DOE's transfer of LEU to USEC, USEC provided the natural uranium component of the LEU to DOE and, therefore, USEC gained the net value of the enrichment component of that LEU. ERI determined that only the enrichment component of this transaction needed to be examined because DOE was not transferring any natural uranium into the market. ERI ultimately concluded that this DOE transfer would not constitute an adverse material impact on the domestic uranium enrichment industry.

DOE Did Not Take Sufficient Steps to Assess the Technical Quality of Market Impact Studies, and the Studies Did Not Sufficiently Document Their Methodology, Data Sources, and Assumptions

We found that DOE did not take steps to ensure the technical quality of ERI's market impact studies. DOE's contract with ERI includes a statement of work, which states that, at regular intervals DOE will formally evaluate the contractor's performance, which may include the technical quality of the contractor's deliverables, among other things. Moreover, because the two studies were published on DOE's website, DOE's *Information Quality Guidelines* apply. These guidelines—developed by DOE as required by the Information Quality Act and under associated guidelines issued by the Office of Management and Budget—set forth

quality assurance steps and procedures to ensure the technical quality of information that DOE makes publicly available.[87] The guidelines state that DOE should seek to ensure that information disseminated to the public meets a basic level of quality, which is measured by the objectivity of the information and whether the information is accurate, clear, complete, and reliable.

However, DOE officials told us that they neither conducted an assessment of the technical quality of the ERI studies, nor requested any additional information from ERI about the studies. DOE officials told us that they reviewed the studies to ensure that they accurately described the department's plans for uranium transfers. They also provided us a copy of a brief internal e-mail, dated June 11, 2013—more than 1 year after the first study was completed and about 5 months after the second study was completed—from DOE's Contracting Officer's Representative for its ERI contract that stated that, overall, ERI's performance had been satisfactory and within scope. According to DOE officials, they did not examine the studies' methodology or conduct an assessment of the studies' technical quality because they wanted ERI's studies to be independent and did not want to influence their results. Furthermore, DOE officials told us that they contracted with ERI to provide subject matter expertise that did not exist within DOE and trusted ERI to provide that expertise. However, if DOE did not have the internal subject matter expertise to review the studies, another tool available to the department is peer review, which is generally defined as the process of having independent experts assess the technical and scientific merit of studies. DOE's *Information Quality Guidelines* state that the department may have information peer reviewed and that "if the data and analytical results have been subject to formal, independent, external peer review, the information may generally be presumed to be of acceptable objectivity." Nonetheless, ERI's principal author told us that the two studies were not peer reviewed by a third party. Without taking quality assurance steps, DOE cannot be assured of the reliability and quality of the analyses conducted. Moreover, DOE cannot be certain of the studies' conclusions, which the department used as the basis for the Secretary's determination that DOE's uranium transfers did not have an adverse material market impact and to meet its legal requirements under the USEC Privatization Act.

[87]Consolidated Appropriations Act, 2001, Pub. L. No. 106-554 Title V § 515 (a) 114 Stat. 2763A-153 to 2763A-154 (2000) (commonly referred to as the Information Quality Act).

In addition, we found that ERI's studies provided limited detail about its methodology, data sources, and assumptions, even though DOE guidelines require such information to be included in publicly disseminated documents. DOE's *Information Quality Guidelines* state that information disseminated to the public should contain full, accurate, and transparent documentation and include information on assumptions, data sources, and methods. Moreover, the guidelines state if DOE "disseminates influential scientific, [or] financial information, a high degree of transparency of data and methods should be ensured to facilitate the reproducibility of such information by qualified third parties."[88] However, the information ERI provided about its methodology was limited. For example, the information ERI provided about its methodology for its market clearing model—which was the foundation of ERI's analysis and represents ERI's estimate of the supply and demand for each sector of the domestic uranium market—was summarized at a high-level in a three-sentence footnote. As another example, ERI did not provide information about the sources of data it used to develop its market supply curves, which were fundamental to its market analysis. In its April 2012 report, ERI states that it developed an annual supply curve from each mining and conversion company using company cost and production data, but ERI did not provide any details about the sources from which it obtained this data (*e.g.*, from the companies themselves or publicly available information). This raises questions about whether ERI's methodology, data sources, and assumptions were clearly defined and presented, as required by DOE's *Information Quality Guidelines*.

According to the studies' principal author, ERI views its methodology as proprietary and consequently did not include details about its methodology and data sources in the two studies. Although the studies' principal author was willing to answer our questions about ERI's methodology and data sources, we were told that documentation underlying ERI's methodology could not be provided because ERI's methodology is considered to be proprietary, and the costs and sources used in the studies were developed independently of the work performed for DOE. DOE's *Information Quality Guidelines* do provide for situations where compelling interests—such as when using trade secret (or

[88]This threshold likely applies because the studies could be seen as detailing influential financial information. Specifically, the results of these studies are used by DOE decision makers to determine whether DOE transfers will have an adverse material impact on the domestic uranium market.

proprietary) information—may preclude public access to data and methods. In such cases, DOE should "apply rigorous robustness checks to analytical results and document what checks should be undertaken." As mentioned above, DOE neither conducted a review of the studies' technical quality, nor did the department have the studies peer reviewed by a third party.

Based on the information that was provided in the studies and supplemented by additional information we learned by interviewing the studies' principal author and DOE officials and from subsequent correspondence with ERI officials, we were able to conduct a limited review of ERI's 2012 and 2013 studies. We did not identify any significant flaws; however, we found that the studies have shortcomings that raise questions about the definitiveness of ERI's conclusions, on which the Secretary of Energy based his determinations that DOE's uranium transfers would not have an adverse material impact on the domestic uranium market. Specifically, we identified several concerns with the certainty of ERI's conclusions regarding the effect of DOE's uranium transfers on the term and spot markets, including

- the completeness of the data ERI used to develop the market supply curves, which were fundamental to its term market analysis;
- ERI's assumption that DOE's planned uranium transfers would not have a cumulative effect on the term market; and
- ERI's model that it developed for its analysis of the spot market, which accounts for some, but not all, factors that can affect spot market prices.

See appendix VI for our analysis of ERI's market impact studies and discussion of these shortcomings.

The Transparency of DOE's Future Uranium Sales and Transfers May be Affected by DOE's Recent Elimination of its Internal Guideline

In its July 2013 *Excess Uranium Inventory Management Plan*, DOE announced its decision to discontinue using its guideline for uranium sales and transfers of generally no more than 10 percent of the annual U.S. requirements for nuclear fuel. In 2008, the Secretary of Energy stated that uranium transfers involving non-U.S. government entities would be undertaken in a transparent manner and established the 10 percent sales and transfer guideline, which, according to DOE, generally would ensure that such transfers would not have an adverse material

impact on the domestic uranium industry.[89] In addition, DOE has based programmatic decisions on adherence to this guideline. For example, in 2009 DOE based its Environmental Assessment and Finding of No Significant Impact under the National Environmental Policy Act for disposition of excess uranium on the assumption that DOE sales and transfers generally would not exceed the 10 percent guideline.[90] As we reported in 2011, the guideline was established with input from representatives from the uranium industry and intended, in part, to alleviate their concerns that DOE uranium sales could harm the domestic uranium mining, conversion, and enrichment industries by depressing prices.[91]

DOE officials told us that DOE is not obligated to establish a guideline and, according to DOE's July 2013 *Excess Uranium Inventory Management Plan*, the department determined that it can meet its statutory and policy objectives with regard to DOE uranium sales and transfers without an established guideline. Instead, DOE will review decisions to introduce uranium into the market every 2 years. While we agree that DOE's periodic review of the potential market impact is constructive, we note that DOE is already required to perform such reviews by law, and the periodic conduct of these reviews may not in and of itself obviate the need for a guideline to enhance the transparency of DOE's planned future transactions. According to DOE's 2013 *Excess Uranium Inventory Management Plan*, its May 2012 secretarial determination covers uranium transfers that are planned or under consideration by the department through 2021. However, DOE released additional uranium and sought another determination in March 2013—less than 1 year after the May 2012 determination—and thus, the Secretary's previous determination was quickly outdated. Moreover, according to ERI's April 2012 analysis, in some years, DOE's planned transfers might reach values in the range of 12 to 15 percent of U.S. annual requirements for uranium mining and conversion services—which is greater than DOE's previous 10 percent guideline that limited its annual

[89]Secretary of Energy's *Policy Statement on Management of the Department of Energy's Excess Uranium Inventory*, (March 11, 2008).

[90]DOE, Environmental Assessment for the Disposition of DOE Excess Depleted Uranium, Natural Uranium, and Low-Enriched Uranium, DOE/EA-1607 (June 2009).

[91]See GAO-11-846.

uranium sales and transfers—and it will reach values of not more than 7 percent of U.S. annual requirements for enrichment services.

Industry representatives we interviewed raised several concerns about DOE's July 2013 plan, including its decision to no longer use an established guideline. First, DOE officials did not consult with industry before deciding to discontinue using its 10 percent guideline or disseminating the updated plan. Industry representatives told us that they believe DOE's decision to cease use of the guideline indicates that DOE has already determined—without industry input and with no clear basis—that no future DOE uranium transfers will have an adverse material impact on the market. DOE officials acknowledged that the department did not specifically seek comment from industry representatives on its 2013 plan or its decision to discontinue use of the 10 percent guideline but noted that industry representatives could request informal meetings with DOE to discuss their concerns. In addition, DOE officials told us that they have presented the department's plans and listened to views of interested stakeholders at formal industry meetings.

Second, industry representatives told us that DOE's new plan lacks transparency because it does not provide information about DOE's future uranium disposition plans. The Uranium Producers of America—an association that promotes the viability of the domestic uranium industry—stated in July 2013 that DOE's plan is ambiguous and lacks predictability, which is needed for the uranium industry—a sector that is currently struggling to secure capital to start up, sustain, or grow its operations. Industry representatives that we spoke with underscored that DOE's introduction of material into the market is further deteriorating demand for uranium and driving down uranium prices. For example, one company representative told us that his company has recorded a loss in all of the previous 5 years and that the volume of DOE's uranium transfers into the market is significant enough to tip the scales between making an annual profit and realizing losses because of the slim margins in the industry. However, by eliminating its guideline without considering input from the domestic uranium industry, DOE's uranium management plan provides less transparency on DOE's future uranium transfers for members of industry.

Conclusions

The relationship between DOE and USEC is long and complex. DOE has come to rely exclusively on USEC as its sole supplier of uranium enrichment services to meet national security needs because, according to DOE, USEC was the only supplier of enrichment services that is not

subject to obligations under certain international agreements. In the nearly two decades that USEC has existed as a private company, no other wholly domestic enrichment services provider has entered the market. As a result of lower than anticipated global demand for enrichment services since the tsunami in Japan in 2011, the prohibitive cost of continuing to operate inefficient gaseous diffusion technology, and the company's lack of financing for the American Centrifuge Plant, USEC filed for Chapter 11 bankruptcy protection in March 2014. The nation is currently without an enrichment capability that can meet national security needs and be consistent with DOE's position that these needs be met using unobligated LEU. USEC and DOE had been looking toward the successful commercialization of the American Centrifuge technology to reestablish a domestic enrichment capability that can fulfill national security needs, but USEC's financial condition and the absence of project financing raise questions about when and how this will occur. Under the June 2012 cooperative agreement between DOE and USEC to demonstrate the American Centrifuge technology, which was extended through the end of April 2014, DOE provided about $280 million in funding, which included $148 million in eight separate transfers of appropriated funds and $132 million in credited value of two of the four uranium transactions with USEC. For one of these uranium transactions—its June 2012 tails acceptance—we found that agency documentation varied pertaining to the amount of material that could be transferred, which could lead to DOE having to incur additional tails disposal liability in the future.

After USEC officials informed DOE as early as December 2011 that the company was considering closing the Paducah GDP, DOE amended the terms of its 2002 agreement with USEC to secure a royalty-free license to all centrifuge intellectual property for government purposes as well as a license with the right to sublicense to other parties for commercial purposes. In addition, DOE identified options to ensure that it obtained or created a near-term supply of unobligated LEU for tritium production and continued to support development of American Centrifuge technology. It did so primarily by relying on various legal authorities it believes it has with respect to the transfer and sale of various forms of uranium under the Atomic Energy Act. Over the course of a 14-month period beginning in March 2012, DOE conducted four uranium transactions involving USEC. We identified legal concerns with all four uranium transactions that relate to DOE's reliance on general Atomic Energy Act authorities without recognizing governing uranium-specific USEC Privatization Act provisions that condition, or likely prohibit the transactions, as well as the extent to which DOE met applicable conditions. We continue to believe that our

previous matter for congressional consideration—that Congress consider clarifying DOE's statutory authority to manage depleted uranium and provide explicit direction about whether and how DOE may sell or transfer depleted uranium—could, if implemented, help to address these concerns. We also believe the transparency of future uranium transactions would be enhanced if DOE takes steps to expressly and publicly cite the legal authorities governing uranium transactions that it believes authorize its transactions and demonstrates that it satisfied the conditions required by the cited legal authorities.

DOE does not have guidance or a consistent method for determining the value of tails when they are transferred in the form of an asset. Lacking such guidance, DOE treated the tails that it transferred to Energy Northwest in May 2012 as a liability and determined that there was no cost to the department for this transfer. The department's treatment of tails without value in this instance directly contradicts how it treated tails in other situations, such as in 2013 when it determined DOE's inventory of tails were an asset and sought to sell them with the express purpose of creating "value" for the U.S. government and in 2005 when it set a per-cylinder price for tails. Because DOE may sell or transfer additional tails in the near future, having guidance that provides a consistent and transparent method for determining the value of tails in the context of a transaction is timely and necessary to help DOE ensure that it is receiving reasonable compensation in return for its tails. We continue to believe that further congressional clarification is warranted, consistent with our suggestion, in 2011, with respect to DOE's authority to retain the proceeds from barters, transfers, or sales of excess uranium.[92]

In May 2012, DOE transferred a significant quantity of its highest value tails without receiving payment, in order to ultimately ensure that a 15-year supply of unobligated LEU is available to produce tritium. While DOE identified some risks associated with the May 2012 tails transfer, it did not take steps to mitigate risks that might ultimately prevent the department from ensuring the supply of unobligated LEU for the production of tritium at the end of this complex set of transfers, which won't conclude for a decade. We identified risk mitigation measures potentially available to the department if it pursues future uranium transactions involving third-party contracts.

[92]GAO-11-846.

We found that DOE did not conduct quality assurance reviews of the two market impact studies for which it contracted, the conclusions of which served as the basis for (1) secretarial determinations that certain DOE sales or transfers of uranium material would not have an adverse material impact on the domestic uranium market and (2) meeting a required condition of the USEC Privatization Act. Such reviews should have been undertaken consistent with DOE's contracts for these studies and with internal DOE *Information Quality Guidelines*. Our review also found that the studies included limited information about their methodology, data sources, and assumptions, and we identified several shortcomings with the studies that raise questions about the definitive conclusions that were drawn. Enhanced steps by DOE to ensure the quality of these studies would improve confidence in the basis for secretarial determinations regarding findings of no adverse material impact on the domestic uranium market as a result of future DOE uranium sales or transfers.

