Railroads: The Vital Link to North America's Economic Future

Freight Railroads & Greenhouse Gas Emissions

ASSOCIATION OF AMERICAN RAILROADS **JUNE 2008**

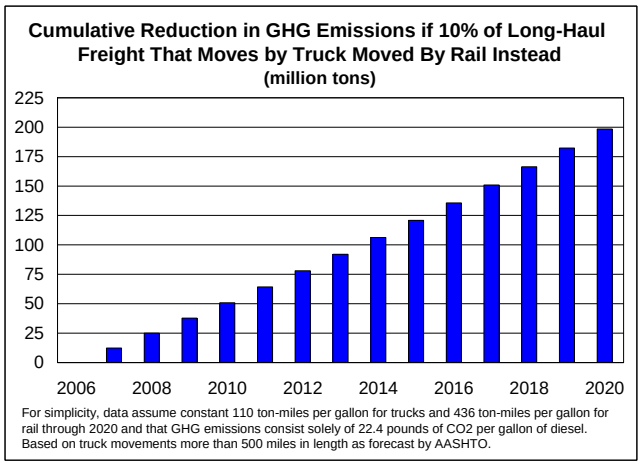
Summary

Greater use of freight rail offers a simple, inexpensive, and immediate way to meaningfully reduce greenhouse gas (GHG) emissions without harming the economy. Because railroads are, on average, three or more times more fuel efficient than trucks, railroads have a smaller carbon footprint: every ton-mile of freight that moves by rail instead of truck reduces greenhouse gas emissions by two-thirds or more. According to Environmental Protection Agency (EPA) data, freight railroads account for just 2.6 percent of U.S. GHG emissions from transportation sources and just 0.7 percent of U.S. GHG emissions from all sources.

Moving More Freight By Rail Would Reduce Greenhouse Gas Emissions

- Because railroads are, on average, three or more times more fuel efficient than trucks (in terms of ton-miles per gallon), and because GHG emissions are directly related to fuel consumption, every ton-mile of freight that moves by rail instead of truck reduces greenhouse gas emissions by two-thirds or more.

- Moving more freight by rail is a straightforward way to meaningfully reduce greenhouse gas emissions without harming our economy. Based on data from the American Association of State Highway and Transportation Officials (AASHTO), for each 1 percent of long-haul freight that currently moves by truck that moved by rail instead, fuel savings would be around 110 million gallons per year and annual greenhouse gas emissions would fall by around 1.2 million tons. If 10 percent of long-haul freight now moving by truck moved by rail instead, annual greenhouse gas emissions would fall by more than 12 million tons.



- Because freight transportation demand is expected to rise sharply in the years ahead, future fuel savings — and greenhouse gas reductions — would be much higher if more freight moved by rail. For example, AASHTO projects that ton-miles for truck movements more than 500 miles long will increase from 1.40 trillion in 2000 to 2.13

trillion in 2020. If 10 percent of long-haul truck traffic went by rail — perhaps via efficient intermodal movements involving both railroads and trucks — cumulative GHG reductions from 2007 to 2020 would be around 200 million tons.

- Moving more freight by rail would also help reduce highway congestion, which costs $78 billion just in wasted travel time (4.2 billion hours) and wasted fuel (2.9 billion gallons), according to the Texas Transportation Institute's 2007 Urban Mobility Report. The total costs of highway congestion are far higher if lost productivity, costs associated with cargo delays, and other items are included. A typical train takes the freight equivalent of several hundred trucks off our highways. Railroads thus enhance mobility, reduce the costs of maintaining existing roads, and reduce the pressure to build costly new roads.

