DOE/EIS-0283-S2
July 2012

Savannah River Site – South Carolina

Sequoyah Nuclear Plant – Tennessee

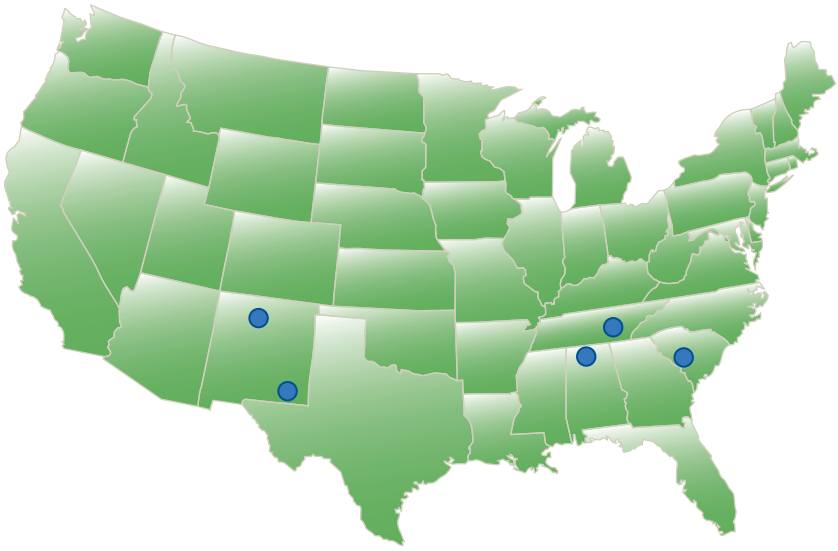
Browns Ferry Nuclear Plant – Alabama

Waste Isolation Pilot Plant – New Mexico

Los Alamos National Laboratory – New Mexico

Draft Surplus Plutonium Disposition Supplemental Environmental Impact Statement

Volume 2
(Appendices A through K)



National Nuclear Security Administration

U.S. Department of Energy
Office of Fissile Materials Disposition
and
Office of Environmental Management
Washington, DC

AVAILABILITY OF THE
DRAFT SURPLUS PLUTONIUM DISPOSITION
SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT
(SPD Supplemental EIS)

To submit comments on this *SPD Supplemental EIS*, or to request a copy, please contact:

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Locations: South Carolina, New Mexico, Alabama, and Tennessee

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This document is available on the *SPD Supplemental EIS* website (http://nnsa.energy.gov/nepa/spdsupplementaleis), the DOE NEPA website (http://energy.gov/nepa/nepa-documents), and the Savannah River Operations Office website (http://www.srs.gov/general/pubs/envbul/nepa1.htm) for viewing and downloading.

Abstract: On March 28, 2007, DOE published a Notice of Intent (NOI) in the *Federal Register* (72 FR 14543) to prepare the *SPD Supplemental EIS* to evaluate the potential environmental impacts at the Savannah River Site (SRS) in South Carolina of disposition pathways for surplus weapons-usable plutonium (referred to as "surplus plutonium") originally planned for immobilization. The proposed actions and alternatives included construction and operation of a new vitrification capability in K-Area, processing in H-Canyon/HB-Line and the Defense Waste Processing Facility (DWPF), and fabricating mixed oxide (MOX) fuel in the MOX Fuel Fabrication Facility (MFFF) currently under construction in F-Area. Before the *Draft SPD Supplemental EIS* was issued, DOE decided to modify the scope of this *SPD Supplemental EIS* and evaluate additional alternatives. Therefore, on July 19, 2010 and again on January 12, 2012, DOE issued amended NOIs (75 FR 41850 and 77 FR 1920) announcing its intent to modify the scope of this *SPD Supplemental EIS* and to conduct additional public scoping.

The public scoping periods extended from March 28, 2007, through May 29, 2007; July 19, 2010 through September 17, 2010; and January 12, 2012 through March 12, 2012. Scoping meetings were conducted on April 17, 2007, in Aiken, South Carolina; April 19, 2007, in Columbia, South Carolina; August 3, 2010, in Tanner, Alabama; August 5, 2010, in Chattanooga, Tennessee; August 17, 2010, in North Augusta, South Carolina; August 24, 2010, in Carlsbad, New Mexico; August 26, 2010, in Santa Fe, New Mexico; and February 2, 2012, in Pojoaque, New Mexico. A summary of the comments received during the public scoping periods is provided in Chapter 1 of this *SPD Supplemental EIS* and available on the project website at http://nnsa.energy.gov/nepa/spdsupplementaleis.

