

# Freight Railroads & Climate Change

Our planet and nation face challenges that demand communities, businesses, and policymakers come together and create solutions that will fuel economic recovery and combat climate change. With nearly 200 years of experience moving America through times of both prosperity and trouble, freight railroads have always looked to the future, adapted, and risen to the challenge.

**March 2021**



## Summary

As policymakers attempt to balance economic recovery from the coronavirus pandemic with meaningful progress toward combating climate change, the nation's railroads want to be — and must be — a part of the solution.

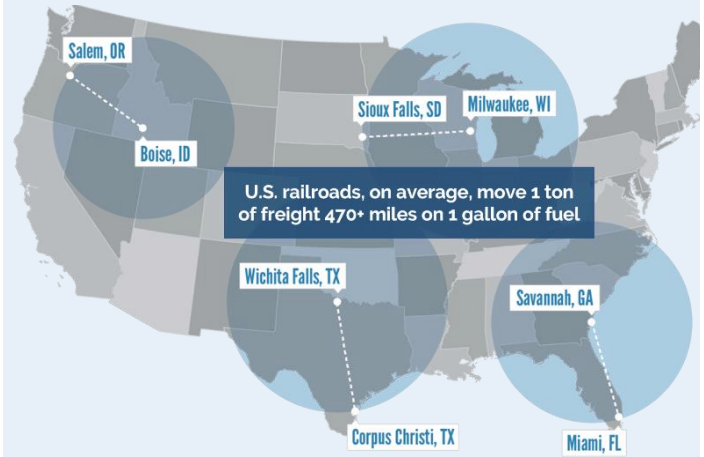
The Association of American Railroads (AAR) and the rail industry recognize that the climate is changing. If action is not taken, climate change will have significant repercussions for the planet, our economies, our society, and even day-to-day railroad operations.

The Congressional Budget Office recently projected that the effects of climate change will reduce real GDP growth rate by 0.03% annually from 2020-2050, and, as a result, this diminished annual GDP growth rate will reduce real U.S. GDP by 1.0% in 2050. AAR urges U.S. policymakers to adopt effective, coordinated, and market-based strategies to significantly reduce greenhouse gas (GHG) emissions and combat climate change.

Today, railroads account for roughly 40% of U.S. long-distance freight volume (measured by ton-miles) — more than any other mode of transportation.<sup>1</sup> Through smart, targeted investments, the freight rail industry has worked to increase fuel efficiency, drive down GHG emissions, and make rail operations even more sustainable. However, the industry recognizes there is much more work to be done and the right policies are essential for charting a path forward.

To be effective, policy strategies aimed at fighting climate change must encourage innovative solutions, leverage market-based competition, and allow for varied approaches that drive down emissions. Most importantly, these strategies must be grounded in data and established through a cooperative, multi-faceted approach involving all stakeholders.

## Railroads Are the Most Fuel Efficient Way to Move Freight Over Land



One train can carry the freight of hundreds of trucks, which reduces highway congestion\*\*



Freight railroads are 3-4 times more fuel efficient than trucks, on average



Moving freight by train instead of truck reduces greenhouse gas emissions by up to 75%



Railroads account for 40% of U.S. freight but only 2.1% of U.S. transportation-related greenhouse gas emissions\*

*\*According to the U.S. Environmental Protection Agency (EPA).*

*\*\*According to the Texas Transportation Institute's 2019 Urban Mobility Report, highway congestion cost Americans \$165 billion in wasted time (8.8 billion hours) and wasted fuel (3.3 billion gallons) in 2017.*

## Leading by Example: How Railroads Help Reduce Emissions

Railroads are developing and implementing new technologies, refining operating practices, and working with their suppliers, customers, and supply chain partners to create a more sustainable future. For example, railroads have greatly improved their fuel efficiency. On a gross ton-miles per gallon basis (gross tons include the weight of rail cars as well as the weight of the freight in them), rail fuel efficiency in 2019 was up 82% since 1980 and up 17% since 2000.

U.S. freight railroads move more freight with much less fuel than before thanks to technological innovations, improved operating practices and a lot of hard work. In 2019 alone, U.S. freight railroads consumed some 656 million fewer gallons of fuel and emitted 7.3 million fewer tons of CO<sub>2</sub> than they would have if their fuel efficiency had remained level compared to 2000. From 2000 through 2019, U.S. freight railroads consumed 9.6 billion fewer gallons of diesel fuel and emitted 108 million fewer tons of CO<sub>2</sub> thanks to industry-wide fuel efficiency efforts. In 2019, railroad CO<sub>2</sub> emissions from diesel fuel consumption were 18% lower than their peak in 2006.

These efforts continue. Many of AAR's members voluntarily report GHG emissions from their operations to the Climate Disclosure Project (CDP), an international non-profit organization that helps companies disclose their environmental impact. Several Class I railroads have also committed to voluntary reductions in GHG emissions intensity.

