

**DWPF GLASS PRODUCT CONTROL AND
CHARACTERIZATION**

**Presentation to
Nuclear Waste Technical Review Board**

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**Radisson Hotel
Augusta, GA**

GLASS PRODUCTION REPORTING REQUIREMENTS

- **Report chemical composition, on oxide basis, for those elements present at > 0.5 wt%**
- **Report radionuclides > 0.05% of inventory (Ci) at any time up to 1100 years and with half lives > 10 years**
- **Report U and Pu isotope content to meet International Atomic Energy Agency (IAEA) requirements**
- **Report Product Consistency Test (PCT) results (actual or predicted) to verify acceptability**

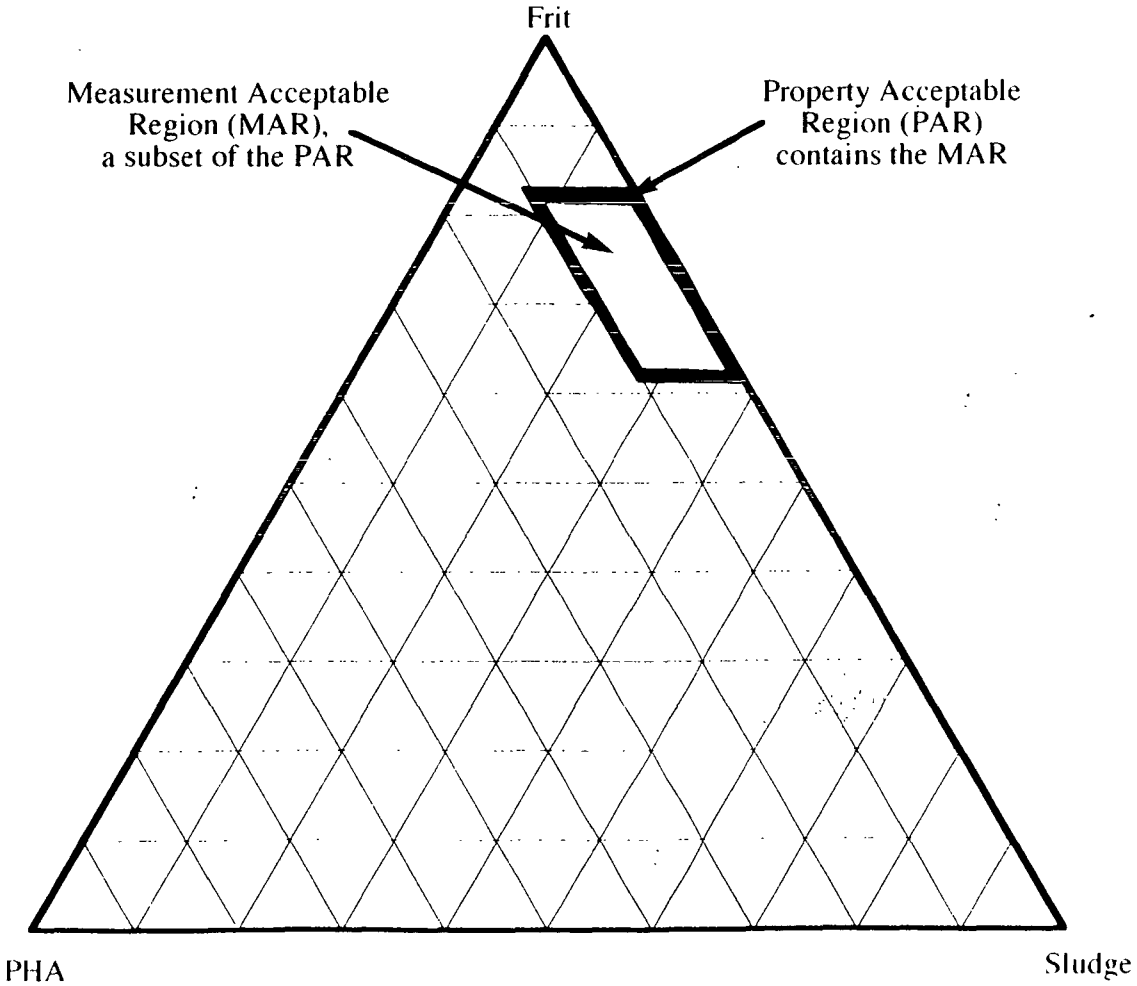
GLASS REPORTING REQUIREMENTS AT TIME OF SHIPMENT

- **Heat generation rate per canister**
 - limit is 1500 watts/canister
- **Dose rate per canister**
 - limit is 10^5 rem/hr gamma dose rate
 - limit is 10 rem/hr neutron dose rate

