Shielded Payload Containers Will Enhance the Safety and Efficiency of DOE's Remote Handled Transuranic Waste Operations

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WM2008
February 27, 2008

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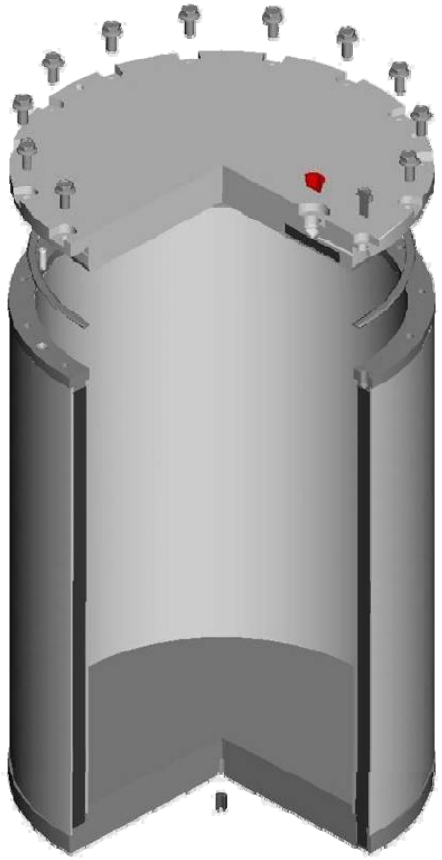
Shielded Containers - Approach

- Candidate waste streams to be characterized and certified under WIPP's existing WAP/WAC as RH TRU waste (prior to shielding)
- New Mexico C&C Agreement and the requirements of the LWA for RH TRU waste will continue to be met
- All waste received in shielded containers (and in RH-72Bs/10-160Bs) will count against RH waste volume capacities:
  - Table IV.A.1 of the Hazardous Waste Facility Permit
  - 730 RH canisters ~ 5900 shielded containers (max)
- RH-72B/10-160B shipments and canister disposal operations will continue

Shielded Containers - Approach (Continued)

- External dimensions = 55-gal drum, internal capacity for a standard 30-gallon drum
- Transport in 3-pack configuration in HalfPACT under current design and licensing bases:
  - 7,600 lb max payload
  - 30 watts max decay heat
  - 325 max Fissile Gram Equivalent (FGE) Pu
- Handling, storage, and emplacement in 3-pack configuration
- Incorporate into existing CH TRU waste handling infrastructure



