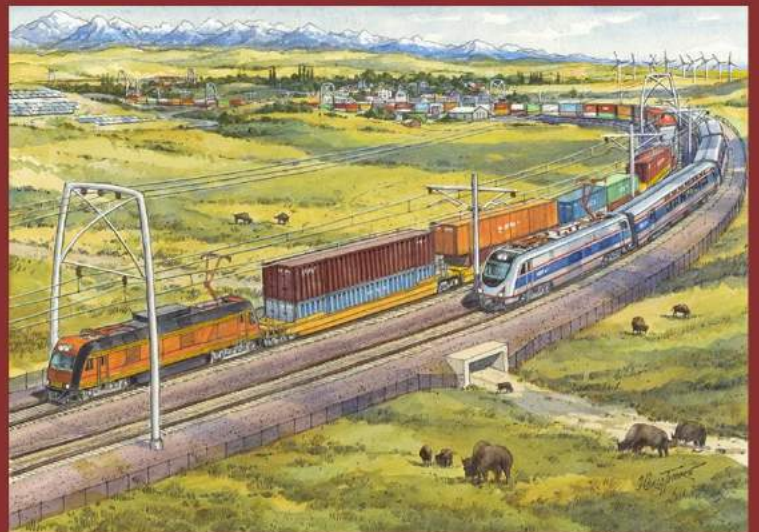


Solutionary Railroads

Moonshot Modeshift

Supplemental Brief #1 for the Select Comm. on the Climate Crisis



Solutionary Rail's Moonshot Modeshift Getting US long haul freight back on tracks by 2030

Abstract: Solutionary Rail is a proposal that originated in 2016 to electrify Class 1 railroads in the United States and additionally to use the rail corridors for renewable energy transmission lines. Its purpose is to aid decarbonization of the nation's transportation sector by: (1) eliminating greenhouse gas emissions from the railroads' locomotives by running them on renewable power; (2) using the resulting improvement of the railroads' operational economy to shift freight from highways to rail, eliminating emissions; and (3) moving renewable electricity from remote sources to cities. It became apparent that an important precursor for feasibility is to start the roads-to-rails mode shift of freight *first*. The **2030 Moonshot Modeshift** is a proposal to transform the US rail infrastructure, maximizing cost-competitive, increased-capacity freight rail service for medium and long haul freight. It does so while ensuring that the railroads are fiscally stable as the nation eliminates its use of coal and oil, and that the railroads are able to continue their vital service to the American economy. Electrifying the railroads will happen gradually, but mode shifting must start immediately.

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1. Introduction: A Roads-to-Rails 2030 Moonshot Modeshift

Because the world is now in a climate emergency, it is imperative that the United States decarbonize its economy and society as rapidly as possible. The transportation sector is responsible for nearly 30% of US greenhouse gas emissions. Longer haul transportation is difficult to rapidly decarbonize due to the limitations of battery technology into the foreseeable future. Railroads offer high energy efficiency, and the technology to electrify them is already mature and proven worldwide. Therefore, rail should play a central role in decarbonizing the U.S. transport sector. Every failure to substitute rail transport for trucks or airplanes more than triples the amount of energy generation required, making decarbonization far more difficult.

U.S. railroads and rights-of-ways are indispensable for U.S. decarbonization. They are the result of over 150 years of public and private investment and partnership, and must be used to their best advantage in this most-important-of-all task.

Transportation of people and goods causes 30% of all U.S. carbon emissions, an amount roughly equal to that of electricity generation from fossil fuels. Land-based transportation (roads and rails) contributes more than 85% of GHG emissions from transportation, and is a full quarter of total U.S. emissions.¹ Transforming the transportation sector in terms of both energy sources and greenhouse gas emissions is essential.

¹ 2017 data from EPA <https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions>

Accordingly, our 2016 book *Solutionary Rail* emphasized the electrification of Class 1 railroads and using rail corridors for renewable energy transmission. What has become abundantly clear over the last few years is that *mode shifting freight from roads to rails* is at least as important as electrification and that it likely must begin first. Getting freight - and concurrently people - off of roads and onto tracks as quickly as possible is necessary to improve the economic situation for rail electrification projects.

