Fissile Loading in SR HLW Glass

HLW Corporate Board

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UNCLASSIFIED
DOES NOT CONTAIN
UNCLASSIFIED CONTROLLED
NUCLEAR INFORMATION
ADC/REVIEWING
Official: Marc Woodworth
Date: 02/23/2009
Guidance Used: 16-SR-3

Department of Energy

Savannah River Operations Office

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The Issue

- The existing Yucca Mountain pre-closure analysis limits total fissile concentration in SRS glass at 897 g/m^3
  - The LA includes only discussion of the 13 MT of Pu to be dispositioned through "can-in-can" (a.k.a. lanthanide glass) – No analysis performed
- *The Challenge* – maintain canister production to be within limits:
  - the existing Pu inventory (in the waste) limits the disposition of plutonium through H-Canyon
  - must control the limits via waste characterization and limiting waste loading

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Nuclear Materials Position

- 3/08 - Preferred Alternative – 13MT: 5 MT through DWPF, 7.8 MT-MOX, 0.2 MT - WIPP
  - HLW Impacts:
    - Pu Vit or Can in Can– no change to current System Plan – studies required in DWPF
    - Through Sludge – LA amendment required – glass studies, criticality studies
    - WIPP & MOX, no impact to HLW system
- 6/08 - Under Sec approves Alternative CD-1A – disposition 5 MT through DWPF
- 10/08 - EM notified of fissile limit in LA SAR for SRS HLW
- 11/08 - HQ directs SRS to maintain 897 g/m^3 fissile limit in LA – resulted in stopping 5MT of Pu to DWPF
- 1/09 - Pu Disposition Optimization Alternatives Analysis
  - Expected in 4-6 months
  - Various alternatives – including WIPP
    - Pu Vit
    - Ceramic Glass (can-in-can)
    - Direct disposal through sludge
    - Other Alternatives – WIPP, MOX

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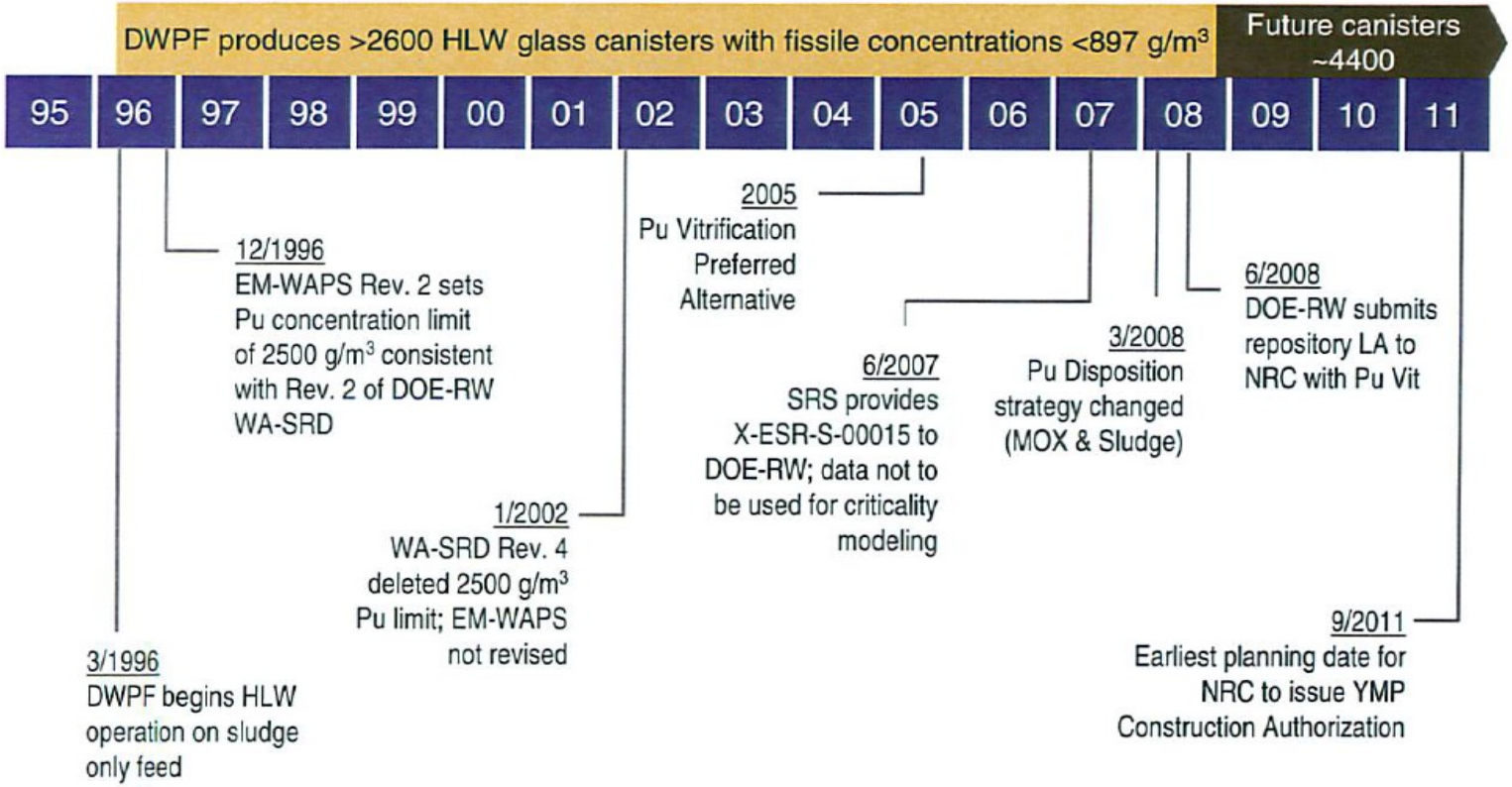
How We Got Here



