

BNSF Rail Safety Overview

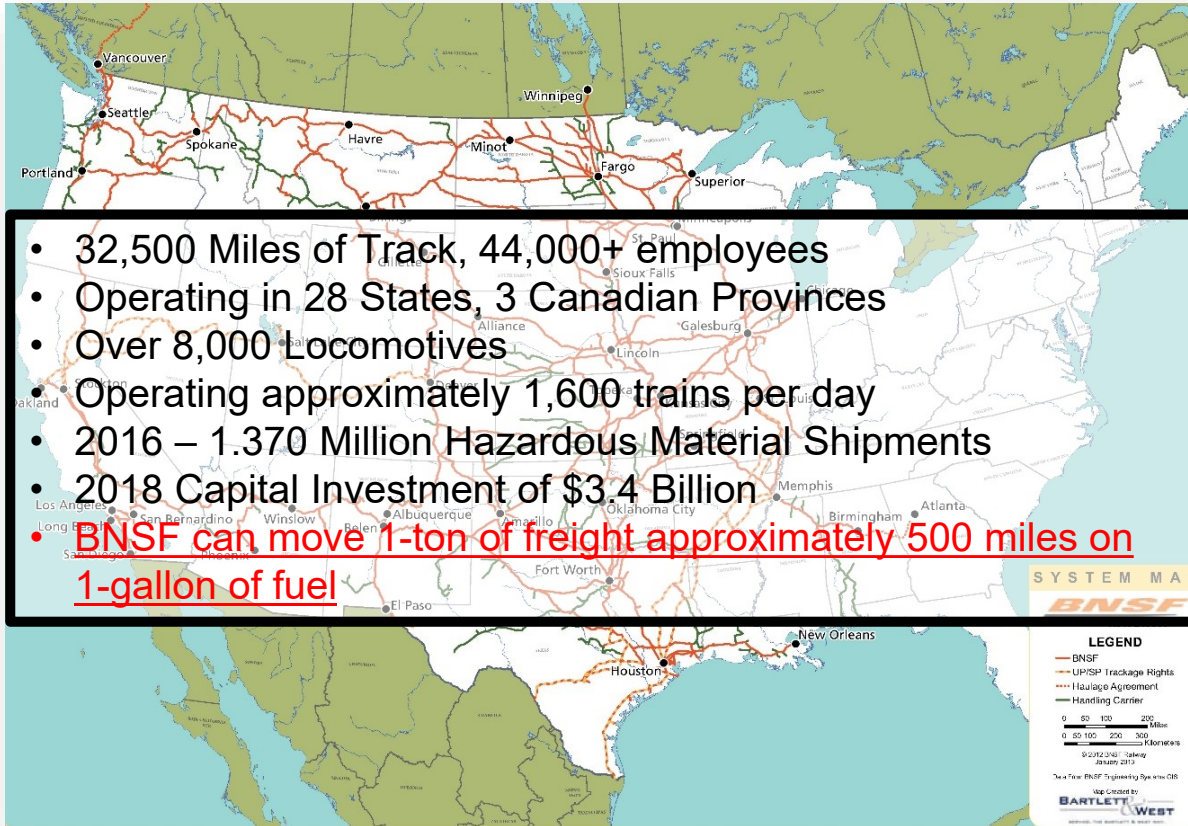
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GENERAL DIRECTOR HAZMAT SAFETY

DECEMBER 13, 2018



Who and What We Are.....