Prioritizing reliable and cost competitive freight rail service, with increased capacity for rapid delivery of high value freight, will draw both goods and people from roads to tracks. *Electrification will happen gradually, but mode shifting must start immediately.*

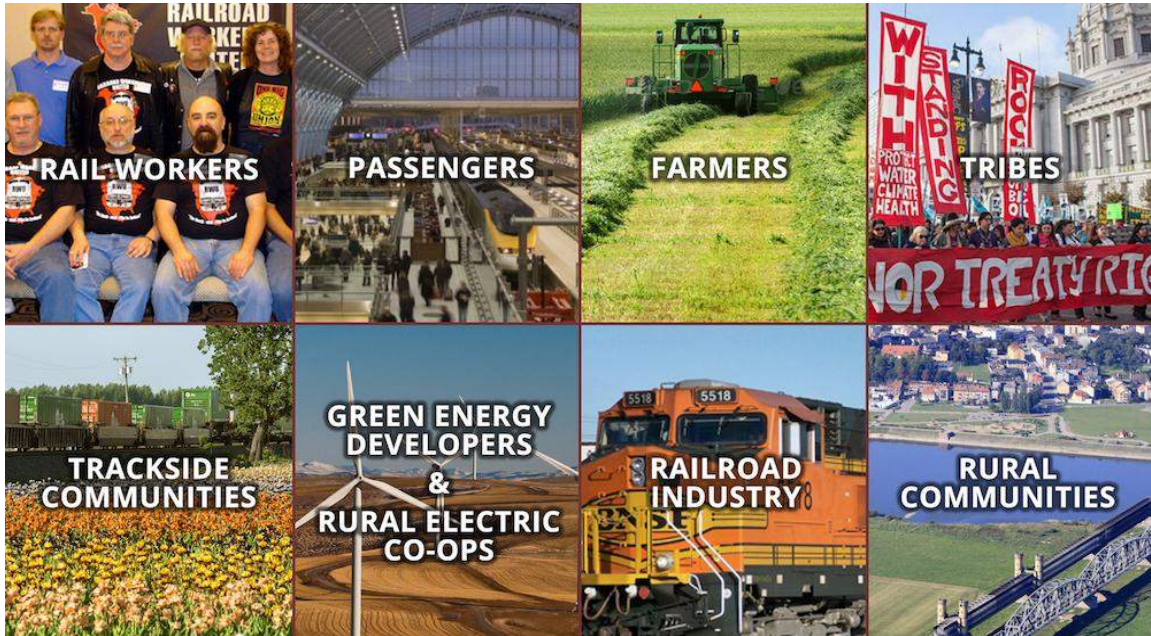
For both the modeshift and the larger Solutionary Rail effort, partnering with railroads is necessary but exceedingly difficult. Railroads inherently resist change. As *The Atlantic* reported recently, America's four largest Class 1 railroads funded actions to impede public awareness of climate change and governmental policies to effectively address it.² Railroads invested heavily in denying the reality of climate change, in order to slow the inevitable decline in their business of hauling the fossil fuel commodities they've become so dependent upon, especially coal. One avenue for their climate denial effort is the American Coalition for Clean Coal Electricity (ACCCE). Although the Association of American Railroads (AAR) left the clean coal trade group ACCCE in 2015, the four major Class 1 railroads remain ACCCE members. *Solutionary Rail* is calling for a 180-degree shift in Class 1 railroad companies' political activities and their business model. We assert it is

² A Major but Little-Known Supporter of Climate Denial: Freight Railroads
<https://www.theatlantic.com/science/archive/2019/12/freight-railroads-funded-climate-denial-decades/603559/>

absolutely urgent that the railroads become society's partner to mitigate the climate emergency the industry sought to obscure.

