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Used Nuclear Fuel Management at Savannah River Site (SRS)

INMM 27th Spent Fuel Seminar
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Outline

- **Mission**
- **Facility description / capability**
- **Current & projected fuel inventories**
- **Challenges**
  - Storage capacity
  - Long term basin storage
  - Fuel packaging & handling for disposition
- **Summary**

Mission

- Receive and store aluminum-based Used Nuclear Fuel (UNF) from foreign & domestic research reactors pending disposition decision
- Operated by Savannah River Nuclear Solutions, LLC (SRNS) for DOE Environmental Management (DOE-EM)
- Support National Nuclear Security Administration's (NNSA's) Global Threat Reduction Initiative for removal of Highly Enriched Uranium (HEU) from civilian reactor sites worldwide
  - Authorized through May 2019
- Support ongoing domestic research reactor programs
- Store legacy special nuclear materials
- Maintain capability to package and ship fuel for disposition

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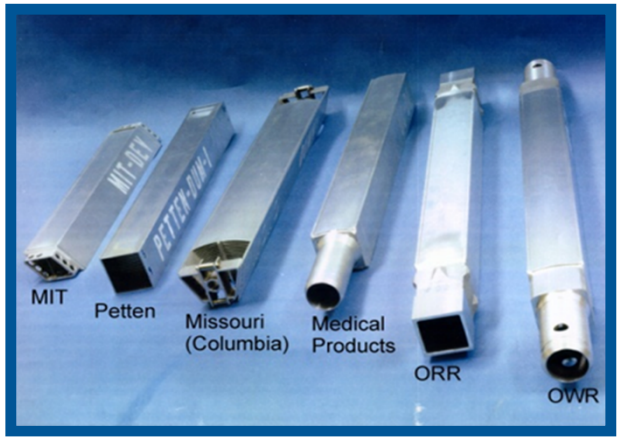
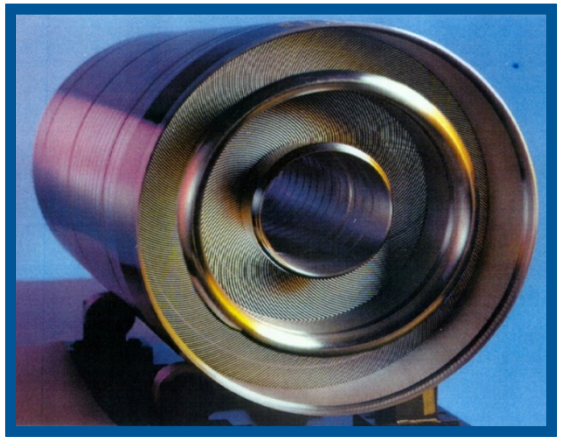
SRS L Area Material Storage Facility

- Former L Reactor facility converted for offsite fuel receipts
  - Wet storage in 3.4 million gallon basin
  - Limited dry storage
- Capability to handle wide variety of fuel sizes, shapes, enrichments, conditions
- Current Inventory:

Aluminum-based UNF	~13,000
Higher Actinide Targets (SRS-origin)	~200
Non-Al-based UNF	~2000
TOTAL	~15,000



Material Test Reactor (MTR) Fuels



High Flux Isotope Reactor (HFIR)

Cask Management

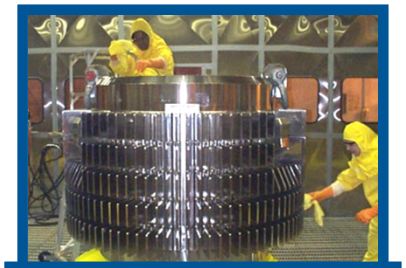
Cask: BRR
Owner: DOE
Max. Capacity: 8 MIT or MURR
Fleet size: 1

Cask: GE-2000
Owner: GE/DOE
Max. Capacity: 42 MTR, 1 HFIR Core
Fleet size: 3: 2 (GE), 1 (DOE)

Cask: LWT
Owner: NAC
Max. Capacity: 42 MTR
Fleet size: 5

Cask: TN-7/2
Owner: NCS
Max. Capacity: 64 MTR, 60 DIDO
Fleet size: 2

Cask: GNS-16
Owner: NCS
Max. Capacity: 33 MTR, 28 DIDO
Fleet size: 2



Cask: 18.5T
Owner: JAERI, KUR, BNFL
Max. Capacity: 30 MTR
Fleet size: 4, 2, 2

Cask: LHRL-120
Owner: ANSTO
Max. Capacity: 120 (DIDO)
Fleet size: 1

Cask: JRF-90Y-950K
Owner: JAERI
Max. Capacity: 5 MTR
Fleet size: 4

Cask: TN-MTR
Owner: Cogema Logistics
Max. Capacity: 52 MTR, 52 DIDO
Fleet size: 3

