U.S. DEPARTMENT OF ENERGY

Citizens Advisory Board
Nuclear Materials Subcommittee

L-Basin Augmented Monitoring and Condition Assessment Program

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Maxcine Maxted
DOE-SR Assistant Manager for
Nuclear Materials Stabilization Projects
Used Nuclear Fuel Program Manager

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safety ❖ performance ❖ cleanup ❖ closure

Purpose

- To fulfill the Nuclear Materials Subcommittee Work Plan topic
- Address a request from the Nuclear Materials Subcommittee / CAB

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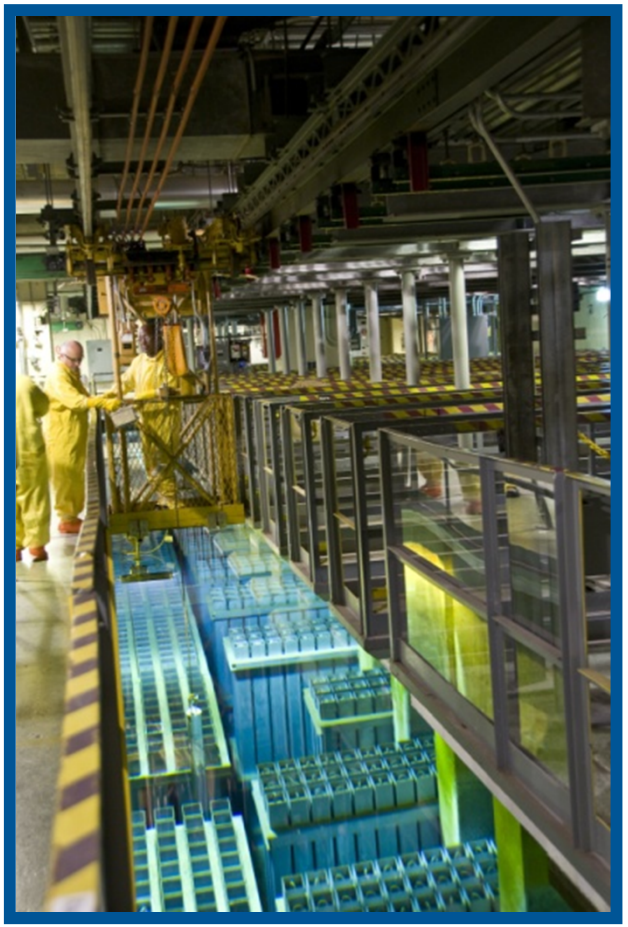
L-Basin Mission

- Receive and Store Aluminum-based Used Nuclear Fuel (UNF) from Foreign and Domestic Research Reactors.
- Support the National Nuclear Security Administration's (NNSA's) Global Threat Reduction Initiative for removal of Spent Nuclear Fuel from research reactors worldwide.
  - Foreign fuels 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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L-Basin 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:

Fuel Type	Assemblies
Aluminum-Based UNF	~13,000
Higher Actinide Targets (SRS-origin)	~200
Non-Aluminum Based UNF	~2000
Total	**~15,000**

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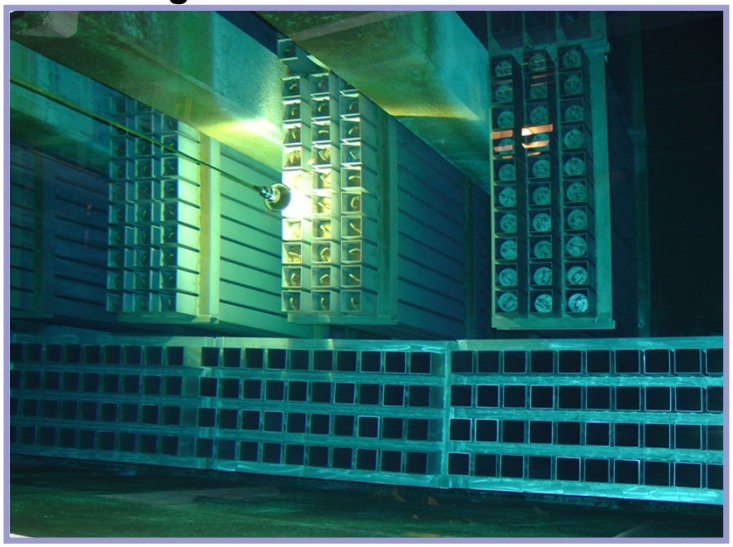
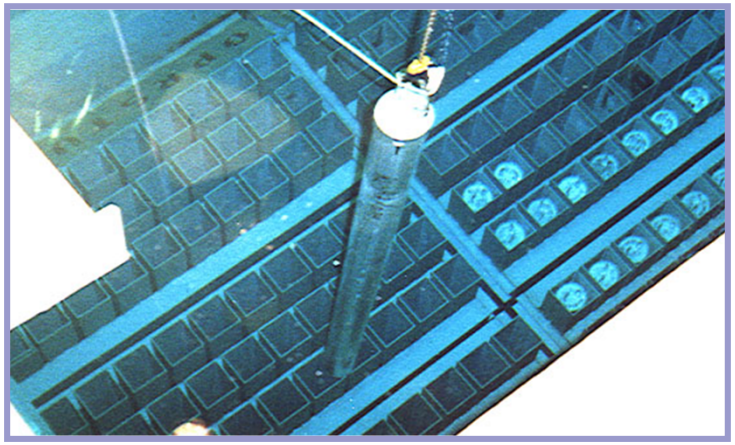
L- Basin Storage Configurations

