

DOE's Railcar Development Projects Update

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Legal Disclaimer

This is a technical presentation that does not take into account the contractual limitations or obligations under the Standard Contract for Disposal of Spent Nuclear Fuel and/or High-Level Radioactive Waste (Standard Contract) (10 CFR Part 961). For example, under the provisions of the Standard Contract, spent nuclear fuel in multi-assembly canisters is not an acceptable waste form, absent a mutually agreed-to contract amendment.

To the extent discussions or recommendations in this presentation conflict with the provisions of the Standard Contract, the Standard Contract governs the obligations of the parties, and this presentation in no manner supersedes, overrides, or amends the Standard Contract.

This presentation reflects ongoing work to design, fabricate and test prototype railcars. No inferences should be drawn from this presentation regarding future actions by the U.S. Department of Energy (DOE or Department), which are limited both by the terms of the Standard Contract and Congressional appropriations for the Department to fulfill its obligations under the Nuclear Waste Policy Act, including licensing and construction of a spent nuclear fuel repository.

Railcar Status Presentation Outline

- **Why is DOE Developing Railcars?**
- **What Railcars are being developed?**
- **Current status for each of the Railcars**
- **Next Steps**

Why is DOE Developing Railcars?

- DOE and DOD have negotiated Settlement Agreements with 3 of the Class I railroads
 - Union Pacific, Norfolk Southern, BNSF
 - Negotiating with CSX, others may follow
- Settlement Agreements require

“All cars supplied by the Government Shipper shall be designed and maintained suitable for interchange service and **will comply with AAR Construction Standards** at the time built...”
- S-2043 is the Association of American Railroads’ (AAR) railcar construction standard for transport of *high-level radioactive material* (HLRM)
 - AAR uses the term HLRM
 - DOE uses the terms Spent Nuclear Fuel (SNF) and High-Level Radioactive Waste (HLW)
- S-2043 compliance is not currently required by regulation
 - Compliance will reduce likelihood of derailment during operations
 - It’s the right thing to do

What Railcars is DOE Developing?

- DOE has 2 ongoing railcar development projects
 - Atlas Railcar Project
 - 12-axle Atlas railcar for carrying SNF/HLW casks
 - Buffer car
 - Rail Escort Vehicle (REV)
 - Single-car testing (Atlas + Buffer)
 - Multi-car testing (Atlas + Buffer + REV)
 - Fortis Railcar Project
 - 8-axle Fortis railcar for carrying SNF/HLW Casks
 - Single-car testing (Fortis)
 - Multi-car testing (Fortis + Buffer + REV)
- Why 2 railcars to carry SNF/HLW?
 - Moving forward this approach will provide DOE options to ensure a safe and economical transportation system

Railcar Status – Atlas Railcar

- AAR EEC approved the Atlas railcar design and instructed DOE to move to the testing phase in 2018 and the fabricated Atlas railcar was delivered to DOE for testing in 2019
- Data Collection for single-car testing is complete
 - Some performance issues were encountered during single car testing
 - Primary suspension pads of varying rigidity (Shore D Hardness rating of 58*, 65, 68, and 70)
 - The best blend of performance characteristics were found with the original 58 primary suspension pads
 - Ongoing root cause analysis to better understand initial issues with original 58 primary suspension pads
 - Atlas single-car test reports are in progress
 - Expect AAR EEC approval to begin multiple-car testing in January 2022