Further, by removing the annual 10 percent guideline from its 2013 *Excess Uranium Inventory Management Plan*, without input from industry, DOE has introduced uncertainty in the domestic uranium market. This action runs counter to DOE's stated objectives in the updated plan to provide current information and enhanced transparency to the general public and interested stakeholders regarding the management of DOE's potentially marketable uranium. It also runs counter to our 2011 recommendation to DOE to enhance transparency in an updated excess uranium management plan. Without formal consultation with industry on these matters, members of the domestic uranium industry will have less insight into DOE's future plans for uranium sales and transfers, and DOE decision makers may have less assurance that they are upholding their 2013 commitment to conduct uranium transfers in a transparent manner.

Recommendations for Executive Action

We recommend that the Secretary of Energy take the following six actions:

(1) To ensure that DOE's cooperative agreement and internal documentation supporting its June 2012 acceptance of depleted uranium tails are accurate and transparent, the Secretary of Energy should continue to review the accuracy of its documentation associated with this transaction and seek an independent review of this documentation by a third party, such as the DOE Inspector General.

(2) To ensure that DOE manages its excess uranium inventories in a manner that is both consistent with all applicable legal requirements and

transparent, the Secretary of Energy should publicly identify the legal authority it relied on for each uranium transaction the department conducts and explain how the transaction meets the requirements of that authority.

(3) If DOE continues to transfer, sell, or barter depleted uranium tails pursuant to its general authority under the Atomic Energy Act, notwithstanding that the USEC Privatization Act likely prohibits such actions, to ensure that DOE is receiving the required compensation under the Atomic Energy Act and DOE policy, the Secretary of Energy should develop guidance for setting an appropriate method for determining the value of depleted uranium tails when transferring them as an asset and apply the method consistently and transparently, prior to conducting such transfers, sales, or barters.

(4) To ensure that DOE mitigates risks associated with achieving the expected benefits of future uranium transactions that may rely on third-party contracts, the Secretary of Energy should take steps to mitigate the risks for each uranium transaction, in accordance with federal internal control standards.

(5) To ensure the quality, credibility, and transparency of any future uranium market impact studies, the Secretary of Energy should

- conduct a rigorous and documented internal assessment consistent with contract provisions and the Department of Energy's *Information Quality Guidelines* of the quality of such studies and/or have an independent third party conduct a peer review; and
- to the extent that market impact studies are made publicly available, require that studies include information on the methods, data sources, and assumptions used in such a way that allows others to understand, interpret, and evaluate the studies consistent with DOE's *Information Quality Guidelines*.

(6) To further ensure that DOE's future uranium transfers do not have an adverse material impact on the domestic uranium market, the Secretary of Energy should seek and consider industry input both on the amount of DOE sales or transfers of uranium the market can absorb annually and on whether there is a need to reinstitute a guideline that limits annual uranium sales or transfers.

Agency Comments and Our Evaluation

We provided a draft of this report for review and comment to the Secretary of Energy, the Secretary of State, Executive Director for Operations of NRC, and the Vice President for Government Relations of TVA on March 14, 2014. DOE provided written comments on April 18, 2014, which are summarized below and reproduced in appendix VII. DOE also provided technical comments, which we incorporated as appropriate. The Department of State did not provide comments. We received a written response from NRC on April 9, 2014, which is reproduced in appendix VIII. NRC noted GAO's findings and recommendations and did not provide any additional technical comments. TVA did not provide comments on GAO's findings and recommendations but did provide technical comments on April 9, 2014, which we incorporated as appropriate. We also provided a technical statement of facts to the following third parties: Energy Northwest, ERI, and USEC. We received technical comments from these parties and incorporated them as appropriate prior to providing the draft of this report to the agencies noted above.

In its written comments, DOE generally disagreed with our report's findings and recommendations. DOE contended that various aspects of GAO's legal analysis are unfounded or erroneous, although DOE noted that it gave careful consideration to GAO's legal analysis and conclusions. We appreciate DOE's willingness in this regard, but it has offered no compelling reason to reach different conclusions than in our report. GAO and DOE therefore continue to disagree. DOE also appeared to question whether GAO has legal authority to interpret federal laws and to evaluate whether agencies have complied with them. However, it is GAO's statutory duty to assist the Congress in carrying out its oversight and appropriations responsibilities by, among other things, "evaluat[ing] the results of a program or activity the Government carries out under existing law" and "investigat[ing] all matters related to the receipt, disbursement, and use of public money."[93] These GAO duties, often involving interpretation of statutes and other "existing law," are not, as DOE asserts, "execution" of the law.[94] Interpretation of the laws at issue in this report ultimately would be the responsibility of the courts, not DOE or

[93]31 U.S.C. §§ 712(1), 717(b) (2012).

[94]DOE relies on a sentence in *Bowsher v. Synar*, 478 U.S. 714 (1986), taken out of context, to suggest that it is unconstitutional for GAO to interpret a statute. *Bowsher v. Synar* did not hold this and did not involve GAO evaluation of whether agency actions comply with a federal statute.

GAO.[95] In the meantime, it remains GAO's responsibility, using our expertise in accounting for the use of taxpayer money, to advise the Congress and the public concerning the use of appropriated funds and to review agency compliance with relevant laws as part of that process. It also remains GAO's responsibility to make the type of recommendations we have made to DOE in this report, which are designed to achieve greater transparency and accountability in the Department's management of federal uranium assets worth billions of dollars.

DOE's comments also suggested that as long as it meets the requirements of a general statutory authority, it is in compliance with law notwithstanding the existence of another more specific (and usually more restrictive) statutory authority. DOE may not, however, select which statute it will follow; rather, when two statutes are applicable to a situation they must be harmonized to the extent possible and if they are truly in conflict, the more specific provision takes precedence.[96] Under this principle, DOE's actions raise significant legal compliance issues:

- DOE states that it continues to be authorized to transfer depleted uranium under provisions of the AEA.[97] Those provisions generally authorize DOE to distribute source material, which includes depleted uranium. However, Congress explicitly limited this general AEA authority when it enacted the uranium-specific section 3112 of the USEC Privatization Act, 42 U.S.C. § 2297h-10, amending the AEA. Section 3112 states unequivocally that DOE "*shall not* . . . transfer or sell *any* uranium (*including* [but not limited to] natural uranium concentrates, natural uranium hexafluoride, or enriched uranium in any form) to *any* person except as consistent with this section" (emphasis added), with no provision for sale or transfer of depleted uranium. We interpret this plain language, supported by legislative history, as likely

[95]As the U.S. Supreme Court ruled in *Marbury v. Madison*, 5 U.S. (1 Cranch) 137, 177 (1803), "[i]t is emphatically the province and duty of the judicial department to say what the law is. Those who apply the rule to particular cases, must of necessity expound and interpret that rule. If two laws conflict with each other, the courts must decide on the operation of each."

[96]*See, e.g., Preiser v. Rodriguez*, 411 U.S. 475, 489- 90 (1973). *See also Watt v. Alaska*, 451 U.S. 259, 266-67 (1981); *Radzanower v. Touche Ross & Co*., 426 U.S. 148, 153 (1976); *Morton v. Mancari*, 417 U.S. 535, 550-51 (1974).

[97]Atomic Energy Act §§ 63, 161(m), codified as amended at 42 U.S.C. §§ 2093, 2201(m).

prohibiting DOE from selling or transferring depleted uranium. DOE mischaracterizes this interpretation of section 3112 as a "*sub silentio* implied repeal" of its general AEA authority but in fact our interpretation attempts to reconcile the two statutes and their legislative histories and to resolve any conflict in favor of the plain meaning of the more recent and more specific statute. In addition, as we explained in our 2008 report cited above,[98] our interpretation respects the policy considerations and choices Congress made in 1996 when it considered the disposition of DOE's valuable uranium in a crowded and price-sensitive market. It would be incongruous to read the applicable statutory provisions to allow DOE to sell or transfer potentially billions of dollars' worth of federal assets without the scrutiny Congress gave to disposition of DOE's valuable uranium in enacting section 3112. By contrast, DOE's interpretation would rewrite section 3112 by reading a depleted uranium exception into the unqualified term "any uranium." In addition, DOE's assertion that it can sell depleted uranium "consistent with" section 3112 does not explain how disregard of section 3112 amounts to consistency.[99]

- DOE suggests that it does not have to comply with the specific requirement of section 3113 of the USEC Privatization Act, 42 U.S.C. § 2297h-11, to seek reimbursement for the costs of disposing of depleted uranium, because section 3113 is not the "sole mechanism" under which it may accept depleted uranium. Rather, DOE suggests that it may rely on its general authority in 42 U.S.C. § 2096 to acquire source material as authority to accept depleted uranium. Further, DOE asserts that section 3113 does not apply because it does not require depleted uranium to be characterized as low-level waste. However, the NRC has the authority to classify material as low-level radioactive waste and

[98]GAO-08-606R.

[99]Our 2008 report suggested that the Congress clarify through legislation DOE's authority to transfer or sell depleted uranium. While to date, such legislation has not been enacted, H.R. 1999, the SAVE Act, introduced in 2013 and currently in committee, includes language that provides DOE with specific authority to transfer or sell depleted uranium tails, meeting the intent of our 2008 suggestion. In 2008, DOE declined to comment on our interpretation of section 3112 or on our suggestion that Congress clarify this provision.

has classified depleted uranium accepted for disposal (which DOE does not dispute is what it did) as such.[100]

- DOE, with regard to its May 2012 transfer of depleted uranium to Energy Northwest, states that such transfers are authorized under its general AEA section 63 and 161(m) authorities. However, DOE asserts that it is not required to receive compensation in accordance with a set monetary price when it sells or transfers depleted uranium as a resource notwithstanding section 161(m)'s requirement that DOE establish "prices to be paid . . . which . . . will provide reasonable compensation to the Government . . .." We continue to maintain that the intangible benefits cited by DOE as a justification for this transfer did not amount to a "price." We note further that DOE's interpretation ignores section 161(m)'s requirement that the price must be paid *by the recipient* of the depleted uranium. DOE does not deny that it received nothing from Energy Northwest, however, and does not explain how the department complied with the AEA.

In its comments, DOE also dismissed our finding that it did not obtain a determination from the president, required by USEC Privatization Act section 3112(d)(2)(A), that the specific LEU it transferred to USEC in March 2013 was not needed for national security purposes. DOE confirms that it used the most recent *Nuclear Weapons Stockpile Plan* (NWSP), dated July 2011, as a proxy for such a determination and that the LEU in question was not in its possession at the time that that plan was signed by the president. DOE states that its reliance on the July 2011 plan followed its standard practice to rely on the most recent NWSP but does not explain how in this case, a document predating DOE's possession of the material in question could speak to whether that material was needed for national security. Nor does DOE explain how, in general, the use of the NWSP meets the requirements of section 3112(d)(2)(A). Accordingly, we see no reason to change our position that the department did not comply with the requirement to obtain a presidential determination.

Finally, DOE generally disagreed with our six recommendations that were broadly aimed at improving the transparency of DOE's uranium transactions. We believe transparency is a fundamental tenet of good

[100]42 U.S.C. § 2021b(9). *See* NRC Memorandum and Order, filed in *Louisiana Energy Services, L.P.*, Docket No. 70-3192-ML, CLI-05-05, at 17 (Jan. 18, 2005).

government and that our recommendations support actions needed to enhance DOE's transparency. In 2009, the president and OMB issued memos stating that "transparency promotes accountability and provides information for citizens about what the Government is doing…and that the Administration will take appropriate action, consistent with law and policy, to disclose information rapidly in forms that the public can readily find and use."[101] To facilitate transparency, we believe it is incumbent upon DOE to provide public information on the costs and risks of, market impact for, and legal authorities for its uranium transactions. Furthermore, we find it difficult to reconcile DOE's unwillingness to improve publicly available information about its uranium transactions with the stated objectives of DOE's 2013 uranium management plan, which seeks to provide current information and enhanced transparency to the general public and interested stakeholders regarding DOE's management of its uranium inventory. Our response to DOE's comments on our six recommendations is as follows:

- Concerning our first recommendation that the Secretary of Energy clarify the total amount of tails it intended to accept from USEC as a part of its June 2012 tails acceptance, and, if necessary, amend its cooperative agreement with USEC to ensure the department is not required to accept additional tails liability at a later date, in its response to our draft report, DOE did not provide an explanation regarding the conflicting amount of tails reported in various documents supporting this transaction. Instead, DOE simply stated that it had accepted 38,317 metric tons of depleted uranium hexafluoride from USEC and that its cooperative agreement with USEC did not require amendment. However, this quantity of tails further differs from the documentation DOE previously provided and which we assessed about this tails transaction—including its summary of the material transfer forms DOE filed with the NRC. This uncertainty regarding the amount of tails reinforces the need for additional clarification from DOE. If the figures in DOE's comments on our draft report are accurate, then other documentation DOE provided to us during the course of our review indicates that DOE has significantly underestimated its liability cost for accepting the tails in its internal financial

[101]Transparency and Open Government, Memorandum for the Heads of Executive Departments and Agencies, 74 Fed. Reg. 4,685 (Jan. 21, 2009); Office of Management and Budget, Open Government Directive, M-10-06 (2009).

analysis and that DOE's summary of documentation required by NRC regulation tracking this nuclear materials transaction is incorrect. We modified our report to reflect how DOE's comments raise further questions about the amount of tails involved in the June 2012 tails acceptance. We revised our recommendation to state that DOE should continue to review the accuracy of its documentation associated with this transaction and seek an independent review of this documentation by a third party, such as the DOE Inspector General.

- In response to our second recommendation that the Secretary of Energy publicly identify the legal authority it relied on for each uranium transaction the department conducts and explain how the transaction meets the requirements of that authority, DOE stated that it will comply with all legal requirements for future transactions, but will not publicly document the authorities it relied on because doing so goes beyond what is legally required and would disclose information "traditionally…protected as attorney work product or privileged pre-decisional documents." DOE misconstrues our recommendation. We did not recommend that DOE release attorney work product, which is information prepared in advance of litigation,[102] or any internal legal memoranda that may reveal pre-decisional deliberations regarding which legal authority it believes authorized its transaction. Rather, we simply recommended public notice of DOE's final decision about which legal authority it relied on and a brief explanation of how the department complied with individual requirements of that authority. For example, such explanations could be included in documents DOE already prepares concerning uranium transactions—such as advance congressional notifications of uranium transactions required by the department's fiscal year 2014 appropriation. Since, as noted above, DOE implies that it may select which legal authority to follow in conducting uranium transfers, documenting which authority DOE relied on would at least make transparent the conditions with which DOE believes that transaction must comply.

[102]Fed. R. Civ. P. 26(b)(3).

- In commenting on our third recommendation that the Secretary of Energy develop guidance for setting an appropriate method for determining the value of depleted uranium tails when transferring them as an asset and apply the method consistently and transparently prior to conducting such transfers, sales, or barters, DOE stated that it is not required to establish guidance or a pricing policy for depleted uranium, and to do so would hinder DOE's ability to maximize the value received by the government in a given transaction. Again, DOE misconstrues our recommendation. We did not recommend that DOE develop a pricing policy, but rather that DOE document a consistent method for valuing depleted uranium tails when transferring them as an asset in the context of a transaction. In doing so, our recommendation acknowledges (a) that there may be considerations to DOE other than price that figure into the overall value of a transaction involving tails, and (b) that different circumstances may warrant utilization of different valuation methods. Our recommendation does not preclude DOE from establishing a valuation method that can be tailored to consider these nuances, but it does seek to ensure that DOE's actions are consistent across transactions. Furthermore, it is our view that any valuation method established by DOE would seek to maximize the value received by the government.

