Used Fuel Management Fleet Perspective

Tennessee Valley Authority

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Used Fuel Management

Fleet Perspective - Overview

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- **Fleet Perspective**
  - ✓ Strategy Philosophy
  - ✓ Descriptions
  - ✓ Strategic Plans
- **Wet Storage**
  - ✓ SFP Management
  - ✓ Fukushima Impacts
  - ✓ Neutron Absorber Aging Management
- **Dry Storage**
  - ✓ Status
  - ✓ Loading Plans
  - ✓ Future Challenges
- **Summary**

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Fleet Perspective – Strategy Philosophy

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- **Used Fuel Management consists of:**
  - ✓Wet Storage - Spent Fuel Pool (SFP) and Spent Fuel Racks
  - ✓Dry Storage – Independent Spent Fuel Storage Installation (ISFSI) pad and Dry Cask Systems (canisters, overpacks, transfer casks and ancillary equipment)
- **Used Fuel Management Strategy ensures:**
  - ✓Continued storage capacity
  - ✓Un-interrupted operation of site

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Fleet Perspective – Strategy Philosophy

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- **A Used Fuel Management Strategy attempts to balance the needs of the SFP and those of the dry cask systems such as:**
  - ✓ Space
  - ✓ Heat load
  - ✓ Dose
  - ✓ Enrichment
  - ✓ Burnup

  Competing interests between SFP and Dry Casks

- **TVA's Used Fuel Management Strategy**
  - ✓ Fleet approach by using same dry cask technology at all sites
  - ✓ Allows for sharing of equipment and personnel
  - ✓ Provides operational flexibility by striving to remain one dry cask outage ahead (Provides additional empty SFP spaces)

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Fleet Perspective - Strategy

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	BFN	SQN	WBN
Site Description			
Reactor Type	GE BWR	W PWR	W PWR
No. of Units	1 / 2 / 3	1 / 2	1 / 2
Operational	1973 / 1975 / 1977	1980 / 1981	1995 / 2015 est.
No. of SFPs	3 (1 per unit)	1 (Shared)	1 (Shared)
SFP Strategic Plan			
Full Core Reserve (FCR)	764	193	193
New Fuel	342	160 (80 each)	176 (84/92)
Fuel Inspection Equipment /Downcomer	15	100	81
Core Design Changes	30	10	10
Total Open SFP Cells	**1151**	**463**	**460**

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Wet Storage – SFP Management

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Challenges to SFP Management – Criticality and Heat Load

- **Criticality control achieved by Technical Specification Requirements on (mainly for PWRs):**
  - ✓ Burnup - High burnup is good for SFP Tech Spec compliance but generates higher heat
  - ✓ Enrichment - Low enrichment is good for SFP Tech Spec compliance but generates higher heat
  - ✓ Neutron Absorber Material Credit - Material Aging Management
  - ✓ Cooling Time Credit
- **Heat Load Requirements**
  - ✓ Total heat in SFP (affects core offload times)
  - ✓ Heat load dispersal (dependent on individual assembly heat load)

Additional challenges – Other work performed in SFP area

- **Requirements due to Fukushima (such as level instrumentation)**
- **Neutron Absorber Material Aging Management Requirements**

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Wet Storage – Fukushima Impacts

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NRC Near Term Task Force Recommendation 7 – Tier 1 (Ongoing)

- **NRC Order EA-12-051** – Requires a reliable indication of the water level in associated spent fuel storage pools capable of supporting identification of the following pool water level conditions by trained personnel:
  - (1) Level that is adequate to support operation of the normal fuel pool cooling system
  - (2) Level that is adequate to provide substantial radiation shielding for a person standing on the spent fuel pool operating deck
  - (3) Level where fuel remains covered and actions to implement make-up water addition should no longer be deferred

- **TVA implementing SFP level instrumentation modification**

- **Considering Guided Wave Radar equipment for each site**

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Wet Storage – Fukushima Impacts

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NRC Near Term Task Force Recommendation 7 – Tier 2 (Potential)

- 7.2 - Provide safety-related AC power to the SFP makeup system (Industry proposes non-Safety Related)
- 7.3 - Revise Technical Specifications to address requirements to have one train of onsite emergency power operable for SFP makeup and instrumentation, regardless of mode
- 7.4 - Install a seismically qualified means to spray water into the SFP, including easily accessible connection points, using a portable pump outside the building
- 7.5 - Initiate rulemaking or licensing activities or both to require the actions related to the SFP described in the recommendations

TVA actions are being developed for these recommendations

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Wet Storage - Neutron Absorber Aging Management

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- **IN 2009-26 –** Degradation of Neutron Absorbing Materials in the SFP
- **NUREG-1801 –** Generic Aging Lessons Learned (GALL), Section XI.M40 Monitoring of Neutron-Absorbing Materials Other than Boraflex (License Renewal) - 2010
- **IN 2012-13 –** Boraflex Degradation Surveillance Programs and Corrective Actions in the SFP

