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To: Surface Transportation Board
RE: EP 775- Notice of Intent to Participate in Oral Argument/Hearing
Requested time: 15 minutes
Day preference: September 16, 2024

Subject:
Public Interest in Mode Shift, Quantifying External Costs and the Relevance of Motive Power.

Respected Chair Primus, Vice Chair Hedlund, Member Fuchs and Member Schulz. Thank you for the opportunity to address you today. I am Bill Moyer, the executive director and co-founder of Backbone Campaign, a creative activist organization that provides artful activism tools, tactics training and action support to progressive causes across the US and beyond. . Though a lifelong activist, tactician and social movement strategist, until a decade ago, I knew very little about rail.

While opposing the expansion of fossil fuel exports through the beautiful Pacific Northwest - a place I deeply revere - I entered into a conversation with Mike Elliott, a railroad worker and labor advocate working on the opposite side of that particular issue. We discussed whether the proposed coal export terminal was the truly highest use of this infrastructure and whether rail workers and environmentalists might have more in common than was immediately apparent. Eventually, Mike presented me with a 2008 paper on modernizing the Northern Transcon and challenged me and “*my people*” to “*green it.*”

I took that relationship and Mike’s challenge seriously. I assembled a team of folks and began the long climb up the vast steep grade of learning about railroad. Three years later, we published the book [*Solutionary Rail - A people-powered campaign to electrify America’s railroads and open corridors to a clean energy future.*](#) What struck me most about that initial process and continues to be true after a decade of learning from, interviewing and collaborating with other stakeholders for rail in the public interest is this: after spending much of my activist life saying *NO!* to this or that injustice, saying *YES!* to a rail-centric vision for the future - is tremendously refreshing, uplifting and fills me with hope.

Like all of you, I have come to love trains. This is not just because the technology of rail is so efficient; the history is so compelling; or the promise of electrification is so cool. I love rail because it provides people from very different places and points of view an opportunity to connect and find common cause. This is a precious thing in a society that currently suffers so much polarization and division. It allows unlikely allies to come together in service of a shared vision. Only together, can those allies overcome the obstacles and topple the practices that are - and have been harming us all.

Putting Rail in Service of the Public Interest

Today, I would like to share some key lessons about rail and the public interest in regards to mode share, external costs of mode choice, and how your work can shape a future freight system that increases benefits and reduces harms of rail as a critical element of our national freight system.

Solutionary Rail has engaged with hundreds of people from all walks of life and all corners of this country. We’ve conducted hundreds of interviews with stakeholders whose lives intersect with railroads in numerous ways. Though public interests in rail vary from community to community and from one sector of society to another, common interests far outweigh conflicting interests. And, where conflict exists, it is resolvable.

Increased rail capacity and improvements to operations that deliver reliable service and draw freight from roads to rails is most definitely in the public interest. On time performance and returning access to communities that have been left behind is good for passengers as well as shippers - large and small - and it is critical to reshoring, supply chain resilience and national security. What cannot be allowed is for the benefits of mode shift to come at the expense of already overburdened communities that live adjacent to rail yards.

A robust and resilient rail system must be accomplished in concert with the decarbonization of our entire freight system. The Biden Administration recently announced a National Goal for a Zero Emissions Freight System. Though symbolic, this is an important recognition that the challenge of decarbonization of freight cannot be tackled in artificial silos of trucking and rail. The same is true with mode shift and electrification. Investment in the electrification of rail yards must go hand in hand with mode shift. And the electrification of rail yards should be declared a national priority.

In 2020, Solutionary Rail submitted comments to the Select Committee on the Climate in the form of our paper [Moonshot Mode Shift](#). In its creation we learned how unreasonably difficult it is in the US to quantify the external costs of freight transport. (The EU did an Internalization Study to quantify the external costs of mode choice in 2019. They followed that with the Shift2Rail Joint Undertaking, published a Shift2Rail handbook, and declared 2020 the Year of the Train.) Since our *Moonshot* paper, we have advocated at the TRB for a user-friendly *External Cost Calculator* for public interest advocates, policy makers, and planners. SR even [developed a prototype](#) that draws data from the obtuse, limited and user-hostile Freight Analysis Framework and formulas from the Kansas DOT to show how such a tool might work.

It says something about the current state of public access to data that only recently was I able to find a [2015 report](#) by the Congressional Budget Office and the systematically developed set of formulas to quantify accident risk, pavement damage, particulates + NOx, traffic congestion and CO2. This slide from a

Typical External Costs May Be Eight Times Higher for Transport by Truck Than by Rail		
2014 Cents Per Ton-Mile		
Type of Cost	Truck	Rail
Accident Risk	0.8 to 2.3	0.1 to 0.25
Pavement Damage	0.7 to 1.0	0.05 to 0.06
Particulates + NOx	0.6 to 0.8	0.1 to 0.2
Traffic Congestion	0.4 to 0.9	0 to 0.03
CO ₂	0.02 to 0.22 to 0.9	0.01 to 0.05 to 0.2
Total of Median Costs	4.0	0.5
Note: For damages from CO ₂ , three numbers are shown to describe the distribution of estimates of external costs; values toward the middle of the range are much more likely to be selected. For other sources of external costs, two numbers are shown; all of the values in the range are equally likely to be selected.		

[2016 CBO presentation](#) shows the range of cost estimates (in 2014 dollars), the median and the resulting 8:1 ratio between truck and rail freight, by ton-mile.

Thanks to the CBO formulas and FAF data it is possible (though still not user-friendly) to estimate the external cost of freight by ton-mile.

Solutionary Rail has applied these formulas to FAF 2023 data. We excluded cereal grains/coal/oil which railroads still have a *common carrier obligation* to transport and are unlikely to move by truck. We also exclude distance bands less than 500 miles, since railroads are explicit about their market advantage for longer hauls. FAF estimates that the long haul (>500 miles) freight moved by truck in 2023 was approximately 954 billion ton-miles. The CBO report used 2014 dollars. Adjusting for inflation, the external cost of this long haul freight is \$0.0559 per ton-mile by truck and only \$0.00674 per ton-mile when moved by rail.

This adds up to a \$53 billion cost to society with a potential savings from mode shift of \$46.87 billion dollars. In reality, people are paying with their lives. 200 million tons of carbon pollution could have been avoided had this long haul freight moved by train rather than truck. This societal cost is being paid annually.

Parameter	Truck Cost (\$/ton-mile)	Truck cost (\$)	Rail cost (\$/ton-mile)	Rail cost (\$)	Difference (\$)
Pavement Damage	\$0.0118	\$11,271,510,000.00	\$0.00076	\$729,333,000.000	\$10,542,177,000.0000
Traffic Congestion	\$0.0096	\$9,149,814,000.000	\$0.00021	\$198,909,000.000	\$8,950,905,000.0000
Accident Risk	\$0.0218	\$20,752,839,000.00	\$0.00250	\$2,386,908,000.00	\$18,365,931,000.0000
Emissions: PM and NOx	\$0.00966	\$9,216,117,000.000	\$0.00257	\$2,453,211,000.00	\$6,762,906,000.0000
Emissions: CO₂	\$0.0031	\$2,917,332,000.000	\$0.000695	\$663,030,000.000	\$2,254,302,000.0000
	\$0.0559	\$53,307,612,000.	\$0.00674	\$6,431,391,000.00	\$46,876,221,000.

When rail operations over emphasize short term profits, lower operating ratios and stock buybacks rather than investments in capacity and service, we all suffer. As we know, Class 1 railroads spent \$196 billion on stock buybacks and dividends for shareholders between 2010 and 2020, but who really paid for that? The numbers above make clear that it is the US public and future generations who are sacrificing to subsidize the outrageous profits of the Class 1 railroads and the predation of an unaccountable investor class.

Despite this staggering cost to society - this hearing makes clear - mode shift of truck freight to rail is not the direction the Class 1 railroads are pursuing. In fact, they are headed in the opposite direction. So, how do we stop the managed decline of our rail system and turn it around to serve the public interest?

What won't work are the half-measures the Association of American Railroads call for to "level the playing field." The 2015 CBO confirmed what others have found, conventional strategies such as VMT and fuel taxes for trucking hold little promise, with maximum impact of <4% modal shift. They are not enough to compel shippers to utilize rail rather than trucks, even for long hauls.

Reliability and service are critical factors for shippers, but it feels naive to think that there is a market strategy to pivot to growth, when activist investors enforce their wrath on even the most modest of initiatives. We need a dramatic course correction that only the STB our federal government can provide.

Putting Rail in Service of the Public Interest

The country depends upon the STB to chart this new path forward. Certainly, the White House and Congress must also do their part, but the STB does not need to wait. It is time for the STB to clarify and return the power of *common carrier obligations*, revoke service and commodity exemptions and to restore service to industries and communities that have been left behind.

It is also time for the STB to consider the broader implications of the National Rail Transportation Policy's mandates to protect workers, communities, the environment and national interests. A system that prioritizes private profit over public benefit is exactly what is pushing freight off rails and onto roads and what is keeping the railroads from following the global trend to electrification.

Without a shift in the ownership and operation model of US rail infrastructure, the public will continue to suffer and bear unnecessary external costs of an industry flawed from its creation.

Two important documents that Solutionary Rail asks the Board to consider are:

1. Toll Roads for Train by Thomas White posted at <https://www.solutionaryrail.org/trt>, and
2. Maddock Thomas' *Putting America Back on Track: The Case for a 21st Century Public Rail System* available at PublicRailNow.org
3. [Moving Forward Network testimony](#) to Senate Committee, sub Com on Clean Air, Climate & Nuclear Safety

Railroads are critical national infrastructure and play a pivotal role in determining the future resilience, prosperity and health of our country. Increasing rail capacity, utilization, and sustainability through investments in infrastructure, improvements in service and accessibility, and its conversion to a backbone for a zero emissions freight system is inseparable from our public interests and national security.

Railroads have always existed in this quasi-utility space. Their continuation as profit generating monopolies is not compatible with national interests, therefore a reorganization of how they are regulated, incentivized, and assets utilized must be considered. It is time that we embrace the unique role that rail can play in our future and [Reconnect America](#).

Thank you for the opportunity to present to you today

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Toll Roads for Trains



***A Plan for Effective American
Supply Chain and Climate
Emergency Response***

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Developed by Thomas White



Revised March 30, 2023 based on review and comments received from Robert J Wasson. His insight and advice is appreciated.

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Toll Roads for Trains: The Plan

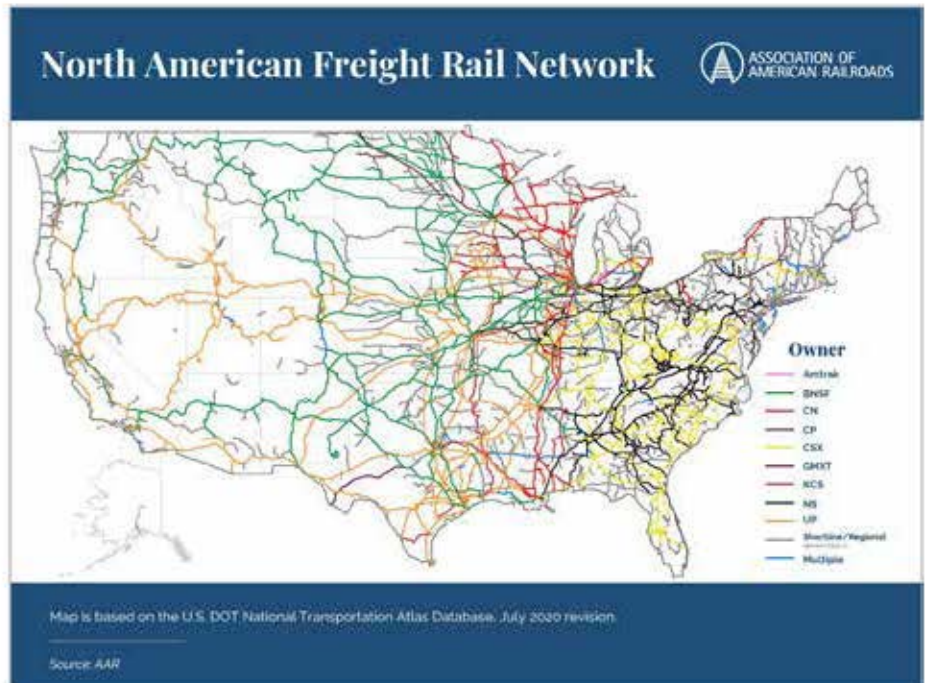
Toll Road for Trains (TRT) is a new model for operation of the US rail system that would be similar to tolled highways, except the infrastructure could remain in private ownership. The plan separates rail infrastructure and rail service into financially independent businesses. Existing railroad companies could, if desired, retain ownership of both by forming a holding company that owns both divisions. Any business or public entity that is qualified to provide rail service would have nondiscriminatory access to operate trains on the national rail network for a published fee paid to the infrastructure company. Access for train operation would be reserved on a per train basis for a specific time and route schedule. The TRT arrangement serves the national interest and brings rail infrastructure under public control.

Why is it Needed?

Rail transportation has been diminished by the Monopoly power that comes from the lack of intra-modal competition.

A monopolist maximizes his profit by producing less while charging more than he could in a competitive market. There are two elements to this:

- The higher price for rail is probably a factor in current extreme income inequality. We all pay a little more for what we use directly or indirectly that is shipped by rail, and all this money goes to the few.
- Railroads doing less than market economics suggests they should.
- Working conditions and the levels of service and safety of the railroad industry are unacceptable.
- Deregulation has allowed the railroad industry to generally operate as regional monopolies. Freight customers have a limited choice of carriers, if they have any choice at all. Railroad labor, generally with specialized, not-easily-transferable skills, is placed in the same disadvantaged position.
- As corporations, railroad companies have the fiduciary responsibility to act in the best interests of the stockholders. That is accepted to mean making the greatest possible return on investment



This color-coded Association of American Railroads map, generated from US Department of Transportation data clearly demonstrates the local and regional monopolies of the railroad industry. There are a small number of routes on which trains of more than one railroad operate, usually required by regulators because of a merger.



The highway network in the US is subsidized by federal, state, and local governments. The property is not taxed. Funding sources are more favorable than available from commercial banks for improvement to railroad property. The highway system is available to any business that desires to engage in passenger or freight transportation.

Enforcement of railroads' common carrier duties, both before and after the Staggers Rail Act of 1980, has been ineffective. The Class 1 railroads discourage shipments they consider to be not profitable enough. They provide a level of service and/or a rate that is not competitive with trucks, the truck 'wins,' and the railroad company's Common Carrier obligation has been met.

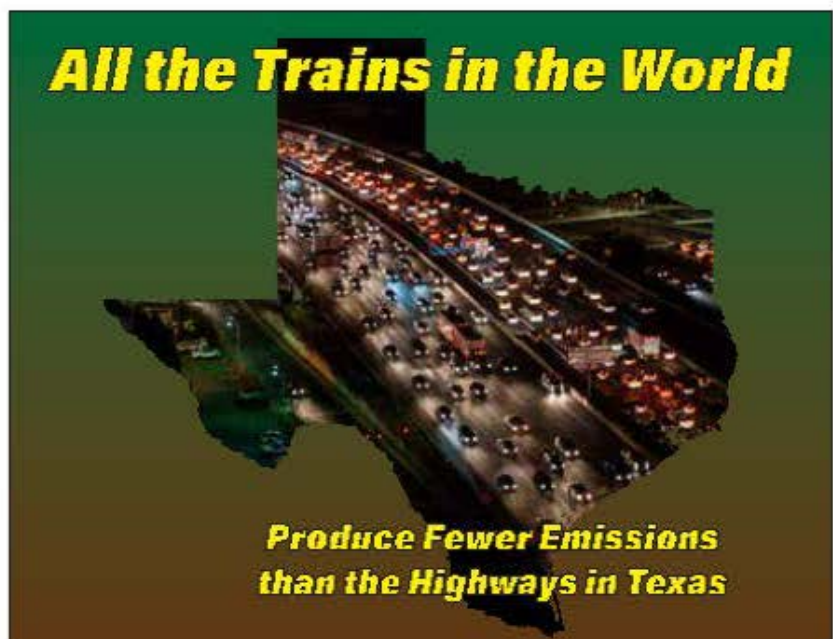
- Safety of railroad operations is directly related to crew scheduling, among other factors. A more structured and competitive model will provide better workforce standards and protections. Work schedules can be anticipated, allowing for rest, sleep, and optimal worker performance.
- The US rail system is far from being well utilized because of the chaotic way in which it is operated. Improvised operation results in long stretches of tracks that see trains only infrequently, as well as segments that are heavily congested.
- The US needs economic opportunities to expand in the form of rail industry-related jobs and professional careers. Competition among operators incentivizes retention of workers and fair worker contracts. Industry-wide opportunities will be created by reinstating professional institutional knowledge through expanded post secondary rail programs and curricula.
- Railroad companies have developed their business model in part as a result of the federal, state, and local governments subsidizing highway transportation.

Three Critical Challenges

The US is facing three critical challenge areas that are linked to rail transportation:

1. Climate Change: Greenhouse gas emissions must be reduced by about 50% by 2030 to prevent irreparable climate damage¹. A rapid and substantial mode shift from highway to rail, for passenger and freight, is essential for reducing emissions and conservation of energy.

- The Department of Defense has stated that the climate emergency is a matter of national security².
- Rail generates only one-third of the emissions of equivalent highway transportation. Nationwide, highway transportation is responsible for 82 percent of greenhouse gas emissions; rail is responsible for two percent³. As an example of the magnitude of the problem, the combined emissions of all the trains in the world are less than the emissions of the highways in Texas⁴.
- Rail uses one-third the energy of highway vehicles, which is important when considering the immense



amount of new electric power generation needed to electrify highway vehicles, a greatly expanded power grid, and other industry requirements.

2. Supply Chain: The supply chain must be restored to efficient and effective operation.

- Aspen Institute has stated that supply chain weakness is a threat to national security⁵.
- **Imbalance in subsidies: Highway, air, and marine transportation are heavily subsidized.** With only a few exceptions, rail transportation, an important climate emergency response, is not. Funds must be redirected to investment in rail transportation. The TRT arrangement gives the railroad system the same public utility as the highway system.
- Rail transportation should play a much more substantial and important role in the US transportation system.
 - ◆ **By any measurement, US passenger rail transportation is last in the developed world.**
 - ◆ US railroads are second in the world in ton miles carried. That is not surprising since the US has the largest rail network in the world, the Class 1 railroads discourage shipments of under about 700 miles, and they discourage shipments of less than the maximum permissible weight per car. They also discourage shipments of a single car or a small number of cars.
 - ◆ Measured by weight, trains carry 9.3 percent of the freight; trucks carry 71.5 percent⁶.
 - ◆ Measured by value, trains carry 1.4 percent of the shipments; trucks carry 73 percent⁷.
 - ◆ **Measured in train miles per mile of track, the US is 11th in the world, adjusted for US train lengths⁸.**

3. Workforce Policy: Restore integrity and fairness in rail workforce policies.

- Many railroad industry trades have unique knowledge requirements and characteristics that are not easily transferable to other industries.
- Many railroad employment locations are substantially served by only one railroad.
- The railroad industry takes advantage of employees by subjecting them to oppressive working conditions, with the knowledge that employees have limited chances for other similarly compensated employment near where they live.
- The ways in which the railroad companies circumvent the intention of the hours of service regulations is dangerous to employees and to the public.

Rail Transportation is Essential to the National Interest

Effective rail transportation is an essential climate emergency response, important for national security, and for public safety

- The Pentagon has declared climate change a national security issue. The low energy consumption, low emissions, safety, and better land use of rail transportation are needed for continued economic strength and reversal or mitigation of the climate crisis.
- The US Department of Transportation estimated in 2009 that highway congestion costs the US \$85 billion annually⁹. It also causes secondary problems related to delayed emergency response as the traffic has no way to clear for the passage of emergency vehicles.
- Building highway capacity has been demonstrably ineffective in reducing congestion.
- The number of highway accident fatalities is about 732 percent of rail accident fatalities. The number of highway accident injuries is about 396 percent of rail accident injuries.
- **Every month, the number of fatalities in highway accidents is the equivalent of the fatalities in the September 2001 attacks. The number of highway accident injuries every year exceeds the number of wounded US soldiers in all conflicts since 1940¹⁰.**

How To Improve Rail Transportation by Bringing Rail Infrastructure Under Public Control

The Non-Option of Nationalization

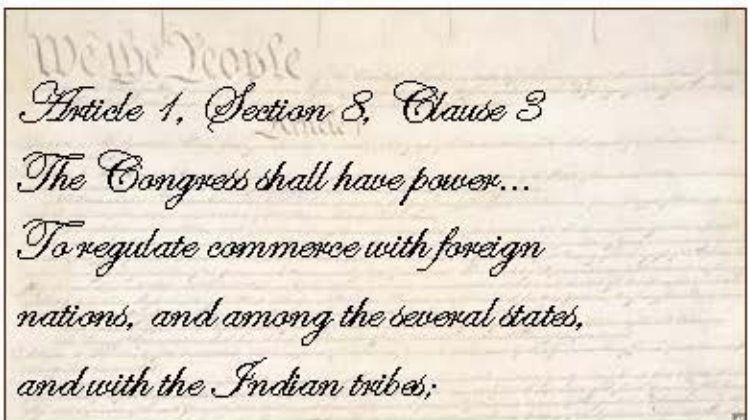
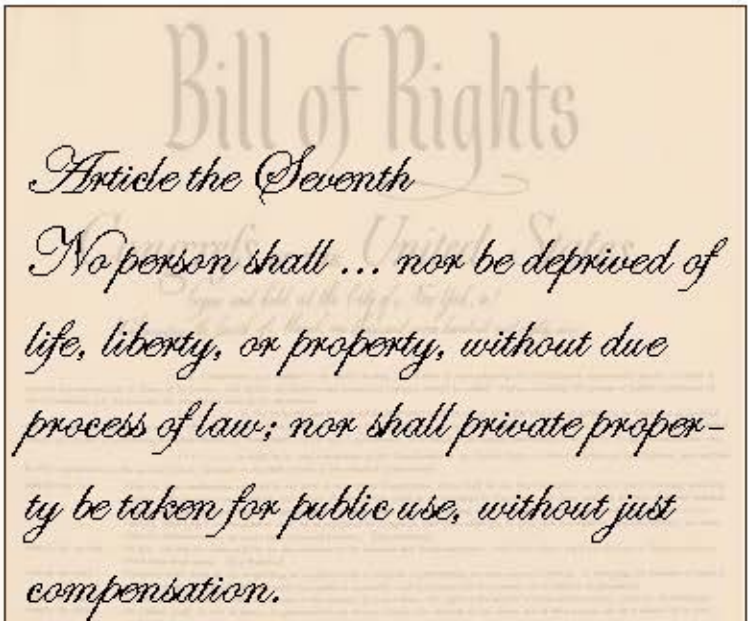
Eliminating the regional monopoly arrangement of the railroad industry is essential for improving rail transportation. There are many proponents of nationalization of the US railroad network. They observe that the other modes of transportation, highway, air, and navigation, are conducted on publicly-owned facilities and rail transportation should be likewise.

However, nationalization is not practical. By definition, nationalization involves conversion of an industry to government ownership and control. Government ownership is the general implication of nationalization. That connotation is also generally associated with the government commandeering the industry.

Government taking of property in that manner is prohibited by the Constitution.

The US rail network of about 90,000 route miles is almost entirely privately owned. There are few rail lines that were constructed by a public/government agency, for example the New Orleans Public Belt. A small amount of the network is owned by states, branch lines purchased to prevent abandonment.

Actual nationalization would require the government to purchase the property and infrastructure. Not only would the purchase price be great, but determination of the fair value would also require extensive litigation. Alternatively, the federal government might merely buy



Railway Control Act, March 21, 1918

An Act To provide for the operation of transportation systems while under Federal control, for the just compensation of their owners, and for other purposes.

Be it enacted ..., That the President, having in time of war taken over the possession, use, control, and operation (called herein Federal control) of certain railroads and systems of transportation (called herein carriers), is hereby authorized to agree with and to guarantee to any such carrier making operating returns to the Interstate Commerce Commission, that during the period of such Federal control it shall receive as just compensation an annual sum, payable from time to time in reasonable instalments, for each year and pro rata for any fractional year of such Federal control, not exceeding a sum equivalent as nearly as may be to its average annual railway operating income for the three years ended... [June 30, 1917].

The nationalization that wasn't. The nationalization of 1918 was regulation. It did not involve government seizing property, but rather government controlling the property and compensating the owner.

out the railroad corporations entirely, but that might present substantial political and economic problems.

There have been two nationalizations of US railroads. However, both were nationalized in name only. They were regulation, not taking property.

The Constitution gives Congress the power to regulate interstate commerce and establish post roads (a road constructed and maintained for the purpose of transporting and delivering postal mail). A subsequent Supreme Court decision stated that post roads could be used for other concurrent uses. The general interpretation was public highway. In 1838, Congress designated all existing and future railroads as post roads.

While nationalization is not practical, effective public control of rail transportation is possible.

Government Control vs. Government Ownership

The US government need not own a transportation facility to control it. Commercial airports are typically publicly owned facilities. Ownership is local, e.g., a city, county, or port district, but operation is under strict federal control. The same arrangement can apply to railroads.

Also, train dispatchers and traffic scheduling and planning personnel may work for the federal government, as do most air traffic controllers, but federal employment is not necessary. The model of the Federal Aviation Administration (FAA) Contract Tower Program¹¹ may be used. Contract controllers are employees of private companies, but meet the same qualification and training requirements of FAA controllers and are subject to the same regulations and procedures.

Toll Road for Trains

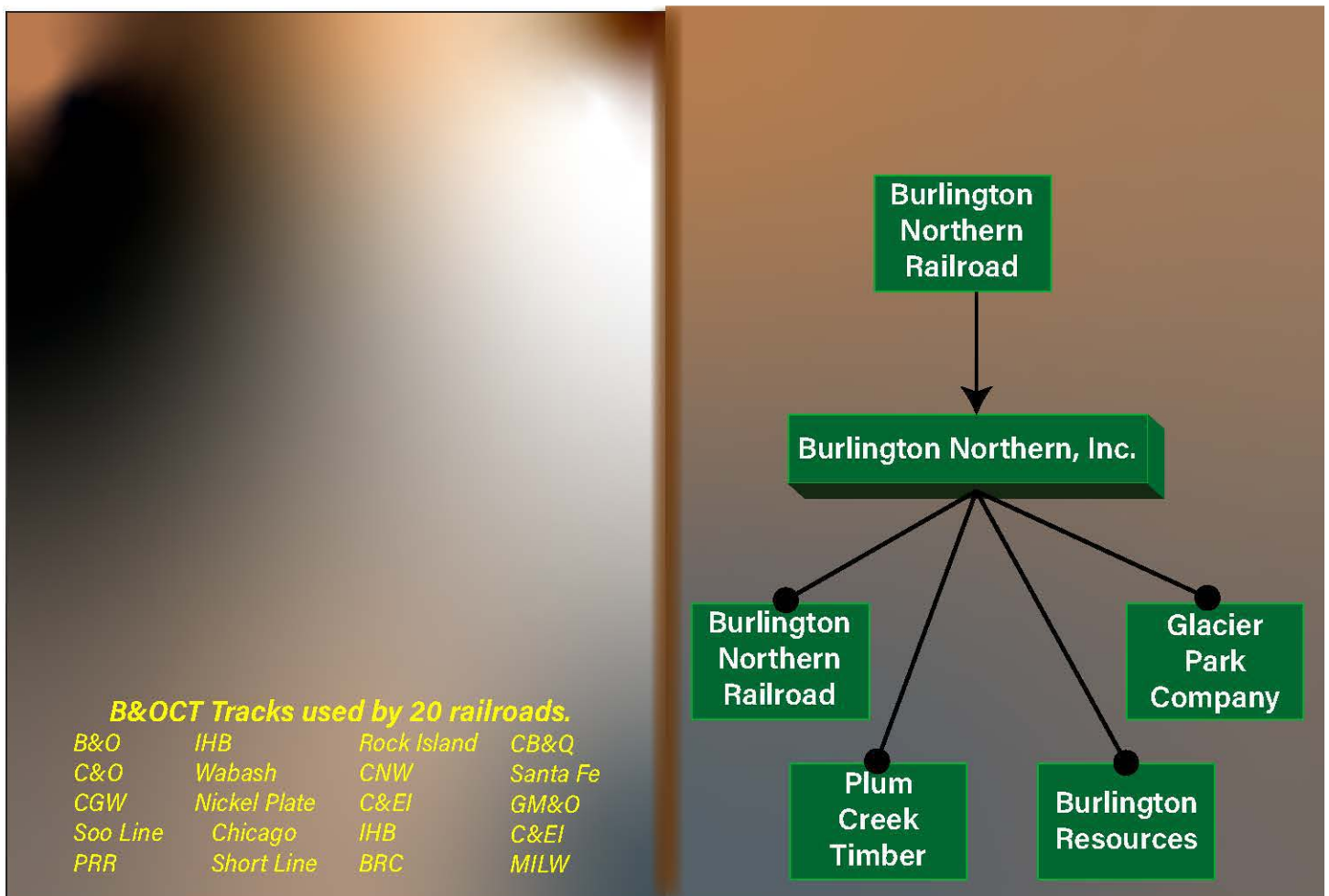
The Model

- The European Commission found that a government-owned monopoly was as detrimental to the national interest as a privately-owned monopoly. The European Union established a system of open access to the rail network through EU Council Directive 91/440/EEC of 29 July 1991¹².
 - ◆ The directive requires the financial and management separation of infrastructure from service regardless of ownership.
 - ◆ Infrastructure and service may share ownership, but only as financially separate subsidiaries. This arrangement may need to be modified or structured by regulation or legislation to ensure that there is no conflict involved in common ownership through a holding company.
 - ◆ The directive requires non-discriminatory access to the infrastructure, using a published fee schedule applicable to all train operators.
- Railroad infrastructure in the EU has effectively become a toll road for trains. In Germany, this has increased rail market share by almost 100 percent¹³ and has generated the need to greatly expand and improve the rail system to accommodate more traffic¹⁴.
- The TRT model for efficient, competitive use in the U.S. is essential. It does not involve nationalization or government taking or purchasing of private property.
- Rail infrastructure in the US would operate similarly to highway infrastructure, many individual transportation companies sharing the infrastructure.
- For comparison, European railroads were nationalized generally in the early 20th Century. Rail transportation was considered too valuable to the national interest to be trusted to for-profit corporations. In the late 20th Century, they were generally made government-owned corporations, similar to Amtrak and the Postal Service.
- The fee structure prescribed by EU regulations includes the cost of owning and operating the infrastructure and a profit margin.
 - ◆ In certain circumstances, mark-ups, additional fees, are allowed.
 - ◆ When an infrastructure company has a need for additional infrastructure to accommodate additional traffic, a business case is made to the government. Grants are awarded for the new infrastructure, which becomes

property of the infrastructure owner upon completion.

Business

- Congress can enact regulations that require separation of rail infrastructure from rail service, in the manner of the EU regulation. A rail infrastructure subsidiary owns and manages infrastructure. One or more Train Operating Company (TOC) subsidiaries provide rail transportation service.
- There is US precedent for the separation of elements of railroad corporations into holding companies controlling financially independent subsidiaries. For example Burlington Northern Inc. from Burlington Northern Railroad and Santa Fe Industries from Atchison, Topeka & Santa Fe Railway. Both formed a holding company to separate assets from the railroad company subsidiary.
- There is precedent in the US for the TRT arrangement. Baltimore & Ohio Chicago Terminal Railroad (B&OCT) was a wholly owned subsidiary of Baltimore & Ohio Railroad (B&O). The purpose of separation was the ability to take advantage of benefits available to railroads located entirely within the Chicago Switching District. Each railroad using B&OCT, including B&O, was charged a fee to use B&OCT tracks. Indiana Harbor Belt, Belt Railway of Chicago, and Chicago & Western Indiana Railroad, also in the Chicago Switching District, presented a similar situation.



- TRT does not exploit the infrastructure owner, a fear of the railroad companies when this model is discussed. The arrangement would be an advantage to the owners of greatly underutilized US rail infrastructure. The US has vast expanses of virtually empty rail lines and a relatively small number of extremely congested areas, generally due to operating and infrastructure minimization practices.
- TRT allows the current railroad corporations to provide or discourage service as they currently do. However, they will compete with other TOCs.
- TRT allows other companies to provide the service that is now missing.
- Public agencies may subsidize rail infrastructure and/or operations as a matter of policy, for example, because of the climate emergency importance of rail transportation.
- In cases that involve service for public necessity that is not suitable for profitable operation, such as commuter or suburban service, (Public Service Obligations - PSO) public agencies may engage and subsidize a TOC to provide the service.
- The model would provide alternative employment opportunities for people currently trapped in an unacceptable employment arrangement.
- TRT would facilitate implementing new passenger rail service and would improve the punctuality of current passenger service.
- Prior to Amtrak, passenger trains carried a significant amount of express freight, most of which was lost to the government-supported competition of trucks. From the mid-1980s into the early 2000s Amtrak operated an extensive express freight service on passenger trains, but track access and schedule restrictions and opposition of the freight carriers caused the service to fail. Under the TRT model, such service could return and provide the basis for new passenger rail service and improvements to existing passenger and freight service.
- Service must be scheduled in detail, as is the current practice in most of the world. The schedule is a reservation for segments of track at specific times.
- TRT procedures include assessment of penalties for entities causing delays. For example, if a TOC's train breaks down and delays another TOC's train, the delaying TOC must pay the TOC of the delayed train. If the TOC's broken down train delays track maintenance work, the delaying train's TOC must pay the infrastructure company. If a track or signal failure delays trains, the infrastructure company must pay the TOCs of the delayed trains.

Infrastructure

The US railroad network presents a paradox. The US is 11th in the world in utilization¹⁵, measured in train miles per track mile and adjusted for the length of typical US freight trains. This manifests in long distances of infrequent trains and small areas with heavy congestion. The US rail network has been configured for the industry's preferred traffic: infrequent, long, slow, heavy trains that are not time sensitive. Faster trains are stuck behind slower trains for the lack of a track to get out of the way.

The railroad industry has spent decades reconfiguring the infrastructure for their preferred business, long, heavy, low to moderate speed trains. The changes have involved removing track, closing yards, and modifying signal and traffic control systems.

To achieve the rail transportation we need, substantial infrastructure improvement must be made, but more infrastructure is not required in order for TRT to work effectively. However, substantial improvement in utilization can be achieved by changing the way rail service is conducted on the system we have now.

How is infrastructure improved for increased capacity or shorter transit times?

Infrastructure improvement in the TRT model is similar to the current practice for new or improved passenger service. The standard practice involves a public agency requesting and sponsoring the service. The property owner (host railroad) determines the new infrastructure needed to support the proposed service. The public agency funds the infrastructure improvements necessary for the new or improved service. The host railroad performs the work and/or hires contractors to do it. The improvements become property of the host railroad. The fee charged to the sponsoring agency



Funding Toll Roads for Trains



Like Highways

includes the cost of maintaining the new infrastructure.

The railroad industry pays from almost all infrastructure from revenue. There is great competition among important projects for the available funds, so projects are chosen based on return on investment, typically with a five year planning horizon.

There are also federal grant programs for railroad infrastructure improvement. Again, the railroad company applies for the grant, describing the improvement and its purpose and intended result. On approval, the grant is funded, and the railroad company performs the work or hires contractors. The improvements become the property of the applicant.

Under the TRT model, improvements will be handled similarly. An infrastructure company may improve the infrastructure from revenue. It may determine that improvements are needed and apply for a grant. Public agencies may also apply for rail improvement grants. As part of regular review of the state of the network, FRA may also determine that improvements are needed. The cost of owning and maintaining the improved infrastructure will become part of the access fee charged to Train Operating Companies.

The TRT model provides a way to configure the railroad system for the public interest, for example, track arrangements needed for the desired freight and passenger services, and electrification. It also addresses the uneven distribution of public money for highways instead of railroads. Public funds support system expansion. Maintenance is funded by user fees.

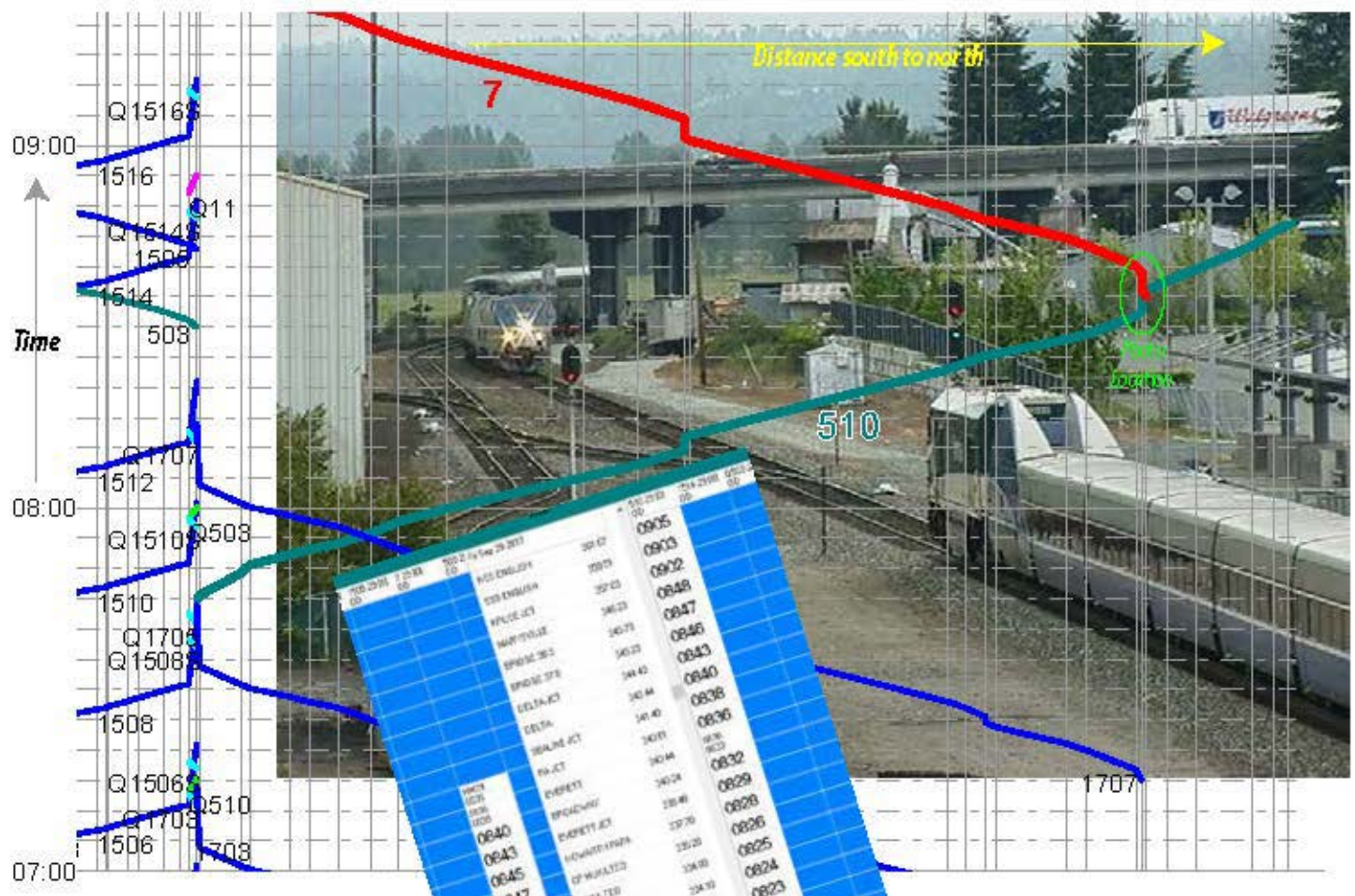
Accommodating trains for reliable service

In the US, the best reliability of Amtrak passenger trains is about the same as the worst reliability in Europe. In a substantial part of Europe and China, freight trains are roughly half of the traffic and the shared operation is relatively seamless¹⁶. The important difference is the method of managing the use of the infrastructure. Properly managed, the US rail infrastructure can accommodate, in its current state, a substantially higher volume of traffic. Future infrastructure needs cannot be determined until the current chaotic improvised operation has been structured.

