Freight Railroads are Part of the Solution to Climate Change

**KEY TAKEAWAY:** As the most fuel-efficient way to move freight over land, freight railroads actively invest in infrastructure, equipment, and technology and deploy sustainable business practices to reduce their carbon footprint and build a more resilient network for a future shaped by climate change.

As cumulative global emissions and CO₂-attributable warming continue to rise annually, immediate emissions reductions and smart policies to transition toward a net-zero economy are critical. Railroads remain a responsible partner capable of delivering sustainable transportation solutions in the near term and for the long haul.

With an eye trained on that goal, freight railroads are developing and implementing new technologies, refining operating practices, and working with their suppliers, customers and supply chain partners to reduce GHG emissions. Every North American Class I railroad has an approved target with the Science Based Targets initiative, an organization driving ambitious climate action in the private sector and working to curb temperature rise and mitigate climate change-related impacts.

In 2023, railroads made significant progress as they embraced innovative solutions, from hydrogen-powered locomotives to more electric cranes in intermodal yards. Below are just a few examples.

**Recyclable Ties**
Union Pacific replaced three million traditional wooden rail ties with recyclable composite materials. The new ties have a 50-year lifespan and divert 90,000 tons of plastic from landfills for every million composite ties laid.

**Hydrogen Hub**
BNSF partnered with Bakken Energy to design the Heartland Hydrogen Hub, exploring clean hydrogen production and distribution using rail transport.

**Electric Cranes**
Norfolk Southern swapped 22 of its 68 diesel cranes with hybrid or fully electric, aiming to eliminate all diesel cranes within the next decade. Each hybrid crane slashes emissions by 75%, preserving 22,000 gallons of diesel fuel and curbing 225 tons of emissions annually.

**AC Locomotives**
Canadian National modernized 60 locomotives, converting them to AC-powered traction, which reduces GHG emissions by enhancing fuel efficiency, reliability and pulling power.

**Hydrogen Engines**
CPKC ordered 12 additional hydrogen fuel cell engines to further decarbonize its switching and freight service locomotives in Alberta. The engines should be in service by late 2024.

**Biodiesel Testing**
CSX is finishing up testing a 20% soybean oil-based fuel blend (B20 biodiesel) in its Tampa locomotive fleet. With over 200,000 gallons burned, the initiative has achieved nearly 20% GHG reduction.
Reducing Emissions

Fuel consumption is directly tied to greenhouse gas (GHG) emissions. According to the EPA, freight railroads contribute only 0.5% to total U.S. GHG emissions and 1.7% to transportation-related GHG emissions.

One train can remove hundreds of trucks off the highways. Not only does moving freight by rail instead of truck lowers GHG emissions by up to 75%, on average, it reduces the economic toll of congestion and expensive highway repairs. As taxes and fees from commercial trucks inadequately cover the cost of highway damage, freight rail's private investments don't just drive down emissions, they alleviate taxpayer burden.

Although freight rail's share of transportation-related GHG emissions is small, their decarbonization efforts are mighty. Through strategic, targeted investments, railroads have worked to improve fuel efficiency and drive down GHG emissions associated with their locomotives. Class I railroads are also working to decarbonize yard equipment, such as switcher locomotives, cranes, and service trucks. Each yard asset represents an opportunity to drive down GHG and criteria pollutant emissions and lessen impacts on local communities.

- **Locomotives**: Thousands of more fuel-efficient locomotives emit fewer criteria air pollutants and help reduce emissions.
- **Railcars**: More aerodynamic, high-strength, lighter-weight steel railcars can be used for longer and decrease fuel usage.
- **Fuel management systems**: Fuel management and network optimization systems calculate the most fuel-efficient speed for a train over a given route.
- **Trucks**: Technologies like automated gate systems help trucks get in and out of yards more quickly, reducing idling and fuel usage.
- **Alternative fuels**: Exploring alternative fuel use in existing locomotive fleets and hybrid diesel-electric propulsion technology drive down emissions.
- **Cranes**: Hybrid and natural gas and battery-electric service trucks reduce ambient noise and yard emissions.
Building Resiliency

Freight railroads — facing increasing climate-driven disasters like floods, wildfires, and storms — invest around $23 billion annually to fortify their expansive nationwide network so it can withstand climate-related hazards and continue moving the supply chain. These substantial private investments have earned rail infrastructure the highest grades in the American Society of Civil Engineers’ last two Infrastructure Report Cards.

- **Geomapping**: Geomapped areas of track prone to wildfires, extreme temperature fluctuations and flooding help show vulnerabilities.
- **Vegetation management**: Clearing rights-of-way of grasses and brush help prevent wildfires and safeguard technology and infrastructure.
- **Fire trains**: Specialized “fire trains” carry thousands of gallons of water and firefighting equipment along railroad rights-of-way.
- **Early warning systems**: Seismic, wind and water detectors monitor high-risk parts of the network.
- **Steel vs. wood**: Concrete or steel replaces wooden infrastructure where possible and thousands of miles of track are now raised to avoid flooding.
- **Infrastructure timing**: Adjusted timing of track installation and maintenance projects reduce track-buckling that can happen with temperature changes.

Evolving Operations

Embracing a sustainability-focused culture, railroads recognize their skilled workforce’s collective power to drive eco-friendly practices. Each railroader contributes to environmental protection, from developing fuel-saving software to sharing best practices and promoting overall environmental stewardship. Beyond emission reduction, freight railroads actively engage in recycling, resource management, office efficiency improvements, electricity conservation and landscape protection along their routes.

- **Conserving water**: CSX’s multimillion-dollar water reuse project in Baltimore collects stormwater to wash locomotives and suppress dust.
- **Saving fuel**: BNSF developed spill-prevention measures after analyzing fuel and lubricant leaks at one of their busy yards.
- **Repurposing steel tracks**: Canadian National repurposes steel rail tracks from the main lines to secondary lines and then into rail yards.
- **Making efficient spaces**: CPKC reduced its data center in Wyandotte, KS, from 3,500 sqf. to 800 sqf. and installed more efficient cooling and lighting systems.
- **Reducing energy consumption**: Union Pacific reduced energy consumption in 2020 by 2.0 million kilowatt-hours, enough to power more than 239 U.S. homes annually.
- **Recycling locomotives**: At its Juniata locomotive shop in Altoona, PA, Norfolk Southern remanufactures locomotives to emit less emissions.