For example, Canadian Pacific, Canadian National, CSX, Kansas City Southern, and Union Pacific are participating in the Science Based Targets Initiative (SBTi), an international collaboration focused on limiting global warming to less than two degrees Celsius. Norfolk Southern has created the "Trees to Trains" program — a carbon-mitigation strategy that reforests thousands of acres in environmentally critical areas to offset the company's carbon footprint. BNSF is testing the first battery electric locomotive in the United States and Canadian Pacific is participating in a pilot project to test hydrogen fuel cell locomotives. And AAR and its members have formed a dedicated working group to understand new lower-or-zero-carbon fuel technologies and other climate-related issues.

### Railroads Consistently Improve Fuel Efficiency



**Fuel-efficient Locomotives:** Acquiring and retrofitting thousands of new, more fuel-efficient locomotives that emit fewer criteria pollutants and GHGs over the past decade.



**Operational Improvements:** Carrying an average of 3,667 tons of freight per train in 2019, up 25% since 2000. By carrying more freight, railroads reduce unnecessary train and railcar movements, which reduces fuel use.



**Fuel Management Systems:** Developing and installing computer systems that calculate the most fuel-efficient speed for a train over a given route, determine the most efficient spacing and timing of trains on a railroad's system and monitor locomotives to ensure peak performance and efficiency.



**Zero-emission Cranes:** Increasing use of zero-emission cranes to transfer containers between ships, trucks, and trains at ports and rail facilities.



**Aerodynamics & Lubrication:** Adopting operational fixes to reduce fuel use. For example, advances in lubrication techniques reduce friction, ultimately decreasing drag and saving fuel.



**Anti-idling Tech:** Installing idling-reduction technologies, such as stop-start systems that shut down a locomotive when it is not in use and restart it as needed.



**Distributed Power:** Expanding use of distributed power (positioning locomotives throughout the train) to reduce the total horsepower required for train movements.



**Training:** Training employees and contractors to help locomotive engineers and other personnel develop and implement best practices and improve awareness of fuel-efficient operations.

## More Rail Means a Sustainable & More Prosperous Future

The potential reduction in transportation-related GHG emissions associated with moving more freight by rail is substantial. If 10% of the freight shipped by the largest trucks were moved by rail instead, greenhouse gas emissions would fall by more than 17 million tons annually. That's the equivalent of removing 3.35 million cars from our highways or planting 260 million trees. Policymakers can help make this happen by removing impediments to transporting freight by rail, promoting policies that enable the rail industry to move more goods, more efficiently, and promoting modal equity in the incorporation of new and emerging technologies. Here are three approaches to consider:



**Leverage Market-based Competition**

**Encourage Innovative Solutions**

**Allow For Varied Approaches**

### Encourage Competition & Harness Market-based Solutions to Reduce Emissions

*Policies that demand change through market solutions — rather than prescriptive regulations — hold the greatest promise for lasting change and meaningful emissions reductions. Through well-designed policies, market behavior can — and will — shift toward lower-emission fuels and modes of transportation. Several examples of these policies within the transportation space are provided below.*

#### ✓ Institute market solutions to reduce emissions

Programs that establish market incentives to reduce emissions from the freight transportation sector specifically should strive to achieve two key policy goals: encouraging businesses to ship their products using modes with lower GHG emissions — such as rail — and incentivizing transportation providers to find the most cost-efficient ways to further reduce or eliminate emissions associated with their operations.

Any broad climate change policies should provide long-term regulatory certainty and be crafted to permit capital-intensive industries to make investment and planning decisions in an economically rational manner while also maintaining their competitiveness. This approach will allow markets, not mandates, to drive the reduction in GHG emissions. An appropriate, predictable policy can enhance the nation's competitiveness, grow the economy, and create jobs.

#### ✓ Return the Highway Trust Fund to a user-pays system

The pending insolvency of the Highway Trust Fund (HTF) should be a matter of significant concern within the larger transportation sector and beyond. Policymakers can address both the solvency of the HTF and climate change through a short-term, temporary fuel tax increase. In the longer term, policymakers should implement a vehicle miles traveled (VMT) fee that takes into account vehicle weight or axle count along with an emissions surcharge (see below for a more detailed discussion).

The United States has historically relied upon a user-pays system to fund investments in public road and bridge infrastructure. Unfortunately, revenues into the HTF have failed to keep pace with investment needs, requiring general fund transfers to cover the shortfall.

According to the Congressional Budget Office, general fund transfers into the HTF have totaled almost \$157 billion since 2008, including the \$13 billion provided by the continuing resolution signed on October 20, 2020. An additional \$203 billion could be required to cover expected deficits through 2030.<sup>2</sup> With the one-year extension of the FAST Act, the issue of HTF solvency will come to a head in September 2021.