DOE has revised the scope of this *SPD Supplemental EIS* to refine the quantity and types of surplus plutonium, evaluate additional alternatives (including additional pit disassembly and conversion options), no longer

consider in detail one of the alternatives identified in the 2007 NOI (ceramic can-in-canister immobilization), and revise DOE's preferred alternative. In this *SPD Supplemental EIS*, DOE describes the environmental impacts of alternatives for disposition of 13.1 metric tons (14.4 tons) of surplus plutonium for which DOE has not made a disposition decision, including 7.1 metric tons (7.8 tons) of plutonium from pits that were declared excess to national defense needs after publication of the 2007 NOI, and 6.0 metric tons (6.6 tons) of surplus non-pit plutonium. The analyses also encompass potential use of MOX fuel in reactors at the Sequoyah and Browns Ferry Nuclear Plants of the Tennessee Valley Authority (TVA).

In this *SPD Supplemental EIS*, DOE evaluates the No Action Alternative and four action alternatives for disposition of 13.1 metric tons (14.4 tons) of surplus plutonium: (1) Immobilization to DWPF Alternative – glass can-in-canister immobilization of both surplus non-pit and disassembled and converted pit plutonium and subsequent filling of the canister with high-level radioactive waste (HLW) at DWPF at SRS; (2) MOX Fuel Alternative – fabrication of the disassembled and converted pit plutonium and much of the non-pit plutonium into MOX fuel at MFFF, for use in domestic commercial nuclear power reactors to generate electricity, and disposition of the surplus non-pit plutonium that is not suitable for MFFF as transuranic waste at the existing Waste Isolation Pilot Plant (WIPP), a deep geologic repository in southeastern New Mexico; (3) H-Canyon/HB-Line to DWPF Alternative – processing the surplus non-pit plutonium in the existing H-Canyon/HB-Line at SRS with subsequent disposal as HLW (i.e., vitrification in the existing DWPF), and fabrication of the pit plutonium into MOX fuel at MFFF; and (4) WIPP Alternative – processing the surplus non-pit plutonium in the existing H-Canyon/HB-Line for disposal as transuranic waste at WIPP, and fabrication of the pit plutonium into MOX fuel at MFFF. Under all alternatives, DOE would also disposition as MOX fuel, 34 metric tons (37.5 tons) of surplus plutonium in accordance with previous decisions. The 34 metric tons (37.5 tons) of plutonium would be fabricated into MOX fuel at MFFF, for use at domestic commercial nuclear power reactors. Within each action alternative, DOE also evaluates options for pit disassembly and conversion to, among other things, disassemble nuclear weapons pits and convert the plutonium metal to an oxide form for disposition. Under three of the options, DOE would not build a stand-alone Pit Disassembly and Conversion Facility in F-Area at SRS, which DOE had previously decided to construct (65 FR 1608).

Preferred Alternative: The MOX Fuel Alternative is DOE's Preferred Alternative for surplus plutonium disposition. DOE's preferred option for pit disassembly and the conversion of surplus plutonium metal, regardless of its origins, to feed for MFFF is to use some combination of facilities at Technical Area 55 at Los Alamos National Laboratory and K-Area, H-Canyon/HB-Line, and MFFF at SRS, rather than to construct a new stand-alone facility. This would likely require the installation of additional equipment and other modifications to some of these facilities. DOE's preferred alternative for disposition of surplus plutonium that is not suitable for MOX fuel fabrication is disposal at WIPP. The TVA does not have a preferred alternative at this time regarding whether to pursue irradiation of MOX fuel in TVA reactors and which reactors might be used for this purpose.

Public Involvement: Comments on this *Draft SPD Supplemental EIS* should be submitted within 60 days of the publication of the U.S. Environmental Protection Agency's Notice of Availability in the *Federal Register* to ensure consideration in preparation of the *Final SPD Supplemental EIS*. DOE will consider comments received after the 60-day comment period to the extent practicable. Written comments may be submitted to Sachiko McAlhany via postal mail to the address provided above, via email to spdsupplementaleis@saic.com, or by toll-free fax to 1-877-865-0277. Public hearings on this *Draft SPD Supplemental EIS* will be held during the comment period. The dates, times, and locations of these hearings will be published in a DOE *Federal Register* notice and will also be announced by other means, including the project website, newspaper advertisements, and notification to persons on the mailing list. Information on this *SPD Supplemental EIS* can be found on the project website at http://nnsa.energy.gov/nepa/spdsupplementaleis.

