DOE/EA-1607-SA-01

SUPPLEMENTAL ANALYSIS FOR THE DISPOSITION OF DOE EXCESS DEPLETED URANIUM, NATURAL URANIUM, AND LOW ENRICHED URANIUM

United States Department of Energy
Portsmouth/Paducah Project Office

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Acronyms and Abbreviations

ACP	American Centrifuge Plant
ALARA	as low as reasonably achievable
ANSI	American National Standards Institute
CaF_2	calcium fluoride
CEQ	Council on Environmental Quality
CFFF	Columbia Fuel Fabrication Facility
CFR	U.S. Code of Federal Regulations
D&D	decontamination and decommissioning
dB[A]	A-weighted decibel
DCP	dry conversion process
DOE	U.S. Department of Energy or the Department
DOT	U.S. Department of Transportation
DU	depleted uranium
DUF_6	depleted uranium hexafluoride
EA	environmental assessment
EIS	environmental impact statement
EPA	U.S. Environmental Protection Agency
ERI	Energy Resources International, Inc.
ETTP	East Tennessee Technology Park
FONSI	Finding of No Significant Impact
FFF	fuel fabrication facility
g	acceleration due to Earth's gravity
GDP	gaseous diffusion plant
GNF-A	Global Nuclear Fuel–Americas
HEU	highly enriched uranium
HF	hydrogen fluoride
IAEA	International Atomic Energy Agency
ISO	International Organization for Standardization
LCF	latent cancer fatality
LES	Louisiana Energy Services
LEU	low-enriched uranium
$LEUF_6$	low-enriched uranium hexafluoride
LLMW	low-level mixed waste
LLW	low-level waste
µCi/cc	microcuries per cubic centimeter
MAP	mitigation action plan
MEI	maximally exposed individual
mg/kg	milligrams per kilogram
mrem	millirem
mSv	millisievert
MT	metric ton
MTCA	Model Toxics Control Act

Acronyms and Abbreviations (continued)

MTU	metric tons of uranium
N/A	not applicable
NAAQS	National Ambient Air Quality Standards
NEF	National Enrichment Facility
NEPA	National Environmental Policy Act
NRC	U.S. Nuclear Regulatory Commission
NU	natural uranium
NUF_6	natural uranium hexafluoride
pCi/g	picocuries per gram
PEIS	programmatic environmental impact statement
$PM_{2.5}$	particulate matter with a diameter of 2.5 microns or less
PM_{10}	particulate matter with a diameter of 10 microns or less
PSF	Physical Sciences Facility
RAI	request for additional information
ROD	Record of Decision
SA	Supplemental Analysis
SAR	safety analysis report
SNM	special nuclear material
SWU	separative work unit
Tc	technetium
TCE	trichloroethylene
U_3O_8	triuranium octoxide
UDS	Uranium Disposition Services, LLC
UF_6	uranium hexafluoride
UO_2	uranium dioxide
UO_2F_2	uranyl fluoride
USEC	United States Enrichment Corporation
VOC	volatile organic compound
WEC	Westinghouse Electric Corporation

1.0 INTRODUCTION

The Council on Environmental Quality (CEQ) National Environmental Policy Act (NEPA) regulations (40 Code of Federal Regulations (CFR) 1502.9) require Federal agencies to prepare supplements to either draft or final environmental impact statements (EIS) if (i) The agency makes substantial changes in the proposed action that are relevant to environmental concerns or "(ii) There are significant new circumstances or information relevant to environmental concerns and bearing on the proposed action or its impacts." The Department of Energy (DOE) follows the same requirements for an Environmental Assessment (EA). In cases where it is unclear whether a supplemental EIS or EA is required, DOE regulations (10 CFR 1021.314) direct the preparation of a supplement analysis (SA) to assist in making that determination. The SA is intended to address whether there is a change in the proposed action that is "substantial" or whether new circumstances or information are "significant," pursuant to the CEQ NEPA regulations.

This SA examines the proposed action to include depleted uranium (DU) down to 0.25% assay, to verify if the *Disposition of DOE Excess Depleted Uranium, Natural Uranium, and Low-Enriched Uranium* (DOE/EA-1607) remains adequate, or whether significant new circumstances or information exist relevant to environmental concerns and bearing on the proposed action and its impacts that would require preparation of a new or supplemental EA (or EIS). EA-1607 only analyzed a portion of the excess U inventory (material above .35% assay).

Since the EA-1607 was issued in 2009, technological advances such as new centrifuge systems and laser enrichment technologies have lowered the cost of production per Separative Work Unit (SWU) as compared to gaseous diffusion. These improvements in efficiency would result in an additional 225,269 metric tons of DOE's inventory of DUF_6 from .35% assay level down to 0.25% assay level to be considered economically recoverable. The Proposed Action is for disposition of DOE's excess inventories of NU, DU, and LEU. The relative market prices for uranium and enrichment services may affect the economic advantages to the enrichment of NU, DU, and LEU; thus implementation of the Proposed Action could enhance DOE's ability to support a healthy domestic nuclear infrastructure.

Uranium-235: DU, LEU, and HEU

Uranium exists as three naturally occurring isotopes: **uranium-238 (^{238}U), uranium-235 (^{235}U)**, and **uranium-234 (^{234}U)**. Natural uranium (NU) refers to refined uranium ore with the same isotopic ratio found in nature; it contains approximately 0.711 percent ^{235}U. Through gaseous diffusion or centrifugation enrichment processes, the concentration of ^{235}U can be increased (enriched), and the resultant uranium is called either low-enriched uranium (LEU) or highly enriched uranium (HEU). LEU has a concentration of ^{235}U less than 20 percent. HEU has a concentration of ^{235}U of 20 percent or greater. HEU is not part of the original EA-1607 or this SA.

After increasing the concentration of ^{235}U in a portion of the uranium mixture during the enrichment process, the remaining uranium mixture has a reduced concentration of ^{235}U. This is called depleted uranium (DU) or sometimes DU tails with the ^{235}U below 0.711percent. **This SA focuses specifically on the additional DU material between 0.35% and 0.25% assay that was included but not analyzed in EA-1607.**

2.0 PURPOSE AND NEED FOR ACTION

DOE owns and manages an inventory of DU, NU, and LEU that is currently stored in large cylinders as depleted uranium hexafluoride (DUF6), natural uranium hexafluoride (NUF6), and low-enriched uranium hexafluoride (LEUF6) at the DOE Paducah site in western Kentucky (DOE Paducah) and the DOE Portsmouth site near Piketon in south-central Ohio (DOE Portsmouth). This inventory exceeds DOE's current and projected energy and defense program needs. DOE therefore needs to disposition this inventory in a manner safe and secure for public health and environmental safety and security.

Accordingly, DOE completed EA-1607 in June 2009, addressing a Proposed Action to disposition up to 22,000 metric tons of uranium (NU equivalents) over 25 years, using one or a combination of two methods – (1) enrichment to either NU or LEU product and subsequent storage or sale of the resultant NU or LEU product (Enrichment Alternative), and (2) direct sale to appropriately licensed entities (Direct Sale Alternative). Based on the EA analyses, DOE determined that the Proposed Action did not constitute a major federal action significantly affecting the quality of the human environment within the meaning of the NEPA regulations.

EA-1607 evaluated disposition of 75,296 metric tons of uranium (MTU) DUF_6 taking up to a 25-year period. As mentioned above, proposed technologies and efficiencies have now advanced to support consideration of enriching feedstock with an assay as low as 0.25% from what was originally evaluated in EA-1607 (0.35% assay). This has added an additional 225,269 MTU DUF_6 of DOE excess inventory into the overall consideration for enrichment that would increase the inventory in the analysis from 75,296 MTU DUF_6 to 300,565 MTU DUF_6. With the increased DUF_6 inventory included as a part of this SA, there would be a corresponding increase of NU and/or LEU produced. Alternatively, the NU could increase from 22,213 MTU to 80,000 MTU. The LEU could increase from 4,919 MTU to 11,136 MTU. Comparison Table 2-1 captures the changes to the inventory covered by this SA. The duration for processing this additional material would extend the proposed action up to 40 years. However, consistent with EA-1607, the annual MTU would remain at 2,000 MTU NU equivalents with certain circumstances supporting as high as 4,000 MTU NU equivalents. Section 5.4 of this SA discusses the requirements for ensuring the Uranium Industry is not impacted with these levels of excess uranium being introduced annually into the market.

In addition to the Finding of No Significant impact (FONSI) for EA-1607, a Mitigation Action Plan "MAP" was also required for the proposed action. The MAP became an integral part of the FONSI. Section 5.4 of this SA identifies how the market industry impacts have evolved into today's climate requiring a Secretarial Determination as mandated by Congress in Section 306(a) of the Consolidated Appropriations Act of 2014 and DOE Excess Uranium Management Policy of 2013. Any sale or transfer of excess uranium relies on a current market analysis, which factors in the additional uranium material. Section 5.4 provides additional detail with regards to the MAP and omnibus requirements that actually take precedence over the MAP.

This SA acknowledges that prior to any sale, transfer, etc., of DU, NU or LEU, that a review of the most recent market analysis to date will need to be performed in order to complete the Secretarial Determination (See section 5.4). If the Market Analysis does not address the

inventory proposed for transfer then a new Market Analysis will be prepared. If the Market Analysis is already being prepared for its biennial review then the new information will be included to support the Secretarial Determination.