The movement of trains is constrained by the tracks. Trains cannot merely change lanes as needed when there is an obstruction or congestion ahead. Trains can only move from one track to an adjacent track or a branching track where the infrastructure (one or more switches) is in place to accommodate the movement. Reliable schedules require the schedule to have time to anticipate all predictable events (e.g., clearing the way for another train, waiting for another train, slowing to change routes).

An effective and reliable train schedule is a Track Resource Allocation Plan (TRAP). The schedule is a series of reservations for a specific track segment at a specific time. No other train can be allocated the same segment at that time. Train schedules cannot be developed in isolation. All traffic on the line must be considered. That process is called timetabling. The desired schedules for every train are considered simultaneously. Adjustments are made to schedules until the timetable is conflict-free (no track segment is scheduled to accommodate two trains simultaneously). Adjustments to

Track Resource Allocation Plan



The timetable (a conflict-free set of schedules, a TRAP) in tabular and time-distance graph form shows that train 7 (red on the time-distance diagram, left in the photo) leaves the junction point and pulls into the station upon train 510 (green on the time-distance diagram, right in the photo) turning left and clearing the junction, just as shown in the photo.

create a conflict-free timetable include routing a train to another track, stopping a train to let another pass, reduce the speed of a train to prevent waiting, changing the leaving time at the initial station, or a combination of two or more of these methods¹⁷.

Typically, a timetable of all traffic expected throughout a period such as annually, semi-annually, or quarterly. Traffic planned that far in advance generally consists of passenger trains and important freight trains such as mail and package freight trains. When a schedule is purchased for a periodic timetable, the TOC must pay for it for the life of the timetable whether or not the train is operated. The timetable is developed in priority order, the most important and travel-time-sensitive trains are allocated first, then other trains in successive levels of importance.

After the long term timetable is complete and in operation, additional (extra) trains may be operated using the TRAP method. The additional trains must be scheduled around the regularly scheduled trains. This arrangement allows extra trains to be requested on short notice, about three hours depending upon the scheduling entity's capabilities.

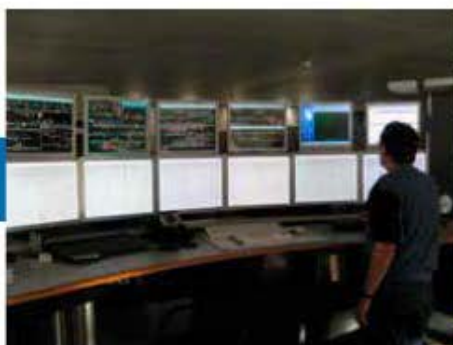
Operating under the TRAP method requires discipline and knowledge. Developing a timetable can be time-consuming and require substantial effort, even when assisted by computer software. A train that is not on time effectively loses its right to the tracks that had been allocated to it. The train dispatcher must develop a new allocation (schedule) that is not in conflict with other trains at the time the delayed train will be operating. Train Operating Companies must assemble trains complete with locomotives, crews, and the required cars, ready to start at the time required by the schedule.

Scheduling staff must be cognizant of every detail that can affect train operation. Dispatchers must be capable of and have a workload allowing anticipating delays and adjusting traffic to keep delayed trains moving while not affecting trains that are on time.

Infrastructure access managed and regulated by the TRAP method would bring the rail service reliability that is now lacking.



Federal Agencies



Control Procedures



Federal Aviation Administration



Who directly controls the scheduling and traffic movement?

When structured operation is correctly arranged, the procedures are fully documented like air traffic control procedures, and the scheduling and traffic control staff are fully educated in those disciplines, the employer is irrelevant. They may work for the infrastructure owner, their cost being included in the access fee, or for the government.

Which factors of TRT affect safety?

Many safety issues involving train crews arise primarily due to workforce management models. The number of hours that a conductor and engineer were off duty and whether they are rested when they go on duty are not related. US railroad operation is typically improvised. A crew that is off duty awaiting assignment may receive several conflicting updates of their expected on duty time. The actual time, of which they are notified one or two hours in advance, may be radically different from any of the updates. The question of sleep now or later to be awake and ready for work at the on duty time is common. Given the various updates during the off duty time, an employee may start a 12 hour shift having been already awake for many hours. The railroad industry does not consider this situation as a safety factor¹⁸.

TRAP scheduled railroad operation is an effective response to that array of situations. All trains must be pre-planned. A train schedule may be purchased with only three hours notice, but the schedule will have a higher cost than one purchased well in advance. Other safety factors are outside the discussion of the TRT model.

Regulation

The Federal Railroad Administration (FRA) will continue to develop, maintain, and enforce safety regulations and administer infrastructure grant applications. FRA will also establish and maintain track access and traffic management like the FAA regulations for air traffic. FRA will also determine infrastructure adequacy of the national rail system, make periodic reviews, and initiate improvement projects as needed.

The Surface Transportation Board (STB) will administer network access, publish access charges and conditions, resolve disputes, and regulate access fees.

The cost of owning, operating, and maintaining railroad infrastructure may vary by line characteristics. Infrastructure operators will annually (or more frequently if needed) submit their access fees and documentation to STB for approval and publication.

Education

Occupations that manage the assets and provide the transportation that generates revenue, are not treated as professions by the US railroad industry. Often, the railroad employees providing transportation and managing or maintaining the infrastructure are considered by corporate management to be menial labor. There is no incentive for employees to invest in comprehensive rail-transportation-specific education. Consequently, there is almost none available.

For effective rail service, rail engineering, operating, and maintenance professions require a high level of expertise.

Before the 1980s, US railroads trained new employees by apprenticeship combined with on the job training. Many positions that the railroad industry has considered redundant and unnecessary in the past five decades were filled by junior employees gaining experience and training for the next level. That career path has been replaced with a system involving a training program of as little as six weeks, and the assumption of a responsible position. The result of this training method is manifested in safety deficiencies and inefficient operation.

There are three universities in the US that have a railroad engineering degree program. There are 37 in Europe. Germany alone has nine universities with railroad degree programs. In Germany, train dispatchers, conductors, and engineers in Germany must complete a three year trade school program that includes 840 hours of instruction in railroad operations. Of course, individuals in those professions may have a university degree in railroad engineering and operations instead

of trade school.

The rail transportation the US needs is dependent upon knowledgeable, professional workforce. To that end, the US must develop extensive and comprehensive education in rail engineering and operation. New employees, labor and management, must be required to graduate from an accredited rail engineering and operations program. For the locomotive engineer, and conductor professions, a trade school equivalent to the German model would be an acceptable alternative. Current employees will need an extensive continuing education program to match the qualifications for new employees.

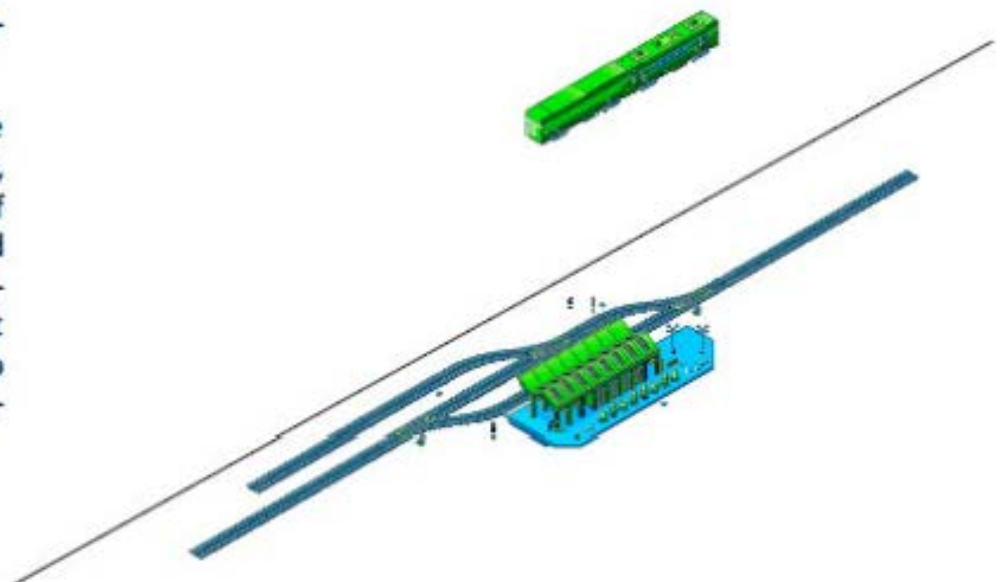
Curricula must include all aspects of railroad planning, implementation, and operation, importing foreign expertise as needed, e.g., from Germany, Switzerland, Austria, or Netherlands:

- infrastructure system design (what infrastructure is needed to provide the desired service and reliability),
- infrastructure engineering design (how to build the needed infrastructure),
- infrastructure maintenance,
- vehicle design and maintenance,
- service planning,
- scheduling and timetabling,
- traffic management,
- transportation management,
- yard and terminal management,
- laws and regulations applicable to railroad operation.

Almost all personnel engaged in air traffic control are federal employees, but there are a substantial number who are contractors. The FAA requirements for Air Traffic Controller, whether employed by FAA or a contractor, are

- hold three years at the same job, get a bachelor's degree, or do some combination of post-secondary education and work that totals three years followed by a 12 week program at the FAA Academy and two to four years of on the job training.

or



- complete education and training through a FAA approved Air Traffic Collegiate Training Initiative (AT-CTI) program; and then obtain a letter of recommendation from the school, spend seven weeks at the FAA Academy, and two to four years of on the job training.

Railroad professions engaged in operations must have a similar level of training and education.

The US must have a much greater emphasis on managing operations than current programs include. On the job training requirements must be much more extensive, similar to the FAA Air Traffic Controller requirements. The programs should be available at public universities throughout the country.

An Early Start

Railroad education need not be limited to formal education. Before the 1970s, many railroad professionals began their career as unofficial apprentices during middle and high school, learning on the job from family or friends. The practice was not officially approved, but it was often accepted.

The countries of the Soviet Union thought railroad knowledge to be of such importance that Children's Railways (also called Pioneer Railways), small-scale railroads like a zoo or park train ride in the US, were established. Here, any interested child, sometimes as young as 10 years old, "worked" in railroad professions, learning from experienced railroad profession teachers. After high school, they would go on to one of the railway universities. The Soviet Union is gone, but 55 of the Children's Railways remain.

Existing Children's Railways

	Armenia	1
	Belarus	1
	Bulgaria	2
	China	1
	Cuba	3
	Georgia	1
	Germany	13
	Hungary	2
	Kazakhstan	3
	Lithuania	1
	Poland	2
	Russia	25
		55

Summary

The report issued March 20 2023 by the United Nations International Panel on Climate Change has reinforced the conclusion of several reports published by the panel in over a decade. A reduction of about 50 percent in greenhouse gas emissions is essential.¹⁹

Effective rail transportation is an essential climate emergency response and essential to efficient and dependable supply chain and mobility. TRT is the best route to effective rail transportation.

TRT involves separating rail infrastructure and service into separate financial companies using the regulatory authority of Congress. Existing railroad corporations may continue to own the infrastructure and provide service as a TOC through a holding company arrangement. The infrastructure company charges a fee that includes all costs of owning and operating the property and infrastructure plus a profit. Infrastructure companies publish a schedule of fees for track access, based on factors such as origin and destination, scheduled travel time, and time of day

Rail infrastructure under TRT is open to any qualified TOC. Each train must be scheduled in advance to prevent track use conflicts with other trains.

TRT increases the utility of US rail transportation, reduces pollutant and greenhouse gas emissions, reduces transportation energy consumption, provides business opportunities, improves working conditions and safety, reduces highway congestion, and increases mobility.

TRT is an essential transportation solution that is needed as soon as possible.

Appendix

Line Hannover - Braunschweig						Seattle - Portland					
section Lehrte - Gross Gleidingen						Typical trains at Kalama					
trains counted at station Peine						2007 data					
Timetable 2000/2001											
	eastbound		westbound				northbound		southbound		
hour	freight	passenger	freight	passenger			freight	passenger	freight	passenger	hour
00:00 - 01:00	2	1	4	0	7	2	1	0	1	0	00:00 - 01:00
01:00 - 02:00	3	0	4	1	8	7	3	0	4	0	01:00 - 02:00
02:00 - 03:00	2	1	4	1	8	0	0	0	0	0	02:00 - 03:00
03:00 - 04:00	5	1	2	0	8	1	1	0	0	0	03:00 - 04:00
04:00 - 05:00	3	1	0	1	5	2	0	0	2	0	04:00 - 05:00
05:00 - 06:00	2	2	2	3	9	0	0	0	0	0	05:00 - 06:00
06:00 - 07:00	6	2	3	2	13	2	2	0	0	0	06:00 - 07:00
07:00 - 08:00	2	2	3	3	10	4	3	0	1	0	07:00 - 08:00
08:00 - 09:00	3	2	3	2	10	0	0	0	0	0	08:00 - 09:00
09:00 - 10:00	2	2	1	2	7	3	1	1	1	0	09:00 - 10:00
10:00 - 11:00	2	2	2	2	8	5	3	0	1	1	10:00 - 11:00
11:00 - 12:00	1	2	4	2	9	2	1	0	1	0	11:00 - 12:00
12:00 - 13:00	3	2	0	3	8	2	0	1	0	1	12:00 - 13:00
13:00 - 14:00	3	3	3	2	11	2	1	0	1	0	13:00 - 14:00
14:00 - 15:00	3	3	1	2	9	3	1	0	1	1	14:00 - 15:00
15:00 - 16:00	2	3	3	2	10	3	2	0	1	0	15:00 - 16:00
16:00 - 17:00	1	3	2	2	8	1	0	0	1	0	16:00 - 17:00
17:00 - 18:00	2	3	1	2	8	5	1	1	2	1	17:00 - 18:00
18:00 - 19:00	3	3	3	3	12	3	0	1	2	0	18:00 - 19:00
19:00 - 20:00	2	2	2	3	9	2	2	0	0	0	19:00 - 20:00
20:00 - 21:00	2	2	0	2	6	3	2	0	0	1	20:00 - 21:00
21:00 - 22:00	1	2	4	2	9	0	0	0	0	0	21:00 - 22:00
22:00 - 23:00	2	2	4	2	10	1	1	0	0	0	22:00 - 23:00
23:00 - 00:00	1	2	4	2	9	7	6	0	1	0	23:00 - 00:00
sum	58	48	59	46	211	60	31	4	20	5	sum

Counts of passenger and freight trains passing an example station on a double track line in Germany and in the US.(page 11)

Endnotes

- 1 Reiterated in several consecutive reports for over a decade. The latest was issued March 20, 2023 <https://www.ipcc.ch/report/ar6/wg3/>
- 2 *Department of Defense Climate Risk Analysis*, October 2021 <https://media.defense.gov/2021/Oct/21/2002877353/-1/-1/0/DOD-CLIMATE-RISK-ANALYSIS-FINAL.PDF>
- 3 Environmental Protection Agency data
- 4 Jordan, Jay R. *Jordan Texas Drivers Put Out More Carbon Dioxide Than Every Train In The World Combined*. Chron, <https://www.chron.com/news/houston-texas/transportation/article/texas-cars-pollution-carbon-dioxide-16316641.php> July 15, 2021
- 5 Viola, Melissa& Hogan, John P. *Supply Chain Weaknesses Are a Threat to National Security* Aspen Institute, <https://www.aspeninstitute.org/blog-posts/supply-chain-weaknesses-are-a-threat-to-national-security/> November 30, 2021
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- 11 https://www.faa.gov/about/office_org/headquarters_offices/ato/service_units/mission_support/faa_contract_tower_program
- 12 <https://lexparency.org/eu/31991L0440/>
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- 14 Prof. Dr. Ing. Jörn Pachl, Professor, railway program, Technical University, Braunschweig DE
- 15 UIC Railway Data <https://uic-stats.uic.org/>
- 16 Example table in the Appendix
- 17 Hansen, Ingo and Pachl, Jörn. *Railway Timetabling & Operations*. Eurailpress, 2014
- 18 White, Thomas. *Quality of Life and Safety - Theirs and Yours*. <https://climaterailalliance.org/quality-of-life-and-safety-theirs-and-yours/>
- 19 Reiterated in several consecutive reports for over a decade. The latest was issued March 20, 2023 <https://www.ipcc.ch/report/ar6/wg3/>

PUTTING AMERICA BACK ON TRACK: THE CASE FOR A 21st CENTURY PUBLIC RAIL SYSTEM

MADDOCK THOMAS

JULY 2024



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MADDOCK THOMAS

JULY 2024

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EXECUTIVE SUMMARY

This White Paper makes the case that the U.S. needs a public rail system fit for the 21st century, which we will accomplish in several ways. We will examine the innumerable failures of the privately-owned, duopolistic Class I railroads to serve their purpose as critical transportation arteries. We will explore the history of public/governmental involvement in the development of the U.S. rail system and consider the ways private management has betrayed the investments made by the public. We will learn from examples of contemporary public rail ownership in the United States. We will also draw inspiration internationally from the successes of integrated public rail systems and lessons from the failures of fragmented, privatization rail systems. Finally, we will explore contemporary models of railroad organization to jump-start the conversation about how we should structure a public rail system that truly meets the needs of the 21st century.

The failures of private railroad management have been laid bare over the course of the past 30 years, including—

FAILING SAFETY MEASURES

- The rate of rail accidents rose by 28% between 2013 and 2022 as railroads prioritized speed over safety as a part of so-called “Precision Scheduled Railroading”
- At Norfolk Southern, the accident rate rose by a whopping 128%; at CSX it rose 72%
- Various Class Is have been caught ignoring maintenance; in a shocking example, FRA inspectors found 73% of Union Pacific locomotives to have federal defects

DISRESPECT FOR RAILROAD WORKERS:

- Over 50,000 workers have been laid off since 2015, equal to nearly 30 percent of the total workforce
- Railroad workers face increasingly unpredictable schedules and forced overtime, leading to chronic fatigue
- Railroad companies regularly retaliate against employees for reporting defects or voicing concerns over safety

DETERIORATION OF FREIGHT SERVICE:

- Class I railroads moved 30% fewer carloads of freight in 2023 than in 2000
- Rail customers described service as “the worst it has ever been” during a Surface Transportation Board hearing in 2022
- Class Is are providing a fraction of the service promised to customers, with decreased reliability

OBSTRUCTION OF PASSENGER SERVICE:

- In 2023 alone, host railroads (predominantly Class Is) caused 2,238 days of delay to Amtrak passenger trains
- By removing double trackage and cutting maintenance, Class Is have caused passenger train derailments and impeded the expansion of new Amtrak service

UNDERINVESTMENT IN CAPACITY EXPANSION:

- A 2007 study outlined the need for Class Is to invest \$135 billion in capacity expansion to meet demand in 2035
- Instead, the Class Is spent \$196 billion on buybacks and dividends for shareholders between 2010-2020
- Aside from this study, no national rail capacity planning has ever taken place, due to a lack of coordination among private Class Is, in contrast with regular planning conducted by public agencies for publicly owned highways and waterways

DISREGARD FOR LOCAL COMMUNITIES:

- Despite clear health risks for workers and communities near rail yards, Class Is shifted their switcher fleet towards dirtier, polluting locomotives between 2017 and 2020
- Class Is operate ever-lengthening trains that block railroad crossings, impeding first responders and forcing children to crawl under railcars to get to school

IGNORING THE NEED FOR ELECTRIFICATION:

- Overhead catenary electrification improves operational performance and lowers costs, yet Class I's have all but obstructed electrification to avoid capital investment
 - Instead, they have experimented with small-scale battery and hydrogen locomotives—technologies that they themselves have testified are not viable for mainline freight rail
-

An alternative to this failed private model exists: public ownership.

A SYSTEM WHICH CAN—

- Reinvest income in critical infrastructure improvements and electrification
- Deliver frequent, reliable service for freight customers with greater efficiency
- Democratically involve workers in decision-making and maintain sufficient staffing to provide them with regular schedules
- Create tens of thousands of quality union jobs through service expansion, capital reinvestment, and electrification projects
- Cooperate with Amtrak to reduce freight train delays, boosting on-time-performance for rail passengers
- Achieve a modal shift towards rail, reducing carbon emissions, shipping costs, and wear-and-tear on our nation's highways
- Electrify and decarbonize the rail system, avoiding thousands of premature deaths and reducing the negative health impacts from diesel emissions on trackside communities

Public ownership and investment have been central to the growth of the American rail industry, but private railroads have failed to uphold their end of the deal and serve the public interest:

- The Baltimore & Ohio, our nation's first common carrier railroad, was funded by the State of Maryland and City of Baltimore, who retained a majority stake in the company until the turn of the century
- Through various acts of Congress, 179 million acres of public land was given to railroads as land grants to support railroad development
- The rail system was nationalized during WWI, after private management proved incapable of the coordination needed to meet wartime demand
- The Plumb Plan, for public ownership and democratic management, was supported by rail labor and the AFL, offering a bold alternative to the chaos of private ownership
- Conrail successfully revived the Northeastern rail network after a series of dramatic railroad bankruptcies

Today, publicly owned rail systems continue to exist as critical passenger links for millions of people a day and provide freight services to countless communities that would otherwise have been abandoned by the Class Is:

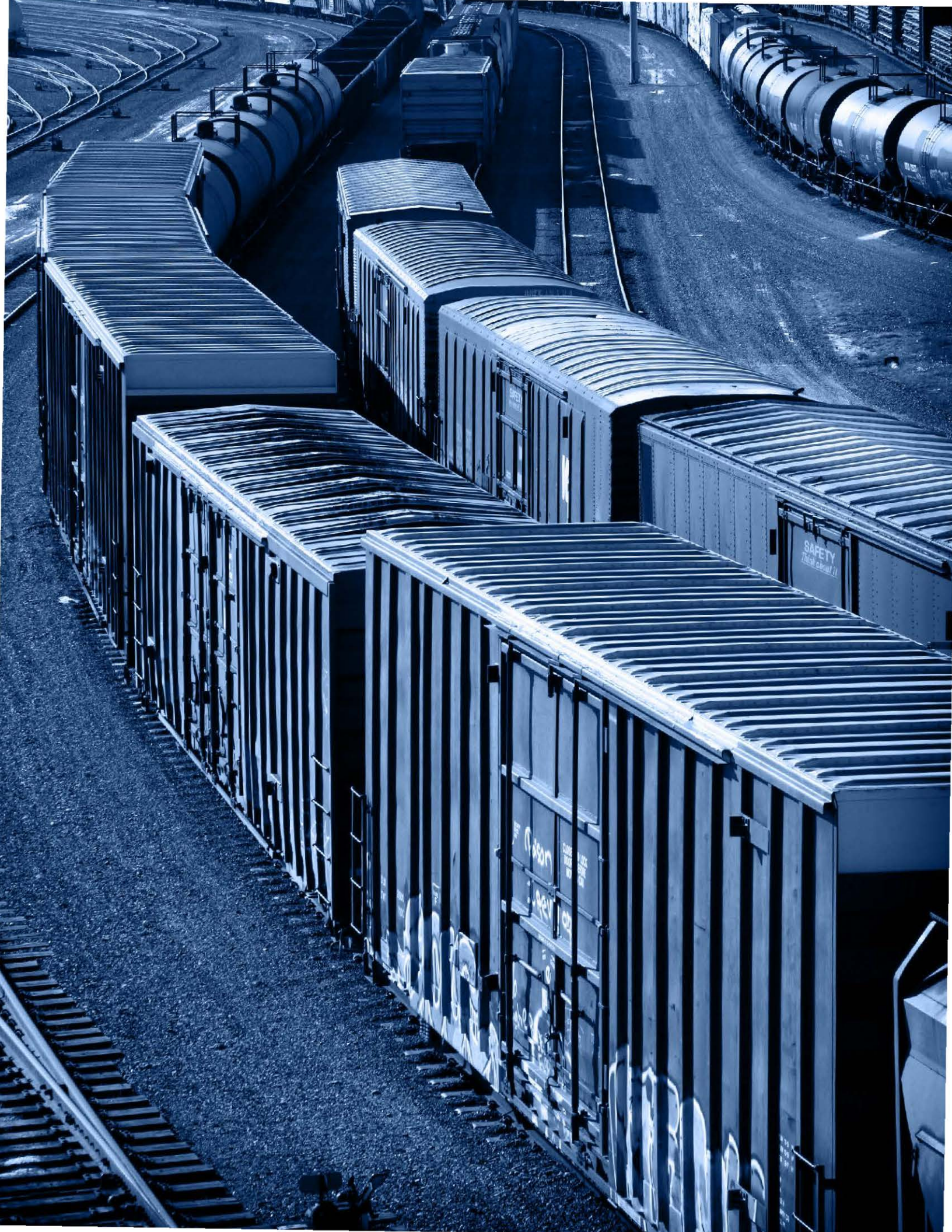
- Amtrak provides rail service to over 500 towns, and has recovered from the pandemic with record-setting ridership figures
- Over 30 commuter/regional rail systems across the country move passengers in and around cities, many on fully-electrified trains
- Tacoma Rail has operated as a non-profit public utility since 1918, serving to connect the Port of Tacoma with the national rail network
- State DOTs own thousands of miles of rights-of-way, preserving freight services where Class Is sought abandonment

Internationally, publicly owned rail systems have demonstrated the advantages that such a system can provide:

- Indian Railways has electrified over 25,000 miles of track with overhead catenary in less than 10 years
- The Swiss Rail system has the highest passenger ridership in the world and a strong modal share of freight, all while achieving Europe's best on-time-performance and safety record

There are multiple models that we might draw upon when designing a new public rail system for the United States. Open access, franchising, and integrated public operation are all explored. Each has various strengths and weaknesses, and in-between options exist, but integrated public operation provides the strongest path to a rail system with nationwide coordination, operating truly in the public interest.

This paper is intended to rekindle a national conversation about our rail network. It is time for railroad workers, communities, shippers, climate activists, and rail passengers to support the Public Rail Now campaign for a publicly owned rail system – a rail system that works for all of us.



INTRODUCTION

The American railroad system is broken. Just six mega-corporations, known as Class I railroads, control 70 percent of all track miles in the United States. These Class Is have run our rail system into the ground for the sake of short-term profit. Workers are plagued by erratic schedules resulting from job cuts and face retaliation for calling out safety hazards. Towns have been blown up in dramatic rail accidents from Lac-Mégantic to East Palestine, and the accident rate has risen by double-digits. The quality of rail service has deteriorated, driving customers away and harming the economy. Underinvestment in infrastructure has obstructed plans for passenger expansion and threatens to put the rail system over capacity by 2035. Trackside communities' concerns are ignored as they deal with health risks from diesel pollution and long trains cut their towns in half.

Over the past ten years, the number of railroad workers has fallen by over 50,000 since its peak in 2015. The threat of layoffs is always just around the corner, with the next round of "cost cutting." Railroad workers who survive layoffs face increasingly unpredictable schedules and forced overtime, which contribute to widespread chronic fatigue. The Class I railroads have cut the number of Shop Craft workers, who repair locomotives and freight cars, by nearly 40 percent. The number of maintenance-of-way workers—those who maintain tracks, signals, and defect detectors—has fallen by more than 21 percent. Needless to say, this cost cutting has been disastrous for rail safety.

While broadly, over the past few decades, railroads have become safer and safer, we have seen that trend reverse over the last ten years. The accident rate on several of the Class Is has more than doubled. Not only have railroads been operating with bare minimum maintenance crews, but managers have also been instructing workers to sign off on maintenance work that was not performed. Workers who speak out about these practices have been fired.

"The American railroad system is broken. Just six mega-corporations, known as Class I railroads, control 70 percent of all track miles in the United States."

Rampant cost cutting has also impacted our nation's businesses who ship by rail. In pursuit of "efficiency" and a lower operating ratio (operating costs as a percentage of revenue), railroads have unilaterally cut back on service to customers. Rail customers who used to send and receive shipments five times a week are being told that their railcars will only be picked up twice a week. Excluding intermodal container traffic, the number of carloads shipped by rail has declined by a third since 2000. It has fallen after each economic recession and each time it has failed to reach pre-recession levels. This pattern is largely because railroads furlough their workers and are unwilling to bring them back in order to support demand as our nation's economy recovers. As a result, shippers turn to trucking and never return.

Railroads have underinvested in infrastructure. Despite traffic projections from 2007 suggesting that railroads will need to invest \$148 billion (more than \$225 billion in 2024 dollars) in new trackage to meet demand by 2035, the Class I's have barely built any new trackage, contenting themselves to drive away customers with the ensuing poor service. This underinvestment also severely restricts the potential for expanding passenger service, even as Amtrak continues to set annual ridership records. The Class I's have similarly failed to invest in decarbonization. While the rest of the world invests in overhead catenary electrification—which brings significant operational benefits and cost saving—American railroads have only toyed with experimental battery locomotives that can only operate for 30 minutes at full power. For a country whose railroads were once the envy of the world, this is a disgrace.

Why has this happened? Simply put: instead of investing in their workers, in safe infrastructure, and in quality services, the Class I's prefer to cut costs to the bone in pursuit of short-

“While the rest of the world invests in overhead catenary electrification—which brings significant operational benefits and cost savings—American railroads have only toyed with experimental battery locomotives that can operate for a limited 30 minutes at full power. For a country whose railroads were once the envy of the world, this is a disgrace.”

term profits to lavish on their shareholders in the form of stock buybacks and dividend payments. Railroad executives hold the operating ratio— derived from expenses as a percent of revenue—to be supreme. As a result, railroads will refuse even profitable traffic if it means their ratio of expenses to revenue might rise by 0.5 percent. This short-term profit-focused management system is no way to steward our nation’s critical rail infrastructure.

The worsening condition of the railroads over the past few decades can be tied to Wall Street’s desire to extract maximum “value” out of our transportation system. This pressure has led to an unhealthy focus on achieving low operating ratios and cutting costs, culminating in the regime of so-called “Precision Scheduled Railroading.” Norfolk Southern’s attempt to adopt a slightly more service-focused operating plan, in response to massive shipper and public pressure in the wake of the disastrous derailment in East Palestine, was torpedoed by Ancora Holdings, an investor group that sought to return NS to full-blown Precision Scheduled Railroading. In the wake of this proxy battle, NS has recommitted to cut costs for an exceedingly low operating ratio and began axing service before the vote even took place. This experience has clearly demonstrated that private ownership is incapable of meeting the needs of America’s shippers and public.

Then what is the solution, you say? Public ownership, democratic management, and service-focused operation. By removing private investors whose sole focus is short-term profit from the governance of our nation’s critical railroads, our railroad system can finally be run in the collective public interest. Workers, shippers, and community members—who all hold critical stakes in how the railroads are operated—can have a say in running our rail system. Workers wouldn’t be fired for speaking out and deferring maintenance for the sake of a quarterly earnings statement would be a thing of the past. Instead, railroaders would be encouraged to speak out to demand safety improvements and better maintenance, so that another East Palestine never happens again.

“By removing private investors whose sole focus is short-term profit from the governance of our nation’s critical railroads, our railroad system can finally be run in the collective public interest.”

Management can eschew the operating ratio once and for all, instead pursuing sustainable long-term growth. Investments in high quality service will bring profitable traffic back to the railroad. Instead of siphoning away railroad income for buyback and dividends to shareholders, a public railroad will reinvest operating income in better infrastructure and electrification. This infrastructure investment can be coordinated and planned on a national scale to achieve cost economies and ensure the rail system is meeting the needs of all of its users. Dividends will come to the public in the form of better service at a lower price. Tens of thousands of high-quality jobs will be created through renewed investment in and expansion of rail service, as well as through the economic activity spurred by high-quality rail transportation.

This white paper will lay out the case for public ownership. It will examine in detail how the private Class I railroads are failing almost every constituency in America and how a public rail system might rectify these failings. It will touch on the long, proud, yet largely unknown history of publicly owned railroads in America, dating back to the very first common carrier. It will also compare international rail systems to evaluate how a public rail system might be best structured in the United States. This paper will conclude by recommending how the American rail system should be restructured to serve the public interest and meet our country's transportation needs in the 21st century.

WHY WE NEED A PUBLIC RAIL SYSTEM

The struggle between robber barons and the public interest for control of the U.S. railroad system dates back to the 19th century. Railroads have frequently pursued “efficiency” in the form of longer trains, fewer workers, and less frequent service to customers. Shippers fought for the Interstate Commerce Act of 1887, to enshrine the common carrier obligation in law and require railroads to carry all customers’ traffic at a fair price. The Act also created the Interstate Commerce Commission (ICC) to regulate the rail industry and check its monopolistic power over interstate shipping.

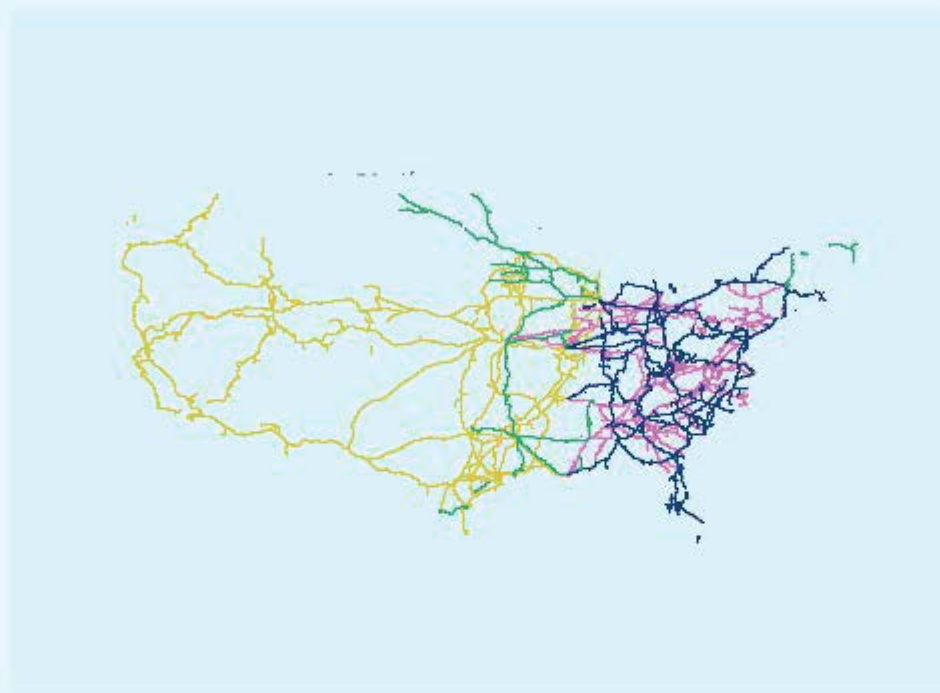
Even under ICC regulation, railroads frequently fought with passengers and shippers over the extent of their obligations and sought to discontinue low-margin service. With railroad bankruptcies commonplace in the 1960s and 70s, Congress passed the Staggers Act of 1980 to deregulate the railroads in the hope of saving the industry. Deregulation led to massive consolidation, creating the rail network that we know today, with just six Class I railroads: Union Pacific, BNSF, CSX, Norfolk Southern, CPKC, and Canadian National. These railroads control the overwhelming majority of all rail traffic in North America. The Class Is represent roughly 69 percent of U.S. trackage and a staggering 94 percent of the rail industry’s revenue.¹

1. Association of American Railroads. “Overview of America’s Freight Railroads.” October 2018.

As figure 1 shows, the United States has two railroad duopolies: Union Pacific and BNSF in the west, CSX and Norfolk Southern in the east. There are also two Canadian Class Is that operate much smaller networks in the United States. In addition to the Class Is—railroads earning \$1 billion or more in annual revenue—there are hundreds of smaller Class II and Class III railroads. These local/regional railroads are not the core subject of our analysis because they comprise such a comparatively small proportion of U.S. rail volume and oftentimes face similar issues to shippers with the Class Is.

This duopolistic railroad system has left many American companies as captive shippers, with only one railroad to serve them. With near-monopolies, railroads have begun earning enormous profits. Shippers, however, have not seen

consummate enormous improvement in service quality and the number of carloads shipped by rail has plummeted since 2000. Rather than reinvesting their profits in infrastructure improvements and ensuring a better quality of life for their workers, the Class I have chosen to lavish their shareholders with billions in dividends and buybacks.



The combination of deregulation and a focus on “efficiency” above all else culminated in Precision Scheduled Railroading (PSR), a model developed by railroad executive Hunter Harrison in the 1990s. Above all, PSR concentrates on reducing the operating ratio, a metric representing operating expenses as a percentage of revenue. To achieve a low operating ratio, railroads have begun running miles-long trains, cut tens of thousands of jobs, and removed trackage deemed unnecessary. By 2019 nearly every Class I railroad had adopted PSR. The results have been disastrous, from a rise in railroad accidents and the disruption of long trains parked in the middle of towns to increasing complaints about service quality.

Ten- and thirty-year trends show that PSR is not the sole culprit for this decline in the American rail industry. Instead, the horrendous state of the North American railroad system is the result of a long history of prioritizing corporate profit over

the public interest. There have been many attempts at checking railroads' monopoly power over the past two centuries but none of them have succeeded in a lasting way.



Figure 2. Class I railroads by 2023 revenue³

This section will make the case that Class I railroads' preoccupation with "efficiency" and private profit has been an existential threat to our nation's commerce, workers, and communities for decades — and remains one today. In the face of the issues outlined below, the only lasting solution is to bring the railroads under public ownership.

3. Respective Annual Reports, SEC, STB filings. CPKC and CN revenues are comprehensive, including Canadian and Mexican revenue—both railroads are comparatively small Class I within the United States.

LASTING IMPROVEMENTS IN RAIL SAFETY

Concerns about railroad safety were catapulted to the forefront of the national conversation in the wake of the explosive train derailment in East Palestine, Ohio in February 2023. An overheated wheel bearing led a Norfolk Southern train to derail and spill hundreds of thousands of gallons of hazardous chemicals into the environment and surrounding town, with a "controlled release" of vinyl chloride causing a mushroom cloud to rise over the horizon.⁴

4. Mike Gauntner, "Norfolk Southern fights federal, state penalties over East Palestine derailment," (June 20 2023). <https://www.wfmj.com/story/49098538/norfolk-southern-fights-federal-state-penalties-over-east-palestine-derailment>; Josh Funk, "Union Official Says Railroad Safety Compromised by Job Cuts, Time Constraints," *Industrial Distribution* (June 29 2023). <https://www.inddist.com/logistics/news/22866187/union-official-says-railroad-safety-compromised-by-job-cuts-time-constraints>.

The events in East Palestine were dramatic, but the decisions that led to this derailment can be traced to a long history of cost-cutting and ignoring workers. Reversing a decades-long trend of safety improvements, the advent of PSR and consolidation have led to a 28 percent increase in the accident rate between 2013 and 2022.

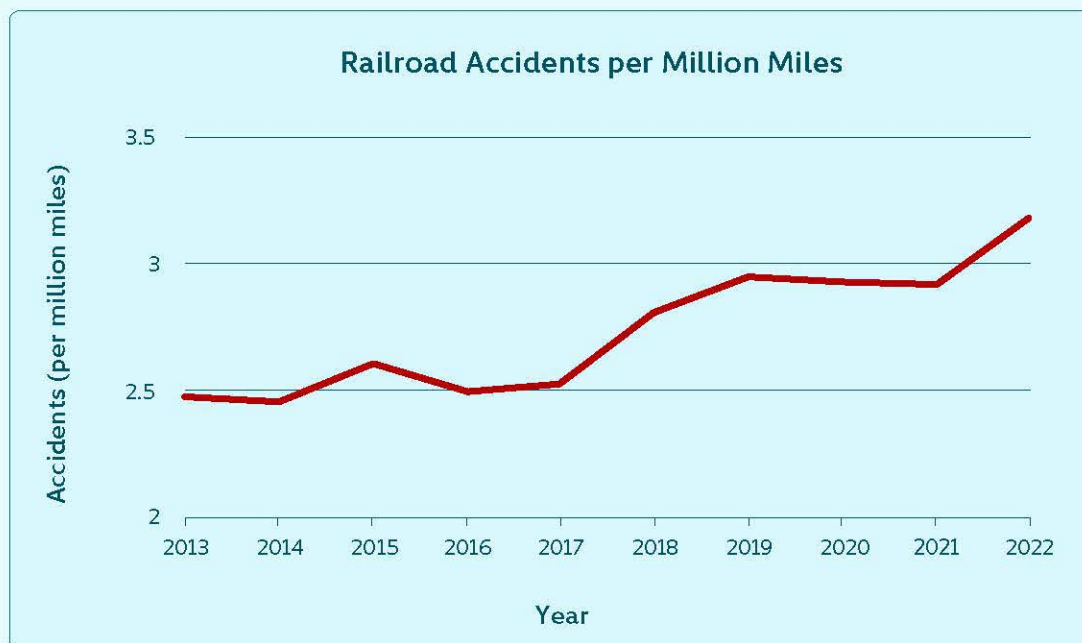


Figure 3. Railroad accidents per million train miles⁵

This rise in accidents comes as the direct result of a private operating model that prioritizes “efficiency” and a lower operating ratio at the expense of safety. Tens of thousands of maintenance workers have been laid off. Between 2011 and 2021, 40 percent of all Shop Craft workers’ jobs were cut.⁶ Those who remain are given less and less time to inspect longer and longer trains. Oftentimes, workers are given one minute or less to inspect each railcar—down from three just a few years ago.⁷

The safety picture is even worse if you look at the big Class I railroads. Since 2013, the accident rate has more than doubled (up 123 percent) at Norfolk Southern, risen 52 percent at Union Pacific, and increased 72 percent at CSX.⁸ The only Class I not to see a marked rise in its accident rate is BNSF, which is the only one not to implement PSR (though as we shall see, this does not exempt BNSF from criticism). This steeper increase in accidents can be traced to aggressive cost cutting combined with a growing pressure to speed miles-long trains through the network without inspection. In the

5. “2.09 - Train Accidents and Rates,” Federal Railroad Administration, accessed July 26, 2023, <https://safetydata.fra.dot.gov/officeofsafety/publicsite/query/TrainAccidentsFYCYWithRates.aspx>.