- Expanded Basin Storage (EBS) Racks
  - Fixed geometry for criticality control
  - 4 to 5 Material Test Reactor (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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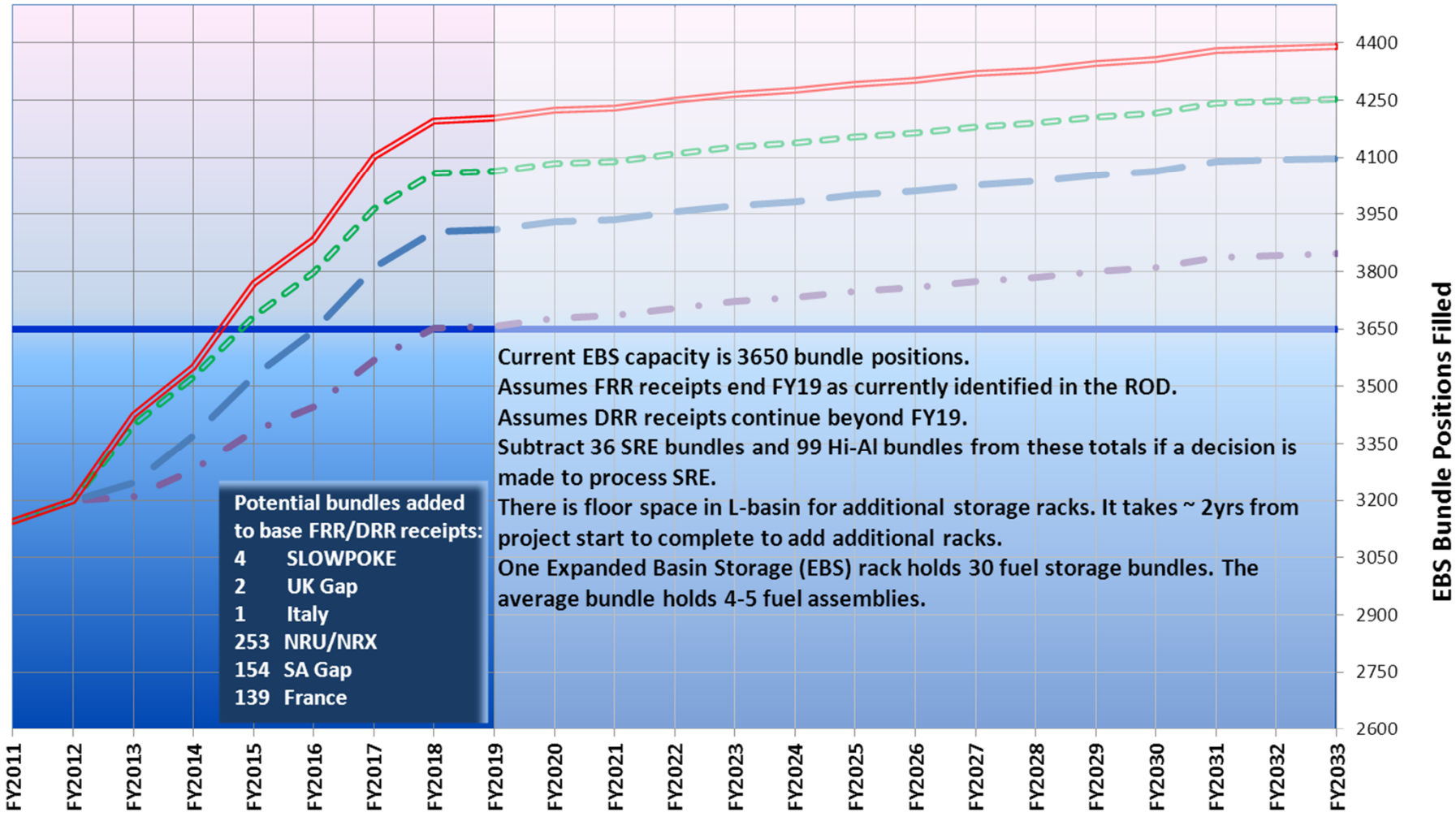
Storage Capacity Considerations