3.0 PROPOSED ACTION

Consistent with EA-1607, DOE proposes to disposition its excess uranium inventory using one or a combination of two methods: (1) enrichment to either NU or LEU product and subsequent storage or sale of the resultant NU or LEU product (the Enrichment Alternative), and (2) direct sale to appropriately licensed entities (the Direct Sale Alternative). Under the Enrichment Alternative in the original EA, DOE could enrich DU to the ^{235}U content of NU (i.e., 0.711% ^{235}U), and DOE could enrich DU, NU, and/or LEU (with a current ^{235}U content of less than 4.95%) up to 4.95 percent ^{235}U content. A target enrichment level for LEU of 4.95% ^{235}U content was selected for analysis in the original EA because it is near the upper end of the range of enrichment (3 to 5% ^{235}U) used in fuel for most commercial light-water power reactors. As discussed in Section 2 of this SA, DOE has chosen to include uranium with an assay of 0.25% or greater as a feedstock to the original proposed action as defined in EA-1607. DOE would contract to ship and enrich excess NU, DU (having an assay equal to or greater than 0.25% ^{235}U), and LEU (having an assay greater than 0.711% ^{235}U but less than 4.95% ^{235}U) as UF_6. Again, for clarification, DOE is now including DU down to an assay level of 0.25% ^{235}U from what was originally evaluated at assay level of 0.35% in EA-1607, which adds an additional 225,269 MTU of DU to the inventory under consideration.

Consistent with the original EA, enriching the excess inventory to either NU or LEU product would result in the production of "DU tails." This SA assumes that the DU tails would have 0.08% ^{235}U content after enrichment operations as opposed to the 0.20% ^{235}U content assumed in the original EA. The final DU tails are an end product that results from uranium enrichment; they have lower ^{235}U content than the DU that would serve as feed for enrichment operations. The reason from the decrease in tails value from 0.20% to 0.08% is due to the more efficient enrichment systems discussed previously in this SA. To illustrate the change in efficiencies between Gaseous Diffusion, Centrifuge, and Laser enrichment systems, a comparison of kwh/SWU between the three systems shows Gaseous Diffusion with approximately 2,500 kWh/SWU, centrifuge systems with approximately 50 kWh/SWU, and laser enrichment systems with an estimated 25 to 35 kWh/SWU. The lower the kWh power requirements for a given enrichment system allows the use of more SWU for a given price, thus, the tails assay value could decrease to a tails value of 0.08% ^{235}U, which allows for the recovery of lower assay DU. EA-1607 assumed recovery of DU down to 0.35% assay; whereas, this SA assumes recovery of DU down to 0.25% assay due to the greater efficiencies of enrichment systems.

Comparison Table 2-1 summarizes the weight and number of cylinders of excess NU, DU, and LEU inventory that are assumed to be enriched and/or sold and the number of cylinders of NU product, LEU product and DU tails that would result, including the revisions due to increased inventory. The increased inventory is due to the efficiencies previously discussed that allows recovery of down to 0.25% assay as opposed to 0.35% assay.

There were four enrichment facilities identified in EA-1607: (1) United States Enrichment Corporation (USEC) gaseous diffusion plant (GDP) in Paducah, Kentucky; (2) the USEC American Centrifuge Plant (ACP) near Portsmouth, Ohio; (3) the Louisiana Energy Services (LES) National Enrichment Facility (NEF) near Eunice, New Mexico; and (4) a foreign enrichment facility operated by AREVA and located at the Tricastin nuclear complex in south-central France on a diversion canal of the Rhone River, approximately 130 kilometers (80 miles) north of the port of Marseilles. Storage and fuel fabrication facilities are included in the analysis because EA-1607 and this SA examine the transportation impacts to the storage and fuel fabrication facilities as well as the enrichment facilities (see following text box).

Affected Facilities

Locations where the excess DU is either currently stored, where enrichment could occur, and where NU, LEU, and DU tails could be stored. **Transportation risks in EA-1607 and this SA are based on these general facility locations.**

- DOE Paducah/DOE GDP-current DU storage, enrichment capabilities and DU Tails storage
- DOE Portsmouth/USEC ACP- current DU storage, enrichment capabilities and DU Tail's storage
- Louisiana Energy Services (LES) National Enrichment Facility (NEF) Eunice New Mexico-enrichment and temporary storage of NU
- AREVA NC, Richland Washington-LEU storage, Fuel Fabrication Facility
- GNFA-A, Wilmington, North Carolina-LEU storage, Fuel Fabrication Facility
- CFFF, Columbia, South Carolina – LEU storage, Fuel Fabrication Facility

Consistent with EA-1607, the excess inventory would be shipped from DOE Paducah or DOE Portsmouth to U.S. enrichment facilities by either truck or rail. The NU and LEU product and DU tails would also be shipped to storage sites by either truck or rail. EA-1607 analyzed the possibility of rail shipments, assuming that potentially affected sites have serviceable rail sidings and transfer terminals within a reasonable distance. The EA determined that there was not a need for major new rail infrastructure as part of the Proposed Action. This SA also concludes that even with the additional inventory there is no need for new rail infrastructure. Minor upgrades to existing sidings or rail terminals could be implemented, if necessary, to maintain rail shipping capacity at existing levels. The decision whether to undertake any rail upgrades would be DOE's responsibility only at DOE Paducah or DOE Portsmouth, and DOE would evaluate the need for related NEPA analysis if such a proposal were under consideration. Commercial Rail would be responsible for its infrastructure over the 40-year period regardless of this action.

Comparison EA-1607 Table 2-1

Table 2-1 Excess Inventory, LEU Product, and DU Tails Characteristics

Material Type	MTU SA Proposal	MTU *Original EA*	Number of Cylinders SA Proposal	Number of Cylinders *Original EA*
Excess Inventory				
- NU feed	17,595	17,595	2,270	2,270
- DU feed [a]	300,565	75,296	35,334	10,776
- LEU feed [b]	2,000	2,000	296	296
Alternative potential products, and DU tails that would result from the production of all the material above				
- LEU product [c]	11,136	4,919	7,233	3,195
- DU tails [d]	312,376	89,972	40,568	10,931
- NU product	80,000	22,213	10,390	3,445
- DU tails [e]	220,000	53,083	28,571	6,450

a. The SA uses the DOE Inventory table amount for all assays equal to or greater than 0.251% ^{235}U. The nominal value is 0.2505% and above. The lower assay value is based on current enrichment technologies (centrifuge and laser enrichment technology) which have greater efficiencies than gaseous diffusion. The change (delta) between EA-1607 and this SA is result of an increase of 225,269 MTU of additional DU or in terms of NU equivalent, the change (delta) is 57,787 MTU NU produced from the additional 225,269 DU.

b. DOE currently has identified approximately 1,110 MTU of LEU feed; however for the purposes of analysis, EA-1607 conservatively assumes 2,000 MTU in the event that additional LEU may be identified as excess inventory.

c. LEU product is calculated at 4.95% assay wt by ^{235}U with a tails value of 0.25%, shipped in 30B cylinders.

d. DU tails from enriching NU feed, DU feed, and LEU feed to LEU product. The delta of 222,404 MTU of DU tails is due to the 225,269 MTU of DU used to create LEU UF_6.

e. DU tails from enriching DU feed to NU product. The delta of 166,917 MTU of DU tails is due to the 225,269 MTU of DU used to create normal assay UF_6.

Transportation of the excess inventory to be shipped from DOE Paducah or DOE Portsmouth to France is identified in EA-1607, and is also evaluated as part of the increased inventories in this SA. EA-1607 chose one foreign location to represent all foreign enrichment facilities for modeling purposes. The material could be transported to New Orleans, Louisiana, by barge, rail, and/or truck, and then transported to Marseilles by ship. LEU or NU product imported from France could be first returned to DOE Portsmouth or DOE Paducah via New Orleans, and then shipped to one or more of the three-fuel fabrication facilities (FFF) by truck or rail. This two-step shipment scenario for importing LEU product from France would provide conservative impact estimates (that is, larger estimated impacts than if the LEU product were shipped directly from France to an FFF). Uranium could be exported to and imported from France via U.S. marine terminal ports other than the port of New Orleans. Other options include the ports of Providence, Rhode Island; New York, New York; Elizabeth, New Jersey; Philadelphia, Pennsylvania; Baltimore, Maryland; Hampton Roads, Virginia; Morehead City, North Carolina; Charleston, South Carolina; Savannah, Georgia; Jacksonville, Florida; Fernandina, Florida; and Houston, Texas. However, of these and other optional marine terminal ports, only New Orleans

can be reached directly or nearly directly by barge from DOE Paducah and DOE Portsmouth. Commercial carriers would decide which ports to use. Impacts would be generally similar at any port capable of handling the materials because the operations would be the same or similar. In the 1994 DOE/EA-0837 (EA for the Purchase of Russian Low Enriched Uranium Derived from the Dismantlement of Nuclear Weapons in the Countries of the Former Soviet Union), DOE found no significant difference in comparative transportation-related risks among 13 optional ports of entry for importing LEU into the United States (DOE 1994). Based on the availability of direct barge access and the previously determined comparability of transportation-related risk to optional ports, DOE has determined that analyzing only New Orleans as a marine terminal port is representative for the purposes of this SA. If other marine terminal ports were proposed, DOE would evaluate the need for additional NEPA analysis.