- Regarding our fourth recommendation that the Secretary of Energy should take steps to mitigate the risks for each uranium transaction in accordance with federal internal control standards, DOE stated that the department will take steps to mitigate risks where appropriate or feasible, but that DOE cannot control the actions of third parties and must not attempt to exert control or influence third parties in a way that establishes an agency or apparent agency relationship.[103] DOE's separately-provided technical comments characterize the nature of the agreements among other parties to the May 2012 tails transaction, which it repeatedly told us it had not

[103]DOE's reference to an agency or apparent agency relationship, as it explains further in its technical comments, is a reference to our 2011 report, GAO-11-846, in which we concluded that a uranium transaction with USEC constituted a sale through an agent, rather than a barter, and that DOE was required to deposit the proceeds of that sale into the Treasury. There is no prohibition on DOE conducting sales through an agent.

seen or read. These technical comments acknowledge the possibility, however remote, that while the transaction could fall apart and fail to produce its intended result, the transaction would still result in an increased volume of domestic-origin LEU on the market. But DOE neglects to mention that, in the event this occurs, it has no contractual remedy to ensure that the government indeed would receive reasonable value for the material it transferred to initiate the transaction. We continue to believe that DOE did not take available steps to mitigate identified risks of the May 2012 tails transaction, such as the potential remedies we suggested—a right of first refusal for the LEU. As such, we continue to believe that DOE should pay special attention to the steps it can take to mitigate the risks associated with third-party contracts.

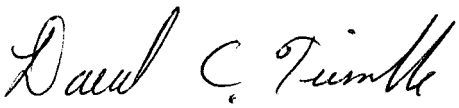
- In response to our fifth recommendation that DOE conduct a rigorous and documented internal assessment consistent with contract provisions and DOE's *Information Quality Guidelines* of the quality of such studies and/or have an independent third party conduct a peer review, DOE stated that it will continue to consider the applicability of the *Information Quality Guidelines* to independent analyses of the potential market impact of the proposed transactions, and take appropriate steps if applicable. DOE did not comment on the second part of our recommendation—that consistent with DOE's *Information Quality Guidelines*, DOE require that studies include information on the methods, data sources, and assumptions used in such a way that allows others to understand, interpret, and evaluate the studies. We continue to believe that DOE should require that its studies contain such information to ensure their quality, credibility, and transparency.

- Concerning our sixth recommendation that the Secretary of Energy seek and consider industry input both on the amount of DOE sales or transfers of uranium the market can absorb annually and on whether there is a need to reinstitute a guideline that limits annual uranium sales or transfers, DOE stated that it has met in the past and continues to meet with industry parties and is open to receiving related information under advisement as it makes future plans. However, we do not believe that DOE's position is consistent with the Secretary of Energy's 2008 Policy Statement on the

transparent conduct of uranium transactions. Further, DOE's apparent hesitancy to be transparent about the legal justifications for its uranium transactions contribute to overall concerns about DOE's transparency in conducting uranium transactions.

As agreed with your offices, unless you publicly announce the contents of this report earlier, we plan no further distribution until 30 days from the report date. At that time, we will send copies to the appropriate congressional committees, Secretary of Energy, and other interested parties. In addition, this report will be available at no charge on the GAO website at http://www.gao.gov.

If you or your staff members have questions about this report, please contact David Trimble at (202) 512-3841 or trimbled@gao.gov or Susan Sawtelle at (202) 512-6417 or sawtelles@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. Key contributors to this report are listed in appendix VIV.



David C. Trimble
Director, Natural Resources and Environment

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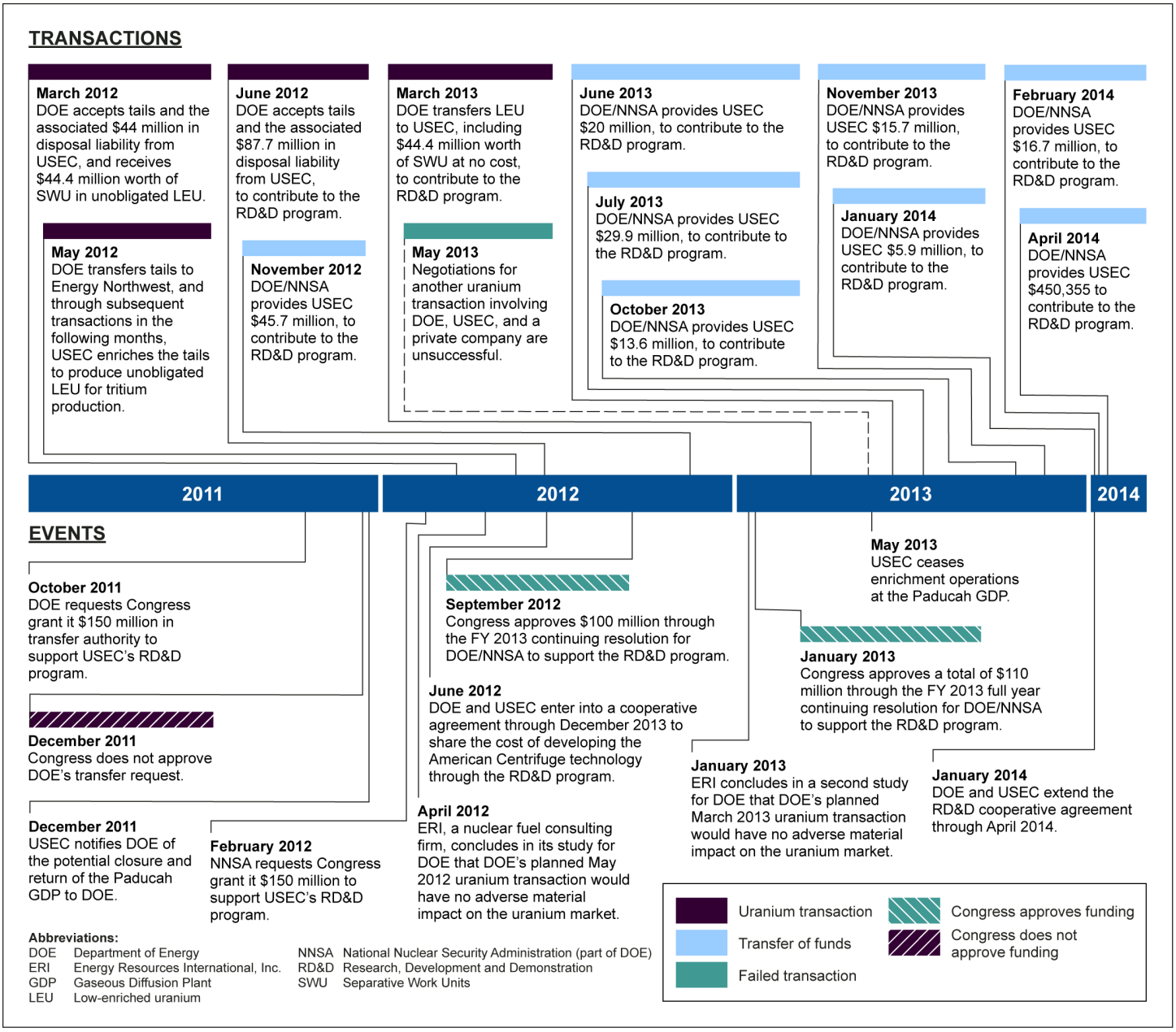
Managing Associate General Counsel

Appendix I: Timeline Showing DOE's Uranium and Financial Transactions Involving USEC Since 2012



Sources: GAO analysis of DOE and USEC documents.

Appendix II: Scope and Methodology

The objectives of our review were to assess (1) the details of the uranium transactions that the Department of Energy undertook in 2012 and 2013 involving USEC Inc., (2) any legal concerns that may exist with respect to these uranium transactions, (3) any other issues that may be raised by these uranium transactions, and (4) the extent to which DOE assessed the market impact of these uranium transactions.

For our first objective regarding the details of the uranium transactions that DOE undertook in 2012 and 2013 involving USEC, we reviewed and analyzed DOE documents pertaining to all transactions that the department undertook in 2012 and 2013 involving USEC. These included contracts, cooperative agreements, internal memos and letters, public notices, internal analyses, budget documents, secretarial determinations, and fact sheets. We also reviewed USEC's corporate financial filings with the U.S. Securities and Exchange Commission and contracts between other parties that were related to transactions that DOE undertook involving USEC. In addition, we interviewed officials at DOE's headquarters in Washington, D.C., and from the Portsmouth/Paducah Project Office in Paducah, Kentucky, as well as, officials from DOE's Office of Nuclear Energy, Loan Guarantee Program Office, Office of Environmental Management, and the National Nuclear Security Administration's (NNSA) Tritium Readiness Subprogram Office regarding the details of and purposes for conducting its uranium transactions. We also interviewed officials from DOE's Oak Ridge Office to learn about the Cooperative Agreement for Research, Development, and Demonstration (RD&D) of the American Centrifuge technology and the requirements and process for de-leasing the Paducah Gaseous Diffusion Plant (GDP) facilities following USEC's decision to cease enrichment at this facility. Moreover, we interviewed USEC officials involved with the American Centrifuge project in Piketon, Ohio, and at the Paducah GDP in Paducah, Kentucky, as well as senior USEC officials, including its Chief Financial Officer, to learn more about the details of DOE's uranium transactions. In addition, we interviewed officials from the Nuclear Regulatory Commission (NRC), Tennessee Valley Authority (TVA), and Energy Northwest. Using this information, we identified the number and types of uranium transactions that DOE undertook in 2012 and 2013. We then summarized the details of each transaction, noting the amount of funds and uranium (or enrichment services) transferred, as well as the

estimated value of the material transferred,[1] and the purposes for those transactions.

For our second objective regarding any legal concerns that may exist with respect to these uranium transactions, we reviewed statutes governing DOE's uranium activities, including the Atomic Energy Act and USEC Privatization Act, regulations, legislative history, and other sources of law, and assessed DOE's compliance with key statutes, reviewed our previous related work, examined contracts and other documents associated with these transactions, and obtained and reviewed key internal agency memorandums, including secretarial determinations that uranium transactions would have no adverse material impact on the domestic uranium market. Also, we interviewed senior officials from DOE, Department of State, TVA, and Energy Northwest.

For our third objective regarding any other issues that may be raised by these uranium transactions, we reviewed key agency documents and interviewed DOE and contractor officials from NNSA's Y-12 National Security Complex in Oak Ridge, Tennessee, and Office of Fissile Materials Disposition regarding the potential alternatives that DOE considered, including using downblended highly enriched uranium (HEU) to provide unobligated low-enriched uranium (LEU) for tritium production instead of participating in the May 2012 tails transfer. Further, we interviewed senior officials from DOE's Office of the Chief Financial Officer and NNSA's Office of Management and Budget to discuss valuation methodologies. In addition, we reviewed DOE's prior tails valuations and information pertaining to its former pricing policy. In addition, we interviewed senior officials from all four parties to the May 2012 tails transfer (DOE, USEC, TVA, and Energy Northwest). We also reviewed internal memos and other agency documents to determine the risks that DOE had identified for the May 2012 tails transfer. In addition,

[1]We did not did not attempt to independently verify the reliability of DOE's estimates for the value of goods transferred between the agency and other parties because the amount and quality of data on how estimated costs and benefits were determined varied so greatly between the transactions. As a result, data on DOE's reported estimated costs and benefits are of undetermined reliability.

we reviewed the *Standards for Internal Control in the Federal Government* regarding practices for risk identification and mitigation.[2]

For our fourth objective regarding the extent to which DOE assessed the market impact of these uranium transactions, we analyzed two market impact studies that DOE contracted with ERI—a nuclear fuel consulting firm—an April 2012 study,[3] and a January 2013 study.[4] In addition, we interviewed the principal author of the ERI studies and conducted follow-up correspondence with that ERI official. We also corresponded with DOE's Contracting Officer and Contracting Officer's Representative and interviewed officials from DOE's Office of Nuclear Energy, which initiated the contract for the study from ERI. Moreover, we interviewed representatives from the uranium mining, conversion, and enrichment industries—including with Uranium Producers of America, an organization that promotes the viability of the domestic uranium industry, as well as with Uranium One, Cameco, Uranium Resources Inc., Uranium Energy Corp., Energy Fuels Inc., and ConverDyn—and we reviewed annual reports for domestic uranium producers. We also interviewed an official from TradeTech, a consulting company that specializes in nuclear fuel markets regarding the uranium market in general. Further, we reviewed determinations made by the Secretary of Energy stating that DOE's uranium transfers would not have an adverse material impact on the domestic uranium market; DOE's contracts with and task assignments for ERI; internal DOE memos and e-mails regarding evaluations of ERI's contract performance; as well as DOE's *Information Quality Guidelines*, which set forth quality assurance steps and procedures to ensure the quality and objectivity of information that DOE makes publicly available.

[2]GAO/AIMD-00-21.3.1. These standards provide an overall framework for establishing and maintaining internal control and for identifying and addressing major performance and management challenges and areas at greatest risk of fraud, waste and abuse, and mismanagement.

[3]Energy Resources International, Inc., *Quantification of the Potential Impact on Commercial Markets of Introduction of DOE Excess Uranium Inventory in Various Forms and Quantities During Calendar Years 2012 through 2033* (Washington, D.C.: Apr. 23, 2012).

[4]Energy Resources International, Inc., *Quantification of the Potential Impact on Commercial Markets of Introduction of the Enrichment Services Component of DOE Low Enriched Uranium Inventory During Calendar Year 2013* (Washington, D.C.: Jan. 28, 2013).

To develop a general understanding of U.S. nuclear cooperation agreements and how peaceful use restrictions affect the goods and services that may be used for military or national security purposes, we interviewed officials from the Department of State's Bureau of International Security and Nonproliferation and Office of the Legal Advisor and NNSA's Office of Nonproliferation and International Security. In addition, we reviewed two relevant studies from the Congressional Research Service.[5]

We conducted this performance audit from January 2013 to May 2014 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 objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

[5]CRS, *Peaceful Use Restrictions on Uranium Enriched at the Urenco Uranium Enrichment Facility* (Washington, D.C., May 21, 2012). CRS, *Potential Sources of Nuclear Fuel for Tritium Production* (Washington, D.C., May 15, 2012).