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Timeline

2007				2008				2009			
Q-1	Q-2	Q-3	Q-4	Q-1	Q-2	Q-3	Q-4	Q-1	Q-2	Q-3	Q-4

Engineering and testing

Stakeholder meeting 11/29/07

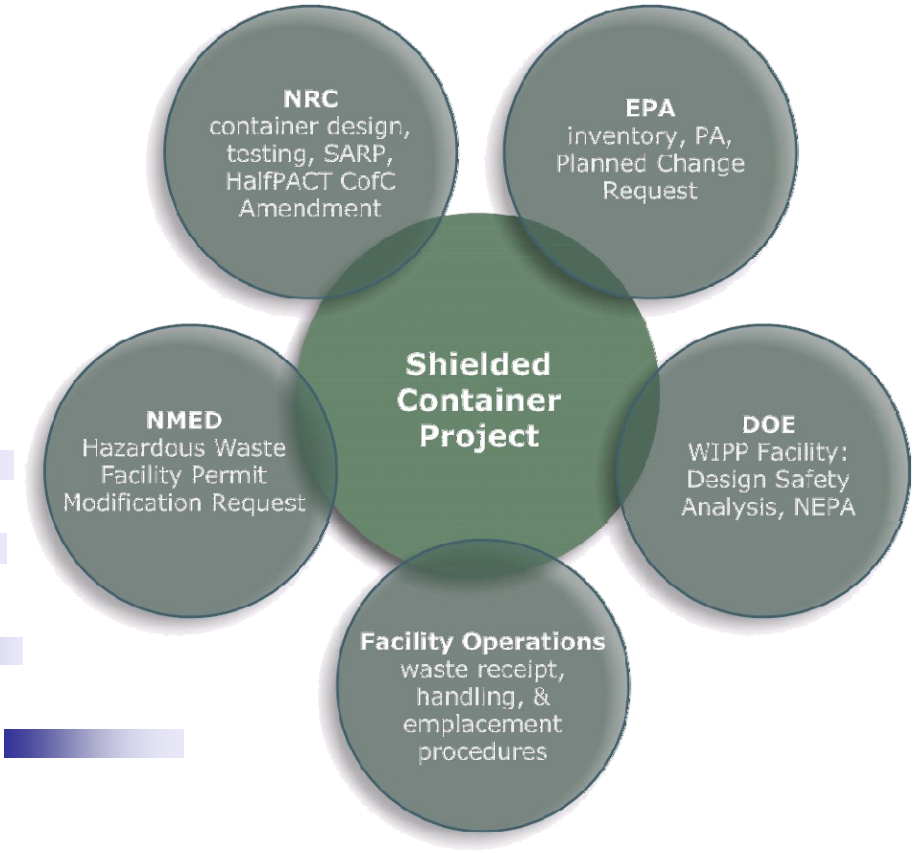
EPA Planned Change Request

NRC HalfPACT SAR

WIPP DSA Review

NEPA Review of Facility Waste Handling

NMED Permit Modification Request



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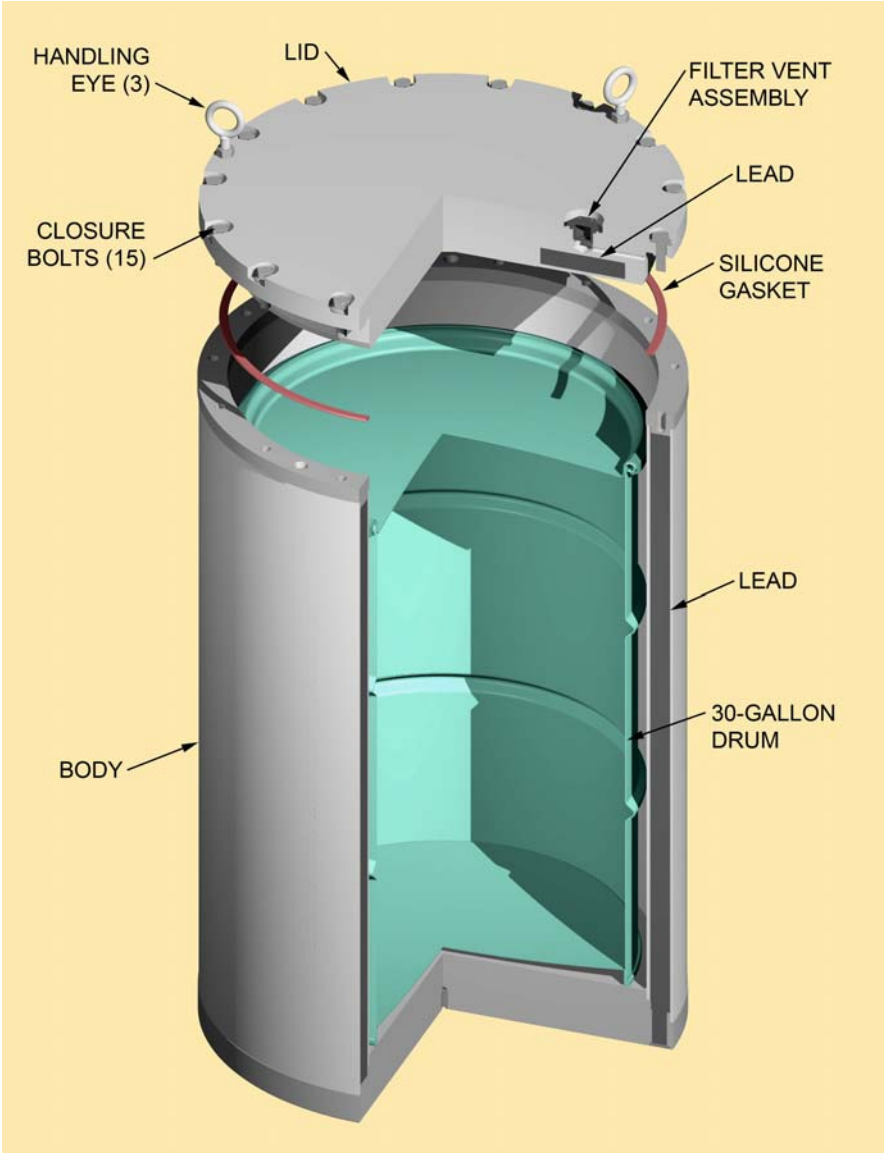
Shielded Container