3.1 Maximum Annual Amount and Program Duration

Per EA-1607 the Department believes that the introduction into the domestic market of uranium from Departmental inventories in amounts that do not exceed 10% of the total annual fuel requirements of all licensed nuclear power plants—that is, approximately 2,000 MTU NU equivalent based on current requirements—should not have an adverse material impact on the market or uranium industry. The bounding analysis as defined in EA-1607 remains unchanged. In addition, the Secretarial Determination (SD) and biennial development of a Market Analysis is required prior to any transfer or sales of uranium. The Secretarial Determination is the formal approval by the Department of Energy to perform uranium sale/transfers. Prior to the Market Analysis/ Secretarial Determination Process, DOE EA-1607 included a specific MAP in order to make a NEPA determination of a Finding of No Significant Impact (FONSI). A Market Analysis requirement has been formalized with the SD process required by Congress, with each SD requiring a specific market analysis to examine impacts of uranium sales or transfers of uranium covered in the proposed years.

The Department anticipates, however, that in any given year, it may introduce into the domestic market less than that amount, or, for certain special purposes (such as the provision of initial core loads for new reactors), more than that amount as bounded by the analysis in EA-1607. These annual amounts would include uranium introduced into the domestic uranium market from all Departmental inventories, including LEU generated via the down-blending of highly enriched uranium (HEU) in the ongoing National Nuclear Security Administration (NNSA) HEU disposition program (61 FR 40619). The NNSA HEU program is subject to the SD policy; however, transportation coverage is provided in a separate NEPA document.

The specific annual amounts would be determined on an ongoing basis; the amounts would depend upon market analyses for particular sales. The current DOE 2013 Excess Uranium Inventory Management Plan is a source of the information for the DOE excess uranium inventories, which is relied on as part of the required Market Analyses and any Secretarial Determinations. The precise annual enrichment or sale quantities would be uncertain and could change from year to year. Therefore, for purposes of assessing environmental impacts in this SA, DOE assumes that the Proposed Action could result in the annual enrichment and/or sale of excess inventory sufficient to introduce approximately 2,000 MTU NU to 4,000 MTU NU equivalents, respectively, into the domestic market. The use of 2,000 to 4,000 MTU annual limit

is consistent with EA-1607 assumptions, which is why the proportionality rule for overall impact analysis was appropriate. The use of the proportionality rule in this SA relies on (1) annual impacts do not change from what was analyzed in EA-1607 and (2) the number of years increased due to the increase in uranium inventory analyzed by this SA. The only change caused by the proposed increase in inventory is the length of time the proposal will last. Thus, the same assumptions and impacts using proportionality principles will be applied for the additional years of the proposal.

The actual annual amounts of excess inventory enriched would likely be less than the maximum annual amount, and as it would probably change from year to year, DOE did not limit the Proposed Action in the original EA to a number of years. However, for purposes of modeling the impacts of processing the entire inventory, 25 years was identified in EA-1607. With the additional inventory of material being evaluated as part of this SA, and to be consistent with not exceeding the annual limits, the processing time was adjusted to 40 years in this SA to support and be consistent with the original modeling assumptions.

4.0 STATUS OF ENRICHMENT FACILITIES, STORAGE FACILITIES, AND FUEL FABRICATION FACILITIES

There were four enrichment facilities identified in EA-1607: (1) United States Enrichment Corporation (USEC) gaseous diffusion plant (GDP) in Paducah, Kentucky; (2) the USEC American Centrifuge Plant (ACP) near Piketon; (3) the Louisiana Energy Services (LES) National Enrichment Facility (NEF) near Eunice, New Mexico; and (4) a foreign enrichment facility operated by AREVA and located at the Tricastin nuclear complex in south-central France on a diversion canal of the Rhone River, approximately 130 kilometers (80 miles) north of the port of Marseilles.

The status of the USEC GDP in Paducah, Kentucky has changed since the issuance of EA-1607. USEC has ceased commercial enrichment operations and has returned leased facilities to DOE. USEC American Centrifuge Plant (ACP) operates a test cascade; however, the Department of Energy — through its Oak Ridge (Tenn.) National Laboratory — has contracted with Centrus Corporation to operate the American Centrifuge Project in Piketon. The Louisiana Energy Services (LES) National Enrichment Facility (NEF) began enrichment operations in 2010. The foreign enrichment facility at Tricastin has maintained operations.

There has been no operational status change since the issuance of EA-1607 of storage and fuel fabrication facilities. If DOE contracts for the enrichment of DU to NU, DOE would contract for the storage of the resultant NU at the enrichment facility performing the enrichment operations, or for the transport of the NU to DOE Paducah and/or DOE Portsmouth. If DOE contracts for the enrichment of DU, NU, or LEU to obtain LEU with up to 4.95% ^{235}U content, DOE would contract to transport the LEU product to, and store it at, one or more of five domestic sites. Three of these sites are commercial nuclear FFFs operated by AREVA NC in Richland, Washington; by Westinghouse Electric Corporation (WEC) at its Columbia Fuel Fabrication Facility (CFFF) near Columbia, South Carolina; and by Global Nuclear Fuel– Americas (GNF-

A) near Wilmington, North Carolina. DOE considers on-site storage at these FFFs to be desirable because they require LEU as process feedstock and already store quantities of LEU on-site. In total, up to 670 MTU could be stored at the three commercial nuclear FFFs. DOE also could contract to ship the LEU product to DOE Paducah and/or DOE Portsmouth and store or sell it as identified in the Enrichment Alternative scenario. Both DOE sites have the required infrastructure and security, as well as extensive experience in the safe management, storage, and logistics of uranium cylinders. If other sites are proposed in the future for storage, additional NEPA analysis would be prepared, as appropriate.

5.0 EXISTING NEPA AND OTHER ENVIRONMENTAL ANALYSIS

As the original EA-1607 identified, existing NEPA documents were reviewed, used as sources of information, and, when appropriate, incorporated by reference in EA-1607. As part of this SA, those EAs were reviewed again for applicability. It was determined that the additional excess uranium inventory being analyzed in this SA did not alter any of the conclusions that were produced as part of the original EA-1607 analyses. The EISs and EAs summary of content can be found in original EA-1607 Appendix C. Specifically for this SA, the summary section of EA-1607, FONSI, and integral MAP is what was most heavily relied on when performing this analysis. Section 5.1 through 5.5 below will provide the additional details for how the use of proportionality was utilized in analyzing impacts as originally identified in EA-1607, and the potential impacts from additional excess uranium being added to the proposed action.

5.1 Comparison of Impacts

DOE considered the extent to which DOE's current proposal to increase excess uranium inventories to the proposed action either has been previously analyzed or may require additional analysis. This SA followed the CEQ guidance that allows for the use of proportionality and sliding scales for determining impacts. It was determined that the only two resource areas that need to be carried forward in this SA for determination of impacts were transportation and socioeconomic. Socioeconomic impacts are addressed as a part of the market analysis commitments and the Secretarial Determination; therefore, no additional detailed analysis was deemed necessary for socioeconomic impacts in this SA. Transportation was the resource area that carried forward in this SA for further analysis.

All previous related NEPA documents were reviewed with the existing EA-1607 NEPA being most applicable. DOE reviewed these documents to consider whether the new additional information or changes constitute significant new circumstances or information relevant to environmental concerns and bearing on the actions or impacts previously analyzed by DOE in EA-1607.

The affected environment identified in EA-1607 described two classes of environment-geographic and economic - that could have been potentially affected by DOE's Proposed Action. The geographic environment comprises the six sites where the excess uranium is either now stored where enrichment could occur, and where LEU and DU tails could be stored and fuel fabricating facilities. Section 4.0 above in this SA discusses the current status of these facilities and includes any changes in status that may need to be considered since 2009 when the FONSI

was signed for EA-1607. Section 5.2 will identify any impact changes that may be expected relating to the enrichment, conversion and fabrication facilities due to the additional inventory of excess uranium being proposed.

The economic environment, which is the existing uranium market, will be discussed in Section 5.4. As with the original EA-1607, this SA focuses on the impacts from the releases to the atmosphere and traffic fatalities. Section 5.3, Transportation Impacts, below compares the key potential impacts of shipping DU, NU and LEU at the original inventory as identified in EA-1607 to the proposed additional inventories identified in this SA, including extended duration. Summary comparison tables have been included in Section 5.3 to aid in presenting the conclusions of the analysis.

5.2 Enrichment, Conversion and Fabrication Facility Impacts

In the context of impacts at enrichment facilities, the original EA-1607 concluded that impacts to the human environment due to enrichment operations and conversion of DU tails from enrichment (1) have been adequately characterized in existing DOE and NRC documents and (2) are small to moderate in nature. The additional inventory of excess uranium will have lower concentrations of ^{234}U and ^{235}U thus resulting in slightly lower radiological hazards on a per cylinder basis than what was originally analyzed in EA-1607. Most importantly, the analysis for this SA reviewed the quantities of material originally evaluated in the other DOE and NRC supporting NEPA documents, and concluded the additional volume of this lower assay material fell within the bound of those analyses. EA-1607 determined the impacts of enriching the DU tails were adequately covered and this SA has also concluded the additional inventory is also bounded by the previous analyses.

Consistent with the conclusions identified in EA-1607, this SA also determined the primary potential for impacts under the additional inventory being proposed would be related to (1) health, safety, and accident impacts associated with transportation of the excess inventory to the proposed enrichment sites; (2) health, safety and accident impacts associated with transportation and storage of NU product and LEU product and transportation of DU tails; and (3) relevant socioeconomic impacts. Section 5.3 shows the impacts identified in the original EA-1607 and the impacts based on the additional proposed excess uranium inventory as identified in Section 2.0 of this SA for comparison purposes.