Cask: 20T
Owner: JAERI
Max. Capacity: 30 MTR
Fleet size: 2

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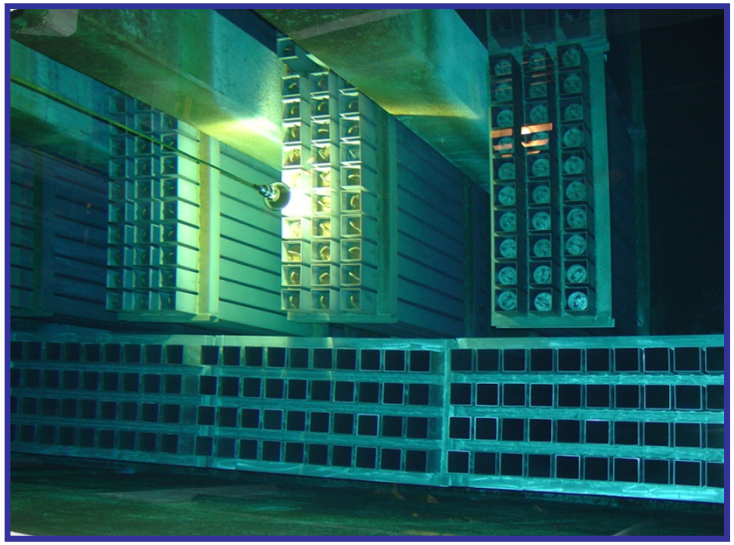
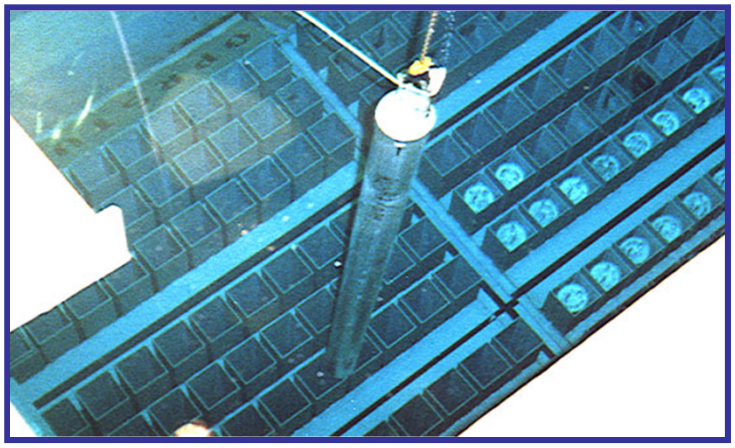
Material Test Reactor Fuel Storage

- Expanded Basin Storage (EBS) Racks
  - Fixed geometry for criticality control
  - 4 to 5 MTR assemblies per tube (bundle)
  - one tube per storage rack position
  - 3650 positions currently installed
  - 3174 positions currently filled
  - Space to add more racks

- Racks seismically qualified for design basis seismic event
- No active cooling required

Submerged 3 x 10 and 4 x 10 EBS racks





Loaded tube ready for storage

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UNF Storage – Current Status

