

Federal Railroad Administration Alternative Fuels Research Program

Presented by

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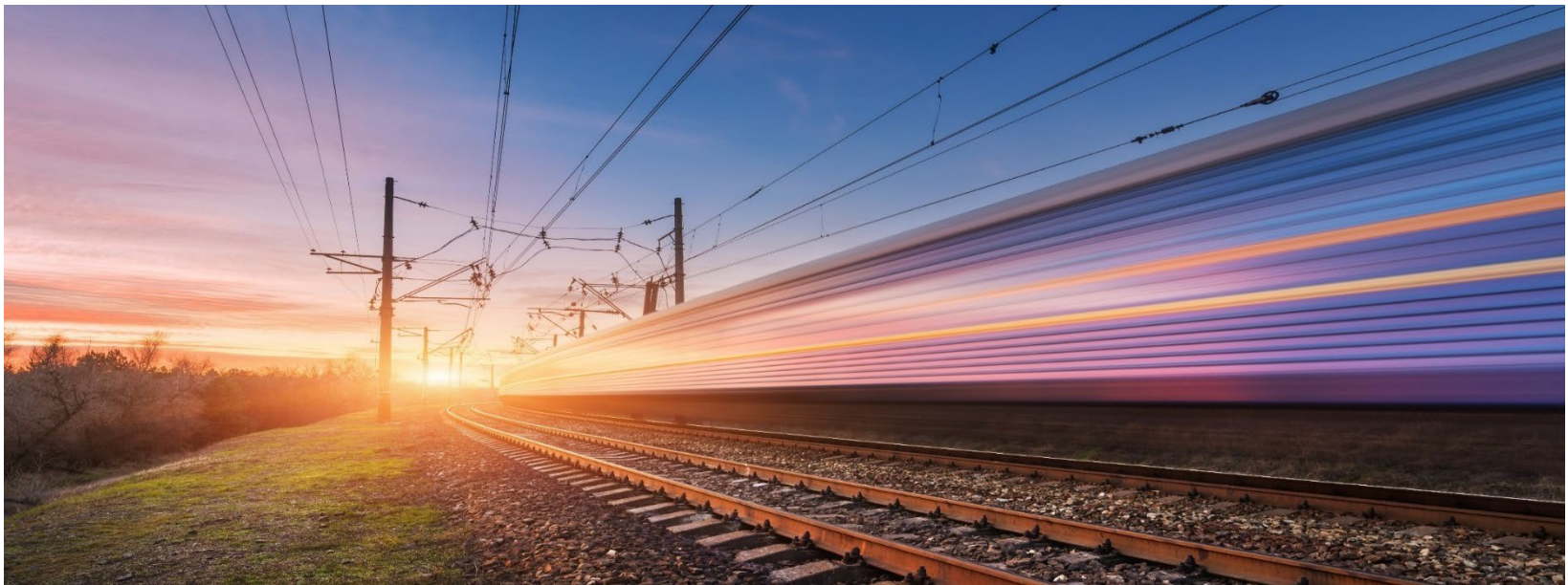
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*H2@Rail Workshop • March 26–27, 2019
Lansing, Michigan*