5.3 Transportation Impacts

DOE analyzed in EA-1607 the potential impacts of shipping part of its excess NU, LEU and DU feed from its current storage locations at the Portsmouth and Paducah GDPs to location(s) where it could be enriched. This SA considers all these locations and for comparison purposes assumes these locations or any future proposed location in close proximity (approximately 1 mile and using same routes) that could be created as part of a DOE re-industrialization initiative as part of this analysis.

Consistent with the approach followed in EA-1607, DOE used 2,000 MTU NU equivalent and 4,000 MTU NU equivalent as the bounding parameters for annual shipping quantities. Using

this assumption and with the increased volumes of excess NU equivalents of 57,787 MTU produced from the additional 225,269 MTU of DU, the duration of transportation would extend to 40 years. The analyses assumed full compliance with the federal regulations that govern required activities related to transportation practices and accidents. DOE O 460.2A requires that DOE organizations conduct operations in compliance with all applicable international, federal, state, local, and tribal laws and regulations governing materials transportation that are not inconsistent with federal regulations. Consistent with EA-1607, this SA also considered that this additional inventory will follow the same transportation requirements contained in 49 CFR Parts 171 through 180, Federal Motor Carrier Safety Administration regulations contained in 49 CFR 395 and 397, and NRC regulations contained in 10 CFR 71, as applicable.

All shipments will follow DOE Manual 460.2-1A, which establishes a set of standard transportation practices for DOE to use in planning and executing off-site shipments of radioactive materials. These practices establish a standardized process and framework for interacting with state, tribal, and local authorities, other federal agencies, and transportation contractors and carriers regarding DOE radioactive material shipments.

As previously discussed in this SA, the two alternatives evaluated in EA-1607 in addition to the No-Action alternative included enrichment to either NU or LEU product and subsequent storage or sale of the resultant NU or LEU product (Enrichment Alternative), and (2) direct sale to appropriate licensed entities (Direct Sale Alternative). This SA considered the additional excess uranium inventories and, consistent with EA-1607, concluded that the impacts associated with the Direct Sale Alternative would be virtually the same as impacts associated with the Enrichment Alternative. Therefore, this SA analyzed the difference in potential impacts under both the incident-free (routine transportation) and accident conditions based on the Enrichment Alternative. The following tables were re-constructed from EA-1607 for comparison purposes incorporating the additional uranium inventories and duration of shipments in order to determine if any potential for significant changes would be expected.

EA-1607 Proposed Action and Alternative Actions

Proposed Action: Enrichment to either NU or LEU product and subsequent storage or sale of the resultant NU or LEU product (the Enrichment Alternative).
Direct Sale Alternative: Direct sale to appropriately licensed entities (the Direct Sale Alternative)
No Action: continue to convert ALL DU to more stable chemical form at both Paducah and Portsmouth DUF6 facilities and no enrichment or sales would occur (status quo alternative).

EA-1607 and this SA address the transportation of uranium between sites for enrichment, fuel fabrication, and storage. Each of these types of facilities would be covered under an individual NEPA document and are not part of EA-1607 or this SA. The SA examines the most resistive case (the transportation path with the greatest number of individual locations) of enrichment of DUF_6 to normal at the one facility then transport to a second facility for enrichment to LEU, then to a fuel fabrication facility and to storage.

EA-1607 used representative highway, rail, and barge routes from the enrichment, storage, and commercial nuclear FFFs which were determined using WebTRAGIS routing computer code. This SA reviewed the status of the facilities and routes and concluded there was no need to change any routes that were identified in EA-1607. Route characteristics include the distances and population densities in rural, suburban, and urban population density zones. The populations

that might be exposed along these routes were determined in EA-1607 using data from the 2000 census. This SA also relied on the 2000 census data when analyzing the risks. The 2010 Census data identified a 9.7 % increase in population since the 2000 Census data. Population increases can affect the estimates of some categories of transportation impacts that are proportional to change in population (incident-free impacts; non-radiological pollution health effects, and radiological accident risk). This SA did not re-calculate these impacts since the original EA-1607 included multiple layers of conservatism (use of urban population densities 3 times greater, atmospheric conditions at most conservative condition and no factors for over-pack protection on severe accidents). The 9.7% increase in population would not result in a significant difference in the impacts. EA-1607 clearly identified the major factors in the differences in overall impacts were quantity of material and trip distance. Therefore, this SA determined that the additional inventory equated to 300% more material using 40 years as the duration. The original EA arbitrarily selected 25 years for modeling purposes where this SA used 40 years based on a total inventory of 80,000 MTU NU equivalent and 2,000 MTU annually, which in a worst case scenario, would take 40 years to process.

All data tables provided using the law of proportionality will identify the EA-1607 data and then for comparison purposes the adjusted data based on a linear 300% increase in impacts over the 40 years.

EA-1607 table 4-6 presents the number of cylinders that were originally expected to be shipped up to a period of 25 years. As stated, for comparison purposes a comparison Table 4-6 was created and represents the total inventory proposed under this SA over 40 years.

EA-1607 Table Total Inventory and Time Period Table 4-6. Number of Cylinders and Truck, Rail, and Barge Shipments under the Proposed Action				
Material	**Number of Cylinders**	**Truck Shipments**	**Rail Shipments**	**Barge Shipments**
NU feed	2,270	2,270	568	36
DU feed [a]	10,776	10,776	2,695	167
LEU feed	296	296	75	7
LEU product	3,195	1,065	267	17
DU tails [b]	10,931	10,931	2,733	169
NU product	3,445	3,445	862	53
DU tails [c]	6,450	6,450	1,613	100

a. This EA uses 10,776 DU cylinders for its estimate of impacts. In Appendix D, comment #4 from USEC noted that the actual DU cylinder count would be less, later determined to be 8,871 for DU feed. This correction would normally provide the basis for a recalculation of estimated impacts, and, in this case, would lower the estimate of impacts. In light of the already low estimates of potential impacts, this recalculation was not performed.

b. DU tails from enrichment of NU feed, DU feed, and LEU feed to LEU product.

c. DU tails from enrichment of DU feed to NU product.

Comparison EA-1607 Table Total Inventory and Time Period
Table 4-6 Number of Cylinders and Truck, Rail, and Barge Shipments under the Proposed Action based on projected increase

Material	**Number of Cylinders**	**Truck Shipments**	**Rail Shipments**	**Barge Shipments**
NU feed	2,270	2,270	568	36
DU feed [a]	***35,334***	***35,334***	***8,834***	***548***
LEU feed	296	296	75	7
LEU product	***7,233***	***2,411***	***604***	***38***
DU tails [b]	***40,568***	***40,568***	***10,143***	***627***
NU product	***10,390***	***10,390***	***2,600***	***160***
DU tails [c]	***28,571***	***28,571***	***7,145***	***443***

Bold italic number denotes the changes in amount due to the additional 225,000 MTU DUF_6

a. This SA uses the DOE Inventory table amount for all assays equal to or greater than nominal 0.251% ^{235}U. Nominal value is 0.2505% and above compared to the 0.35% nominal assay in the original EA-1607. The lower assay value is based on current enrichment technologies (centrifuge and laser enrichment technology) which have greater efficiencies than gaseous diffusion.

b. DU tails from enrichment of NU feed, DU feed, and LEU feed to LEU product.

c. DU tails from enrichment of DU feed to NU product.

There was no need to construct a comparison Table 4-7 because the curie content was based on an average single cylinder. Using the existing table adds additional conservatism because the DU tails average 0.32% assay being evaluated in this SA as part of the Proposed Action is less than was evaluated in the original table. Therefore, the risk is less for each cylinder than originally calculated.

Table 4-7 Radionuclide Inventory of Uranium Cylinders

Material	^{234}U Inventory (Ci)	^{235}U Inventory (Ci)	^{238}U Inventory (Ci)
NU feed or product [a]	2.8	0.13	2.8
DU feed [b]	1.1	0.064	2.8
LEU feed [c]	7.4	0.31	2.8
LEU product [d]	4.4	0.16	0.49
DU tails [e]	0.5	0.037	2.8

a. NU feed or product assumed to be 0.711 weight percent ^{235}U.
b. DU feed has a range of enrichments from 0.25 to less than 0.711 weight percent ^{235}U. In this analysis, the DU feed enrichment was assumed 0.35 weight percent ^{235}U, which maximizes the amount of DU tails.
c. LEU feed assumed to be 1.7 weight percent ^{235}U.
d. LEU product assumed to be 4.95 weight percent ^{235}U.
e. DU tails assumed to be 0.08 weight percent ^{235}U.

The impacts from truck shipments of UF_6 were originally listed in EA-1607 Tables 4-8a, 4-8b and 4-8c. Impacts were qualified in terms of total fatalities, which were the sum of radiation-related latent cancer fatalities (LCFs), vehicle emission health effects, and traffic fatalities. The original EA-1607 for enrichment of NU, DU and LEU feed to product, estimated the number of total fatalities in the range from 0.19 to 2.7, depending on where the enrichment would occur and where the LEU product and DU tails would be shipped. The estimated number of fatalities by truck from enriching the equivalent of 2,000 MTU of NU in a given year ranged from 0.017 to 0.25, and the estimated number of fatalities from enriching the equivalent of 4000 MTU of NU in a given year ranged from 0.031 to 0.45. For enrichment of DU feed to NU product followed by subsequent enrichment of NU product to LEU product, enrichment at more than one facility would occur. **The estimated total number of fatalities ranged from 0.19 to 2.7, depending on where the enrichment of the DU feed to NU product occurred, where the enrichment of the NU product to LEU product occurred, where DU tails were shipped, and where the LEU product was shipped. This SA identifies, for purposes of this analysis, that the last scenario is the most reasonable, plausible, and the worst-case scenario from an impact perspective, and therefore will be used for purposes of evaluating the additional excess inventory scenario.**

This SA, using the rule of proportionality, assumed a 300% increase in inventory and therefore assumed a 300% increase in total fatalities over the life of the project, which is now 40 years. Comparison Table 4-8A provided below assumed the additional excess inventory over 40 years at 2000 MTU NU equivalent would result in a range of total fatalities between 6.8 E-01 and 9.8E+00. The estimated fatalities under normal conditions over the period of the 40-year project

with the additional 300% increase is still under 1 fatality (0.68) for the duration of the project. The estimated fatalities under the normal accident scenario over the 40-year period is 0.68. When applying the severe accident scenario the estimated fatalities increase to an estimated 9.8 fatalities over the life of the project. The probability for multiple severe accidents to occur over the life of the project is very unlikely. DOE ships millions of pounds of radiological waste across the United States each year from various sites and has minimal fatalities ever documented for all wastes being transported. The impacts in any singular year did not change due to the increased excess inventory. In fact, the overall assay level would be slightly less for calculation purposes but was not considered in this analysis to make a significant reduction in LCFs.