This recent Industry Operating Experience led to:

- **Implementation of a Fleet-wide SFP Neutron Absorber Material Monitoring Program incorporating Aging Management plans**

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Wet Storage - Neutron Absorber Aging Management

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- **Program consists of tiered approach**
- **Provides for three types of testing:**
  - ✓Basic Coupon Surveillance
  - ✓Full Coupon Surveillance
  - ✓In-Situ Testing
- **Type and frequency of testing determined by events and conditions**
- **Need to ensure coupons are available for the life of the SFP racks**

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Wet Storage - Neutron Absorber Aging Management

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Impact on Fleet Program

	BFN	SQN	WBN
Current Requirements	Coupons ✓ Visual ✓ Dimensional ✓ Dormant since 2003	None Coupons installed at time of rack	None No coupons available
New Program Requirements	Coupons ✓ Visual ✓ Dimensional ✓ Restarted in 2010 ✓ Blackness Testing of coupons prior to period of extended operation (license renewal) ✓ Frequency to be determined by results but not to exceed 10 yrs In-Situ inspection of racks if indicated by coupons	Coupons ✓ Visual ✓ Dimensional ✓ Blackness Testing of coupons prior to period of extended operation (license renewal) ✓ Frequency to be determined by results but not to exceed 10 yrs In-Situ inspection of racks if indicated by coupons	In-Situ Inspections ✓ Blackness Testing of racks ✓ Frequency to be determined by results but not to exceed 10 yrs

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Dry Storage - Fleet Status

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	BFN	SQN	WBN
ISFSI Pad Capacity	96	90	TBD
New Pad Need	2018	2026	2015
System Type (Current)			
MPC	MPC-68	MPC-32	N/A
Overpack	HS 100S VB	HS 100S VB	N/A
System Type (Future)			
MPC	MPC-89	MPC-37	MPC-37
Overpack	HS FW	HS FW	HS FW
Expected Transition	2013	2014	2015

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Dry Storage - Fleet Status

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	BFN	SQN	WBN	Total
Current Pad Status				
2004	0	3	N/A	3
2005	3	0	N/A	3
2006	0	5	N/A	5
2007	1	6	N/A	7
2008	0	6	N/A	6
2009	12	0	N/A	12
2010	9	3	N/A	12
2011	0	9	N/A	9
2012	15	0	N/A	15
Total on Pad	**40**	**32**	**N/A**	**72**

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Dry Storage - Fleet Loading Plans

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	BFN	SQN	WBN	Total
2013	5	10	N/A	15
Begin Using FW				
2013	6	0	N/A	6
2014	6	5	0	11
2015	8	0	6	14
2016	4	5	5	14
2017	8	5	0	13
2018	4	0	5	9
2019	8	5	5	18
2020	4	5	0	9
2021	8	5	5	18
Total	**61**	**40**	**26**	**127**

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Dry Storage - Fleet Loading Plans

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Key to Loading Plans and Optimizing Wet and Dry Storage is Performing Fuel Scoping Plans

- **Fuel Scoping Plans - Looking out a minimum of 5 years**
  - ✓ Evaluate the spent fuel which will be available for loading into dry casks a minimum of 5 years beyond the current dry cask outage
  - ✓ Ensure enough acceptable fuel is available to satisfy cask loading requirements
  - ✓ Identify the existence of fuel not covered by the cask certificate amendment currently being implemented
  - ✓ Identify any fuel spacer requirements (as applicable)
  - ✓ Identify requirements for fuel sipping, inspections, repairs, or evaluations
  - ✓ Identify failed fuel requirements (failed fuel canisters)

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Dry Storage - Fleet Loading Plans

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Fuel Selection Criteria - Competing Interests

- **Fuel Selection Criteria**
  - ✓ Criticality - dependent on enrichment and burnup
  - ✓ Heat Load - Individual assembly and total cask limits dependent on burnup and cooling time
  - ✓ Dose - dependent on enrichment, burnup and cooling time

- **Fuel Scoping Plans - Crucial due to long lead times**
  - ✓ New Amendment (design, analysis, NRC approval, implement) - 4 to 5 years
  - ✓ Amendment Transition (calculations, implement) - 1 to 2 years
  - ✓ Fuel Inspections, Repairs, Evaluations (budget, schedule, perform, evaluate)
  - ✓ Failed Fuel Canisters (budget, manufacture, load) - 1.5 years

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Dry Storage - Fleet Future Challenges

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Fleet Near Term Work on Dry Storage Activities