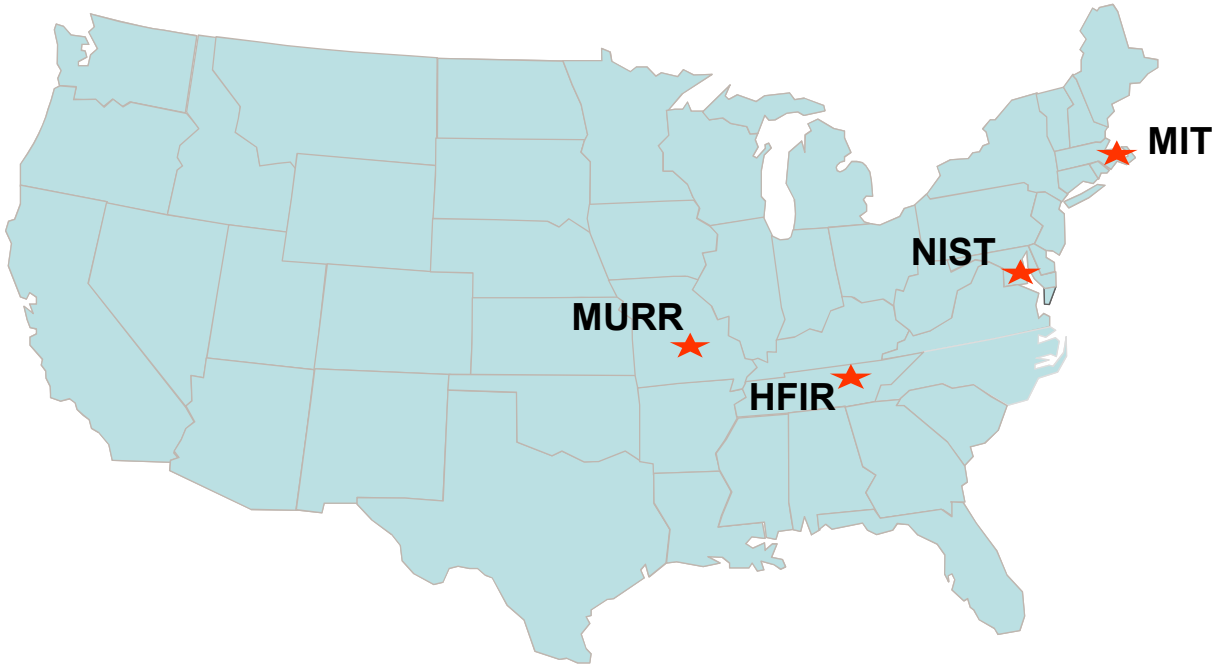
Storage Type	Total Approved Positions	Positions Filled	Percent Filled (Rounded)
HFIR Cores	120	120	100
Expanded Basin Storage Racks – Vertical Tube Storage (VTS) Basin	3500	3174	91
Expanded Basin Storage Racks - Dry Cave Basin	150	0	0
Bucket Row Storage	19	7	37
Bucket Racks	4	4	100
Oversized Can Racks	42	23	55
Dry Fuel Storage Rooms	43	39	91

Future Foreign Research Reactor Receipts

Type	Location	Reactor	2012	2013	2014	2015	2016	2017	2018	Grand Total
FRR	Australia	OPAL				140		140		280
	Germany	BER-2	33			66		33		132
		FRG-1	25							25
	Israel	IRR-1						51		51
	Jamaica	SLOWPOKE		1						1
	Japan	DCA					4			4
		JMTR			120	120	120	120	120	600
		JMTRC			16	16				32
		JRR			40	40	40	80	80	280
		KUR							60	60
	Peru	RP-10			29					29
	Portugal	RPI						14		14
FRR Total			**58**	**1**	**205**	**382**	**164**	**438**	**260**	**1508**
New Scope	Canada	NRU / NRX		144	216	216	216	182	36	1010
		SLOWPOKE		8						8
	S. Africa Gap	SAFARI		770						770
	UK Gap	Dounreay		5						5
New Scope Total				**927**	**216**	**216**	**216**	**182**	**36**	**1793**
Grand Total			**58**	**928**	**421**	**598**	**380**	**620**	**296**	**3301**

- **Potential Gap Nuclear Material Program Receipts**
  - South Africa
  - Syria
  - Nigeria
  - United Kingdom
  - Pakistan
  - Venezuela
  - Ghana
  - Iran
  - Italy
  - Denmark
- **Other Potential FRR receipts not in current baseline**
  - NRU / NRX (1010 HEU)
  - SLOWPOKE (Canada) HEU