Appendix III: Summary of DOE's Uranium and Financial Transactions Involving USEC Since 2012

Date and transaction name	Uranium transaction[a] or transfer of appropriated funds	Details
March 13, 2012 Separative Work Units procurement	Uranium transaction	The Department of Energy (DOE) accepted low-assay depleted uranium tails, and their associated disposal liability, from USEC. DOE provided natural uranium to USEC and in return received unobligated low-enriched uranium (LEU), equivalent to the natural uranium DOE provided and Separative Work Units (SWU). DOE paid USEC for the SWU by accepting liability for the depleted uranium tails.
May 15, 2012 Tails transfer	Uranium transaction	DOE transferred high-assay tails to Energy Northwest. Through a series of subsequent transactions, USEC enriched the tails to create a supply of unobligated LEU that is to be used for tritium production, in anticipation of the closure of the Paducah Gaseous Diffusion Plant.
June 12, 2012 Tails acceptance	Uranium transaction	DOE accepted depleted uranium tails, and their associated disposal liability, from USEC.
November 30, 2012 Financial transfer	Transfer of appropriated funds	DOE provided $45.7 million in funding to USEC.
March 15, 2013 SWU transfer	Uranium transaction	DOE provided SWU to USEC by transferring unobligated LEU. USEC transferred to DOE the natural uranium component of the transferred LEU and accepted the value of the SWU component of the transferred LEU.
June 13, 2013 Financial transfer	Transfer of appropriated funds	DOE provided $20 million in funding to USEC.
July 24, 2013 Financial transfer	Transfer of appropriated funds	DOE provided $29.9 million in funding to USEC.
October 25, 2013 Financial transfer	Transfer of appropriated funds	DOE provided $13.6 million in funding to USEC.
November 20, 2013 Financial transfer	Transfer of appropriated funds	DOE provided $15.7 million in funding to USEC.
January 28, 2014 Financial transfer	Transfer of appropriated funds	DOE provided $5.9 million in funding to USEC.
February 12, 2014 Financial transfer	Transfer of appropriated funds	DOE provided $16.7 million in funding to USEC.
April 1, 2014 Financial transfer	Transfer of appropriated funds	DOE provided $450,355 in funding to USEC.

Transaction to obtain a short-term supply of unobligated LEU for tritium production

Transaction to secure unobligated LEU for up to a 15-year supply of tritium production

Transactions to support development of the American Centrifuge technology

Source: GAO analysis of DOE documents.

[a]For the purposes of our review, uranium transfers involve the exchange of natural, enriched, or depleted uranium, or uranium enrichment services between DOE and another party.

Appendix IV: Legal Analysis of DOE's Four Uranium Transactions

Introduction and Summary of Conclusions

As part of GAO's review of four recent uranium transactions by the Department of Energy (DOE), we examined the consistency of these transactions with federal law governing uranium transactions. For the reasons discussed below, we found as follows:

Regarding DOE's May 2012 depleted uranium tails transfer, we found that, under its plain meaning, the USEC Privatization Act likely prohibited DOE from making this transfer. In addition, DOE did not comply with the requirements of the Atomic Energy Act (AEA) provision upon which it solely relied for this transaction, in particular, with the requirement that DOE charge the tails recipient a "price" that is established to be nondiscriminatory and that provides reasonable compensation to the government. In fact, DOE did not charge the tails recipient any price at all.

Regarding the March 2012 separative work units (SWU) procurement, we found that DOE did not properly take into account its transfer of natural uranium in subsequent market impact studies.

Regarding DOE's acceptance of depleted uranium tails from USEC in both the March 2012 SWU procurement and the June 2012 tails acceptance, we found that DOE failed to apply the governing statutory provision and consequently undercharged USEC Inc. (USEC) by an estimated $9 million in one of the transactions.

Finally, regarding DOE's transfer of low-enriched uranium (LEU) to USEC in March 2013, we found that DOE did not obtain a presidential determination that the material is not necessary for national security needs, as required by the USEC Privatization Act.

Analysis

I. DOE Likely Lacked Authority to Transfer Depleted Uranium Tails in May 2012, and Even If DOE Had the Authority It Asserts, It Did Not Charge the Recipient a Price as Required

A. By Its Plain Meaning, the USEC Privatization Act Prohibits DOE from Transferring Depleted Uranium

On May 15, 2012, DOE entered into an agreement with Energy Northwest providing for, among other things, DOE's transfer to Energy Northwest of between 9,082 and 9,156 metric tons of uranium (MTU) of unobligated

depleted uranium hexafluoride with a minimum average assay of 0.44% (so-called "high-assay tails") over the period May 15, 2012 to April 30, 2013.[1] As we have reported, section 3112(a) of the USEC Privatization Act[2] likely prohibits DOE from transferring depleted uranium tails,[3] and thus we found that DOE's 2012 transfer of depleted uranium tails to Energy Northwest was likely unauthorized. As we noted in 2008, DOE has general authority to distribute "source material" such as depleted uranium under sections 63 and 161(m) of the AEA, 42 U.S.C. §§ 2093 and 2201(m).[4] Congress explicitly limited this general authority in 1996, however, in section 3112 of the USEC Privatization Act. As we previously explained:[5]

> [I]n 1996, Congress enacted section 3112 of the USEC Privatization Act, which limits DOE's general authority, under the AEA or otherwise, to sell or transfer uranium. In particular, section 3112 explicitly bars DOE from selling or transferring "*any* uranium"—including but not specifically limited to certain forms of natural and enriched uranium—"except as consistent with this section." Section 3112 then specifies conditions for DOE's sale or transfer of natural and enriched uranium of various types, including conditions in section 3112(d) for sales of natural and low-enriched uranium from DOE's inventory. . . . Nowhere, however, does section 3112(d) or any other provision of section 3112 . . . provide conditions for DOE to transfer or sell

[1]See DOE and Energy Northwest, "Agreement Between the US Department of Energy and Energy Northwest for the Transfer of Depleted Uranium Hexafluoride and the Storage of Low Enriched Uranium" (May 15, 2012). DOE also agreed to accept further depleted uranium tails ("residual tails") resulting from Energy Northwest's enrichment of the high-assay tails it received from DOE under the agreement, and DOE agreed to provide certain ancillary services, such as delivery and storage, on a cost reimbursement basis.

[2]USEC Privatization Act of 1996, Pub. L. No. 104-134, § 3112(a), 42 U.S.C. §§ 2297h-10(a) (2014). All references herein to the USEC Privatization Act are as amended.

[3]GAO-08-606R. See also GAO, *Nuclear Material: Several Potential Options for Dealing with DOE's Depleted Uranium Tails Could Benefit the Government,*GAO-08-613T (Washington, D.C.: Apr. 3, 2008); GAO-11-752T; GAO-11-846.

[4]Both DOE and GAO have found that depleted uranium qualifies as "source material" under the AEA. See DOE, Scott Harris, General Counsel, *GC Guidance on Barter Transactions Involving DOE-Owned Uranium* at 1, note 2 (June 16, 2010); GAO-08-606R at 15.

[5]Legislation has been enacted concerning the USEC Privatization Act since GAO's 2008 report (GAO-08-606R), but no changes have been made that would compel a change to GAO's prior interpretation of section 3112.

> depleted uranium. Because section 3112(a) states that DOE may not "transfer or sell any uranium. . . except as consistent with this section" and because no other part of section 3112 sets out the conditions for DOE to transfer or sell depleted uranium, we believe that, under rules of statutory construction, DOE likely lacks authority to sell the tails. . . . It would also be incongruous to allow DOE to sell or transfer potentially billions of dollars' worth of federal assets without the scrutiny Congress gave to disposition of DOE's valuable uranium in enacting section 3112.[6]

DOE disagrees with our finding that the USEC Privatization Act likely restricts its authority to dispose of depleted uranium. DOE does not believe that the USEC Privatization Act amended the department's AEA authority by creating a blanket prohibition on uranium transfers or sales except as authorized by the USEC Privatization Act. Rather, in DOE's view, section 3112(a) simply requires that any uranium transfers or sales be "consistent with" section 3112 conditions and because the statute does not contain conditions explicitly pertaining to depleted uranium, DOE's sale and transfer of depleted uranium under its AEA authority is "consistent" with the USEC Privatization Act. With respect to DOE's specific 2012 transfer of depleted uranium to Energy Northwest, the department's documentation indicates it relied on the AEA alone as authority for this transaction, principally AEA section 63 authorizing transfer of source material such as high-assay tails. AEA section 161(j), also identified as a possible source of authority by DOE, in fact does not apply to the tails that DOE transferred to Energy Northwest.[7]

B. DOE Did Not Comply With Key Requirements of the AEA Provision It Relied Upon

Even assuming that the USEC Privatization Act did not prohibit DOE from transferring depleted uranium to Energy Northwest and DOE retained its general authority under the AEA to make the transfer (which we do not

[6]GAO-08-606R at 5, 17 (emphasis added). DOE declined to comment on these legal conclusions or provide its own legal position in its response to our 2008 report. DOE asserted that it had previously transferred depleted uranium tails under its AEA authority.

[7]AEA section 161(j), 42 U.S.C. § 2201(j), authorizes DOE "[to] make such disposition as it may deem desirable" of radioactive material if the department believes it is in the interest of national security. However, section 161(j) by its terms does not apply to property furnished to licensees in accordance with the provisions of subsection 161(m), as DOE asserts it has done here.

believe it did), DOE did not comply with key AEA statutory conditions. Its transfer to Energy Northwest therefore was unauthorized for this reason as well.

A transfer to Energy Northwest would be governed by AEA section 63(a)(3), which authorizes distribution of source material for use under a commercial AEA section 103 license (Energy Northwest is a power utility holding a section 103 license from NRC).[8] In contrast to distributions authorized under AEA sections 63(a)(1), (2) and (4) for which DOE "may" make a "reasonable charge" pursuant to AEA section 63(c), section 63(c) *requires* DOE to impose a charge for transfers under AEA section 63(a)(3): DOE "*shall* make a reasonable charge determined pursuant to section 161(m)" for source material distributed under section 63(a)(3) (emphasis added). Section 161(m), in turn, requires DOE to:

> establish *prices to be paid by licensees* for material or services to be furnished by [DOE] pursuant to this subsection, which *prices* shall be established on such a *nondiscriminatory basis as*, in the opinion of [DOE], *will provide reasonable compensation* to the Government for such material or services and will not discourage the development of sources of supply independent of [DOE].[9]

AEA sections 63(c) and 161(m), then, for depleted uranium such as DOE furnished to licensee Energy Northwest, would require DOE to: (1) make a reasonable charge, (2) based on an established price that will be paid by the recipient licensee, (3) which will provide reasonable compensation to the U.S. government, and (4) which price is nondiscriminatory.

DOE failed to satisfy any of these requirements. First, DOE did not make any charge to Energy Northwest for the uranium tails in its agreement. In addition, DOE documents we reviewed show the department's legal analysis neither acknowledged the requirement to impose a "reasonable charge" nor asserted that DOE complied with the requirement of AEA section 63(c) to impose such a charge.

[8]*See* Energy Northwest, Columbia Generating Station License Renewal Application at p.1.1-6 (January 2010); Renewed License No. NPF-21 Amendment No. 225, at 2-3 (May 22, 2012).

[9]AEA §161(m), 42 U.S.C. § 2201(m) (2014) (emphasis added).

Second, DOE did not meet the requirement of section 161(m) to "establish a price" to be paid by the recipient. Although the AEA does not define the term "price,"[10] DOE's consistent practice in establishing prices under this provision has been to set them as standard, monetary charges. DOE historically maintained and revised from time to time a pricing schedule for the supply of uranium, including depleted uranium, in conjunction with its pricing policy for its provision of enrichment services and enriched uranium when DOE operated the Gaseous Diffusion Plants (GDP).[11] In its last such pricing policy published in the *Federal Register* in 1982, DOE established a price for depleted uranium as follows:

> The price for uranium depleted in the isotope U-235 (tails) will be established in consideration of the market value of the material at the time of sale, or on a negotiated basis if market value cannot reasonably be determined.[12]

Furthermore, although there is no pricing policy for uranium currently in effect, according to DOE officials, DOE regulations in effect for non

[10]The Supreme Court has discussed prices in the context of uranium sales. *See U.S. v. Eurodif S. A.,* 555 U.S. 305 (2009) (discussing certain regulated uranium sales as including those with purchase prices in cash alone or cash combined with a commodity).

[11]*See, e.g.*, DOE, "Uranium Hexafluoride; Base Charges, Use Charges, Special Charges, Table of Enriching Services, Specifications and Packaging," 47 Fed. Reg. 17,110 (April 21, 1982). *See also* 23 Fed. Reg. 4813 (June 28, 1958) (pricing policy of DOE predecessor Atomic Energy Commission); AEC, "Uranium Hexafluoride: Base Charges, Use Charges, Special Charges, Table of Enriching Services, Specifications, and Packaging," 32 Fed. Reg. 16,289 (Nov. 29, 1967) (stating "[t]he base charge for depleted uranium requested without a specification as to assay is $2.50 per kilogram V. The assay furnished by the AEC in this case will normally be in the neighborhood of 0.20 wt. percent U235, of which large amounts are available.").

[12]47 Fed. Reg. at 17,111.

uranium materials and services under the same statutory provision, AEA section 161 define price as a monetary amount.[13]

Thus, in instances where DOE has interpreted section 161(m)—historical regulations applicable to uranium and current regulations applicable to non uranium items—DOE has established and published a standard pricing schedule in monetary terms or uniform criteria, such as commercial value or market value, that are to be applied in individual transactions to establish charges to recipients.

In the May 2012 agreement, however, DOE did not "establish a price to be paid by the licensee [recipient]" Energy Northwest. DOE documents we reviewed show the agency neither asserted it had established a price, nor acknowledged the statutory requirement that it do so. Instead of addressing this requirement or the requirement to make a reasonable charge, DOE documents show that the agency justified the agreement on its assertion that it would receive intangible benefits which amounted to

[13]*See, e.g.,*10 C.F.R. § 1009.3(a) (2014) (DOE policy is that the price or charge for materials and services sold to persons and organizations outside the federal government "shall be the Government's full cost for those materials and services, unless otherwise provided in this part."). Exceptions to this policy may be authorized but "[p]rices and charges for materials and services sold pursuant to 42 U.S.C. § 2201 *shall be either the full cost recovery price or the commercial price, whichever is higher,* except that lower prices and charges may be established by the department if it is determined that such lower prices and charges will provide *reasonable compensation* to the Government and will not discourage the development of sources of supply independent of the DOE of such material." 10 C.F.R. § 1009.3(b)(2) (2014) (emphasis added). *See also* DOE, Order 522.1 at 5 § 5(c) (Nov. 3, 2004). The regulation and order indicate that standard price and charge lists will be developed.

"reasonable compensation" to the government.[14] Under principles of statutory construction, however, "reasonable compensation" would have a broader meaning than "reasonable charge."[15] Whereas "compensation" is "something given or received as an equivalent for services," "charge" typically focuses on a monetary price or fee: "expense or cost," "a fee or price charged."[16]

Third, because DOE did not establish or impose any price paid by the recipient for the depleted uranium, DOE cannot satisfy the requirement that such price provide "reasonable compensation" to the government. A finding that, from a series of transactions, DOE received intangible benefits amounting to reasonable compensation does not meet the statute's requirement to charge a price to the *recipient of the source materia*l—here, Energy Northwest—and a price that *itself* provides reasonable compensation. Even if the intangible benefits could be viewed

[14]According to DOE, it would receive intangible benefits from a series of transactions of which the May 2012 transfer of high-assay tails to Energy Northwest was one. The other transactions, according to DOE, were Energy Northwest's agreement with USEC to enrich the uranium to LEU, Energy Northwest's agreement with TVA for future deliveries of the unobligated LEU, and the DOE-NNSA agreement with TVA for the production of tritium. The intangible benefits identified by DOE include providing a source of unobligated LEU for TVA's use in the tritium program, projected reduced rates for Bonneville Power Administration ratepayers, and the deferred and avoided costs for DOE's Office of Environmental Management at the Paducah GDP associated with USEC's continued operations of the plant for an additional year. By contrast, in 2005, DOE conducted a pilot project to enrich depleted uranium in which DOE did charge a price, according to a DOE Memorandum for the Deputy Secretary. DOE entered into agreements with Bonneville Power Administration and Energy Northwest, which states that DOE would transfer 5,720 MTU as DUF6 of depleted uranium tails to Bonneville Power Administration in 2005-2006 and Energy Northwest, on behalf of Bonneville, would pay DOE $10,450 per cylinder successfully enriched.