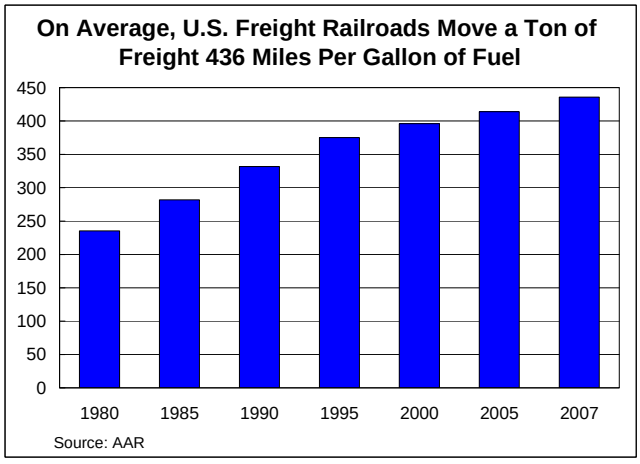
The seven largest U.S. freight railroads have all joined EPA's "SmartWay Transport," a voluntary partnership between freight transporters and the EPA that establishes incentives for fuel efficiency improvements and greenhouse gas reductions. The initiative is designed to reduce annual carbon dioxide emissions by 36 to 73 million tons and nitrogen oxide (NOx) emissions by up to 220,000 tons. As part of the partnership, each railroad has committed to evaluating the environmental impacts of its operations and agreed to work with the EPA to develop and implement plans to improve fuel efficiency and reduce emissions in coming years.

Policymakers should take steps to attract more freight to railroads and expand the greenhouse gas emissions benefits of rail transportation. For example, transportation-related greenhouse gas emissions would fall more quickly if tax incentives for projects that expand rail capacity were instituted and if more public-private partnerships for freight railroad infrastructure projects were implemented.

Policymakers should also avoid actions that hinder freight railroads. For example, reregulation of the rail industry would lead to a shrunken rail network. This would mean less freight moving by rail (and, consequently, higher greenhouse gas emissions) when we should have more freight moving by rail.

Railroads Are Constantly Working to Improve Fuel Efficiency

- In 1980, one gallon of diesel fuel moved one ton of freight by rail an average of 235 miles. In 2007, one gallon of fuel moved one ton of freight by rail an average of 436 miles — roughly the distance from Boston to Baltimore and an 85 percent increase over 1980.



- In 2007 alone, Class I freight railroads used 3.5 billion fewer gallons of fuel — and emitted nearly 39 million fewer tons of carbon dioxide — than they would have if their fuel efficiency had remained constant since 1980. From 1980 through 2007, U.S. freight railroads consumed 48 billion fewer gallons of fuel and emitted 538 million fewer tons of carbon dioxide than they would have if their fuel efficiency had not improved.

- Railroads use technology, training, and changes in operating practices to curb fuel consumption. For example:
  - New locomotives. Railroads have spent billions of dollars in recent years on thousands of new environmentally-friendly locomotives. They have also overhauled thousands of older locomotives to improve their environmental friendliness.

    Many of the new locomotives are high-horsepower units used in long-haul service. For example, one major locomotive manufacturer recently began commercial production of a 12-cylinder locomotive that produces the same 4,400 horsepower as the company's 16-cylinder predecessor, but uses less fuel and has lower emissions.

    Some new switching locomotives that are used to assemble and disassemble trains in rail yards are "genset" (generator set) switchers that sharply reduce fuel use and emissions. Gensets have two or three independent engines that cycle on and off, depending on need. If load conditions are such that one engine can handle the task, just one is engaged; if loads are heavier, other engines switch on.

    Some switching locomotives are hybrids with a small fossil-fueled engine in addition to a large bank of rechargeable batteries. Hybrid switchers can save up to half the fuel of conventional switchers while releasing a fraction of smog-inducing emissions. Research is ongoing on advanced hybrid technology for long-haul locomotives that will store energy captured during braking for later use.
  - Locomotive monitoring systems. Railroads use sophisticated on-board monitoring systems to gather and evaluate information on location, topography, track curvature, train length and weight, and more to provide engineers with real-time "coaching" on the optimum speed for that train from a fuel-savings and operational standpoint.
  - Training. In many cases, railroad fuel efficiency is directly related to how well an engineer handles a train. That's why railroads are using the skills of their engineers to save fuel. For example, railroads commonly offer training programs through which engineers and simulators provide fuel-saving tips. On one railroad, the fuel consumption performance of participating engineers in the same territory is compared, with awards given to the top "fuel masters."
  - Information technology. Railroads use advanced computer software to improve their operational efficiency and, therefore, their fuel efficiency. For example, railroads use sophisticated modeling software to identify the best ways to sequence cars in a large classification yard. The result is more efficient, faster yard operations.