EA-1607 Table 4-8a
Total Transportation Impacts from Truck Shipments of Uranium Hexafluoride under the Proposed Action

Case	Public (LCFs)	Worker (LCFs)	Vehicle Emission Health Effects (LCFs)	Radiological Accident Risk (LCFs)	Traffic Fatalities	Total Fatalities
Enrichment to LEU at the Paducah GDP						
NU, DU, LEU feed	1.7 × 10-2	8.3 × 10-2	2.3 × 10-2	8.7 × 10-2	9.9 × 10-2	3.1 × 10-1
LEU product (on-site storage)	--	5.2 × 10-3	--	--	--	5.2 × 10-3
LEU product if shipped to FFFs[a]	4.0 × 10-3 to 1.0 × 10-2	1.2 × 10-2 to 2.5 × 10-2	3.7 × 10-3 to 7.5 × 10-3	4.9 × 10-2 to 1.2 × 10-1	1.4 × 10-2 to 5.2 × 10-2	8.3 × 10-2 to 2.1 × 10-1
Total	1.7 × 10-2 to 2.7 × 10-2	8.9 × 10-2 to 1.1 × 10-1	2.3 × 10-2 to 3.0 × 10-2	8.7 × 10-2 to 2.1 × 10-1	9.9 × 10-2 to 1.5 × 10-1	3.1 × 10-1 to 5.2 × 10-1
Enrichment of DU to NU at the Paducah GDP						
DU feed	1.3 × 10-2	6.7 × 10-2	1.8 × 10-2	6.3 × 10-2	7.9 × 10-2	2.4 × 10-1
NU product (on-site storage)	--	8.0 × 10-3	--	--	--	8.0 × 10-3
Total	1.3 × 10-2	7.5 × 10-2	1.8 × 10-2	6.3 × 10-2	7.9 × 10-2	2.5 × 10-1
Enrichment to LEU at the ACP (Portsmouth)						
NU, DU, LEU feed	1.1 × 10-2	6.5 × 10-2	1.5 × 10-2	5.7 × 10-2	6.5 × 10-2	2.1 × 10-1
LEU product (on-site storage)	--	5.2 × 10-3	--	--	--	5.2 × 10-3
LEU product if shipped to FFFs[a]	3.4 × 10-3 to 1.2 × 10-2	1.3 × 10-2 to 2.8 × 10-2	4.2 × 10-3 to 8.3 × 10-3	6.3 × 10-2 to 1.2 × 10-1	1.1 × 10-2 to 5.9 × 10-2	9.4 × 10-2 to 2.3 × 10-1
Total	1.1 × 10-2 to 2.3 × 10-2	7.1 × 10-2 to 9.3 × 10-2	1.5 × 10-2 to 2.3 × 10-2	5.7 × 10-2 to 1.8 × 10-1	6.5 × 10-2 to 1.2 × 10-1	2.2 × 10-1 to 4.4 × 10-1
Enrichment of DU to NU at the ACP (Portsmouth)						
DU feed	9.0 × 10-3	5.3 × 10-2	1.2 × 10-2	4.2 × 10-2	5.3 × 10-2	1.7 × 10-1
NU product (on-site storage)	--	8.0 × 10-3	--	--	--	8.0 × 10-3
Total	9.0 × 10-3	6.1 × 10-2	1.2 × 10-2	4.2 × 10-2	5.3 × 10-2	1.8 × 10-1
Enrichment to LEU at the NEF						
NU, DU, LEU feed	6.6 × 10-2	2.2 × 10-1	9.3 × 10-2	4.2 × 10-1	4.1 × 10-1	1.2
LEU product [a]	6.1 × 10-3 to 1.0 × 10-2	1.6 × 10-2 to 2.4 × 10-2	5.2 × 10-3 to 8.1 × 10-3	8.0 × 10-2 to 1.4 × 10-1	2.7 × 10-2 to 5.1 × 10-2	1.4 × 10-1 to 2.3 × 10-1
DU tails (to Portsmouth or Paducah)	4.0 × 10-2 to 6.3 × 10-2	1.6 × 10-1 to 2.0 × 10-1	5.3 × 10-2 to 9.1 × 10-2	1.8 × 10-1 to 3.1 × 10-1	2.8 × 10-1 to 3.7 × 10-1	7.1 × 10-1 to 1.0
Total	1.1 × 10-1 to 1.4 × 10-1	3.9 × 10-1 to 4.4 × 10-1	1.5 × 10-1 to 1.9 × 10-1	6.7 × 10-1 to 8.7 × 10-1	7.2 × 10-1 to 8.3 × 10-1	2.0 to 2.5
Enrichment to NU at the NEF						
DU feed	5.3 × 10-2	1.8 × 10-1	7.5 × 10-2	3.0 × 10-1	3.3 × 10-1	9.4 × 10-1
NU product [a]	1.3 × 10-2 to 2.0 × 10-2	4.9 × 10-2 to 6.2 × 10-2	1.7 × 10-2 to 2.9 × 10-2	9.6 × 10-2 to 1.7 × 10-1	8.9 × 10-2 to 1.2 × 10-1	2.6 × 10-1 to 4.0 × 10-1
DU tails (to Portsmouth or Paducah)	2.4 × 10-2 to 3.7 × 10-2	9.2 × 10-2 to 1.2 × 10-1	3.2 × 10-2 to 5.4 × 10-2	1.0 × 10-1 to 1.8 × 10-1	1.7 × 10-1 to 2.2 × 10-1	4.2 × 10-1 to 6.1 × 10-1
Total	8.9 × 10-2 to 1.1 × 10-1	3.2 × 10-1 to 3.5 × 10-1	1.2 × 10-1 to 1.6 × 10-1	5.0 × 10-1 to 6.5 × 10-1	5.9 × 10-1 to 6.7 × 10-1	1.6 to 1.9
Enrichment of DU to NU Followed By Subsequent Enrichment of NU to LEU						
Total	0.0090 to 0.15	0.072 to 0.49	0.012 to 0.21	0.042 to 0.96	0.053 to 0.89	0.19 to 2.7

a. Range in product results is due to shipping product to various off-site storage locations.

Comparison Table 4-8a. Total Transportation Impacts from Truck Shipments of Uranium Hexafluoride under the Proposed Action