The *Solutionary Rail* project used to assume that the Class 1 railroads would be excited to have grassroots advocates building a case for a public private partnership to assist in shifting their business model. It took years for us to understand that *what seemed to us to be a win-win approach is opposite the direction market forces are pushing the railroads. The current dominant business model* is to reduce service, run longer trains, and refuse to provide the reliability needed in order to be competitive for medium and long haul freight. The dominant business model is referred to as "Precision Scheduled Railroading" (PSR). PSR has put railroads increasingly in the hands of Wall Street. Though no one is truly opposed to precision in railroading, PSR is a flashy name for a strategy to increase short-term profits by mining assets, constricting service to only the most profitable shippers, and reducing marginal costs. (More on PSR is included below.)

Turning this tide requires a bold vision and a broad stakeholder alliance. That alliance will need to work with state and national policymakers to craft win-win partnerships that will be attractive to Class 1 railroads. These would be partnerships to transform railroads' service models, align their common carrier status with 21st Century public interests, and put their rights-of-way in service of a new national purpose – the transmission of renewable electricity from remote sources to cities.



2. A Modeshift to Rail Solves Multiple 21st Century Problems

Efforts to decarbonize

U.S. transportation have thus far focused narrowly on road vehicle electrification, while overlooking that subsector's most broadly harmful and most difficult to address aspects.



Railroad electrification has been overlooked as well. Decarbonizing light-duty passenger vehicles is certainly important because they are the source of 60% of transportation emissions. Falling prices of electric vehicles - and the realistic expectation that battery capacity will be adequate for most people's needs - make this a relatively easy portion of transportation to electrify. Our focus is on solving the more difficult problem: decarbonizing long-haul freight.

2.1 The Multiple Problems Caused by Long-haul Trucking

Progress in electrifying the trucking sector is slow. Some ports are electrifying port equipment, and industry is beginning to use short range electric vehicles able to operate approximately 150 miles per charging cycle. Though Tesla is taking orders for its Cybertruck with a 500-800 mile range, it has not yet begun to deliver. With a \$200,000 price tag, this vehicle is not a feasible option for replacing the ~11 million trucks in the U.S. tractor trailer fleet.

Even if it were affordable to electrify all combination trucks in the U.S., *neither electrification nor automation of trucking solves the vexing infrastructure problems of congestion.* The most recent version of the Texas Transportation Institute's U.S. congestion study estimates the national total cost of lost time and fuel from gridlock to be **\$166 billion a year.**³ The study hints at benefits of getting trucks off the roads but sets no goals, nor does it estimate the potential savings of such changes.

Tractor trailers and other heavy trucks also cause a disproportionate amount of wear and tear to roads, bridges and other infrastructure, for which the trucking industry does not pay. Fuel taxes on commercial trucks cover far less than the



Average Daily Long-Haul Truck Traffic on the National Highway System: 2015



³ <https://today.tamu.edu/2019/08/22/tti-report-nationwide-gridlock-costs-166-billion-per-year/>

cost of the roadway damages these trucks cause. A GAO⁴ study estimates it takes 9,600 cars to cause the same pavement damage as just one five-axle trailer hauling 80,000 pounds. Evidence suggests that shifting to heavier trucks in order to reduce the number of trucks on the highways doesn't pencil out, even with additional axles. Michigan has learned that distributing weight among additional axles only prevents damage when running on smooth surfaces. When trucks bounce on uneven surfaces, heavier trucks (even with additional axles) still inflict more damage to pavement than more numerous lighter trucks.⁵ Importantly, additional axles do nothing to reduce the extra burden on bridges.

Exhibit 11-10: Forecasted Average Daily Long Haul Freight Truck Traffic on the NHS, 2045



Note: Major flows include domestic and international freight moving by truck on highway segments with more than 25 FAF trucks per day and between places typically more than 50 miles apart.
Source: DOT, FHWA Office of Freight Management and Operations, Freight Analysis Framework, version 4.3, 2017.