- Nominal 55-gallon exterior size
- 1” lead and ~5/16” steel thickness in side; 3” steel lid and base
- ASTM A516, Grade 70, carbon steel lid, base, and flange normalized to fine grain practice, and ASTM A1011, Grade 45, carbon steel shells
- 15, 1/2” Grade 8 closure bolts
- Silicone rubber gasket
- Filtered vent port w/ lead shield plug
- Empty weight 1,730 pounds nominal



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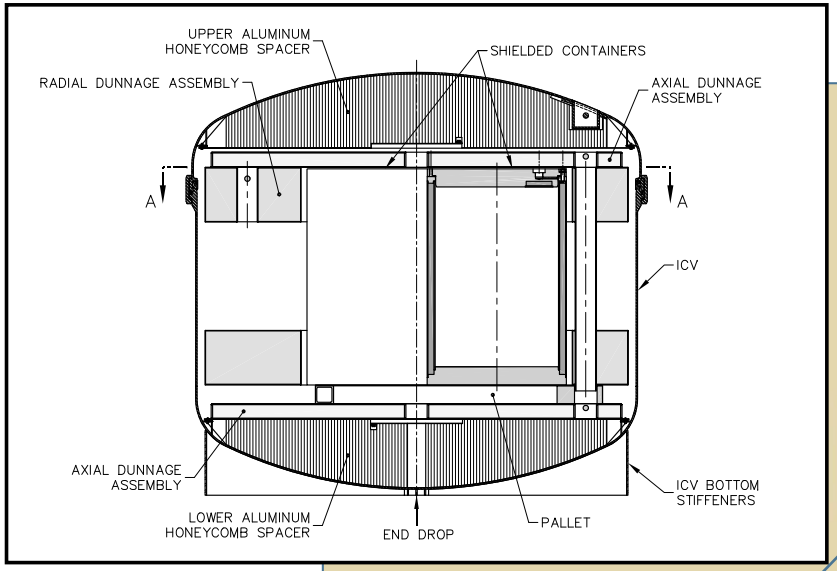
Shipping Configuration



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3 Shielded Containers on a Pallet

Axial Shock Absorber

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Radial Shock Absorber

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Container Testing

DOT Type 7A Certification – Shielded Container

4 ft. drop test onto unyielding surface in worst case orientation w/ inner 30 gallon container maximally loaded:

- Design robustness
- Payload confinement
- Shielding effectiveness

NRC Hypothetical Accident Conditions – Payload Assembly

30 ft. drop onto unyielding surface in worst case orientations, HalfPACT inner containment vessel (ICV) with three shielded containers with inner 30 gallon containers maximally loaded:

- Overall design robustness
- Payload confinement
- Shielding effectiveness
- HalfPACT ICV Integrity

7A Drop Test Orientations

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Video clip of DOT-7A Drop Test

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DOT 7A Drop Test Results

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7A Drop Test Results (cont.)