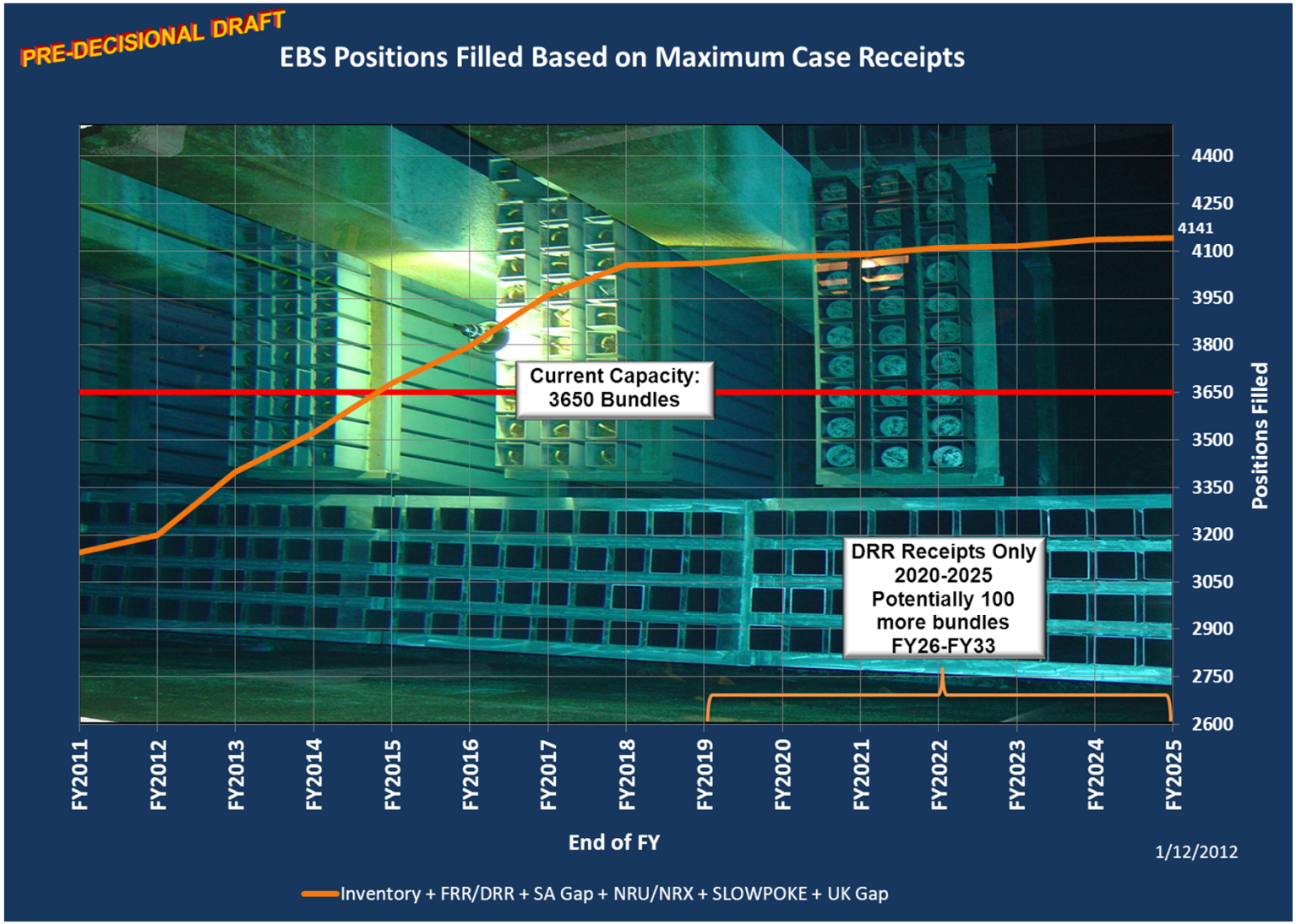
Future Domestic Research Reactor Receipts



Projected Number of Assemblies

Type	Reactor	2012	2013	2014	2015	2016	2017	2018	2019	Grand Total
DRR	HFIR			12	12	12	12	12	12	72
	MIT	16	8	8	8	8	8	8	8	72
	MURR	24	24	24	24	40	40	40	16	232
	NIST	91		42		42		42		217
DRR Total		**131**	**32**	**86**	**44**	**102**	**60**	**102**	**36**	**593**

