



U.S. DEPARTMENT OF  
**ENERGY**

Nuclear Energy

Environmental Management

# Approach to Addressing NWTRB Questions

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# NWTRB Questions for DOE

## May 15, 2017 pre-meeting briefing questions for DOE:

- Provide an overview of the compositions and projected quantities of existing and future HLW glass at the West Valley Demonstration Project, Savannah River Site, and the Hanford Site (including “German” glass logs).
  - How is the variability in DOE HLW glass composition taken account of in DOE’s glass corrosion models?
  - How well are the glass corrosion model parameters supported by experimental data?
- What is the status of DOE R&D activities to understand and model the long-term performance of borosilicate HLW glass?
  - Which R&D activities are run or managed by the different DOE offices and programs [DOE-NE (including NEUP), DOE-EM, DOE Office of Science (if any)] and how are these activities integrated? What are the accomplishments?
  - A detailed plan for joint DOE-NE and DOE-EM R&D activities on glass corrosion initially was developed in 2011 (Ryan et al. 2011)<sup>1</sup> that included experiments and modeling. What are the status and results of the tasks described in the plan?
  - How are the results of international R&D activities integrated with the results of DOE R&D?
- From DOE’s perspective, what are the remaining technical uncertainties and gaps in data and understanding of the long-term performance of HLW glass? How is DOE addressing these uncertainties and gaps?
- How is DOE integrating process-level models of HLW glass corrosion and radionuclide release into generic repository performance assessments?
  - How is the DOE approach to HLW glass performance modeling different from that for the low-activity waste (LAW) glass to be disposed of at the Hanford Site Integrated Disposal Facility?
  - What lessons learned from LAW glass corrosion experiments and modeling can be applied to HLW glass?
- What is the technical basis for extrapolating the results of short-term, small-scale tests on glass corrosion to long-term glass waste form performance in a repository?



# Status of Glass Corrosion Modeling

- Corrosion models were developed and applied to assess the likely performance of both HLW and LAW glasses in disposal environments
- These existing models are adequate for their intended purposes
- We are improving our scientific understanding of the processes controlling glass corrosion through continued research
- The improved understanding is leading to models with less uncertainty



1. Masses and compositions of DOE HLW glasses (Vienna)
2. DOE HLW glass degradation model (Ebert)
3. Hanford low-activity waste glass performance models (Ryan)
4. Summary of programs and collaborations (Vienna)
5. Progress on ITEAM plan (Ryan)
6. Example of detailed investigations: transport in alteration layers, ion exchange, near-field materials impacts (Ryan)
7. Example of detailed investigations: Stage 3 corrosion (Ebert and Jantzen)
8. Implementing a Stage 3 glass degradation model (Ebert)
9. Ongoing scientific research program (Gray)



# Cross-Talk of Questions to Presentations

Talk #(s)

May 15, 2017 pre-meeting briefing questions for DOE:

Talk #(s)

[1]	<ul style="list-style-type: none"> <li>• Provide an overview of the compositions and projected quantities of existing and future HLW glass at the West Valley Demonstration Project, Savannah River Site, and the Hanford Site (including “German” glass logs).</li> </ul>	
	<ul style="list-style-type: none"> <li>– How is the variability in DOE HLW glass composition taken account of in DOE’s glass corrosion models?</li> <li>– How well are the glass corrosion model parameters supported by experimental data?</li> </ul>	[2]
[4,5]	<ul style="list-style-type: none"> <li>• What is the status of DOE R&amp;D activities to understand and model the long-term performance of borosilicate HLW glass?</li> </ul>	
	<ul style="list-style-type: none"> <li>– Which R&amp;D activities are run or managed by the different DOE offices and programs [DOE-NE (including NEUP), DOE-EM, DOE Office of Science (if any)] and how are these activities integrated? What are the accomplishments?</li> </ul>	[4]
[5]	<ul style="list-style-type: none"> <li>– A detailed plan for joint DOE-NE and DOE-EM R&amp;D activities on glass corrosion initially was developed in 2011 (Ryan et al. 2011)<sup>1</sup> that included experiments and modeling. What are the status and results of the tasks described in the plan?</li> </ul>	
	<ul style="list-style-type: none"> <li>– How are the results of international R&amp;D activities integrated with the results of DOE R&amp;D?</li> </ul>	[4,5,6,7]
[9]	<ul style="list-style-type: none"> <li>• From DOE’s perspective, what are the remaining technical uncertainties and gaps in data and understanding of the long-term performance of HLW glass? How is DOE addressing these uncertainties and gaps?</li> </ul>	
	<ul style="list-style-type: none"> <li>• How is DOE integrating process-level models of HLW glass corrosion and radionuclide release into generic repository performance assessments?</li> </ul>	[8]
[2,3]	<ul style="list-style-type: none"> <li>○ How is the DOE approach to HLW glass performance modeling different from that for the low-activity waste (LAW) glass to be disposed of at the Hanford Site Integrated Disposal Facility?</li> <li>○ What lessons learned from LAW glass corrosion experiments and modeling can be applied to HLW glass?</li> </ul>	
	<ul style="list-style-type: none"> <li>• What is the technical basis for extrapolating the results of short-term, small-scale tests on glass corrosion to long-term glass waste form performance in a repository?</li> </ul>	[2]

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Time	Topic	#	Lead
8:30-8:55	Introductions and description of how we plan to answer questions	0	Vienna
8:55-9:20	Masses and compositions of glasses	1	Vienna
9:20-10:10	Historical basis for current HLW model	2	Ebert
10:10-10:40	LAW glass model and lessons learned	3	Ryan
10:40-10:55	Break		
10:55-11:20	General program description	4	Vienna
11:20-12:00	Status of ITEAM planned research	5	Ryan
12:00-1:00	Lunch Break		
1:00-2:15	Specific highlights of significant results from ITEAM	6	Ryan
2:15-3:45	Stage 3 testing and modeling	7	Ebert/Jantzen
3:45-4:00	Break		
4:00-4:20	Approach to implementation of models in GDSA	8	Ebert
4:20-4:35	Summary of research program	9	Gray
4:35-5:00	General questions and discussion		All