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HAC End Drop Test

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HAC Side Drop Test

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Video clip of NRC HAC Drop Test

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End Drop Test Results

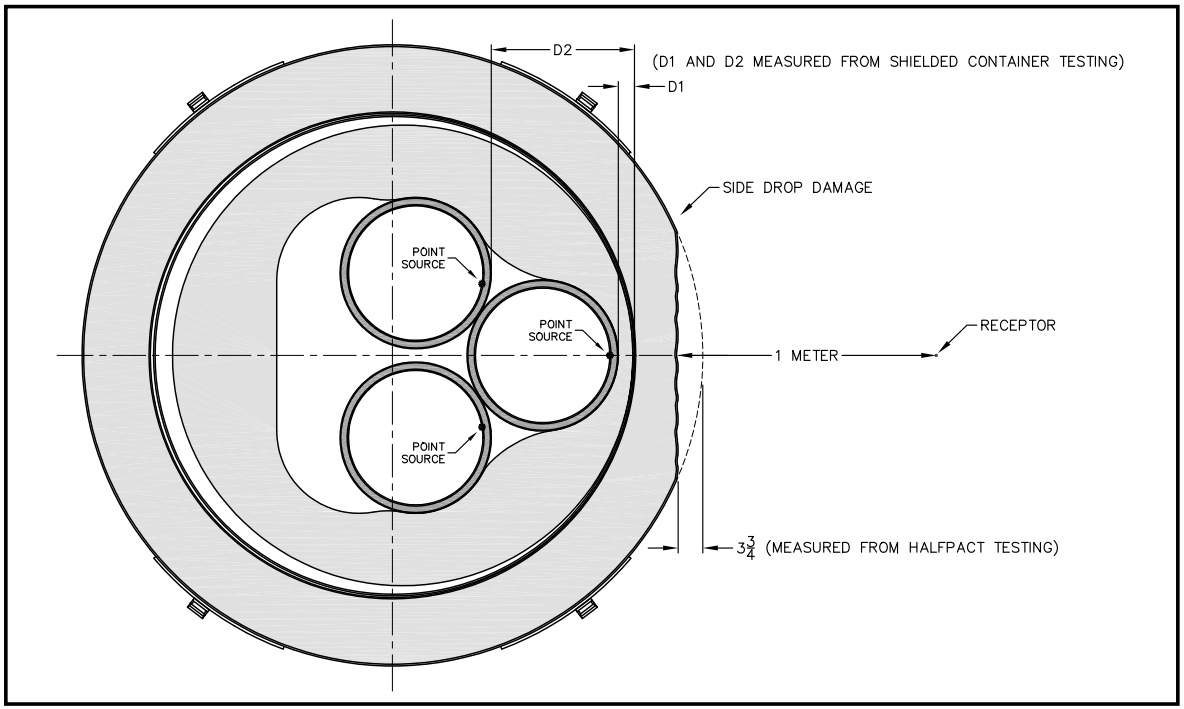
- Pre- and post-drop position of SCAs and radial shock absorber within ICV
- 6.5 inch crush of bottom end axial dunnage and aluminum honeycomb spacer equates to an impact of approximately 60 g for SCAs
- SCAs see a very “soft landing” compared to the HalfPACT itself, which experiences approximately 400 g in bottom end drop

Side Drop Test Results

- Pre- and post-drop position of SCAs and radial shock absorber within ICV
- 4.5 inch crush of radial shock absorber equates to a lateral impact between 80 and 160 g for SCAs
- SCAs see a “softer landing” compared to the HalfPACT itself, which experiences a crush of 3.75 inches in side drop, equating to between 100 and 200 g

Thermal, Shielding and Criticality Evaluations

- SAR analyses utilize NRC previously approved analytic methods and assumptions
  - ***30 watt payload decay heat limit results in no change to HalfPACT normal or accident condition temperatures***
  - ***PU-238 FGE is set at 200 per SCA (same as for 55-gallon drums) and remains at a max of 325 per HalfPACT***
  - ***Radionuclide activity limits are set such that even if reconfigured into a point source, accident condition limit of 1 R at 1 meter is still satisfied***