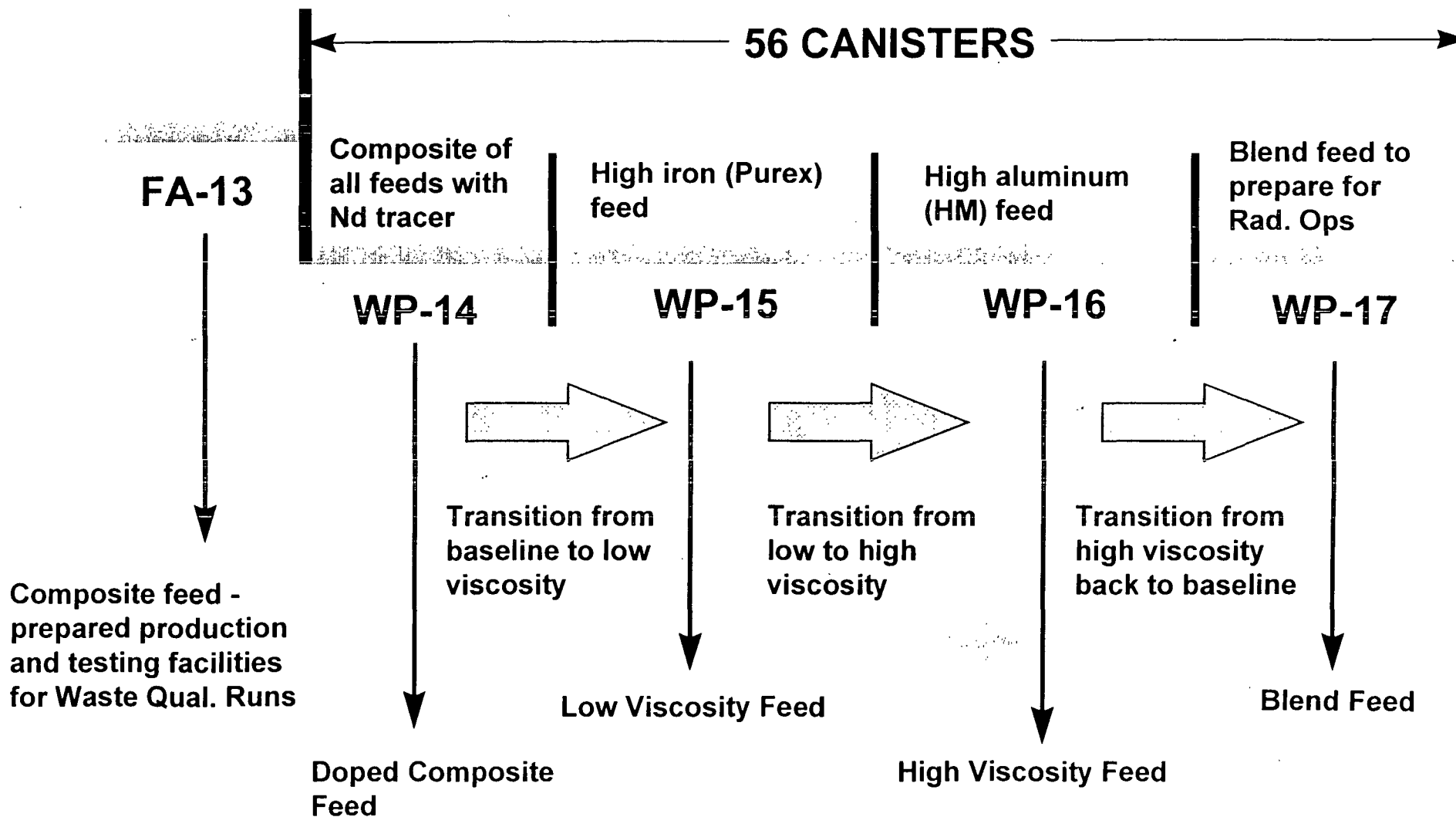
GLASS PRODUCT CONTROL

- **DWPF must control process so glass better (by 2 standard deviations) than benchmark Environmental Assessment glass**
 - **As measured by Product Consistency Test (Li, Na, B release)**
- **Glass Product Control Program developed to ensure acceptable glass produced**
 - **Control feed composition at last feed preparation vessel**
 - **Provides documented evidence that control is achieved**
 - **Program robust to handle changes**
 - **demonstrated during startup testing (Waste Qualification Runs)**

