RAIL

MOVING AMERICA FORWARD

Rail Transportation Decarbonization Research & Safety

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Discussion Overview

- Federal Railroad Administration & Strategic Goals
- Research Program Objectives
- Decarbonization Technology Development
- Questions

FRA & Strategic Goals

Federal Railroad Administration (FRA) - https://railroads.dot.gov

- Agency within US Department of Transportation
- Safety oversight of nation's railroads
- Management and oversight of Amtrak public funding

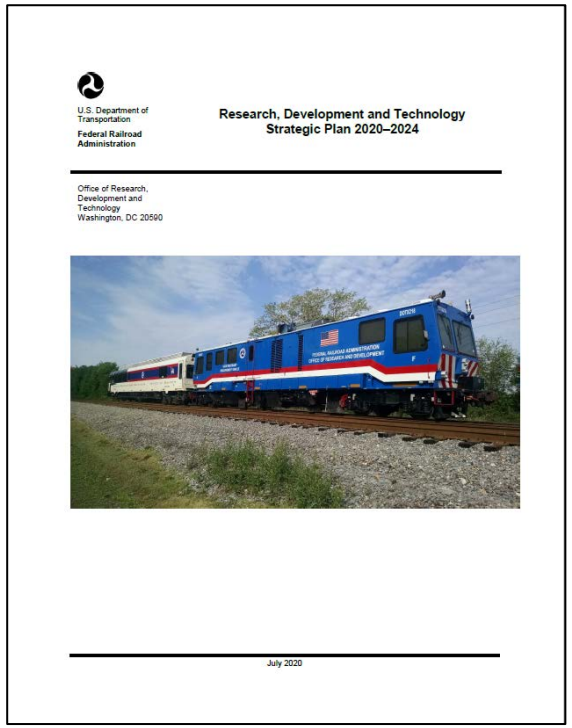
John A. Volpe Center National Transportation Systems Center (U.S DOT Volpe Center)

- National research center for all modes of transportation
- Supporting FRA on topics of equipment crashworthiness, vehicle-track-interaction, track buckling, tank car research, alternative fuels, fire safety, human factors, etc.

FRA Office of Research, Development and Technology (RD&T) - Mission

To ensure the safe movement of people and goods by rail through applied research and the development of innovative technologies and solutions.

- *Safety* is the USDOT's primary Strategic Goal, and thus is the principal driver of the RD&T program.
- Other USDOT Strategic Goals: *Economic Strength and Global Competitiveness, Equity, Climate and Sustainability, Transformation, Organizational Excellence*


U.S. Department of Transportation
Federal Railroad Administration

Research, Development and Technology Strategic Plan 2020–2024

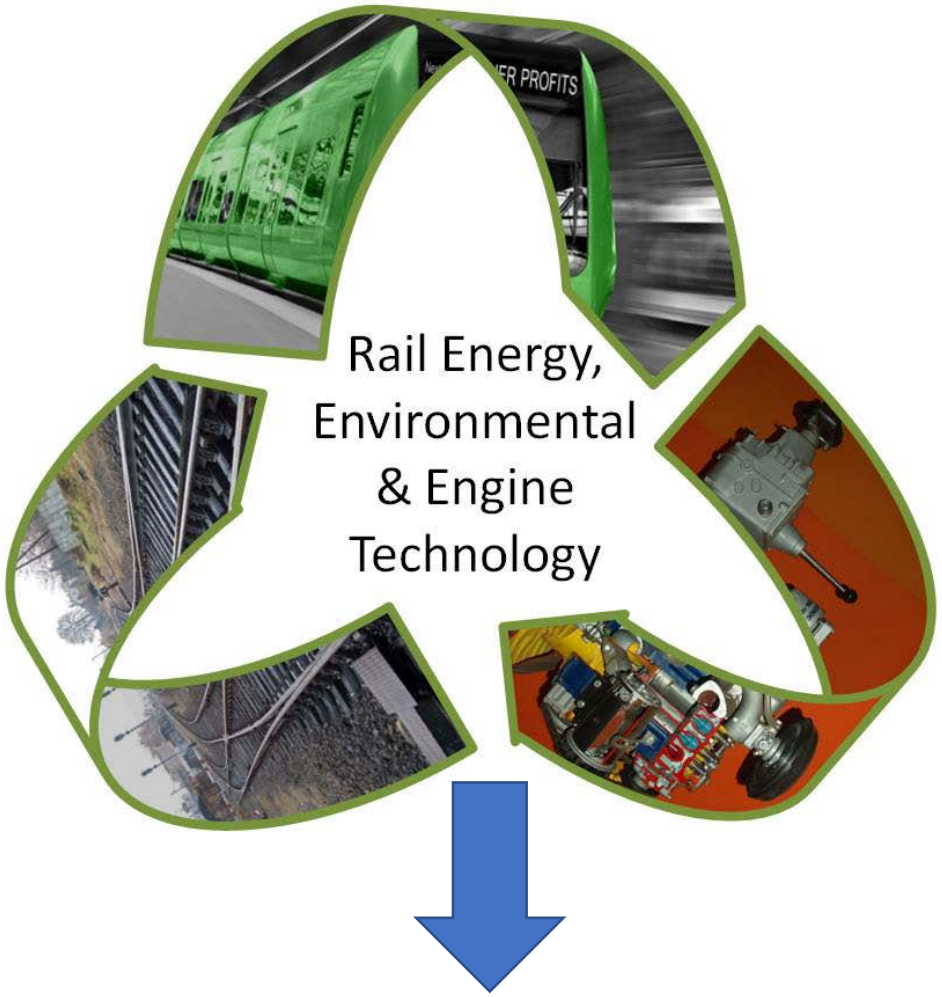
Office of Research, Development and Technology
Washington, DC 20590