Rail Hazmat Safely

- Since 1980, railroads reduced rates for employee injuries, train accidents and grade crossing collisions by **80%**
- In 2017 BNSF moved hazardous materials **99.999%** of the time without an accidental release
- Fissile materials are a very small percentage of the traffic handled by rail. Currently:
 - 0.0029% of all hazmat
 - 0.00023% of all shipments

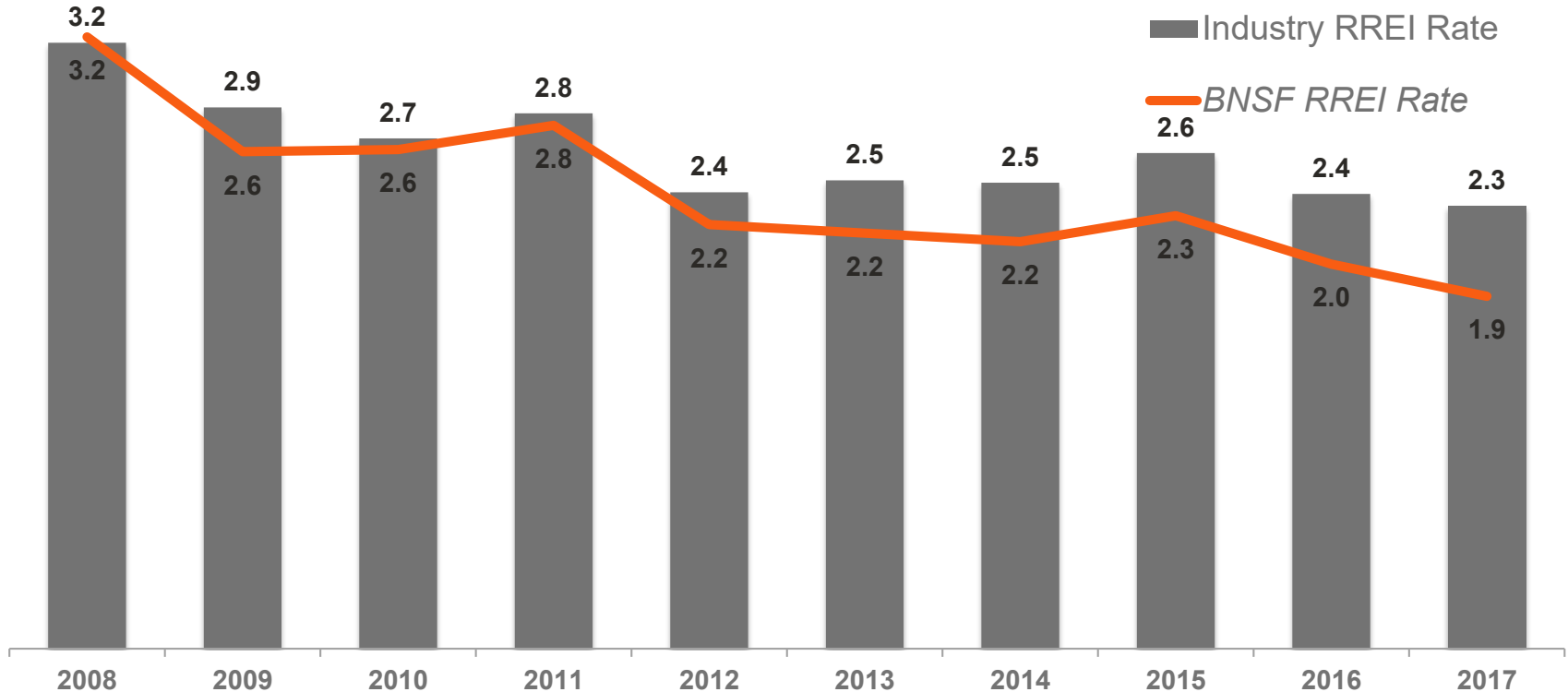


- Rail is the safest mode of land transportation.
- BNSF's safety vision is to prevent accidents in the first place.
- BNSF has a broad-based risk reduction program.