Continued dependence on trucks for carrying medium and long-haul freight, when rail could be made an option, perpetuates unending cycles of damage, deferred maintenance and a perpetually bankrupt highway trust fund. The total tonnage for trucking is forecast to grow by almost 45% by 2045, and the value of freight is forecast to increase by 84%.⁶ That future is incompatible with meeting decarbonization goals unless there is a dramatic shift in how long-haul freight is transported. The Federal Highway Administration (FHWA) estimates that semi-trailer and multi-trailer trucks cause 44% of highway maintenance costs.⁷ We cannot

⁴ <http://www.gao.gov/products/CED-79-94>

⁵ <https://www.freep.com/story/news/local/michigan/2019/04/19/heavy-truck-damage-michigan-roads/3474156002/>

⁶ Status of the Nation's Highways, Bridges, and Transit | Conditions and Performance | 23rd Edition <https://ops.fhwa.dot.gov/freight/infrastructure/nfm/rptc/cp23hwyfreight/index.htm>

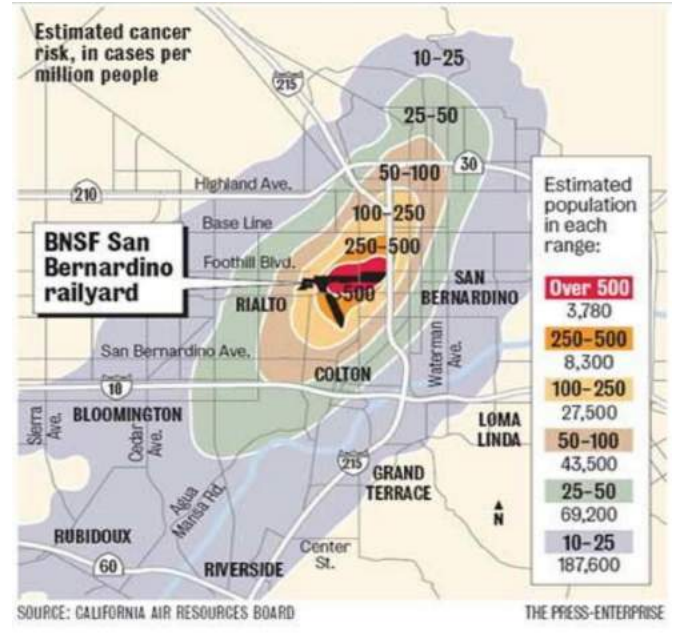
⁷ Federal Highway Administration, "1997 Federal Highway Cost Allocation Study —Summary Report: V—Highway Cost Responsibility," 1997, <http://www.fhwa.dot.gov/policy/hcas/final/execsum.cfm>.

simply build our way out of this mess. Getting a significant portion of these trucks off the road is guaranteed to save tax-payers many billions of dollars per year, help keep road infrastructure safer, and reduce GHG emissions.

The current *goods movement system* is causing a health crisis for the many communities and workers exposed directly to air pollution from freight transport. In the U.S., 13 million people live near major marine ports, rail yards and warehouse hubs. Those communities are primarily low-income, communities of color which makes this an issue of environmental injustice due to its

disproportionate impacts. These communities are highly vulnerable to climate change impacts and to toxic air pollution – CO₂ and Black Carbon – produced by the diesel-powered vehicles and equipment currently used by the freight industry. Black Carbon is fine particulate matter, and besides its impact on health, it is a short-lived climate pollutant having a very high global warming potential – some estimate over 600 times higher than CO₂.

Epidemiologic studies consistently show that children and adults living close to freight transportation hubs and corridors have elevated health problems, including asthma, poor lung



development, lung cancer, cardiovascular disease, preterm births and infants with low birth weight, and premature death.^{8 9}

As these statistics indicate, our current freight distribution system is literally killing people. These communities cannot wait for development and fleet-penetration of affordable electric trucks that can travel 500 miles on a charge. These communities need zero emissions freight transport *yesterday*.