Case	Public (LCFs)	Worker (LCFs)	Vehicle Emission Health Effects (LCFs)	Radiological Accident Risk (LCFs)	Traffic Fatalities	Total Fatalities
Enrichment to LEU at the Paducah GDP						
NU, DU, LEU feed	2.7E-02	1.3E-01	3.6E-02	1.4E-01	1.6E-01	4.9E-01
LEU product (on-site storage)	--	8.4E-03	--	--	--	8.4E-03
LEU product if shipped to FFFs[a]	6.2E-03 to 1.6E-02	1.9E-02 to 4.0E-02	5.8E-03 to 1.2E-02	8.0E-02 to 1.9E-01	2.3E-02 to 8.4E-02	1.3E-01 to 3.4E-01
Total	2.7E-02 to 4.3E-02	1.4E-01 to 1.7E-01	3.6E-02 to 4.8E-02	1.4E-01 to 3.3E-01	1.6E-01 to 2.4E-01	5.0E-01 to 8.3E-01
Enrichment of DU to NU at the Paducah GDP						
DU feed	4.8E-02	2.4E-01	6.4E-02	2.3E-01	2.9E-01	8.7E-01
NU product (on-site storage)	--	2.9E-02	--	--	--	2.9E-02
Total	4.8E-02	2.7E-01	6.4E-02	2.3E-01	2.9E-01	9.0E-01
Enrichment to LEU at the ACP (Portsmouth)						
NU, DU, LEU feed	1.8E-02	1.0E-01	2.4E-02	9.2E-02	1.0E-01	3.4E-01
LEU product (on-site storage)	--	8.4E-03	--	--	--	8.4E-03
LEU product if shipped to FFFs[a]	5.6E-03 to 2.0E-02	2.0E-02 to 4.4E-02	6.8E-03 to 1.3E-02	1.0E-01 to 2.0E-01	1.8E-02 to 9.6E-02	1.5E-01 to 3.7E-01
Total	1.8E-02 to 3.7E-02	1.1E-01 to 1.5E-01	2.4E-02 to 3.7E-02	9.2E-02 to 2.9E-01	1.0E-01 to 2.0E-01	3.5E-01 to 7.1E-01
Enrichment of DU to NU at the ACP (Portsmouth)						
DU feed	3.3E-02	1.9E-01	4.4E-02	1.5E-01	1.9E-01	6.1E-01
NU product (on-site storage)	--	2.9E-02	--	--	--	2.9E-02
Total	3.3E-02	2.2E-01	4.4E-02	1.5E-01	1.9E-01	6.4E-01
Enrichment to LEU at the NEF						
NU, DU, LEU feed	1.0E-01	3.5E-01	1.5E-01	6.8E-01	6.5E-01	1.9E+00
LEU product [a]	1.0E-02 to 1.6E-02	2.6E-02 to 3.8E-02	8.5E-03 to 1.3E-02	1.3E-01 to 2.2E-01	4.4E-02 to 8.0E-02	2.2E-01 to 3.7E-01
DU tails (to Portsmouth or Paducah)	6.4E-02 to 1.0E-01	2.5E-01 to 3.1E-01	8.5E-02 to 1.5E-01	2.8E-01 to 4.8E-01	4.5E-01 to 6.0E-01	1.1E+00 to 1.6E+00
Total	1.8E-01 to 2.2E-01	6.3E-01 to 7.0E-01	2.4E-01 to 3.1E-01	1.1E+00 to 1.4E+00	1.1E+00 to 1.3E+00	3.3E+00 to 3.9E+00
Enrichment to NU at the NEF						
DU feed	1.9E-01	6.3E-01	2.7E-01	1.1E+00	1.2E+00	3.4E+00
NU product [a]	4.6E-02 to 7.2E-02	1.8E-01 to 2.2E-01	6.0E-02 to 1.0E-01	3.5E-01 to 6.1E-01	3.2E-01 to 4.4E-01	9.6E-01 to 1.4E+00
DU tails (to Portsmouth or Paducah)	8.6E-02 to 1.3E-01	3.4E-01 to 4.2E-01	1.2E-01 to 1.9E-01	3.8E-01 to 6.8E-01	6.0E-01 to 7.8E-01	1.5E+00 to 2.2E+00
Total	3.3E-01 to 4.0E-01	1.1E+00 to 1.3E+00	4.5E-01 to 5.7E-01	1.8E+00 to 2.4E+00	2.1E+00 to 2.4E+00	5.9E+00 to 7.0E+00
Enrichment of DU to NU Followed By Subsequent Enrichment of NU to LEU						
Total	3.3E-02 to 5.6E-01	2.6E-01 to 1.8E+00	4.4E-02 to 7.6E-01	1.5E-01 to 3.5E+00	1.9E-01 to 3.2E+00	6.8E-01 to 9.8E+00

a. Range in product results is due to shipping product to various off-site storage locations.

Comparison Table 4-9 below lists the impacts for the maximally exposed individual (MEI) along the transportation routes. This individual in EA-1607 was assumed to be located 30 meters (100 feet) from the route and to be exposed to all shipments of the UF_6 (i.e., NU feed, DU feed, DU tails, LEU feed, and LEU product). The shipments were assumed to travel at a speed of 24 kilometers (15 miles) per hour, which is representative of speeds in urban areas. The original EA-1607 LCF probability for the MEI along the transportation route estimated a range of 8.3 x 10-8 to 5.3 x 10-7 up to 25 years. Comparison Table 4-9 below, using the rule of proportionality, calculated the range for the additional excess uranium analysis to be 3.59 x 10-7 to 1.92 x 10-6. There is a slight increase and yet again, this is due to the overall increase in the material shipped over a longer period of time. The annual impact to the MEI does not change.

EA-1607 Table 4-9. Maximum Individual Impacts from Truck Shipments [a]

Case	Mode	LCFs
Enrichment to LEU at Paducah GDP	Truck	1.9 × 10-7
Enrichment of DU to NU at Paducah GDP	Truck	1.2 × 10-7
Enrichment to LEU at Portsmouth ACP	Truck	1.3 × 10-7
Enrichment of DU to NU at Portsmouth ACP	Truck	8.3 × 10-8
Enrichment to LEU at NEF	Truck	5.0 × 10-7
Enrichment of DU to NU at NEF	Truck	4.0 × 10-7
Enrichment of DU to NU followed by subsequent enrichment of NU to LEU	Truck	9.9 × 10-8 to 5.3 × 10-7

a. Impacts are based on a person located 30 meters from the highway. The person was assumed to be exposed to all shipments of UF_6. The shipments were assumed to travel at a speed of 24 kilometers per hour.

Comparison Table 4-9. Maximum Individual Impacts from Truck Shipments [a]

Case	Mode	LCFs
Enrichment to LEU at Paducah GDP	Truck	3.04E-07
Enrichment of DU to NU at Paducah GDP	Truck	4.38E-07
Enrichment to LEU at Portsmouth ACP	Truck	2.08E-07
Enrichment of DU to NU at Portsmouth ACP	Truck	3.05E-07
Enrichment to LEU at NEF	Truck	8.21E-07
Enrichment of DU to NU at NEF	Truck	1.45E-06
Enrichment of DU to NU followed by subsequent enrichment of NU to LEU	Truck	3.59E-07 To 1.92E-06

a. Impacts are based on a person located 30 meters from the highway. The person was assumed to be exposed to all shipments of UF_6. The shipments were assumed to travel at a speed of 24 kilometers per hour.

The impacts from rail shipments of UF_6 were originally listed in Table 4-10a, 4-10b, and 4-10c of EA-1607. Impacts were quantified in terms of fatalities in the original EA-1607 for both rail shipments and truck shipments. The fatalities are a sum of radiation-related LCFs, vehicle emission health effects, and traffic fatalities. For enrichment of NU, DU, and LEU product, the estimated number of total fatalities using rail shipments in EA-1607 ranged from 0.17 to 2.6 depending on where the enrichment of the NU, DU and LEU feed occurred and where the LEU product and DU tails were shipped. Using the same approach for truck transportation as in EA-1607, the worst-case scenario would be enrichment of the DU feed to NU product, followed by subsequent enrichment of NU product to LEU product, and the use of more than one enrichment facility. This scenario alone drove the highest number of estimated fatality range of 0.17 to 2.6. Comparison Table 4-10a provided below incorporates the use of proportionality and analyzes for a 300% increase in total fatalities based on increased excess inventory over the 40-year duration.

This SA, using the rule of proportionality, assumed a 300% increase in inventory and therefore assumed a 300% increase in total fatalities over the life of the project, which is now 40 years. Comparison Table 4-10a provided below assumed the additional excess inventory over 40 years at 2,000 MTU NU equivalent would result in a range of total fatalities between 0.63 and 9.2. The difference between 2.6 and 9.2 is a factor of the additional years of transportation. The impacts in any singular year did not change due to the increased excess inventory. In fact, the overall assay level would be slightly less for calculation purposes but was not considered in this analysis to make a significant reduction in LCF. The probability in any one year within the total project does not changed because there are no proposed changes to the annual limits analyzed in EA-1607. Due to increase in uranium inventory analyzed by this SA and the annual limits of 2,000 to 4,000 MTU NU, the period of performance (duration) examined was increased from 25 years to 40 years in order to account for the total uranium inventory. Consequences of severe accident scenarios did not change from the original EA-1607 since they were not driven from the quantities of material. Because the annual probabilities remain the same and the years are independent, the probability that a fatality will occur is the probabilistic sum of all years. In EA-1607, there were years within the 25 year analysis period where no uranium was transported; however, under this SA, it is assumed each year there would be a minimum of 2,000 MTU transported. The probability of a severe accident occurring in an urban area considering that the duration of the project extended by 15 years would be increased from the range of 8.1 x 10-4 to 0.016 over 25 years to 2.92 x 10-3 to 0.058 over 40 years, a **0.041** increase in probability. In other words, there will be no change in the consequence of a severe rail or truck accident just the probability of an accident will increase slightly. Ultimately, there could be a slight decrease in overall impacts due to less assay level material and use of overpacks for transport of LEU but these were not recalculated as part of this SA.

Probability Comparison Table

Case	Project Duration	Probability of a Severe Accident		
Total EA-1607	25 years	8.10E-04	to	0.016
Total SA	40 years	2.90E-03	to	0.057
Delta Increase	15 years	2.09E-03	to	0.041

Key Facts:

1. The probability in any one year within the total project does not changed.
2. The consequence of individual accidents do not change.
3. Annual limits of 2,000 to 4,000 MTU NU does not change
4. Project years are mutually exclusive, the probability that at fatality will occur is the sum of the probability of each individual year over the 40 year analysis period.
5. Note difference between EA-1607 and this SA is:
    a. In EA-1607 there were years within the 25 year analysis period where no uranium was transported.
    b. In this SA, there is a minimum of 2,000 MTU NU equivalent transported each of the 40 years analyzed.