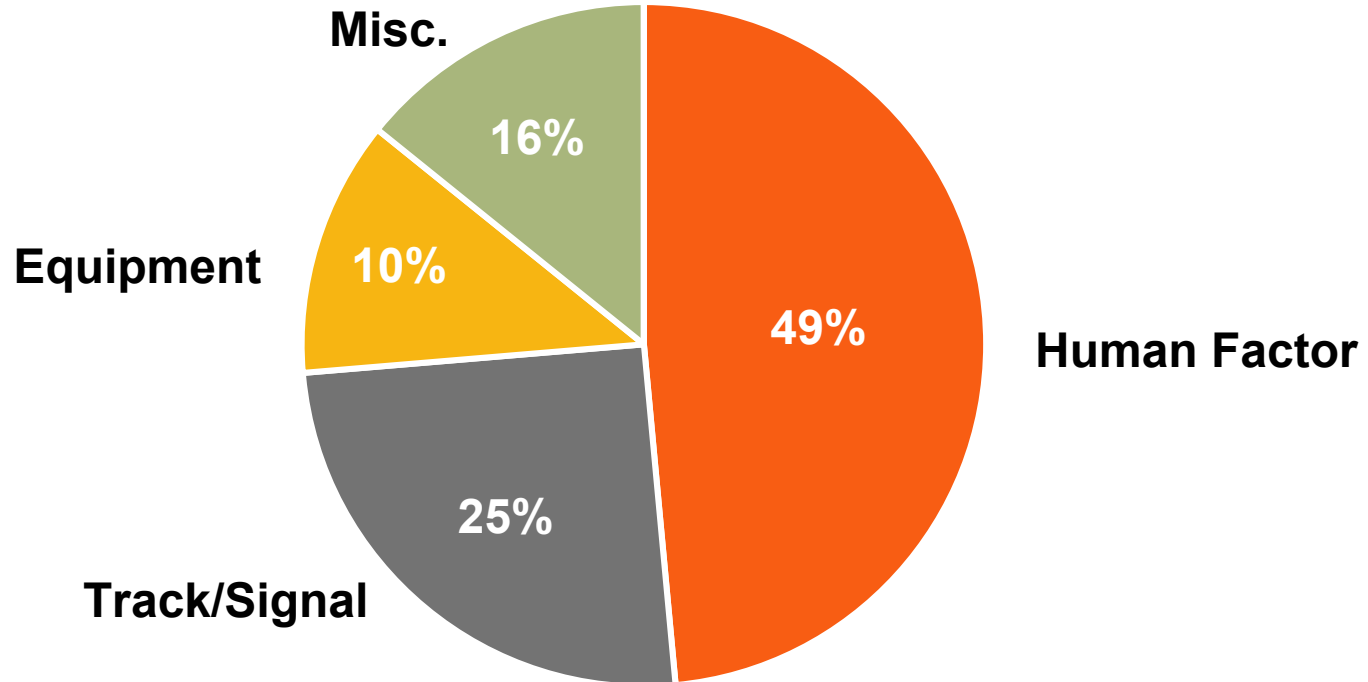
Safety Leader for Continuous Risk Reduction

BNSF vs. Industry Reportable Rail Equipment Incident Rate (Incidents per Million Train Miles)