Railcar Photos

Atlas Railcar with Light Load, October 2019



Railcar Photos

Atlas Railcar with Heavy Load, October 2019



Railcar Status – Buffer Railcar

- Single-car testing is complete
 - Buffer railcar met all S-2043 single-car testing requirements
 - Single-car test reports have been approved by the AAR EEC
 - Buffer car is ready for multiple-car testing

| S-2043 Section | Met/Not Met |
|--|-------------|
| 5.2 Nonstructural Static Tests | |
| 5.2.1 Truck Twist Equalization | Met |
| 5.2.2 Carbody Twist Equalization | Met |
| 5.2.3 Static Curve Stability | Met |
| 5.2.4 Horizontal Curve Negotiation | Met |
| 5.4 Structural Tests | |
| 5.4.2 Squeeze (Compressive End) Load | Met |
| 5.4.3 Coupler Vertical Loads | Met |
| 5.4.4 Jacking | Met |
| 5.4.5 Twist | Met |
| 5.4.6 Impact | Met |
| 5.5 Dynamic Tests | |
| 5.5.7 Hunting | Met |
| 5.5.8 Twist and Roll | Met |
| 5.5.9 Yaw and Sway | Met |
| 5.5.10 Dynamic Curving | Met |
| 5.5.11 Pitch and Bounce (Chapter 11) | Met |
| 5.5.12 Pitch and Bounce (Special) | Met |
| 5.5.13 Single Bump Test | Met |
| 5.5.14 Curve Entry/Exit | Met |
| 5.5.15 Curving with Single Rail Perturbation | Met |
| 5.5.16 Standard Chapter 11 Constant Curving | Met |
| 5.5.17 Special Trackwork | Met |

Railcar Photos - Buffer Railcar



Railcar Status – Rail Escort Vehicle

- The Rail Escort Vehicle (REV) is being developed jointly by the U.S. Navy and U.S. DOE
 - The Navy is building a total of 6 REVs
 - The first REV was used by the Navy to complete the Single Car Testing process
 - Outfitted with dummy weights
 - REV single-car test report is currently being reviewed by the AAR EEC
 - The 2nd REV is being built for DOE to use for multi-car testing
 - DOE will own this REV
 - This REV will be fully outfitted prior to multi-car testing
 - » Initial outfitting has provided some challenges but is now progressing rapidly