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ACRONYMS, ABBREVIATIONS, AND CONVERSION CHARTS

ACRONYMS, ABBREVIATIONS, AND CONVERSION CHARTS

ALARA	as low as reasonably achievable
AREVA	AREVA fuel fabrication plant
ARF	airborne release fraction
ARIES	Advanced Recovery and Integrated Extraction System
BFN	Browns Ferry Nuclear Plant
BMP	best management practice
BWR	boiling water reactor
CCC	criticality control container
CFR	*Code of Federal Regulations*
CMRR-NF	Chemistry and Metallurgy Research Building Replacement Nuclear Facility
CPA	cargo palette assemblies
CRT	cargo restraint transporters
CSSC	Container Surveillance and Storage Capability
CSWTF	Central Sanitary Wastewater Treatment Facility
D&D	decontamination and decommissioning
DHS	U.S. Department of Homeland Security
DMO	direct metal oxidation
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
DR	damage ratio
DSA	Documented Safety Analysis
DUF_6	depleted uranium hexafluoride
DUNH	depleted uranyl nitrate, hexahydrate
DWPF	Defense Waste Processing Facility
EA	environmental assessment
EIS	environmental impact statement
EPA	U.S. Environmental Protection Agency
EPRI	Electric Power Research Institute
ETP	F- and H-Area Effluent Treatment Project
FEMA	Federal Emergency Management Agency
FFTF	Fast Flux Test Facility
FONSI	Finding of No Significant Impact
FR	*Federal Register*
FGE	fissile gram equivalent
GDP	Gross Domestic Product
GTRI	Global Threat Reduction Initiative
GWSB	Glass Waste Storage Building
Hanford	Hanford Site
HC/HBL	H-Canyon/HB Line
HEPA	high-efficiency particulate air
HEU	highly enriched uranium

HLW	high-level radioactive waste
HUFP	Hanford Unirradiated Fuel Package
HVAC	heating, ventilating, and air conditioning
HWR	heavy-water reactor
IPE	Individual Plant Examination
ISLOCA	interfacing systems loss-of-coolant accident
JFD	joint frequency distribution
KAMS	K-Area Material Storage capability
KIS	K-Area Interim Surveillance capability
LANL	Los Alamos National Laboratory
LCF	latent cancer fatality
LEU	low-enriched uranium
LLNL	Lawrence Livermore National Laboratory
LLW	low-level radioactive waste
LOCA	loss-of-coolant accident
LPF	leak path factor
LTA	lead test assembly
MAR	material at risk
MEI	maximally exposed individual
MFFF	Mixed Oxide Fuel Fabrication Facility
MLLW	mixed low-level radioactive waste
MOX	mixed oxide
MSA	K-Area Material Storage Area
MT	metric ton
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NNSA	National Nuclear Security Administration
NNSS	Nevada National Security Site
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NRC	U.S. Nuclear Regulatory Commission
NRF	National Response Framework
NRHP	National Register of Historic Places
NRIA	Nuclear/Radiological Incident Annex
ORNL	Oak Ridge National Laboratory
Pantex	Pantex Plant
PC	performance category
PCB	polychlorinated biphenyl
PDC	Pit Disassembly and Conversion capability
PDCF	Pit Disassembly and Conversion Facility
PF-4	Plutonium Facility
PIDADS	perimeter intrusion, detection, assessment and delay system
POC	pipe overpack container
PRA	probabilistic risk assessment

psig	pounds per square inch gauge
PWR	pressurized water reactors
RANT	Radioassay and Nondestructive Testing Facility
RF	respirable fraction
RFETS	Rocky Flats Environmental Technology Site
RLUOB	Radiological Laboratory/Utility/Office Building
RLWTF	Radioactive Liquid Waste Treatment Facility
ROD	Record of Decision
ROI	Region of Influence
SAR	safety analysis report
SCDHEC	South Carolina Department of Health and Environmental Control
SGTR	steam generator tube rupture
SHPO	State Historic Preservation Office
SQN	Sequoyah Nuclear Plant
SRARP	Savannah River Archaeological Research Program
SRS	Savannah River Site
STA	Secure Transportation Asset
SWPPP	Storm Water Pollution Prevention Plan
TA	technical area
TRAGIS	Transportation Routing Analysis Geographic Information System
TRU	transuranic waste
TRUPACT-II	Transuranic Package Transporter Model 2
TSCA	Toxic Substances Control Act
TVA	Tennessee Valley Authority
UFSAR	Updated Final Safety Analysis Report
U.S.C.	United States Code
VRM	Visual Resource Management
WIPP	Waste Isolation Pilot Plant
WSB	Waste Solidification Building
Y-12	Y-12 National Security Complex
°C	degrees Celsius
°F	degrees Fahrenheit