6. Government Accountability Office, *Information on Precision-Scheduled Railroading*, United States Government Accountability Office (December 2022), 15.

7. Funk, “Union Official Says Railroad Safety Compromised by Job Cuts, Time Constraints.”

8. Office of Safety Analysis, “2.09 - Train Accidents and Rates.”

last decade, CSX and Norfolk Southern cut their overall workforces by 39 percent. BNSF cut the fewest employees but still laid off 9 percent of its workforce during the same period.⁹ Not only are there far fewer workers, but longer trains are also more dangerous. A recent academic study found that 100 car trains are 11 percent more likely to derail compared to 50 car trains and 200 car trains have a 24 percent higher derailment risk.¹⁰

9. Government Accountability Office, *Information on Precision-Scheduled Railroading*, 14.

10. Peter M. Madsen et al., "The relationship between freight train length and the risk of derailment," *Risk Analysis* (2024), <https://doi.org/10.1111/risa.14312>, <https://onlinelibrary.wiley.com/doi/abs/10.1111/risa.14312>.

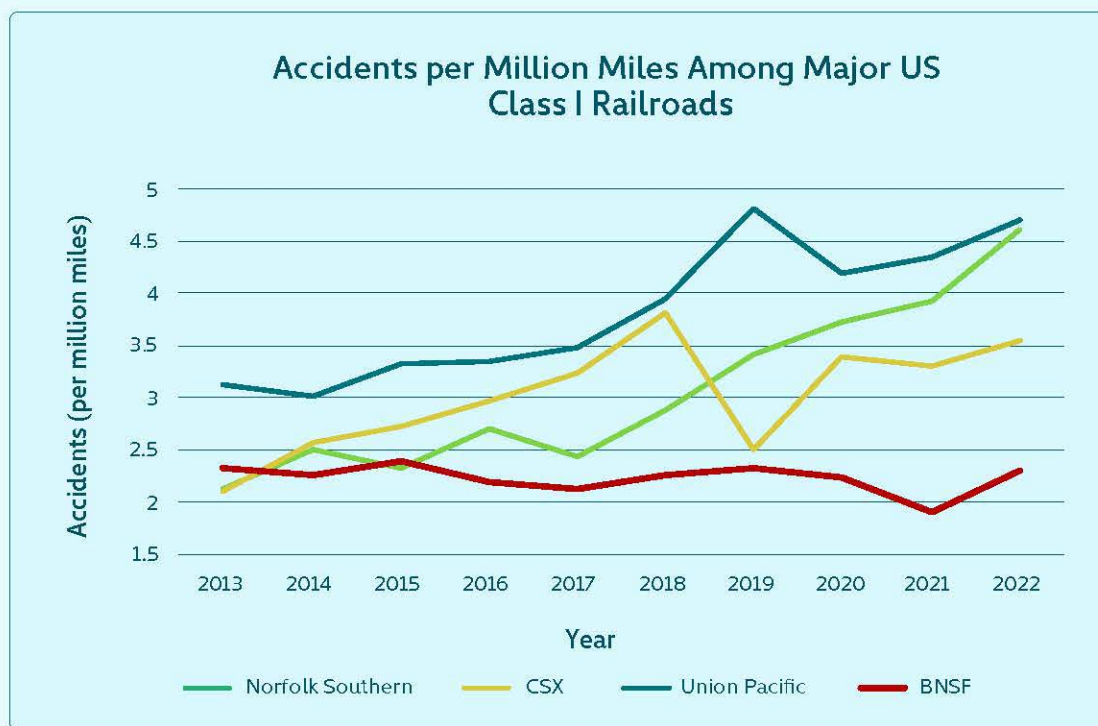


Figure 4. Railroad accidents per million train miles among major U.S. Class I railroads

However, these statistics fail to provide a complete picture. Countless incidents go unreported due to a pervasive culture of railroads retaliating against, or even firing, workers who speak out about safety concerns. There is a widespread practice of supervisors pressuring car inspectors to flag fewer defects.¹¹ In some cases, car inspectors will refuse to sign off on a railcar due to safety concerns and their supervisor will sign the car themselves in order to move it out of the yard quicker.

These practices are reinforced by railroads' performance-pay systems that incentivize efficiency when calculating bonus pay, and score managers based on how few "bad orders" their yard issues. These incentives encourage managers and supervisors to push cars through their yards as fast as possible, even if that means skipping inspections or overlooking

11. Topher Sanders et al., "'Do Your Job.' How the Railroad Industry Intimidates Employees Into Putting Speed Before Safety," *ProPublica*, November 15, 2023, <https://www.propublica.org/article/railroad-safety-union-pacific-csx-bnsf-trains-freight>.

car defects. Union Pacific has been so bold as to ask Federal Railroad Administration inspectors to leave its yards because they were slowing down freight.¹²

The focus on minimizing dwell times by the Class I's has put immense pressure on yardmasters to send train consists out of the yard as fast as possible. Many rail yards were not designed for today's trains, which can approach miles in length. Under pressure from management to keep cars moving, with inadequate yard space, yardmasters are often forced to send unsafe train consists, with poor weight distribution, out on the mainline. In one notable example, a two-mile-long CSX train derailed while going down a mountain grade.¹³

A report by the railroad unions highlights BNSF instructing its managers to "Sign off the general maintenance items; they do not need to be performed" for its locomotive fleet.¹⁴ A year later, BNSF claimed not to have the manpower to perform required maintenance on a backlog of over 1,000 locomotives. As BNSF has continued to furlough Shop Craft workers, unions have called on the FRA to inspect BNSF's locomotive fleet, alleging widespread defects as a result of the railroad's cost cutting and deference of maintenance.¹⁵

Widespread defects at BNSF do not seem altogether unlikely. An unannounced FRA inspection of Union Pacific in fall 2023 identified federal defects on a staggering 72.7 percent of its locomotives and nearly 20 percent of its railcars.¹⁶ Federal defects on three out of four locomotives should be cause for an immediate program to increase maintenance efforts and hire more Shop Craft workers. Unfortunately for the public and for railroaders who rely on these locomotives, Union Pacific has exhibited little interest in doing so, preferring to keep employee headcounts depressed and spend money on dividends instead.

Not only are equipment defects being underreported, so are incidents with moving trains. Without an FRA requirement to report close calls, railroaders seldom do, thanks to the frequent practice of railroads retaliating against whistleblowers. Incidents like when a 90-car train full of highly flammable propane rolled three miles through a town in Mississippi without its crew are excluded from FRA data because the train fortuitously came to a stop without injuring anyone.¹⁷ A confidential federal safety hotline, called the Confiden-

12. Topher Sanders, "Regulators Blast Union Pacific for Running Unsafe Trains," *ProPublica*, September 11, 2023, <https://www.propublica.org/article/union-pacific-federal-railroad-administration-unsafe-trains>.

13. Dan Schwartz and Topher Sanders, "The True Dangers of Long Trains," *ProPublica*, April 3, 2023, <https://www.propublica.org/article/train-derailment-long-trains>.

14. Brotherhood of Railroad Carmen Division et al., *A Five-Pronged Approach To Improve Industry Safety And Service Reliability For Class I Freight Railroads* (Surface Transportation Board, January 9 2024), 15-17.

15. Noi Mahoney, "Mass furloughs reported at BNSF Railway operations in 4 states," *FreightWaves* (March 1 2024), <https://www.freightwaves.com/news/mass-furloughs-reported-at-bnsf-railway-operations-in-4-states>.

16. Brotherhood of Railroad Carmen Division et al., *A Five-Pronged Approach To Improve Industry Safety And Service Reliability For Class I Freight Railroads*, 17.

17. Sanders et al., "'Do Your Job.' How the Railroad Industry Intimidates Employees Into Putting Speed Before Safety."

tial Close Call Reporting System (C3RS) exists to remedy this problem but until 2024, no Class I railroad used it.¹⁸ In fact, making the case that public ownership would be more transparent and accountable, 22 of the 28 railroads that participate in C3RS are publicly owned or operated—and one of the six private railroads is a heritage steam operator, the Strasburg Rail Road.¹⁹ Norfolk Southern only joined C3RS in February 2024 under immense public pressure from the fallout of its derailment in East Palestine, Ohio.

All of these unsafe practices can be traced back to the private railroads' focus on lowering their operating ratio and boosting profits at all costs. We have seen an unconstrained effort to operate with the smallest workforce possible. Railroads spend as little money on maintenance as they can. As a result, they have to hide defects en masse, but they cannot hide worsening accident rates that threaten workers' and communities' safety.

The only way that we will achieve true safety is if extracting short-term profit for shareholders ceases to be the railroads' primary objective. This outcome can be achieved through a public rail system, one that operates in the public interest, putting workers' and communities' safety ahead of profit. A public rail system means one that centers rail workers and communities in decision-making, inviting them to propose reforms to improve safety, rather than threatening them for speaking up. A public rail system also means employing sufficient maintenance workers to keep equipment and tracks defect free. It means regular inspections with sufficient time given for car inspectors to do their jobs thoroughly. None of these proposals are remotely unfeasible, but they will require a paradigm shift in how we operate our railroads.

RESPECT FOR RAIL WORKERS AND SUFFICIENT STAFFING

Railroad workers play a critical role in ensuring that America's rail traffic moves safely and efficiently across the country. Unfortunately, their ability to do so has been hampered by railroad company's aggressive layoffs and understaffing. Workers are pressured by management to ignore defects and face retaliation when they report safety concerns nonetheless.

18. Josh Funk, "Railroads resist joining safety hotline because they want to be able to discipline workers," *Associated Press*, August 24, 2023, <https://apnews.com/article/railroad-safety-derailments-anonymous-hotline-dc509efa21aa51554078998964ba4ea6>.

19. "Participating Railroads," updated February 20, 2024, accessed March 24, 2024, <https://railroads.dot.gov/railroad-safety/divisions/safety-partnerships/c3rs/participating-railroads>.

The conflict between railroad workers and management is as old as the industry itself, but the pursuit of short-term profits under Precision Scheduled Railroading (PSR) over the past ten years has drastically accelerated the decline in workers' quality of life. Putting America's rail industry back on track will require prioritizing workers safety and wellbeing—this can be best achieved through public ownership that incorporates workers into the decision-making process.

Total railroad employment has dropped nearly thirty percent between 2013 and 2024. This precipitous decline began well before the Covid-19 recession and its steepest drop aligns closely with many of the Class I's implementation of PSR beginning in 2019.²⁰

20. Government Accountability Office, *Information on Precision-Scheduled Railroading*, 9-15.



Figure 5. Total railroad employment (2013-2024)²¹

Following these massive staffing cuts, many railroaders are doing the same work as two or three people beforehand. Railroad companies are forcing employees to work longer, more irregular hours, with less time to perform critical tasks. Examples previously discussed in the safety section such as car inspectors having only one minute to inspect each railcar or a track inspector working 13-hour days for weeks on end are just the tip of the iceberg.

Irregular schedules, overwork, and persistent understaffing have contributed to an epidemic of fatigue among railroaders in the operating crafts. Nearly 40 percent of all locomo-

21. U.S. Bureau of Labor Statistics, "All Employees, Rail Transportation [CES4348200001]," (FRED, Federal Reserve Bank of St. Louis). <https://fred.stlouisfed.org/series/CES4348200001>.

tive engineers and conductors are highly fatigued, according to an FRA study.²² This is detrimental to workers' health and poses a public safety risk. Highly fatigued conductors are 4 times more likely to miss a required stop and fatigued engineers are 3.4 times more likely to have had a near miss while operating a locomotive.

This widespread fatigue can be traced directly to railroads' cost cutting which has put more and more railroaders on the "extra board" where they don't know which train they will be on until they get a call telling them they have two hours to report to work.²³ Just under 90 percent of engineers and conductors report "irregular work hours" as contributing to fatigue.²⁴ The next four most cited causes for fatigue are long work hours, lack of sleep, and little time off between shifts (all reported by 60 percent or more of surveyed workers).

This epidemic of fatigue is entirely of railroad companies' own making and represents a deliberate choice to prioritize profits over workers' wellbeing. Railroaders could be provided with more regular work hours and proper time off between jobs, but our rail system would have to be properly staffed and workers would need to be respected. This would be possible under a public rail system where workers have a say in operations, but the Class I's have provided little reason to believe such an improvement is possible under private ownership.

Fatigue and overwork have hardly been limited to the operating crafts. Pursuant to job cuts of more than 40 percent in equipment maintenance over the past ten years, Shop Craft employees are now working 59 percent more overtime hours.²⁵ Work that was previously distributed among a larger workforce is now forced overtime for the employees who remain. Maintenance-of-way employees face understaffing, furloughs, and increased outsourcing of their work to non-union contractors, in violation of collective bargaining agreements (CBAs).²⁶

Unfortunately, Class I's are no stranger to illegal behavior or violating CBAs. In June 2023, a Canadian federal court held Canadian Pacific (CP) in contempt for more than 20 incidents of "intentionally" overworking crews.²⁷ The court ruling noted that CP's own evidence suggests there are thousands of incidents annually where crews are not off within 10 hours, as stipulated under the CBA. Retaliation against employees who speak up about safety or dire workplace conditions is

22. Federal Railroad Administration, *The Impact of Commute Times on the Fatigue and Safety of Locomotive Engineers and Conductors*, Department of Transportation (June 2023), 31-35.

23. The amount of time varies slightly by railroad, but the general principle remains the same: more and more railroaders are on unstable schedules, in large part thanks to PSR and job cuts.

24. Federal Railroad Administration, *The Impact of Commute Times on the Fatigue and Safety of Locomotive Engineers and Conductors*, 28.

25. Brotherhood of Railroad Carmen Division et al., *A Five-Pronged Approach To Improve Industry Safety And Service Reliability For Class I Freight Railroads*, 22.

26. Joanna Marsh, "Maintenance-of-way union sues BNSF over workforce shortages," *FreightWaves* (August 2 2023), <https://www.freightwaves.com/news/maintenance-of-way-union-sues-bnsf-over-workforce-shortages>; Mahoney, "Mass furloughs reported at BNSF Railway operations in 4 states."

27. "Canadian Pacific Guilty of Contempt of Court in Sweeping Decision on Excessive Hours," updated June 7, 2023, accessed August 4, 2023, <https://teamsters.ca/blog/2023/06/07/canadian-pacific-guilty-of-contempt-of-court-in-sweeping-decision-on-excessive-hours/>.

also commonplace. Workers have been fired for reporting track or equipment defects, as the railroads prioritize speed over safety.²⁸ This response has put workers' lives and livelihoods at risk. When accidents do occur, railroad companies are quick to shift the blame from themselves onto the workers. On top of the FRA accident statistics are hundreds of other deaths and injuries on the job that don't make it to federal regulators.²⁹

Railroaders who are injured on the job and subsequently fired by the railroads as scapegoats frequently sue their company in recourse. Railroad companies' behavior in these cases has been combative, and in some cases, outright illegal. Courts have found railroad companies guilty of destroying evidence, witness tampering, and intimidating workers in case after case spanning decades of litigation.³⁰ Despite repeated multi-million-dollar fines and admonishment from judges over withholding evidence and intimidation tactics, railroads continue to engage in the very same practices.

After all the harm that these cost-cutting measures have caused to railroaders, the railroad industry is still pushing to eliminate onboard conductors and shift to one-person crews.³¹ The prospect of one-person crews raises serious concerns, particularly when 40 percent of engineers already report being highly fatigued due to the Class I's PSR-induced irregular work schedules and long hours. There are further concerns about the inaccessibility of much of America's rail network to proposed ground-based conductors, such as on mountainous routes with no adjacent road, or the role of conductors in checking railcars while engineers stay in the locomotive.³²

The Federal Railroad Administration recently promulgated a final rule on train crew staffing that on surface mandates two-person crews. The rule, however, contains a number of exemptions leaving open the future possibility for railroads to implement one person crews.

In an industry that has already cut staffing to the bone, a complete restructuring is needed to get back on track. Fines and legal action have failed to hold railroads accountable for providing unsafe working conditions or disrespecting their employees. Class Is have consistently shown a willingness to prioritize profit over workers' health and wellbeing, as evidenced by widespread fatigue and forced overtime.

28. Danelle Morton and Topher Sanders, "Union Pacific Fired Him Rather Than Heed His Warnings of Dangerous Rail Conditions," *ProPublica*, November 18, 2023, <https://www.propublica.org/article/union-pacific-railroad-dangerous-conditions-warnings-fired-employee>; Sanders et al., "'Do Your Job.' How the Railroad Industry Intimidates Employees Into Putting Speed Before Safety.," Maximillian Alvarez, "Railroad Whistleblowers Keep Losing Their Jobs," *In These Times* (July 21 2023). <https://inthesetimes.com/article/working-people-rail-worker-whistleblower>.

29. Topher Sanders et al., "What's Missing From Railroad Safety Data? Dead Workers and Severed Limbs.," *ProPublica*, March 13, 2024, <https://www.propublica.org/article/railroad-safety-data-missing-dead-workers-severed-limbs>.

30. Ryan Raiche, "Destroyed evidence and retaliation: The alarming pattern at Minnesota's largest railroad," (June 8 2023). <https://kstp.com/5-investigates/destroyed-evidence-and-retaliation-the-alarming-pattern-at-minnesotas-largest-railroad/>; Topher Sanders et al., "When Railroad Workers Get Hurt on the Job, Some Supervisors Go to Extremes to Keep It Quiet," *ProPublica*, December 16, 2023, <https://www.propublica.org/article/railroad-worker-injuries-union-pacific-csx-cn-norfolk-southern>.

31. "Freight Rail & Crew Size," Association of American Railroads, updated February, 2024, <https://www.aar.org/issue/crew-size/>.

32. Ron Kaminkow, "What's Wrong with Single Employee Train Operations?," <https://www.railroadworkersunited.org/problems-w-1person-crews>.

Providing workers with safe working conditions and a decent quality of life outside of work will require reprioritizing our railroad system away from short-term profit and towards a long-term focus on quality of service. This pivot, under public ownership, must include worker involvement in decision-making and full staffing. Frontline workers have unique and unparalleled knowledge of railroad operations, knowledge that could be harnessed to achieve safety improvements and operational efficiencies instead of resorting to layoffs to reduce costs. Public ownership can improve operational safety, provide workers with regular schedules, and replace retaliation with genuine worker participation at every level of decision-making.

RESTORING RELIABLE, HIGH-QUALITY SERVICE

Railroads have gone through periods of poor service quality before, but the advent of Precision Scheduled Railroad-ing (PSR), accompanied by rampant cost cutting, has driven freight customers away from the railroads in droves. Seeking to minimize their operating ratio, railroads have neglected customers, in favor of lowering expenses. The result has been utter neglect of rail shippers. To quote the National Stone, Sand and Gravel Association, whose members rely on railroads to ship their products: “[rail service] is the worst that it has ever been.”³³

PSR’s regime of cost cutting and service reduction is the logical conclusion of management’s obsession with the operating ratio, a metric representing operating expenses as a percentage of revenue. This metric dates back to the late 1800s but has become ingrained in railroad management practices to this day.³⁴ A consequence of management’s obsession with the operating ratio and maximizing “efficiency” is that railroads will avoid growth, out of concern that new profitable traffic might not be profitable enough and would worsen the company’s operating ratio. While this operating mantra is enormously profitable for railroad shareholders, it has stifled our nation’s economy and harmed businesses that rely on rail transportation. Furthermore, these practices are destroying the rail industry itself, by cutting service and driving away traffic that could otherwise strengthen rail volumes.

33. National Stone Sand and Gravel Association, “National Stone, Sand and Gravel Association Comments on Urgent Issues in Freight Service,” (Surface Transportation Board, April 22 2022).

34. Uday Schultz, “Efficiency and the Decline of American Freight Railroads,” *Home Signal*, December 27, 2021, <https://homesignalblog.wordpress.com/2021/12/27/efficiency-and-the-decline-of-american-freight-railroads/>.

As a result of PSR, railroads have cut switching service to customers, in some cases picking up railcars only two days a week, rather than five, even when a contract is in place for service five days a week. Railroads are making these changes without any communication to their customers, hampering shippers' ability to compensate for the service outage.³⁵ Service is increasingly inconsistent even when frequency is not cut: shippers report receiving railcar deliveries on Wednesdays and Saturdays, even when the agreed upon switching days are Tuesday and Thursday.³⁶ It is nearly impossible to plan a supply chain when you have no idea when railcars will arrive or be picked up, but this is the situation that railroads have foisted on countless businesses across the country.

These issues cost businesses millions of dollars from spoiled products, production shutdowns, unplanned overtime, and unfilled orders. Collectively the impact to the economy can be hundreds of millions of dollars lost annually from poor rail service.³⁷ Poor rail service has been particularly harmful to our nation's farmers and agriculture industry. Agriculture is an inherently seasonal industry, and railroads' cost-cutting has hampered farmers' ability to meet higher shipping demand during harvest seasons, undercutting U.S. agriculture's competitiveness and raising prices on consumers.³⁸

35. National Stone Sand and Gravel Association, "National Stone, Sand and Gravel Association Comments on Urgent Issues in Freight Service.," Food and Beverage Issue Alliance, "Food and Beverage Issue Alliance Comments on Urgent Issues in Freight Rail Service," (Surface Transportation Board, April 22 2022). https://snacintl.org/wp-content/uploads/2022/04/FoodandBeverageIssueAllianceComments-STB_EP770_220422-1.pdf; U.S. Wheat Associates, National Association of Wheat Growers, and North American Millers' Association, "U.S. Wheat Associates, National Association of Wheat Growers and North American Millers' Association Comments," (Surface Transportation Board, April 22 2022). <https://namamillers.org/wp-content/uploads/2022/04/04-21-22-Joint-Wheat-Comments-STB-Service-Challenges.pdf>.

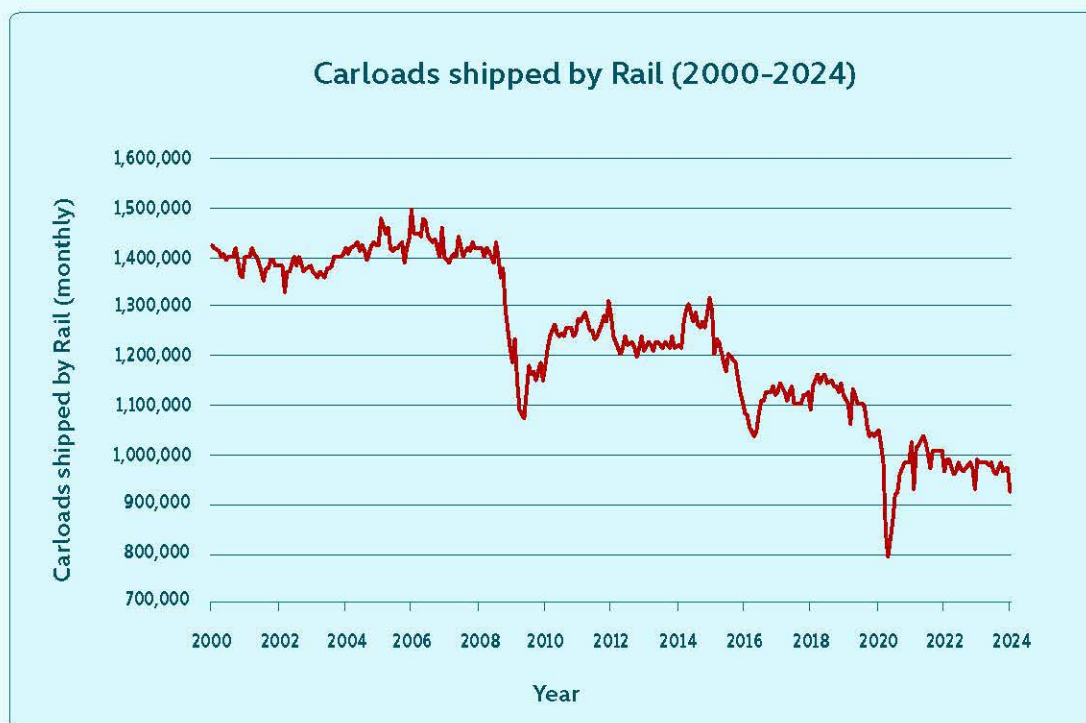


Figure 6. Monthly carloads shipped by rail, seasonally adjusted, 2000-2023³⁹

Laying off workers and mothballing equipment during a recession may help railroads' bottom line in the short term, but it also handicaps their ability to provide service to customers as the economy recovers. Railroads' focus on "efficiency" and a low operating ratio leads customers to shift their traffic away from rail and onto trucks, never to return. We can watch this pattern play out in the 21st century in figure 6 as the number of rail carloads trends consistently down after each recessionary period, even once the economy fully recovers and returns to growth.

This trend has been exacerbated by PSR, but the tendency of private railroads to cut their workforce and inadequately respond to demand during economic recovery was noted as far back as the early 1900s, by Glenn Plumb and the Interstate Commerce Commission.⁴⁰ Rail carloads have declined by nearly 30 percent between the turn of the century and 2023.⁴¹ This loss represents a concrete failure of our nation's railroads and transportation planning. At the same time that we should be shifting more freight onto rail, for its greater efficiency, environmental friendliness, and ability to reduce congestion on highways, poor rail service from the Class I's has driven customers to put their freight onto trucks. This has harmed America's economic competitiveness through higher transportation costs. When companies cannot rely on our transportation networks, they are also likely to consider relocating their manufacturing abroad.

Intermodal container traffic has been one bright spot for railroads, growing by roughly 40 percent since 2000.⁴² However, this growth has primarily focused on high volume shipments between ports and large cities. As with carload shipments, smaller shippers and cities are being intentionally left behind by railroads in the name of "efficiency." In 2018, in order to implement PSR, CSX cut hundreds of origin-destination pairs, or "lanes," from its service offerings. This included all domestic intermodal traffic to Detroit. CSX also rerouted Baltimore-bound freight to its terminal in Chambersburg, adding a minimum two hours' drive each way for trucks picking up containers bound for Baltimore.⁴³

These service cuts force rail shippers to redesign their supply chains and can cause millions of dollars in added costs. One of the crucial problems is that intermodal traffic is very low margin, due to the added cost of transloading and truck transportation on either end of the rail journey. The only highly

36. National Stone Sand and Gravel Association, "National Stone, Sand and Gravel Association Comments on Urgent Issues in Freight Service."

37. Mary Kennedy, "STB Rail Service Hearing Exposes Insufficient Service, Poor Worker Morale," *Market Matters Blog*, *Progressive Farmer*, May 2, 2022, <https://www.dtnpf.com/agriculture/web/ag/blogs/market-matters-blog/blog-post/2022/05/02/stb-rail-service-hearing-exposes>.

38. U.S. Wheat Associates, National Association of Wheat Growers, and Association, "U.S. Wheat Associates, National Association of Wheat Growers and North American Millers' Association Comments."

39. U.S. Bureau of Transportation Statistics, "Rail Freight Carloads," (FRED, Federal Reserve Bank of St. Louis). <https://fred.stlouisfed.org/graph/?g=18mpS>.

40. Glenn E. Plumb and William G. Roylance, *Industrial Democracy: A Plan For Its Achievement* (New York: B. W. Huebsch, Inc, 1923), 172-75.

41. U.S. Bureau of Transportation Statistics, "Rail Freight Carloads."

42. U.S. Bureau of Transportation Statistics, "Rail Freight Intermodal Traffic," (FRED, Federal Reserve Bank of St. Louis). <https://fred.stlouisfed.org/series/RAILFRTINTERMODALD11>.

43. Ari Ashe, "CSX to eliminate about 300 more intermodal lanes in 2019," *Journal of Commerce* (October 5 2018). https://www.joc.com/article/csx-eliminate-about-300-more-intermodal-lanes-2019_20181005.html.

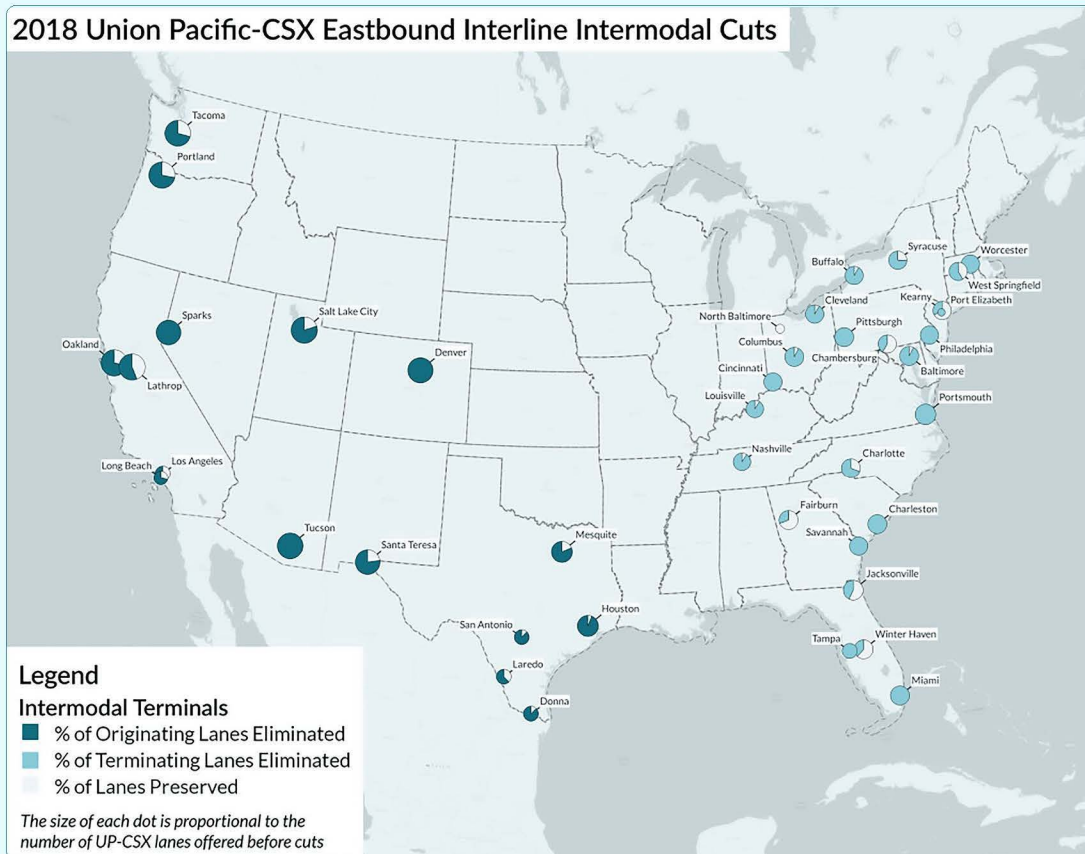


Figure 7. Cut to Union Pacific–CSX eastbound interline intermodal lanes, 2018⁴⁴

profitable form of intermodal service is that which is operated between large cities or ports, such as Los Angeles and New York City, in miles long trains. To focus on this traffic, as seen in figure 7, railroads have eliminated hundreds of services that don't meet this high threshold of profitability.⁴⁵

44. Uday Schultz, "Chicago's Railroad Problem," *Home Signal*, July 18, 2023, <https://homesignalblog.wordpress.com/2023/07/18/chicagos-railroad-problem/>.

The message that the rail industry has sent to customers outside a select few cities is simply "we do not want your business." This runs counter to the idea that railroads should serve as a common carrier—providing transportation to all customers equally at reasonable rates—and creates regional inequalities in access to transportation.

45. Schultz, "Chicago's Railroad Problem".

Creating a resilient rail transportation system, with high quality service, in the United States will require a publicly owned rail system. It is insufficient to hope that Class I railroads will shift away from Precision Scheduled Railroading towards a better, more service-focused business model. As the Ancora–Norfolk Southern proxy battle goes to show, whenever railroads so much as appear to be prioritizing long-term gains over short-term profits, Wall Street firms will jump in to oust management. In response to Ancora's proxy battle, Norfolk Southern completely succumbed to their demands,

refocusing executive compensation on the operating ratio, slashing 15 percent of their intermodal lanes, and targeting an incredibly low sub-60 percent operating ratio by 2026.⁴⁶

A public rail system would allow railroad management to refocus from short-term quarterly profit statements to providing quality services to customers and pursuing profitable traffic growth. This would mean ending the fixation with the operating ratio. Achieving long-term growth will require capital investment and a strong workforce to ensure that our railroads have sufficient capacity to provide frequent, reliable service. A public rail system will also restore service to regions across the country who have seen a constant decline in transportation access because their area is not deemed profitable enough. America deserves better. Under a public rail system, this country can finally get the world-class rail service it deserves, fostering economic development and egalitarian access to transportation from its biggest city to its smallest town.

LONG-TERM PLANNING AND INFRASTRUCTURE INVESTMENT

To understand how the Class I railroads are underinvesting in America's rail system, we can look at a 2007 study, commissioned by the Association of American Railroads (AAR) which examined the infrastructure needs for and investment costs of providing sufficient capacity for freight traffic in 2035. Private railroad companies neither plan their own capital investment long-term to meet future demand nor provide the U.S. DOT (or State DOTs) with sufficient data for public agencies to carry out long-term planning on their behalf.⁴⁷ Unlike "national infrastructure needs and cost estimates for the publicly owned highway systems...no comparable, long-term, national estimates [had] been developed for the rail system" before this 2007 study, commissioned by the AAR at the request of a federal transportation policy commission. The study was "the first effort of its kind" and provides an excellent picture of the investments that the Class Is need to—and have failed to—make in the American rail system.⁴⁸

Demand for rail freight is expected to increase 88 percent from 2005 levels by 2035.⁴⁹ As figure 8 indicates, barring significant investment, 55 percent of our rail network will

46. Bill Stephens, "Norfolk Southern prunes intermodal network and puts focus on operating ratio improvement," *Trains* (April 5 2024). <https://www.trains.com/trn/news-reviews/news-wire/norfolk-southern-prunes-intermodal-network-and-puts-focus-on-operating-ratio-improvement/>.

47. Cambridge Systematics Inc., *National Rail Freight Infrastructure Capacity and Investment Study*, 2-6.

48. Cambridge Systematics Inc., *National Rail Freight Infrastructure Capacity and Investment Study*, American Association of Railroads (Washington, D.C., September 2007), 2-6, <https://grandavebridge.codot.gov/programs/transitandrail/assets/AARStudy.pdf>.

49. Cambridge Systematics Inc., *National Rail Freight Infrastructure Capacity and Investment Study*, 2-5.



be at or above capacity with the level of traffic predicted for 2035.⁵¹ The consequences could be disastrous, from further deteriorating service quality and increased train accidents, to pushing new traffic off rail and onto trucks straining our already congested highway system.

Avoiding this outcome necessitates significant investment and capacity expansion. The AAR's study examined only the need for capital investment in additional trackage and facilities such as rail yards.⁵² It did not include the cost of new locomotives and railcars or the cost of maintaining existing or new trackage. The study provided a minimum estimate to maintain sufficient capacity, as seen in figure 9, with the projected increase in freight traffic. With this focus in mind, the study concluded that \$148 billion (in 2007 dollars) in capacity expansion would be required for railroads to meet freight traffic demand in 2035.⁵³

When this report was commissioned, Class I railroads were collectively spending around \$1.5 billion a year on capacity expansion. To meet the Class I's estimated \$135 billion share of the overall \$148 billion in infrastructure investments needed would mean an increase to about \$4.8 billion a year over 28 years. At the time, the railroads estimated that they would be able to provide roughly half of that amount—\$70 billion—funded by the earnings from traffic growth, with an estimated \$26 billion provided by improvements in train productivity reducing capital expenditures elsewhere. The report leaves the balance, \$39 billion, to be funded by public-private partnerships or tax incentives—public funds. A sizable chunk, to be sure, but an amount that pales in comparison to federal funding for our public interstate highway system.

In the decade and a half since the AAR study was published, Class I's have failed to make the necessary capital investments, falling short by billions of dollars in capital expenditures and hundreds of miles of track. The two largest Class I's, BNSF and Union Pacific, invested a mere \$580 and \$584 million, respectively, in capacity expansion in 2022.⁵⁴ Union Pacific added only 44 miles of track to its 26,121-mile network (0.17% growth). Canadian Pacific invested an infinitesimally small \$81 million in capacity expansion, constructing 17 track miles in 2022.⁵⁵

This rate of investment is far too slow to meet the capacity needs of the U.S. rail network by 2035—let alone to support expanded passenger service and attempt to attract freight traffic back from trucks. In 2010, the AAR pleaded poverty, claiming that the gap between “what railroads can invest in capacity expansion and what should be invested at more than \$50 billion.”⁵⁶ The reality is that railroads can invest much more than they currently are doing; the Wall Street interests that control them simply don't want them to.

50. Cambridge Systematics Inc., *National Rail Freight Infrastructure Capacity and Investment Study*, 4-10 & 5-5.

51. An estimated 25% will be “at capacity” and 30% will be “above capacity.”

52. Cambridge Systematics Inc., *National Rail Freight Infrastructure Capacity and Investment Study*, 3-1 & 3-2.

53. Cambridge Systematics Inc., *National Rail Freight Infrastructure Capacity and Investment Study*, section 7.

54. Union Pacific Corporation, *FORM 10-K - 2022*, Securities and Exchange Commission (February 10 2023), 36; BNSF, “BNSF announces plan for 2022 capital investments,” news release, February 28, 2022, <https://www.bnsf.com/news-media/news-releases/newsrelease.page?relId=bnsf-announces-plan-for-2022-capital-investments>.

55. Canadian Pacific, *2022 Annual Report* (2023), 62, https://s21.q4cdn.com/736796105/files/doc_financials/2022/ar/CP_AnnualReport_2022.pdf.

56. Kristen McIntosh, “AAR Executive Discusses Future Prosperity Of Nation's Railroads,” *Crossties*, January/February, 2010.