Prevention: Causes for Derailments

BNSF REPORTABLE TRAIN ACCIDENT CAUSES - 2017



Prevention: Risk-Reduction Efforts – Layers of Safety

Risk Identification

Risk ID

Proactively determine and prioritize sources of risk

Incident & Injury Prevention

Design-In Safety

Engineer out risk during equipment, facility and process design

Rules & Procedures

Set rules and procedures, culture of compliance and accountability

Safety Information

Align efforts and communicate key messages to all levels

Approaching Others About Safety

Develop people to ID, address and respond to exposure

Incident & Injury Response

Emergency Planning & Response

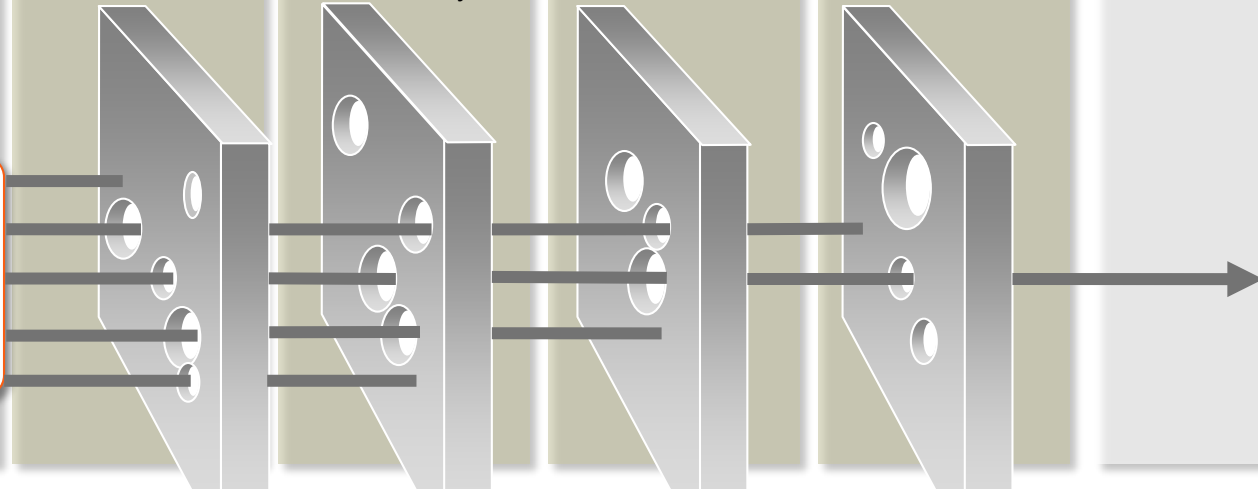
Reduce severity and impact

Re-enactment

Reduce severity and impact

Sources of Risk

Incident



Prevention: Reducing Risk

Human Factor

- Training
- Remote monitoring
- Positive Train Control
- Self reporting protocol

Equipment/Mechanical

- Ultrasonic inspection
- Detector network - dragging equipment
- Technology
 - Thermal/infrared scanning for warm bearing detection