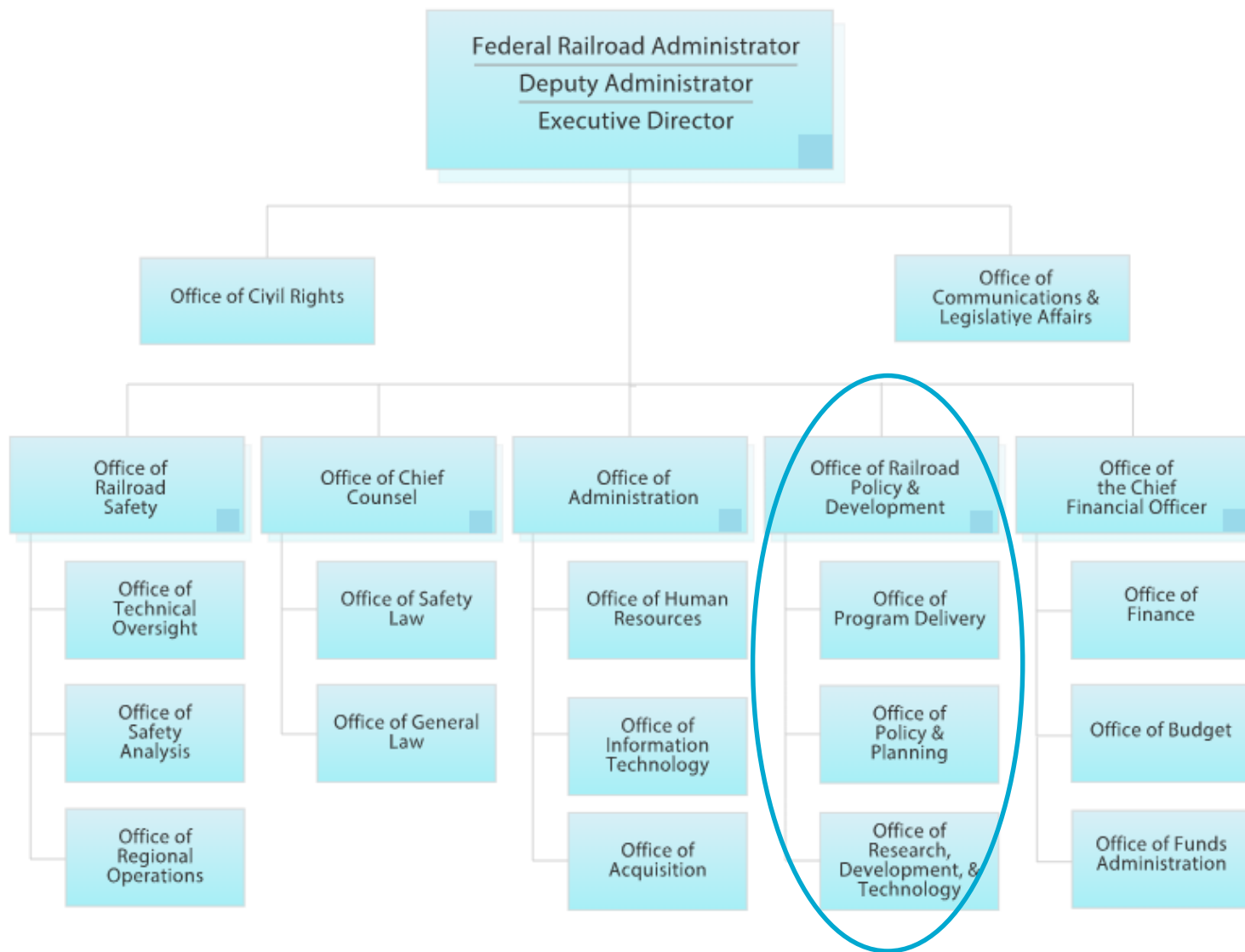


FRA's Mission

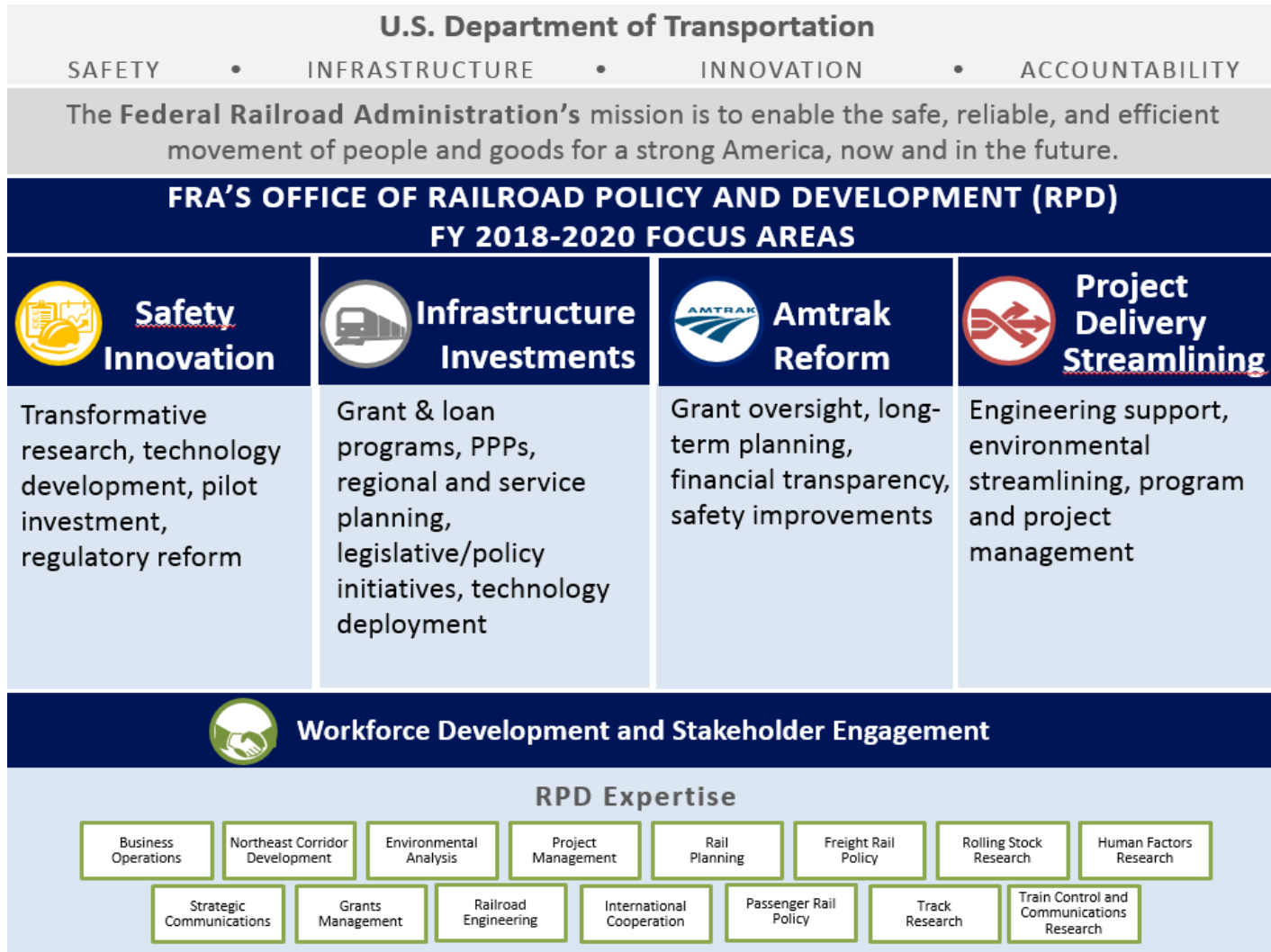
*To enable the safe, reliable, and efficient movement of people and goods
for a strong America,
now and in the future.*



Federal Railroad Administration (FRA)

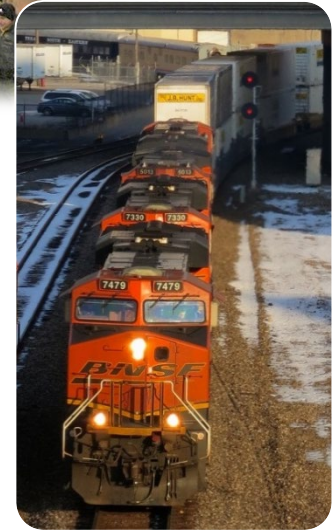


FRA: Office of Railroad Policy & Development



FRA RD&T's Mission

- **RD&T's mission** is to ensure the safe, reliable, and efficient movement of people and goods by rail through basic and applied research, and development of innovations and solutions.
 - **Safety** is the principal driver of FRA's RD&T program activities.
 - Other drivers include DOT's strategic goals of innovation and accountability.



