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Disclaimer:

Savannah River Site

Nuclear Materials Management Plan

FY 2017-2031

SRNL-RP-2017-00234 rev 0

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Prepared by
Savannah River Nuclear Solutions, LLC
Savannah River National Laboratory
Nuclear Materials Management Programs
for the U.S. Department of Energy

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ACRONYMS

CNL	Canadian Nuclear Laboratories
DOE	Department of Energy
DP	Defense Programs
DRR	Domestic Research Reactor
DSA	Documented Safety Analysis
DWPF	Defense Waste Processing Facility
EM	DOE Environmental Management
EU	Enriched Uranium
FRR	Foreign Research Reactor
HCA	H-Canyon Area
HEU	Highly Enriched Uranium
HFIR	High Flux Isotope Reactor
HLW	High Level Waste
LANL	Los Alamos National Laboratory
LEU	Low Enriched Uranium
LWT	Legal Weight Truck
M3	DOE Office of Material Management and Minimization (NA-23)
MTR	Material Test Reactor
NEPA	National Environmental Policy Act
NDU	No Defined Use
NMIA	Nuclear Materials Inventory Assessment
NNSA	National Nuclear Security Administration
Np	Neptunium
NRU/NRX	National Research Universal / National Research Experimental
NU	Natural Uranium
ORNL	Oak Ridge National Laboratory
P&PD	Production and Planning Directive
Pu	Plutonium
SNF	Spent Nuclear Fuel
SNM	Special Nuclear Material
SRNL	Savannah River National Laboratory
SRNS	Savannah River Nuclear Solutions
SRS	Savannah River Site
SRTE	Savannah River Tritium Enterprise
TPBAR	Tritium Producing Burnable Absorber Rod
TRM	Target Residue Material
TRU	Transuranic
TVA	Tennessee Valley Authority
WIPP	Waste Isolation Pilot Plant

1.0 EXECUTIVE SUMMARY

The purpose of the Nuclear Materials Management Plan (herein referred to as "this *Plan*") is to integrate and document the activities required to disposition the legacy and/or surplus Enriched Uranium (EU) and Plutonium (Pu) and other nuclear materials already stored or anticipated to be received by facilities at the Department of Energy (DOE) Savannah River Site (SRS) as well as the activities to support the DOE Tritium mission. It establishes a planning basis for EU and Pu processing operations in Environmental Management Operations (EMO) facilities through the end of their program missions and for the tritium through the National Nuclear Security Administration (NNSA) Defense Programs (DP) facilities. Its development is a joint effort among the Department of Energy - Savannah River (DOE-SR), DOE – Environmental Management (EM), NNSA Office of Material Management and Minimization (M3), NNSA Savannah River Field Office (SRFO), and the Management and Operations (M&O) contractor, Savannah River Nuclear Solutions, LLC (SRNS). Life-cycle program planning for Nuclear Materials Stabilization and Disposition and the Tritium Enterprise may use this *Plan* as a basis for the development of the nuclear materials disposition scope and schedule.

This *Plan* assumes full funding to accomplish the required project and operations activities. It is recognized that some aspects of this *Plan* are pre decisional with regard to National Environmental Policy Act (NEPA); in such cases new NEPA actions will be required.

1.1 Spent Nuclear Fuel, Target Material, and Plutonium Receipts

In response to the Annual Call for Site Nuclear Materials Management Plans from FY 2017-2031 timeframe, SRS is currently scheduled to receive spent nuclear fuels (SNF) to L-Basin in the form of Domestic Research Reactor (DRR) assemblies including High Flux Isotope Reactor (HFIR) cores; and Foreign Research Reactor (FRR) assemblies. H-Canyon is scheduled to receive liquid Canadian HEU target residue material (TRM) in approximately 100 Legal Weight Truck (LWT) casks between the FY 2017 and FY 2020. K Area received fuel plates and rods from Japan's Fast Critical Assembly reactor in June 2016. Additionally, K-Area has enough capacity to continue to receive and store Gap Special Nuclear Material (SNM) as well as excess plutonium oxides from Los Alamos National Laboratory (LANL) and other DOE facilities. Plutonium shipments from LANL to SRS for interim storage are currently suspended.

One of the key goals for L-Area in FY 2017 is to continue Canadian National Research Universal / National Research Experimental (NRU/NRX) receipts into L basin in coordination with other FRR receipts, the DRR receipts, and SNF transfers to H-Canyon (HCA) for processing. These NRU/NRX receipts are scheduled to complete in FY 2020. H-Canyon has completed modifications to allow the receipt of the Canadian TRM from their molybdenum 99 processing. Another key management goal is for HCA to continue receipt of this TRM through FY 2020.