- 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 High Flux Isotope Reactor (HFIR) racks
    - New higher-capacity HFIR-C Rack design to replace existing racks
    - Design review & project planning activities ongoing
  - 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

EBS Positions Filled by Base FRR/DRR plus Receipt Scenarios

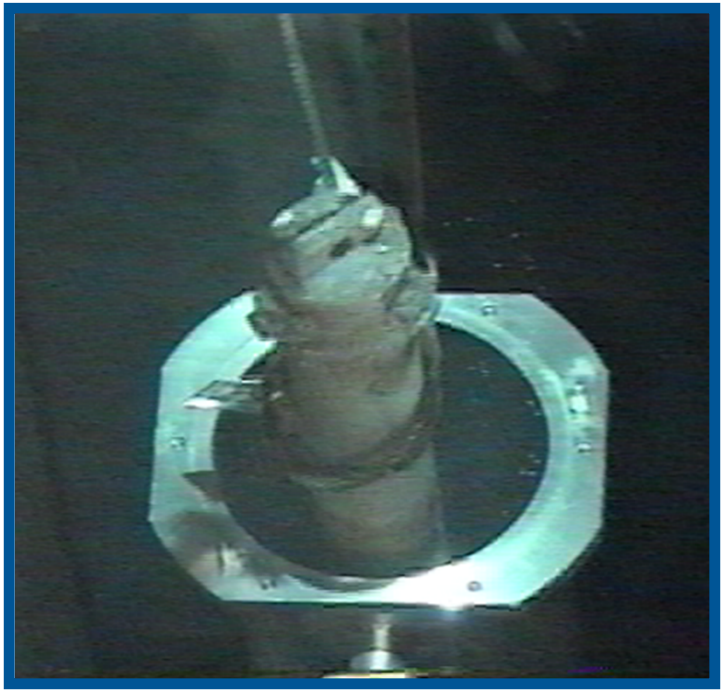


End of Fiscal Year

2/8/12

Ensuring Safe 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

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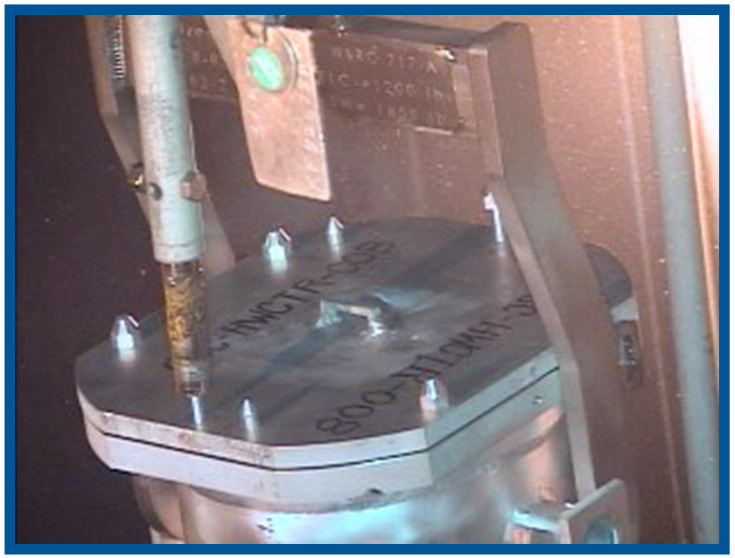
Potentially Vulnerable Fuels

- **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

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Basin "Cobwebs"

- First Line Manager identified them during an inspection round
- Facility attempted sampling but the webs broke apart
- SRNL assisting in sampling and analysis
- Currently believed to be a form of Bacteria
- Samples have been taken and are under review by SRNL

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Growth Level 1

Growth Level 2

Growth Level 3

Growth Level 4

Growth Level 5

Web-like structures at Reactor High Flux (RHF) Fuel Positions in the water

Cobweb Sample Collection

Summary

- Safely receive and store SNF 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

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