[15]*See, e.g.*, *Walters v. Metropolitan Educational Enterprises, Inc.*, 519 U.S. 202 (1997) (it is a fundamental principle of statutory construction that words in a statute must be given their ordinary or natural meaning whenever possible).

[16]Random House Dictionary available at www.dictionary.com (2013).

as reasonable compensation,[17] these benefits did not come from Energy Northwest. Energy Northwest is expected to sell some of the resulting LEU to TVA, which in turn will use it in its performance of its contract for tritium production and charge DOE accordingly for the use of the material.[18] The statute requires that the "price" paid *by the licensee* provide reasonable compensation to the government and any benefits expected to be received by DOE are too attenuated to constitute "reasonable compensation" *from Energy Northwest*. While DOE may receive intangible benefits from these transactions and such benefits may have been relevant to DOE's decision to enter into the transactions, they do not constitute a price or a charge paid by Energy Northwest providing reasonable compensation to the government.

Finally, because DOE did not establish any price paid by the recipient for the depleted uranium, DOE cannot satisfy the requirement of establishing a nondiscriminatory price. The statute requires DOE to set a price that is nondiscriminatory as to other nuclear power plants or other potential users of the tails. We believe that "discriminatory" in this context has its

[17]DOE cites several cases holding that "compensation" can include intangible benefits. We do not believe these cases are relevant in the current context. First, the statute or regulation at issue in those cases interpret the word "compensation" alone, not, as in AEA section 161(m) involved here, when there is a requirement to establish a *price* which in turn provides reasonable *compensation*. Second, the cases involve restrictions to be enforced *by* the agency rather than conditions imposed *on* the agency. *See, e.g., Regents of the University of California v. Public Employment Relations Board*, 485 U.S. 589 (1988) (interpreting the private hands exception to the Private Express Statute which prohibited private mail carriage, 18 U.S.C. § 1696(c); where the exception requires that the mail carriage be "without compensation," Court held that "compensation" should be read by its normal meaning and not restrictively, explaining "[i]f we read the exception to include any private carriage so long as no direct payment is made, it quickly would swallow the rule."); *Clair Aero, Inc. v. Nat. Transp. Safety Board*, 2007 WL 754789 (D.C. Cir. 2007) (unpublished case interpreting Federal Aviation Administration regulation, 14 C.F.R. § 119.5(g), requiring commercial operators who carry persons or property by aircraft for compensation or hire to hold a valid certificate, where an operator without a certificate claimed to have provided a complimentary flight, that is, without compensation). The intangible benefits provided by sources other than the price paid by the recipient could, perhaps, be relevant to DOE's decision as to whether to enter into the transaction, but they are not relevant to the statute's requirements that DOE set a price and that the price itself provide reasonable compensation.

[18]Energy Northwest officials told us that, because it holds title to the LEU resulting from re-enrichment, it could use the LEU in any way it chooses, including selling or leasing it. Energy Northwest is obligated only to provide TVA with unobligated LEU according to the schedule in their agreement. DOE is not a party to the Energy Northwest-TVA agreement. *See* Interagency Agreement Between DOE and TVA for Irradiation Services (originally executed Dec. 21, 1999), as amended through modification 26 (May 15, 2012).

plain meaning of "characterized by or showing prejudicial treatment."[19] Energy Northwest deemed it financially attractive to obtain the tails from DOE, and documents show that DOE was generally aware that other entities may also have wanted an opportunity to buy the high-assay tails.[20] The statute does not expressly require that DOE offer the tails to other parties, but it does require DOE to establish the price in a nondiscriminatory manner, which DOE did not do. For example, subsequent to the May 2012 agreement with Energy Northwest, DOE sought buyers for depleted uranium, repeatedly using the word "sale" to describe the prospective agreements, and requiring payment in the form of natural uranium. Specifically, the DOE Request for Offers for the purchase of a portion of its depleted uranium inventory stated that DOE "will evaluate the form and method of payment to the department for the UF6 inventories," and "DOE will only accept payment in the form of natural uranium, which must be provided at the time of the annual transfers of the UF6 inventories."[21] After reviewing the responses to this solicitation, DOE announced, in November 2013 that the department was in negotiations to "sell" the depleted uranium hexafluoride inventory.[22] The actions taken by DOE in 2013 to sell other depleted uranium and its requirement to be paid in natural uranium stand in contrast to its agreement with Energy Northwest, which involved no price at all, suggesting that DOE may have discriminated among the parties in its pricing approach.

[19]*Random House Dictionary*, available at www.dictionary.com (2013).

[20]For example, in 2008 DOE received a proposal from Urenco, Inc. to purchase the tails. DOE declined to consider the proposal stating, among other things, that alternatives may be available to ensure that the price paid for the uranium is not less than its fair market value.

[21]DOE, Request for Offers for the Sale of Depleted and Off-Specification Uranium Hexafluoride Inventories, Request for Offers Number: DE-SOL-0005845 (July 3, 2013). The Request for Offers further stated that as one of the considerations for making a selection, DOE would consider the economic benefit to the United States taking into account a number of factors, such as the monetary value of the natural uranium to be transferred to DOE, the amount of the UF6 inventories transferred over the course of the agreement, any incidental economic benefits resulting from the agreement, and managing the costs for the Paducah site.

[22]DOE, Press Release: Energy Department Selects Global Laser Enrichment for Future Operations at Paducah Site (Nov. 27, 2013), *available at* http://energy.gov/em/articles/energy-department-selects-global-laser-enrichment-future-operations-paducah-site.

In sum, DOE did not meet the requirements of AEA section 63(c) in its May 2012 transfer of high-assay tails to Energy Northwest. Section 63(c) requires DOE to make a reasonable charge determined pursuant to section 161(m), which in turn requires DOE establish, on a nondiscriminatory basis, a price to be paid by the recipient, that itself provides reasonable compensation for the source material. DOE made no charge, and did not establish any price—nondiscriminatory or otherwise—that was paid by Energy Northwest. To the extent that DOE received intangible benefits, the benefits were not provided by Energy Northwest pursuant to the agreement but were a consequence of actions outside the agreement and involving third parties and, moreover, are not guaranteed.

II. DOE Failed to Apply Proper Legal Authorities Governing Its Transfer of Natural Uranium and Acceptance of Tails in the March 2012 SWU Procurement

On March 13, 2012, DOE entered an agreement with USEC which DOE labeled a contract to procure SWU.[23] Under this agreement, DOE (1) took title to and disposal responsibility for 13,073 MTU of depleted uranium tails[24] and (2) provided 409 MTU of Russian-origin natural uranium as uranium hexafluoride in exchange for receiving 48 MTU of U.S.-origin LEU from USEC.[25] We found that DOE neither recognized the transfer of natural uranium it conducted pursuant to this agreement, nor the legal authority governing the transfer, and consequently did not account for it in subsequent market analyses. Further, we found that DOE's acceptance of depleted uranium from USEC in this transaction is governed by section 3113 of the USEC Privatization Act, and DOE did not meet the requirement of that provision to charge its full costs of disposal.

[23] *See* Agreement between the DOE and USEC Inc., March 13, 2012 at 3 (2012 Agreement) ("this barter contract for commercial items is to acquire separative work units (SWU) in exchange for DOE's accepting title to, and disposal responsibility for, a quantity of depleted uranium tails (DUF6). DOE will also provide feedstock in the form of Russian-origin natural uranium from its inventory; United States Enrichment Corporation (USEC) will provide an amount of low-enriched uranium (LEU) as specified.").

[24] *See* USEC, Annual Report (Form 10-K) (Mar. 13, 2012) at 15 (stating that the disposal of the depleted uranium tails in the 2012 agreement freed up $44 million USEC was using to secure bonds for disposal costs).

[25] *See* 2012 agreement at 1.

A. DOE Failed to Recognize Its Transfer of Natural Uranium and Consequently Failed to Account for the Transfer in Subsequent Market Impact Studies

We conclude subsection 3112(b) of the USEC Privatization Act governed DOE's transfer of natural uranium under this agreement.[26] As noted, subsection 3112(a) mandates that DOE "shall not provide enrichment services or transfer or sell any uranium (including natural uranium . . .) to any person except as consistent with [section 3112]." Subsections 3112(b), (c), (d), and (e) then each impose conditions on a particular subset of uranium transfers and sales. As relevant here, subsection 3112(b) applies to DOE sales of uranium hexafluoride that it received pursuant to the Russian HEU Agreement.[27] According to a DOE official, the natural uranium that DOE provided to USEC pursuant to the March 13, 2012, agreement was Russian-origin natural uranium that was a portion of the HEU Agreement feed component from 1995 through 1998. As we have previously reported, section 3112, entitled "Uranium transfers and sales," directs DOE how to carry out virtually every step of the

[26]DOE documents that we reviewed identified a governmentwide contract authority that authorizes use of noncompetitive procedures. 41 U.S.C. § 3304(a)(1) (2014). None of the documents that we reviewed, however, identified DOE's authority for the uranium transfers themselves. For example, AEA section 55 generally authorizes acquisition of special nuclear material such as LEU. 42 U.S.C. §§ 2075 (authorizing acquisition of special nuclear material), 2014 (aa) (defining special nuclear material). In any case, GAO found subsection 3112(b), 42 U.S.C. 2297h-10(b), to govern the transfer of the subject Russian-origin natural uranium, under the terms of subsection 3112(a) and the principle of statutory interpretation that "[w]here there is no clear intention otherwise, a specific statute will not be controlled or nullified by a general one." *Morton v. Mancari*, 417 U.S. 535, 550-51 (1974).

[27]42 U.S.C. § 2297h-10(b)(1), (b)(2). Pursuant to the Russian HEU Agreement—a nuclear non-proliferation pact between the U.S. and the Russian Federation—and subsequent extension agreement the U.S. purchased weapons grade uranium from the Russian Federation and then blended it down to create lower grade uranium for commercial use. Although subsection 3112(b)(2) expressly applies to DOE sales "[w]ithin 7 years of April 26, 1996," in the view of both GAO and DOE this statutory provision did not expire. GAO, *Department of Energy: December 2004 Agreement with the United States Enrichment Corporation*, B-307137 (Washington, D.C.: Jul. 12, 2006) at 8-12. As DOE and GAO found, citing settled Supreme Court holdings, "if a statute does not specify a consequence for noncompliance with statutory timing provisions, the federal courts will not in the ordinary course impose [a] coercive sanction of terminating the agency's authority to act." *See id.* at 6 (quoting *Barnhart v. Peabody Coal Co.*, 537 U.S. 149, 159 (2003) (internal quotations omitted)). Given that section 3112(b)(2) did not specify a consequence for non-compliance, DOE and GAO agreed that the authority was not terminated on April 26, 2003.

disposition of both Russian-origin and other uranium in DOE's inventory.[28] Subsection 3112(b) specifically concerns Russian-origin uranium, and subsection 3112(b)(2) governs DOE's disposition of the Russian-origin natural uranium that the department received under the HEU Agreement, as here, specifying that DOE "shall" sell it.[29] Thus, the natural uranium was subject to subsection 3112(b)(2).

With respect to DOE's transfer of the Russian-origin uranium, this transfer was not subject to subsection 3112(d)(2) and hence a secretarial determination was not required. When DOE prepared secretarial determinations for its other uranium transfers conducted in 2012,[30] however, subsection 3112(d)(2)(B) required that the assessment of the impact of those transfers on the domestic uranium industry account for Russian-origin uranium. That is, when the Secretary of Energy makes a determination that a given sale of uranium will not have an adverse material impact on the uranium industry under subsection 3112(d)(2)(B), the determination is to "tak[e] into account the sales of uranium under the Russian HEU Agreement and the Suspension Agreement."[31] Accordingly, DOE should have accounted for this transfer in the market impact analyses that it conducted under subsection 3112(d)(2)(B) for other uranium transfers,[32] but the May 15, 2012, secretarial determination did not do so.[33]

[28]See GAO, *Department of Energy: December 2004 Agreement with the United States Enrichment Corporation*, B-307137 at 10 (Washington, D.C.: Jul. 12, 2006); 42 U.S.C. § 2297h-10 (2014).

[29]42 U.S.C. § 2297h-10(b)(2) (2014).

[30]The secretarial determination of May 15, 2012, includes the transfer of up to 2,400 MTU per year from 2012-2021 to DOE contractors for cleanup services at the GDPs, and up to 400 MTU NU-equivalent of LEU per year from 2012-2020 to NNSA contractors for downblending HEU, and also notes the transfer of depleted uranium discussed herein. The determination states that the Secretary has "taken into account the sales of uranium under the Russian Highly Enriched Uranium Agreement and the Suspension Agreement."

[31]42 U.S.C. § 2297h-10(d)(2)(B) (2014).

[32]Energy Resources International, Inc., *Quantification of the Potential Impact on Commercial Markets of Introduction of DOE Excess Uranium Inventory in Various Forms and Quantities During Calendar Years 2012 through 2033* (Washington, D.C.: Apr. 23, 2012).

[33]Secretarial Determination for the Sale or Transfer of Uranium (May 15, 2012).

DOE officials state that the agency did not "transfer" the natural uranium at issue.[34] If DOE did not transfer the Russian-origin natural uranium, arguably section 3112 may not apply. We conclude that DOE did transfer this uranium, however. Under rules of statutory construction, unless otherwise defined, statutory terms are generally interpreted in accordance with their ordinary, plain meaning.[35] "Transfer" is not defined in the USEC Privatization Act or the AEA, nor explained in relevant legislative history; hence, "transfer" must be interpreted in accordance with its plain meaning. The verb "to transfer" means "to convey or remove from one place or one person to another," or "to pass or hand over from one to another, especially to change over the possession or control of."[36] Accordingly, a uranium transfer occurs when there is a "change over [in] the possession or control of" uranium.

The evidence shows that DOE, in fact, did transfer the natural uranium. First, DOE prepared Nuclear Material Transaction Reports for the transaction, documenting that it transferred natural uranium from DOE to USEC.[37] According to the forms used for the transfer, "[t]his information is required for IAEA accounting reports that show changes in inventory of nuclear materials."[38] On one of the forms, the party indicates the shipper and the receiver, and has space to indicate the "transfer" authority. NRC's instructions and supporting materials describe the subject of the forms as "transfers." In addition, DOE officials acknowledged that they did not expect that the natural uranium DOE gave USEC would actually be

[34]In commenting on a draft of this report, DOE stated "the natural uranium provided to USEC as feed, when combined with the SWU purchased, was included in the LEU returned to DOE. Put another way, the uranium market views the feed material provided by DOE as having been enriched by USEC and returned to DOE as LEU. As such, the natural uranium was never 'provided' to USEC for USEC's subsequent ownership and control."

[35]*See, e.g., BP America Production Co. v. Burton*, 549 U.S. 84, 91 (2006).

[36]*Black's Law Dictionary* (9th ed. 2009).

[37]DOE, summary of Form 741 reports provided to GAO ("a. Natural uranium from DOE to USEC: 2 transactions totaling 409 MTU").