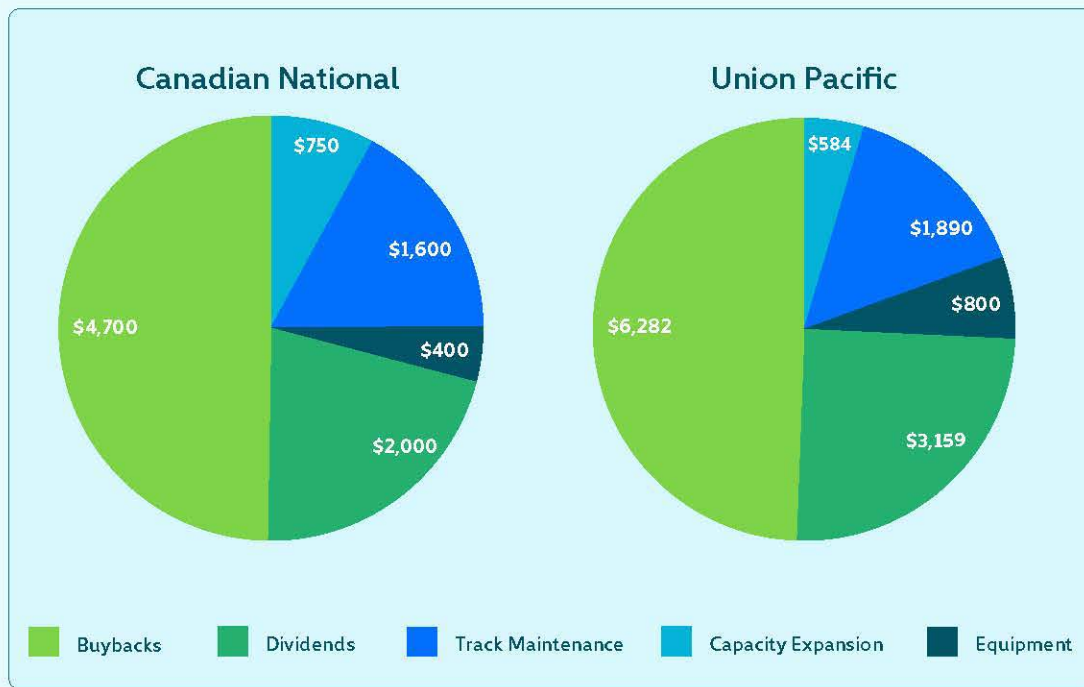


Figure 10. Capital expenditures and shareholder returns, Canadian National and Union Pacific 2022, in millions of U.S. dollars⁵⁷

As figure 10 shows, railroads are spending almost three times as much on stock buybacks and dividends as on maintenance, equipment and capacity expansion combined. Union Pacific alone spent \$6.28 billion on share buybacks in 2022—enough money to fully fund capacity expansion for the entire network. Instead of using that money to invest in critical infrastructure improvements, the Class I's have contented themselves to ripping up track and solving capacity issues by driving away customers through bad service.

The Surface Transportation Board calculated that between 2010 and 2020, Class I railroads paid out \$196 billion in buybacks and dividends (in 2021 dollars).⁵⁸ This is roughly \$20 billion more, paid out in 10 years, than the total inflation-adjusted \$175 billion (in 2021 dollars) needed for capacity expansion over the 28 years between 2007 and 2035. Despite spending gratuitously on buybacks, Class I's have still availed themselves of federal funding to support their infrastructure investments. CSX, for example, announced \$100 million in “major upgrades” to the recently-acquired Pan Am system in New England, which includes \$17.5 million in Consolidated Rail Infrastructure and Safety Improvements (CRISI) funding that “the Maine [DOT] obtained to help CSX fund infrastructure improvements.”⁵⁹

57. Note: Union Pacific figures exclude \$346 million in “technology and other” included in their investing activities. Canadian National groups tech investments with track capacity into one figure. All figures reported in U.S. Dollars. Canadian National, *Annual Report - 2022* (2023), 7; Union Pacific Corporation, *FORM 10-K-2022*, 36.

58. This figure excludes Canadian National and Canadian Pacific. Martin J. Oberman, “STB Chairman Address Before North American Rail Shippers Association” (North American Rail Shippers Association Annual Meeting, September 8 2021).

59. Jeff Stagl, “CSX to continue major upgrades to former Pan Am system in 2024,” *RailPrime* (February 26 2024). <https://www.progressiverailroading.com/RailPrime/details/CSX-to-continue-major-upgrades-to-former-Pan-Am-system-in-2024--71330>.

While it is good to have public funding for infrastructure, it is hypocritical for Class I's to underinvest in capacity expansion and plead poverty to ask for federal funds to support investment, while spending billions upon billions on stock buybacks. Instead of the public subsidizing these corporations' bottom lines, public infrastructure funding would be better spent supporting a public rail system, where the money would wholly benefit the public.

By bringing the railroads under public ownership, we can close the gap in infrastructure investment by re-directing earnings currently spent on stock buybacks and dividends to fund infrastructure improvements. This will not only allow our rail network to meet projected capacity requirements for 2035, but also attract freight back to the rail network from trucking through better, more dependable service.⁶⁰ A publicly owned rail network will also be capable of proper long-term planning, ensuring that our railroads can continue to serve the public interest with sufficient capacity for decades to come.

ELECTRIFICATION AND DECARBONIZATION

Much like planning for capacity expansion, the task of decarbonizing our nation's transportation networks is a one that will require long-range planning, sufficient funding, and national coordination. So far, the Class I's have not shown themselves to be up to the task. Rather than pursuing tried and tested overhead catenary electrification, with known operational and cost benefits, railroads have only dabbled in untested technologies such as battery electric or hydrogen locomotives.

The benefits of overhead catenary electrification are clear. Electrification is important not just for its potential to decarbonize our rail infrastructure, but also for the key operational benefits that come alongside electric traction:

- The cost to buy a new electric locomotive is 20-33 percent less than a diesel locomotive of the same tractive capability.⁶¹
- The cost to operate electric locomotives is 25-35 percent cheaper than diesels.⁶²

60. The AAR-commissioned study assumed no increase in mode share from trucking. Further investments in capacity and a focus on quality service would be necessary to achieve a mode shift, in addition to meeting projected base-level freight demand.

61. John W. Barriger III, "Foreward," in *When The Steam Railroads Electrified* (Indiana University Press, 2002); Bill Moyer, Patrick Mazza, and Solutionary Rail Team, *Solutionary Rail: A people-powered campaign to electrify America's railroads and open corridors to a clean energy future* (Backbone Campaign, 2016), 20.

62. Moyer, Mazza, and Solutionary Rail Team, *Solutionary Rail*, 20.

- On a per mile basis, maintenance for diesels is three to four times higher than for electric locomotives.⁶³
- Electric locomotives also have a much higher utilization rate, breaking down far less frequently, 40 percent less according to some estimates.⁶⁴
- Electric locomotives last two to three times longer than diesel locomotives due to fewer high-wear components.⁶⁵
- Electric locomotives can haul up to three times more freight than diesel locomotives while drawing the same raw power, due to the higher efficiency of direct high voltage electric power.⁶⁶
- As a result of their superior performance and reliability, electrified railroads also require a smaller locomotive fleet to move the same amount of freight.⁶⁷

Electric locomotives have the additional advantage of being able to capture energy through regenerative braking and put it back into the grid. Regenerative breaks exist on diesel electric locomotives now, turning the electric traction motors into electricity generators drawing power from the wheels in order to slow the locomotive. On diesel electric locomotives, this energy is vented into the air as wasted heat. With electrification, the power generated by regenerative breaks on downhill mountainous grades can be put directly back into the overhead wires to power other locomotives up the grade.⁶⁸

In the rest of the world, these benefits are understood, and catenary electrification is the gold standard. Countries including China, Russia, Germany, France, Japan, and Ethiopia have electrified the majority of their rail networks. Switzerland's rails are 100 percent electrified and India aims to achieve full electrifications of its rails the end of 2024. Dozens of other countries are currently in the process of installing catenary electrification across their rail networks.

At one time the U.S. was a world leader in railroad electrification, with over 6,300 miles of electrified track at its peak.⁶⁹ Unfortunately, a lot of this trackage was discontinuous, with electric locomotives used to haul trains up the steepest mountain grades or through long tunnels. With the advent of diesel locomotives, it became cheaper for companies to tear down wires and switch to fleets of exclusively diesel loco-

63. Barriger III, "Foreward."

64. Moyer, Mazza, and Solutionary Rail Team, *Solutionary Rail*, 20; Garry Keenor, *Overhead Line Electrification for Railways*, 6th ed. (Permanent Way Institution, 2021), 5. <https://ocs4rail.com/wp-content/uploads/2022/04/Overhead-Line-Electrification-for-Railways-6th-edition-R2.pdf>.

65. Barriger III, "Foreward."

66. Keenor, *Overhead Line Electrification for Railways*; Barriger III, "Foreward."

67. Barriger III, "Foreward."

68. Keenor, *Overhead Line Electrification for Railways*, 86-88.

69. William D. Middleton, *When The Steam Railroads Electrified*, Rev., 2nd ed. (Bloomington: Indiana University Press, 2001), 412. <http://www.loc.gov/catdir/toc/fy031/2001024681.html>.

motives, avoiding the cost of adding and removing electric locomotives to accompany trains through tunnels or over steep mountain grades. Today electric locomotives persist in the United States on the Northeast corridor for passenger trains, several commuter rail systems, and on a few short freight lines like the Iowa Traction Railway and Deseret Power Railroad.

Climate change and the need to shift freight from congested highways onto rail have renewed the drive for electrification globally. The United States, dominated by privately-owned Class I railroads, is being left far behind. Rather than invest in catenary electrification, U.S. railroads are merely toying with untested battery and hydrogen technologies. Described as the “world’s first 100 percent battery-electric, heavy-haul locomotive,” Wabtec’s FLXdrive locomotive is only capable of full power output for 30-40 minutes before needing an 8-hour recharge.⁷⁰ Hydrogen locomotives are similarly problematic. A pilot project using hydrogen trains for passenger service in Germany found them to be up to 80 percent more expensive to own and operate than electric trains with catenary wires.⁷¹ In addition, hydrogen trains have limited range and low energy density. By contrast, catenary electrification provides locomotives with an infinite range, under wire, and can be seamlessly switched to renewable energy as the grid transitions.

Railroads are pursuing these experimental technologies in order to claim that “a clear technological path [for electrification] has not emerged.”⁷² This claim is entirely false and flies in the face of U.S. railroad history. Over a century ago in 1918, the director general of the USRA (which controlled the entire railroad system during WWI) was advocating for full electrification, telling the New York Times that “the problem is no longer a technical but a financial one.”⁷³

This statement is no less true today. Electrification technology has only advanced since 1918, and catenary electrification remains the most efficient method of powering a locomotive. However, the financial problem is equally troubling. The private railroads in the U.S. do not want to invest the capital required to install catenary poles and cables across their networks. Despite the long-term cost savings and operational benefits, the massive short-term cost is too much for private investors focused on quarterly earnings.

70. William C. Vantuono, “FLXdrive ‘Electrifies’ Pittsburgh,” *Railway Age*, September 13, 2021, <https://www.railwayage.com/news/flxdrive-electrifies-pittsburgh/>; “FLXdrive,” Wabtec Corporation, 2023, accessed July 24, 2023, <https://www.wabteccorp.com/locomotive/alternative-fuel-locomotives/flxdrive>.

71. Leigh Collins, “‘Will no longer be considered’ | Hydrogen trains up to 80% more expensive than electric options, German state finds,” *Hydrogen Insight* (October 20 2022). <https://www.hydrogeninsight.com/transport/will-no-longer-be-considered-hydrogen-trains-up-to-80-more-expensive-than-electric-options-german-state-finds/2-1-1338438>.

72. Association of American Railroads, “Railroads File Suit Against California Over Untenable Locomotive Rule,” news release, June 16, 2023, <https://www.aar.org/news/railroads-file-suit-against-california-over-untenable-locomotive-rule/>.

73. Eugene L. Huddleston, *Uncle Sam’s Locomotives: The USRA and the Nation’s Railroads* (Indiana University Press, 2002), 108-09..

74. Note: Unlike our contemporary railroads, the Pennsylvania wanted to aggressively push forward with electrification due to its operational benefits and cost savings along its dense east coast corridor. Even during the Great Depression, the electrification project was self-funded until 1932, when the Pennsy received a \$27.5 million loan from the Reconstruction Finance Corporation. Middleton, *When The Steam Railroads Electrified*, 318.

The solution then is for the government to fund electrification, as it did with loans to the Pennsylvania Railroad in the 1930s under the New Deal.⁷⁴ The federal government is well positioned to fund electrification. It is able to borrow at lower interest rates through Treasury Bonds and invest on a long time scale. The economic justification for electrification is solid. A cost/benefit analysis for electrifying a core 29,000 miles of the U.S. rail network in 1983 estimated the rate of return on electrification to be a generous 19 percent, saving over 50 million barrels of oil a year.⁷⁵

Cost estimates for electrification vary, but it will likely run tens of billions to electrify the core U.S. rail network. A significant portion of this cost could be paid for, as discussed in the infrastructure section above, through nearly \$20 billion saved annually under public ownership by reinvesting the money that the Class I's presently spend on dividends and stock buybacks. Given the scale of the investment, it is only logical that if the public is to foot the bill that the benefits should accrue to a public asset, in the form of public ownership. Any bonds issued will easily be paid back by the immense cost savings from cheaper electrical operation.

Electrification also presents a colossal engineering and planning challenge that will require national coordination to ensure that catenary is built continuously along key corridors with compatible technical specifications. Both the experience with federal control during WWI and Indian Railways' impressive electrification program demonstrate that the best option for projects of this magnitude is to coordinate them through a unified publicly controlled railroad.⁷⁶ National coordination will also be critical to facilitate the co-location of new power transmission lines alongside rail catenary, which will be necessary for decarbonizing the grid.

75. This core network includes all lines with traffic equal to 30 million gross ton-miles per route mile or more. C.H. Spenny and G.B. Mott, "Cost/Benefit Evaluation of Electrification of a U.S. Rail Network," *Transportation Research Record*, no. 939 (1983).

76. Both of these are discussed in sections below.

COMMUNITY HEALTH AND ENVIRONMENTAL JUSTICE

Tracksides communities have an important stake in our rail system that has long gone underappreciated. Railyards are primarily sited in low-income and minority communities. These residents, along with rail workers, bear the brunt of the health risks from high volumes of diesel exhaust and other hazardous waste. Concerns have also been raised nation-

wide over Class I railroads' record length trains parking across grade crossings, cutting off children from their schools and first responders from emergencies. Correcting this environmental injustice and achieving safer communities should be an imperative for railroads. Unfortunately, the behavior of Class I railroads has shown that trackside communities from East Palestine to Los Angeles are a low priority.

To combat harmful diesel emissions from locomotives, the Environmental Protection Agency has issued a series of rules prescribing standards for locomotive emissions in various Tiers based on their build year. The Tiers range from pre-1973 "not classified" (NC) locomotives and Tier 0 which use the dirtiest diesel technology to Tier 4 locomotives produced post-2015 to high emissions standards. EPA regulations require new locomotives to meet Tier 4 standards and for rebuilt locomotives to be improved to a higher emissions standard (i.e. Tier 1 to 1+). Despite these regulations, Class Is have replaced very little of their fleet over the past 10 years and primarily chosen to rebuild existing locomotives. Though this has led to slight improvements, rebuilt locomotives produce much worse emissions than Tier 4 compliant locomotives.⁷⁷

77. Eastern Research Group, 2020 *National Emissions Inventory Locomotive Methodology*, Environmental Protection Agency (Environmental Protection Agency, May 19 2022), 4-5, https://www.epa.gov/system/files/documents/2023-01/2020_NEI_Rail_062722.pdf; "Final Rule for Control of Emissions of Air Pollution From Locomotive Engines and Marine Compression-Ignition Engines Less Than 30 Liters per Cylinder," updated May 5, 2023, accessed March 4, 2024, <https://www.epa.gov/regulations-emissions-vehicles-and-engines/final-rule-control-emissions-air-pollution-locomotive>.

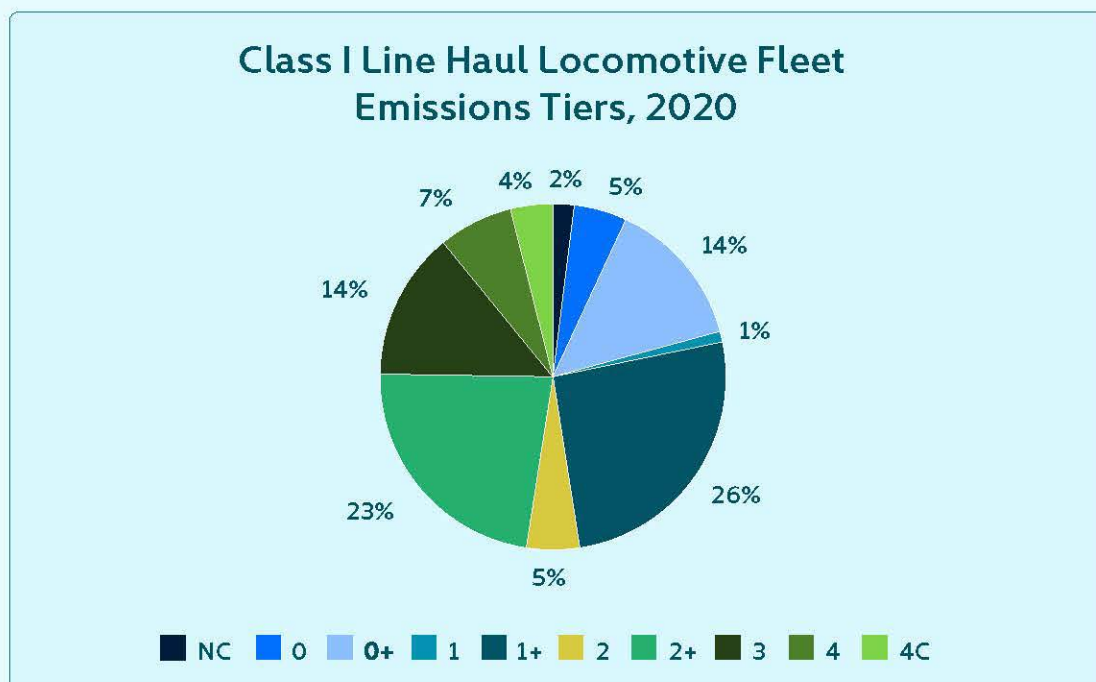


Figure 11. Class I line haul locomotive fleet by EPA tier, 2020⁷⁸

Locomotives below Tier 2 represent more than fifty percent of the current in-use line haul locomotive fleet for Class I railroads. These low tier locomotives emit five-to-eight times

78. Eastern Research Group, 2020 *National Emissions Inventory Locomotive Methodology*, 4.

more nitrous oxide (NO_x) and ten-to-twenty times more particulate emissions ($\text{PM}_{10}/\text{PM}_{2.5}$) compared to Tier 4 compliant locomotives, which represent a mere seven percent of the fleet.⁷⁹

Emissions from Class I line haul locomotives totaled more than 370,000 tons of NO_x and more than 18,000 tons of particulate emissions in 2020. Emission factors reduced overall between 2017 and 2020 by around 17 percent, but it should be noted that locomotive activity on the railroad also decreased by 15 percent as a consequence of the pandemic. While Class Is did shift to lower emissions locomotives during this period, it is at a much too slow rate to meet the EPA's goal of preventing 1,100 PM-related premature deaths annually alongside \$10 billion in other health benefits by 2030 that it outlined in its 2008 Tier 4 rule.⁸⁰

Despite this slight improvement in emissions from Class I line haul locomotives, 2017 to 2020 saw a reverse trend towards dirtier, lower-tier yard switcher locomotives. This trend occurred alongside an overall decrease in in-service yard switchers, due to the pandemic and "Precision Scheduled Railroading," which has led to the shuttering of numerous railyards around the nation. As demonstrated by figure 11, Class I railroads opted to remove higher tier, cleaner locomotives from yard switching service and replace them with lower tier locomotives, even as the overall number of switchers declined by nearly 200 locomotives.

79. Eastern Research Group, 2020 *National Emissions Inventory Locomotive Methodology*, 5.

80. Environmental Protection Agency, "Final Rule for Control of Emissions of Air Pollution From Locomotive Engines and Marine Compression-Ignition Engines Less Than 30 Liters per Cylinder."

81. Eastern Research Group, 2020 *National Emissions Inventory Locomotive Methodology*, 20.

82. Yard locomotives emitted 9.79% of Class I emissions and 10.14% of $\text{PM}_{10}/\text{PM}_{2.5}$ emissions in 2020 according to data from Eastern Research Group, 2020 *National Emissions Inventory Locomotive Methodology*.

83. Paul Allen et al., Newark *Community Impacts of Mobile Source Emissions: A Community-Based Participatory Research Analysis* (New Jersey Environmental Justice Alliance, November 2020), https://njeja.org/wp-content/uploads/2021/06/NewarkCommunityImpacts_MJBA.pdf.

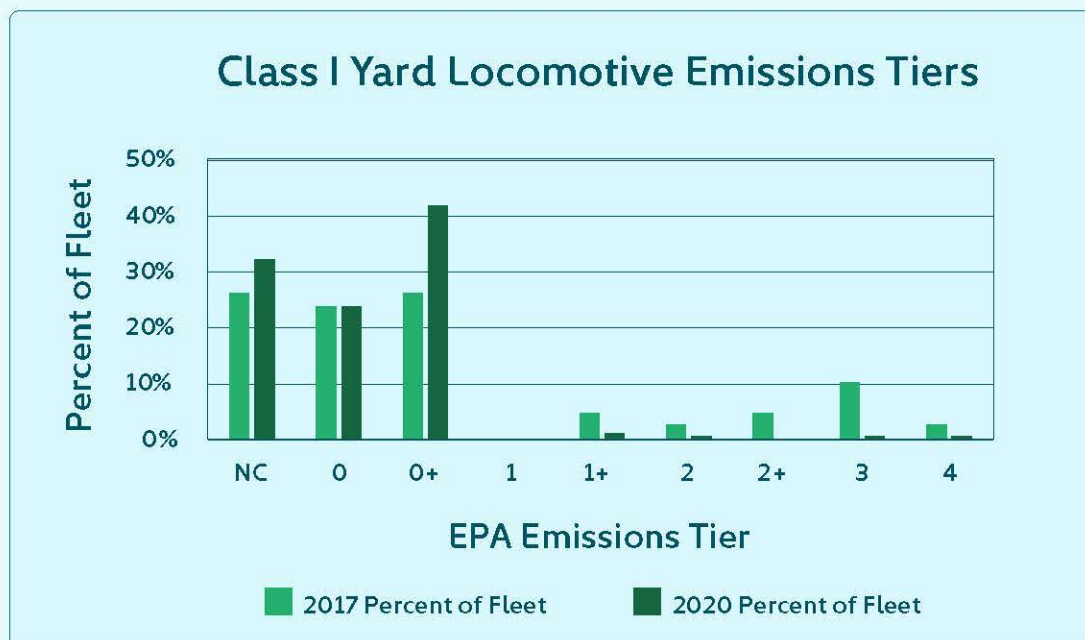


Figure 12. Class I yard locomotive emissions by EPA tier, 2017 and 2020⁸¹

While these yard locomotives represent only a fraction (14.4%) of Class I fleets and emit a roughly a tenth of their NO_x and particulate matter emissions (PM₁₀ and PM_{2.5}), the health impact of yard locomotives is disproportionately large on those living near railyards.⁸² The concentration of locomotives within yards leads to dispersion of diesel pollution into surrounding communities, which is linked to an outsized exposure risk for NO_x and particulate matter.⁸³

Exposure to these diesel pollutants contributes to a risk of cancer for those living near railyards that is 10 times higher than among the general population.⁸⁴ Diesel exhaust has been linked to higher risks of lung cancer among rail workers.⁸⁵ The pollution from diesel locomotives contributes to higher rates of asthma, heart disease, and other maladies in predominantly low income, minority, and rural communities that already lack equitable access to healthcare.⁸⁶ Eliminating this source of pollution has the potential to prevent thousands of premature deaths and hospitalizations annually.⁸⁷

The locomotive technology already exists to alleviate this pollution risk and achieve more sustainable freight transportation. Yet Class Is have moved in the opposite direction, claiming that zero emissions technology does not exist while employing older, more polluting locomotives in yards. For the health and safety of communities near tracks and railyards, an urgent investment in cleaner locomotives is needed. This investment is possible under public ownership, where the public interest is centered, but remains distant as long as the Class Is continue to prioritize short-term profit over community health.

In addition to concerns over pollution from locomotives, trackside communities have to reckon with the impact of increasingly long trains. The average train length is now well over a mile and over one in four trains is nearly two miles long, according to one Class I railroad.⁸⁸ These long trains raise a number of safety concerns, though the FRA claims it has no conclusive evidence on their safety because the Class Is refuse to share data with the administration.⁸⁹ Despite this lack of regulatory clarity, a recent academic analysis found a 24 percent higher derailment risk for 200 car trains⁹⁰ compared to 50 car trains. Even aside from derailment risk, long trains pose serious dangers to the communities they pass through when railroads choose to park them in the middle of town blocking road crossings for a mile or more.

84. Andrea Hricko et al., "Global Trade, Local Impacts: Lessons from California on Health Impacts and Environmental Justice Concerns for Residents Living near Freight Rail Yards," *International Journal of Environmental Research and Public Health* 11, no. 2 (2014), <https://doi.org/10.3390/ijerph110201914>.

85. E. Garshick et al., "Lung cancer in railroad workers exposed to diesel exhaust," *Environ Health Perspect* 112, no. 15 (Nov 2004), <https://doi.org/10.1289/ehp.7195>, <https://www.ncbi.nlm.nih.gov/pubmed/15531439>.

86. Moving Forward Network, "Phase 3 Greenhouse Gas Rule Public Comments," (June 16 2023), Public Comment. https://www.movingforwardnetwork.com/wp-content/uploads/2023/07/MFN_Comments_Rail-and-Locomotive-on-Greenhouse-Gas-Phase-3-Rule-Comment.pdf.

87. Environmental Protection Agency, "Final Rule for Control of Emissions of Air Pollution From Locomotive Engines and Marine Compression-Ignition Engines Less Than 30 Liters per Cylinder.," California Air Resources Board, "CARB passes a new In-Use Locomotive Regulation estimated to yield over \$32 billion in health benefits," news release, April 27, 2023, <https://ww2.arb.ca.gov/news/carb-passes-new-use-locomotive-regulation-estimated-yield-over-32-billion-health-benefits-0>.

88. Government Accountability Office, *Information on Precision-Scheduled Railroading*, 15-16.

89. Schwartz et al., "The True Dangers of Long Trains."

90. Madsen et al., "The relationship between freight train length and the risk of derailment."

The issue of blocked crossings is incredibly pressing and has only grown in recent years along with average train lengths. In many towns and cities, trains routinely block grade crossings, preventing emergency vehicles from passing for hours on end. Children are forced to choose between making an incredibly dangerous climb over stopped railcars or not attending school.⁹¹ Blocked crossings are a representation of Class I railroads' prioritization of their operating ratios over community safety. Many instances of blocked crossings could be avoided by running shorter consists or investing in longer rail sidings so that trains could park on them, rather than on city streets.

91. Topher Sanders and Dan Schwartz, "As Rail Profits Soar, Blocked Crossings Force Kids to Crawl Under Trains to Get to School," *ProPublica*, April 26, 2023, <https://www.propublica.org/article/trains-crossing-blocked-kids-norfolk-southern>.

Trackside community members are important stakeholders whose lives are directly impacted by decisions over capital investment and operations. Communities near rail yards face a battery of health risks, which alone is reason enough for them to have a role in governing our railroads, not to mention blocked crossings, noise pollution, fallout from derailments, and other impacts. The idea of community involvement in railroad governance is incompatible with our present system of private railroad ownership but sits at the core of a democratically-managed public railroad system. Concrete improvements are also achievable under public ownership: investments in cleaner locomotives, electrification, longer sidings, and safe operation are all important measures that can be taken to allow railroads to achieve a sustainable mode shift without contributing to further environmental injustice.

REVIVING PASSENGER SERVICE

Private freight railroads represent one of the greatest impediments to the restoration of passenger rail in America. Nearly every time that Amtrak seeks to restore or increase service on a passenger route where a freight railroad owns the tracks (and the vast majority of Amtrak's network operates over Class I tracks) the freight railroad demand tens to hundreds of millions of dollars in improvements before allowing Amtrak to run passenger service. While these improvements are in many cases necessary, they are only required because of the Class I's own underinvestment in infrastructure and insistence on running long, cumbersome unscheduled trains.

It must be remembered that a century ago, many of these same rail lines hosted dozens of passenger trains per day, mixed in among freight traffic, often with faster schedules than they have today. In the name of cost cutting, the freight railroads have ripped up much of the double trackage that allowed for passenger service decades ago. Without double trackage, trains must fit into passing sidings in order to pass yet the Class I's have failed to extend many of their passing sidings long enough for freight trains, which forces shorter passenger trains to wait on sidings, despite their legal priority. These factors have left Amtrak and the American taxpayer on the hook for improvements to freight railroads' infrastructure to restore capacity that was once there.

There is perhaps no better example of the impediment freight railroads represent to passenger service in this country than the 20-year odyssey to restore passenger service between New Orleans and Mobile. After Hurricane Katrina in 2005, Amtrak suspended its Sunset Limited route east of New Orleans because of heavy damage to the track. The tracks between New Orleans and Orlando were repaired within a year, but CSX and Norfolk Southern refused to allow Amtrak access to their tracks to restore service. CSX claimed that \$2.3 billion—more than double CSX's \$1.1 billion capital expenditure for its entire network—was needed to make improvements before Amtrak could operate one train every 12 hours along the corridor.⁹²

92. John Sharp, "CSX, Southern Rail Commission battle it out over costs to restore passenger rail to Gulf Coast," AL.com (July 20 2017). https://www.al.com/news/mobile/2017/07/csx_southern_rail_commission_b.html.

93. "Making the Case for Intermodal Transportation in the Gulf Coast Region | Rail Passengers Association | Washington, DC," accessed June 21, 2024, <https://www.railpassengers.org/happening-now/news/blog/making-the-case-for-intermodal-transportation-in-the-gulf-coast-region/>.



Figure 13. Suspended portion of the Sunset Limited, between New Orleans, Jacksonville, and Orlando⁹³

This obstructionism has meant that as of 2024, service has yet to be restored east of New Orleans, though New Orleans-Mobile service is planned to begin later this year after more than \$200 million of federal investment in CSX's infrastructure.⁹⁴ In 1965, CSX's predecessor the Louisville and Nashville operated no fewer than a dozen daily passenger trains across the route between New Orleans and Orlando.⁹⁵

Freight railroads cause further issues for passenger services in operation by denying Amtrak the preference in dispatching that it is guaranteed under federal law. This preference is enshrined in the Amtrak Improvement Act of 1973, which states: Except in an emergency, intercity and commuter rail passenger transportation provided by or for Amtrak has preference over freight transportation in using a rail line, junction, or crossing.

Despite this statutory requirement for freight railroads to give preference to passenger trains, in fiscal year 2023, freight train interference accounted for 945,911 minutes of delay to Amtrak trains. Put another way, that is 657 straight days of delays. Freight trains caused one and three-quarters days of delay to Amtrak trains for each day of the year. Freight train interference was the most significant cause of delay to Amtrak across every quarter of 2023, representing between 14 and 18 percent of total delay minutes.⁹⁶

In addition to freight train interference, host railroads—predominantly Class I—are responsible for a slew of other delays, the second largest category of which is slow orders.⁹⁷ Slow orders are implemented because of poor track quality or other safety concerns, often a symptom of Class I's cost cutting and inadequate maintenance. As is clearly demonstrated by figure 14, freight railroads are responsible for an overwhelming majority of delays to passenger trains across the United States.⁹⁸ In 2023, host railroads were responsible for the equivalent of more than 2,238 days of delay to Amtrak trains.

The Class I's failure to maintain their own trackage creates risks for rail passengers. In a recent example, the National Transportation Safety Board determined a 2021 Amtrak derailment that took the lives of three passengers and injured 49 others was the fault of BNSF's poor track maintenance. Worse still, an inspector had noticed defects in the track joints two days before the inspection but hadn't stopped to take a

94. Steve Davis, "Final grant clears the way to restore Gulf Coast passenger rail service," *T4AMERICA BLOG, Transportation for America*, 2023, <https://t4america.org/2023/10/03/final-grant-clears-the-way-to-restore-gulf-coast-passenger-rail-service/>.

95. Louisville and Nashville Railroad, "Passenger Train Time Tables," (December 18 1965). <https://streamlinermemories.info/South/L&N65TT.pdf>.

96. Delay minutes due to freight train interference Q1: 252,957; Q2: 234,110; Q3: 240,886; Q4: 217,958. Federal Railroad Administration, *Quarterly Reports on the Performance and Service Quality of Intercity Passenger Train Operations*, Q1-Q4 2023

97. Federal Railroad Administration, *Quarterly Report on the Performance and Service Quality of Intercity Passenger Train Operations: Covering the Quarter Ending September 2023* (Fourth Quarter of Fiscal Year 2023), U.S. Department of Transportation (2023), 6, https://railroads.dot.gov/sites/fra.dot.gov/files/2024-01/FY23%20Q4%20Service%20Quality%20Report_r1_PDFA.pdf.

98. Amtrak, "The Truth About Amtrak's Legal Right to Preference," <https://www.amtrak.com/content/dam/projects/dotcom/english/public/documents/corporate/HostRailroadReports/mythbusters-enforcing-amtraks-legal-right-to-preference.pdf>.

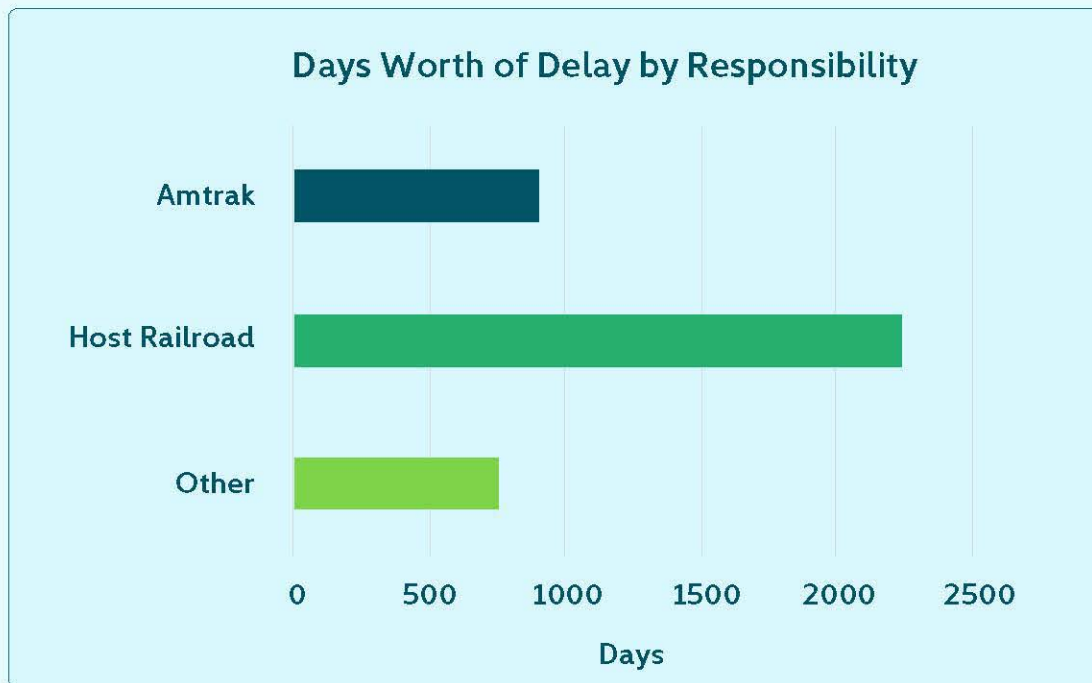


Figure 14. Days of passenger train delay by responsibility, 2023¹⁰⁰

closer look that might have prevented the incident. This incident traces back to BNSF's cost cutting and understaffing, as the inspector responsible for the corridor had been working an average of 13 hours a day over the four weeks prior to the crash.⁹⁹

Private railroads' failure to invest in their own infrastructure has also led to the cancellation of entire Amtrak trains. In 2023 and 2024, Canadian National imposed a 10-mph speed restriction on its New York trackage in temperatures over 86 degrees, a symptom of poorly maintained ballast and ties. This caused Amtrak to suspend Adirondack service north of Albany.¹⁰¹ In another instance, Amtrak went to the Supreme Court to assert its power to condemn track under eminent domain from the Boston and Maine Railroad because its track was too poorly maintained for passenger service to safely operate over.¹⁰²

Almost all of these ills that freight railroads pose to passenger rail could be easily addressed by a publicly owned rail system. Routine preventative maintenance coupled with a focus on high quality infrastructure rather than short-term profit margins should make passenger trains safer and faster. Reducing delays to Amtrak trains can be achieved by improvements in infrastructure, such as double tracking busy corridors, and by giving Amtrak trains the priority to which they are entitled under federal law. A return to shorter, scheduled freight

99. Amy Beth Hanson and Sam Metz, "Investigators say poor track conditions caused a 2021 Amtrak derailment in Montana that killed three," *Associated Press*, July 27, 2023, <https://apnews.com/article/amtrak-derailment-montana-b5901eee31b544496edc8a5c2664aeb1>.

100. Federal Railroad Administration, *Quarterly Reports on the Performance and Service Quality of Intercity Passenger Train Operations*, Q1-Q4 2023.

101. Bob Johnston, "Amtrak abruptly suspends 'Adirondack' after CN imposes heat restriction," *Trains* (February 4 2024), <https://www.trains.com/trn/news-reviews/news-wire/amtrak-abruptly-suspends-adirondack-after-cn-imposes-heat-restriction/>.

102. *National Railroad Passenger Corporation v. Boston & Maine Corp.*, 503 U.S. 407 (1992).

trains as a component of higher quality service to customers would also be conducive to better passenger service. Under public ownership, America will be able to experience a true passenger rail renaissance.

HISTORY OF PUBLIC RAIL IN AMERICA

Public ownership and support have been central to railroads since the birth of railroading in America. This section will delve into the long and complicated history of public ownership in the rail industry from the first common carrier railroad in the United States to the quasi-nationalization of the Northeast's entire rail network under Conrail. Railroads have long been seen as critical transportation links and servants of the public interest, as such public ownership of the railroads is far from a novel concept.

THE EARLY DAYS AND STATE-CHARTERED RAILROADS IN AMERICA

In the early days of rail, nearly every railroad was built with significant public support, if not directly by a city or state. Railroads were seen as an integral public good, key to maintaining trade links in an ever accelerating and expanding economy. Cities competed to provide the best routes between various regions. Publicly owned and funded railroads were a source of pride for citizens.¹⁰³ Furthermore, private investors were simply unwilling to bear the risk of supporting such a new and uncertain industry, requiring government to take the lead in railroad development. Government investment was seen as appropriate because railroads were understood as an improvement to benefit the public rather than a small group of investors.¹⁰⁴

One of the first intercity common carrier railroads, built to keep Baltimore competitive in the trade between the Atlantic and expanding western frontier, the Baltimore and Ohio Railroad (B&O) was chartered by the state with fifty percent government ownership.¹⁰⁵ The city of Baltimore would continue to support the B&O, along with other railroads such as the Western Maryland, throughout the rest of the 19th century.¹⁰⁶ Though not all municipally-supported railroads were as famous as the B&O, hundreds of other municipali-

103. Allen W. Trelease, "The Passive Voice: The State and the North Carolina Railroad, 1849-1871," *The North Carolina Historical Review* 61, no. 2 (1984): 175, <http://www.jstor.org/stable/23518751>; Carter Goodrich, "Local Government Planning of Internal Improvements," *Political Science Quarterly* 66, no. 3 (1951): 432, <https://doi.org/10.2307/2145119>, <http://www.jstor.org/stable/2145119>.

104. Milton S. Heath, "North American Railroads: Public Railroad Construction and the Development of Private Enterprise in the South before 1861," *The Journal of Economic History* 10 (1950): 48, <http://www.jstor.org/stable/2113926>.

105. John F. Stover, *History of the Baltimore and Ohio Railroad* (West Lafayette, Ind.: Purdue University Press, 1987), 1-18.

ties similarly provided aid to railroads during the early period of their development.¹⁰⁷ Even the well-known Pennsylvania Railroad, once the largest corporation in the world, received the majority of its initial funding from the cities of Philadelphia and Pittsburgh.¹⁰⁸

In the South, which had less access to private capital than northern industrial regions, city and state governments provided over 55 percent of construction costs for southern railroads built prior to the Civil War.¹⁰⁹ This value doesn't even include grants of right-of-way or other support, leading its originator to conclude that "this estimate attributes to private investors, inferentially at least, a greater role than is warranted," underscoring the critical importance of public investment to railroad development.¹¹⁰

Two broad models of state support from the period have been identified. The first, exemplified by Georgia, involved significant state support to primary main lines, with cities and counties encouraged to build local branch lines.¹¹¹ This approach allowed the state to shape the overall rail network. Major rail lines were built by the state or by a corporation in which the state was the sole or controlling owner. The most famous example in Georgia is the Western & Atlantic Railroad, built and owned by the state, spanning from Atlanta to Chattanooga.¹¹² This rail line is still owned by the State of Georgia and leased to CSX.¹¹³

The second model, exemplified by Virginia, was a more balanced approach of providing support to all rail lines within the state. Initially this consisted of an offer for the state to purchase two-fifths of the shares in any railroad. Finding inadequate private interest in subscribing to the full three-fifths remaining, local communities convinced the state legislature to up its commitment to three-fifths interest.¹¹⁴ Consequently, the state was the majority and controlling shareholder in nearly all railroads in Virginia for a large portion of the 19th century. Yet, stock subscription alone was not sufficient to induce private investors to fund the railroad construction and many states were induced to further provide loans; Virginia provided around \$5 million in loan support—a hefty sum for the day.¹¹⁵

These models are certainly not all encompassing, and public support for railroads occurred in a variety of other forms throughout the 19th century. One of the most unique pub-

106. Goodrich, "Local Government Planning of Internal Improvements," 435.

107. Goodrich, "Local Government Planning of Internal Improvements."

108. Albert J. Churella, *The Pennsylvania Railroad, Volume 1: Building an Empire, 1846-1917* (Philadelphia: University of Pennsylvania Press, 2012), x-xiv.