Table 4-10a. Total Transportation Impacts from Rail Shipments of Uranium Hexafluoride EA-1607

Case	Public (LCFs)	Worker (LCFs)	Vehicle Emission Health Effects (LCFs)	Radiological Accident Risk (LCFs)	Traffic Fatalities	Total Fatalities
Enrichment to LEU at the Paducah GDP						
NU, DU, LEU feed	2.1 × 10-3	3.5 × 10-2	1.3 × 10-2	1.1 × 10-1	1.3 × 10-1	2.8 × 10-1
LEU product (on-site storage)	--	5.3 × 10-3	--	--	--	5.3 × 10-3
LEU product if shipped to FFFs[a]	1.2 × 10-3 to 1.1 × 10-3	6.1 × 10-3 to 7.1 × 10-3	3.0 × 10-3 to 3.1 × 10-3	7.7 × 10-2 to 8.2 × 10-2	2.5 × 10-2 to 7.8 × 10-2	1.1 × 10-1 to 1.7 × 10-1
Total	2.1 × 10-3 to 3.2 × 10-3	4.0 × 10-2 to 4.2 × 10-2	1.3 × 10-2 to 1.6 × 10-2	1.1 × 10-1 to 1.9 × 10-1	1.3 × 10-1 to 2.0 × 10-1	2.9 × 10-1 to 4.5 × 10-1
Enrichment of DU to NU at the Paducah GDP						
DU feed	1.6 × 10-3	2.8 × 10-2	1.0 × 10-2	7.6 × 10-2	1.0 × 10-1	2.2 × 10-1
NU product (on-site storage)	--	8.0 × 10-3	--	--	--	8.0 × 10-3
Total	1.6 × 10-3	3.6 × 10-2	1.0 × 10-2	7.6 × 10-2	1.0 × 10-1	2.2 × 10-1
Enrichment to LEU at the ACP (Portsmouth)						
NU, DU, LEU feed	1.3 × 10-3	3.4 × 10-2	8.2 × 10-3	7.0 × 10-2	8.3 × 10-2	2.0 × 10-1
LEU product (on-site storage)	--	5.3 × 10-3	--	--	--	5.3 × 10-3
LEU product if shipped to FFFs[a]	6.5 × 10-4 to 1.5 × 10-3	6.0 × 10-3 to 7.2 × 10-3	1.3 × 10-3 to 4.9 × 10-3	2.9 × 10-2 to 1.5 × 10-1	2.0 × 10-2 to 8.1 × 10-2	5.7 × 10-2 to 2.4 × 10-1
Total	1.3 × 10-3 to 2.8 × 10-3	3.9 × 10-2 to 4.1 × 10-2	8.2 × 10-3 to 1.3 × 10-2	7.0 × 10-2 to 2.2 × 10-1	8.3 × 10-2 to 1.6 × 10-1	2.0 × 10-1 to 4.4 × 10-1
Enrichment of DU to NU at the ACP (Portsmouth)						
DU feed	1.1 × 10-3	2.7 × 10-2	6.7 × 10-3	5.1 × 10-2	6.8 × 10-2	1.5 × 10-1
NU product (on-site storage)	--	8.0 × 10-3	--	--	--	8.0 × 10-3
Total	1.1 × 10-3	3.5 × 10-2	6.7 × 10-3	5.1 × 10-2	6.8 × 10-2	1.6 × 10-1
Enrichment to LEU at the NEF						
NU, DU, LEU feed	1.0 × 10-2	4.3 × 10-2	5.2 × 10-2	4.0 × 10-1	6.2 × 10-1	1.1
LEU product[a]	1.1 × 10-3 to 1.7 × 10-3	6.4 × 10-3 to 7.1 × 10-3	2.9 × 10-3 to 6.7 × 10-3	7.7 × 10-2 to 2.2 × 10-1	4.0 × 10-2 to 7.8 × 10-2	1.3 × 10-1 to 3.1 × 10-1
DU tails (to Portsmouth or Paducah)	6.3 × 10-3 to 9.6 × 10-3	3.4 × 10-2 to 3.6 × 10-2	3.0 × 10-2 to 5.1 × 10-2	1.7 × 10-1 to 3.0 × 10-1	4.1 × 10-1 to 5.7 × 10-1	6.5 × 10-1 to 9.7 × 10-1
Total	1.8 × 10-2 to 2.1 × 10-2	8.4 × 10-2 to 8.7 × 10-2	8.5 × 10-2 to 1.1 × 10-1	6.4 × 10-1 to 9.2 × 10-1	1.1 to 1.3	1.9 to 2.4
Enrichment to NU at the NEF						
DU feed	8.2 × 10-3	3.5 × 10-2	4.2 × 10-2	2.9 × 10-1	5.0 × 10-1	8.8 × 10-1
NU product[a]	2.0 × 10-3 to 3.0 × 10-3	1.1 × 10-2 to 1.1 × 10-2	9.5 × 10-3 to 1.6 × 10-2	9.1 × 10-2 to 1.6 × 10-1	1.3 × 10-1 to 1.8 × 10-1	2.4 × 10-1 to 3.8 × 10-1
DU tails (to Portsmouth or Paducah)	3.7 × 10-3 to 5.7 × 10-3	2.0 × 10-2 to 2.1 × 10-2	1.8 × 10-2 to 3.0 × 10-2	9.8 × 10-2 to 1.8 × 10-1	2.4 × 10-1 to 3.4 × 10-1	3.8 × 10-1 to 5.7 × 10-1
Total	1.4 × 10-2 to 1.7 × 10-2	6.6 × 10-2 to 6.8 × 10-2	6.9 × 10-2 to 8.8 × 10-2	4.8 × 10-1 to 6.3 × 10-1	8.7 × 10-1 to 1.0	1.5 to 1.8
Enrichment of DU to NU Followed By Subsequent Enrichment of NU to LEU						
Total	0.0011 to 0.023	0.046 to 0.11	0.0067 to 0.12	0.051 to 0.97	0.068 to 1.4	0.17 to 2.6

a. Range in product results is due to shipping product to various off-site storage locations.

Table 4-10a. Total Transportation Impacts from Rail Shipments of Uranium Hexafluoride under the Proposed Action Update

Case	Public (LCFs)			Worker (LCFs)			Vehicle Emission Health Effects (LCFs)			Radiological Accident Risk (LCFs)			Traffic Fatalities			Total Fatalities		
Enrichment to LEU at the Paducah GDP																		
NU, DU, LEU feed			3.3E-03			5.6E-02			2.0E-02			1.7E-01			2.0E-01			4.5E-01
LEU product (on-site storage)			--			8.4E-03			--			--			--			8.4E-03
LEU product if shipped to FFFs[a]	1.9E-03	to	1.8E-03	1.0E-02	to	1.1E-02	4.8E-03	To	4.8E-03	1.2E-01	to	1.3E-01	4.0E-02	to	1.2E-01	1.8E-01	to	2.7E-01
Total	3.3E-03	to	5.1E-03	6.4E-02	to	6.7E-02	2.0E-02	To	2.5E-02	1.7E-01	to	3.0E-01	2.0E-01	to	3.3E-01	4.6E-01	to	7.3E-01
Enrichment of DU to NU at the Paducah GDP																		
DU feed			6.0E-03			1.0E-01			3.6E-02			2.8E-01			3.7E-01			7.9E-01
NU product (on-site storage)			--			2.9E-02			--			--			--			2.9E-02
Total			6.0E-03			1.3E-01			3.6E-02			2.8E-01			3.7E-01			8.2E-01
Enrichment to LEU at the ACP (Portsmouth)																		
NU, DU, LEU feed			2.2E-03			5.4E-02			1.3E-02			1.1E-01			1.3E-01			3.1E-01
LEU product (on-site storage)			--			8.4E-03			--			--			--			8.4E-03
LEU product if shipped to FFFs[a]	1.0E-03	to	2.4E-03	9.6E-03	to	1.2E-02	2.2E-03	To	8.0E-03	4.8E-02	to	2.4E-01	3.2E-02	to	1.3E-01	9.3E-02	to	3.9E-01
Total	2.2E-03	to	4.6E-03	6.2E-02	to	6.5E-02	1.3E-02	To	2.1E-02	1.1E-01	to	3.5E-01	1.3E-01	to	2.6E-01	3.2E-01	to	7.0E-01
Enrichment of DU to NU at the ACP (Portsmouth)																		
DU feed			4.0E-03			1.0E-01			2.4E-02			1.8E-01			2.5E-01			5.6E-01
NU product (on-site storage)			--			2.9E-02			--			--			--			2.9E-02
Total			4.0E-03			1.3E-01			2.4E-02			1.8E-01			2.5E-01			5.9E-01
Enrichment to LEU at the NEF																		
NU, DU, LEU feed			1.6E-02			6.8E-02			8.4E-02			6.4E-01			1.0E+00			1.8E+00
LEU product [a]	1.8E-03	to	2.7E-03	1.0E-02	to	1.1E-02	4.8E-03	To	1.1E-02	1.2E-01	to	3.4E-01	6.4E-02	to	1.2E-01	2.1E-01	to	4.9E-01
DU tails (to Portsmouth or Paducah)	9.8E-03	to	1.5E-02	5.6E-02	to	6.0E-02	4.8E-02	To	8.0E-02	2.6E-01	to	4.8E-01	6.4E-01	to	9.2E-01	1.0E+00	to	1.6E+00
Total	2.8E-02	to	3.4E-02	1.3E-01	to	1.4E-01	1.4E-01	To	1.7E-01	1.0E+00	to	1.5E+00	1.7E+00	to	2.0E+00	3.0E+00	to	3.9E+00
Enrichment to NU at the NEF																		
DU feed			3.0E-02			1.3E-01			1.5E-01			1.1E+00			1.8E+00			3.2E+00
NU product [a]	7.2E-03	to	1.1E-02	3.9E-02	to	4.0E-02	3.4E-02	To	6.0E-02	3.3E-01	to	6.0E-01	4.6E-01	to	6.4E-01	8.7E-01	to	1.4E+00
DU tails (to Portsmouth or Paducah)	1.4E-02	to	2.1E-02	7.2E-02	to	7.7E-02	6.4E-02	To	1.1E-01	3.6E-01	to	6.4E-01	8.6E-01	to	1.2E+00	1.4E+00	to	2.1E+00
Total	5.0E-02	to	6.2E-02	2.4E-01	to	2.5E-01	2.5E-01	To	3.2E-01	1.7E+00	to	2.3E+00	3.2E+00	to	3.7E+00	5.4E+00	to	6.6E+00
Enrichment of DU to NU Followed By Subsequent Enrichment of NU to LEU																		
Total	4.0E-03	to	8.4E-02	1.7E-01	to	3.9E-01	2.4E-02	To	4.4E-01	1.8E-01	to	3.5E+00	2.5E-01	to	4.8E+00	6.3E-01	to	9.2E+00

a. Range in product results is due to shipping product to various off-site storage locations.