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Transportation Certification Status

Certification of design to the requirements of DOT 7A Type A is underway:

- Free drop by tests
- Post-drop gamma scan
- All other load cases by analysis

HalfPACT SAR, Rev. 6 and CH-TRAMPAC, Rev. 4 submitted to obtain NRC authorization to ship shielded containers in the HalfPACT:

- Free drop by tests
- Post-drop gamma scan
- All other load cases by analysis (e.g., thermal)

Operations Overview

- Shielded containers will be managed as any other contact-handled waste (generator site loading through final WIPP disposal)
- Receipt of 3-pack assemblies – no breaking apart or reassembly
- Management, including storage, in the WIPP CH-bay
- Use of existing infrastructure and equipment:
  - Lifting fixtures
  - Fork lifts
  - Facility pallets

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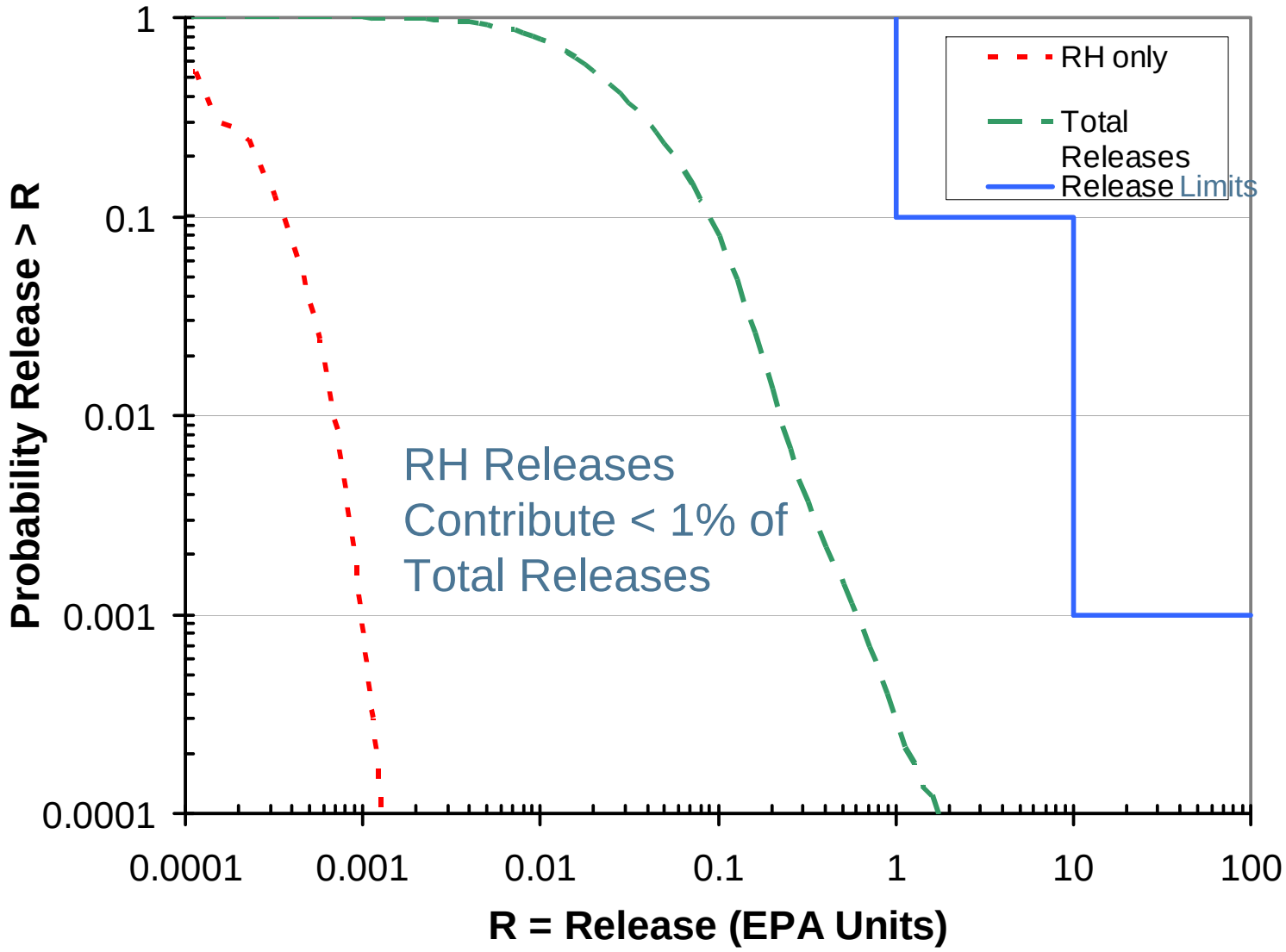
WIPP Long-term Repository Performance is Insensitive to RH Inventory