1.2 SNF, Plutonium, and Mark-18A Processing

H-Canyon is scheduled to process approximately 1,000 Material Test Reactor (MTR) type bundles and approximately 200 HFIR cores by the end of FY 2024. The uranium from the SNF processing will be combined with the TRM receipts and purified through H-Canyon to make the uranium acceptable for blending down to low enriched uranium (LEU). The resultant ~4.95%

LEU will become part of the DOE/Tennessee Valley Authority (TVA) Interagency Agreement (IA). Per the IA, DOE supplies ~4.95% LEU to TVA for use as feed for the fabrication of TVA commercial power reactor fuel. The material, currently approved for processing through H-Canyon, is scheduled to produce ~40 metric tons uranium (MTU) between FY 2019 and FY 2025.

The transfer and dissolving of excess Pu from K-Area through H-Canyon has ceased. The dissolver used for this activity will be replaced and H-Canyon will begin processing SNF in two canyon dissolvers. Two SNF dissolver operations are scheduled to begin in FY 2018 and complete in FY 2024.

HB Line is continuing to process existing Pu solutions within the facility producing oxides in FY 2017. The resultant Pu oxide material will be returned to K-Area for continued interim storage until final disposition. Due to equipment and operational issues, the facility has not yielded the planned rates of production therefore the planned future production is under review.

K-Area established the capability to down blend and package Pu not suitable for mixed oxide fuel fabrication feed. Processing of the non-suitable Pu was initiated in FY 2016 and continues in FY 2017. The decision to down blend up to 6 MT of non-suitable Pu was announced in a Record of Decision (ref. Federal Register notice 81 FR 19588) as analyzed in the Surplus Plutonium Disposition Supplemental Environmental Impact Statement (ref. Federal Register notice 80 FR 80348; 12/24/2015). The disposition of 6 MT of non-suitable plutonium is baselined to complete in FY 2046 using a 1 shift, 1 glovebox scenario. The final disposition path for this material after processing is to the Waste Isolation Pilot Plant (WIPP) in Carlsbad, NM.

The baseline schedule for Savannah River National Laboratory (SRNL) to process 65 Mark-18A targets begins in FY 2021 and processes through FY 2028. The scope of this project is to recover the Pu-244 and heavy curium contained in these targets. The targets will be processed in SRNL's shielded cells, where the plutonium-244, americium, curium, and fission products will be converted into oxide to be transported to Oak Ridge National Laboratory (ORNL) for future use.

1.3 Tritium Processing and Recovery

The Tritium Enterprise manages tritium as a defined work activity positioned to be responsive to NNSA needs. The NNSA Tritium Facility is scheduled to continue the supply of mission deliverables in support of the nation's nuclear defense, including limited-life components, surveillance function testing, and tritium extraction. NNSA is projecting an increased demand for new tritium therefore the Tritium Facility is anticipating a ramp up in Tritium-Producing Burnable Absorber Rods (TPBAR) processing rates. These projections will be reflected in the Production and Planning Directive (P&PD).

1.4 Nuclear Materials Planning Roadmap

The planning Roadmap, in Figure 1.4-1, shows the integrated activities of the EMO approved missions for H-Area, K-Area, L-Area, E-Area, and SRNL which allow disposition of legacy and/or surplus nuclear materials. Processing activities for the SRS Tritium Enterprise are not included in the Roadmap because there is no interface between the DP activities and the EMO activities. The Roadmap is a living document that is revised periodically and configuration

managed with a formal log to document the basis for each change. It includes the operating and storage plans for the EM and M3 current baseline scopes in this *Plan*.