Comparison Table 4-11 lists the impacts for the MEI along the transportation route. This individual was assumed to be located 30 meters (100 feet) from the route and to be exposed to all shipments of the UF_6 (i.e., NU feed, NU product, DU feed, DU tails, LEU feed and LEU product). These shipments were assumed to travel at a speed of 24 kilometers (15 miles) per hour. EA-1607 calculated a probability of an LCF for the MEI along the transportation route was estimated to range from 8.2 x 10-8 to 5.2 x 10-7 over 25 years. Comparison Table 4-11 below estimated the range based on the increased inventories of excess uranium and over 40 years to be 3.55 x 10-7 to 1.85 x 10-6.

EA-1607 Table 4-11. Maximum Individual Impacts from Rail Shipments [a]

Case	Mode	LCFs
Enrichment to LEU at Paducah GDP	Rail	1.9 × 10-7
Enrichment of DU to NU at Paducah GDP	Rail	1.2 × 10-7
Enrichment to LEU at Portsmouth ACP	Rail	1.4 × 10-7
Enrichment of DU to NU at Portsmouth ACP	Rail	8.2 × 10-8
Enrichment to LEU at NEF	Rail	5.0 × 10-7
Enrichment of DU to NU at NEF	Rail	4.0 × 10-7
Enrichment of DU to NU followed by subsequent enrichment of NU to LEU	Rail	1.0 × 10-7 to 5.2 × 10-7

a. Impacts are based on a person located 30 meters from the railroad. The person was assumed to be exposed to all shipments of UF_6. The shipments were assumed to travel at a speed of 24 kilometers per hour.

Comparison Table 4-11. Maximum Individual Impacts from Rail Shipments [a]

Case	Mode	LCFs	
Enrichment to LEU at Paducah GDP	Rail		3.06E-07
Enrichment of DU to NU at Paducah GDP	Rail		4.38E-07
Enrichment to LEU at Portsmouth ACP	Rail		2.22E-07
Enrichment of DU to NU at Portsmouth ACP	Rail		3.01E-07
Enrichment to LEU at NEF	Rail		1.83E-06
Enrichment of DU to NU at NEF	Rail		1.48E-06
Enrichment of DU to NU followed by subsequent enrichment of NU to LEU	Rail	3.55E-07	1.85E-06

a. Impacts are based on a person located 30 meters from the railroad. The person was assumed to be exposed to all shipments of UF_6. The shipments were assumed to travel at a speed of 24 kilometers per hour.

Consequences of severe accident scenarios did not change from the original EA-1607 since they were not driven from the quantities of material. Ultimately, there could be a slight decrease in

overall impacts due to less assay level material but this was not recalculated as part of this SA. The probability of a severe accident occurring in an urban area considering that the duration of the project extended by 15 years would be increased from the range of 8.1 x 10-4 to 0.016 over 25 years to 2.92 x 10-3 to 0.058 over 40 years. In other words, there will be no change in the consequence of a severe rail or truck accident just the probability of an accident will increase **slightly**.

5.4 Uranium Industry Impacts

EA-1607 mitigation action plan (MAP) addressed the DOE commitments that are necessary and how they will be planned or implemented to mitigate any potential significant impacts on the domestic uranium industry from DOE's proposed action. In EA-1607, DOE states two mitigation measures underlie its analysis and would be utilized to mitigate any potentially significant impacts on the domestic uranium industry from its Proposed Action: (1) Prior to particular sales or transfers of NU and LEU, as applicable, a Secretarial Determination pursuant to section 3112(d) of the USEC Privatization Act (Pub. L. 104-134) would be prepared to determine that there is no adverse material impact from the sale or transfer on the domestic uranium industry; and (2) prior to particular sales or transfers of DU, DOE would conduct an analysis to ensure there would be no potentially significant impacts from the sale or transfer on the domestic uranium industry.

Since the issuance of EA-1607 and its subsequent FONSI, additional controls have been implemented by DOE consistent with the commitments outlined in the MAP. These additional controls are identified below.

In July 2013, the U.S. Department of Energy (DOE) issued an Excess Uranium Inventory Management Plan, Report to Congress (2013 Plan). The DOE 2013 Plan states that:

> (DOE) holds inventories of uranium in various forms and qualities, including highly enriched uranium (HEU), low-enriched uranium (LEU), natural uranium (NU), and depleted uranium (DU), that are currently held as excess and not dedicated to U.S. national security missions. Much of this uranium has potential value that could play a role in achieving vital DOE programmatic missions.
>
> The Office of Nuclear Energy, the Office of Environmental Management, and the National Nuclear Security Administration (NNSA) are the organizations within DOE that coordinate the management of these excess uranium inventories. On December 16, 2008, DOE issued its Excess Uranium Inventory Management Plan (2008 Plan), setting forth possible uses for these inventories. This updated Excess Uranium Inventory Management Plan (2013 Plan) replaces the 2008 plan and reflects updated and evolving information, programs, and mission needs, including additions to and

> deletions from the inventory and changes to DOE's uranium management strategy.[1]

The 2013 Plan also states that:

> The Department complies with the requirements in Section 3112(d) of the United States Enrichment Corporation (USEC) Privatization Act, when applicable, to ensure that prior to covered sales or transfers of natural or enriched uranium, the Secretary of Energy determines that those transfers will not have an adverse material impact on the domestic uranium mining, conversion, or enrichment industry (Secretarial Determination).[1]

The most recent Secretarial Determination for the sale or transfer of natural or enriched uranium was issued by the Secretary of Energy on May 1, 2015 (May 2015 Determination). Section 306(a) of the Consolidated Appropriations Act of 2014 requires that:

> Any determination (including a determination made prior to the date of enactment of this Act) by the Secretary pursuant to section 3112(d)(2)(B) of the USEC Privatization Act (110 Stat. 1321-335), as amended, shall be valid for not more than 2 calendar years subsequent to such determination.

Consistent with the original EA, detailed analysis and results of any potential socio-economic impacts are captured as a part of the process/controls listed above.

5.5 Potentially Destructive Acts

As identified in the original EA-1607 the potentially destructive act scenario would result in similar if not the same impacts as would the severe accident scenario. The additional excess inventory does not change the consequences of the act. Although it is not possible to predict the probability of an intentionally destructive act, the consequences would be similar as discussed for a severe accident and the additional excess uranium volume and duration of the project are independent of this possible act occurring.

6.0 CONCLUSION

In this SA, DOE considered impact areas included in several NEPA reviews, including the original EA-1607. The major impact areas that were analyzed in EA-1607 included geographic, economic and transportation. It was determined that the only two resource areas that need to be carried forward in this SA for determination of impacts were transportation and socioeconomic. It was concluded that socioeconomic impacts would be addressed as a part of the market analysis commitments and the Secretarial Determination; therefore, no additional detailed analysis was deemed necessary for socioeconomic impacts in this SA. Consideration was given regarding the additional excess uranium inventory and duration necessary to process, with not-to-exceed

[1] U.S. Department of Energy, Excess Uranium Inventory Management Plan, July 2013 (2013 Plan), pg. iv.

annual MTU NU equivalents as identified in the original EA-1607. The increase in the inventory by 300% and the duration from 25 years to 40 years are the only changes under this SA. The key to the SA analysis is that the annual limits (and annual probabilities) do not change, which allows the application of proportionality among the impact areas, which were transportation impacts. Although there would be overall increases in fatalities and LCFs for the additional excess inventory proposal, there were no additional impacts for any one year. The overall totals were increased proportionally. However, the total fatalities using a time period of 40 years still is estimated to result in less than 1 (0.68) fatality over the life of the project under normal accident scenarios. It is only when severe accident scenarios are considered that the fatalities estimates jump to 9.8. The probability when calculated based on the additional years of transportation of material only resulted in a 0.041 increase in probability of a severe accident. In addition, the probability of multiple severe accidents to occur on any one DOE project that result in multiple fatalities is low and has never happened for any DOE project. DOE concludes that this additional excess inventory and project duration does not constitute a significant change in potential impacts beyond those analyzed and summarized in the original EA-1607. Analysis identified additional potential fatalities, however as they are measurable, they are not deemed any significant difference from what was originally analyzed in EA-1607 when compared against total traffic accidents over 40 years and cancer deaths annually over that period of time.

7.0 DETERMINATION

Based on the analysis in this SA, DOE has concluded that the information evaluated herein does not constitute significant new circumstances or information relevant to environmental concerns and bearing on the Proposed Action, which is increasing the excess uranium volume to 80,000 MTU NU equivalent over 40 years. This addition of excess uranium inventory processing over 40 years does not significantly change the Proposed Action outlined in the original EA-1607 and thus DOE has not made substantial changes in the Proposed Action that are relevant to environmental concerns, nor would contribute to significant additional impacts not previously analyzed in EA-1607. DOE has determined a supplement to the EA-1607 is not necessary nor any amendment to the FONSI or MAP required.

8.0 REFERENCES

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