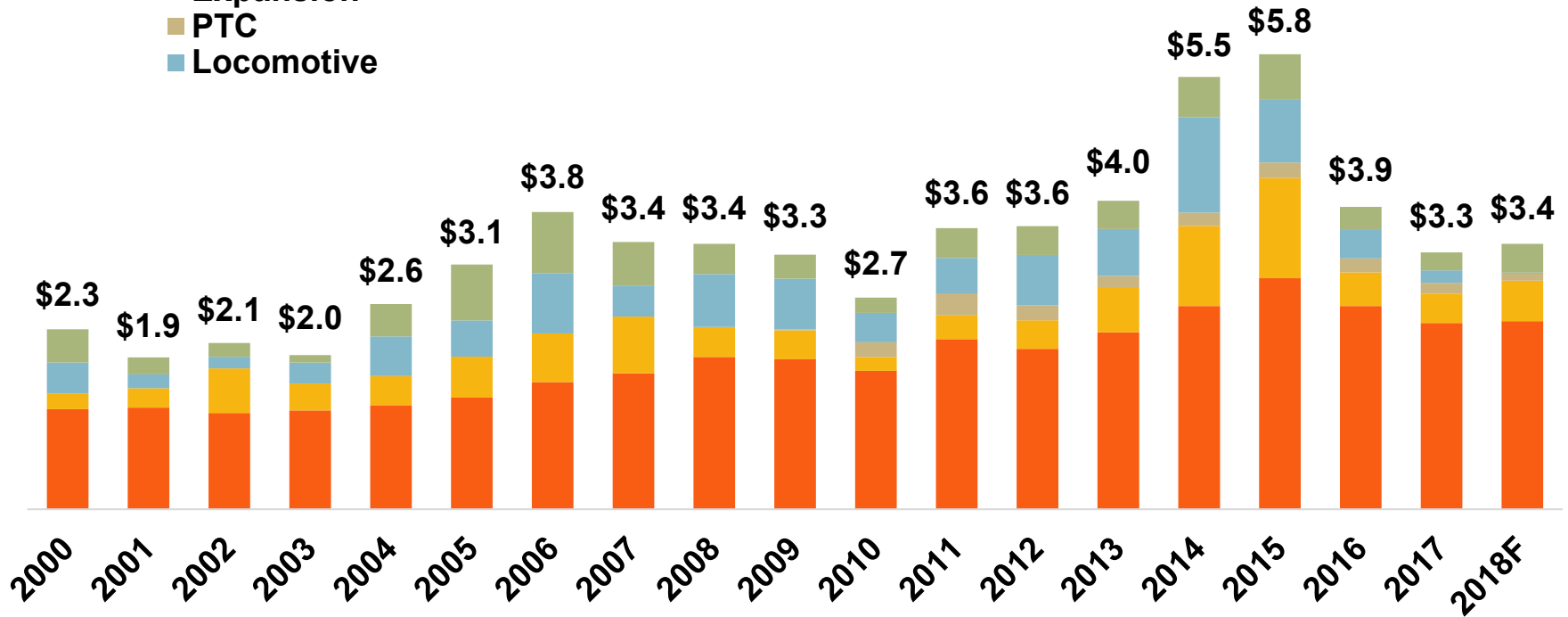
Track/Signal

- Enhanced track inspection training
- Continued elimination of jointed rail
- Strong capital program for tie renewal
- Technology - ground penetrating radar and enhanced geometry testing

BNSF's Capital Investments

\$ Billions

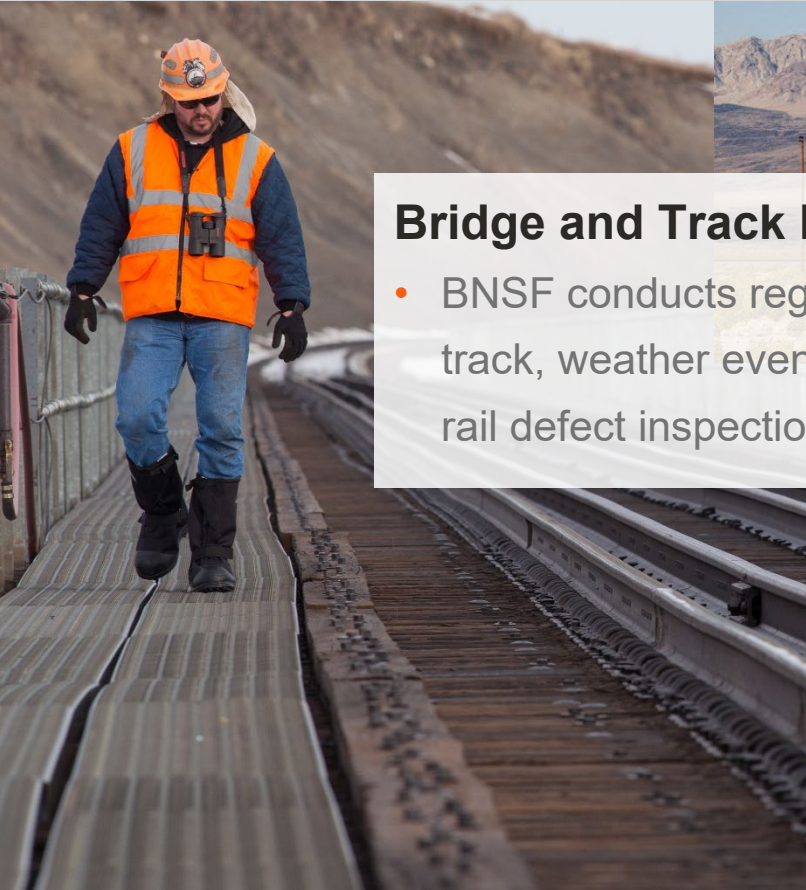
- Replacement Capital
- Expansion
- PTC
- Locomotive



Prevention: Approach to Inspections

Bridge and Track Inspections

- BNSF conducts regular, rigorous track, weather event, bridge and rail defect inspections



HAZMAT INSPECTIONS

To determine if a HAZMAT shipment is in acceptable condition for transportation, the **Federal Railroad Administration (FRA)** requires all loaded and residue/empty HAZMAT shipments be inspected at these certain points:

- ✓ Before accepting the shipment from the shipper.
- ✓ When receiving them in interchange.