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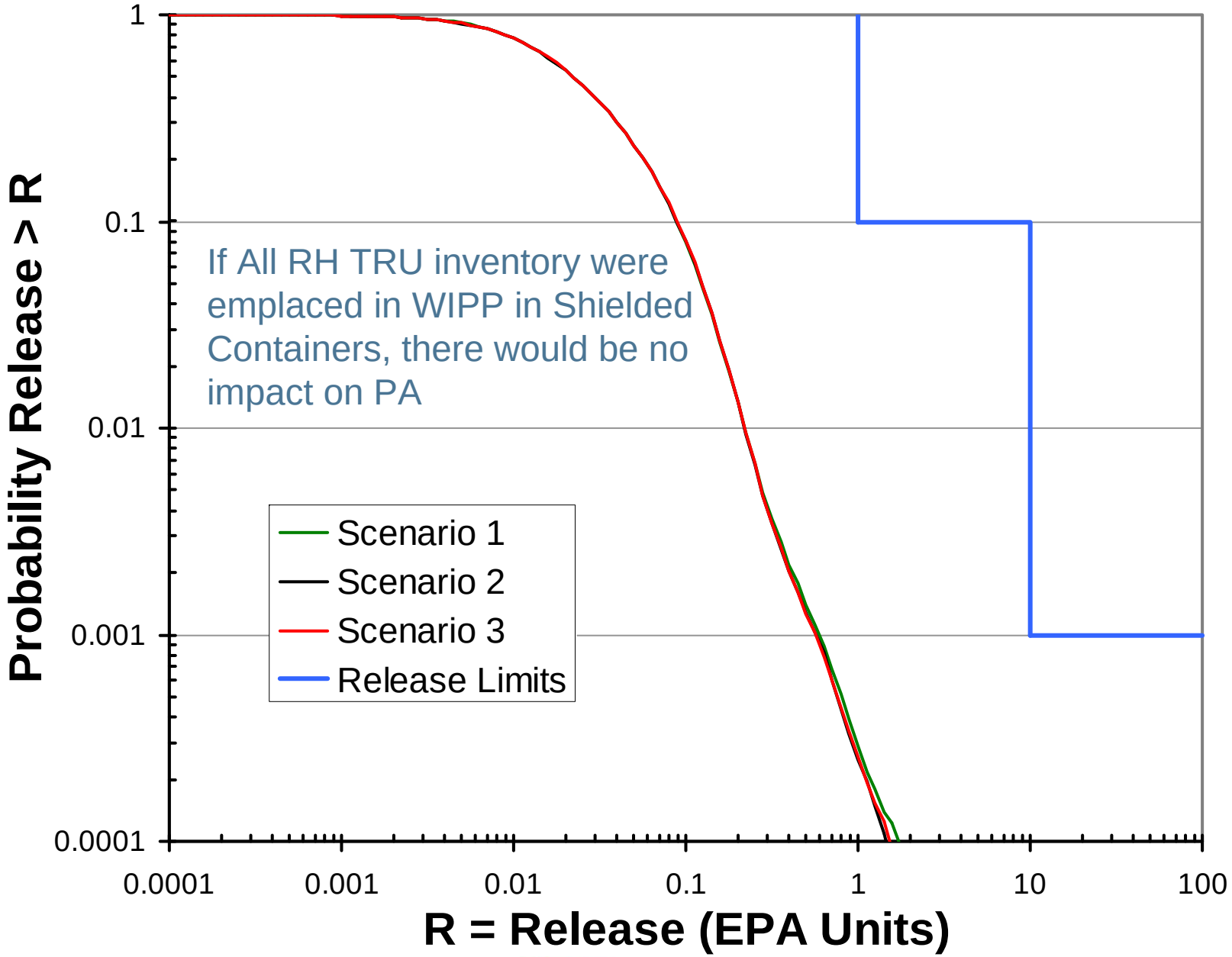
No Impact to Repository Performance