109. Trelease, "The Passive Voice: The State and the North Carolina Railroad, 1849-1871," 174; Heath, "North American Railroads: Public Railroad Construction and the Development of Private Enterprise in the South before 1861," 43.

110. Heath, "North American Railroads: Public Railroad Construction and the Development of Private Enterprise in the South before 1861," 42-43.

111. Heath, "North American Railroads: Public Railroad Construction and the Development of Private Enterprise in the South before 1861," 49-50.

112. Frederick B. Gates, "The Impact of the Western & Atlantic Railroad on the Development of the Georgia Upcountry, 1840-1860," *The Georgia Historical Quarterly* 91, no. 2 (2007), <http://www.jstor.org/stable/40584996>.

113. Surface Transportation Board, CSX Transportation, Inc.-Lease-Western and Atlantic Railroad, 83 FR 58807 (Federal Register, 2018).

114. Heath, "North American Railroads: Public Railroad Construction and the Development of Private Enterprise in the South before 1861," 50.

115. Heath, "North American Railroads: Public Railroad Construction and the Development of Private Enterprise in the South before 1861," 50.

licly owned railroads arose following the Civil War. After Ohio banned cities from investing in joint stock companies, Cincinnati chose to build a railroad on its own.¹¹⁶ The citizens of Cincinnati voted overwhelmingly in 1869 in favor of constructing the Cincinnati Southern Railway, funded by municipally-issued bonds. By 1880, the line had reached 337 miles south to its terminus in Chattanooga.¹¹⁷ The railway remained owned by Cincinnati until March 2024, when it was sold to long-time lessee Norfolk Southern after a hard-fought campaign to keep it under public ownership.

116. "Historical Timeline," Cincinnati Southern Railway, 2009, accessed June 16, 2023, <https://cincinnati-southern-railway.org/about/historical-timeline.php>.

117. Cincinnati Southern Railway, "Historical Timeline."

THE CIVIL WAR

Railroads became a vitally important component of military strategy during the Civil War, shipping troops and supplies over long distances much faster than previous modes of transport. Because of the critical role of railroad movements to military strategy, the U.S. military sought to guarantee their railroad traffic would be prioritized. This coordination faced some initial resistance from the management of privately owned rail lines.¹¹⁸

118. Cristopher R. Gabel, *Railroad Generalship: Foundations of Civil War Strategy* (Combat Studies Institute, 1997), 12-13. <https://www.armyupress.army.mil/Portals/7/combat-studies-institute/csi-books/gabel4.pdf>.

119. TImage from the U.S. Signal Corps, digitized: https://penelope.uchicago.edu/Thayer/E/Journals/JAMHF/2/2/Military_Railroads*.html (1987): 52, <http://www.jstor.org/stable/20092074>.

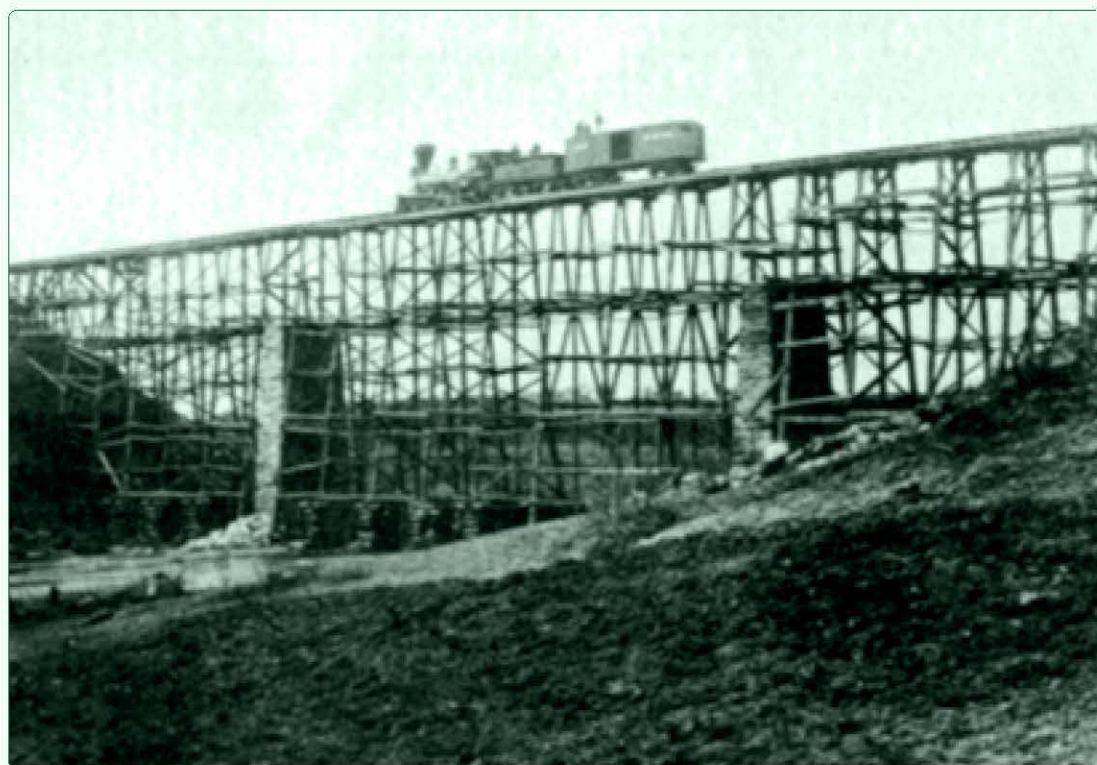


Image 1. USMRR Constructed Bridge over Potomoc Creek¹¹⁹

To remedy this, on January 31, 1862, Congress enacted a law that enabled the president to seize and operate any railroad or telegraph line for the duration of the war, as required by public safety.¹²⁰ The Act also allowed the establishment of the United States Military Railroads (USMRR), granting the Secretary of War purview over all troop, munitions, and equipment transportation throughout the country.

In practice, the Union tended to allow private railroads to continue their operations, as long as they cooperated with the prioritization of military transportation.¹²¹ Railroads near the war's front lines and captured Confederate railroads were put under the direct control of the USMRR, which repaired and operated them in support of advancing armies.¹²² By the end of the war, the USMRR operated 2,105 miles of track with 419 locomotives and 6,330 railcars, making it the larger than any pre-war railroad.¹²³

Despite the USMRR's immense size, it was not a single unified network. The Western and Virginia divisions operated almost independently from each other. Furthermore, at the time, most Southern railroads were broad gauge and as such their rolling stock was incompatible with Northern railroads' standard gauge. This created a break in gauge that left the railroads disjointed and required transferring entire shipments between trains.¹²⁴ On several occasions, the USMRR took it upon itself to remedy this break of gauge by shifting tracks under its control to standard gauge (4 foot, 8.5 inches).¹²⁵ In the decades after the Civil War and the dissolution of the USMRR, railroads nationwide would definitively shift to standard gauge because of the marked benefits of continuous connections.

FEDERAL LAND GRANTS AND THE TRANSCONTINENTAL RAILROADS

During the second half of the 19th century, federal and state governments gave away vast swaths of public land for the construction of railroads, primarily in the West. A total of 130.4 million acres of public land was directly granted to railroads from the federal government, in addition to 48.9 million acres from nine state governments.¹²⁶ Prior to 1862, land grants were made to states, who then transferred the land

120. The formal title of this law is "An Act to authorize the President of the United States in certain Cases to take Possession of Railroad and Telegraph Lines, and for other Purposes." John L. Blackman, "The Seizure of the Reading Railroad in 1864," *The Pennsylvania Magazine of History and Biography* 111, no. 1 (1987): 52, <http://www.jstor.org/stable/20092074>.

121. Gabel, *Railroad Generalship: Foundations of Civil War Strategy*, 13-14.

122. Gabel, *Railroad Generalship: Foundations of Civil War Strategy*, 19-21.

123. E. G. Campbell, "THE UNITED STATES MILITARY RAILROADS, 1862-1865: War Time Operation and Maintenance," *Journal of the American Military History Foundation* 2, no. 2 (Summer 1938): 89.

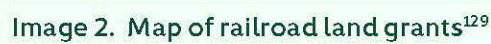
124. Douglas J. Puffert, "The Standardization of Track Gauge on North American Railways, 1830-1890," *The Journal of Economic History* 60, no. 4 (2000), <http://www.jstor.org/stable/2698082>.

125. Campbell, "THE UNITED STATES MILITARY RAILROADS, 1862-1865," 77.

126. David Maldwyn Ellis, "Railroad Land Grant Rates, 1850-1945," *The Journal of Land & Public Utility Economics* 21, no. 3 (1945): 207-09, <https://doi.org/10.2307/3158889>, <http://www.jstor.org/stable/3158889>.

127. Ellis, "Railroad Land Grant Rates, 1850-1945," 208-09.

128. United States Congress (37th : 1861-1863), *Public Laws of The Thirty-Seventh Congress of The United States vol. XII* (Boston: Little, Brown, and Company, 1861), 492-93. <https://tile.loc.gov/storage-services/service/ll/llsl//llsl-c37/llsl-c37.pdf>.



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expected to provide services to the public.¹³⁰ To guarantee that land grant railroads would serve the public interest, Congress wrote in the 1862 Pacific Railway Act that: "...the object of this act [is] to promote the public interest and welfare by the construction of said rail road and telegraph line" and reserved Congress the right to "add to, alter, amend, or repeal this act" at any time.¹³¹

One benefit that railroads were required to provide in exchange for these substantial land grants and subsidized loans was preferential treatment for government shipments of mail, troops, military supplies, and "public stores."¹³² The majority of land grants also included clauses that required the government's shipments to be carried at a significant discount to normal rates. In some cases, such as with the Illinois Central, railroads were expected to provide free transportation for any government shipment.

While the rate concessions varied between railroads, through equalization agreements, the government eventually came to receive a 50 percent discount on nearly all shipments, even on non-land grant railroads.¹³³ In the original grants, these rate concessions were intended to endure in perpetuity. However, railroads fought to eliminate government rate concession for decades, arguing that they undermined rail company's financial stability. By the time of World War II, these rate concessions were saving the government hundreds of millions of dollars in shipping costs. At the same time, the consensus began to shift towards a repeal of rate concessions, and the House passed a bill to eliminate them.¹³⁴

The enduring legacy of the land grant railroads includes the rights-of-way under thousands of miles of U.S. railroads in which the federal government retains a reversionary interest of ownership and control. Though the nature of this interest has been debated in the courts over the past century, there is a compelling case that every railroad that sits on a right-of-way granted from Congress merely possesses an easement over public land.¹³⁵ Furthermore, Congress reserved the right to "add to, alter, amend" the terms of its land grants. Ultimately, these lands were given under a promise of providing a "public highway" operated in the public interest, a deal that today's Class I's have inherited along with their predecessors' easements. One might argue that the Class I's failed to live up to this deal and that perhaps it is time for Congress to retake control of our public rights-of-way.

129. Note: This image is not a literal depiction of land grant territories, many of the land grants were made in a checkerboard pattern and the scale is not exact; it is based on an earlier map entitled "How the public domain was squandered" from 1884. This image from Samuel Eliot Morison and Henry Steele Commager's *The Growth of the American Republic*. Archived and digitized within the P.J. Mode collection of persuasive cartography, #8548. Division of Rare and Manuscript Collections, Cornell University Library.

130. Darwin P. Roberts, "The Legal History of Federally Granted Railroad Rights-of-Way and the Myth of Congress's "1871 Shift," *University of Colorado Law Review* 82, no. 1 (2011): 146.

131. Roberts, "The Legal History of Federally Granted Railroad Rights-of-Way," 125.

132. United States Congress (37th : 1861-1863), *Public Laws of The Thirty-Seventh Congress of The United States XII*, 493; Ellis, "Railroad Land Grant Rates, 1850-1945."

133. Ellis, "Railroad Land Grant Rates, 1850-1945," 211-14.

134. Ellis, "Railroad Land Grant Rates, 1850-1945."

135. Roberts, "The Legal History of Federally Granted Railroad Rights-of-Way."

WORLD WAR ONE ERA

NATIONALIZATION

The United States' entry into World War One brought a massive spike in rail traffic. The enormous volume of troops and supplies that needed to be brought to the East Coast for shipment to Europe quickly led to bottlenecks and delays.¹³⁶ Private railroads attempted to resolve wartime challenges through the creation of the Railroads' War Board and voluntary cooperation between lines.¹³⁷

However, these efforts failed for numerous reasons. The sheer number of Class Is, 181 at the time, made coordination difficult.¹³⁸ Private railroads were also unwilling to fully pool their rolling stock and other resources, despite a national shortage of cars and locomotives. Railroads also ran into difficulty prioritizing service over profit, and managers refused to divert traffic onto other rail lines even when it would have reduced congestion, because they didn't want to lose the revenue to a competitor.¹³⁹

To resolve these difficulties, on December 26, 1917, President Wilson signed a proclamation that would unify the nation's railroads under federal control by the United States Railroad Administration (USRA).¹⁴⁰ Congress followed with legislation in March 1918 that laid out the structure of the operations and outlined the rent to be paid to railroad companies for use of their property.

Federal control during WWI led to numerous operational changes that resolved the major problems of coordination and equipment shortages. For one, national unification allowed hundreds of locomotives to be diverted from less-busy lines to clogged Eastern lines to boost capacity. Additionally, repairs to cars and locomotives took place at the nearest available shop, rather than at shops belonging to their home railroad, since each railroad's facilities were at the disposal of the USRA. This change resulted in a 24 percent increase in locomotive repairs.¹⁴¹ Railroad cars were properly pooled, which markedly increased their utilization rates and improved traffic flow. Federal Control realized yet other economies of scale by introducing 12 standardized locomotive designs, saving on maintenance cost and facilitating mass production, benefits that led many of these designs to survive long after the war.¹⁴²

136. Walker D. Hines, *War History of American Railroads*, Economic and Social History of the World War American series, (New Haven, London: Yale University Press; H. Milford, Oxford University Press, for the Carnegie Endowment for International Peace: Division of Economics and History, 1928), 10–21.

137. Huddleston, *Uncle Sam's Locomotives*, 2–3.

138. At the time, Class Is were railroads earning over \$1 million in revenue a year. Walker D. Hines, "The Director-General's Position," *The Nation*, 1919.

139. K. Austin Kerr, *American Railroad Politics 1914–1920: Rates, Wages, and Efficiency* (University of Pittsburgh Press, 1968), 57.

140. Hines, *War History of American Railroads*, 22.

141. Hines, *War History of American Railroads*, 33–36.

142. Huddleston, *Uncle Sam's Locomotives*.

Along with achieving operational improvements, the USRA committed to non-interference in unionization drives, which led to the organization of hundreds of thousands of previously unorganized non-operating employees on the railroads. The USRA also granted improvements to wages and conditions as part of ensuring labor's cooperation in the war effort.¹⁴³

143. Kerr, *American Railroad Politics*, 72-127.

THE PLUMB PLAN AND POST-WWI CAMPAIGNS FOR PUBLIC CONTROL

Following the end of World War One, a debate emerged about whether the railroads should be returned to private operation or be transitioned to permanent public ownership. While several proposals existed at the time, by far the most prominent was the *Plumb Plan*, proposed by Glenn E. Plumb, who served as general counsel to America's rail unions.

The Plumb Plan entailed the federal government issuing bonds to buy out the railroads at their "actual value"—as opposed to the inflated value of watered stock. The railroads would then be operated by an independent, federally chartered corporation "not for profit, but exclusively for service," which would lease the underlying rail infrastructure from the federal government.¹⁴⁴

144. Plumb and Roylance, *Industrial Democracy*, 196-200.

This public corporation was to be democratically managed—overseen by a board of directors with appointees representing labor, management, and the public in equal proportion.¹⁴⁵ Shipping rates would be set by the Interstate Commerce Commission to cover all operating costs as well as necessary infrastructure reinvestment and bond repayment. Any surplus earnings from efficiency improvements, as Plumb expected from a unified system, would be disbursed: one-half as dividends to management and workers, one-half to the public in the form of infrastructure investments and lower freight rates (which would benefit consumers by lowering the cost of goods).¹⁴⁶

145. Glenn E. Plumb, Labor's plan for government ownership and democracy in the operation of the railroads, (Washington, D.C.: 1919), 8-9; Plumb and Roylance, *Industrial Democracy*, 198; Kerr, *American Railroad Politics*, 163.v

146. Plumb and Roylance, *Industrial Democracy*, 198-200.

This proposal for public ownership and democratic management of the railroads was widely supported by labor. The Plumb Plan itself was endorsed in 1919 by every railway union along with the United Mine Workers of America

and a number of other national unions.¹⁴⁷ A referendum of railroad workers on the question of continued government ownership resoundingly endorsed the idea, with 99.5 percent in favor, 306,720 out of 308,186 votes.¹⁴⁸ After a lengthy debate at its 1920 convention, the American Federation of Labor (precursor to the AFL-CIO) endorsed “government ownership and democratic operation” of the railroads by a vote of 29,159 delegates to 8,349.¹⁴⁹ While this resolution was not an endorsement of any specific plan, it nonetheless followed from the railroad union’s unanimous support for the Plumb Plan.

To promote the Plumb Plan, railroad unions formed the Plumb Plan League, and each paid monthly dues to support its activities and promote public ownership. The League set up branches across the nation and even published its own weekly newspaper *Labor*, which reached a circulation of 500,000 subscribers. The League was headed by rail labor leaders including the Grand Chief Engineer of the Brotherhood of Locomotive Engineers, Warren Stone, and Arthur Wharton, president of the Railway Employee’s Department of the AFL. The League’s staff was filled by leaders from every railroad union. The Plumb Plan League also received the support of some farmers, fed up with mistreatment from the railroads.¹⁵⁰

Despite this strong support among labor and a concerted nationwide campaign, in coalition with other groups such as the Public Ownership League, the Plumb Plan failed to gain traction in Congress. With the passing of the Transportation Act of 1920, the railroads were handed back to their private owners.

THE CONSOLIDATED RAIL CORPORATION (CONRAIL)

The Consolidated Rail Corporation (Conrail) was created by Congress in the aftermath of Penn Central’s demise, which at the time had been the largest bankruptcy in U.S. history. The collapse of Penn Central, and several other Northeastern railroads, threatened to deprive the Northeast of rail service and sever critical supply chains across the nation. To avoid this outcome, Congress enacted the Regional Rail Reorgani-

147. John C. Hennen, *The Americanization of West Virginia: Creating a Modern Industrial State, 1916-1925* (University Press of Kentucky, 1996), 90. <http://www.jstor.org/stable/j.ctt130j893>.

148. Colin J. Davis, *Power at Odds: The 1922 National Railroad Shopmen’s Strike* (University of Illinois Press, 1997), 44.

149. David Montgomery, *The Fall of the House of Labor: The Workplace, the State, and American Labor Activism, 1865-1925* (Cambridge: Cambridge University Press, 1987), 401; *Report of Proceedings, Fortieth Annual Convention of the American Federation of Labor*, (Montreal, Quebec, Canada: The Law Reporter Printing Company, June 7-19, 1920), 419-20.

150. Kerr, *American Railroad Politics*, 72-127.

zation Act of 1973, which created the United States Railway Association (USRA) to oversee the creation and operation of a reorganized Northeastern rail system, and the Consolidated Rail Corporation as the quasi-public railroad to operate the railroads in the Northeast.¹⁵¹ Conrail began operations on April 1, 1976, after the final system plan was approved.¹⁵²

Conrail was structured as a federally chartered, government-owned for-profit corporation. The final system plan for Conrail also brought drastic cuts to trackage and branch lines, in pursuit of profitability. Thousands of miles of lightly used track were abandoned or sold to smaller Class II and III railroads. Despite the pain caused by these cuts, Conrail was effective at reviving rail service and made significant improvements to maintenance of track and equipment over its predecessor railroads. These reforms succeeded in making Conrail profitable sooner than expected, in 1981.¹⁵³

After it became profitable, the government was charged by Congress to sell or liquidate Conrail by 1984. At the first auction, one of the few viable bidders was Conrail's employees, via the Railway Labor Executives Association, with a bid that would have created the nation's largest employee-owned corporation.¹⁵⁴ Labor's bid was ultimately rejected by Congress, and Conrail was publicly listed on the stock market where shares were sold in 1987. Throughout this whole time, Norfolk Southern and CSX were scheming to take over Conrail for themselves. This finally occurred in 1998 when the two railroads divided Conrail's assets, leaving only the jointly owned Conrail Shared Assets areas.¹⁵⁵

151. "Conrail" (Consolidated Rail Corporation)," American-Rails.com, updated June 8, 2023, accessed July 28, 2023, <https://www.american-rails.com/conrail.html>.

152. Burns, "Conrail" (Consolidated Rail Corporation)."

153. Burns, "Conrail" (Consolidated Rail Corporation)."

154. Ed Townsend, "Employees make bid to buy Conrail," *The Christian Science Monitor*, June 16, 1983, <https://www.csmonitor.com/1983/0616/061653.html>

155. "About Conrail: History," Consolidated Rail Corporation, accessed July 28, 2023, <https://conrail.com/about-conrail/history/>.

PRESENT-DAY PUBLIC RAIL IN AMERICA

Many forms of public rail infrastructure and rail operators exist today. They range from small municipal railroads to some of the nation's busiest commuter railroads, Amtrak's Northeast Corridor, and even some of the Class I's own trackage. This section will provide further detail on the different types of publicly owned railroads in the United States and their importance to our nation's transportation system.

THE NATIONAL RAILROAD PASSENGER CORPORATION (AMTRAK)

The National Railroad Passenger Corporation, better known as Amtrak, was created in the same era as Conrail to take over money-losing passenger routes from railroads across the country, many of which were facing bankruptcy. Amtrak would be given the right to operate over the entire national network and assume responsibility for providing passenger service. Even though Amtrak was taking over unprofitable passenger services, for political reasons, Amtrak was charged with achieving profitability, a contradiction that has led to numerous issues in subsequent decades. As with Conrail, Amtrak was formed as a quasi-public corporation with shares held by the federal government.¹⁵⁶

After a long series of debates about which passenger routes would be retained, 20 railroad companies opted to turn over their passenger services to Amtrak, which initially continued operations over 13 of these railroads' trackage. The first official day of Amtrak service began on May 1, 1971.¹⁵⁷ Not all railroads initially handed over their passenger trains to Amtrak. Some, including the Southern Railway and the Rio Grande, chose to continue operating their own passenger trains—though they too eventually handed them over to Amtrak. Companies that did hand over their trains paid a

156. Jeff Davis, "Amtrak at 50: The Rail Passenger Service Act of 1970," (October 30 2020). <https://enotrans.org/article/amtrak-at-50-the-rail-passenger-service-act-of-1970/>.

157. "Historic Timeline," accessed March 26, 2024, <https://history.amtrak.com/amtraks-history/historic-timeline>.

one-time fee or provided equipment to help Amtrak start up service.

Amtrak's subsequent history is complicated and worthy of much more detailed examination than can be provided here. Despite frequent underfunding at a Congressional level, Amtrak has succeeded in providing crucial transportation links across the nation. Today, Amtrak provides passenger rail service to over 500 towns and cities across 46 states.¹⁵⁸ Amtrak still operates three different categories of services: Northeast Corridor, State-Supported Routes, and Long-Distance Routes. Amtrak owns its own tracks in the Northeast, Wolverine, and Keystone Corridors. The remaining routes operate primarily over Class I trackage, whose freight trains are a frequent cause of delays. Freight railroads often ignore statutory priority for Amtrak passenger trains, forcing passengers to wait for freight trains to pass.

After facing a sharp drop in ridership during the Covid-19 pandemic, Amtrak's trains are now setting ridership records as demand for climate-friendly travel options surges.¹⁵⁹ With the injection of tens of billions of dollars from recent infrastructure laws, the FRA's study on restoring long-distance routes, and Amtrak's Connects US plan, America is poised for a passenger rail renaissance. Interference from the Class I railroads remains one of the largest impediments to an otherwise promising landscape for passenger rail.

158. "Amtrak Routes & Destinations," accessed September 5, 2023, <https://www.amtrak.com/train-routes>.

159. Amtrak, *Amtrak Fiscal Year 2023: Ridership Exceeds Expectations as Demand for Passenger Rail Soars* (November 30 2023), <https://media.amtrak.com/2023/11/amtrak-fiscal-year-2023-ridership-exceeds-expectations-as-demand-for-passenger-rail-soars/>.

THE NORTHEAST CORRIDOR

The Northeast Corridor (NEC) is the busiest passenger rail corridor in the United States, stretching between Washington D.C. and Boston, passing through some of the Northeast's largest cities, including Baltimore, Wilmington, Philadelphia, Trenton, Newark, New York City, New Haven, and Providence

The NEC came under public ownership after the collapse of Penn Central, an event that also gave rise to Amtrak and Conrail. Today, the NEC is still owned by several public organizations across its different segments: Amtrak, Metro-North Railroad, Connecticut DOT, and the Massachusetts Bay Transportation Authority (MBTA).¹⁶⁰ Alongside these agencies, NEC rail services are operated by the Long Island Rail

160. "The Corridor," Northeast Corridor Commission, 2023, accessed July 7, <https://nec-commission.com/corridor/>.

Road (LIRR), New Jersey Transit (NJT), Southeastern Pennsylvania Transportation Authority (SEPTA), Maryland Area Regional Commuter (MARC), and Virginia Railway Express (VRE).

The NEC carries hundreds of millions of passengers per year. At the end of fiscal year 2023, 628,000 trips were being made on the average weekday; pre-pandemic that number was 960,000.¹⁶¹ Ridership continues to recover, and Amtrak corridor services exceeded pre-pandemic ridership levels at the end of 2023.¹⁶²

The Northeast Corridor's physical infrastructure has been significantly improved by public investments made over the last 50 years. The Northeast Corridor Improvement Project that began in 1977 revitalized track, signals, and stations in a process of continual improvement that continues to this day. Amtrak also completed the electrification of the corridor by installing catenary between New Haven and Boston in the 1990s.¹⁶³

Several other publicly owned corridors are connected to the NEC: the Keystone Corridor between Philadelphia and Harrisburg and the Empire Corridor from New York City to Albany are also publicly owned. Both of these corridors are electrified as well. The Keystone Corridor uses catenary, and the Empire Corridor is partially electrified using third-rail.

The Wolverine Corridor between Chicago and Detroit is primarily owned by Amtrak and Michigan DOT (MDOT), who have brought track speeds up to 110 mph through a series of infrastructure investments.¹⁶⁴ Under private freight ownership, passenger train speeds were limited to 30 mph because of Norfolk Southern's poor maintenance.

161. *Northeast Corridor Annual Report: Infrastructure and Operations Fiscal Year 2023*, (Northeast Corridor Commission, March 2024), 34-36, <https://nec-commission.com/app/uploads/2024/04/NEC-Annual-Report-FY23.pdf>.

162. Amtrak, *Amtrak Fiscal Year 2023: Ridership Exceeds Expectations as Demand for Passenger Rail Soars*.

163. Amtrak, "Historic Timeline.;" Middleton, *When The Steam Railroads Electrified*, 430-32.

164. "The Chicago – Detroit Wolverine Corridor," accessed July 28, 2023, <https://www.hsrail.org/wolverine-corridor/>.

STATE-OWNED RIGHTS OF WAY

The most common form of publicly owned rail infrastructure in the United States today is in the form of state-owned rights-of-ways. The nature of state-owned rights-of-way varies somewhat by the state but these properties are generally rail corridors entirely owned by a state government, operated by a public entity or leased to a private operator.

A state-owned right-of-way that exemplifies the benefit of public ownership is the North Carolina Railroad (NCRR). The NCRR spans from the Port of Morehead City to Charlotte, passing through Raleigh, Durham, and Greensboro. It has been majority-owned by the State of North Carolina since its inception, in the 1850s.¹⁶⁵ Throughout the 20th century, the line was leased to the Southern Railway, which became Norfolk Southern Railway.¹⁶⁶ In 1998, when the lease was running out, the State of North Carolina finally bought out the remaining privately held quarter of the company, leaving it as the sole owner. Rather than re-leasing full control of the line to Norfolk Southern, the NCRR decided to take back control of its track, while providing Norfolk Southern trackage rights to run freight trains on the line.¹⁶⁷

The NC General Assembly also passed a statute requiring the NCRR to reinvest its lease earnings to improve the line. This has resulted in significant improvements, including increasing passenger speeds from 49 to 79 miles per hour (mph) between Raleigh and Selma and increasing freight speeds east of Goldsboro from 10-25 to 40 mph, while also allowing for trains up to 150 cars long (compared to 10-20 previously).¹⁶⁸ This is a vision of the what all railroads could look like under publicly ownership if earnings were reinvested in maintenance and infrastructure upgrades rather than dividends and stock buybacks.

The Western & Atlantic Railroad (W&A) owned by the State of Georgia is a state-built railroad that continues to exist today, leased to a private operator. The W&A, between Atlanta and Chattanooga, is leased to CSX with a clause that Georgia has the right to run passenger trains on the line if it chooses to do so.¹⁶⁹

Much more common than state-built railroads still in public hands are state-owned rights-of-way purchased from private railroads that wanted to abandon them. States frequently purchase and lease these lines to smaller rail operators to avoid completely abandoning rural communities whose industry and agriculture rely on them. Many states have laws, such as Maine's, providing the state first right of refusal to buy or lease a right-of-way prior to its abandonment or the dismantling of track.¹⁷⁰ With deregulation in 1970s and 80s, the rate at which Class I sought to abandon unprofitable or low-profit trackage increased substantially, and it is in the period that states have acquired the bulk of their current trackage.

165. Trelease, "The Passive Voice: The State and the North Carolina Railroad, 1849-1871," 174-79.

166. North Carolina Railroad Company, "A Brief History of the North Carolina Railroad Company," (North Carolina Railroad Company, 2016). <https://www.ncrr.com/wp-content/uploads/2016/09/NCRR-History-Narrative.pdf>.

167. North Carolina Railroad Company, "A Brief History of the North Carolina Railroad Company."

168. North Carolina Railroad Company, "A Brief History of the North Carolina Railroad Company."

169. Surface Transportation Board, *CSX Transportation, Inc.-Lease-Western and Atlantic Railroad*.

170. STATE RAILROAD PRESERVATION ACT, MRS Title 23 Chapter 615 §7105.

Almost every state has rail lines that have been acquired in this fashion and whose service continues only because of public ownership. The number of rail lines is too numerous to list here, but you can see your own state's publicly owned rail lines by searching for its State Rail Map or State Rail Plan and looking for DOT-owned lines. In Georgia, the state DOT owns 540 miles of rail, that is leases for operation by the Chattooga & Chickamauga Railway, CaterParrot Railnet, Georgia Northeastern Railroad, Georgia Southwest Railroad, Heart of Georgia, and Ogeechee Railroad Company.¹⁷¹

171. GDOT, *Georgia State Rail Plan* (April 6 2021), <https://www.dot.ga.gov/InvestSmart/Rail/StateRailPlan/Georgia%20SRP%20Final%20Draft.pdf>.

PUBLIC BRANCH LINES, PORT AUTHORITIES, AND TERMINAL RAILROADS

Another category of public railroad includes freight and switching railroads owned and/or operated by municipalities and port authorities. Many of these railroads were created in order to efficiently serve ports where multiple competing operators would have led to coordination issues. Others were created to take over rail services after Class I decided to abandon branch lines serving small towns. These railroads exist all across the United States in various forms and sizes, from several miles of track to trackage in excess of 100 miles.

One of the smallest public entity-serving railroads is the Fore River Railroad, a 2.7 mile branch line owned by the Massachusetts Water Resources Authority (MWRA).¹⁷² The line was purchased from General Dynamics when the shipyard it served closed and is now used to ship sludge and fertilizer for the MWRA in addition to serving several other industrial customers on the line.

172. Ronald Dale Karr, *The Rail Lines of Southern New England*, 2nd ed. (Branch Line Press, 2017), 388-90.

The Madison Railroad in Madison, Indiana was bought by the City of Madison in 1978 to avoid the rail line's abandonment, which would have cut off the city's industry from the national rail network.¹⁷³ The city formed the City of Madison Port Authority to operate the railroad. Under Penn Central, no maintenance had occurred between 1964 and 1978 because it was planning on abandoning the line entirely. Since the city took over, the Madison Railroad has invested more than \$15 million to upgrade bridges and track and the Railroad has succeeded in attracting economic development to the region.¹⁷⁴

173. Delay In Block Productions, *Almost Abandoned: Madison Railroad of Indiana* (YouTube, 2022).

174. "Our History," accessed July 25, 2023, <https://www.madisonrailroad.com/our-history-1>; Delay In Block Productions, *Almost Abandoned: Madison Railroad of Indiana*.

Several municipal railroads have been publicly owned since their inception, including the New Orleans Public Belt Railroad and Tacoma Rail. The City of Tacoma has owned and operated Tacoma Rail as a public utility since 1914. Tacoma Rail operates service through the Port of Tacoma and over more than 100 miles of connecting track. Its status as a public operator has allowed it to provide its services at close to cost and achieve an impressive on-time performance exceeding 99 percent.¹⁷⁵ Both Tacoma Rail and the New Orleans Public Belt Railroad are self-supporting from revenue and even financially support their municipalities.

175. "2022 Tacoma Rail Highlights," 2023, accessed March 27, 2024, <https://www.mytpu.org/2022-annual-report/2022-directors-letter/2022-tacoma-rail-highlights/>; "Tacoma Rail increases business with new port-of-call," updated May 11, 2021, accessed March 27, 2024, <https://www.mytpu.org/tacoma-rail-increases-business-with-new-port-of-call/>.

COMMUTER/REGIONAL RAILROADS

Commuter rail systems and regional railroads exist all across the United States, providing crucial passenger services over shorter distances than Amtrak. Traditional commuter rail services shuttle commuters between suburbs and city centers at the beginning and end of the workday, during peak hours. This commuting pattern has been significantly disrupted by the pandemic and more and more commuter rail systems are switching to a regional rail model with more regular service throughout the day to serve a broader range of customers.

Originally, most of these systems were operated by private railroads alongside their core freight services. However, with the rise of the automobile and alternative modes of transportation, passenger services began to lose money and railroads sought ways to dispose of their obligations. This led to public subsidies for commuter rail services and eventually public buyouts of entire operations.

Public ownership has allowed for the continued operation of these rail services that transport over a million riders per day in cities all across the United States.¹⁷⁶ Commuter rail operations are often directly owned and operated by a government authority, though some contract out operations to private companies. Although sources differ on which lines count as "commuter rail" precisely, today there are around 30 different systems in operation around the United States.¹⁷⁷

176. Timothy J. Brock and Reginald R. Soulerette, *An Overview of U.S. Commuter Rail* (University of Kentucky, May 2 2013), Appendix A, https://uknowledge.uky.edu/cgi/viewcontent.cgi?article=1323&context=krc_researchreports;NortheastCorridorAnnualReport:InfrastructureandOperationsFiscalYear2022, (Northeast Corridor Commission, March 2023), <https://nec-commission.com/app/uploads/2023/03/NEC-Annual-Report-FY22.pdf>.

177. Brock and Soulerette, *An Overview of U.S. Commuter Rail*; "Commuter Rail Systems in North America," Texas A&M Transportation Institute, accessed March 27, 2024, <https://transit-mobility.tti.tamu.edu/resources/crprofiles/>.

Many of these legacy systems, which were taken over from private operators, own the trackage they operate on, such as the MBTA in Boston or Caltrain in the Bay Area.¹⁷⁹ There are also legacy systems that don't, such as Metra, which has a complex system that includes the publicly owned and operated Electric District, Rock Island, Milwaukee North, and Milwaukee West lines as well as the BNSF and Union Pacific lines whose operations are still contracted out to their epon-

178. "Commuter Rail Systems in North America."

179. Brock and Soulerette, *An Overview of U.S. Commuter Rail*.

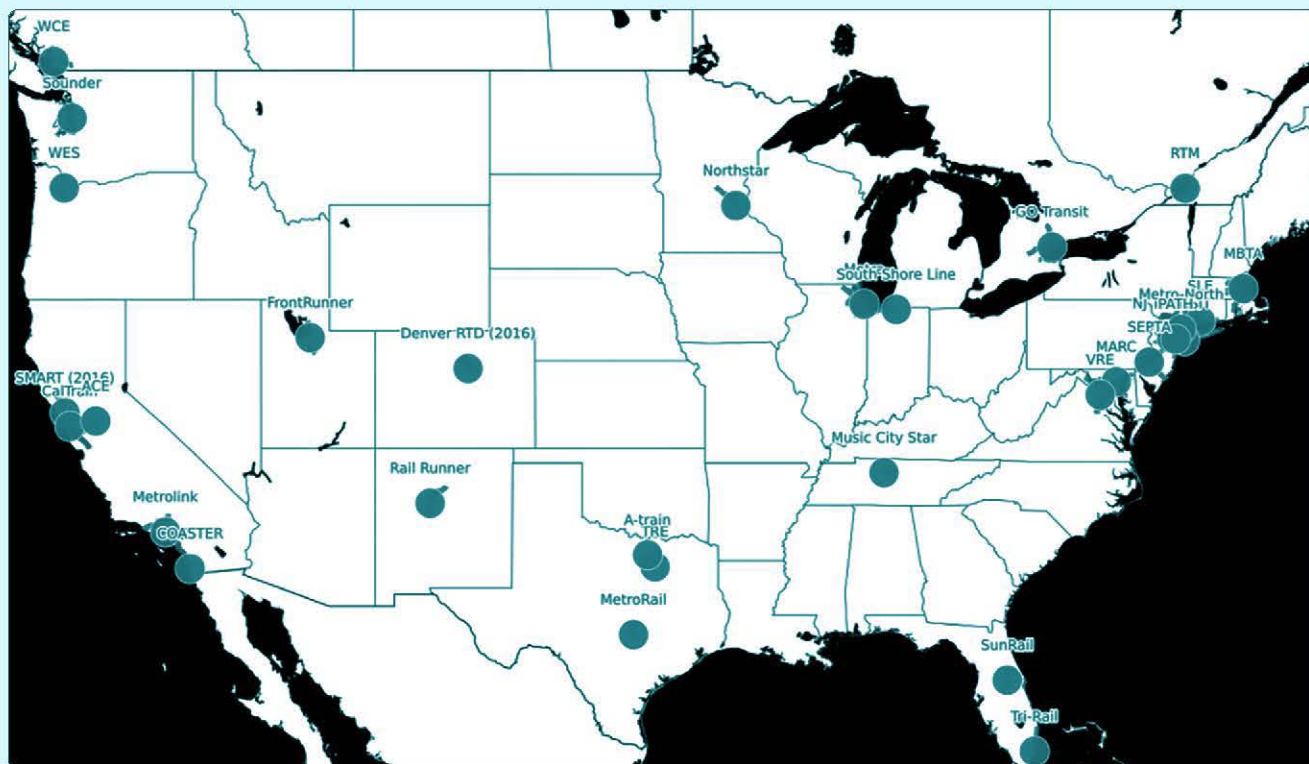


Figure 15. Map of U.S. commuter/regional Railroads¹⁷⁸

ymous freight railroads. In general, unified operations and track ownership allows for more frequent service and better control over operations.