CONVERSIONS

METRIC TO ENGLISH			ENGLISH TO METRIC		
Multiply	**by**	**To get**	**Multiply**	**by**	**To get**
Area					
Square meters	10.764	Square feet	Square feet	0.092903	Square meters
Square kilometers	247.1	Acres	Acres	0.0040469	Square kilometers
Square kilometers	0.3861	Square miles	Square miles	2.59	Square kilometers
Hectares	2.471	Acres	Acres	0.40469	Hectares
Concentration					
Kilograms/square meter	0.16667	Tons/acre	Tons/acre	0.5999	Kilograms/square meter
Milligrams/liter	1 [a]	Parts/million	Parts/million	1 [a]	Milligrams/liter
Micrograms/liter	1 [a]	Parts/billion	Parts/billion	1 [a]	Micrograms/liter
Micrograms/cubic meter	1 [a]	Parts/trillion	Parts/trillion	1 [a]	Micrograms/cubic meter
Density					
Grams/cubic centimeter	62.428	Pounds/cubic feet	Pounds/cubic feet	0.016018	Grams/cubic centimeter
Grams/cubic meter	0.0000624	Pounds/cubic feet	Pounds/cubic feet	16,018.5	Grams/cubic meter
Length					
Centimeters	0.3937	Inches	Inches	2.54	Centimeters
Meters	3.2808	Feet	Feet	0.3048	Meters
Kilometers	0.62137	Miles	Miles	1.6093	Kilometers
Radiation					
Sieverts	100	Rem	Rem	0.01	Sieverts
Temperature					
Absolute					
Degrees C + 17.78	1.8	Degrees F	Degrees F - 32	0.55556	Degrees C
Relative					
Degrees C	1.8	Degrees F	Degrees F	0.55556	Degrees C
Velocity/Rate					
Cubic meters/second	2118.9	Cubic feet/minute	Cubic feet/minute	0.00047195	Cubic meters/second
Grams/second	7.9366	Pounds/hour	Pounds/hour	0.126	Grams/second
Meters/second	2.237	Miles/hour	Miles/hour	0.44704	Meters/second
Volume					
Liters	0.26418	Gallons	Gallons	3.7854	Liters
Liters	0.035316	Cubic feet	Cubic feet	28.316	Liters
Liters	0.001308	Cubic yards	Cubic yards	764.54	Liters
Cubic meters	264.17	Gallons	Gallons	0.0037854	Cubic meters
Cubic meters	35.314	Cubic feet	Cubic feet	0.028317	Cubic meters
Cubic meters	1.3079	Cubic yards	Cubic yards	0.76456	Cubic meters
Cubic meters	0.0008107	Acre-feet	Acre-feet	1233.49	Cubic meters
Weight/Mass					
Grams	0.035274	Ounces	Ounces	28.35	Grams
Kilograms	2.2046	Pounds	Pounds	0.45359	Kilograms
Kilograms	0.0011023	Tons (short)	Tons (short)	907.18	Kilograms
Metric tons	1.1023	Tons (short)	Tons (short)	0.90718	Metric tons

ENGLISH TO ENGLISH					
Acre-feet	325,850.7	Gallons	Gallons	0.000003046	Acre-feet
Acres	43,560	Square feet	Square feet	0.000022957	Acres
Square miles	640	Acres	Acres	0.0015625	Square miles

a. This conversion is only valid for concentrations of contaminants (or other materials) in water.

METRIC PREFIXES

Prefix	Symbol	Multiplication factor
exa-	E	1,000,000,000,000,000,000 = 10^{18}
peta-	P	1,000,000,000,000,000 = 10^{15}
tera-	T	1,000,000,000,000 = 10^{12}
giga-	G	1,000,000,000 = 10^{9}
mega-	M	1,000,000 = 10^{6}
kilo-	k	1,000 = 10^{3}
deca-	D	10 = 10^{1}
deci-	d	0.1 = 10^{-1}
centi-	c	0.01 = 10^{-2}
milli-	m	0.001 = 10^{-3}
micro-	μ	0.000 001 = 10^{-6}
nano-	n	0.000 000 001 = 10^{-9}
pico-	p	0.000 000 000 001 = 10^{-12}