[38]NRC, Form 741 at upper right box. *See also* NRC, Instructions for Completing Nuclear Material Transaction Reports (DOE/NRC Forms 741 and 740M) NUREG/BR-0006, Rev. 7 at 1 (effective Jan. 1, 2009) ("Licensees use DOE/NRC Form 741 to report physical transfers of nuclear materials between facilities.").

enriched and returned to DOE as LEU.[39] DOE also acknowledged that USEC would own the natural uranium provided by DOE. Furthermore, USEC provided the same natural uranium to DOE as consideration[40] in a subsequent transaction under a different agreement.[41] If USEC did not own that uranium, it could not have provided it to DOE as consideration. In light of the forms, the shift in ownership of the natural uranium, and DOE's subsequent receipt of the same material as consideration under a different agreement,[42] DOE's argument that it merely "provided" and did not "transfer" the natural uranium is not supported by the record. We conclude that the transfer was subject to subsection 3112(b) and should have been accounted for in market analyses supporting secretarial determinations for that time period.

B. DOE Failed to Recognize and Apply the Governing Legal Authority for its Acceptance of Tails

We conclude that Section 3113 of the USEC Privatization Act governed DOE's acceptance of title and disposal responsibility for USEC's tails under the March 2012 agreement. Subsection 3113(a) provides in relevant part:

> (1) The Secretary, at the request of the generator, shall accept for disposal low-level radioactive waste, including depleted uranium if it were ultimately determined to be low-level radioactive waste, generated by—

[39]That is, as is customary in the uranium industry, feed material may be provided with a SWU contract but it is not necessary that the enriched product returned to the SWU purchaser utilize that particular feed material.

[40]Consideration is a legal term meaning something (such as an act, a forbearance, or a return promise) bargained for and received by a promisor from a promisee. *Black's Law Dictionary* (9th ed. 2009). More simply, consideration is the promise, object, or other thing given by one party to persuade another to enter into a contract. *Collins English Dictionary (*2009).

[41]Secretarial Determination, March 15, 2013 (regarding DOE transfer of LEU "*in exchange* for DOE receiving approximately 409 metric tons of uranium hexafluoride, the equivalent amount of natural uranium feed component") (emphasis added). DOE officials also stated that it was the same uranium hexafluoride.

[42]We note that the May 13, 2012, agreement uses the language "provide" in reference to the natural uranium, but this language does not shed light on whether the transaction was a transfer.

> (A) [USEC] as a result of the operations of the gaseous diffusion plants or as a result of the treatment of such wastes at a location other than the gaseous diffusion plants
>
> ***
>
> (3) In the event depleted uranium were ultimately determined to be low-level radioactive waste, the generator shall reimburse the Secretary for the disposal of depleted uranium pursuant to paragraph (1) in an amount equal to the Secretary's costs, including a pro rata share of any capital costs.[43]

Since passage of the USEC Privatization Act, NRC has determined that depleted uranium, when intended for disposal, is low-level radioactive waste.[44] Thus, depleted uranium that DOE, on the request of the generator, accepts for disposal is subject to the conditions of subsection 3113(a)(3).[45]

According to DOE documents we reviewed, USEC made an offer to DOE for SWU services in exchange for DOE taking the depleted uranium. These documents further show that DOE was accepting the depleted uranium for disposal. For example, DOE noted it would assume liability for the disposal of depleted uranium, and it analyzed the cost of DOE

[43]42 U.S.C. § 2297h-11(a) (2014).

[44]*See* NRC Memorandum and Order, filed in *Louisiana Energy Services, L.P.*, Docket No. 70-3192-ML, CLI-05-05, at 17 (Jan. 18, 2005) (hereinafter *LES Adjudication)*. In the *LES Adjudication*, the Nuclear Information and Resource Service and Public Citizen (hereinafter Intervenors) argued that LES did not have a "plausible strategy" for the disposal of the depleted uranium produced at its facility. On the other side, LES argued that DOE was obligated to dispose of its depleted uranium tails pursuant to section 3113. USEC, while not a party to the dispute, filed its own brief supporting LES's contention that depleted uranium should be classified as low-level radioactive waste under section 3113. According to the NRC's Memorandum and Order, "the Commission finds that depleted uranium, assuming it is not treated as a resource, is appropriately categorized as a low-level radioactive waste," *id.* at 15, and concludes, "depleted uranium is properly considered a form of low-level radioactive waste." *Id.* at 17. Intervenors appealed on separate grounds, but NRC's finding that depleted uranium was low-level radioactive waste was not contested. *See Nuclear Information and Resource Service v. NRC*, 509 F.3d 562, 569-70 (D.C. Cir. 2007) ("[p]etitioners do not challenge the plausibility of giving the waste to the Department of Energy; they acknowledge that the department is legally required to take title to the waste at LES's request, with LES bearing disposal cost.").

[45]In the *LES Adjudication*, NRC noted that when depleted uranium is treated as a "resource," rather than a waste, section 3113 does not apply. *See* NRC, *In re Louisiana Energy Services, L.P.* (National Enrichment Facility), No. CLI-05-05 (Jan. 18, 2005), at 1, 3, 15, 17.

conversion and disposal of the depleted uranium. The DOE analysis assumed 25 years of storage before conversion and disposal, based on the volume of material already scheduled for disposition.[46] The documents identify potential uncertainties such as that disposition costs could increase, or conversely that uranium prices could increase to the point where re-enriching the depleted uranium becomes economical. At the time of the agreement, however, DOE documents show the agency believed it was accepting the depleted uranium for disposal and based its charge to USEC on DOE disposal costs. Moreover, the agreement itself treated the depleted uranium as a liability, not a resource.

Subsection 3113(a)(3) requires that generators reimburse DOE "in an amount equal to [DOE's] costs, including a pro rata share of any capital costs." DOE documents we reviewed show that the agency had previously provided a unit cost estimate for DOE's conversion and disposal of depleted uranium to private companies planning new enrichment facilities, and that target cost estimate of $4.13 per kilogram (kg) of DUF6 included capital costs. In determining the costs to be charged USEC in the March 13, 2012, agreement, however, DOE subtracted the capital cost component, to arrive at a figure of $3.43 per kg of DUF6. As a result, DOE undercharged USEC by an estimated $9 million.

DOE officials stated that the agency has never accepted tails under section 3113. In DOE's view, in order for depleted uranium to be governed by section 3113, the generator must first "declare" the material to be waste.[47] The statute, however, contains no such requirement. On the contrary, NRC's order interpreting the statute states that depleted uranium is a low-level radioactive waste unless it is treated as a

[46]The fact that depleted uranium would be stored before disposal does not affect whether its acceptance by DOE falls under section 3113. In 2004, Congress enacted an amendment to section 3113 indicating that depleted uranium accepted under this section would typically be stored. Pub. L. No. 108–447 § 311 (Dec. 8, 2004) (providing that "In the event that a licensee requests the Secretary accept for disposal depleted uranium pursuant to this subsection, the Secretary shall be required to take title to and possession of such depleted uranium at an existing DUF6 storage facility.").

[47]DOE also commented on a draft of this report: "DOE has not declared its depleted uranium tails to be 'waste;' the tails are nuclear material which is distinct from a waste product in many ways, including for example in regard to requirements for storage, management and disposition. . . . [DOE] has never indicated that it considers the tails 'waste.'"

resource.[48] Further, the agreement itself and DOE documents indicate that the parties viewed the material as requiring disposal, and that it was being transferred for disposal by DOE. Conversely, there is no evidence that the parties viewed the material as a resource.

Further, DOE documents that we reviewed did not indicate the authority under which DOE believed it accepted the tails. For example, a key justification document identifies a procurement authority, but does not identify any authority regarding transfers of uranium.

In sum, the evidence shows that DOE transferred Russian-origin uranium to USEC, and DOE was required to have accounted for this material in its May 15, 2012, secretarial determination that DOE prepared for other uranium transfers it conducted. In addition, we believe that DOE's acceptance of depleted uranium under this agreement was governed by section 3113 of the USEC Privatization Act and, as such, DOE should have charged USEC the price for full cost recovery, without subtracting capital costs amounting to an estimated $9 million. Its failure to do so resulted in a loss to the government of $9 million.

III. DOE Failed to Recognize and Apply the Governing Legal Authority for Its June 2012 Acceptance of Tails

In June 2012, DOE entered into a cooperative agreement with USEC to provide funding for the American Centrifuge Research, Development, and Demonstration (RD&D) program. To fulfill the first installment of its financial commitment under the agreement, DOE accepted from USEC low-assay depleted uranium tails. Specifically, for the first budget period, DOE agreed to accept title to, and eventual disposal responsibility for, about 39,200 metric tons of depleted uranium hexafluoride of USEC's tails, according to DOE and USEC's cooperative agreement, which allowed USEC to free up $87.7 million in surety bonds committed to the future disposal obligation of these tails. USEC applied this funding toward DOE's financial commitment to supporting the development of the American Centrifuge RD&D program. The agreement cites two sources of authority: 42 U.S.C. § 7256(a) (general DOE authority for contracts,

[48]According to the NRC's Memorandum and Order, "the Commission finds that depleted uranium, assuming it is not treated as a resource, is appropriately categorized as a low-level radioactive waste." *LES Adjudication* at 15.

cooperative agreements) and 42 U.S.C. § 2011 *et seq.* (the entire AEA, including the USEC Privatization Act).

As with DOE's acceptance of low-assay tails from USEC as part of the SWU Procurement in March 2013, we believe this action was governed by section 3113 of the USEC Privatization Act. Documents that we reviewed show that beginning in spring 2011 or earlier, USEC approached DOE concerning DOE taking USEC's depleted uranium tails to reduce USEC's liabilities and free up cash to support the American Centrifuge RD&D program. Specifically, these documents indicate that USEC initially submitted a formal unsolicited proposal for a transfer of depleted tails from USEC to DOE in April 2011, followed by proposals in October 2011 and May 2012 for the purpose of supporting development of the American Centrifuge technology. We find these documents to support the proposition that USEC "requested" DOE to take the tails.

Additionally, as with the March 2012 transaction, DOE supporting documents that we reviewed show that DOE was accepting the depleted uranium for disposal. For example, DOE noted it would assume liability for the disposal of depleted uranium, and it analyzed the cost of DOE conversion and disposal of the depleted uranium. DOE documents show the agency believed it was accepting the depleted uranium for disposal and based its charge to USEC on DOE disposal costs. Moreover, the agreement itself treated the depleted uranium as a liability, not a resource.

Accordingly, we believe that section 3113 applied to this transaction. DOE officials, however, stated that DOE has never accepted tails under section 3113.[49] We conclude that DOE nonetheless charged USEC the amount that was required by section 3113: "an amount equal to [DOE's] costs, including a pro rata share of any capital costs."[50] DOE documents we reviewed show that the agency had previously provided a unit cost estimate for DOE's conversion and disposal of depleted uranium to

[49]As noted above, DOE documents we reviewed did not clearly identify the specific authority under which DOE accepted the tails. The agreement cited a general contract authority and the AEA generally.

[50]USEC Privatization Act section 3113(a)(3), 42 U.S.C. § 2297h-11(a)(3) (2014). In the context of a cooperative agreement with a cost-share component, "reimbursement" would be reflected in the cost-share amount attributed to DOE as a result of the agency accepting the tails.

private companies planning new enrichment facilities, and that the cost estimate, with a target of $4.13 and a high end of $5.13 per kg of DUF6 (in fiscal year 2012 dollars) included capital costs. In determining the costs to be charged USEC in the June 12, 2012, agreement, DOE used the high end of the range of costs that it had provided other private enrichment companies ($5.13 per kg of DUF6).

In sum, we believe that DOE's acceptance of tails under the June 2012 cooperative agreement was governed by section 3113 and hence was subject to the condition that full costs be reimbursed. We found that DOE charged the proper cost, despite not recognizing, and not technically applying, the proper authority with respect to the tails. If DOE does not cite the applicable authority when it enters into agreements, it may not be clear what conditions apply to the transaction, and the agency may not take steps to ensure the applicable conditions are met, as we found in the March 2012 transaction.

IV. DOE Failed to Obtain the Required Presidential Determination for Its March 2013 LEU Transfer

DOE transferred 48 MTU LEU to USEC in March 2013 to satisfy payment under its RD&D Cooperative Agreement. DOE acknowledged that the transaction was subject to the conditions of section 3112(d) of the USEC Privatization Act. Section 3112(d) authorizes sales and transfers of LEU, among other things, subject to three conditions.[51] The first condition is that "the President determines that the material is not necessary for national security needs."[52] We conclude that DOE did not meet this condition.

DOE officials told us they believed they satisfied this condition by reviewing whether the July 2011 *Nuclear Weapons Stockpile Plan* (NWSP) included this material as being necessary for national security needs. The NWSP is DOE's and the Department of Defense's overarching plan that specifies the size and composition of the nuclear

[51]42 U.S.C. §§ 2297h-10(d)(1), (2) (2014).

[52]42 U.S.C. § 2297h-10(d)(2)(A) (2014).

stockpile for a projected multiyear period.[53] The NWSP, which is classified, is based on the Nuclear Weapons Stockpile Memorandum (the Memorandum) submitted by DOE and DOD to the President, accompanied by a presidential directive; when the directive is signed, the Memorandum goes into effect as the NWSP. Thus, the NWSP is approved by the President.

We find DOE's reliance on the NWSP to satisfy the presidential determination requirement of USEC Privatization Act section 3112 to be unfounded, at least with respect to this particular transaction. DOE officials told us they determined that the LEU that DOE transferred to USEC in the March 2013 agreement was not included in the NWSP and that this meant the material was unnecessary for national security needs. Even assuming that an NWSP can satisfy the legal requirement for a presidential determination under the USEC Privatization Act, however, which we do not decide, the specific July 2011 NWSP that DOE relies on as constituting the presidential determination for its March 2013 transaction was signed by the President *before* the material was in DOE's inventory. The July 2011 document therefore could not have included inventory that DOE did obtain until March 2012.[54] Because the NWSP predated the time that the agency acquired the LEU, we find DOE's reliance unfounded.

We also note that the NWSP does not in fact identify any LEU needed for national security, and question whether the lack of inclusion of specific uranium has the significance DOE ascribes to it. Internal DOE documents in fact suggest the opposite: that the LEU was necessary for national

[53]42 U.S.C. § 2121(a)(2) (2013). *See also* 10 U.S.C. § 179 (2013) (discussing duties of the Nuclear Weapons Council).*See* Office of the Assistant Secretary of Defense for Nuclear, Chemical, and Biological Defense Programs, *The Nuclear Matters Handbook* (c. 2011) at 26, 33 (discussing the "Nuclear Weapons Stockpile Plan (NWSP) that authorizes specific quantities of warheads, by type, by year, for a multi-year period"), 36, App. A, 289 ("The Nuclear Weapons Stockpile Plan (NWSP) authorizes the production, conversion, or elimination of specific types and quantities of nuclear weapons by specifying authorized weapons quantities to be in the stockpile at the end of each fiscal year.").