"New start" commuter rail systems that have begun more recently often negotiate agreements with private freight railroads for the use of their tracks. Operating over freight rail tracks limits service frequency to such an extent that some systems have opted to purchase right-of-way from the Class I's to expand service and improve on time performance, such as the Virginia Railway Express and Tri-Rail in Florida.¹⁸⁰

180. Marybeth Luczak, "CSX Starts Sale for Virginia's \$3.7B Rail Initiative," *Railway Age* (April 15 2021). <https://www.railwayage.com/passenger/csx-starts-sale-for-virginias-3-7b-rail-initiative/>; Brock and Soulerette, *An Overview of U.S. Commuter Rail*.



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INTERNATIONAL RAIL SYSTEMS

In this section, we will examine rail systems from four different countries: India, Great Britain, Japan, and Switzerland. Two of these nations have privatized, or partially privatized, rail systems (Britain and Japan) and two have publicly owned rail systems (India and Switzerland). Each country's railroad is uniquely structured with its own history. By studying these systems, we can better understand the advantages and disadvantages of various decisions that might inform a public rail system for the United States.

INDIA

India's rail network is publicly owned and operated by Indian Railways, under the Ministry of Railways. Indian Railways is fully integrated, operating freight and passenger services, building rolling stock, and constructing new rail lines. Indian Railways serves as an effective example of the massive improvements in infrastructure and operations that are possible with an integrated publicly owned national railway and strong government support.

Like those in the US, India's railways carry a lot of freight. In fact, Indian Railways carries more freight tonnage in a year than the entire U.S. rail network. In 2023, Indian Railways carried 1.67 billion tons of freight traffic, which is more than the 1.6 billion tons carried by U.S. railroads in the average year.¹⁸¹ Freight traffic in India has also steadily recovered from the pandemic, rising from 1.36 billion tons in 2021 to 1.56 billion tons in 2022.¹⁸²

Unlike the Class I's in the US, however, Indian Railways carries this enormous volume of freight while also providing over ten thousand passenger train runs daily. In 2022, Indian Railways carried over 3.5 billion passengers, more than 100 times more than Amtrak carries in a year.¹⁸³

Indian Railways is funded by revenue from operations, as well as support from the Ministry of Railways as allocated

181. Brock and Soulerette, An Overview of U.S. Commuter Rail; "Commuter Rail Systems in North America," Texas A&M Transportation Institute, accessed March 27, 2024, <https://transit-mobility.tti.tamu.edu/resources/crprofiles/>.

182. Short tons. Original figures: 1.231 and 1.416 billion metric tons (tonnes) respectively. Ministry of Railways, *Indian Railways Year Book 2021-22* (2023), 6, <https://iritm.indianrailways.gov.in/uploads/files/1680252282408-PDF%20Year%20Book%202021-22-English.pdf>.

183. Ministry of Railways, *Indian Railways Year Book 2021-22*, 5-6.

in the government budget. In 2024, the amount allocated to the Ministry is 2.5 trillion Rupees, or around 30 billion dollars.¹⁸⁴ The amount of funding provided to the railways reflects a coordinated push to improve India's rail network. Government funding to the railways has grown nearly ten times since 2014 when a program for strong investment in rail began

Indian Railways has done an impressive job of coordinating this infrastructure investment. In the past ten years, Indian Railways has electrified more than 40,000 route kilometers (25,000 route miles) of track with overhead catenary.¹⁸⁵ The pace of construction has only accelerated as the project has progressed. In 2023 alone, Indian Railways electrified over 6,500 kilometers (4,000 miles) of track. India is electrifying using the international standard 25 kilovolts AC and has set an ambitious goal of full decarbonization by 2030. With 100 percent of the railways set to be electrified by the end of 2024, full decarbonization may well be within reach by 2030, requiring only a switch to renewable power sources.¹⁸⁶ This decarbonization deadline is decades ahead of those set in the rest of the world.

Indian Railways' electrification serves as a powerful counterpoint to the claim that electrification is unfeasible because double stack containers cannot fit under catenary wires. Not only does Indian Railways operate electric locomotive-pulled

184. Harshit Sabarwal, "India Budget 2024: For railways, FM Sitharaman says 3 major economic corridor programmes to be implemented," *WION* (February 1 2024). <https://www.wionews.com/india-news/india-budget-2024-for-railways-fm-sitharaman-says-3-major-economic-corridor-programmes-to-be-implemented-685834>.

185. Indian Railways, "Status of Railway Electrification," (March 1 2024). https://indianrailways.gov.in/railwayboard/uploads/directorate/ele_engg/RE/2024/Railway%20Electrification_final.pdf.

186. Nick Ferris, "How India electrified 45% of its railway network in just five years," *Energy Monitor* (February 2 2024). <https://www.energymonitor.ai/tech/electrification/how-india-made-45-of-its-railway-network-electric-in-just-five-years/?cf-view>.

187. Indian Railways, "Status of Railway Electrification."

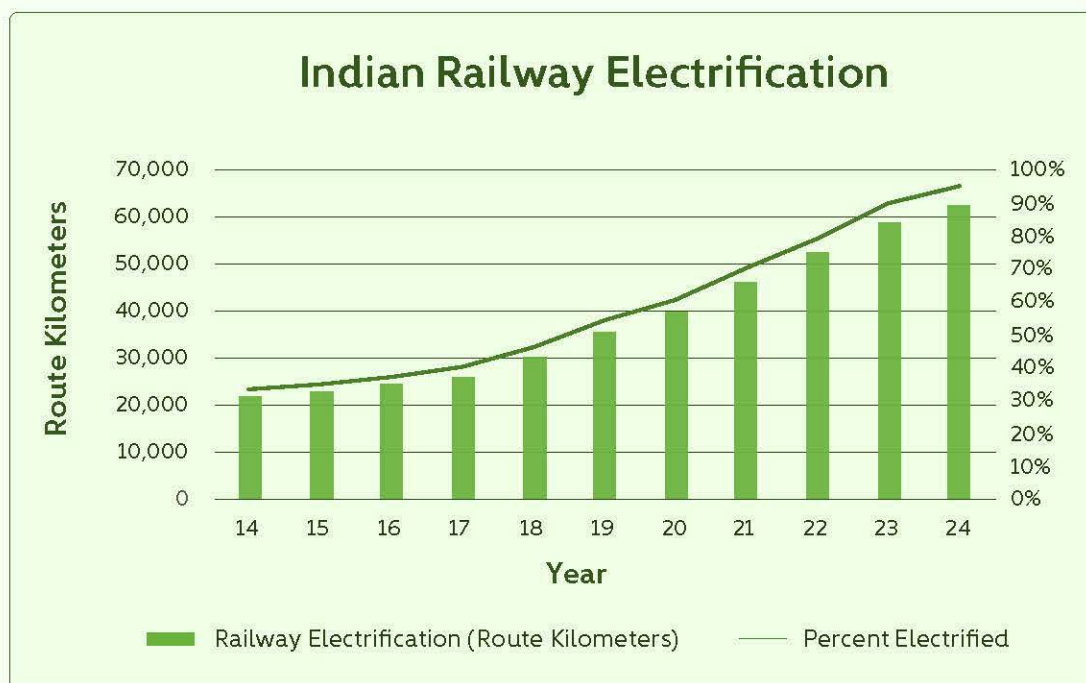


Figure 16. Indian Railway electrification rate (as of February 2024)¹⁸⁷

trains of double stacked containers on electrified corridors, but the height of Indian double stacks is also greater than that of American trains.¹⁸⁸ This greater overall height is due to Indian Railway's use of flatcars where containers sit above the wheels, unlike American or Chinese "well cars" where containers sit down below the wheels, lowered down in a "well" in the middle of the railcar.

Indian Railways has also begun the construction of dedicated freight corridors. These routes are, at minimum, double tracked and electrified for high volume freight traffic.¹⁸⁹ The alignments are also designed for speeds up to 100 kilometers per hour (62 miles per hour). Trains on the dedicated freight corridors average 50-60 kilometers per hour (30-37 miles per hour), roughly three times faster than freight trains on conventional railway tracks where they intermingle with passenger traffic. These dedicated corridors are anticipated to cut freight travel times across India, while freeing up capacity on conventional tracks for passenger trains and shifting freight from congested highways onto rail.

Aside from sufficient government funding, one of the key reasons why India has been so effective at carrying out these large-scale rail infrastructure projects is national coordination. Since Indian Independence in 1947, Indian Railways has laid out strategic 5-year plans for infrastructure investment and service.¹⁹⁰ These strategic plans are only possible because Indian Railways is fully integrated and publicly owned. It has also spent considerable effort to develop domestic capabilities to produce its own locomotives, rolling stock, and track components.

Indian Railways is not without its issues—it has had several high-profile crashes in the past several years—but the sheer amount of freight and passengers it moves is astounding. Without stopping its operations, Indian Railways has undertaken an electrification project unparalleled throughout the rest of the world, made possible by strong government support and internal coordination. India's rail network presents a vision for what the U.S. could achieve if we made a concerted effort to invest in capacity and electrify our trackage while running many more passenger trains.

188. Oliver Cuenca, "Indian Railways launches electric double-stack container operation," *International Railway Journal* (June 16 2020). <https://www.railjournal.com/freight/indian-railways-launches-electric-double-stack-container-operation/>.

189. IANS, "Freight corridors to speed up flow of goods, free up railway tracks," *ET Infra* (January 7 2024). <https://infra.economictimes.indiatimes.com/news/railways/freight-corridors-to-speed-up-flow-of-goods-free-up-railway-tracks/106609523>.

190. Ferris, "How India electrified 45% of its railway network in just five years."

GREAT BRITAIN

Britain's rail system is quite different from that of the United States. It spans much shorter distances with a higher density of track, and it primarily carries passengers rather than freight. Nonetheless, it provides a useful example of the dangers that come from the privatization and fragmentation of a railroad system into dozens of pieces.

After decades of public ownership in the mid-20th century, British Rail was split into dozens of pieces, and privatized, separating track from operations and rolling stock and splintering train operations into regional franchises. The privatization of the railways had been seen as a step too far, even by Conservative Prime Minister Margaret Thatcher, and the British Treasury warned of the dangers of privatizing an industry with "many joint costs and interdependence of different services [which] cannot easily be broken down into separate elements."¹⁹¹

191. Sean McCartney and John Stittle, *The Privatisation of British Rail: How Not to Run a Railway* (Routledge, 2023), 6.

Despite these concerns, privatization went ahead under the subsequent government of John Major. It took less than a decade for private ownership of the track infrastructure, under Railtrack, to be deemed an utter failure. Railtrack's management had resulted in several deadly derailments, deferred maintenance, and rising construction costs. In 2002, the physical infrastructure was functionally renationalized under Network Rail, which shortly thereafter reabsorbed maintenance operations as well.¹⁹²

192. José Gómez-Ibáñez, "Open Access to Infrastructure Networks: The Experience of Railroads," *Review of Industrial Organization* 49, no. 2 (2016): 332–34, <https://www.jstor.org/stable/44737421>.

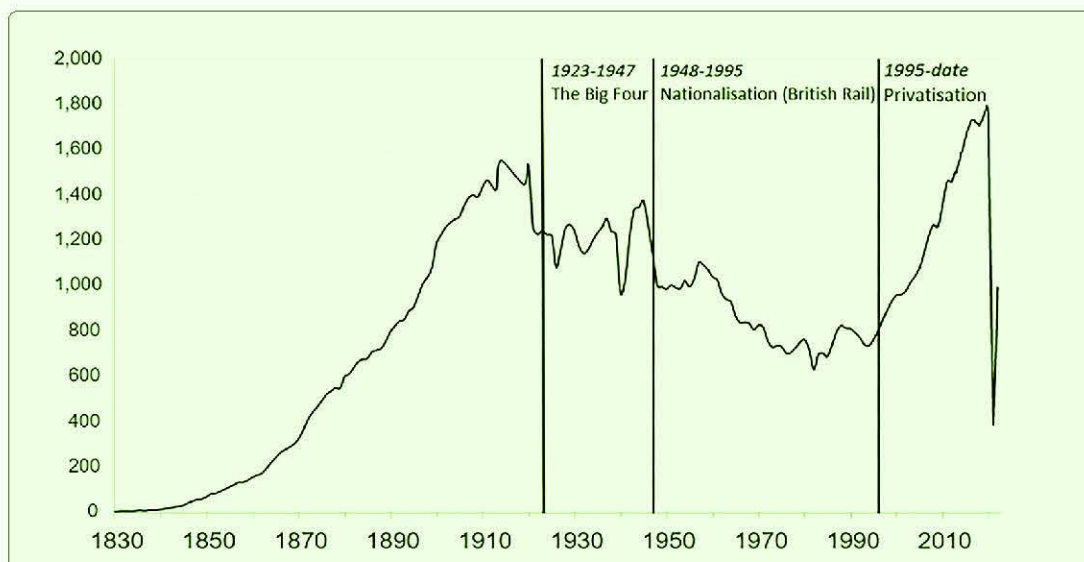


Figure 17. Rail passengers by year in Great Britain (in millions)

But the physical infrastructure was only part of the story. Defenders of Britain's rail privatization frequently point to a graph of rail passengers, included here as figure 17, to prove that privatization was a success.¹⁹³ While at first glance this graph looks impressive, the return of passengers to British railroads can be explained by other factors: as a phenomenon that occurred in spite of—rather than thanks to—private railroad operators.

To avoid getting bogged down in minutiae such as the early 1990s recession that the United Kingdom emerged from simultaneously with the privatization of British Rail, let us instead compare this supposed miraculous British passenger rail renaissance with ridership in another country. Switzerland, whose rail network we shall examine in greater detail later, has a fully integrated public rail system. If we set our base year in 1970, when passenger rail ridership was near its very lowest, we can compare the ridership recovery of Britain and Switzerland.

193. Bellowhead678, "GBR rail passengers by year 1830-2015," (Wikimedia Commons: Wikimedia Commons, 2022).

194. "Table 1230: Passenger kilometres, Great Britain, January 1938 to March 2023," ed. Office of Rail and Road (United Kingdom, 2023). <https://dataportal.orr.gov.uk/statistics/usage/passenger-rail-usage/table-1230-passenger-kilometres/>; "Transport de personnes: prestations de transport," ed. Bundesamt für Statistik (Switzerland, 2023). <https://www.bfs.admin.ch/bfs/de/home/statistiken/mobilitaet-verkehr/personenverkehr/leistungen.assetdetail.29365088.html>.

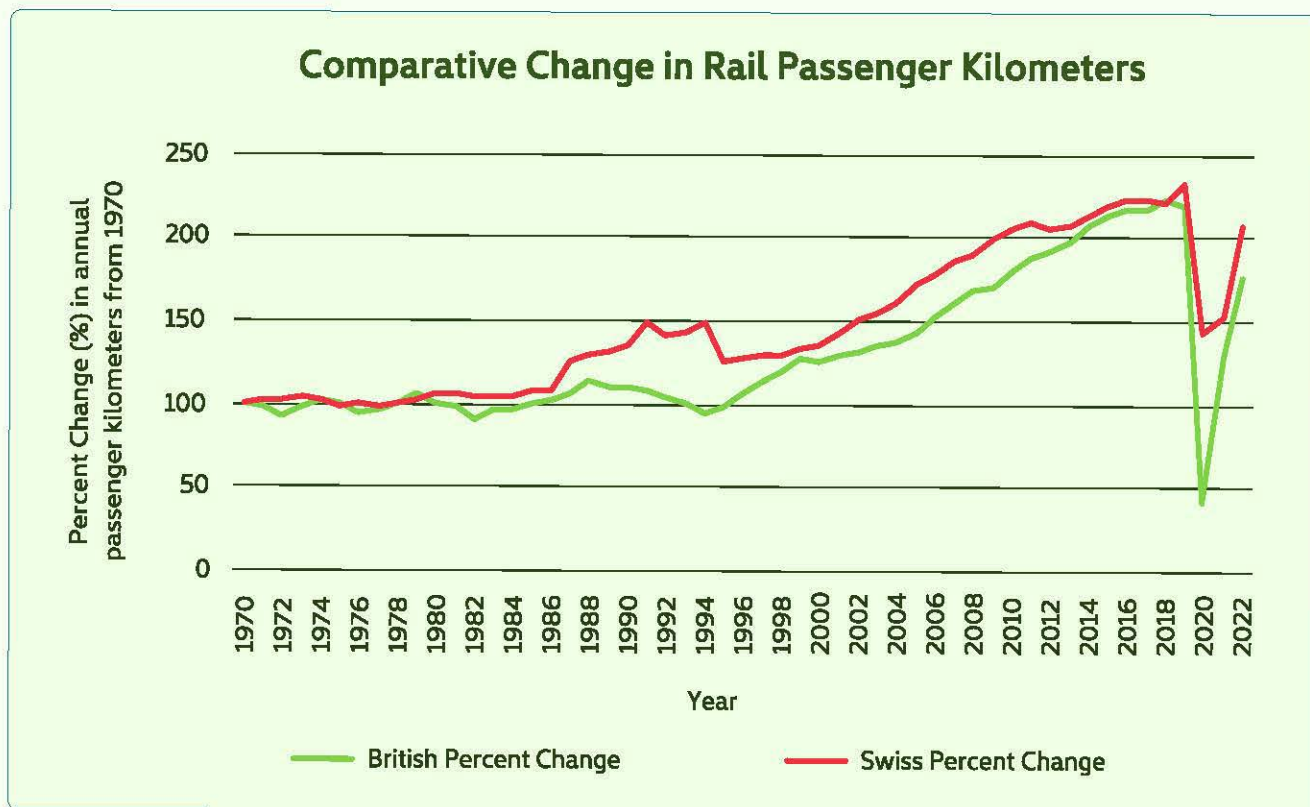


Figure 18. Comparative percent change in rail passenger-kilometers in Great Britain and Switzerland since 1970

As figure 18 shows, the increase in passenger-kilometers traveled in both Switzerland and Great Britain follows broadly the same trend over the past 50 years.¹⁹⁴ If anything, Switzerland outperformed Britain in both its ridership growth and its swift

recovery from Covid-19. In both countries, there are dozens of factors that influence ridership aside from private vs public ownership. All the same, this comparison demonstrates that British privatization did not produce some extraordinary, unparalleled result.

Privatization failed to deliver the innovation and cost-savings promised by its backers. In fact, prior to privatization, British Rail was among the most productive railways in Europe, even while receiving less public subsidy. Before privatization, British Rail's subsidy represented 0.16 percent of British GDP, compared to the 0.52 percent of GDP that countries in mainland Europe were spending on their railroads.¹⁹⁵ Since privatization, the amount of public subsidy to the railways has exploded. Rather than bringing in revenue from "premium payments," the British government is now paying exorbitant amounts to private corporations to operate its rail network.

The vast inefficiencies of the fragmented, private train operating companies have led to ballooning operating costs. Normally, when passenger volumes increase, unit costs per passenger decrease. Prior to privatization, British Rail was reducing its unit operating costs (that of carrying one passenger one kilometer) by around 2 percent per year.¹⁹⁶ This has not been the case for the privatized train operating companies, whose unit costs have risen at the same time as passenger volumes have soared.¹⁹⁷ One estimate suggests that £51 billion (in 2013/14 prices – roughly £69 billion in 2023) in additional costs between 1997 and 2014 would have been avoided if British Rail hadn't been privatized.¹⁹⁸

The operating subsidy paid to British Rail in the late 1980s and early 90s hovered around £1-2.4 billion pounds (in 2020/21 prices).¹⁹⁹ By the mid-2000s, subsidy to private train operators had grown to £4-8 billion pounds, hitting £6.5 billion in 2019 pre-Covid. As a result of the Covid-19 pandemic, operating subsidy paid to train operating companies hit £16.9 billion, leading to a wholesale reevaluation of the franchising mode.

Private train operating companies have also failed to provide quality service or induce competition. Fragmentation has made the system more confusing for passengers and led to poor on-time performance across the nation.²⁰⁰ To quote the government: "Before the pandemic, performance was disappointing and passengers' biggest priority for improvement

195. Christian Wolmar, *British Rail: A New History* (Penguin Random House UK, 2022), 332.

196. McCartney and Stittle, *The Privatisation of British Rail: How Not to Run a Railway*, 103-06.

197. McCartney and Stittle, *The Privatisation of British Rail: How Not to Run a Railway*, 89-104.

198. McCartney and Stittle, *The Privatisation of British Rail: How Not to Run a Railway*, 107.

199. McCartney and Stittle, *The Privatisation of British Rail: How Not to Run a Railway*, 20-21.

200. Keith Williams and Grant Shapps, *Great British Railways: The Williams-Shapps Plan for Rail* Department for Transport (May 20 2021), 13, <https://www.gov.uk/government/publications/great-british-railways-williams-shapps-plan-for-rail>.

was punctuality. Around half of trains in northern England and a third of trains nationally were late in 2019/20. This has barely improved in the past five years.”²⁰¹ On top of poor service quality, private operators have also raised prices for consumers in pursuit of profit, making Britain’s rail tickets some of the most expensive in Europe.

201. Williams and Shapps, *The Williams-Shapps Plan for Rail*, 13.

There have been so few companies bidding for franchises that two-thirds of contracts have been awarded without any competition since 2012.²⁰² In the absence of any real consequences for failing to fulfill the terms of their franchise, train operating corporations often overbid during contract tendering, promising high premium payments to the government at the end of their contract period. This tendering process allows companies to cash in for the first few years of low premium payments and cease operation when they can’t afford to make the premium payments they promised for the end of the contract.²⁰³

202. Williams and Shapps, *The Williams-Shapps Plan for Rail*, 18.

203. McCartney and Stittle, *The Privatisation of British Rail: How Not to Run a Railway*, 79-80.

When these failures occur, the Department for Transport steps in to either re-bid the franchise or take over as operator of last resort. Prior to Covid, two franchises had already been taken over by the government for the long-term. After Covid, the prevalence of government operators ballooned, with most rail services in Scotland and Wales being re-nationalized as Scot Rail and Transport for Wales. In 2021, the Williams-Shapp White Paper was published outlining the failures of the franchising system and calling for a new model for the railways. The introduction to the white paper concludes with precisely what we posited earlier: “The railways have been successful despite this complex system and culture, not because of it.”²⁰⁴

204. Williams and Shapps, *The Williams-Shapps Plan for Rail*, 15.

Privatization failed to deliver the innovation or competition it promised. Instead, Britain has seen rising ticket prices, declining service quality, and a higher subsidy payment to private companies. Britain’s privatization of the railways was a failure that they are slowly rectifying by bringing the train operations and infrastructure back under public control.

JAPAN

Japan's railway system is famous for its Shinkansen high speed rail network. Japan's rail system also has some of the highest ridership in the world, carrying 25.2 billion passengers in 2019 across 435 billion passenger-kilometers. Over 80 percent of all passengers carried in Japan travel on the rail network, while the remaining 20 percent are split between buses, airlines, and ferries.²⁰⁵

Since 1987, Japan's railway system has been partially privatized, albeit through a very different process than British Rail. The former state-owned railway company, Japan National Railways (JNR), was divided into six vertically-integrated companies as a part of Japan Railways Group (commonly referred to as JR Group). Freight services remained under a nationwide provider with universal track access, JR Freight.

The JR Group companies were very carefully designed when JNR was split up in 1987. The territory and Shinkansen access charges paid by the Honshu JR companies (JR East, West, and Central), on Japan's main island, were planned so that each company's profits would be relatively equal, and capable of paying off their portion of JNR's debt. The Honshu JR companies also paid into a fund to subsidize the unprofitable Island JR companies (JR Kyushu, Shikoku, and Hokkaido).²⁰⁶ The JR Group companies further benefited from the majority of JNR's debt being taken over by the JNR Settlement Corporation.²⁰⁷

The Honshu JR companies, as the profitable railways among the group, were the first to be fully privatized. One of the island railways, JR Kyushu, was also privatized in an initial public offering in 2016. JR Hokkaido, JR Shikoku, and JR Freight remain publicly owned by Japan Railway Construction, Transport and Technology Agency (JRTT).

The government remains deeply involved in the railway system through JRTT constructing new Shinkansen lines. The earliest Shinkansen lines were constructed with government funds under JNR and though originally planned to be leased to JR Group for operation after privatization, these lines were sold to the Honshu JR companies to ensure the private company's financial success.²⁰⁸ Subsequent Shinkansen lines have been constructed by JRTT, including the Hokkaido, Tohoku, Joetsu, Hokuriku, and Kyushu Shinkansen. These lines remain publicly owned and are leased to JR Group companies.²⁰⁹

205. *Statistical Handbook of Japan 2023*, ed. Statistics Bureau (Ministry of Internal Affairs and Communications, 2023), 97-98.

206. Tatsujiro Ishikawa and Mitsuhide Imashiro, *The Privatisation of Japanese National Railways: Railway Management, Market and Policy* (Great Britain: The Athlone Press, 1998), 31-43.

207. Ishikawa and Imashiro, *The Privatisation of Japanese National Railways*, 27-30.

208. Ishikawa and Imashiro, *The Privatisation of Japanese National Railways*, 32-33.

209. JRTT, *JRTT Profile*, <https://www.jrtt.go.jp/english/jrttprofile-en.pdf>.

The Chuo Shinkansen, JR Central’s ultra-high-speed maglev project, has also received preferential government bonds for 3 trillion yen (over half of the project’s total projected cost when awarded).²¹⁰ In addition to Shinkansen Lines, JRTT has constructed and owns several urban rail lines, which are leased to JR Group companies.

210. Keith Barrow, “JR Central’s Shinkansen ‘dual system’ to create Japanese megaregion,” *International Railway Journal* (April 17 2019). https://www.railjournal.com/in_depth/jr%E2%80%88centrals-shinkansen-dual-system-japanese-megaregion/.

Japan also has non-JR Group railways, which largely fall into two categories: private railways and “third sector” railways, which have mixed public-private ownership. Many of these rail lines fall into similar categories as Class II and III railroads in the United States. During the process of privatizing JNR, dozens of local rail lines were transferred to local control under third sector railways.

As well as receiving government support for infrastructure investment, both JR Group and private railways remain carefully regulated as public utilities. JR Group companies’ business plans and debt issuances are subject to approval by the Ministry of Transport.²¹¹ Railways in Japan derive the majority of their revenue from passenger fares and hold a significant share of the transportation market.

211. Chul Ju Kim and Michael C. Huang, “The Privatization of Japan Railways and Japan Post: Why, How, and Now,” November 2019, 1039, Working Paper, Asian Development Bank Institute.

To prevent railways from abusing their position, fare increases are subject to approval by the Ministry of Transport. Railway

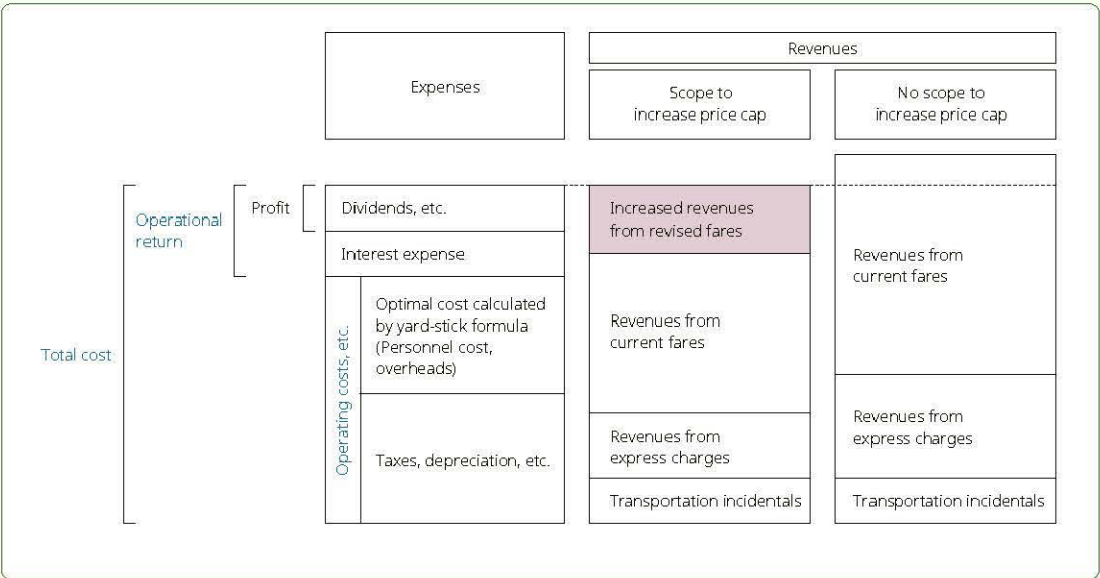


Figure 19. Total cost calculation and fare price cap approval on Japanese railways²¹²

companies in Japan are allowed to earn revenues equal to their total cost, determined to be a combination of operating costs and a reasonable return on investment, as shown in

212. Masaru Okabe, “New Passenger Railway Fares,” *Japan Railway & Transportation Review*, no. 37 (2004).

figure 19. The government approves a price ceiling for passenger fares, rather than setting a fixed fare, to allow flexibility while also preventing customers from being overcharged.²¹³

Another defining feature of post-privatization JR Group companies and private railways in Japan is their diversification outside rail transportation.²¹⁴ JR East and JR Kyushu derive 32 percent and 60 percent of their operating revenue from non-rail ventures such as real estate and retail respectively.²¹⁵ This non-rail revenue helps to stabilize income during years of lower ridership and transportation revenue.

This diversification for the JR Group was possible as a result of two convergent factors. First, the process of privatization removed a statutory restriction on JR Group companies that had prevented JNR from operating non-rail-related businesses.²¹⁶ Second, JR Group companies own their stations and surrounding real estate because they remained vertically integrated. These two conditions have allowed for JR Group to capitalize on the extremely high ridership that passes through their system each day through desirable apartments near stations and retail within—both forms of transit-oriented development.

Japan's rail system is truly unique in the world. It is highly efficient at carrying tens of billions of passengers each year. Japan's regulatory approach is an in-between compared to the United States' pre-ICC rate setting model and post-Staggers deregulation. While this is a model applied to passenger fares, the concept of rate ceilings for freight might be applied to a U.S. public rail corporation. Japan's privatization has been successful relative to other countries like the United Kingdom largely because it has been limited in essence. The government still plays a strong role in overseeing and supporting the rail industry. JR Group companies, controlling the vast majority of Japan's trackage, are a unique entity within the corporate landscape and treated as public utilities.

213. West Japan Railway Company, *Fact Sheets 2023* (2023), 19, <https://www.westjr.co.jp/global/en/ir/library/fact-sheets/2023/pdf/fact19.pdf>.

214. Eleanor Warnock, "Lessons from Railway Privatization in Japan," *Tokyo Review* (October 11 2018), <https://tokyoreview.net/2018/10/japan-railway-privatization/>.

215. East Japan Railway Company, *FY2024.3 Financial Results Presentation* (April 30 2024), https://www.jreast.co.jp/e/investor/pdf/2024_presentation.pdf; Kyushu Railway Company, *FY24.3 Annual Investors Meeting Presentation* (May 10 2024), https://www.jrkyushu.co.jp/company/ir_eng/news/___icsFiles/afieldfile/2024/05/10/9142.FY2024.4q.material.en_1.pdf.

216. Kim and Huang, "The Privatization of Japan Railways and Japan Post", 4.

SWITZERLAND

Switzerland is renowned for its frequent and reliable rail system. It has the highest rail utilization in Europe, with the average person travelling 2,451 kilometers by train annually—1,013 more kilometers than the average French person who travels the second most by rail. Swiss railways also rank highest in Europe for punctuality, safety, and overall ridership.²¹⁷ This world-leading performance is all thanks to meticulous planning and sustained public investment.

Switzerland's largest railroad is Swiss Federal Railways (SBB), a public corporation owned by the Swiss Confederation, carries over 80 percent of the nation's passenger-kilometers. In addition to SBB, there are over 40 private railways in Switzerland.²¹⁸ However these private railways are predominantly owned by the Swiss Confederation and regional Canton governments. The average private share of ownership in private Swiss railway companies is only around 10 percent.²¹⁹

For the bulk of the 20th century, SBB was a public institution within the Swiss federal government. In 1996, Switzerland began a series of railway reforms which led to redesignating SBB as an independent corporation with shares 100 percent owned by the Swiss Confederation. This reform gave SBB operational autonomy from the Swiss government, but the Confederation still shapes SBB's "strategic direction" through contracts signed every 4 years for rail services.²²⁰

Swiss railway reform over the past 30 years was carried out slightly differently than the European Union's (EU) standard liberalization policy to introduce competition through vertical separation of track from operations, open access for international trains, and franchising of regional services. SBB and large private railways' infrastructure and operations were split into separate divisions but remain within the same companies. The idea of full separation into infrastructure management and train operating companies²²¹ was rejected because of concerns that it would lead to much higher coordination costs and prevent the Swiss rail system from maintaining its extraordinarily high track capacity utilization.²²²

While railway companies remain vertically integrated, train paths are allocated neutrally by an independent federal entity known as TVS. The Federal Office of Transport maintains a key role in coordinating between SBB and private operators to determine the country's transport needs and design the

217. Luigi Jorio, "Are Swiss trains becoming less punctual, pricier and more dangerous?" (September 16 2019). https://www.swissinfo.ch/eng/business/public-transport-in-numbers_are-swiss-trains-becoming-less-punctual-pricier-and-more-dangerous/45231238.

218. Didier van de Velde, Switzerland: Research on Railway Competition - National Report, Erasmus University Rotterdam (January 1998), 40-41; "TVS Briefly Explained," accessed April 29, 2024, <https://www.tvs.ch/tvs-briefly-explained>.

219. van de Velde, Switzerland: Research on Railway Competition, 40-41.

220. SBB was restructured as a public corporation in 1999 during the second stage of Swiss railway reform. Christian Desmaris, "The reform of passenger rail in Switzerland: More performance without competition," Research in Transportation Economics 48 (December 2014): 291, <https://www.sciencedirect.com/science/article/pii/S0739885914000961>.

221. Desmaris, "The reform of passenger rail in Switzerland: More performance without competition," 291; van de Velde, Switzerland: Research on Railway Competition, 24.

222. van de Velde, Switzerland: Research on Railway Competition, 83; "Railway Reform," Swiss Confederation, accessed May 17, 2024, <https://www.bav.admin.ch/bav/en/home/modes-of-transport/railways/informations-for-professionals/railway-reform.html>.

nationwide timetable.²²³ These timetables are then submitted to TVS to ensure that all of the proposed train routes are viable and resolve any conflicts that may exist between train paths.²²⁴

Switzerland has a nationwide clockface timetable. Intercity trains depart from each station at regular intervals, hourly or half-hourly, allowing for easy connections between different routes. The average wait time for a connection between two lines at any station across Switzerland is less than 10 minutes.²²⁵ Passengers are able to make their connections 98 percent of the time.²²⁶ Planning for this timetable requires an incredible amount of coordination between SBB and the smaller private railways. This coordination is only possible because of Switzerland's public owned rail system that is focused on high quality service. Planning for Switzerland's nationwide timetables begins years ahead of time and has already begun planning for 2030-2040 timetables.²²⁷

Trains included in the national timetable are given priority over all other trains in the allocation of train paths by TVS. This prioritization is seen as necessary for Switzerland to maintain its impressive on-time-performance, with 90 percent of trains at each station within 3 minutes of their scheduled arrival.²²⁸ For non-timetable services seeking access to the network, there is a procedure for authorization and path allocation that ensures that new services will not hinder the system's overall performance. New train operating companies must also fulfill wage and work standards to prevent "social dumping" where companies seek to compete by undermining existing collective bargaining agreements to provide cheaper service.²²⁹

Another aspect of Swiss railway reform was regionalization, whereby Cantonal governments were given a greater role in designing and coordinating regional services. The greater autonomy for Cantons to coordinate regional rail service has allowed for greater responsiveness to local needs and demands. This regionalization has been effective insofar as it has increased regional passenger ridership in line with the increase in intercity ridership. At the same time, the amount of subsidy per train-kilometer decreased from 10.2 Swiss Francs (CHF) in 2000 to 7.8 CHF in 2013.²³⁰

Swiss railway reform has been overwhelmingly successful, coupled with strong investments in infrastructure improve-

223. Desmaris, "The reform of passenger rail in Switzerland: More performance without competition," 296; Ian Griffiths, "Notes from Switzerland: The nation-wide system of coordination," Seamless Bay Area, May 18, 2023, <https://www.seamlessbayarea.org/blog/2023/6/5/notes-from-switzerland-the-nation-wide-system-of-coordination-for-9m-people>; Tim Petersen, "Watching the Swiss: A network approach to rural and exurban public transport," Transport Policy 52 (November 2016): 184, <https://www.sciencedirect.com/science/article/pii/S0967070X16301469>.

224. TVS, "TVS Briefly Explained."

225. "The integrated timetable of Switzerland," Jokteur, 2022, accessed May 18, 2024, <https://www.jokteur.com/a/integrated-timetable-switzerland/>.

226. Chantal Britt, "The Swiss timetable is due to meticulous planning," (December 9 2012). <https://www.swissinfo.ch/eng/democracy/the-swiss-timetable-is-due-to-meticulous-planning/34102496>.

227. "Über uns," accessed May 16, 2024, <https://www.sob.ch/die-sob/ueber-uns>.

228. Britt, "The Swiss timetable is due to meticulous planning."

229. van de Velde, *Switzerland: Research on Railway Competition*, 25-29; Luigi Jorio, "Does the Swiss rail network have room for international competition?," (April 24 2024). <https://www.swissinfo.ch/eng/life-aging/does-the-swiss-rail-network-have-room-for-international-competition/76350426>.

230. Desmaris, "The reform of passenger rail in Switzerland: More performance without competition," 292.

ments. Unlike other European countries that underwent reform in their rail industries, Switzerland has achieved productivity improvements based on increases in passenger and freight traffic instead of reductions in employees. Between 1995 and 2011, passenger ridership increased 51.6 percent and freight traffic grew 51.4 percent.²³¹

In addition to its impressive passenger service, the Swiss rail network moves a sizeable amount of freight. Since the 1990s, between 37 and 40 percent of all tonne-kilometers of freight in Switzerland has moved by rail.²³² Rail's share of trans-Alpine freight traffic crossing the country is even higher. In 1994 Swiss voters approves the Alps Initiative to shift trans-Alpine freight to rail in order to protect the Alps from heavy truck traffic. As of 2023, rail has increased its share of trans-Alpine freight traffic to 72 percent.²³³ To achieve this modal shift, Switzerland has invested significantly in two new rail tunnels beneath the Alps and other infrastructure upgrades.²³⁴

Switzerland's world-class rail system represents a glimpse of the national coordination and high-quality services that are possible under public ownership. Precision Scheduled Railroading has been anything but in the United States. The Swiss rail system is not only precise and scheduled, but it has achieved double digit growth over the past few decades in freight and passenger traffic.

231. Desmaris, "The reform of passenger rail in Switzerland: More performance without competition," 294.

232. "Goods transport by rail," Swiss Confederation, accessed May 18, 2024, <https://www.bfs.admin.ch/bfs/en/home/statistics/mobility-transport/goods-transport/rail.html#1341356389>.

233. Quintus Vosman, "Swiss report drop in trans-Alpine rail freight," *International Railway Journal* (March 26 2024). <https://www.railjournal.com/freight/swiss-report-drop-in-trans-alpine-rail-freight/>; Britt, "The Swiss timetable is due to meticulous planning."

234. van de Velde, Switzerland: *Research on Railway Competition*, 36.



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ANALYZING MODELS FOR PUBLIC RAIL

There are multiple models of public ownership and operation that have been developed by different rail systems over the past century. For the sake of brevity, they have been broken down in this section into three categories representative of the contemporary international rail landscape: open access, franchising, and fully integrated public operation. Within each category there is a great deal of variation, and many countries have a hybrid structure that includes components of each model. Each model has its own advantages and disadvantages.

OPEN ACCESS: PUBLIC OWNER, MULTIPLE OPERATORS

Open access is a model that has become increasingly popular over the past 30 years as it has continued to be rolled out in the European Union. Open access is relatively novel and is composed of several principles. One of the most basic principles of the open access model is vertical separation. Track infrastructure is separated from train operations. The track infrastructure is either owned and maintained by an infrastructure manager or segmented into an independent subsidiary of a railroad holding company.