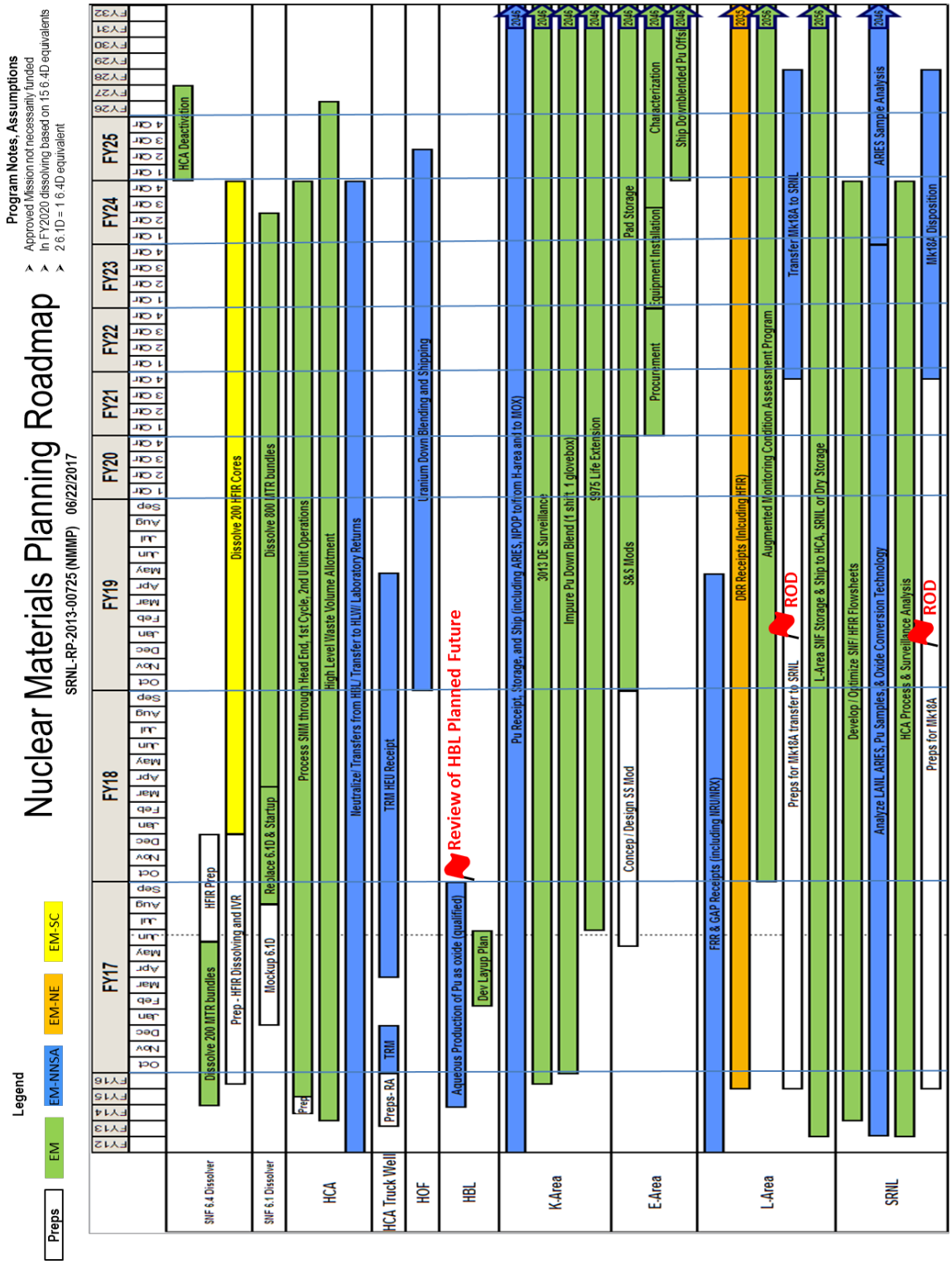

Figure 1.4-1 Nuclear Materials Planning Roadmap (June 2017)

2.0 SUMMARY INVENTORY

SRS manages a large set of operations for a variety of nuclear materials. Significant projects, accomplishments, and recommendations related to materials production, disposition, and processing are grouped into three areas, SNM Storage, SNM Disposition, and Tritium Supply that are significant to national goals:

1. SNM Storage
   Receive, store, and ship nuclear materials in a safe and secure manner. Operate and maintain L and K area facilities to support consolidation of FRR and DRR fuel returns and consolidate storage of plutonium for processing and disposition.
2. SNM Disposition
   Develop uranium and plutonium throughput improvement and preparation initiatives to allow for continued disposition of uranium items and SNF from L-Area through H-Canyon and SRNL, and plutonium processing through H-Area and K-Area.
3. Tritium Supply
   Manage tritium per the classified Nuclear Weapons Complex directives, including the P&PD to define the work scope and establish a delivery schedule.

The SRS Nuclear Material Inventory Assessment (NMIA) contains both Defined Use and No Defined Use materials.

2.1 Defined Use

The “Defined Use” materials within the SRS inventory consist of materials for tritium operations, Mark 18A targets, and various sources and standards.

The tritium inventory is needed to continue to meet the NNSA demands for defense needs. The tritium in inventory is managed as defined use and scheduled within the classified Nuclear Weapons Complex directives, including the P&PD.

SRS has 65 Mark 18A targets in inventory. There is a DOE Program in progress to process the 65 targets at the SRNL and recover the Pu-244 and heavy curium. The Pu-244 will be packaged and transported to the Oak Ridge National Laboratory (ORNL) for storage as material for critical uses. During the recovery of the Pu-244, heavy curium will also be recovered as a byproduct and shipped to ORNL for potential use.

The sources and standards are required to complete the current SNF, plutonium disposition, and tritium missions.

2.2 No Defined Use

The “No Defined Use” (NDU) materials include the remaining material in SRS inventory with no programmatic use in a DOE program and either a known disposition path or a disposition to be determined.

The NDU inventory constitutes over 90% of the SNM inventory. These materials contain various plutonium and uranium items stored in K-Area and L-Area as well as the HEU and LEU SNF stored in L-Basin.

The excess plutonium items in inventory are both metals and oxides whose proposed disposition paths are either to process for use as feed for mixed oxide fuel fabrication or to process for disposition to the Waste Isolation Pilot Plant (WIPP). These items include consolidated plutonium inventories excessed from Rocky Flats, Hanford, Lawrence Livermore National Laboratory, Los Alamos National Laboratory, SRS FB Line facility, and Gap Pu materials which are DOE origin materials returned from foreign location.

