U.S. DEPARTMENT OF ENERGY

SRS Used Nuclear Fuel Management

A Presentation to the
Citizens Advisory Board
Nuclear Material Committee
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safety ❖ performance ❖ cleanup ❖ closure

Acronyms

Al – Aluminum
BRC – Blue Ribbon Commission
DOE – Department of Energy
DRR – Domestic Research Reactor
FRR – Foreign Research Reactor
FY – Fiscal Year
HEU – Highly Enriched Uranium >20%
HFIR – High Flux Isotope Reactor
INL – Idaho National Laboratory
LAC – L Area Complex
LEU – Low Enriched Uranium <20%
NNSA – National Nuclear Security Administration
SNF – Spent Nuclear Fuel
SRNS –Savannah River Nuclear Solutions, LLC
SRS – Savannah River Site
UNF – Used Nuclear Fuel

Purpose

SRS Used Nuclear Fuel Management

- Mission
- UNF Storage
- UNF Inventory
- UNF Receipt Forecast
- SNF Casks Received
- Vulnerable UNF
- L-Area Status
- Summary

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Mission

- L Area Complex (LAC) is operational for receipt and wet storage of Used nuclear fuel (UNF)
- FRR SNF receipts are part of NNSA's Global Threat Reduction Initiative which supports the removal of HEU from civilian reactor sites worldwide
- DRR receipts support domestic nuclear research
- Because of the significant amount of useable uranium content in Spent Nuclear Fuel (SNF), the term UNF is now being used interchangeably

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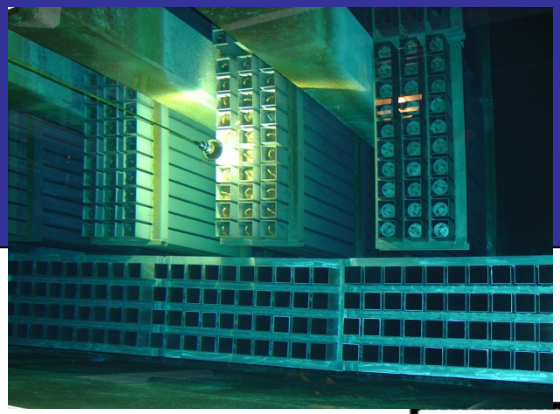
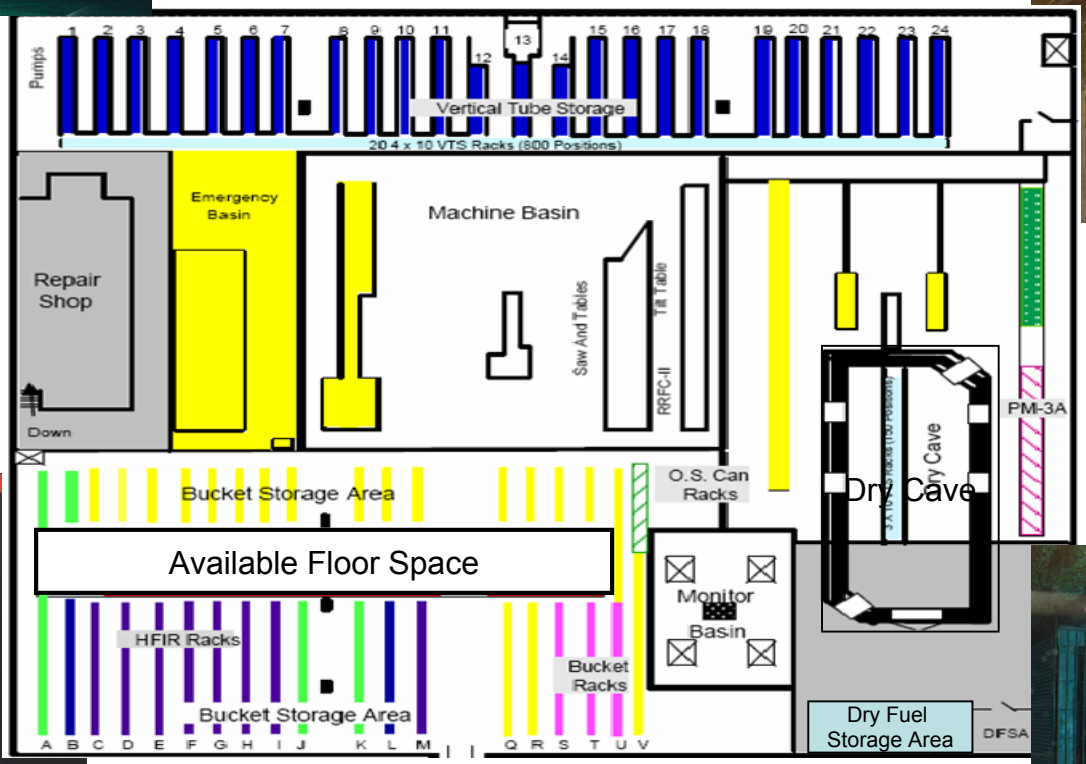
UNF Storage