This vertical separation is designed to allow for nondiscriminatory allocation of train paths by a third party. This structure allows for new market entry by small train operating companies and fosters “on track” competition. Proponents of open access suggest that competition between multiple operators will lead to more plentiful, higher quality services at lower prices. In the US, open access has also been proposed as a solution to the problem of “captive shippers” served by one railroad. “On track” competition under open access is intended to spur a modal shift to rail. Though open access remains relatively novel, a study of its effects in Europe concluded that neither vertical separation nor the introduction of competition has led to an increase in rail’s modal share.²³⁵

235. Zdeněk Tomeš, “Do European reforms increase modal shares of railways?,” *Transport Policy* 60 (November 2017): 150, <https://www.sciencedirect.com/science/article/pii/S0967070X16306941>.

One of the driving forces behind open access in the EU is the desire to develop more long-haul international rail traffic by allowing train operators to cross between national rail networks.²³⁶ This motivation is less important in the United States, or even North America more broadly, as our rail network is already based on common technical and operating standards across the continent. In this way, open access is less important if we can have a unified railroad across the entire United States—or facilitate efficient interchanges between railroads.

The concept of shared access is not entirely foreign to the United States—out of our 171,061 miles of railroad, approximately 20 percent had some sort of shared access, as of 2005.²³⁷ This represents 30,151 miles (17.7%) of rails with shared access rights and 6,678 miles (3.9%) of terminal and switching railroads which provide customers with access to multiple other railroads. These access rights are often reciprocal with other railroads, and in many cases date back decades. Open access would be a significant departure from this precedent, by providing all rail operators access to the entire public rail network.

Open access runs into issues with the fundamental economics of railroads. Railroads experience significant economies of density—it is much more efficient for one railroad to serve three customers on a line than for three railroads to individually operate a train for each customer. As a consequence, open access might not even lead to a competitive market for rail transportation, especially if the Class I's continue to exist, because there are dramatic benefits to operational efficiency resulting from traffic density.²³⁸ Competition, then, may come at the expense of operational efficiency and frequent turnover among rail companies. Another issue with the open access model is the sacrifice of the numerous cost benefits of vertical integration and the economies of scale that are experienced by rail companies.²³⁹

Open access also removes the common carrier obligation from each train operator, granting them permission to compete in each market as they desire. Under an open access regime, one can easily imagine that private operators would compete for profitable, high volume unit train customers while leaving lower-volume shippers to the public option operator—who would then have to rely on greater public subsidy in order to continue providing its services. Across-

236. Chris Nash, "Europe: Alternative Models for Restructuring," in *Competition in the Railway Industry: An International Comparative Analysis*, ed. José Gómez-Ibáñez and Ginés de Rus (Edward Elgar, 2006; reprint, 2015), 27–29.

237. Gómez-Ibáñez, "Open Access to Infrastructure Networks: The Experience of Railroads," 335.

238. Robert E. Gallamore and John C. Panzar, "When is Competition Not Good? The Case of Compelled Access and Maximum Rate Regulation for Railroad 'Captive Shippers'" (October 6 2004), 12–14; Russell Pittman, "Structural Separation to Create Competition? The Case of Freight Railways," *Review of Network Economics* 4, no. 3 (2005): 191–92, <https://doi.org/10.2202/1446-9022.1072>.

239. Pittman, "Structural Separation to Create Competition? The Case of Freight Railways."

240. Interview with Christian Wolmar; José Gómez-Ibáñez, "The Simple Analytics of Open Access With Illustrations From Railroads" (paper presented at the Australian Competition and Consumer Commission, Surfers' Paradise, Queensland, July 29 2010), 10; McCartney and Stittle, *The Privatisation of British Rail: How Not to Run a Railway*, 9–13.

241. Monika Jandová and Tomáš Paleta, "Impact of on-track competition on public finances – The case of the Czech Republic," *Journal of Rail Transport Planning & Management* 12 (December 2019): 11, <https://www.sciencedirect.com/science/article/pii/S2210970619300198>.

the-board open access was not chosen in the EU or the UK for the same reason: concern that open access operators would “cherry pick” profitable routes, leaving the government to operate the remaining services at an even higher cost.²⁴⁰ This exact behavior has been observed with the introduction of open access passenger service on the most profitable lines in Czechia.²⁴¹

The most troubling drawback to open access is the specter of high transaction and coordination costs. Significant economic literature suggests that even a small decrease in productive efficiency brought about by vertical separation, and its added coordination costs, can outweigh even a significant decrease in freight rates.²⁴² From a purely operational perspective, vertically-integrated railroads are more effective at routing trains, switching cars, and allocating scarce track capacity.²⁴³ Vertically-integrated railroads can make decisions internally, rather than through a complex system of negotiations involving the infrastructure owner, various private operators, and the government regulator.

Resolving disputes over train paths/time slots, enforcing technical standards for the wheel-rail interface, and determining responsibility for any delays or wrecks in a situation with multiple operators and an infrastructure manager would require a strong independent regulatory agency.²⁴⁴ This situation would lead to a decrease in service flexibility and make responding to service disruptions more difficult, requiring more rigid contracting and a potentially enormous amounts of litigation.²⁴⁵ Vertical separation tends to cause more issues for systems with higher freight densities—such as ours in the United States—compared with more passenger heavy networks, implying that open access may be a poor choice for the U.S. even if it succeeds in Europe.²⁴⁶

A similar dilemma presents itself as relates to service innovation under open access. While competition may incentivize operators to innovate service patterns or infrastructure design, the design of open access may prohibit as much innovation as it incentivizes. The separation of infrastructure from operations and the need to coordinate between the many parties involved can make it harder to agree on investments or respond to shifts in demand.²⁴⁷

The heart of the issue with open access is that it does not necessarily resolve the existing problems of the private rail

242. John D. Bitzan, “Railroad Costs and Competition: The Implications of Introducing Competition to Railroad Networks,” *Journal of Transport Economics and Policy* 37, no. 2 (2003), <http://www.jstor.org/stable/20053931>; Gallamore and Panzar, “When is Competition Not Good? The Case of Compelled Access and Maximum Rate Regulation for Railroad “Captive Shippers,”” 14; Gómez-Ibáñez, “Open Access to Infrastructure Networks: The Experience of Railroads,” 340-41; Lorenzo Casullo, “The efficiency impact of open access competition in rail markets: The case of domestic passenger services in Europe,” March 2016, No. 2016-07, Discussion Paper, The International Transport Forum.

243. Gallamore and Panzar, “When is Competition Not Good? The Case of Compelled Access and Maximum Rate Regulation for Railroad “Captive Shippers,”” 15-16.

244. Malcolm Abbott and Bruce Cohen, “The privatization and de-privatization of rail industry assets in Australia and New Zealand,” *Utilities Policy* 41 (August 2016): 49, <https://www.sciencedirect.com/science/article/pii/S0957178716300923>.

245. Gómez-Ibáñez, “Open Access to Infrastructure Networks: The Experience of Railroads,” 326; Gertjan Driessen, Mark Lijesen, and Machiel Mulder, *The impact of competition on productive efficiency in European railways*, CPB Netherlands Bureau for Economic Policy Analysis (September 2006), 32.

246. Fumitoshi Mizutani et al., “Comparing the Costs of Vertical Separation, Integration, and Intermediate Organisational Structures in European and East Asian Railways,” *Journal of Transport Economics and Policy* 49, no. 3 (2015): 513, <https://www.jstor.org/stable/jtranseconpoli.49.3.0496>; Pittman, “Structural Separation to Create Competition? The Case of Freight Railways.”

system. A public infrastructure manager might improve track maintenance on the rail system, as the North Carolina Railroad has, but it is unlikely that private open access operators (possibly the same Class I's) would suddenly put a strong emphasis on equipment maintenance when they are relieved of responsibility for maintaining the tracks. Locomotive and railcar maintenance might even decline, as vertical separation reduces the incentive for resolving flat spots or other wheel defects that might damage rail—since the track maintenance is no longer the operator's responsibility.²⁴⁸

There is likewise little reason to believe that open access operators would be more willing to listen to whistleblowers, provide crew with ample rest time, or hire sufficient workers to provide regular schedules. Lastly, the coordination challenges presented by open access make infrastructure investment more difficult.²⁴⁹ Consequently, open access is likely to be an impediment to electrification and infrastructure investments needed to guarantee America has a climate friendly rail system with sufficient capacity to meet the demands of the 21st century.

FRANCHISING: PUBLIC INFRASTRUCTURE, CONTRACTED OPERATIONS

Franchising is an option that would allow different segments of the public rail network to be contracted or leased out to various operators, public or private. The style and terms of franchises/concessions/leases vary greatly among existing examples around the globe and in the United States. Some agreements include responsibility for track maintenance by the franchisee and others have the infrastructure manager retain that responsibility. In the United States, many commuter railroads and tracks owned by state DOTs are contracted out to private railroads to operate.²⁵⁰

Franchises can be awarded in a number of ways, but the most popular method is through "competitive tendering" where various companies compete for the concession to operate a franchise. The conditions for awarding a franchise vary, but often rely on setting a baseline of service expectations with companies competing to pay the government the most for the privilege of operating the service (or require the least

247. Gómez-Ibáñez, "Open Access to Infrastructure Networks: The Experience of Railroads," 318.

248. Pittman, "Structural Separation to Create Competition? The Case of Freight Railways," 183–87; Gómez-Ibáñez, "The Simple Analytics of Open Access With Illustrations From Railroads," 12.

249. Gómez-Ibáñez, "The Simple Analytics of Open Access With Illustrations From Railroads," 4; Abbott and Cohen, "The privatization and de-privatization of rail industry assets in Australia and New Zealand," 49.

250. For more detail, see the "History of Public Rail in America" section above.

subsidy, in the case of unprofitable lines). This is considered “competition for the market” rather than “competition in the market” exemplified by open access. Competitive tendering is intended to decrease the average price of providing a public service.

However, franchising in the UK has failed to lower public subsidy—in fact annual operating subsidy for the railroads has more than doubled since privatization and train operators’ costs have only risen.²⁵¹ While these impacts are, in part, the result of the peculiarities and poor design of British Rail’s fragmentation—which is discussed in more detail in above—there are still numerous challenges with franchising that should give us pause before implementing it in the United States.

For one, competitive tendering is not guaranteed. In the UK, the pool of franchise bidders has settled into an oligopoly, with little real competition for franchises, and an increasing number are awarded without competitive bids or simply operated by a public corporation.²⁵² Since 2012, two-thirds of contracts have been awarded without competition.²⁵³

A challenge presented by competitively-tendered franchises that arose in the UK is the tendency for companies to optimistically over-bid franchise premium payments at the end of the contract, with several lower payment years included to enter the business. This structure allows companies to cash in for the first few years of low premium payments and simply cease operation when they can’t afford to make the premium payments they promised for the end of the contract.²⁵⁴

An important question for designing a franchise system is “who holds the risk?”. The risk could be entirely placed upon the franchise holder, effectively in the form of a lease, granting them access to the tracks for a set period of time, with the responsibility of providing crews, equipment, and planning services entirely theirs—alongside any downside from a recession or natural disaster. The opposite could also be true, with the government ultimately responsible for bailing out franchisees, who themselves have little to no capital invested (this method has been disastrous for the UK).²⁵⁵

For the United States, franchises with full risk borne by the railroad franchisee would be a better fit, since unlike the UK or Europe, most of our freight network is profitable and does

251. McCartney and Stittle, *The Privatisation of British Rail: How Not to Run a Railway*, 20-21.

252. McCartney and Stittle, *The Privatisation of British Rail: How Not to Run a Railway*, 91-92; Tony Prosser and Luke Butler, “Rail Franchises, Competition and Public Service,” *The Modern Law Review* 81, no. 1 (2018/01/01 2018): 29-31, <https://doi.org/10.1111/1468-2230.12315>.

253. Williams and Shapps, *The Williams-Shapps Plan for Rail*, 18.

254. McCartney and Stittle, *The Privatisation of British Rail: How Not to Run a Railway*, 79-80.

255. McCartney and Stittle, *The Privatisation of British Rail: How Not to Run a Railway*, 72-75.

not need public subsidy to operate. Franchisees would provide their own equipment, so as not to repeat the UK's error of fragmenting the industry into 1,000 pieces. If this approach were taken, there is a significant chance that the Class I railroads would bid for franchises on the tracks that they currently operate. An unintended consequence of a competitive bidding process, where private rail operators are involved, could be to actively worsen the cost-cutting practices of PSR. We might also see new private equity firms enter the rail market with poorly-compensated, newly-trained, non-union crews, attempting to undercut bids—a result which could be disastrous for safety and labor relations.²⁵⁶

256. This is a concern that has been raised abroad with respect to the prospect of “social dumping” by new entrants in Switzerland, discussed in the above section on the Swiss railway system.

As with open access, when franchising relies on vertical separation, it faces higher coordination costs leading to an industry with higher overall costs than one that is vertically integrated. As much has been said by the former operator of the UK's East Coast Main Line franchise, who claims that most other franchisees agree with his view that:²⁵⁷

257. McCartney and Stittle, *The Privatisation of British Rail: How Not to Run a Railway*, 74.

“the cost of operating separate infrastructure and train companies is much higher ... than if we had an integrated railway.”

The higher operating and infrastructure costs resulting from vertical separation have in turn increased costs passed on to customers and taxpayers.²⁵⁸

258. Prosser and Butler, “Rail Franchises, Competition and Public Service,” 33-34.

Determining how to divide the rail system into franchises presents another challenge. Railroads, as natural monopolies experiencing significant operating cost benefits from having larger networks, tend towards consolidation—evident by the current dual duopoly system we have with our private railroads. If public rail infrastructure were to be franchised for operational efficiency, we could very well end up with the same system we have now, albeit with payments from the Class Is for use of public infrastructure.

If the system is broken up into many smaller franchises, to induce competition, the rail system will immediately become less competitive with truck or air freight, counteracting the goal of shifting freight to more environmentally friendly rail. Yet the option of franchising the entire U.S. rail network as a single unit is almost unthinkable: allowing a for-profit private operator or consortium to control the entire rail network is clearly against the public interest and would require an even more intensive return to regulation.

Given these constraints, it seems that franchising may be best suited to the role that it currently plays, providing operators for state-owned Class II and III railroads where the state does not have the capacity or desire to operate them directly. Franchising the core mainline freight rail network would not only be burdensome administratively, but there is also limited evidence suggesting that it would be economically advantageous. Considering further that franchising might only entrench the profit-first ethos into our railroads, another option should be explored.

FULLY-INTEGRATED RAIL SYSTEM: PUBLIC OWNER AND OPERATOR

A horizontally- and vertically-integrated public rail system is the model that has been predominant worldwide for nearly a century. It entails one public corporation managing the underlying track infrastructure and operating the trains over it. The public railroad would be nationwide, allowing for transcontinental coast-to-coast freight service and potentially eliminating the need for some of the inter-carrier exchanges that slow down long-distance freight traffic.

An integrated railroad is able to coordinate the movement of freight more effectively through nationwide dispatching and planning.²⁵⁹ Coordinated national freight planning has the potential facilitate faster exchanges and improve the speed with which freight cars move around the system. Additionally, a service-first focus, as opposed to a short-term profit focus, will allow a public operator to employ enough workers in its yards to facilitate expedient switching moves and make rail freight more competitive with trucking, even if it lowers the operating ratio in the short-term.

A study evaluating more than 20 years of data from U.S. freight railroads found that fully integrated operations provide a 20–40 percent cost advantage over vertical separation of infrastructure from operations when hauling merchandise and bulk freight.²⁶⁰ An integrated railroad that combines bulk and merchandise freight has an even-more-substantial 70 percent cost advantage over two vertically-separated companies, where one moves bulk and the other merchandise. This study's findings corroborate our earlier discussion, in the

259. Tomeš, "Do European reforms increase modal shares of railways?," 149.

260. Marc Ivaldi and Gerard McCullough, "Subadditivity Tests for Network Separation with an Application to U.S. Railroads," 7, no.1 (2008): 167, <https://doi.org/10.2202/1446-9022.1143>.

open access section, about the importance of economies of density. This finding must also be considered alongside the tendency for open access operators in the EU to segment along different types of freight rather than compete directly.

The ability for an integrated public railroad to cross-subsidize less profitable or at-cost traffic is another key advantage. The high fixed costs of railroad infrastructure mean that railroads must charge some customers above marginal cost in order to afford to reinvest in infrastructure and improved service.²⁶¹ A single national railroad is able to allocate a larger proportion of fixed costs to customers with a higher willingness to pay. This allows the railroad to serve customers who might otherwise ship by truck or who cannot afford higher rates close to marginal cost.

A fully integrated public rail system has benefits for infrastructure investment as well. An integrated public railroad is more likely to make long-term investments to improve service quality than any system with private involvement.²⁶² Because infrastructure and operations are held within the same organization, an integrated railroad is more effective at coordinating the needs of operations and customers with the planning of track improvements and reinvestment.²⁶³ This closer, and sometimes informal, communication between operations and infrastructure departments not only allows for better planning and safer operations, but it also has the potential to minimize added costs that might spring up during infrastructure projects due to failures in communication.²⁶⁴

For long-term planning, infrastructure investment decisions have important downstream effects on future operations, impacts that can be best planned for within an integrated railroad.²⁶⁵ The ability to perform long-term planning would be a considerable change from our present private rail system in which the Class I's have only once cooperated to produce a long-term capacity plan, which they subsequently failed to implement.²⁶⁶ In terms of construction, a unified public railroad could capture significant economies of scale for infrastructure projects, leading to lower overall costs and faster implementation.

Achieving an electrified national rail system with sufficient capacity for the projected growth in demand for rail over the coming decades will require implementing an aggressive

261. John D. Bitzan and Fecri Karanki, "Costs, density economies, and differential pricing in the U.S. railroad industry," *Transport Policy* 119 (April 2022): 75, <https://doi.org/10.1016/j.tranpol.2022.02.012>; Gómez-Ibáñez, "Open Access to Infrastructure Networks: The Experience of Railroads," 338.

262. Andreas Schöne and Philipp Kunz-Kaltenhäuser, "Track access charges in the European Union railroad sector: A consideration of company organization and institutional quality," 2022, 164, Working Paper, Institute of Economics, Ilmenau University of Technology.

263. Tomeš, "Do European reforms increase modal shares of railways?," 149.

264. Eri Nakamura and Hiroki Sakai, "Does vertical integration facilitate coordination between infrastructure management and train operating units in the rail sector? Implications for Japanese railways," *Utilities Policy* 66 (October 2020), <https://doi.org/10.1016/j.jup.2020.101099>.

265. P. Cantos Sánchez, "Vertical relationships for the European railway industry," *Transport Policy* 8, no. 2 (April 2001): 83, <https://www.sciencedirect.com/science/article/pii/S0967070X00000391>.

266. Cambridge Systematics Inc., *National Rail Freight Infrastructure Capacity and Investment Study*, 2-6.

program of electrification and double tracking along core main lines. Countries that successfully completed such programs, whether India, Russia, or Switzerland, were able to do so through the coordination of an integrated publicly owned railroad.

A public railroad also presents the greatest potential to achieve true worker input in the running of the rail system. Open access or franchise operators would likely still be owned and operated in the interest of Wall Street firms concerned with extracting maximum profit margins. By contrast, a fully public system can be set up to operate as a public benefit corporation with a board appointed to represent railroad workers, community members, shippers, and other stakeholders whose views compose the wholistic public interest. This public service model would provide for better safety-focused oversight and permit far-sighted decision-making that prioritizes optimal working conditions and quality service over short term profits.

Rather than allowing private operators to extract profits from the use of public infrastructure, an integrated public owner-operator would reinvest any earned income in infrastructure and service improvements, as seen with the Madison Railroad in Indiana, or proposed in the Plumb Plan. Over the long term, this should lead to higher quality infrastructure, enhance safety, boost the quality of rail service and reap enormous benefits for the American economy.



CONCLUSION

By now, we have well established that the current system of private ownership and operation of the railroads has failed. The Class Is are providing customers with infrequent, unreliable service. This poor service is driving customers away from rail, and the number of carloads carried by rail has fallen by 30 percent this century. The Class Is are prioritizing dividends and buybacks over capital investment. They are annually responsible for millions of hours of preventable delays to passenger trains. Rather than investing in tried-and-tested catenary electrification, which could provide operational benefits and decarbonize rail, the Class Is have opted to putz around with experimental technologies that they already know are unviable.

They have cut tens of thousands of railroad jobs, leaving workers with irregular schedules, chronic fatigue, and little-to-no work-life balance. Furthermore, as the accident rate has ticked up for the past ten years, the Class Is continue to retaliate against employees who speak up about safety concerns. They have waived Railcar inspections and locomotive repairs in the name of speed. Similarly, the Class Is have ignored community demands for cleaner locomotives in rail yards—where diesel pollution has well-documented negative health impacts on workers and community members. Instead, the railroads have transitioned towards older, more-polluting yard locomotives. Altogether, the vision that the Class I railroads offer is one of decline—sacrificing the vibrancy and potential of our rail system on the altar of extracting profit for their shareholders.

Public ownership offers a remarkably different vision. Rather than a private duopolistic network of massive corporations only concerned with next quarter's profit, a public rail system would be democratically accountable to workers, shippers, trackside communities, and would serve the collective public interest. A unified national rail system would achieve sub-

“Rather than a private duopolistic network of massive corporations only concerned with next quarter’s profit, a public rail system would be democratically accountable to workers, shippers, trackside communities, and would serve the public interest.”

stantial efficiencies and economies of scale to speed up rail transportation and lower costs on shippers. At the end of the day, such a system would deliver savings to the American consumer.

The Class I railroads currently extract tens of billions of dollars a year from the rail system, through dividends and buy-backs. These same Class Is are years behind on crucial capital investments needed to maintain capacity on our rail network based on their own 2007 study. Rather than continuing to play this reckless waiting game with our nation's critical infrastructure, a public rail system would reinvest its income in infrastructure improvements and electrification. This reinvestment would improve operations through added capacity, more efficient and cheaper electric traction power, and greater service flexibility. It would also deliver meaningful safety improvements and better air quality for workers and trackside community members — and for all of us.

Involving workers democratically in decision-making would present a dramatic change from the Class Is' pattern of repressing workers' safety concerns and operating on bare-minimum staffing levels. Doing so could improve workers' quality of life and boost rail's long-term competitiveness through resilient staffing for frequent, reliable service. Involving workers in decision-making could also combat some of the worst safety violations present under the current system of profit-focused management.

Maintaining quality rail infrastructure and delivering frequent, reliable service is critical to supporting small businesses, farmers, manufacturers, and putting rail back on a growth trajectory. Shifting freight to rail will alleviate highway congestion, cut down on carbon emissions, and reduce wear on roads and bridges, especially by large and heavy trucks.

A shift to public ownership is not without precedent. Public investment, ownership, and control have all been core to the development of American rail industry. The first common carrier railroad—the Baltimore & Ohio—was publicly funded, as

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were many other railroads when the rail system was expanding in the 19th century.

Perhaps the greatest public contribution to the development of the U.S. rail network were the hundreds of millions of acres of land given to railroad companies on the condition that they construct rail “for the benefit of the public.” The right-of-way easements granted under the various land grant acts in the late 19th century still carry a large portion of all U.S. rail traffic. Given that the Class I’s are more interested in short-term profit than serving the public, it may be time for Congress to revisit the land grant acts and reallocate these rights-of-way to a public corporation.

Nationalization was critical to coordinating freight service during World War One, after private management proved incapable of cooperation. After the war, the Plumb Plan offered a bold alternative of a publicly owned, democratically managed rail system that attracted the support of the entire labor movement. By the 1970s, with railroad bankruptcies occurring left and right, Congress created Conrail to revive the Northeast’s rail industry.

“A shift to public ownership is not without precedent. Public investment, ownership, and control have all been core to the development of American rail industry.”

Today, publicly owned railroads continue to play a crucial role in our rail system. Amtrak and commuter railroads provide public transportation to millions of passengers all across the country, from big cities to small towns. State-owned rights-of-way maintain freight services on tracks that Class I’s sought to abandon. Publicly operated port and terminal railroads provide high-quality, low-cost freight services and support economic development.

Internationally, publicly owned railroads are the norm. They offer insight into the potential benefits that a publicly owned and operated rail system could provide. Switzerland has the highest per capita rail ridership in the world, alongside a robust freight mode share—all on a fully electrified rail system. These achievements are only possible because of the high degree of coordination under integrated public ownership. Similarly, Indian Railways has succeeded in electrifying over 25,000 miles of track in 10 years, while moving the same tonnage by rail as the entire US rail network.

Building on this history, international precedent, and present need, we must look towards a new direction: that of a publicly owned rail system for the United States. There is an urgent need to transition to a sustainable, publicly accountable, worker-friendly, service-focused rail system. But this transition will not happen overnight. This White Paper seeks to rekindle a long-dormant conversation about public ownership of the railroads. Making this vision a reality will require a bold coalition of workers, shippers, trackside communities, concerned citizens, and rail passengers. The Public Rail Now campaign has begun the task of forming this coalition, but there is still much discussion and organizing that needs to take place, across the country. The time to act is now. America deserves a rail system that works for all of us.

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Written Testimony to the
U.S. Senate Committee on Environment & Public Works
Subcommittee on Clean Air, Climate, and Nuclear Safety

“Cleaner Trains: Opportunities for Reducing Emissions from America’s Rail Network”

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San Bernardino, California
July 26, 2023

Executive Summary

The Moving Forward Network (MFN)’s mission is to build power with frontline and fenceline communities, transform the global freight transportation system, and advance environmental justice. We are a national network with 50 organizations in 20 cities representing over 2 million people from across the country who are working together to eliminate the deadly public health and environmental impacts caused by the freight transportation system.

The rail industry remains one of the most significant sources of environmental injustice impacting our communities. We live near railyards and freight rail routes, where some of the dirtiest switcher and line-haul locomotives belch diesel pollution into our neighborhoods every day, often just feet from our homes, schools, and workplaces. In order to address the impacts of locomotives and rail yards, MFN demands comprehensive regulations that center the needs of frontline and fenceline workers and communities. To date, the rail and locomotive industry has been permitted to operate with very little oversight and accountability, relying on voluntary measures and disclosures.

Rail pollution is a national issue with local impacts. The freight system remains one of the largest sources of pollution in the country and locomotives, in particular, are responsible for a large amount of pollution in communities across the country. Rail pollution impacts our health, safety, and well-being. Bright lights, noises, and vibrations that feel like earthquakes are torturous consequences of passing trains. Asthma, cardiovascular disease, and other dangerous diesel-related illnesses contribute to shorter lifespans. Rail pollution has serious negative effects on our air quality and the climate. In fact, more than 13 million of us in the United States live and work near railyards, rail lines, and ports. We are forced to breathe in diesel pollution day after day. Cancer clusters in neighborhoods near railyards show the undeniable link between diesel emissions from locomotives and other railyard equipment and adverse health harms—yet

our well-being rests on outdated locomotive emission standards that no longer reflect the current state of technology.

The EPA last issued an updated emission standard for locomotives 15 years ago. At that time, the Tier 3 and 4 standards were created. Yet, these new tiers did not result in any meaningful retirement or turnover of the lower, more polluting tiers.

Kansas City, Kansas – Atenas Mena, CleanAirNow

*My hometown, Kansas City, is home to the second-largest rural transportation center in the country. In fact, the rail industry remains one of the most significant sources of this environmental injustice for many of our communities. Diesel-powered locomotives emit large quantities of nitrogen oxide, diesel particulate matter, and volatile organic compounds. **Residents of Armourdale, which is a neighborhood in Kansas City, Kansas, predominantly Latino, Hispanic working class, is enclosed between large rail yards, dirty industry and heavily trafficked highways. They experience a life expectancy 22 years shorter, according to the CDC...** Healthcare and other resources are limited, and climate change weather patterns are felt regularly with record-breaking heat waves, floods, droughts and concerning poor air quality days. **KCK is not siloed in this large and impactful discrepancy. Our nation has been overburdening environmental justice communities by having them bear the brunt of systemic racism with the legacy of redlining, zoning and dumping practices, leaving families without access to clean air, water and land.***

To make matters worse, regulatory loopholes allow the powerful railroad industry to skirt obligations to meet federal locomotive emission standards. Under EPA's current requirements, freight trains can recertify their engines repeatedly until the locomotive operator chooses to retire the locomotive. This explains why so many of the dirtiest, pre-Tier 0 trains that are 50+ years old continue to operate in railyards and pollute communities across the country. Despite EPA adopting the most stringent Tier 4 standards 15 years ago, these trains make up less than 10 percent of locomotives today. This failure to adopt cleaner technologies has made railyards some of the most toxic facilities in the freight movement system. For the sake of our health, this loophole must be fixed.

We have the technology today to require all rail in the United States to use electric, zero-emission technology. Locomotives powered by electricity via an overhead catenary system are the most established and widely used locomotives around the world. These electric locomotives are also the highest-powered locomotives in the world, which are capable of carrying the heaviest loads. This explains why many of the world's largest freight rail systems are fully electrified—from China, France, Russia, and South Africa to Switzerland, Ethiopia, Japan, and South Korea. It is time for the United States to catch up with the rest of the world.

Battery-electric locomotive technology has also made tremendous advances over the past decade that make them well-suited for deployment across the United States. Important advances in battery-electric locomotive technology, rapidly declining costs of batteries, and increasing availability of fast charging show that the technology is ready for the transition to zero-emissions. In fact, lead researchers find that battery-electric freight trains can achieve cost parity with diesel trains today.

We are committed to working with the EPA to address the deadly pollution from freight locomotives and rail yards. We also implore regulators to demonstrate leadership in responding to the deadly and dangerous impacts from rail and locomotives, in line with President Biden's commitments to environmental justice. The Moving Forward Network calls on Congress and EPA to take the following actions:

1. Call on EPA to adopt a Tier 5 zero-emission locomotive standard that requires all locomotives and engines used in locomotives operate in zero-emissions by 2045 in the United States.
2. Require EPA and states to collaborate in developing a program to scrap all non-Tier 5 locomotives and locomotive engines by 2045.
3. Ask EPA to finalize its locomotive preemption regulations in the Phase III Greenhouse Gas rule by the end of October 2023.
4. Close the regulatory loophole that allows the locomotive industry to operate old locomotives (i.e., pre-Tier 0-Tier 3) for decades without reducing their pollution.
5. Deploy regulatory air monitors near railyards around the United States to better understand on-the-ground emission impacts. Data should be public and accessible. Deployment of monitors should be in consultation with environmental justice leaders.
6. Conduct emissions modeling that looks at the proximity of railyards to sensitive receptors, cumulative impacts, and health impacts, accounting for race and socio-economic factors.
7. Develop a nationwide locomotive registry for all Class I, II, and III locomotives. Registry should include the tier, years in operation, locations, routes, and hours of operation for each locomotive.
8. Use the authority in section 108(f)(1)(C) of the Clean Air Act to identify strategies to clean up the toxic hot spots associated with rail and railyard activities to "protect the health of sensitive or susceptible individuals or groups."
9. Work with Moving Forward Network and other environmental justice community leaders to apply the Biden Administration's whole-of-government approach to create a strategy to eliminate pollution burdens from concentrated railyard operations that pose significant health and safety risks, including but not limited to pollution and impacts from the operation of

locomotive maintenance facilities, locomotive parking/idling, and supporting warehouses, which are often located in environmental justice communities.

The communities present here today represent just a small portion of the families, children, and workers around the country that are being dumped upon by the rail industry. We cannot wait another minute for clear, actionable regulations and programs that finally prioritize the protection of communities that have been suffering for too long. Zero-emission solutions are available today—it's time to take action.

I. Background on Locomotives & Current Regulations.

The nearly \$80-billion freight rail industry is operated by seven Class I railroads (each of which have operating revenues of \$490 million or more per year), 22 regional Class II railroads, and 584 local or short-line Class III railroads. Diesel-electric locomotives, which are the most commonly used locomotives in the United States, are incredibly polluting. They have a large diesel engine with up to 4,400 horsepower that generates electricity to power traction motors near the wheels and propel the locomotive. **Because diesel serves as the power source that drives the electric generator or alternator, developing zero-emission locomotives is a matter of changing the source of electricity generation from diesel to non-combustion alternatives.**

There are two main duty cycles for freight locomotives: switcher operations and line-haul operations. Line-haul locomotives transport heavy freight over long distances and have over 2,300 horsepower. Line-haul operation involves traveling long distances and transporting tons of cargo, so the operational duty cycles of high horsepower line-haul locomotives are dominated by higher power notch settings (i.e., notches 5-8). When operating in railyards, line-hauls typically operate in idle or lower power settings. The pollution from line-hauls is considerable. For example, Class I interstate line-haul locomotives in California contribute 85% of statewide locomotive NOx emissions.

Switchers are used in rail yards to assemble and disassemble trains and to move trains from one point of the rail yard to another. EPA defines switcher locomotives to be between 1,006 and 2,300 horsepower. Beyond idling, switchers are supposed to operate primarily in the lower-powered notches (i.e., notch 1-4). Oftentimes, locomotives performing line-haul operations are downgraded to switcher operations over the course of their service life as the engine wears down and hauling heavy loads over long distances becomes more taxing. Because of this, switcher locomotives are often amongst the oldest models of locomotives and, therefore, the dirtiest.

Some railyards also have major locomotive repair and maintenance facilities. The activities associated with the repair and maintenance of locomotives often require idling and other operations that result in additional localized emissions. Routine servicing and maintenance are common to prepare for locomotive operation. Routine maintenance includes refueling and checking oil levels, performing minor repairs, and addressing major repairs of locomotive components, including services like traction motor replacement and diesel engine maintenance requiring load testing. In addition to routine service, locomotives are required to undergo several types of periodic inspections and major maintenance activities, including load testing. Depending on the maintenance test and locomotive model, these maintenance activities and tests require

some period of idling, notch 1 operation, and notch 8 operations, adding to the pollution toll on nearby communities. It is common practice for locomotives to be remanufactured every seven to ten years to ensure the locomotive engine continues to function properly and to extend the life of the locomotive. Through this process, the locomotive is disassembled to the frame, and its components are replaced as needed.

Locomotives must be recertified at each remanufacture before they may be placed back into service. Under EPA's current regulations, EPA has determined that "existing locomotive engines, when they are remanufactured, are returned to as-new condition and are expected to have the same performance, durability, and reliability as freshly-manufactured locomotive engines." This has the effect of allowing decades-old locomotives to continue to pollute at the same levels today as they did many years ago, without updating their technology. This loophole is exploited by the rail industry to evade adopting cleaner locomotive technology—and means communities pay the price with their health.

II. Locomotive and railyard pollution is very harmful to our human health and the environment.

A. Railyard pollution has created a national public health crisis.

There is no debate that rail pollution negatively affects the health, safety, and well-being of communities across the country. Exposure to diesel exhaust from locomotives is deadly. Exposure to the pollutants in diesel exhaust—especially long-term exposure—has clear, adverse health effects. More than 90% of diesel exhaust consists of ultra-fine particles that are less than 1 micron in diameter. These ultra-fine particles are so small that they can cross the air-blood barrier in the lungs and enter the bloodstream, allowing them to travel to virtually any organ system in the body and disrupt normal cell function.

The California Air Resources Board (CARB) performed health risk assessments for every major railyard in California from 2005 to 2008. While these reviews are dated, they remain some of the most robust studies of health risks from railyard pollution. This speaks to the need for more current, detailed health assessments of the impacts of railyard pollution on local communities. Thankfully, the U.S. Federal Railroad Administration (FRA) has recognized that there is a disparity in the communities who suffer from railyard pollution. The FRA is developing a mapping tool overlaying railyards on environmental justice communities to assess where these harms are being inflicted. We look forward to engaging with the FRA on the development of this tool. In addition, **we urge EPA to work with sister agencies to invest in developing public health research in railyard hubs around the country, including but not limited to Chicago, Kansas City, Charleston, Houston, and New Jersey.**

In the meantime, CARB's data paints a vivid picture about the **significantly elevated cancer and other health risks from living or working in close proximity to a railyard.** In 2008, the estimated diesel emissions from railyard operations at BNSF San Bernardino, BNSF Barstow, and UP Colton railyards in Southern California was 66.4 tons of PM emissions. Residents living near each of the San Bernardino County railyard facilities experienced between 575 to 3,300 in a million increased risk of cancer from railyard pollution alone—excluding any additional cancer risk from other cumulative impacts or regional air pollution. The UP Colton railyard, which is 5.5 miles long and one-third of a mile wide, is just 350 feet from the nearest homes and

neighbors a local high school. Locomotive operations account for 99% of diesel PM emissions at UP Colton, highlighting the need for stricter locomotive regulations. Residents and local workers near these San Bernardino County railyards were also found to be at increased risk for asthma-related emergency room visits, increased risk of death from cardiopulmonary issues, and increased hospitalizations for cardiovascular and respiratory illness. CARB's assessment also highlights the communities that are saddled with these health risks. For example, residents who live near the BNSF San Bernardino and UP Colton railyards are more likely to be low-income and to self-identify as Latinx than residents in other parts of San Bernardino, Barstow, and Colton.

Given that some of these railyards have since grown and adoption of Tier 4 locomotives remains at less than 5% in California, we can expect that these health impacts have not improved much and in fact, may have worsened over the last 15-20 years. Moreover, a study in Newark, New Jersey, found that “[e]missions of PM_{2.5}, black carbon, and NO_x from non-roadway sources, particularly locomotives and port operations, have the highest air quality impact in the total study area, followed by medium- and heavy-duty vehicles.” Critically, emissions from locomotives and port operations “contribute around 95 percent of the total emissions” from the area, which included much of southeast Newark and north Elizabeth, including Newark Airport and the ports of Newark and Elizabeth, New Jersey.

B. States cannot meet the National Ambient Air Quality Standards without addressing locomotive pollution.

In addition to local health effects, locomotive pollution makes up a considerable portion of regional air pollution and therefore presents challenges for states to reduce regional air quality and to achieve attainment of the federal air quality standards. The Clean Air Act's cooperative federalism scheme holds both states and the federal government accountable for reducing regional air pollution—all parties must do more. Regardless of who is responsible for reducing this pollution, there is no question that locomotive emissions are a major contributor to states' total pollution. Again, we lack sufficient data about the amount of pollution from locomotives in each state, so California's data must serve as a stand in. **In California, rail pollution contributed 15% of all freight sector NO_x emissions and 11% of all freight sector PM_{2.5} emissions in 2022.** In California's case—and likely in the case of other states—it is next to impossible to achieve the National Ambient Air Quality Standards (NAAQS) without addressing locomotive pollution.

Locomotive pollution impacts all of the NAAQS, and ozone and particulate matter in particular. EPA has progressively strengthened the ozone and particulate matter standards in light of new scientific evidence demonstrating health impacts at lower levels of pollution. Most recently, in 2015, EPA revised the primary and secondary 8-hour ozone standard from the 2008 level of 75 parts per billion (ppb) to 70 ppb, and in 2013, the primary annual PM_{2.5} standard was revised from 15 micrograms per cubic meter (µg/m³) to 12 µg/m³.

Although states are required to comply with these standards, many continue to fail to meet one or more ozone standards. In fact, almost 125 million people, or 37.7 percent of the U.S. population, live in areas currently classified as being in nonattainment of the 2015 8-hour ozone standard (70 ppb). These areas include 204 counties in 23 states, including California, Illinois, Missouri, New

Jersey, and New York. Parts of California and Pennsylvania are also in nonattainment of the PM2.5 standard.

Many of the states that continue to fail to meet the ozone standards also have high concentrations of rail activity, which adds to the pollution burden that local residents breathe and that states must clean up. For example, California is home to some of the most polluted air basins in the country. Two of California's airsheds—the South Coast Air Basin and the San Joaquin Valley Air Pollution Control District—suffer from some of the highest levels of ozone and PM2.5 levels in the country. About 12 percent of statewide NOx emissions and 8 percent of statewide PM2.5 emissions originate from locomotives, making the need to regulate rail pollution undeniable. Locomotive pollution is expected to make up about 14 percent of California's NOx inventory and 16 percent of the state's PM2.5 inventory in 2030. This is a staggering proportion of California's total pollution. California and other states have a federal obligation to show how they will attain the NAAQS, and this is nearly impossible without addressing the pollution from locomotives.

C. The impacts of locomotive pollution are compound and widespread.

The impacts of this crisis are being felt across the country. Class I railyards are located in almost every single state, as shown in the following figure.