The majority of the uranium items are in SNF bundles. DOE plans to process 1,000 SNF bundles and up to 200 HFIR cores through the H-Canyon and blend down the resultant uranium for disposition to the TVA for use as commercial power reactor fuel. The disposition path for the remaining excess uranium has not been decided (e.g. processing or dry storage). Funding has not yet been provided to pursue a dry storage option.

2.3 Inventory Quantities

Table C-1, in the classified addendum SRNL-RP-2017-00235 *(U) Savannah River Site Nuclear Materials Management Plan FY 2017*, shows a breakdown summary of the SRS NMIA. Other tables in the classified addendum break down each nuclear material type in inventory by disposition pathway and program location (see section 5.0).

3.0 MATERIAL DEMAND AND RETENTION

SRS has only two programs that require material as a part of material demand; the Tritium Enterprise and the Mark-18A program. The tritium demand is based on the DP need and is shown in various Nuclear Weapons Complex directives, and the Mark-18A demand is the entire inventory of Mark-18A targets which are currently in SRS inventory. Table C-2, of the classified addendum SRNL-RP-2017-00235, is not extended beyond current inventories, except as noted for P&PD projections.

3.1 Estimated Nuclear Material Demand

The estimated nuclear material demand at SRS is based on the current deliverables for tritium as defined/scheduled in several classified Nuclear Weapons Complex directives, including the current Nuclear Weapon P&PD, Master Nuclear Schedule, Integrated Weapons Activity Plan, and specific weapon Program Control Documents, Component Description Documents, and program planning documents.

There is no demand for any Mark-18A material to be sent to SRS because SRS already has all the Mark-18A material in inventory.

3.2 Justification of Retention of Defined Use Materials

The justification for retention of these tritium materials is to allow loading of tritium reservoirs and to support tritium surveillance activities as directed in the Nuclear Weapons P&PD and other classified supporting documents.

The justification for retention of the Mark-18A targets is for processing isotope recovery of this material at SRNL to recover the irreplaceable Pu-244.

The justification for retention of the various sources and standards are to allow for continued disposition of the uranium and plutonium.

3.3 Nuclear Material Shortfalls

NNSA is responsible for ensuring a supply of tritium is produced for the national inventory based on the requirements contained in Nuclear Weapons P&PD and other supporting documents. While tritium is currently produced in a single reactor, tritium needs may demand an additional reactor be placed online for increased tritium production by the early 2020's. This demand would increase TPBAR processing.

4.0 MATERIAL ADDITIONS AND REMOVALS – RECEIPTS, SHIPPING, AND OTHER REMOVALS

Tables C-3 and Table C-4, in the classified addendum SRNL-RP-2017-00235, show the SRS Nuclear Material Removal/Shipping and Nuclear Material Additions/Receiving projections respectively. Tritium Enterprise additions and removals will not be shown on these tables.

4.1 Material Additions (Receipts)

The breakdowns of the following receipts are captured in Table C-3, Nuclear Material Additions/Receiving, of the classified addendum SRNL-RP-2017-00235.

For this data call time period of FY 2017 through FY 2031, SRS is scheduled to receive to L-Basin DRR assemblies, HFIR cores, and FRR assemblies and to H-Canyon Canadian HEU liquid TRM. This material will be dispositioned via the HEU Blend Down program and shipped off site.

H-Area will receive natural uranium (NU) solutions for blending down the HEU to ~4.95% enriched LEU. These tankers will be supplied by TVA as part of the DOE/TVA Interagency Agreement for the HEU Blend Down program from FY 2018 through FY 2025.

K-Area is available until at least FY 2035 to receive Gap SNM within approved shipping containers and additional plutonium oxides. Although the Department has suspended shipments of LANL Pu Oxide to SRS, K-Area remains available for receipts as authorized. K-Area is scheduled to receive 11 drums of uranium mixed oxide material from Y-12 in FY 2020. This HEU oxide material is contained in 8 drums of HEU with neptunium contamination and 3 drums

of HEU with Pu contamination. This material is not acceptable for storage in the Y-12 HEU Materials Facility (HEUMF) and will be dispositioned to WIPP after down blending.

4.2 Material Removals (Shipping)

The details of the following shipping plans are captured in Table C-4, Nuclear Material Removal/Shipping, of the classified addendum SRNL-RP-2017-00235.

The shipping plans for SRS are as follows:

• Ship approximately 40 MT of blended LEU to AREVA (TVA's contractor) beginning in FY 2019 and completing in FY 2025 via the HEU Blend Down program.

• Resume shipping of down blended Pu to WIPP. An initial shipment of excess Pu has been made in FY 2017, with subsequent shipments placed in the queue of waste to be shipped to WIPP.

• SRNL to ship the Pu-244 and the heavy curium recovered from the Mark-18A fuels to ORNL from FY 2021 through FY 2028.