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Fissile Concentration for Completed and Current Sludge Batches

Sludge Batch	Fissile Concentration (g/m^3)
1A	256
1B	219
2	458
3	795
4	674
5	<897*

Maintain <897 g/m^3 by controlling canister waste loading

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Projected Fissile Loading for Sludge Batch 5 Glass

Waste Loading (Wt%)	Fissile Concentration in Glass (g/m^3)	Basis for Loading
33.5	807	90% of Limit
34.0	820	Planned Loading
37.2	897	At Limit
38.0	916	Typical High Loading
42.5	1020	Theoretical Max Loading (Liquidus Limited)

Limiting Sludge Batch 5 to 33% waste loading to ensure fissile loading limits are not exceeded until further analysis justifies a higher loading

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Projected Fissile Loading for Future Sludge Batches **

Sludge Batch	Source Tanks	WL% System Plan	Projected Cans System Plan	Canisters < 897 limit	WL no new Melter tech	Projected Canisters
1, 1A & 2			1826	1826		1826
SB3	7, 18		483	483		483
SB4	11	34	291	291		291
SB5 (LTAD)	5,6,11	34	379***	394	33	394
SB6	4,12	34	279	279	34	279
SB 7 *	4,12,7	34	363	363	34	363
SB8*	12,13, 4,7,8	38	334	334	38	334
SB9 *	11,14,15,13	50	261	261	38	343
SB10 *	13,15	50	252	252	38	332
SB11*	13, 32, 21, 22, 23	50	249	249	38	328
SB12	13, 32, 21, 22, 23	50	250	250	38	329
SB13 *	33,34,47,35,	50	252	252	38	331
SB14	33,34,47,35,	50	254	254	38	334
SB15*	33,34,47,39	50	241	326	37	326
SB16	33,34,47,43	50	186	229	38	245
SB17	33,34,47,43	50	207	382	27	382
Flush of Lines			180	180		180
Total Canisters			6287	6621		7099

* Al Dissolution Required to mitigate # of cans

** Preliminary Projections Only- not to be used for future plans

***Actual expected number of cans

Next Six Months

<u>897 g/m3 limit</u>

- Preliminary analysis to allow continued Pu discards at approximately 70 kgs per sludge batch
- Continue analysis of future sludge batches with imposed fissile limit for glass
- Continue evaluation the life cycle effects for the limited waste loading

<u>Pu Optimization Alternatives Analysis & NEPA Process</u>

- Await recommendations on bulk Pu disposition pathway

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