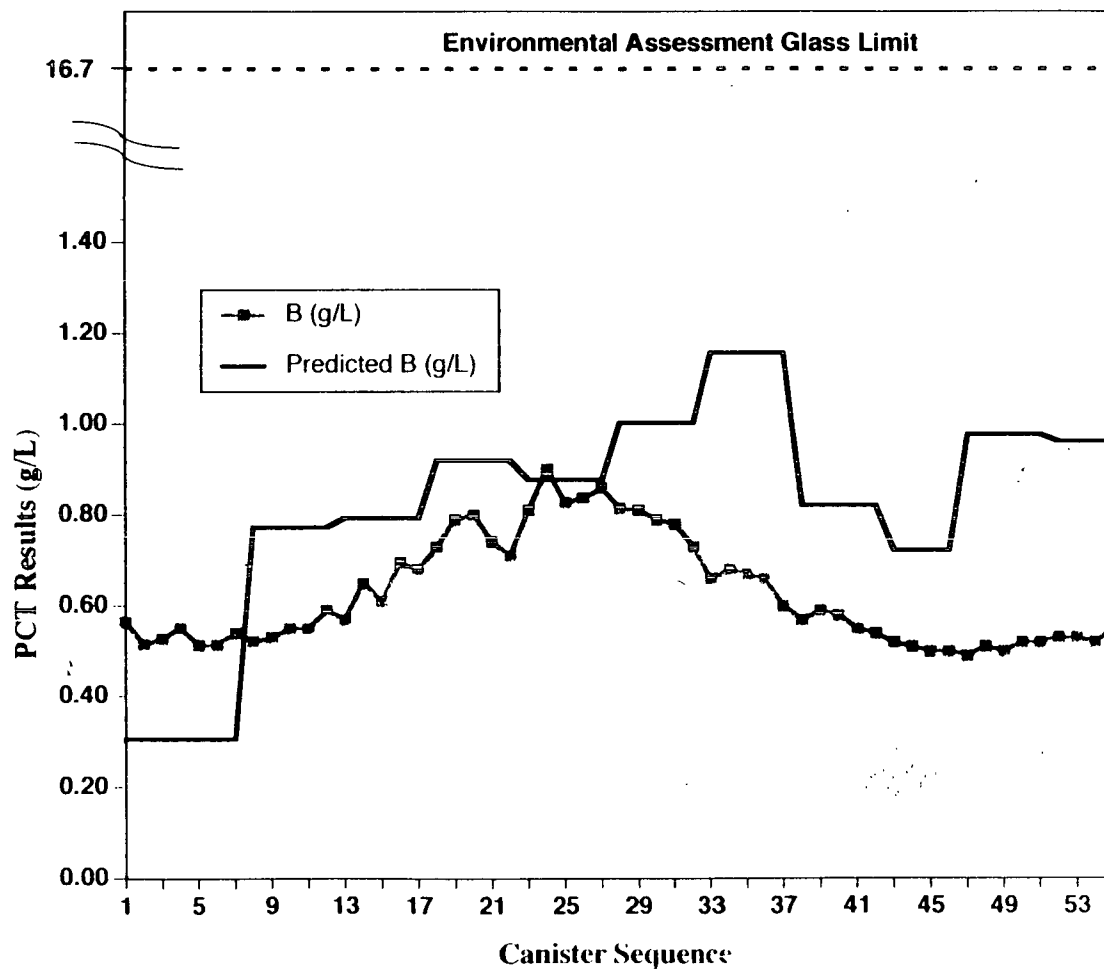
REGION OF PROCESS AND PRODUCT ACCEPTABILITY



WASTE QUALIFICATION RUNS



PREDICTED AND ACTUAL PRODUCT CONSISTENCY TEST RESULTS



RADIOACTIVE OPERATIONS

Product Consistency Test Results (g/L)

	Average Predicted from First 43 Radioactive <u>Batches</u>	Average from Testing of Glass Pour Stream <u>Samples</u>	Limit <u>(EA Results)</u>
B	~0.7	~0.9	16.7
Na	~0.7	~0.9	13.4
Li	~0.7	~0.9	9.6

PROJECTED GLASS COMPOSITIONS

<u>Major Components</u>	<u>Projected Range (wt%)</u>		
Al_2O_3	~ 3	-----	7
B_2O_3	~ 7	-----	10
Fe_2O_3	~ 7.5	-----	12.5
K_2O	~ 2	-----	4
Li_2O	~ 3	-----	4.5
MgO	~ 1.2	-----	1.6
MnO	~ 1.6	-----	3
Na_2O	~ 8.5	-----	12.5
SiO_2	~ 45	-----	54
U_3O_8	~ 0.5	-----	2.5

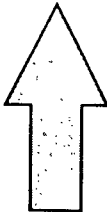

RADIONUCLIDE INVENTORY OF DWPF GLASS

<u>Major Isotopes</u>	<u>DWPF Design-Basis Glass (curies/canister)</u>	<u>Curie Contribution (%)</u>	<u>Tank 51 Sludge-Only Glass (curies/canister)</u>	<u>Curie Contribution (%)</u>