July 2020

Rail Energy, Engine & Emissions (E3) Technology Research Program

Objectives:

- Promote and support the development of safe, efficient, and reliable alternative fuels and motive power for rail transportation.
- Develop and demonstrate safe and reliable technologies that reduce rail transportation emissions.
- Develop knowledge and tools to address climate change and rail infrastructure resiliency.
- Conduct collaborative research with railroads, small businesses, other Federal agencies, national labs, etc.

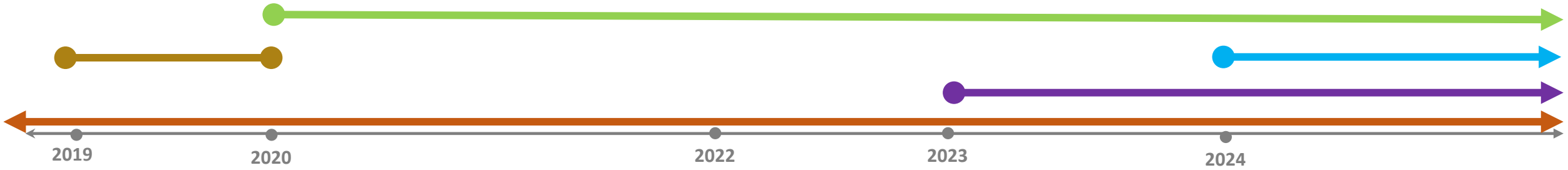


FRA must ensure such technologies are safe!

Hydrogen & Battery Safety Research Activities

- **Impact figures on merits of hydrogen technology in rail**

- **Assessment of post-crash outcomes for rail**
- **Operations and maintenance requirements for hydrogen-fueled rail vehicles**
- **Fuel tender requirements for hydrogen-fueled rail vehicles**



- **Engine performance and emissions of biofuels blends in advanced locomotive engines**

- **Hydrogen dual fuel engine development**

- **Drop test of BESS**
- **Grade-crossing impact test of hydrogen-fueled and battery powered vehicles**
- **Development of models to quantify explosion risks, fire and toxicity of Li-ion batteries**

Example New Rail Equipment

Photo Credit: https://www.greencarcongress.com/2021/05/20210518-wabtech.html

Photo Credit: https://www.railwayage.com/news/hgmotive-cpkc-partner-on-hydrogen-fueling-system/