Note: Run-through trains received in interchange may continue to the next inspection point before being inspected.

- ✓ When placing shipment in a train.
- ✓ At other points where an inspection is required (e.g., 1K/1.5K mile inspection).



Prevention: Equipment Detection Technology

- More than 4,000 trackside detectors
- Hot Box Detector (HBD)
- Wheel Load Impact Detector (WILD)
- Trackside Acoustical Detector (TADS)
- Sonic Cracked Wheel/Axle Detector (CWAD)
- Machine Vision Systems
- Magnetic Particle Inspection
- Warm Bearing Detection System (WBDS)
- Hot Wheel Detectors (HWD)
- Truck Performance Detectors (TPD)



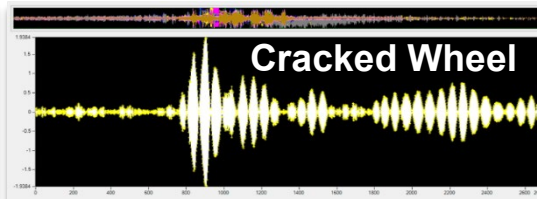
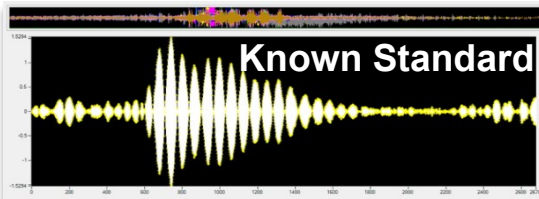
Prevention: Rail Equipment Detector Examples



Acoustic Bearing Detector (ABD)



Hot Box Detector (HBD)



Cracked Wheel/Axle Detector (CWAD)

Prevention: Key Train Operations

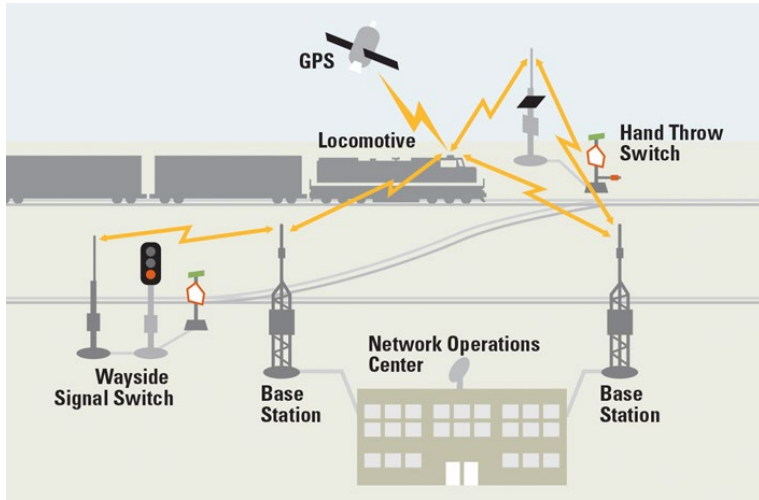
A Key Train has one or more loads of Spent Nuclear Fuel/High Level Radioactive Materials, Toxic Inhalation Hazard/Poisonous Inhalation (TIH/PIH) materials or a train with 20 or more tank loads of any hazardous materials.

Special Handling for Key Trains

- **Speed restrictions**
 - BNSF requires a speed of 35 mph for all Key Trains through municipalities of 100,000 or larger as of March 2015
 - 50 mph for all Key Trains as of July 2014
- **Special identification and tracking**
 - Risk-based Routing
 - Key Train Routes
 - Parked and Secured Trains
 - Locomotive Cab Securement



Prevention: Positive Train Control (PTC) Deployment Enhances Safety



BNSF has installed the PTC infrastructure on all **88 required subdivisions**, covering more than **11,500 route miles** and **80 percent** of our freight volume.