Funding the HTF through a VMT fee instead of the existing gas and diesel taxes could also resolve impending insolvency and restore a user-pays model. Additionally, a VMT fee offers the opportunity to create a more equitable system of funding public road and bridge infrastructure by ensuring that all passenger and commercial vehicles pay for their use. Because the technologies to implement a VMT fee are still under development, a modest, short-term increase in the gas tax and the diesel tax over the next several years would still be required to shore up the HTF.<sup>3</sup> However, while fuel taxes incentivize the purchase of more fuel-efficient vehicles, they are not the long-term solution for HTF solvency.

### ✓ **Impose an emissions surcharge and provide dedicated funding for passenger rail**

Imposing a graduated emissions surcharge based on the fuel efficiency of vehicles (utilizing Environmental Protection Agency miles per gallon ratings), in addition to a VMT fee, as discussed above, could encourage the transition to more environmentally-friendly passenger and commercial vehicles. Doing so would also raise additional revenues for the HTF.

From a modal-shift perspective, a reliable passenger rail network is the most environmentally-friendly mode to move people over land<sup>4</sup> and is essential to helping address transportation-related emissions. Intercity passenger rail is the only mode of passenger transportation in the United States that does not receive any dedicated federal funding through a trust fund, leaving Amtrak completely dependent upon annual discretionary appropriations. This fiscal uncertainty makes it difficult for Amtrak to plan its operations and capital needs for the long term. Given the benefit of reduced congestion on our nation's highways, a Passenger Rail Account similar to the Mass Transit Account of the HTF could be created, and Amtrak's operating and capital costs could be funded with a portion of the additional revenues from the emissions surcharge. This Passenger Rail Account could be dedicated to Amtrak's Northeast Corridor and National Network Accounts. However, states could also be eligible to receive funding for their state-supported routes.

## Drive Research & Adoption of Promising Technologies

*Significant investments in national and sector-specific research are essential to unlocking energy solutions capable of powering our economy and reducing GHG emissions. Just as important as discovering new lower-or-zero-carbon fuels and technologies is ensuring American businesses can test and adopt these innovations. Below are a few policy proposals that will boost and further innovation.*

### ✓ **Embrace partnership opportunities for research funding**

Despite impressive improvements in fuel efficiency, railroads continue to search for ways to further reduce their GHG emissions footprints. Technological advancements will play a major role in future gains, and AAR supports increased federal funding for research into a variety of technologies on the cusp of economic viability.

For decades, diesel fuel has been the only realistic option to power freight rail locomotives. However, BNSF and Wabtec are working with the California Air Resources Board to test a prototype long-haul battery electric locomotive. Additionally, Canadian Pacific plans to develop what would be North America's first line-haul hydrogen-powered locomotives and conduct rail service trials and qualification testing to evaluate the technology's readiness for freight rail operations. Finally, Progress Rail and the Pacific Harbor Line are planning a

<sup>2</sup> Congressional Budget Office, *The Outlook for Major Federal Trust Funds: 2020 to 2030, September 2020, page 3.*

<sup>3</sup> While technologies may not yet be available for implementation of a VMT fee for personal vehicles, previous Congresses have considered proposals to implement a VMT fee for commercial motor vehicles utilizing existing electronic logging devices to measure miles travelled.

<sup>4</sup> [https://www.uic.org/com/IMG/pdf/iea-uic\\_2012final-lr.pdf](https://www.uic.org/com/IMG/pdf/iea-uic_2012final-lr.pdf).

demonstration project of a new EMD Joule battery electric locomotive in the Ports of Los Angeles and Long Beach. These projects have the potential to further reduce GHG emissions.

Partnerships between the federal government and railroads to further research and develop technologies that fuel locomotives with alternatives to traditional diesel fuel are also essential to advancing innovation. Additional funding should be provided for the development of battery and fuel cell technologies, such as the ongoing efforts at the Joint Center for Energy Storage Research (JCESR), a Department of Energy (DOE) Energy Innovation Hub focused on technologies to enable next-generation batteries.

Another potential fuel source is “blue hydrogen,” which is hydrogen made from natural gas in a way that captures, stores, or reuses associated carbon emissions. Similarly, biofuels are traditional fuel alternatives including ethanol, biodiesel (diesel made from nonpetroleum renewable sources such as natural fats and vegetable oils), and renewable hydrocarbon biofuels or green drop-in fuels (renewable hydrocarbon fuels derived from biomass sources that are comparable and compatible to existing petroleum-based fuels). Although biofuels and renewable diesel are widely available as fuel blend stock, there are limited ASTM standards for these fuels, and equipment manufacturers have been leery of approving their use in locomotives. Additional funding for research on these lower-or-zero-carbon fuels and technologies will speed their adoption and continue to inform the development of standards for such fuels. Finally, funding should continue to be provided for grants under the Diesel Emissions Reduction Act (DERA) program.