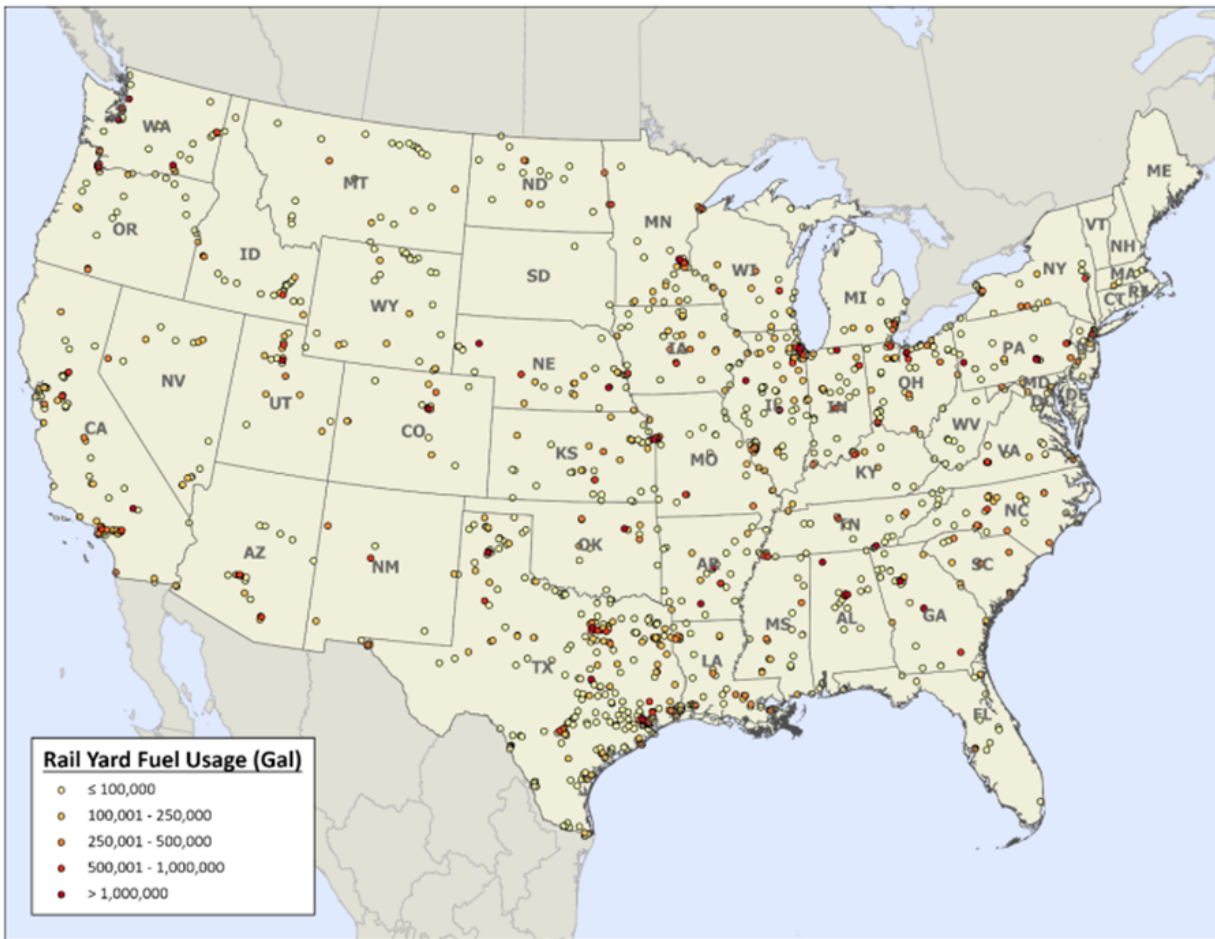


Figure 2. Rail Yard Locations in the United States

Figure 1: Rail Yard Locations in the United States

But the harms from railyards do not stop with public health. Living near a railyard comes with a slew of other debilitating consequences. Stadium-style lights beam into neighboring homes at all hours of the night; trains blare their horns unexpectedly and at jarring levels; and the vibrations from passing trains rumble homes like an earthquake. There have been numerous reported instances of emergency vehicles being unable to travel to where they need to be because a mile-long train or idling locomotive stops them in their path. Trains are often stopped for hours and days at a time, creating safety issues for children walking to school. All of these side effects result in significantly reduced quality of life and shorter average lifespans in our communities. The generational trauma from these cumulative incidents carries the legacy of these dangerous facilities through our communities' family lines.

III. Testimonials from community members living near railyards across the United States.

The health and safety impacts described in the previous section are far from theoretical. Environmental justice communities are very aware that the system we live in does not serve our basic needs for health and safety. Residents living near railyards and rail lines are often

forgotten. These environments are known as “diesel death zones” and “sacrifice zones” because of the very high concentrated levels of diesel pollution, cancer clusters, and premature death suffered in these communities. It is plain to see that our social systems do not protect communities of color and low-income communities in the same way as they protect others. While the powerful logistics industry almost always easily secures prime seats at the table, people most affected by industry’s pollution are often locked out of policy and decision making. The freight rail and locomotive industry is a prime example of this. For decades this industry has been allowed to grow largely unregulated and at the expense of the health and environment of frontline and fenceline communities across the country.

In my own experience, two of the biggest rail communities in the Inland Empire, California, are Colton and San Bernardino... Colton is not only worried about freight. Colton is a small community. There are no official sensors and no official monitoring. **Yet, they're impacted by two industry highways, gas plants, cement plants, and huge warehouse logistics, as well as the expansion of rail coming their way through BNSF and Union Pacific. For San Bernardino, we have the BNSF rail facility that has been in San Bernardino since the beginning. But the facility has expanded throughout the years and continues to expand.** This last year the city council passed another rail expansion, another line, and that is displacing homes and buying out homes on the west side community of San Bernardino, which is already really impacted by the thousands of trucks and trains that come out of that community. And those are during COVID, they took advantage and bought out some homes, and most of these people are renters, so they had no idea they were going to be kicked out of their homes so the BNSF could expand their day-to-day trade.

Community members across the country, from Florida to New Jersey, Illinois to Kansas City, Washington, to Texas and California, share their own experiences and expertise on the impacts they struggle with from the freight rail and locomotive sector.

West Long Beach & Carson, California – Jan Victor Andasan, East Yard Communities for Environmental Justice

- I was born in the Philippines and had the privilege to immigrate to the US where I grew up in West Long Beach. Our apartment was located right next to Union Pacific Intermodal Container Transfer Facility (ICTF). **I thought it was normal growing up next to these facilities. I did not know the health impacts it was ravaging on my body, my family's and my community.** My brother was conceived and born when we were living next to the railyard. Growing up, I was both fascinated and anxious every night because he would have to get on his nebulizer so he can breathe. I didn't understand why he needed this machine, I was 8 years old and this was normal to us. Every night for his young life, he continued to rely on this machine. I didn't understand goods movement, trains, ports, railyards back then but what I know now is that the poor air quality we were exposed to was not normal. It was responsible for why we couldn't breathe. It doesn't have to be a struggle to breathe for a child when they just are born into this world. Both my brother and I grew up with asthma and it's become normal for many families in communities adjacent to railyards and rail lines to have some type of respiratory issues.

We can prevent this. Our communities can breathe cleaner air. We deserve to breathe cleaner air.

Kansas City, Kansas and Missouri – Beto Lugo Martinez, CleanAirNow

- Hello, I am Beto the executive director of CleanAirNow, an environmental justice organization in Kansas City, and have been a member of the Moving Forward Network since its inception. I grew up in Southern California. In my community on the east side of town, 50 feet away from a petrochemical facility, I was exposed to chemical pollution every day. Living on the east side where redlining practices were present, we grew up near continuous engine locomotives transporting industrial and agricultural commodities, including live cattle and compressed chemicals posing a threat to our lives. As these tracks sliced throughout our community, kids grew up jumping on the train to jump off the other side on their way to school. Emergency response units, such as ambulances or even access to the hospital, were not available to us as the rail sliced through our neighborhood, and the train barricaded us. My oldest son could not enjoy life like other children. When he joined sports, specifically little league baseball, he would hold an inhaler in one hand and the glove in the other.

We have been organizing for decades, initiating our own community-led research. Even when our regulators acknowledged there was a problem, they looked the other way and chose to prioritize profits over people, so we continued organizing. The disinvestment of the same communities that built the rail are experiencing lower life expectancy than other communities just a few miles away. The KCMO public health data demonstrates that the life expectancy difference is between 15 and 18 years. **According to the CDC, neighborhoods like Armourdale and Argentine in Kansas City, Kansas, have a shorter life expectancy by 22 years.** We have high-risk zip codes where asthma, heart disease, and cancer are above the national average and are the same areas sliced by highways, the second largest rail system in the nation, and chemical facilities. **We recently had a fire at an industrial recycling facility within the railyard that burned for over 10 hours, with bomb trains within feet of the fire.**

We need ZERO Emissions. You must be intentional in moving this forward. This means implementing this through an environmental justice lens to ensure that disadvantaged, overburdened, redlined communities are a priority.

Newark, New Jersey – Dyna Anderson, New Jersey Environmental Justice Alliance

- I live 20 minutes from Express Rail Elizabeth, 12 minutes from Port Newark-Elizabeth, and near several warehouses. A study conducted of Newark and Elizabeth, including Newark Airport and Port Newark-Elizabeth by M.J. Bradley & Associates, LLC (MJB&A) in close consultation with NJEJA concluded that **“Emissions of PM2.5, black carbon, and NOx from non-roadway sources, particularly locomotives and port operations, have the highest air quality impact in the total study area, followed by**

medium- and heavy-duty vehicles. These sources far outweigh the emissions exposure from passenger vehicles and together contribute around 95 percent of the total emissions exposure modeled within the study area (from mobile source emissions).” We need strong regulations now.

Tallahassee, Florida – Brian Lee, ReThink Florida

- I live and work in Tallahassee, Florida. My work is often in one of the Low-Moderate Income Neighborhoods that sits on the south side of the railroad track that splits Tallahassee. These neighborhoods fall within a Zip Code with the highest energy burden in the state, and Tallahassee was found to be the most economically segregated city in the United States of America less than ten years ago. In these neighborhoods and throughout the state, we are working towards correcting long-time systemic climate justice and energy justice issues by helping residents with energy efficiency and renewable energy to foster healthier communities. **The Florida Gulf & Atlantic Railway line that splits our city, between HBCU Florida A&M University and Florida State University; between Southside and Killearn Estates, has long been a symbol of injustice.** Moving towards safer, cleaner technologies and practices that affect historically vulnerable areas needs to be the highest priority. Zero Emissions freight is a crucial part of transitioning to clean energy locally, statewide, and nationwide for the health and safety of our communities, especially those who are most vulnerable.

Joliet, Illinois – Zhenya Polozova, Warehouse Workers for Justice

- Warehouse Workers for Justice (WWJ) is a worker center based in Will County, IL, in the vicinity of North America’s largest inland port. WWJ fights for the interconnected goals of winning quality, living-wage jobs for workers in Illinois’ warehouse, logistics, and transportation industries and minimizing the environmental injustices faced by communities encircled by networks of freight, including locomotives.

Home to some of the largest companies in the world, nearly \$735 billion, or 4% of the country’s GDP moves through the port district every year. Despite their reliance on the area’s centrality, resources, and workforce, these industries offer little in return to workers and communities in this vital region. As a result, Will County is in the 98th percentile of diesel-related negative health impacts in the nation even while jobs remain low paying and dangerous, with low union density and a high concentration of contingent labor.

The two Norfolk Southern locomotive derailments in Ohio, among hundreds of others that happen in the US on an annual basis, underscore the real existential threat posed to our communities, which serve as a vital rail hub, by a lack of enforced safety rules and meaningful accountability.

Even without derailments, railroad locomotives already inflict severe damages on workers, public health, surrounding communities, and the environment at large by way of diesel emissions containing particulate matter and nitrogen oxides. No amount of diesel

pollution is safe for human consumption, and the heavy concentration of diesel pollution impacts frontline and fenceline communities located around rail infrastructure first and worst. These impacts are concentrated for workers and communities working or living near rail yards. Moreover, the diesel pollution emitted by locomotives contributes to our ongoing climate crisis that contributes to extreme conditions that disproportionately impact and harm working people.

To protect workers, public health, communities, the environment, and climate, we urge you to create incentives for a rapid transition to zero emissions locomotives by encouraging public ports, state departments of transportation to create switching leasing programs, so that the assets remain public. The defense production act might be combined with a climate and/or public health emergency declaration could be combined to address the current harm and avoid future harm. This is an essential first step in both the gradual electrification of rail lines and a general shift toward the big solutions necessary to meet the current crisis.

Chicago, Illinois – Jose Acosta, Little Village Environmental Justice Organization

- There are schools and parks and other things that are near these rail yards (in Chicago). But these are essentially inland ports, right? They function as a port, although they're not... they don't have access to water, but they're just as busy. **If you look at all of our 19 ports, our 19 inland ports, they're all just as busy as or almost as busy as the Los Angeles and Long Beach ports. So this is an issue that primarily impacts black and brown communities. Where the intermodal are located people of color are also living and as a result, we're dealing with the most concentrated pollution.** And in addition to the intermodal, you also have other logistics activities that locate as closely as possible to these intermodal, so distribution centers and warehouses and trucks, other trucking yards, and just all other logistics facilities want to be as close to these as possible. In addition, many of these are also close to highways, so there's that combination of that as well.

Long Beach, California – Theral Golden, West Long Beach Neighborhood Association

- The West Long Beach Neighborhood Association's purpose is to work for an improvement in the quality of life in all Long Beach, Ca. Giving attention to West Long Beach, to include elimination of pollution burdens, health and safety threats from the Goods Movement Industry and issues that directly relate to the quality of life in West Long Beach. Work with the residents, businesses and civic leadership to make the “Westside” of West Long Beach the greatest place to live, in Long Beach, California. West Long Beach is a community in Long Beach, California. It is one of the most ethnically diverse communities in California. We are bordered on the North by the 405 FWY, East by the 710 FWY and, South by The Ports of Long Beach and Los Angeles, West by the city limits and a railroad line that run the length of the city limits from Wardlow Road to the Ports of Long Beach and Los Angeles. This rail line extends to Vernon Yards in East Los Angeles, Ca. and is one of two major rail lines that move goods in and out of the Ports of LB and LA., adjacent to the ports is an approximately five Sq. mile oil refinery facility. West Long Beach is part of a larger community that

includes Carson and Wellington Ca. The port pollution burden has not improved in fifteen years. Combined the ports increase the use of rail to move goods and oil refineries use of rail, their pollution burdens are killing more than three residents a day in these communities. Equivalent to one mass shooting a day. The entire geographical area is in southwest Los Angeles County, has a population of two million people, and their health is threatened twenty-four-seven by one of the largest active toxic sites in the United States. I am a resident. Since the Industrial Revolution, a hundred and seventy years started air and water pollution without any control. Oil spills and oil fires are nothing new. On June 22, 1969, an oil slick caught fire on the Cuyahoga River just southeast of downtown Cleveland, Ohio. The image that “the river caught fire;” motivated change to protect the environment. However, this was, in fact the thirteenth recorded time that the river had caught fire since 1868. Resulting in the creation of the federal Environmental Protection Agency (1970). I am here today to witness what has taken more than seventy-five years of work by the EPA to get to this point and recognize the work of the environmental community over a longer period a job well done. For me Winston Churchill said it best: “Now this is not the end. It is not even the beginning of the end. But it is, perhaps, the end of the beginning”

Seattle, Washington – Christian Poulsen, Duwamish River Community Coalition

- My name is Christian Poulsen, and I am representing the Duwamish River Community Coalition in the Duwamish Valley, Seattle, Washington. The impact of rail and locomotive activity on our community cannot be overstated. The constant noise and vibrations from passing trains disrupt our daily lives, making it difficult to concentrate, sleep, and enjoy our homes. The emissions and air pollution stemming from locomotives pose severe health risks, particularly the dangers of diesel emissions to human health. This issue disproportionately affects vulnerable communities like South Park, where my family resides. As a parent raising two young sons in a fenceline community, the personal anxiety, guilt, and distress caused by the proximity of rail and locomotive operations are overwhelming. Urgent action is needed on a national level to address the adverse effects of rail and locomotive activity, protect the well-being of residents, and find sustainable solutions for the future. The Duwamish River Community Coalition stands united with communities nationwide, emphasizing the urgent need for immediate attention and decisive measures to alleviate these impacts.

West Long Beach & Carson, California – Paola Vargas, East Yard Communities for Environmental Justice

- I was born and raised around Carson, CA and the Long Beach area, constantly traveling between railyards and industrial facilities. It wasn't until I went away to college that I came back and paid attention to where I live and why facilities were located around my community. After progressing through my education away from home, I started noticing the differences of redlined communities and why my mother developed asthma only after moving to the United States. Unknown to the effects of the nearby railyards and

refineries, we had no way to prevent or act against these facilities that my mother has lived around for more than 20 years. The need for clean air and zero emissions is long overdue, as asthma and other respiratory diseases are increasingly common in our households and have already had severe impacts on our communities. It is an important transition to ensure that exposed communities attain the healthy air they've long deserved.

IV. EPA's current locomotive regulations are decades-old and deeply outdated.

Despite EPA adopting four tiers of locomotive emission standards starting in 1998, the state of locomotive pollution in the US remains dire. The nearly \$80-billion freight rail industry remains one of the most polluting industries in the country. Not only is railyard pollution of specific concern, but long-distance line-hauls continue to pollute at concerning levels. The basic reason for this is that the majority of locomotives still in operation are far outdated and therefore emit unnecessarily high levels of diesel exhaust, NOx, and PM.

EPA has a duty to set emission standards for locomotives. However, the agency has not updated its locomotive emission standards since 2008, 15 years ago. Technology has developed significantly since then, making it crucial that EPA adopt new regulations. Under the current emission standards, switchers are subject to slightly more lenient standards than line-hauls, with the justification that, as a total fleet, switchers emit less pollution than line-hauls. While that may be true, this disregards the health impacts of switcher pollution at railyards. In fact, switchers have an outsized impact in the immediate vicinity of where they operate, which is typically near communities. Railyard pollution in particular remains exceptionally harmful to the health of people who live and work near these facilities.

Switcher locomotives make up the largest share of railyard locomotives, yet they are also notoriously some of the most outdated and highest-polluting locomotives. The following table shows that two-thirds of Class I locomotives operating in railyards in 2020 were Tier 0 or Tier 0+. This means that 67% of the locomotives that operate closest to where people live are emitting at extremely high levels.

Table 1: 2017-2020 Yard Engine Fleet Composition Comparison

Emission Tier	2020 Locomotive Count	2017 % of Fleet	2020 % of Fleet
0	673	23.61	23.75
0+	1,182	25.99	41.71
1	0	0.00	0.00
1+	26	4.76	0.92
2	7	2.33	0.25
2+	0	4.64	0.00
3	11	10.18	0.39
4	23	2.47	0.81
Not Controlled	912	26.01	32.18

Even more concerning is that **Class I railyard fleets became *dirtier* over time**. From 2017 to 2020, locomotive fleets used in railyards moved toward older technology and away from cleaner, higher tier engines. This trend is deeply concerning.

This shocking information communicates three things clearly:

1. **The railroads cannot be trusted to voluntarily adopt cleaner technology over time—and in fact will revert to older, dirtier technology if given the choice.**
2. The railroads have no interest in being good neighbors to frontline communities living near railyards.
3. Twenty-five years after EPA adopted its first locomotive emission standard, federal, state and local regulations to address rail pollution remain far too weak.

The current locomotive emission framework categorizes standards by tier. Locomotives must meet emission standards for nitrogen oxide (NOx), particulate matter (PM), hydrocarbon, and carbon monoxide based on the year the locomotive was originally built. The tiers run from pre-Tier 0 up to Tier 4, with increasingly stringent NOx and PM standards. For example, locomotives originally built in 1973 to 1999 are subject to pre-Tier 0 standards, while locomotives built in 2015 or later are subject to Tier 4 standards.

Tables 2 and 3 show the current emission tiers for line-hauls and switchers.

Table 2: Federal Locomotive Emission Standards and Percent Control - Line Hauls

Line Haul Locomotives							
Emission Tier	Year of Manufacture	NOx		PM		HC	
		Standard (g/bhp-hr)	Percent Control	Standard (g/bhp-hr)	Percent Control	Standard (g/bhp-hr)	Percent Control
Pre-Tier 0	1973-1999	13.5	n/a	0.6 ^s	n/a	1.0	n/a
Tier 0	2000-2001	9.5	30	0.6	0	1.0	0
Tier 1	2002-2004	7.4	45	0.45	25	0.55	45
Tier 2	2005-2011	5.5	59	0.2	67	0.3	70
Tier 3	2012-2014	5.5	59	0.1	83	0.3	70
Tier 4	2015	1.3	90	0.03	95	0.14	86

Table 3: Federal Locomotive Emission Standards and Percent Control - Switchers

Switcher Locomotives							
Emission Tier	Year of Manufacture	NOx		PM		HC	
		Standard (g/bhp-hr)	Percent Control	Standard (g/bhp-hr)	Percent Control	Standard (g/bhp-hr)	Percent Control
Pre-Tier 0	1973-1999	17.4	n/a	0.72	n/a	2.1	n/a

Tier 0	2000-2001	14.0	20	0.72	0	2.1	0
Tier 1	2002-2004	11.0	37	0.54	25	1.2	43
Tier 2	2005-2011	8.1	53	0.24	67	0.6	71
Tier 3	2012-2014	5.0	71	0.1	86	0.6	71
Tier 4	2015	1.3	93	0.03	96	0.14	93

Forty-five percent of Class I locomotives are Tier 0 and emit a jarring 860% more NOx, 2,130% more PM2.5, and 1,200% more VOC than Tier 4 line-hauls. Table 4 below shows the emission factors for criteria pollutants for 2020 line-haul locomotives by tier. NOx, PM and VOC emissions for Tier 3 and older locomotives are dramatically higher than for Tier 4 locomotives. For instance, even jumping up just one tier from Tier 3 to Tier 4 results in impressive emission reductions: Tier 3 line-hauls emit almost 500% more NOx, 533% more PM2.5, and 325% more VOC than Tier 4 line-hauls. Yet, **only 9% of Class I locomotives—whether switcher or line-haul—were built in 2015 or later**, meeting the most restrictive Tier 4 standard.

These figures warrant a pause—almost half of all Class I locomotives operating in the United States in 2020 emitted criteria pollution at unnecessarily high levels. These toxins are known to cause conditions like cancer, cardiac and respiratory issues, reproductive issues, asthma, lowered lung function, chronic obstructive pulmonary disorder, and premature death.

Table 4: 2020 Line-haul Locomotive Emission Factors by Tier, AAR Fleet Mix (g/gal)

Tier	Tier Name	CH4	CO	CO2	N2O	NH3	NOX	PM10	PM25	SO2	VOC
0	1973-2001	0.8	26.624	10,150	0.26	0.0833	178.88	6.656	6.45632	0.0939	10.513152
0+	Tier 0 Rebuild	0.8	26.624	10,150	0.26	0.0833	149.76	4.16	4.0352	0.0939	6.57072
1	2002-2004	0.8	26.624	10,150	0.26	0.0833	139.36	6.656	6.45632	0.0939	10.294128
1+	Tier 1 Rebuild	0.8	26.624	10,150	0.26	0.0833	139.36	4.16	4.0352	0.0939	6.351696
2	2005-2011	0.8	26.624	10,150	0.26	0.0833	102.96	3.744	3.63168	0.0939	5.694624
2+	Tier 2 Rebuild	0.8	26.624	10,150	0.26	0.0833	102.96	1.664	1.61408	0.0939	2.847312
3	2012-2014	0.8	26.624	10,150	0.26	0.0833	102.96	1.664	1.61408	0.0939	2.847312
4	2015 and later	0.8	26.624	10,150	0.26	0.0833	20.8	0.312	0.30264	0.0939	0.876096
4C	Tier 3 Built after	0.8	26.624	10,150	0.26	0.0833	102.96	1.664	1.61408	0.0939	2.847312
NC	UNCONTROLLED Pre-1973	0.8	26.624	10,150	0.26	0.0833	270.4	6.656	6.45632	0.0939	10.513152
2020 Class I Line Haul Fleet-Weighted		0.8	26.624	10,150	0.26	0.0833	120.5	3.042	2.95076	0.0939	4.854434

V. Industry will continue to exploit regulatory loopholes absent additional oversight.

Because of loopholes in the regulatory scheme, the adoption of Tier 4 locomotives has been incredibly slow. EPA adopted the Tier 4 standard 15 years ago, yet as of 2021, less than 10% of Class I locomotives meet the Tier 4 standard. A recent report by the California Air Resources Board confirms that “Tier 4 locomotive engine penetration rates sit at under 1 percent per year

on average because the railroads have been purchasing fewer than expected Tier 4 units for the past few years, instead choosing to operate remanufactured Tier 1+ and Tier 2+ units.” Instead, three out of four Class I locomotives are still using Tier 2 or older technology. At the same time, **more than 75% of Class I switcher locomotives—i.e., locomotives operating in railyards near communities—remain at Tier 0.**

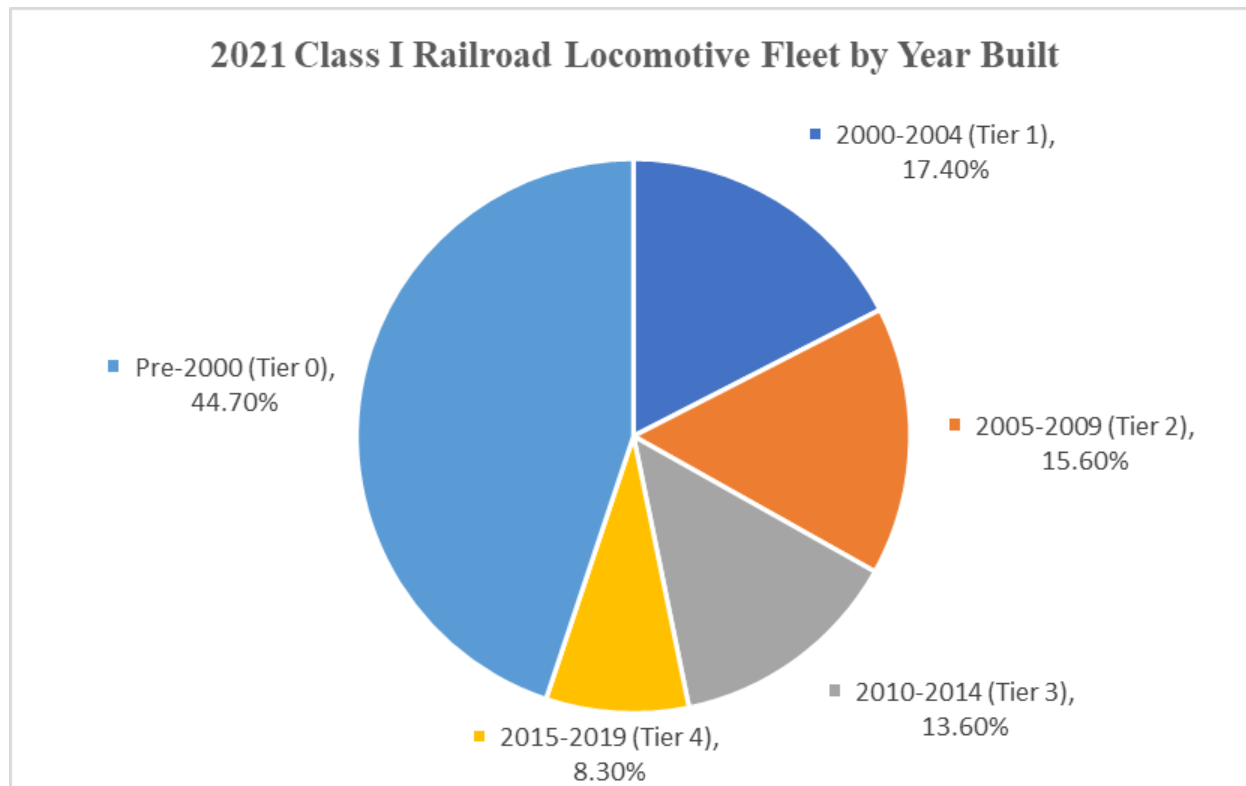


Figure 2: 2021 Class I Railroad Locomotive Fleet by Year Built

A key loophole in EPA’s regulations is to blame for this delay. Under EPA’s regulations, a locomotive is allowed to continue to meet the same emissions tier year after year, so long as the locomotive is remanufactured. Upon remanufacture, the locomotive regains its status as a “new” locomotive, and can therefore remain under the same or a largely similar emissions tier. In effect, this means locomotives are allowed to remain under the same emissions tier from the year they were originally built until the year the engine blocks are finally unable to continue operations and the locomotive must be retired—up to 60 or 70 years in some cases. **In other words, a locomotive may operate for its entire service life without ever having to reduce its emissions.** With this loophole there is no reason for the railroads to purchase a new, cleaner locomotive.

In fact, railroads typically shift line-hauls to railyard operations toward the end of a locomotive’s life. Railyard operation is not as demanding as long-distance line-haul service because switchers mostly transport rail cars within the boundaries of the railyard. The consequence of this is that railroads are moving their oldest, most polluting locomotives to railyard operation, which has a much more direct, negative impact on communities.

We urge this Committee to ask EPA to close this loophole: when a locomotive is remanufactured, it should be required to meet the latest emission standard, which at the moment is Tier 4. Once EPA adopts a Tier 5 zero-emission standard, locomotive operators should be required to meet this standard upon remanufacture.

VI. Zero-emission locomotive technology is widely available today and cost-effective.

Today, zero-emission locomotive technology is already technically feasible for both switcher and line-haul duty cycles. In fact, this technology is not even new—about one-third of the world’s rail lines are electrified. There are several kinds of zero-emission locomotive technologies primed for wide scale adoption across the United States, including locomotives powered by overhead catenary systems, battery-electric models, and hybrid options like discontinuous catenary. In addition, this technology can actually offer cost savings compared to traditional diesel locomotives because the cost of electricity as a fuel source is significantly cheaper than diesel. As background, traditional diesel locomotives use a diesel-powered engine to generate electricity to propel the locomotive. Therefore, transitioning diesel trains to zero-emission operations involves replacing the electricity generation system with one or more non-combustion options.

A. Locomotives Powered by Overhead Catenary Systems.

Locomotives powered by electricity via an overhead catenary system are the most established and widely used zero-emission locomotives around the world—and can be widely replicated in the United States. Power lines located along the railway deliver electricity directly to the train’s electric motor via a contact system on the locomotive. These trains are incredibly efficient. While diesel-powered trains transfer about 30-35% of the energy generated by combustion to the wheels, overhead power lines transfer an incredible 95% of the electricity to the wheels.

Electric locomotives are also the highest-powered locomotives in the world, and capable of carrying the heaviest loads. All-electric line-haul locomotives in China, Russia, South Africa, and Australia carry some of the heaviest hauls in the world. In fact, the world’s highest-powered locomotive is an electric overhead catenary coal train in China with 28.8 MW—almost five times as powerful as the average American line-haul. Similarly, South African catenary locomotives carry iron ore in excess of 40,000 metric tons, which is more than double the weight of a typical line-haul in the United States.

This explains why many of the world’s largest freight rail systems are fully electrified. Almost every industrialized country, including almost all of Europe and Japan, has an extensive network of electrified freight rail. Ethiopia and Switzerland, both very mountainous countries, have freight rail systems that are 99-100 percent electrified. Likewise, 70 percent of railroads in South Korea and Japan are electric.

Moreover, **several countries have embarked on significant overhauls of their diesel-powered rail lines to transition them to electric operation.** China rapidly increased the percentage of its electrified rail from 5 percent in 1975 to over 60 percent as of 2015, and climbing. Russia electrified its Trans-Siberian Railway, the world’s longest continuous rail line measuring 6,000 miles long. Last year, India began operation of the world’s first overhead catenary line that accommodates double-stacked intermodal trains. **The United Kingdom’s rail system is currently 42 percent electrified, and it recently announced that diesel-only trains will be**

phased out by 2040. Likewise, France has set a goal of phasing out diesel trains by 2035. A lack of action could mean our rail industry and those manufacturing locomotives could lose on competitiveness to other countries pursuing these technologies.

Zero-emission electric locomotives powered by overhead catenary are well-established, and they can already be cost-effective compared to diesel locomotives. In fact, the cost of a fully electric engine is about 20% lower than that of a comparable diesel engine, and maintenance costs are also 25-35% less for electric engines because they have fewer moving parts.

Even more importantly, electricity as a fuel is cheaper than diesel. In addition, renewable electricity is already half the price of electricity from fossil fuels and is expected to continue declining even faster than models projected. If locomotives have flexibility in their recharging times, they can charge batteries primarily when there is surplus renewable electricity available. Exploiting low-cost, surplus renewable energy can make locomotives cheaper to fuel with electricity than diesel, even in the near term. **For example, in 2018, researchers examined a simulation of a line-haul locomotive traveling a 2,800 kilometer route from Kansas City to Los Angeles, and found that it would be significantly cheaper for an electric locomotive powered by overhead catenary to travel the route compared to diesel.** In fact, this overhead line-powered locomotive was estimated to have an excellent cost-benefit ratio and a payback period of about 11 years.

Finally, the job creation benefits of building out a nationwide electric freight rail system would be astounding. The president and CEO of Wabtec Corporation, a Pennsylvania-based rail company, testified that increased rail utilization and zero-emission locomotives could create up to 250,000 jobs.

B. Battery-Electric Locomotives.

Battery-electric locomotives are also well-suited for deployment across the United States, particularly for switcher operations in railyards but also for line-hauls. These locomotives are powered by on-board batteries that provide energy to the motor and replace the train's diesel engine. Battery-electric locomotives are also uniquely able to take advantage of regenerative braking, which allows the train to capture enormous amounts of otherwise wasted energy from braking a large, heavy load traveling at high speeds. Important advances in battery-electric locomotive technology, rapidly declining costs of batteries, and increasing availability of fast charging show that the technology is ready for a mandatory transition to zero-emissions. In fact, lead researchers find that battery-electric freight trains can achieve cost parity with diesel trains today.

There are already battery-electric switchers being ordered today. **Union Pacific announced plans to purchase 20 battery-electric locomotives for in-yard operations in 2022.** The battery-electric locomotives will be acquired from Progress Rail and Wabtec Corporation. Progress Rail's EMD Joule Switcher has up to 3,000 horsepower, and a run time of up to 24 hours, depending on charging and utilization. Like any other battery-electric transportation, the switcher's battery recovers energy through dynamic braking, which allows the battery to restore its energy reserves in route. Similarly, Wabtec Corporation completed tests in April 2021 of its battery-powered line-haul locomotive, FLXdrive. BNSF tested the battery-powered heavy line-

haul locomotive in Southern California on a 350-mile track between Barstow and Stockton, California. The electric, battery-powered locomotive was operated between two Tier 4 diesel locomotives as part of a hybrid consist. Wabtec plans to commercialize this battery-powered locomotive for hybrid operation, and this research will also undoubtedly support the further development of fully zero-emission line-haul locomotives.

Electrifying our freight locomotive system also offers attractive cost savings over operating traditional diesel locomotives. Advances in battery energy density translate to lighter, energy-packed battery packs that can carry a battery-electric locomotive very long distances. Indeed, a single typical boxcar can hold a 14-MWh battery and inverter capable of delivering enormous range. In fact, a typical diesel line-haul retrofitted with this technology is capable of traveling an impressive 450 miles—three times the average daily distance for a freight train in the United States. Even with the added weight of the battery car, all-electric drives are far more efficient than diesel trains, and can travel these long distances at cost parity with diesel, assuming electricity charging costs of 0.06\$/kWh.

As the size and capacity of battery packs continue to grow, their costs rapidly decline, outpacing even expert predictions. In 2010, battery packs cost \$1,000 per kWh, and many assumed it might take until 2030 to reach battery pack prices around \$200/kWh. But instead, between 2010 and 2020, battery energy densities tripled and battery pack prices declined 87 percent. The actual average cost in 2020 blew past estimates to \$137/kWh, with some battery packs pricing less than \$100/kWh. Now, average costs of \$100/kWh are expected as early as 2023, and the new estimate for battery prices in 2030 is \$50/kWh.

At the same time, commercial, high-capacity fast charging is increasingly available, which allows battery-powered locomotives to travel longer distances without needing to charge. This rise in fast chargers also allows railroads to have more flexibility in determining their routes without having to necessarily return to a single base to charge and adds the option of quickly charging locomotives during operational hours. All of this is to say that the costs of operating a battery-electric locomotive are already, and will continue to, rapidly decline.

C. Combination of overhead power lines & battery-electric locomotives.

Finally, battery-powered trains are already being blended as hybrid systems with overhead catenary power or fuel cells to perform as fully zero-emission locomotives. Batteries used in conjunction with locomotives that have overhead line power can allow for continued zero-emission operation, whereas some locations, like tunnels, might make it challenging to erect power lines. Hybrid systems can also yield energy savings and improve overall operations since batteries can store braking energy for later use and reduce the strain on overhead lines during peak power periods, while power lines allow the train to travel long distances without recharging.

Several hybrid locomotive systems are already in development. For example, Bombardier plans to convert five diesel-hybrid trains to zero-emissions by 2023 through a combination of overhead catenary and battery power. Likewise, BNSF piloted Wabtec's FLXdrive, a hybrid battery-electric diesel line-haul locomotive, earlier this year. Last year Hitachi Rail and Trenitalia unveiled the first tri-hybrid train, making it a big step in UE's goal in becoming climate neutral by 2050. Green transportation development company, Alstom, is a big proponent of this combination system, stating the importance of a modular number of battery packs for flexible

ranges and using tactics such as regenerative braking to ensure long-lasting batteries, minimizing the need for new infrastructure. In fact, some researchers have studied the efficiencies and feasibility of hybrid systems and found that even without regenerative braking, battery-electric trains should still perform well. Their realistic simulations showed the economic and technological feasibility of this electric transition. Even though some of these hybrid developments are not fully zero-emissions, they have tremendous value in showing that the technology is primed for further direction from EPA, and that various kinds of fully zero-emission switchers and line-hauls are on the horizon.

In sum, there is no question that zero-emission locomotive technology is already technically feasible for both switcher and line-haul duty cycles. In fact, this technology can offer cost savings compared to traditional diesel locomotives. EPA should adopt health- and climate-protecting zero-emission locomotive standards for switcher and line-haul locomotives that requires the industry to clean up its pollution on a wide scale.

VII. Conclusion: We need a Tier 5 zero-emission locomotive standard by the end of 2023.

Now is the time. Progress toward a zero-emission freight rail system has been delayed because of the political economic factors of private rail ownership and upfront costs. There is no question that the rail industry—which includes some of the most profitable companies in the world—is capable of developing the technology to meet a zero-emission mandate. However, the industry will not do so unless regulators and legislators demand these powerful corporations clean up their pollution. The existence of a diesel pollution health crisis in rail-adjacent communities for decades means we are well past the time for voluntary measures.

Locomotive pollution is a national issue. Environmental justice communities across the country continue to bear the public health and environmental consequences of this system. For decades, the rail industry has poisoned families, workers, and communities with a barrage of pollution from outdated locomotives. Issues regarding rail and locomotives go beyond the disastrous effects of air emissions. Locomotives contribute to a range of cumulative impacts further burdening environmental justice communities: bright lights, noises, vibrations that feel like earthquakes, idling locomotives that prevent emergency vehicles from passing, tracks that cut through communities, and parked trains that kids have to jump through to get to school. These cumulative impacts go largely unnoticed, unacknowledged, and unaddressed by our elected leaders and regulators.

The lack of action to clean up rail pollution also indicates a systemic lack of engagement of the federal government with rail-impacted communities. The EPA and its companion agencies in the federal government, like the Department of Transportation, need to engage more with frontline groups to more fully understand the harms the rail industry imposes. We welcome the opportunity to speak at the Senate Environment and Public Works Committee hearing to examine cleaner trains, focusing on opportunities for reducing emissions from America's rail network. We invite legislators and staff, along with critical regulatory agencies, to engage with the MFN to develop an engagement strategy that provides the requisite input from frontline groups.

Our regulators and decision-makers must prioritize community inclusion in the decision-making process and address the urgent climate and public health crisis being caused by the freight rail and locomotive industry. We cannot wait another minute before setting clear, actionable regulations and programs that prioritize protecting community health and well-being. This is especially true knowing that the solutions are there and can be implemented.

Sincerely,

Ivette Torres
Community Research Lead
People's Collective for Environmental Justice

IV. Attachments/Resources/Appendix

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