- **Transitioning to HI-STORM FW design at BFN by 2013 and SQN by 2014**
  - ✓ Evaluations
  - ✓ Implementation
- **Implementing an ISFSI at WBN by 2015**
  - ✓ Siting
  - ✓ Design
  - ✓ Regulatory (72.212 report)
  - ✓ Pad Fabrication
  - ✓ Site Modifications (Crane, Haul path, Aux building)
  - ✓ Cask Loading
- **Implementing an additional ISFSI pad at BFN by 2018**
  - ✓ Siting
  - ✓ Design
  - ✓ Regulatory (72.212 report)
  - ✓ Pad Fabrication
  - ✓ Site Modifications (Haul path)

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Dry Storage - Fleet Planning Overlay

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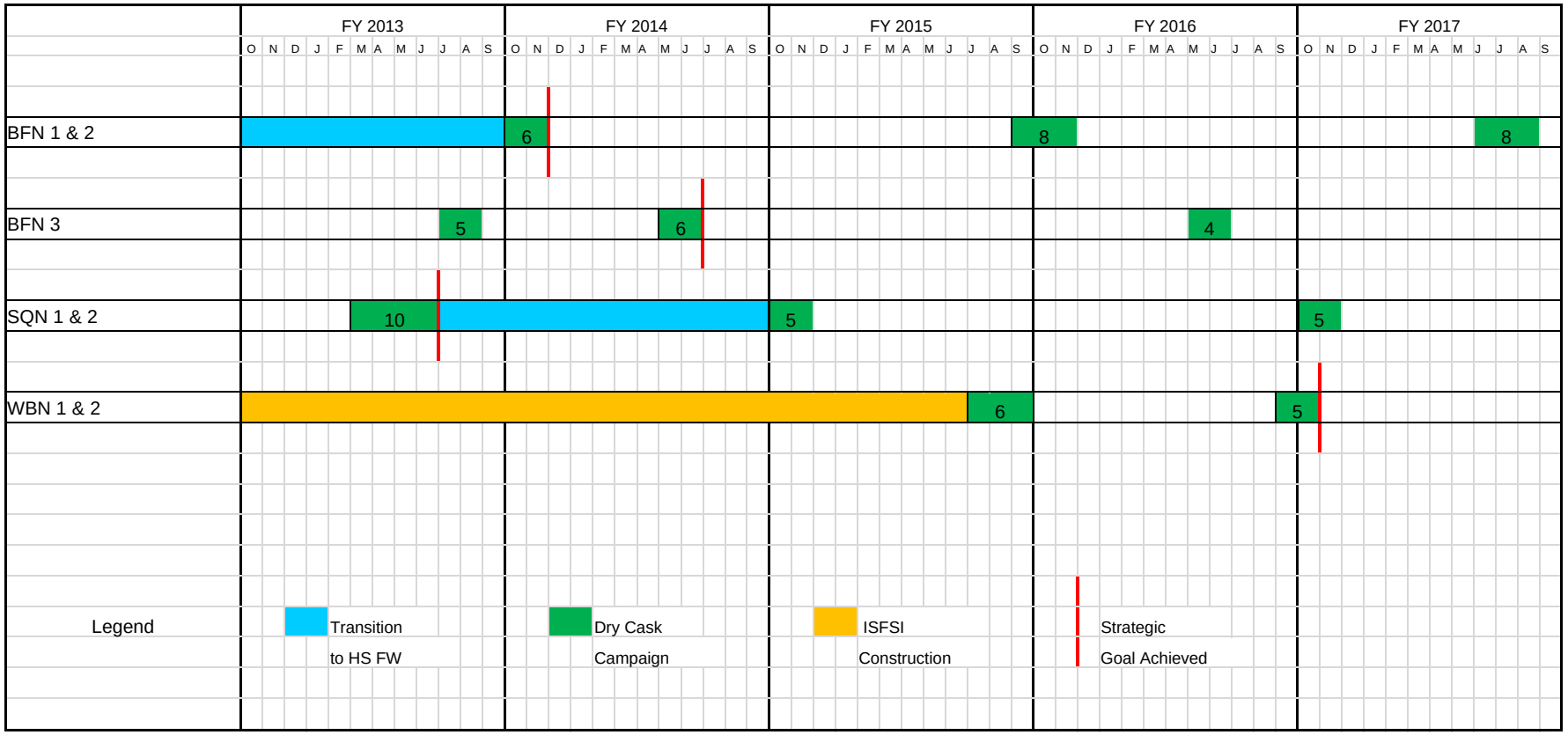

Same cranes and SFP area are also required by refueling outages, new fuel receipt, fuel or insert moves, SFP cleanouts (BWRs), fuel inspections, neutron absorber material surveillances, SNM inventories and Fukushima equipment installation.

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Fleet Perspective - Summary

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- **TVA's Used Fuel Management Strategy balances the needs of the SFP and those of the dry cask systems (since often they are competing interests)**

- **TVA's Used Fuel Management Strategy provides operational flexibility and unplanned events by striving to remain one dry cask outage ahead**

- **Long-term planning and coordination of refuel floor activities is essential.**

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Fleet Perspective - Questions

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Questions?