L Storage Profile

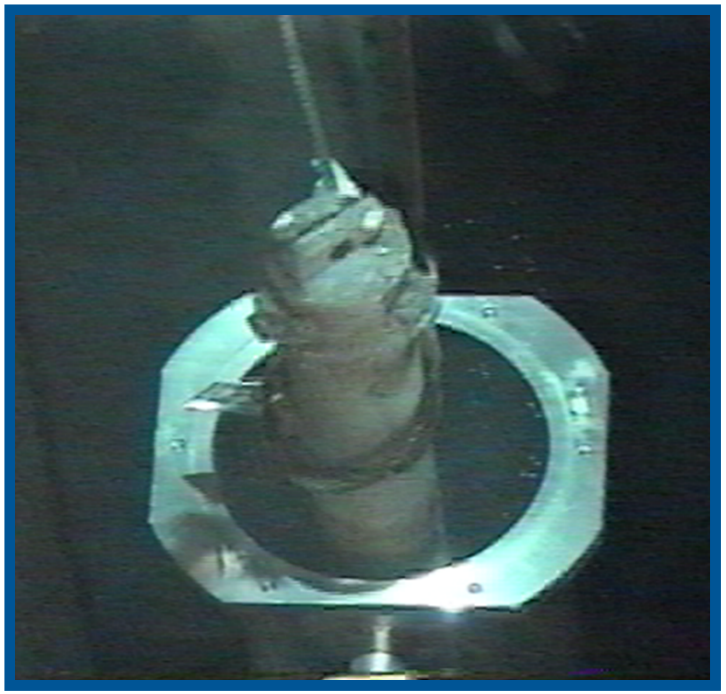


Challenge – Storage Capacity

- **Key variables**
  - Fuel receipt quantity & schedule
  - Canyon processing decision
  - Funding profile
- **Current activities include:**
  - Additional EBS racks
    - Space for ~15 additional racks (450 storage positions)
    - Design & procurement activities initiated
  - Additional HFIR racks
    - New higher-capacity HFIR-C Rack design to replace existing racks
    - Design review & project planning activities ongoing
  - New rack design concepts
    - Utilize other available areas of basin
  - Process fuels in H Canyon
    - Preparations in progress for processing Sodium Reactor Experiment (SRE) fuel
  - Other storage & disposition options
    - Support studies and opportunity evaluations including dry storage alternatives

Challenge – Need for Extended Basin Storage

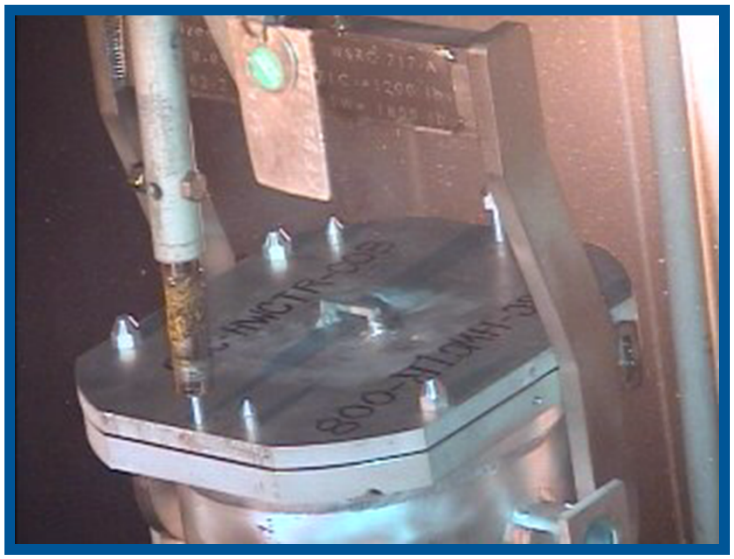
- **Savannah River National Laboratory completed study on fuel & basin life extension (April 2011)**
  - Concludes fuel can be safety stored for an additional 50 years contingent upon continuation of existing management activities and implementation of several augmented program activities
- **Three Program Plans (December 2011):**
  1. Periodic examination of bundled fuel
  2. Assessment of fuel in isolation containers
  3. Basin concrete assessment
- **Continue existing programs:**
  - Basin water chemistry
  - Corrosion evaluation
  - Structural integrity
  - Aging facility management assessments
  - Infrastructure maintenance



Fuel can loading into Oversize Can

Challenge - Fuel Handling for Disposition

- **Subset of stored fuels vulnerable to oxidation**
  - Declad / damaged
  - Intentionally cut
- **~500 sealed & vented cans stored in:**
  - ~20 oversize cans
  - ~200 bundles
- **Stainless steel & zirconium clad items**
- **Experience handling / repackaging degraded fuels & failed containers**
- **Challenges include:**
  - Structural integrity of fuel / container
  - Risk of basin contamination & cleanup
  - Undefined disposition path



Closure of Oversize Can

Summary

- Safely receive and store HEU to reduce global threat
- Foreign fuel receipt mission continues through 2019
- Domestic fuel receipts continue indefinitely
- Additional racks and/or fuel disposition required to support anticipated receipts
- Implementation of augmented monitoring and condition assessments for extended basin storage
- Positioning facility and resources to support DOE programmatic direction