4.3 Estimated Material Removals (Other)

SRS is anticipating the removal of the stored heavy water in the FY 2034 to FY 2039 timeframe. L-Basin could be deinventoried of the remaining SNF (the SNF beyond the 1000 bundles and 200 HFIR cores planned for processing through H-Canyon) by either 1) processing the aluminum clad SNF through H-Canyon and shipment of non-aluminum clad SNF off-site or 2) dry storing the SNF on-site or 3) shipping the SNF off-site. The disposition path for the remaining SNF and other uranium items has not been decided (e.g. processing or dry storage). Funding has not yet been provided to pursue a dry storage option. Conceptually, L-Area could deinventory L-basin to dry storage in the FY 2038 to FY 2056 timeframe, with final removal to an offsite repository by the end of FY 2059 if available.

5.0 FACILITIES, PROCESSES, AND EQUIPMENT

The facilities within SRS which play major roles in nuclear material management and disposition are K-Area, L-Area, H-Area, E-Area, and SRNL.

5.1 K-Area

K-Area was one of the five production reactor areas on the SRS. Since the end of the Cold War when the SRS reactors were shutdown, it has been repurposed for nuclear material storage. It currently has a capacity for approximately 8,500 drums of SNM. SRS does not foresee any capacity challenges with drum storage based on the current receipt and disposition plans.

K-Area has established the capability to down blend nuclear material for disposition to WIPP. This glovebox operation began in FY 2016 and down blending of up to 6 MT of plutonium oxide not suitable for disposition as mixed oxide fuel is planned.

A Documented Safety Analysis (DSA) revision is currently planned which will allow K-Area to expand their capability to receive and store nuclear material in additional types of Type B shipping containers. Some current Type B containers and their content envelopes are currently restricted from storage in K-Area. This revision is scheduled to complete in FY 2020 and will include HEU oxide in an ES3100 configuration, such as the HEU-Np material expected to be received from Y-12.

5.2 L-Area

L-Area, like K-Area, was also one of the five production reactor areas on the SRS. L-Area has maintained its spent fuel wet storage basin and has the capability to receive and store FRR and DRR fuel returns. It has the capability to receive, bundle, and store MTR type fuels (3650 bundle positions) and HFIR fuels (120 full cores). It is currently ~82% full for MTR type fuel storage, and 100% full for HFIR fuels.

In order for L-Area to receive and unload the NRU/NRX fuel from Canadian Nuclear Laboratories (CNL), a modification to the Shielded Transfer System (STS) was completed. This allows L-Area to accommodate the longer and heavier NRU/NRX fuels.

L-Area has limited dry storage capacity for zero burnup, low dose materials in drums. Dry storage capacity is currently ~93% full.

5.3 H-Area (H-Canyon and HB Line)

H-Canyon is the only operating full scale radiochemical processing facility in the United States. H-Canyon's remote operation and versatility allow for processing various types of nuclear materials with the capability to recover uranium, neptunium, or plutonium.

Current mission for the H-Canyon two dissolvers is shifting from processing both uranium and plutonium to processing uranium only. The dissolver used for plutonium processing is being replaced and will be used for processing MTR type SNF, while the current uranium dissolver will be configured for processing HFIR spent fuels. HFIR processing is scheduled to begin in early FY 2018, while the 2nd dissolver replacement and startup is scheduled to complete in mid FY 2018. The downstream unit operations for uranium separation from the SNF dissolution are fully operational. H-Canyon is expected to complete the uranium separation from 1,000 MTR bundles and 200 HFIR cores by mid FY 2024. The potential to continue the SNF disposition after the material covered by the March 2013 Amended Record of Decision (AROD) is completed will require additional NEPA actions to approve additional material processing.

H-Canyon completed modifications, and began direct receipts, off-loading, and processing of the liquid HEU TRM from the CNL. The CNL processing began in FY 2017 and is scheduled to complete in FY 2020. An extension of the FRR ROD will be required beyond May 2019.

HB Line is a glovebox processing facility. HB Line continues plutonium processing in FY 2017. Due to equipment and operational issues, the facility has not yielded the planned rates of production therefore the planned future production is under review.

5.4 E-Area

E-Area has the capability to store low level and transuranic waste. The low level waste remains onsite for disposal, while the TRU waste is packaged and transported to WIPP per the WIPP receipt schedule.

5.5 SRNL

While SRNL is an applied research and development laboratory for the DOE Office of Environmental Management (DOE-EM), it also serves the nation in two other business areas: Clean Energy, and National Security.

SRNL Analytical Laboratories support the various disposition processes by providing high quality analytical, radiometric, and environmental monitoring data. The labs perform analysis to establish chemical flowsheets for the disposition of the array of nuclear materials and the recovery of viable isotopes. SRNL has also established an expertise in tritium processing and its relation to new reservoir design, as well as developing technologies required for modernization of the SRS Tritium Facilities.