### ✓ **Support policies to further develop carbon capture, utilization, and storage technology**

Policymakers should continue to invest in the development and scaling of technologies that would both reduce emissions and keep the economy moving. Carbon capture, utilization, and storage (CCUS) technology is one of these solutions.

CCUS technology would allow industries to capture up to 90% of emissions and prevent their release into the atmosphere. Since 2008, Congress has provided a tax credit (Internal Revenue Code Section 45Q) on a per-ton basis for CO<sub>2</sub> that is captured and either sequestered or utilized. As a result, many programs, including pilot and demonstration projects, have been proposed to spur industries and create new markets for CCUS technology. AAR supports efforts to further mature this technology and expand the commercial use of CCUS technology through market development programs and tax incentives. Encouraging storage and broader industrial utilization of captured carbon creates new economic opportunities, and railroads believe this technology can be an important part of a broad effort to address the impacts of climate change.

Since railroads provide the most fuel-efficient way to move freight over land, railroads believe they can play an integral part in the broader utilization of CCUS, as transportation remains one of the bigger challenges of scaling up CCUS technology. In most cases, captured carbon dioxide must be transported from the point of capture to a permanent storage site. Current limited capacity for these movements has been a significant challenge to further scaling up CCUS technology. Today, trucks, ships, and pipelines transport the carbon that has been captured from the gases produced in electricity generation and industrial processes as part of a CCUS chain using the same technologies as those used to transport natural gas, oil, and other fluids. The rail industry has decades of experience safely transporting carbon dioxide. Moreover, construction of new pipelines in the United States can be a lengthy process that is expensive, environmentally harmful, and subject to intense community and legal opposition.

Railroads are a nimbler transportation solution that can increase traffic as needed, while also meeting demand from varied origins and destinations. As plans for new CCUS facilities are developed, the carbon captured at these facilities could be transported via rail. This would minimize additional GHG emissions, avoid unnecessary highway congestion, and take advantage of the world-class private rail network already in existence. It is likely the facilities where carbon would be captured — and the destination where it would be stored or utilized — already have rail service.

### ✓ **Help railroads test and deploy green technologies by streamlining waiver acquisition**

Railroads have shown their commitment to developing, testing, and deploying new technologies that reduce the environmental impact of their operations. Policymakers should offer industries — including freight rail — operational and regulatory flexibility to encourage further innovation. This would allow railroads to experiment with new technologies and processes that could help meet environmental goals, including decarbonization and lower emissions. This needed flexibility could cover everything from technologies and procedures to increase fuel efficiency to new technologies that require extensive testing and research. Flexibility and streamlining are necessary to empower the rail industry to explore these options without risking regulatory enforcement. For example, policymakers should consider streamlining waiver review timelines, encouraging pilot programs, and establishing performance-based thresholds.

#### **Partner with Industry to Advance Sector-specific Progress**

*Each American industry — including freight railroads — has its own unique set of advantages and challenges to reducing its impacts on the environment. For long-term, sustainable gains, these stakeholders are essential partners in identifying and prioritizing proposals that will empower real change in their own operations. Freight railroads stand ready to be partners in this effort and need policymakers to understand what is already working, as well as what is untenable for the nation's 140,000-mile rail network.*

### ✓ **Ensure railroads can invest in maintaining and greening their infrastructure**

An efficient and sustainable rail industry depends upon railroads' private investments, which the Staggers Rail Act of 1980 helped make possible by creating a balanced regulatory system. Partial deregulation allowed railroads to improve their financial performance from anemic levels prior to Staggers to much healthier levels today. That, in turn, has allowed railroads to pour nearly \$740 billion — of their own funds, not taxpayer funds — back into their networks since 1980. These investments have greatly improved the productivity and sustainability of their operations. Policy decisions that upset the productivity and efficiency gains of the railroads or shift freight to other modes of transportation can impact the environment. Policymakers must maintain the existing regulatory balance to ensure railroads can meet customers' needs in a safe, reliable and sustainable manner.

### ✓ **Invest in what works**

As policymakers examine potential solutions, they should invite stakeholders to the table to provide needed insight and prevent the wasting of resources. While AAR encourages federal investment in the development of technologies that reduce GHG emissions, policymakers should avoid prescriptive means for reducing emissions by certain industries and allow innovation to guide GHG emissions reduction decisions. For example, studies over the years have consistently shown that the catenary electrification of the freight rail network would be unworkable. Initiatives, such as catenary electrification, that are clearly not viable should be set aside to focus on and invest in policies and programs that will work to reduce GHG emissions and combat climate change, such as those noted above.