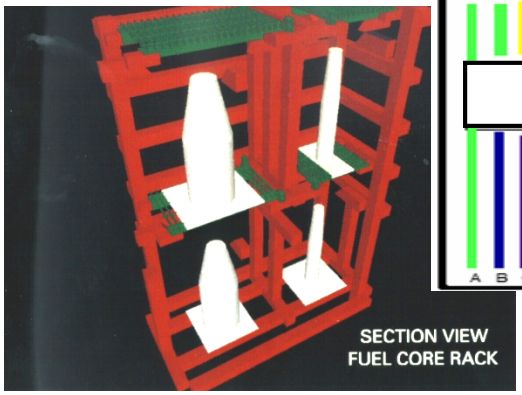
VERTICAL TUBE STORAGE

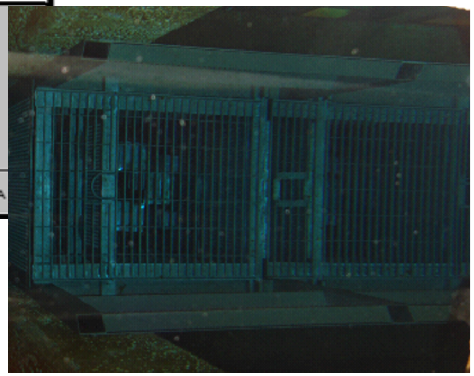
DRY FUEL STORAGE



Dry Fuel Storage Area 2

HFIR STORAGE





BUCKET STORAGE

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UNF Storage

Storage Type	Total Approved Positions	Positions Filled	Percent Filled (Rounded)
HFIR	120	118	98
VTS	3500	3135	90
Dry Cave	150	0	0
Bucket Row Storage	18	10	56
Bucket Racks	32	4	12
Dry Fuel Storage Area 1	27	23	85
Oversized Can Racks	42	23	55
Dry Fuel Storage Area 2	16	16	100

UNF Inventory

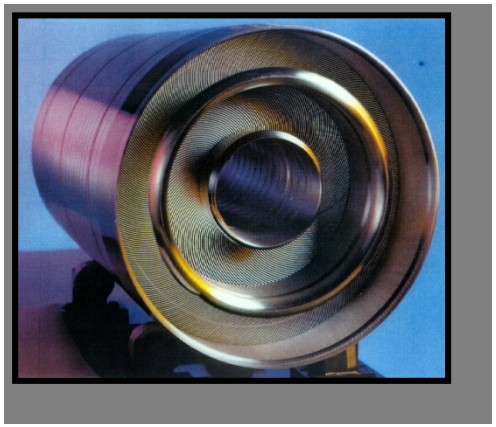
Aluminum-based UNF **12,860 assemblies**
Includes all FRR/DRR, HEU, LEU, U/Th, in all forms that can be processed in H-Canyon

Higher Actinide Targets (SRS-origin) **239 assemblies**
Includes specialty items

Non-Al-Based UNF **1,976 "items"**

Total **15,075 assemblies/items**

Material Test Reactor-Like Fuels



HFIR

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UNF Receipt Forecast

Estimated Number of Assemblies

Assemblies			Fiscal Year									
Type	Location	Reactor	2011	2012	2013	2014	2015	2016	2017	2018	2019	Grand Total
DRR	Maryland	NIST		168		126			126			420
	Massachusetts	MIT	8	8	8	8	8	8	8	8	8	72
	Missouri		16	16	24	16	24	16	24	16	24	176
	Tennessee	HFIR	10		15	15	15	14	14	12	12	107
DRR Total			**34**	**192**	**47**	**165**	**47**	**38**	**172**	**36**	**44**	**775**
FRR	Australia	OPAL					140		140			280
	Canada	PTR	9									9
		SLOWPOKE	1									1
	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	120	90	810
		JMTRC			16	16						32
		JRR						80	80	80	40	280
		KUR								60		60
	Peru	RP-10				29						29
	Portugal	RPI							14			14
	S. Africa	SAFARI	49									49
FRR Total			**59**	**58**	**137**	**165**	**330**	**200**	**438**	**260**	**130**	**1777**
New Scope	Canada	NRU / NRX			120	180	180	180	180	170		1010
		SLOWPOKE		2								2
	France	Osiris		102			237		211			550
	S. Africa Gap	SAFARI		408	362							770
New Scope Total				512	482	180	417	180	391	170		2332
Grand Total			**93**	**762**	**666**	**510**	**794**	**418**	**1001**	**466**	**174**	**4884**