A project for processing Mark-18A targets is being installed in one of the SRNL blocks of shielded cells. SRNL chemical separation processing of the Mark-18A targets from L-Basin is scheduled from FY 2021 through FY 2028. The Pu-244 recovered will be packaged and shipped to ORNL for hold/store as “National Asset” materials for critical uses, and the recovered heavy curium has a potential use in the production of californium at the ORNL HFIR.

5.6 Tritium

The Savannah River Tritium Enterprise (SRTE) consists of four process facilities currently used to execute tritium missions. One facility was built in the 50s, while the other three are modern facilities which utilize advanced technologies that have been developed over the years to greatly reduce cost, footprint, and the amount of tritium released to the environment.

1. The Tritium Extraction Facility (TEF) provides the capability to extract tritium from the TPBARs that are irradiated in commercial light water reactors by TVA. Once the tritium is extracted from the TPBARs, it goes through a preliminary purification process.
2. The H-Area New Manufacturing (HANM) Facility was built in 1994 to replace the original Tritium Manufacturing Facility. It provides the capability to unload, separate, and recover the gases (including Helium-3) from the returned reservoirs, and also houses the ability to load reservoirs as well as perform gas transfer system surveillances.

3. The H-area Old Manufacturing (HAOM) Facility has been expanded twice in its long history, and provides reservoir finishing which ensures the loaded reservoirs are safe and meet Design Agency specifications. The reservoirs are also packaged for shipping in this facility.
4. The final facility is the Materials Testing Facility (MTF) which is primarily run by SRNL personnel providing a facility to conduct studies on different tritium-exposed specimens and collect data on reservoir aging to ensure the integrity of the tritium-loaded reservoirs in the field.

A discussion of the current SRS tritium inventory, components, historical trends, and projections is given in the classified addendum.

6.0 STATUS OF PLANS FOR DISPOSITION PROCESSING OF MATERIALS WITH NO DEFINED USE

Table C-5, in the classified addendum SRNL-RP-2017-00235, shows the SRS Nuclear Material Disposition Processing plans. The disposition plans for SRS No Defined Use materials include the following paths:

- Disposition of the uranium:
  The disposition path for the SNF will be through the HEU blend down process. This path processes the off-specification uranium through H-Canyon to purify and recover the uranium, and then blends the purified uranium with NU to produce a LEU solution product. This LEU solution is transported off-site to a commercial vendor for fabrication into commercial reactor fuel. DOE plans to process approximately 1,000 material test reactor (MTR) type SNF bundles, and up to 200 HFIR cores through H-Canyon for uranium recovery and blend down. These items in the L-Basin inventory have been designated and disposition of this material began in FY 2014 and will continue through mid FY 2024.
  There are additional NDU uranium materials in L and K-Areas as well as the remaining SNF in L-basin. These uranium items could be dispositioned by either 1) processing through H-Canyon, 2) dry storing on-site, or 3) shipping it off-site. The disposition path for the remaining uranium has not been decided (e.g. processing or dry storage). Funding has not yet been provided to pursue a dry storage option.
- Disposition of certain inventories of plutonium:
  The disposition path for certain inventories of plutonium is to down blend to meet the WIPP criteria and package the material for transport to WIPP. DOE approved in a March 2016 Record of Decision for the Surplus Pu Disposition Supplemental Environmental Impact Statement (SPD EIS) to allow for disposition of up to 6 MT of Pu that is not suitable for disposition as mixed oxide fuel. There is unirradiated Fast Flux Test Facility (FFTF) Pu included in this 6 MT. DOE-EM has responsibility for the disposition of this

Pu material not suitable for disposition as mixed oxide fuel, which began in FY 2016 and estimated to complete in FY 2046. This duration is based on the assumption of a single glovebox working a single shift. Installation of additional gloveboxes would shorten the duration.

- Disposition through the SRS high level waste (HLW) system. This path processes waste materials from H Area processing through H Tank Farm to the Defense Waste Processing Facility (DWPF) where it is encapsulated with a glass log matrix. During the processing of the SNF, various accountable materials, including plutonium, are removed as waste and sent to the HLW system for processing through DWPF. The Liquid Waste System Plan revision 20 supports the disposition of H-Canyon SNF processing waste through FY 2024 and will continue to process the H-Canyon deactivation waste through FY 2026.
- Disposition through the SRS on-site low level waste system. This path processes low level wastes produced during any of the other disposition processes as noted above. DOE-EM has responsibility for the disposition of this material which continues through the life of the site.
- The following are additional no defined use materials at SRS with no finalized disposition path. DOE-EM has responsibility for establishing a disposition path for the following materials:
    - Weapons usable plutonium (not addressed in 3/2016 Record of Decision)
    - Depleted uranium oxide
    - Mark-51 and other Target Material (excluding Mark-18As)
    - HEU with U-233
    - Various Standards and Sources
    - Heavy Water

7.0 RESTRICTED USE MATERIALS

DOE Order 410.2 defines “Restricted Use” (RU) to be: “Nuclear Material governed by domestic or foreign agreements or obligations that restrict the use of the material to a specific purpose, most commonly restricting nuclear material from utilization in nuclear weapons.” These materials are tagged in the NMIA when they are identified and primarily fall into three categories: foreign obligations, International Atomic Energy Agency (IAEA) materials, and materials associated with Presidential declarations. Approximately 80% of the SRS HEU inventory is RU, and the portion of SRS plutonium with restrictions is classified.