    Railroads also use innovative "trip planning" systems that automatically analyze a mix of ever-changing variables (*e.g.*, crew and locomotive availability, congestion in rail yards, the priority of different freight cars, track conditions, etc.) to optimize how and when freight cars are assembled to form trains and when those trains depart. The result is smoother traffic flow, better asset utilization, and reduced fuel use.

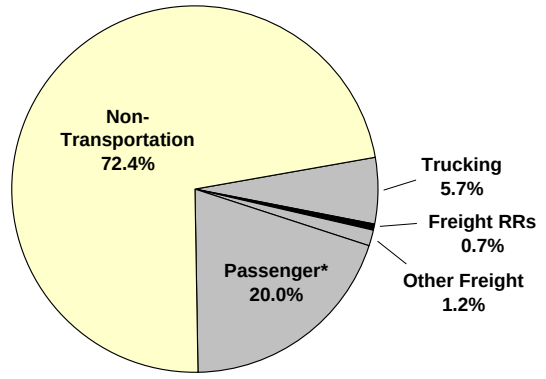
- Reduced idling. Locomotives often have to idle when not in use to prevent freezing of the coolant (most do not use anti-freeze), charge batteries and air reservoirs, or provide for crew comfort. However, some railroads are implementing "stop-start" idling-reduction technology that allows main engines to shut down when ambient conditions are favorable. One advantage of "genset" locomotives is that their smaller engines use anti-freeze, thus allowing them to shut down in cold weather. Some railroads also use "auxiliary power units" that warm engines so that locomotives can be shut down in cold weather.
- Components and design. Railroads use innovative freight car and locomotive components and designs to save fuel. For example, advanced top-of-rail lubrication techniques save fuel by reducing friction and wear. Improving the aerodynamic profile of trains saves fuel be reducing drag.

Freight Railroads Account For a Small Share of U.S. Greenhouse Gas Emissions

According to data from the Environmental Protection Agency, in 2006 total U.S. greenhouse gas emissions were 7,054 teragrams of carbon dioxide equivalents ($TgCO_2Eq$), with transportation accounting for 28 percent of the total. The vast majority of transportation-related greenhouse gas emissions are due to fossil fuel consumption.

According to the EPA, in 2006 freight railroads accounted for 51.5 $TgCO_2Eq$ of greenhouse gas emissions, equal to just 2.6 percent of the transportation-related total and just 0.7 percent of total U.S. greenhouse gas emissions.

U.S. Greenhouse Gas Emissions by Source: 2006
(% of Total U.S. GHG Emissions)



U.S. Greenhouse Gas Emissions By Economic Sector: 2006

Economic Sector	Tg CO2 Eq.	% of Total
Electr. generation	2,377.8	33.7%
Residential	344.8	4.9%
Industry	1,371.5	19.4%
Agriculture	533.6	7.6%
Transportation	1,969.5	27.9%
Commercial	394.6	5.6%
U.S. Territories	62.4	0.9%
Total	7,054.2	100.0%

Data are in teragrams of CO2 equivalents.

U.S. Greenhouse Gas Emissions from Transportation: 2006

Economic Sector	Tg CO2 Eq.	% of Total
Trucking	404.6	20.8%
Freight Railroads	**51.5**	2.6%
Waterborne Freight	30.2	1.5%
Pipelines	32.4	1.7%
Aircraft	157.4	8.1%
Recreational Boats	17.4	0.9%
Passenger Railroads	6.4	0.3%
Pass. Cars & Light Duty Trucks	1,236.9	63.5%
Buses	12.5	0.6%
Total	1,949.3	100.0%

Source: EPA, *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2006, Tables ES-7, A-100, and A-101.*
Totals for "transportation" in the two tables do not match exactly because of estimation issues.