[54]DOE takes the same position as it did when we discussed this issue with DOE officials in 2011. See GAO-11-846. DOE officials told us at that time that the Nuclear Weapons Stockpile Memorandum identifies inventories of uranium for national defense needs and therefore if uranium is not included in the Memorandum, the uranium has been determined to be unnecessary for national security purposes. The uranium at issue in our 2011 review had been in DOE's inventory for many years, however, and we did not review the Memorandum or the NWSP at that time.

security needs. The documents state that when the department acquired this same LEU in March 2012, it would be used in the tritium program—which supports national security purposes.[55] In addition, DOE has repeatedly linked unobligated LEU with national security, for example stating that the transfer of high-assay depleted uranium tails to Energy Northwest and its enrichment to LEU would "deliver important benefits to U.S. national security," "advance America's national security interests at a reduced cost to taxpayers," and "ensur[e] a supply of nuclear fuel essential for national security missions."[56] Similarly, DOE has justified its support of USEC's American Centrifuge technology as rooted in the need for LEU for national security.[57] We are aware of no case law or legislative history interpreting the presidential determination requirement under the USEC Privatization Act and when DOE was asked to explain the department's basis for using the absence of inclusion of certain material in the NWSP to meet the section 3112(d)(2)(A) presidential determination requirement, DOE could not provide documentation.[58] We note that, in contrast, DOE satisfies the similar requirement for a secretarial determination under section 3112(d)(2)(B) with individual determinations signed by the Secretary of Energy for each transaction or group of transactions.[59]

In sum, even assuming that DOE generally may rely on the absence of the designation of certain material in the NWSP as satisfying the presidential determination requirement of the USEC Privatization Act, which we do not decide, it could not rely on the July 2011 NWSP as the presidential determination for LEU that it did not obtain until nearly 8 months later. We conclude that DOE did not satisfy the section 3112(d)(1)

[55]*See* DOE, Notice of Intent-USEC, Solicitation Number: DE-NE0000481 (Jan. 20, 2012).

[56]See DOE, "DOE Announces Transfer of Depleted Uranium to Advance the U.S. National Security Interests, Extend Operations at Paducah Gaseous Diffusion Plant" (May 15, 2012), DOE, Office of Environmental Management, "Paducah Plant Begins Enrichment Operations after Five Parties Strike Agreement" (May 1, 2012).

[57]*See, e.g.,* Letter from Stephen Chu, Secretary of Energy, to Representative Whitfield (Jan. 13, 2012).

[58]DOE did, however, provide several documents showing that referencing the NWSP has been the department's longstanding approach to satisfying this condition.

[59]*Compare* section 3112(d)(2)(A) ("the President determines that…") *with* section 3112(d)(2)(B) ("the Secretary determines that…").

condition that "the President determines that the material is not necessary for national security needs."

Conclusions

In 2012 and 2013, DOE conducted four uranium transactions involving USEC. In these transactions, DOE transferred depleted uranium, natural uranium, and LEU and accepted title to USEC's depleted uranium tails. We found that DOE likely lacked authority to transfer depleted uranium per the USEC Privatization Act and that, even if the department retained general authority to transfer depleted uranium under the AEA as it believes, DOE failed to follow the AEA requirement to charge the recipient a price that is established to be nondiscriminatory and that provides reasonable compensation to the government. In the other transactions, we found that DOE failed to recognize, and in some cases apply, the proper legal authority governing the uranium transfer. For example, in two cases where DOE accepted depleted uranium tails from USEC for disposal, DOE did not recognize or apply section 3113 of the USEC Privatization Act as the governing authority and, in one of them, undercharged USEC by an estimated $9 million as a result. Finally, in the March 2013 transfer of LEU to USEC, DOE acknowledged that section 3112(d) of the USEC Privatization Act governed the transfer, but did not meet one of the conditions—that the President determine the material is not necessary for national security needs. While the AEA, as amended, provides DOE with broad authority to manage its uranium inventory in keeping with the department's statutory responsibilities, the USEC Privatization Act restrains and conditions these authorities. In the four transactions we reviewed, DOE has failed to acknowledge, and in several instances to comply with, the legal authorities governing its uranium transactions.

Appendix V: DOE's Actions to Comply with the National Environmental Policy Act

In addition to the Atomic Energy Act (AEA) and the USEC Privatization Act, the National Environmental Policy Act (NEPA) imposes legal requirements on the Department of Energy's (DOE) transfers of excess uranium. Accordingly, we reviewed the actions DOE took, under NEPA with respect to the May 2012 tails transfer.

NEPA requires federal agencies to assess the effects of major federal actions—those they propose to fund, carry out, or permit—that may significantly affect the environment.[1] The purpose of NEPA is to ensure that: (1) the agency, in reaching its decision, will have available and will carefully consider detailed information concerning significant environmental impacts and (2) relevant information about the proposed project will be made available to the public, so that it may play a role in both the decision-making process and implementation of the decision.[2] Council of Environmental Quality regulations implementing NEPA generally require an agency, before undertaking a major action which may significantly affect the environment, to either prepare an Environmental Assessment (EA)[3] or an Environmental Impact Statement

[1]National Environmental Policy Act of 1969 § 102, 42 U.S.C. § 4332 (2014). *See also* DOE NEPA regulations at 10 C.F.R. pt. 1021 (2014) (for example, defining action as a project, program, plan, or policy that is subject to DOE's control and responsibility, § 1021.104(b)).

[2]*See, e.g.*, *Hodges v. Abraham*, 300 F.3d 432, 446 (4th Cir. 2002), citing *Hughes River Watershed Conservancy v. Glickman*, 81 F.3d 437, 443 (4th Cir.1996).

[3]An Environmental Assessment:

> (a) "[m]eans a concise public document … that serves to:
>
> > (1) Briefly provide sufficient evidence and analysis for determining whether to prepare an environmental impact statement or a finding of no significant impact.
> > (2) Aid an agency's compliance with the Act when no environmental impact statement is necessary.
> > (3) Facilitate preparation of a statement when one is necessary.
>
> (b) Shall include brief discussions of the need for the proposal, of alternatives as required by section 102(2)(E), of the environmental impacts of the proposed action and alternatives, and a listing of agencies and persons consulted."

40 C.F.R. § 1508.9 (2014).

(EIS).[4] If an EA finds that the proposed action will have no significant impacts, the agency prepares a Finding of No Significant Impact (FONSI). DOE regulations do not address the specific circumstance when a proposed major federal action is changed after an EA is prepared. However, they do provide that "DOE may prepare a NEPA document for any DOE action at any time in order to further the purposes of NEPA."[5] In addition, DOE may revise a FONSI at any time, so long as the revision is supported by an EA.[6] DOE regulations require NEPA documents—including an EA, FONSI, or Mitigation Action Plan, among others—to be available to the public.[7] NEPA regulations define effects as including ecological, aesthetic, historic, cultural, economic, social, or health, whether direct, indirect, or cumulative.[8]

With respect to its general plans for disposition—that is, transfer or sale—of excess uranium, in 2009, DOE prepared a final Environmental Assessment for the Disposition of DOE Excess Depleted Uranium, Natural Uranium, and Low-Enriched Uranium ("2009 EA").[9] The 2009 EA proposed the disposition of excess depleted uranium, low-enriched uranium (LEU), and/or natural uranium, by (1) enriching it, followed by storing or selling it; (2) selling it; or (3) a combination of the two. The 2009 EA defined "sale" as including direct sales, transfers, or other transactions for disposition of the department's excess uranium inventory. The 2009 EA assumed "the Proposed Action would result in the annual enrichment and/or sale of amounts of the excess inventory that, combined with other

[4]"Environmental impact statement means a detailed written statement as required by section 102(2)(C) of the Act." 40 C.F.R. §§ 1501.4, 1508.11 (2014); *see also* National Environmental Policy Act of 1969 § 102, 42 U.S.C. § 4332 (c) (2014); *Cal. Wilderness Coalition v. United States Dep't of Energy*, 631 F. 3d 1072, 1103-06 (9th Cir. 2011) (discussing the need for NEPA documents and noting the differences between when to prepare an EA from an EIS).

[5]10 C.F.R. § 1021.300(b).

[6]10 C.F.R. § 1021.322(f).

[7]10 C.F.R. §§ 1021.104, 1021.314(c)(3), 1021.331(d).

[8]40 C.F.R. § 1508.8 (2014).

[9]DOE/EA-1607 (June 2009). *See also* Secretary of Energy's *Policy Statement on Management of the Department of Energy's Excess Uranium Inventory* (2008) ("Before making any final decision on a particular action, the Department must comply with applicable requirements of [NEPA]. This may include the preparation of an [EA}, {EIS}, or other analyses, as appropriate.").

DOE sales or transfers to the market, generally would not exceed 10 percent of the total annual fuel requirements of all licensed U.S. nuclear power plants—that is, approximately 2,000 [Metric Tons Natural Uranium (MT NU)]."[10] The 2009 EA stated that "[t]he specific annual amounts would be determined on an ongoing basis; the amounts would depend upon market analyses for particular sales…[F]or purposes of assessing environmental impacts in this EA, DOE assumes that the Proposed Action could result in the annual enrichment and/or sale of excess inventory sufficient to introduce into the domestic market in a given year up to approximately 2,000 MT NU equivalent."[11] The 2009 EA also identified the possibility that DOE could determine that introduction of more uranium was warranted for certain special purposes, such as the provision of initial core loads for new reactors, and analyzed a doubling of the amount of uranium introduced into the market in a given year (*i.e.*, 4,000 MT NU, rather than 2,000 MT NU).[12] The 2009 EA analyzed various impacts, with detailed, quantitative analysis focused on transportation and related safety impacts.[13]

In July 2009, DOE issued a FONSI and Mitigation Action Plan (MAP), which under department regulations is to include commitments to mitigation that are essential to render the impacts of the proposed action not significant.[14] Based on the 2009 EA and the MAP, the FONSI concluded that the proposed action did not constitute a major federal action significantly affecting the quality of the human environment under NEPA and, therefore, did not require the preparation of an EIS.[15] In the MAP, DOE committed to conduct a market impact analysis, prior to particular sales or transfers of depleted uranium, to determine the potential impacts of the proposed sale or transfer on the domestic uranium industry, taking into account other uranium sales and transfers.[16] Further, the MAP stated that "should the market impact analysis indicate

[10]EA at vii.

[11]EA at 11-12 (section titled "Maximum Annual Amount and Program Duration").

[12]EA at 12.

[13]EA at 57-80.

[14]74 Fed. Reg. 31,420 (July 1, 2009), 10 C.F.R. § 1021.331(b).

[15]74 Fed. Reg. at 31,422.

[16]*Id.* at 31,421.

potentially significant impacts on the domestic uranium industry, the proposed sale or transfer would be adjusted as necessary to ensure that such potentially significant impacts are avoided or mitigated."[17] Thus, the 2009 EA, FONSI, and MAP contemplate that market impact studies will be conducted for each action proposed under the EA, and DOE will adjust the action to ensure there would be no significant market impact.[18]

While the 2009 EA analyzed impacts of a maximum of 4,000 MT NU equivalent from all DOE transfers and sales that may occur in a given year, several DOE documents we reviewed indicate that in 2012 DOE actually transferred considerably more than that. Because DOE's agreement with Energy Northwest provided for DOE's transfer of tails from May 2012 through April 2013, DOE first projected the amounts that would be transferred in 2012 and 2013. Then, DOE considered the timing and amount of other departmental transfers and added them. These documents show that the total transfers for 2012 were projected to be from approximately 37 percent, to as much as 62 percent, greater than the analyzed maximum. Agency regulations allow, but do not require, DOE to prepare additional NEPA documents, such as a supplemental analysis or revised EA and FONSI, and DOE elected not to do so. Instead, DOE considered NEPA consequences of the action in internal documents.[19] The internal documents relied upon the market impact analysis required by the MAP; for example, one key document asserted that the combined 2012 uranium transfers will not have significant impacts on the domestic uranium industry.[20] The documents also noted

[17] *Id.* at 31,422.

[18] DOE posted the market impact analyses on its website after they were completed, but DOE did not provide an opportunity for public review and comment on them.

[19] To the best of our knowledge, NEPA compliance for DOE's May 2012 uranium transfer was not discussed in any publicly released document. DOE prepared a NEPA compliance memorandum that identified several other activities associated with the depleted uranium transaction subject to NEPA, and stated that the activities had each been previously reviewed and analyzed in other NEPA documents, such as the EA for Certification of Gaseous Diffusion Plants and the Final Environmental Impact Statement for operation of the DUF6 conversion facility, among others.

[20] We note that DOE transferred tails to Energy Northwest over a 12 month period spanning 2012 and 2013; however, the market impact analysis did not analyze the entry of this uranium into the market at the time of transfer. Rather, the market analysis contractor projected the impacts of the resulting LEU entering in the market over a 15 year period, relying on information provided by DOE concerning the third-party agreements (*e.g.*, the Energy Northwest-TVA agreement).

that the transportation impacts were adequately addressed by the EA and FONSI, because the proposed action involves only on-site transportation (*e.g.*, the material to be transferred would remain at the Paducah plant).

In summary, DOE documents we reviewed show that, in 2012, DOE projected it would transfer more uranium than was analyzed in its 2009 EA. DOE regulations do not require that an EA be updated in such circumstances, and no update was prepared. In addition to relying on the 2009 EA, DOE used the market impact study and an internal memorandum to consider environmental impacts, draw conclusions about the significance of those impacts, and determine NEPA compliance for the May 2012 transfer of depleted uranium.

Appendix VI: GAO Analysis of DOE-Contracted Market Impact Studies

To support the USEC Privatization Act requirement that the Secretary of Energy determine that certain uranium transfers will not have an adverse material impact on the domestic uranium market, for 2012 and 2013, DOE contracted with Energy Resources International, Inc. (ERI), a nuclear fuel consulting firm, to develop two studies analyzing the potential impact of certain planned uranium transfers on the market.[1] Overall, we found that ERI's studies provided limited details about their methodology, data sources, and assumptions. Because those details were limited, we were able to conduct only a limited assessment of the studies. Based on the information contained in the studies, as well as interviews conducted with the principal author of the ERI studies and with the Department of Energy (DOE) officials and subsequent correspondence with ERI officials, we were able to review ERI's general approach, such as how ERI considers the supply and demand changes in the uranium market due to the transfer of material. However, without a detailed methodology, we were not able to conduct the in-depth review needed to verify the studies' conclusions.

Market Impact Studies' Overall Approach Appears Reasonable, but We Identified Concerns with the Studies' Implementation and Conclusions

Based on our review of ERI's studies, we did not identify significant flaws, but we did identify several areas of concern about how they were conducted. For example, we found that ERI did not have complete information when it developed its term market models, and it did not request data from members of the uranium producing industry to develop and complete the production information it needed. In addition, we identified shortcomings with ERI's spot market analyses that could lead to inconclusive results.[2] As a result, we believe that ERI's definitive conclusions that DOE's uranium transfers will have no adverse material

[1]Energy Resources International, Inc., *Quantification of the Potential Impact on Commercial Markets of Introduction of DOE Excess Uranium Inventory in Various Forms and Quantities During Calendar Years 2012 through 2033* (Washington, D.C.: Apr. 23, 2012). Also see: Energy Resources International, Inc., *Quantification of the Potential Impact on Commercial Markets of Introduction of the Enrichment Services Component of DOE Low Enriched Uranium Inventory During Calendar Year 2013* (Washington, D.C.: Jan. 28, 2013).

[2]Uranium buyers, such as utilities, purchase uranium and the services to convert it into nuclear fuel in one of two ways. First, buyers can obtain uranium under long-term contracts with sellers in the "term" market. In the long and medium term market, fuel material will first be delivered 1 year to 4 years after the signing of the contract. Second, sellers can make their uranium available for immediate sale in a forum called the "spot" market. In the spot market, fuel material will be delivered within a year of signing a contract.

impact on the uranium market implies a level of precision that cannot be supported based on these studies.