7.1 Foreign Obligations

SRS holds materials transferred to the Site from foreign locations, and in most cases those governments placed restrictions on the use of the nuclear materials. SRS has also received foreign obligation flags (no actual material transfer) from other DOE facilities to be placed on materials within the SRS inventory. SRS has materials with foreign obligations from the following entities: Australia, Canada, European Atomic Energy Community (Euratom), and

Japan. These obligations primarily involve Foreign Research Reactor (FRR) irradiated fuels. The foreign obligations on the uranium materials with HEU blend down as their disposition path will be transferred from SRS to the fuel fabrication vendor as the resultant uranium material is transported off-site. Any foreign obligations on the plutonium materials within the HEU blend down disposition path being sent to HLW will be terminated.

7.2 IAEA

SRS also retains SNM that is subject to inspections and surveillance by the IAEA. IAEA surveillance is based on a U.S. Voluntary Offer Agreement consistent with the Nuclear Nonproliferation Treaty (NPT). The disposition for these materials is currently to be determined, but is likely to follow other plutonium disposition paths.

7.3 Materials Associated with Declarations

SRS holds material in inventory associated with two of the three Presidential Declarations, designated by codes S94 and E07. SRS does not currently have any materials covered under the E05 declaration designation. Excess plutonium or HEU materials at SRS that do not fall under any of these declarations are shown as EOT, Excess Other, which does not have a restricted use.

8.0 ISSUES

The most significant issue with respect to the current inventory of SNM at SRS is the lack of an assigned disposition path for certain SNF, uranium, and plutonium materials.

SRS is approved to disposition only a portion of the SNF currently stored in L-Area via processing through H-Canyon. L-Area is planned to continue to receive FRR materials through FY 2019 with a proposed 10 year extension for Japanese fuel expected and DRR materials through FY 2035. Future receipts as well as the remaining L-Area inventory have the potential for continued processing through H-Canyon or a dry storage disposition plan. Continued H-Canyon operation would require additional NEPA decisions. Dry storage at SRS requires funding for demonstration and validation of long term dry storage of aluminum clad fuels as well as NEPA decisions. Current tentative planning shows the dry storage demonstration and validation at SRS from FY 2021 through FY 2024. Pending a favorable validation, dry storage construction is planned to begin in FY 2031 with the first transfer from L-Basin wet storage in FY 2038.

There pending decisions regarding the disposition path for a portion of the consolidated surplus plutonium being stored in K-Area. Decisions/funding need to be made on the appropriate disposition path; which include processing for use as mixed oxide fuel or another disposition path.

9.0 ACCOMPLISHMENTS

SRS manages a large set of operations for a wide variety of nuclear materials. Significant projects, accomplishments, and recommendations related to materials production, disposition, and processing are grouped into four areas that are significant to present owners, programs, and national goals:

A. Receive store, ship, and disposition nuclear materials in a safe and secure manner. Operate and maintain facilities to support consolidation and disposition of nuclear materials.
B. Develop uranium and plutonium throughput improvement and preparation initiatives.
C. Enable EM and NNSA mission accomplishment through:
    a. Effective technical leadership for execution of future site missions
    b. National and regional support in achieving federal and DOE broader goals
D. Manage tritium as a defined work activity positioned to be responsive to NNSA needs.

Selected accomplishments in these focus areas include:

A. Receive, store, ship, and disposition nuclear materials in a safe, and secure manner. Operate and maintain facilities to support disposition of nuclear materials.
    a. Continued uranium separation processing of the approximately 1,000 MTR bundles of SNF through H-Canyon per the approved March 2013 amended ROD limited processing scope.
    b. Continued support for the "Gap" plutonium missions for the NNSA M3 Remove Program.
    c. Continued receiving and safely storing spent nuclear fuel from both domestic and foreign research reactors including the Canadian NRU and NRX SNF in L-Area
    d. Completed design, fabrication, and installation of components and initiated receipt for the Canadian HEU bearing liquid target residue material in H-Area.
    e. Continued production of plutonium oxide acceptable as a potential feed for mixed oxide fuel fabrication or alternate disposition.
    f. Re-established the transfer of TRU materials from SRS to WIPP
    g. Completed an estimate and schedule to transfer fourteen Pu 3013s in 9975s (Phase 1) to LANL for use in the Defense Programs mission. The Phase 2 estimate and schedule for the transfer of up to 1 MT of Pu is working.
    h. Established the DSA, Procedures, Training, and Equipment installation in a K-Area glovebox and initiated the WIPP blending process to allow disposal of plutonium and uranium as TRU waste to WIPP.
    i. Continued the program for the recovery of Pu-244 and heavy curium isotopes from the Mark-18A irradiated targets. An onsite shipping cask design was completed and a fabrication contract initiated for the Mark-18A cask which will

be used for the onsite delivery of fuel bundles from L Basin to SRNL for processing.