Railcar Photos – Rail Escort Vehicle

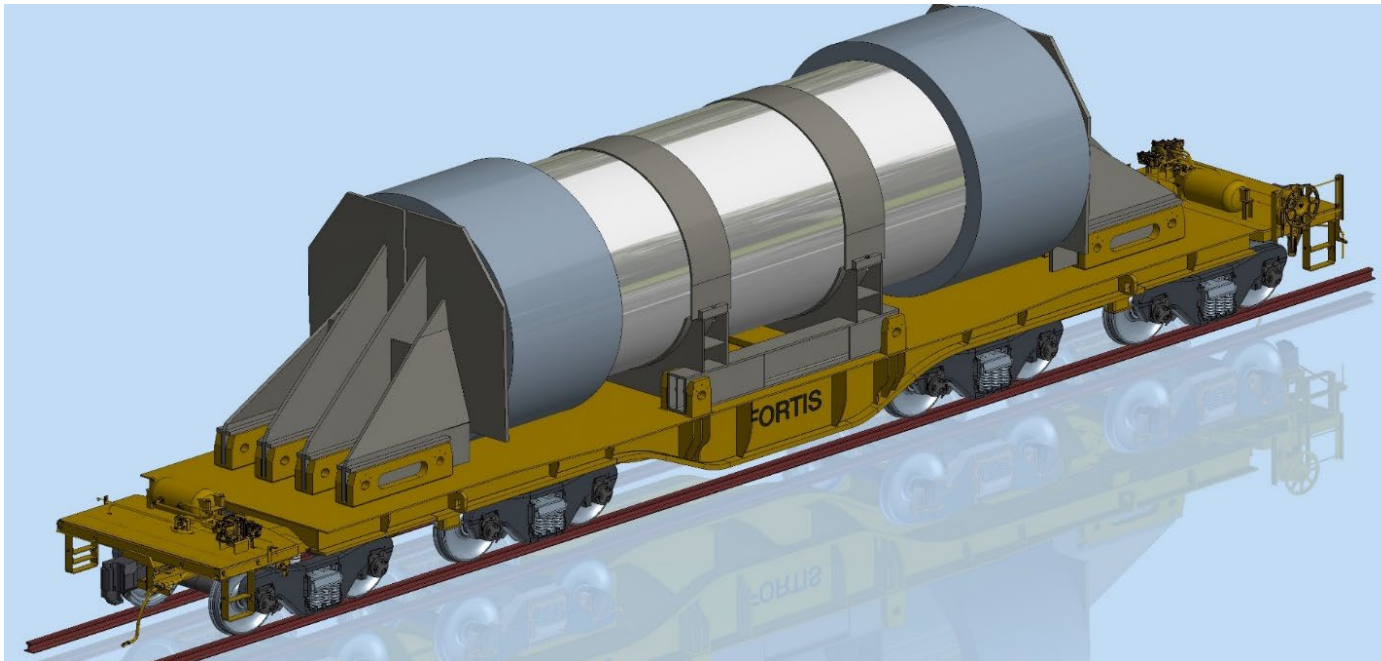


Railcar Photos – Rail Escort Vehicle

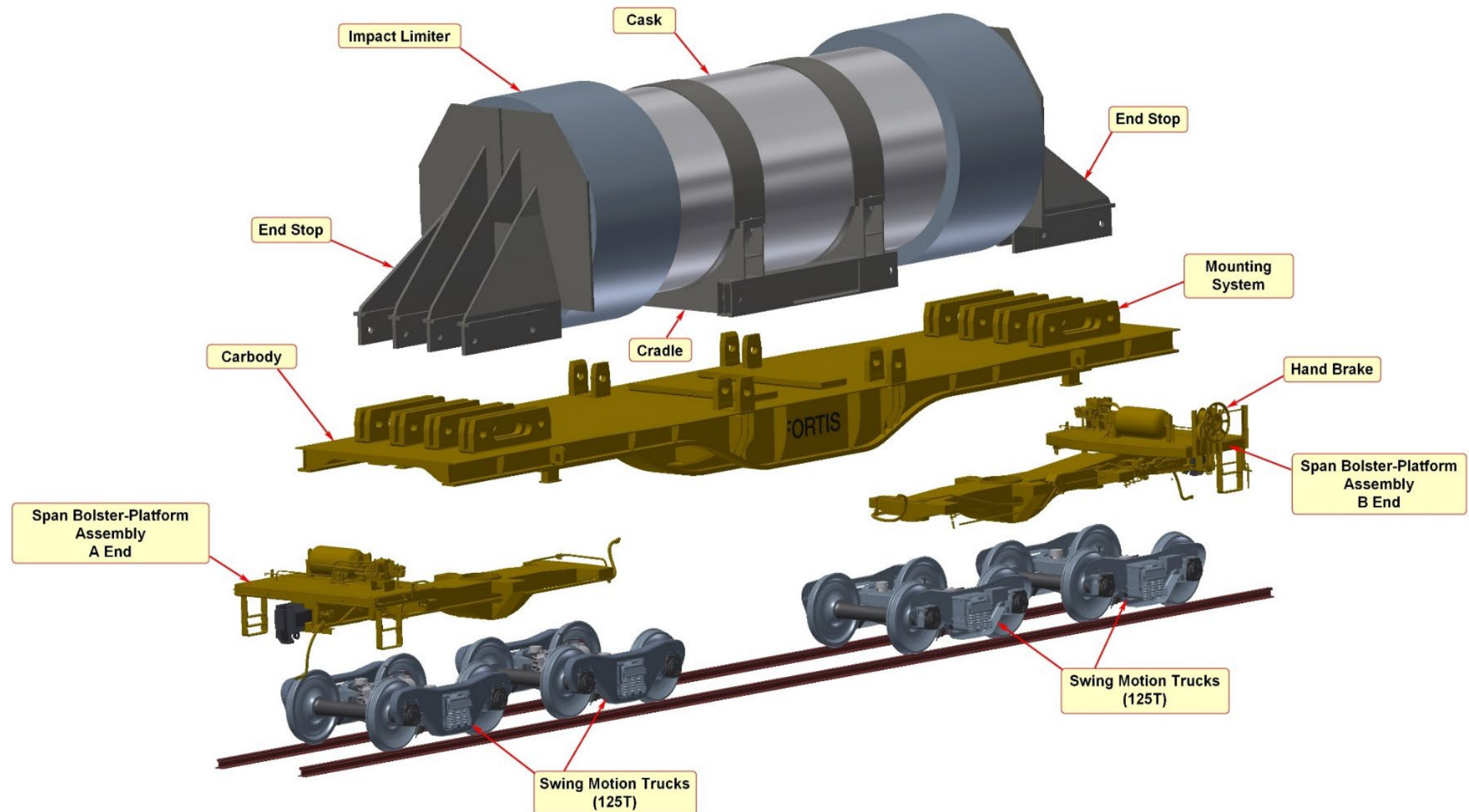


Railcar Status – Fortis Railcar

- Initial design phase of the Fortis railcar is complete
 - A rail engineering company based outside Chicago, IL led the design effort
 - Uses the same payload attachment system as the Atlas railcar
 - Designed to be compatible with the Buffer railcar and the REV
 - AAR EEC has approved the initial design and has instructed DOE to begin the testing process
 - Request for proposals (RFP) for a fabrication and testing contract is expected to be released soon

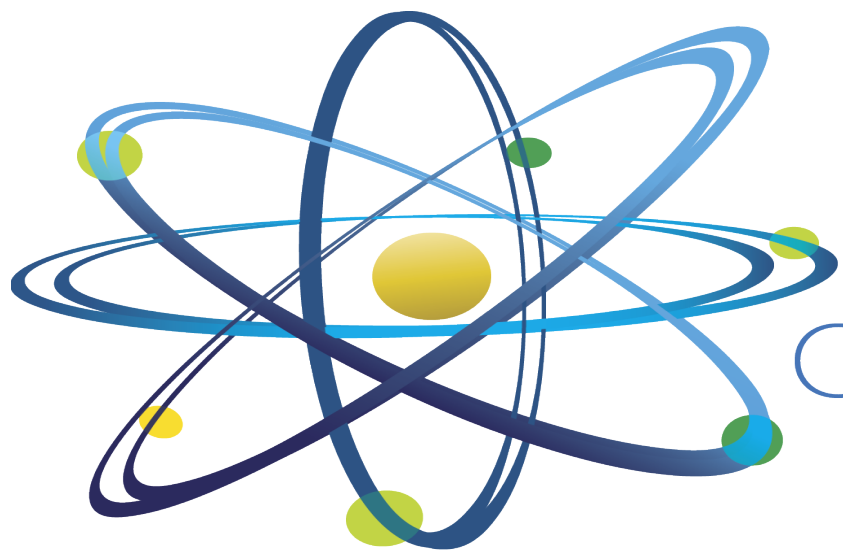


Railcar Status – Fortis Railcar



Railcar Projects – Next Steps

- Begin multi-car testing of Atlas, Buffer car, and REV
 - Need EEC letter to proceed with multi-car testing for Atlas and REV
 - Documentation on single-car testing is being compiled
 - Demonstration Run is the final step in multi-car testing
 - S-2043 says to use an actual service route - however, actual service routes are not yet known at this time
 - Expect Demonstration Run to take place in the Fall of 2022
 - Eastern US
 - Are working to ensure stakeholders can track the train during the demonstration run
- Fabrication of Fortis
 - RFP for fabrication and testing is expected to be released soon
 - Instrumented wheelsets will be procured through the same RFP
 - Fortis will then undergo single car testing and then multi-car testing with the Buffer railcar and the REV



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