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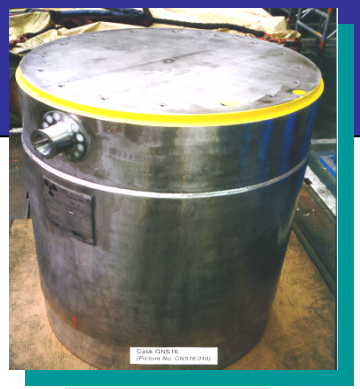
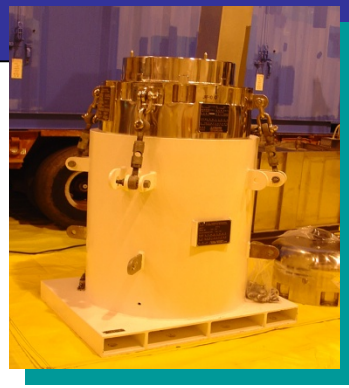
Types of SNF Casks Received



GNS-16

TN-7/2

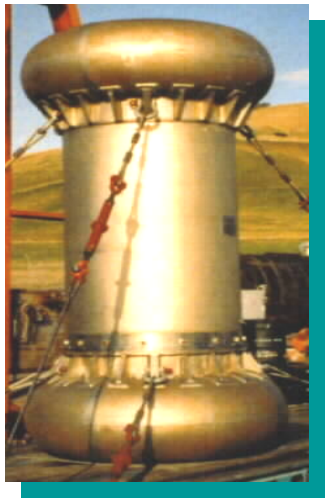


JRF-90Y-950K

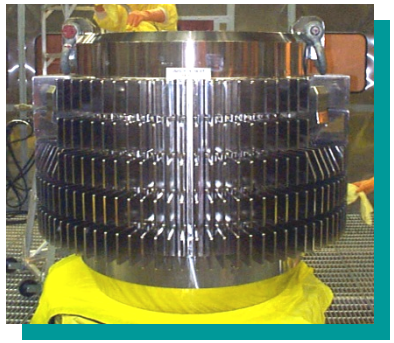
LWT

JRC-80Y-20T

TN-MTR



GE-2000



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Extended UNF Storage

- **Savannah River National Laboratory "Long-Term" storage capability study concludes:**
  - Technical bases and well-founded technologies have been established to store spent nuclear fuel in the L-Basin.
  - Methodologies to evaluate the fuel conditions and characteristics, and systems to prepare fuel, isolate damaged fuel, and maintain water quality storage conditions have been established.
  - Basin structural analyses have been performed against present National Phenomena Hazards criteria.
  - Storage systems that minimize degradation and provide full retrievability of the fuel up to and greater than 50 years will require maintaining the present management programs with the recommended/augmented additional activities.
    - Periodic Inspection of the basin structure and materials
    - Periodic inspection of the fuel and storage materials
    - Evaluation of fuel-specific changes of fuel in canisters

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UNF Processing Candidates

Fuel Type	Number of Items	Status
Taiwan Research Reactor	62 cans	Processing Complete
Experimental Breeder Reactor -II	59 Cans	Processing Complete
Sterling Forest Oxide	878 Cans	Processing Complete
Oak Ridge Reactor	9 Cans	Continued Storage
High Flux Isotope Reactor	1 Can	Continued Storage
Tower Shielding Reactor	2 Cans 22 Fuel Assemblies	Continued Storage
Sodium Reactor Experiment	36 Cans	Continued Storage

From Table 5.2-1

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Vulnerable UNF

- **There is a small percentage of UNF in L-Basin that can be defined as "vulnerable"**
  - **<1% of total inventory**
- **Older UNF (as early as the 1960's) that had been stored in another facility at SRS and moved to L-Basin in 2003**
- **All was handled and some repackaged to move**
- **If there is a "failure," the Basin cleaning systems will handle any contamination**

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L-Area Status

- **Preparations to start shipping UNF from L to H Area were complete September 2010**
- **UNF disposition strategy is awaiting results of BRC recommendations in January 2012**
- **Current strategy does not include processing UNF or implementation of the INL Exchange**
- **L Area Crane Upgrade is mechanically complete; start-up activities are underway with declaration of operable in late July 2011 when FRR/DRR receipts will continue**

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Summary

- **Baseline planning assumptions include:**
  - **Receive and store FRR/DRR**
  - **Additional UNF may be added to the Baseline**
  - **No Chemical processing of UNF; no INL Exchange**

- **Maintain L-Basin in a safe and secure manner until an alternate disposition path is identified and implemented**

- **This fulfills the CAB's work plan items regarding UNF Management at SRs.**