Rail Energy, Environment & Engine Technology Research Program

Advance the modernization of rail transportation through research, development, and demonstration efforts that emphasize:

- Safety of new innovative energy and engine efficiency technologies
- Emissions reduction technologies and environmentally sustainable procedures and investments



Alternative Fuels Research

- **2009-2014: Biodiesel Research Activities**

- Collaboration with Amtrak on passenger locomotive revenue service test on B20 biodiesel
- Evaluation of engine durability on various blends of biodiesel
- Evaluation of engine emissions on various blends of biodiesel

- **2012-Present: Natural Gas Research Activities**

- Collaboration with Association of American Railroads (AAR), DOE National Laboratories, and US railroads on safety evaluation of natural gas (liquid and compressed)
 - Research Needs Workshop
 - Safety evaluation methodologies
 - FMEA of legacy liquefied natural gas (LNG) tenders
 - Crashworthiness of LNG fuel tender
 - Risk criteria for LNG transportation
 - Support in development of AAR specification for natural gas fuel tender cars



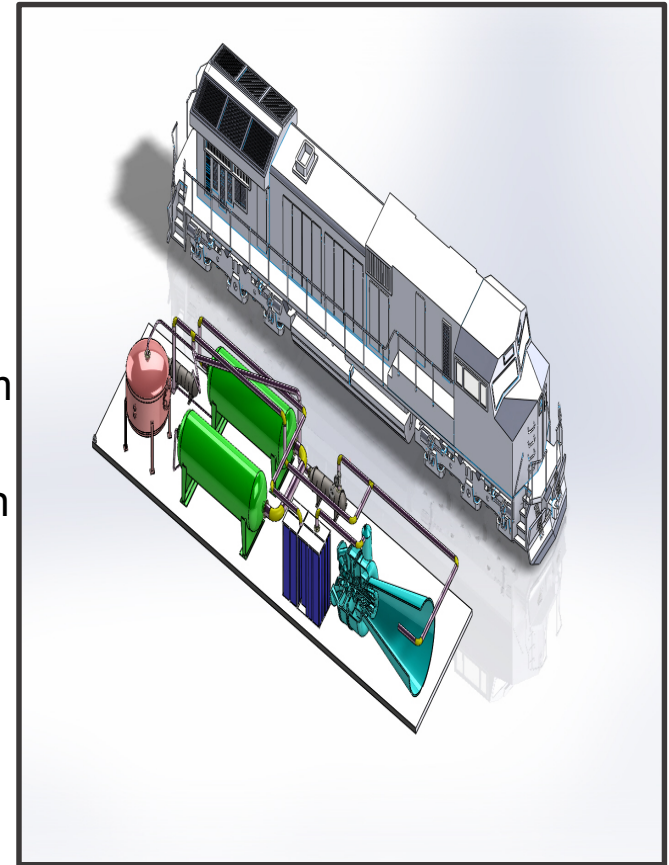
Alternative Fuels Research

- **2014-2016: Solid Oxide Fuel Cell For Rail Applications**
 - Feasibility study and prototype design for locomotive propulsion
- **2018-Present: Hydrogen and Fuel Cell for Rail Applications**
 - Impact study on applicability of hydrogen for rail



RD&T Hydrogen & Fuel Cell Research

- **Objective: Conduct assessment of hydrogen and fuel cell technology for rail applications**
 - Safety, energy efficiency, and environmental impacts
- **Initial Research**
 - Prototype design of 250kW SOFC-Gas Turbine system for locomotive power supply
 - Define metrics to evaluate the introduction of hydrogen fuel cell technology to rail transportation
 - Apply these metrics to rail operations: long haul, switcher and passenger
 - Identify most appropriate rail applications where hydrogen fuel cell usage would be most appropriate
- **Future Research**
 - Safety research on hydrogen fuel tenders and locomotives



Questions?

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