j. Maintained a state of readiness for receipt and storage of plutonium oxide from the LANL ARIES project for eventual disposition. ARIES shipments from LANL to SRS for interim storage remain suspended.
k. Maintained approved supplier status to perform analytical services at SRNL for LANL ARIES oxide production.
l. Completed formal notification and approval of the method for termination of foreign obligations on associated fuels proposed within the limited processing scope from the four foreign entities involved.
m. Finalized a two-phase effort to exchange materials in K-Area Materials Storage (KAMS) under IAEA Safeguards protection to improve coordination of plutonium disposition activities with international safeguards.
n. Prepared tables to support U.S. annual reporting to IAEA on U.S. plutonium inventories and management policy.
o. Managed and executed DOE-STD-3013 Integrated Surveillance Program. Demonstrated relevance of long-term storage standard and identified inventory groups with increased degradation potential.
p. Continued the 9975 Life Extension surveillance program and initiated surveillance of targeted 9975 packages for evaluation.

B. Develop uranium and plutonium throughput improvement and preparation initiatives.
    a. Provided implementation-planning support for DOE/TVA blend down program of additional HEU to LEU for transfer to commercial vendors.
    b. Continued to provide input to DOE-EM report for Congress on methods to maximize the utility of H-Canyon for processing materials from other sites and SRS materials owned by others.
    c. Developed and installed new spectrophotometers in H-Canyon which will result in higher overall production yield.
    d. Continued to perform laboratory studies on a plutonium electrochemical disposition technology.

C. Enable EM and NNSA Mission Accomplishment and Program Support by EM Facilities:
    a. Initiated a study to organize the items from each site's Nuclear Material Inventory Assessments (NMIA) whose disposition process shows "TBD", in an effort to obtain potential disposition paths and to gain synergy for a particular disposition technology or process.
    b. Implemented SRS requirements for DOE Order 410.2, Management of Nuclear Materials.

c. Leveraged SRS materials and facilities by providing direct support to Domestic Nuclear Detection Office, Nuclear Materials Inventory Program, Federal Bureau of Investigation, and Defense Nuclear Non-proliferation activities for emergent receipt analysis, archiving, detector testing, and forensics of nuclear materials.
d. Continued the program for the recovery of Pu-244 and heavy curium isotopes in Mark-18A irradiated targets. Design activities for Mark-18A cask for delivery of fuel bundles to SRNL for processing were completed and a fabrication contract was awarded to an offsite vendor.

D. Manage tritium as a defined work activity positioned to be responsive to NNSA needs.
a. Completed the replacement of the Thermal Cycling Absorption Process beds three months ahead of schedule to ensure the Tritium program is sustained.
b. SRNL and the Savannah River Tritium Enterprise (SRTE) Tritium Implementation Team focused on activities to enhance tritium research and development (R&D) capability for Los Alamos National Laboratory and Sandia National Laboratory in supporting Gas Transfer System (GTS) and process system development.
c. Provided critical support to the design agencies for the B61-12 Life Extension Program (LEP) and W87 Alt 360 through early execution of W87-Alt 360 EC and increased scope for the W87 Alt 360 hydrogen deuterium (HD) System Integration Testing.
d. The Strategic Investment Process and its Strategic Roadmap is being seen as an extremely helpful tool and other program offices are requesting presentations and help in developing this concept/process for their programs.
e. Reported no significant safety, health, or environmental issues.
f. SRNS had some significant accomplishments in the areas of BUILDER and integration of G2 into the SRTE business culture.
g. Completed the installation of Argus backbone in the tritium area on schedule and under budget and thus providing the first step in reducing the security risk for the outdated, failing current system.
h. SRNS's support was critical in supporting the conceptual design team for the Tritium and in support of the Master Asset Plan Deep Dive.
i. Effectively managed programmatic mission risk and responded to issues and opportunities for continuous improvement. This was demonstrated by SRNS's efforts in strategic management of the aging Tritium infrastructure; integrating BUILDER and G2 into its business structure; and renewed emphasis on partnering efforts with DOE/NNSA headquarters and field office management.
j. SRNS successfully engaged with its parent companies to perform value stream mapping of several processes, developed a model to replicate HB-Line's Operational aqueous process, and developed an exchange program with Kansas

City National Security Campus (KCNSC) to provide mutual understanding between engineering organizations on work scope and interdependencies.

10.0 REFERENCES

- SRNL-RP-2017-00235 *(U) Savannah River Site Nuclear Materials Management Plan FY 2017* (classified addendum)