ERI's Analysis of the Uranium Term Market Was Generally Reasonable, but We Identified Areas of Concern

Overall, ERI's approach for its term market analysis appears to be generally reasonable, but we identified areas of concern, including those related to the completeness of ERI's data and ERI's use of a noncumulative analysis. Conceptually, we found that ERI's market clearing methodology was a generally accepted approach for analyzing the impacts of DOE's transfers, as this type of analysis is used in assessing the impacts of changes in the market. In addition, constructing supply and demand schedules to represent the appropriate markets, as ERI indicated it has done, is a common method used by economists to study market behavior. However, the accuracy of results using such an approach depends on the availability of necessary data and the reasonableness of assumptions made to construct the model for a specific market.

- **Completeness of data:** We identified concerns about the completeness of the data ERI used to develop the market supply curves that were fundamental to its market analysis. ERI's report states that it developed an annual supply curve from each mining and conversion company using cost and production data. The studies' principal author told us that ERI obtained this data from publically available sources, such as corporate annual reports and filings with the U.S. Securities and Exchange Commission and industry conference presentations.[3] According to representatives from the mining and conversion industries, some, but not all, of its cost of production data is available from such sources. These representatives told us that additional detailed data would be needed by ERI to conduct a complete analysis and could only be obtained by directly contacting the companies. They added that, to their knowledge, ERI did not contact them to request such information. ERI confirmed that it did not directly contact any companies to supplement its cost data because ERI did not believe that companies would provide cost data beyond public filings that are already available to ERI. In the absence of complete production and cost data, analysts often rely on general

[3]As discussed above, ERI's studies did not disclose its data sources or identify any limitations of those sources. ERI also did not provide us detailed information about its specific data sources, but ERI's principal author told us that they used uranium supply information from approximately 120 existing and potential new uranium production centers.

industry information. Although general industry information may not be inaccurate, it is imprecise, and using imprecise data cannot generate precise results. Nonetheless, ERI did not qualify its conclusion and continued to state that there would be no adverse material impact of transfers on the domestic uranium market.

- **Assumption that the uranium transfers would not have a cumulative effect:** ERI's April 2012 analysis estimated the effect of each uranium transfer in the term market independently of other transfers occurring in prior years. By analyzing the impact of each transfer independently, ERI, in effect, assumed that the impact on the term price of one transfer will dissipate before the next transfer.[4] In general, the amount of time required for any price change to return to the level expected without any DOE transfers would vary due to, among other things, the quantity of uranium that was sold on the market, as well as the total number of transactions in that market during the same time period. However, it cannot be assumed with certainty, as ERI did, that the price effect of each transfer dissipates within the given time and before the next transfer, especially in the thinly traded uranium market—which has relatively few sales within any given year. As a result, we believe that by estimating the effects of each transfer independently—and thus ignoring the cumulative effects of transfers on market prices—ERI presented an overly simplified view of dynamics of the market and price adjustments. Although ERI may have needed to make such assumptions in order to develop a simplified and workable model for its analysis, such simplification raises questions about the definitive conclusions reached by ERI.

ERI's Spot Market Analysis Did Not Account for All Relevant Factors That May Affect Uranium Prices

We found that the model ERI developed for its analysis of the spot market—which it used in its April 2012 study to project the potential price impact on the spot market—accounts for some, but not all, factors that can affect spot market prices. ERI's econometric model relied on the historical relationship between spot market prices, quantity demanded, and quantity supplied and assumed that future spot market prices, the quantity of demand, and the quantity of supply would follow the same relationship they had from 2004 through 2012.[5] ERI then used this model

[4]Specifically, ERI assumed that transfers were sold on the term market annually, and the effect of each transfer was estimated independently of any other transfer.

[5]Econometric models estimate mathematical relationships between factors such as supply, demand, and prices using historical data. Such relationships can then be used to project future values for one factor, such as price, given projected values for other factors.

to predict future spot market price changes resulting from DOE-transferred material that may be sold in the spot market. ERI used the same methodology in its 2010 market impact analysis, which we found to have shortcomings in our 2011 report.[6] Specifically, we found that in relying exclusively on historic spot market relationships, ERI's model excluded many other factors that can affect the behavior of suppliers and buyers and consequently spot market prices. For example, the demand for uranium depends on uranium prices relative to other fuel sources such as oil, gas, or coal. If the prices of these alternatives are projected to change, then the demand for uranium and its price will also change. As a result, if the model does not identify and incorporate such factors, then it will be too simplistic to accurately assess the impact of DOE-transferred material that may be sold in the spot market. ERI officials acknowledged in its 2010 and 2012 studies that it is very difficult, if not impossible, to accurately predict the specific change in spot market price that might result from a particular future event. Nevertheless, ERI continued using the same spot price model in its analyses and concluded that the potential effect on spot prices of DOE transfers did not constitute an adverse material impact on the domestic uranium market.

[6]GAO-11-846.

Appendix VII: Comments from the Department of Energy

Department of Energy
Washington, DC 20585

April 18, 2014

Mr. David Trimble
Director, Natural Resources and Environment
U.S. Government Accountability Office
441 G Street, NW
Washington, DC 20548

Dear Mr. Trimble,

Thank you for providing a copy of your draft report, "Department of Energy: Enhanced Transparency Could Clarify Costs, Market Impact, Risk, and Legal Authority to Conduct Future Uranium Transactions" (the GAO draft report). The GAO draft report describes the conclusions drawn from the GAO's audit of four Department of Energy (DOE or the Department) uranium transactions in 2012 and 2013.

The heart of the GAO draft report is that two elements of the USEC Privatization Act – sections 3112 and 3113 – by their silence have repealed express provisions of the Atomic Energy Act (AEA) that explicitly authorize DOE to engage in certain transactions involving uranium and other materials. The analysis contained in the GAO draft report is legally unfounded because it is based on a *sub silentio* implied repeal of a variety of specific AEA provisions, directly contrary to the Supreme Court's teaching that it is a "cardinal rule [of construction] that repeals by implication are not favored [lest] congressional silence [be read] as effecting a repeal by implication [of] a longstanding, important component of the Government's [atomic energy] program." *Morton v. Mancari*, 417 U.S. 535, 549-550 (1974) (internal citations and punctuation omitted). Such patently erroneous legal contentions cannot contribute to meaningful assessments of the Department's performance of its various responsibilities. We should remain mindful to heed the Supreme Court's guidance for the Comptroller General that "[i]nterpreting a law enacted by Congress to implement the legislative mandate is the very essence of 'execution' of the law, [and may not be done by] an officer under [Congress'] control." *Bowsher v. Synar*, 478 U.S.714, 732, 726 (1986).

First, the GAO draft report repeats its previous and unpersuasive position that the Department does not have the authority to transfer depleted uranium. GAO's position is based on its incorrect belief that the USEC Privatization Act, in particular section 3112(a), repealed or amended the Department's authorities under the Atomic Energy Act (AEA) to distribute or sell depleted uranium (which is source material). Section 3112(a) requires that any uranium transfers or sales be "consistent with this section." The remainder of section 3112 places restrictions on transfers or sales of other Departmental uranium, creating an overlay on the Department's more general AEA authorities to

transfer or sell uranium, but places no such restrictions on the sale or transfer of depleted uranium. GAO disregards a fundamental canon of statutory interpretation and reads section 3112 to implicitly remove the Department's AEA authorities with regard to the distribution or sale of source material even though it is well established that in interpreting a statute, repeals by implication are disfavored.

Second, the GAO draft report wrongly contends that section 3113 of the USEC Privatization Act is the sole mechanism through which the Department could accept title to, and eventual disposal responsibility for, depleted uranium. Section 3113 requires DOE to accept for disposal low level waste (including depleted uranium that is ultimately determined to be low level waste) at the request of the generator. Nothing in section 3113 directs or implies that all depleted uranium accepted by the Department is or necessarily will be determined to be low level waste. Further, section 3113 does not supplant the Department's authority under section 66 of the AEA "to purchase, take, requisition, condemn, or otherwise acquire supplies of source material," which includes DUF6.

This error is compounded with the GAO draft report's contention that the Department did not receive adequate compensation for the depleted uranium it sold or accepted. GAO's arguments are premised upon its erroneous conclusion that section 3113 is the only authority the Department has for accepting depleted uranium and its incorrect assertion that DOE must set a monetary price for its depleted uranium and make its sales or transfers consistent with that price. As noted above, section 3113 is not the sole mechanism for DOE acceptance of depleted uranium and its provisions regarding compensation do not control the analyzed transactions in which the Department took title to, and eventual disposal responsibility for, depleted uranium. Further, the requirements under the AEA (sections 63 and 161m.) for DOE to receive reasonable compensation for its source material are not so rigid as to require compensation only in accordance with a set monetary price.

Finally, the GAO draft report incorrectly contends the Department did not comply with the requirements of section 3112(d) in its March 2013 transfer of low enriched uranium (LEU) to USEC. The GAO draft report alleges, without merit, that the Department did not obtain a determination from the President that the material was not necessary for national security purposes. The LEU was not included in the Nuclear Weapons Stockpile Plan (Plan), a document listing material necessary for defense purposes and signed by the President. The Department's standard practice has been that the last signed Nuclear Weapons Stockpile Plan is valid as a Presidential policy directive and is the standing authority until it has been replaced by an updated plan. The fact that the LEU was obtained by DOE, and then transferred to USEC, after the date of the Nuclear Weapons Stockpile Plan does not undercut the Department's position: the absence of the LEU in the Plan in effect at the time of the transfer meets the requirement of section 3112(d)(2)(A).

The GAO draft report contains five recommendations. The Department notes that many of these recommendations advocate actions by the Department that go far beyond the statutory obligations related to uranium transfers and at least one asks the Department to forego the protections generally afforded to pre-decisional or attorney-client communications. Several of these recommendations could actually have the effect of decreasing the value the government receives from uranium transactions.

- First, the GAO draft report recommends that DOE clarify the total amount of depleted uranium hexafluoride (DUF6 or tails) it intended to accept from USEC in a June 2012 cooperative agreement and, if necessary, amend this cooperative agreement to ensure that DOE is not required to accept additional tails liability at a later date. In accordance with the terms of Cooperative Agreement DE-NE0000530, the Department provided 80% cost share for Budget Period 1 of the June 2012 cooperative agreement by accepting title and liability for up to 39,200 MT of Depleted Uranium Hexafluoride (DUF6). The parties to the cooperative agreement agreed that this acceptance would be treated as DOE providing $87,670,184 in cost share contribution (80% of the total estimated cost of the agreement's Budget Period 1). DOE has accepted 38,317 MT DUF6 to meet this Budget Period 1 cost share obligation. No further action is required to ensure compliance with the terms of the cooperative agreement.

- Second, the draft GAO report recommends that for each uranium transaction it conducts, the Department prepare a document outlining the legal authority for the transaction and outlining how the transaction complies with the cited authority and that the Department make this document publicly available. The Department will comply with all legal requirements for future transactions, but will not create and make publicly available documents that are not required by law and would traditionally be protected as attorney work product or privileged pre-decisional documents.

- Third, the draft GAO report recommends that DOE develop guidance establishing a method for determining the value of depleted uranium for any future transfers and that DOE apply this method consistently and transparently in those transfers. The Department will determine the value of depleted uranium in any given transaction and ensure that the Department receives reasonable compensation in the transaction. The Department is not required to establish guidance or a pricing policy for depleted uranium, and to do so would hinder the Department's ability to maximize the value received by the government in a given transaction.

- Fourth, the draft GAO report recommends that the Department "take steps to mitigate the risks" for uranium transactions where the expected benefits rely on third party contracts. The programs have advised us that, where appropriate or feasible, the Department will take steps to mitigate risks. However, the Department cannot control the actions of third parties in agreements to which it was not a party and must not attempt to exert control or influence in a way that establishes an agency or apparent agency relationship.

- Fifth, the draft GAO report recommends that DOE conduct a "rigorous and documented" internal review of its independent expert's analysis of the market impact of these transactions and, to the extent DOE makes the analyses publicly available, that they be consistent with DOE's Information Quality Guidelines. We have been advised by the Office of Nuclear Energy that it will continue to consider the applicability of the Information Quality Guidelines to independent analyses of the potential market impact of proposed transactions and, if they are applicable, will take appropriate steps to ensure they are satisfied.

- Finally, as part of the fifth recommendation, the GAO draft report recommends that the Department "seek and consider" input from industry on the amounts of DOE transfers and whether the Department should reinstitute a prior guideline on the amounts of uranium transfers it would generally consider in a given year. The Office of Nuclear Energy (NE) advises us that it has met in the past and continues to meet regularly with industry parties, both at conferences and in meetings with Departmental officials when those meetings are requested. In those conversations, NE makes it clear it is open to receiving information from industry and takes that information under advisement as it makes future plans.

The enclosed memorandum provides a more thorough response to these and GAO draft report's other contentions.

Sincerely,

Eric J. Fygi
Deputy General Counsel

Enclosure

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Appendix VIII: Comments from the Nuclear Regulatory Commission

The Nuclear Regulatory Commission's letter was signed electronically by Michael F. Weber, Deputy Executive Director for Materials, Waste, Research, State, Tribal, and Compliance Programs.

April 4, 2014

Mr. David Trimble, Director
Natural Resources and Environment
United States Government
Accountability Office
Washington, D.C. 20548

SUBJECT: DRAFT REPORT, "DEPARTMENT OF ENERGY: ENHANCED TRANSPARENCY COULD CLARIFY COSTS, MARKET IMPACTS, RISK, AND LEGAL AUTHORITY TO CONDUCT FUTURE URANIUM TRANSACTIONS" (GAO-14-291)

Dear Mr. Trimble:

On behalf of the U.S. Nuclear Regulatory Commission (NRC), I am pleased to inform you that NRC staff has reviewed the United States Government Accountability Office (GAO) draft report titled "Department of Energy - Enhanced Transparency Could Clarify Costs, Market Impacts, Risk, and Legal Authority to Conduct Future Uranium Transactions."

NRC understands that the GAO report is based on a review of certain uranium transactions that the U.S. Department of Energy (DOE) undertook with USEC, Inc., and identified some legal and commercial concerns related to these transactions, based on the USEC Privatization Act and the Atomic Energy Act.

NRC notes the GAO findings and proposed recommendations to DOE and we do not have any comments.

We appreciate that your office gave us the opportunity to review this draft report. If you require additional support from NRC regarding this subject matter, please do not hesitate to contact Jesse Arildsen of my office at (301) 415-1785.

Sincerely,

/RA/

Michael F. Weber
Deputy Executive Director for Materials, Waste,
Research, State, Tribal, and Compliance Programs
Office of the Executive Director for Operations

Appendix IX: GAO Contacts and Staff Acknowledgments

GAO Contacts

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Susan D. Sawtelle, (202) 512-6417 or sawtelles@gao.gov

Staff Acknowledgments

In addition to the individuals named above, Allison B. Bawden, Assistant Director; Eric Bachhuber; Elizabeth R. Beardsley; Delwen A. Jones; Amanda K. Kolling; Mehrzad Nadji; and Karen Villafana made key contributions to this report. Also contributing to this report were Antoinette Capaccio; Doreen Eng; Karen K. Keegan; Risto Laboski; Jerry B. Leverich; Dr. Timothy M. Persons; Dan C. Royer; and Rebecca Shea.