Sr-90	4.8E + 04	51%	3.3E + 02	72%
Cs-137	4.3E + 04	45%	4.2E + 01	9.2%
Pu-238	1.5E + 03	1.6%	4.0E + 01	8.8%
Pu-241	1.7E + 03	1.8%	1.5E + 01	3.4%
Sm-151	2.4E + 02	0.25%	9.1E + 00	2.0%
Cm-244	1.1E + 02	0.12%	8.2E + 00	1.8%
Am-241	1.1E + 01	0.012%	4.7E + 00	1.0%
Pu-239	1.3E + 01	0.014%	3.3E + 00	0.72%

Other reportable radionuclides are: Ni-59, Ni-63, Se-79, Zr-93, Nb-93m, Tc-99, Sn-126, Th-229, U-233, 234, 235, 236 & 238, Np-237, Pu-240, Pu-242, Am-243, Cm-245, Cm-246

HEAT GENERATION OF DWPF GLASS

Calculated from Radionuclide Inventory
at Time of Production

DWPF Design Basis Glass (watts/canister)	Tank 51 Sludge- Only Glass (watts/canister)	Tank 42 Sludge- Only Glass (watts/canister)	Limit (watts/canister)
750	4	7.4	1500
			
	<i>Current canisters</i>	<i>Next sludge batch</i>	

Activity/Heat Generation Rate for a Canister of DWPF Design Basis Glass