2.2 Needed: National Policy for Competitive Freight Rail

The current service model of our Class 1 railroads intensifies infrastructure and public health problems by failing to provide cost-competitive and reliable¹⁰ freight service for medium and long-haul distances. The public interest is for freight railroads to draw far more freight off difficult-to-electrify truck routes and onto more efficient – and easier to electrify – trains.

Current public subsidies for trucking hamper railroads' competitiveness for medium hauls of 100-500 miles. This situation is not sustainable, and it inflicts negative impacts on the American people. Freight rail's inability to compete in distance categories, or "distance bands" as they are referred to in the Freight Analysis Framework (FAF), of 100-249 and 250-499 miles perpetuates counter-productive reliance on diesel trucks and is contrary to the public's interest for a number of reasons: the public health impacts of diesel, climate emissions, and unnecessary wear and tear on public roadways. But this dilemma of unbalanced competitiveness can be

⁸ DERA Fourth Report to Congress: Highlights of the Diesel Emissions Reduction Program

<https://www.epa.gov/sites/production/files/2019-07/documents/420r19005.pdf>

⁹ "DPM was significantly higher for corridor towns than non-corridor towns. Hot spot analysis revealed statistically significant clustering of elevated DPM concentrations and asthma incidence in certain towns."

<https://www.sciencedirect.com/science/article/abs/pii/S1353829208000075?via%3Dihub>

¹⁰ Dr. Jose Holguin-Veras points out that the most important factor for shippers is reliability, then cost. Speed has not been a major concern. Speed of distribution to consumers does seem to be a factor. Dr. Holguin-Veras also indicated that the energy efficiency of a shipment is proportionate to the size of the shipment, single packages being the least efficient of all. [Report 44 - NAS - Freight Trip Generation and Land Use](#)
<https://drive.google.com/open?id=1v-q4ApIsUNBfVF3gl0yvLZhtOZSJAcPf>

easily solved. Policies to disincentivize harms by incentivizing the most sustainable transport opportunities are necessary, particularly to enable trains to provide competitive service for hauling any goods beyond the current 150 mile range of electric trucks.

The bias of Class 1 freight railroads for freight travelling 500 miles or more, combined with the propensity of long-haul trucks, tends to cause distribution hubs (e.g. warehouses) to concentrate at locations far apart. As a result, the range capability of electric trucks that will be available for the foreseeable future is insufficient to serve many locations in between. A consequence is the poisoning of communities by diesel trucks and rail yards that serve inland ports and sprawling warehouse districts such as those in Kansas City, Chicago, and San Bernardino. Distribution hubs ought to be close enough together to allow electric vehicles to both supply and distribute, and thereby can be smaller and cause less emissions. Whenever possible, warehouses ought to be directly served by rail, or least situated so that it is feasible for the drayage trucks connecting them to ports or railyards to be electric. This would dramatically eliminate the need for long haul trucks and reduce the need for non-electric medium hauls.

It is intolerable that U.S. freight railroads increasingly fail to be competitive or reliable for long haul trips over 500 miles. Listening to Class 1 railroad ad campaigns on the radio and their boasts about efficiency, one would assume that freight railroad companies enjoy total market domination on trips over 500 miles. But according to the Freight Analysis Framework data tabulation tool,¹¹ *U.S. freight railroads surrender approximately 40% of ton miles to long haul trucks even for distances over 500 miles. In 2017, that amounted to approximately 1 TRILLION ton miles of freight.* This failure of service multiplies the negative impacts of long

¹¹ Freight Analysis Framework data tabulation tool <https://faf.ornl.gov/fafweb/Extraction1.aspx>

haul trucks on communities and infrastructure. These negative impacts are an unnecessary symptom of both skewed policies and the flawed Class 1 railroad business model.