Routing – Explosives 1.1 -1.3, PIH and Radioactive - Highway Route Controlled Quantities

- **Rail transportation route analysis.** For each calendar year, a rail carrier must analyze the safety and security risks for the transportation route(s) using 27 safety and security factors for the primary route and secondary routes (172.820)
- Lessons learned
 - Best track
 - Shortest route
 - Avoiding populations is not normally possible

Typical Steps -

- Obtain origin, interchange and destination locations
- Carrier runs the Risk – Route Model using the 27 factors
- Reviews results with DOE and DOT
 - Tests between the Railroad and DOE model seem to have similar routes.

Why Dedicated Trains

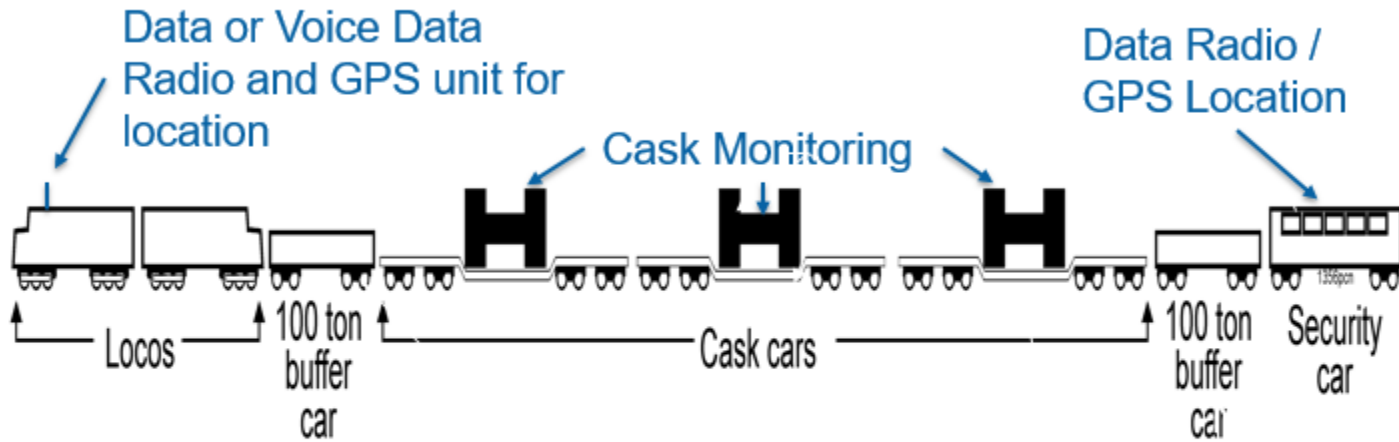
- Equivalent weight distribution / train handling
 - Standard freight car 100 ton = 286,000#
 - SNF Car 125 ton >400,000#
- Less handling
 - Fewer switches
 - No classification
- Best available technology can be utilized

Performance Standard for Spent Nuclear Fuel Trains (S-2043)

- Includes all cars in the trains including buffer cars, security cars
- Requires static and dynamic modeling before construction
- Requires full scale characterization, static, and dynamic testing of each car and the train
- Roadworthiness exceeds standard freight car requirements
 - Enhanced performance trucks

- **On-Board Monitoring Systems**
 - Location Determination
 - Truck Hunting
 - Wheel Flats
 - Braking Performance
 - Vertical, Lateral, Longitudinal acceleration
 - Bearing Condition
 - Speed, Ride Quality

Schematic of SNF Train



Defect detection (all cars) including:

Truck hunting, rocking, wheel flats, bearing condition, ride quality, braking performance, vertical lateral, and longitudinal acceleration



DEC