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Candidate Waste Stream Selection

- Activity of Cs^{137} dominates RH inventory (in some cases Am^{241} or Co^{60})
- Dose ~200 mrem/hr for ~ 2-3 Ci Cs^{137} in 30-gallon drum inside SCA (<0.12 Ci of Co^{60})
- Microshield modeling → candidate waste streams
- Other benefits include higher FGE, PECi, Wattage per shipment (e.g., each HalfPACT with 325 FGE limit) compared to one RH-72B with same limit
- Every RH shipment from INL to WIPP to date ~108 would have been able to be shipped in shielded containers (34)

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Cost/Benefit Considerations

RH shipping comparison for typical 100 m^3 waste stream	Containers	RH-72B Shipments
Direct-load RH canisters	112	112
55-gallon drums in canisters	476	159
30-gallon drums in canisters	909	303
Shielded Containers*	909	101*

*** Shipped in HalfPACT**

- **Cost/benefit break-even SCA cost ~$9000/unit**
- **Engineering estimate ~$5000/unit (bulk quantities)**
- **Use of lead from DOE's Material Recycle program could drop price even more**
- **Cost avoidance of RH-72B and canister insertion inefficiency**

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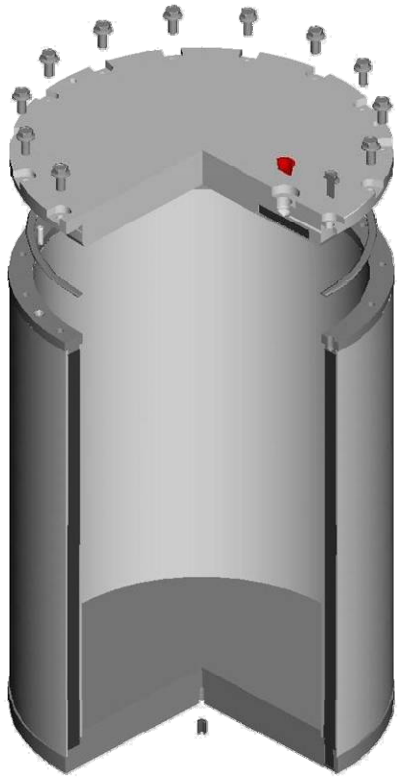
Shielded Container Conclusions

- Shielded containers are robust and safe alternatives to shipping RH-TRU waste in the 72-B cask
- Testing shows that radial and axial dunnage assemblies (with honeycomb end spacers):
  - preserve the shielding capabilities of the shielded containers in the HAC, and
  - protect the HalfPACT ICV during nominal use
- Shielded containers have no discernible impact on long-term repository performance.
- Shielded containers in HalfPACT can increase waste volume/shipment by 63% (vs 55gal drums in RH72B) to 200% (vs 30gal drums)



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