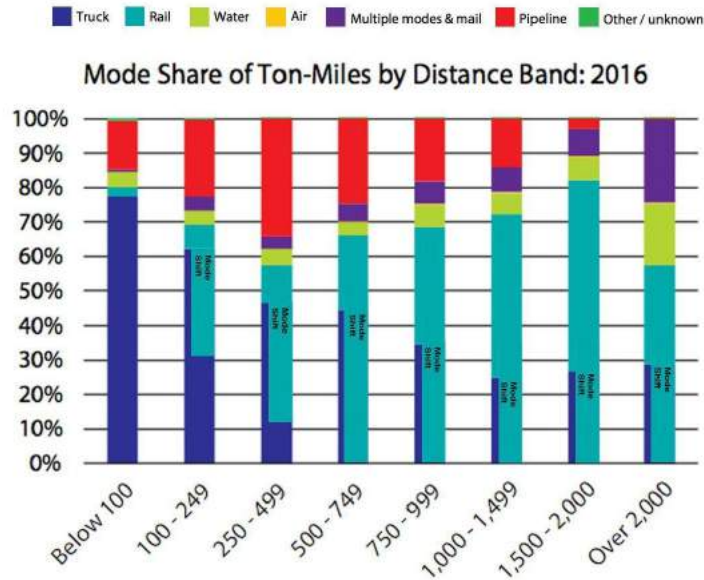
The exigencies of the climate crisis, our urgent need to reduce emissions and support resilient systems, along with the many other compelling public interests elaborated thus far, converge to provide **an unmistakable mandate for a new, clear and bold national goal for our US railroad infrastructure**. Incremental, piecemeal tweaks and flashy transportation gimmicks will waste precious time and will fail to make the systemic changes our freight movement infrastructure requires. As inspiring and unifying as the Apollo Program was, **Solutionary Rail is the “Moonshot” of our time, delivering a yet greater material difference in people’s lives.**

3. Moonshot Modeshift 2030: From Roads to Rails *in 10 Years*

Solutionary Rail proposes that the nation tackle the most difficult aspects of transport decarbonization by starting with a dramatic, common sense “mode shift” of freight from roads to rails. Steel wheels on tracks are much more efficient than tires on pavement. On average, a train can move one ton of freight 473 miles with a gallon of diesel, whereas a truck will move that ton of freight only 135 miles using the same amount of fuel.

Shifting U.S. freight travelling on trucks to trains whenever possible is common sense. Prioritizing according to distance traveled and emphasizing long haul freight will dramatically

reduce diesel consumption, GHG and diesel emissions, and other harmful impacts of truck freight.



This 2016 Bureau of Transportation Statistics graph of freight mode share by ton-miles is modified with the aqua for rail extending into the dark blue of truck share to indicate the extent of our proposed Moonshot Modeshift.

3.1 Goals of the 2030 Moonshot Modeshift

Solutionary Rail's goals for its proposed **2030 Moonshot Modeshift** for transportation of high-value goods are, within 10 years, to make these shifts from trucks to trains:

- 50% of ton miles¹² traveling from 100-249 miles go by train;
- 75% of ton miles traveling from 250-499 miles go by train;
- 100% of ton miles traveling 500 miles or more go by train.

¹² One ton of freight carried one mile, as a unit of traffic.

3.2 Huge Public Benefits the 2030 Moonshot Modeshift Can Deliver

- The **Moonshot Modeshift** will create living wage American jobs - just transition opportunities - in manufacturing and infrastructure construction and logistics.
- A Modeshift will reduce annual U.S. annual diesel consumption by at least 10-20 billion gallons.^{13 14}
- At approximately 10 million metric tons of CO₂ per billion gallons of diesel saved, this modeshift has the potential to rapidly reduce U.S. annual GHG emissions by at least 100 million metric tons.¹⁵



Reaching the 10-year goals of the **Moonshot Modeshift** will dramatically increase the value of freight traveling by rail. Based on data provided in the Freight Analysis Framework, the average value of rail freight per ton mile in 2017 was approximately \$0.50. At current dollar values and volumes, our mode shift would increase the average value per ton mile to nearly \$2.25 by increasing rail share of higher value freight. The increase in average value and the increase in ton miles transported by rail would add \$5-6 trillion to the value of freight

¹³ These numbers are based on analysis utilizing Oak Ridge National Laboratory's *Freight Analysis Framework Tool*. <https://faf.ornl.gov/fafweb/Extraction1.aspx>