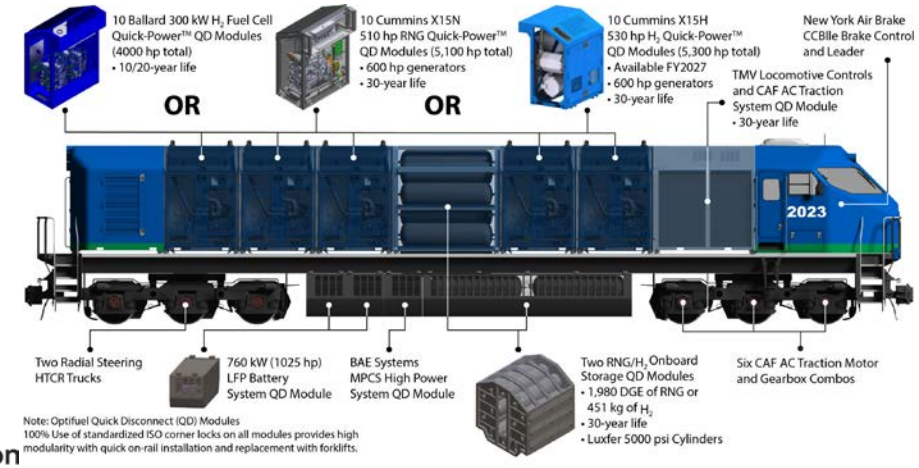


Photo Credit: OptiFuel Systems https://optifuelsystems.com

Scenarios of Concern

1. Underframe Impacts
2. Side Impacts
3. Rollover
4. Incidents Involving Fire
5. Incidents Involving Water

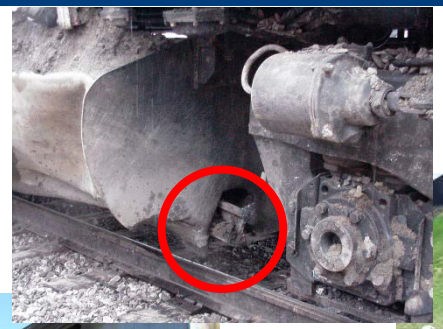
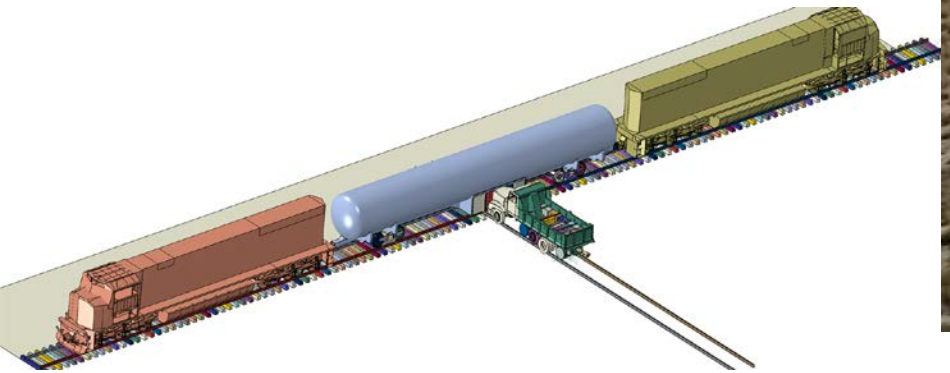


Photo Credit: The Daily Herald, courtesy of Merit Edwards
https://oklahoman.com/article/3759217/ntsb-says-train-didnt-slow-before-oklahoma-collision

Full-scale Impact Test of Alternative Fuel Tender

- Highway-grade-crossing collision of liquefied natural gas fuel tender
- 80,000-lb highway truck at 40 mph (69.2 km/h) into protective housing located on tender, which contained LNG fill valves



Developing Metrics: Testing

- **Crashworthiness Testing** – evaluate the performance of the railcar structures in preventing breach of the hydrogen tanks or batteries
  - Criteria: hydrogen tanks or batteries are not breached and remain attached, contained, and energetically protected

- **Catastrophic Testing** – evaluate safety risks of hydrogen or batteries under failure of protective structures and/or attachments to better understand the consequences of breaching these new-to-rail onboard energy storage systems
  - Demonstrate and measure the resultant outcome including the severity, i.e. explosion/fire/failure, and time to contain
  - Results inform the risk assessment effort and fire standard development effort

What's Next

- FRA review of new technology equipment
  - 2013 Requirements for Obtaining an FRA Letter of Concurrence for use of alternative fuels being updated
- Participate in industry working groups for standards and regulatory development effort
- Collaborate with safety professionals in other modes of transportation

QUESTIONS?

Contact Us

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