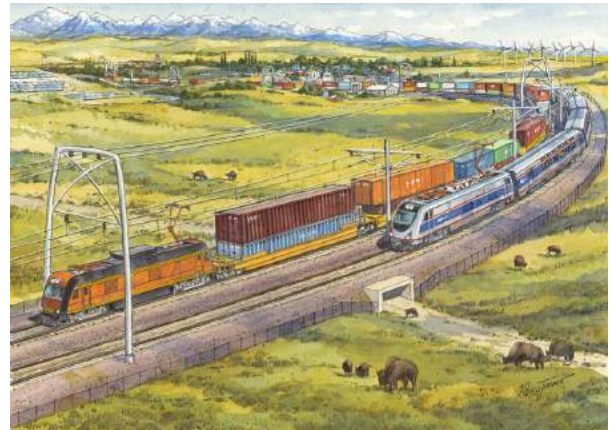
¹⁴ These calculations compiled by *Solutionary Rail* experts, shown at: <https://drive.google.com/file/d/1HwUqHnSGzLbZmB7S13sHyeFgfkz-z4Ny/view>

¹⁵ The AAR equates 1.5 billion gallons per year with annual greenhouse gas emission reduction of 17 million tons. See <https://www.aar.org/issue/freight-rail-and-the-environment/>

transported by rail, approaching a \$7 trillion total value. This would achieve an approximately equal split between freight carried by trucks and freight carried by trains. This provides the railroad and related industries that manufacture rail equipment an opportunity to thrive, rather than diminish.

The 2016 report to Congress by American Academy of Sciences/U.S.DOT/FHA¹⁶ on truck weight and axle weights concluded that data being collected is inadequate to make highly accurate evaluations on impacts and cost/benefit assessments. The “*Freight Transportation Modal Shares: Scenarios for a Low-Carbon Future*” report also calls for additional research and data acquisition.¹⁷ That said, the benefits of our common-sense proposal are self-evident:

- Annual savings from reduced infrastructure wear and tear, and reduced need for additional road construction will be in the tens of billions of dollars per year.
- The annual reduction in truck-related freeway injuries and deaths will be in the thousands of people.
- Improvements to air quality, and as a result to public health (i.e. the reduction of real harms currently perpetrated on people living near transport corridors and



¹⁶ “To make a genuine, measurable improvement in the knowledge needed for these study areas, a more robust study effort should start with the design of a research program that can establish data sources and models to advance the state of practice.” p. 25 2016 Report to Congress on Comprehensive Truck Size and Weight Limits Study

<https://ops.fhwa.dot.gov/freight/sw/map21tswstudy/ctsw/CTSLWS%20Report%20to%20Congress%20FINAL.pdf>

¹⁷ Research gaps and additional analysis recommendations by Freight Transportation Modal Shares: Scenarios for a Low-Carbon Future, p. 68-73

<https://www.energy.gov/eere/analysis/downloads/freight-transportation-modal-shares-scenarios-low-carbon-future>

- hubs), will save thousands of lives per year and improve the health of millions of people.
- Savings of time and fuel through reduced congestion will likely be in the tens of billions of dollars per year.¹⁸

The **2030 Moonshot Modeshift** will deliver mammoth economic and social benefits. Consequences of failing to undertake this moonshot are potentially devastating. Perpetuation of the status quo is a betrayal of the government's public trust.

3.3 Solutionary Rail's Synergistic Strategy

2030 Moonshot Modeshift, combined with the other components of the *Solutionary Rail* approach, will deliver cascading benefits by tackling, head on, the toughest decarbonization challenges. The prospect of electrifying the transport of medium and long haul freight (and at the same time obtaining the emissions reduction and great increase in energy efficiency it would bring) will remain an unreachable goal for the foreseeable future without mode-shifting freight from trucks to trains. For shorter distances, the complementary electrification of trucks, heavy equipment, and passenger vehicles can feasibly be done within the same 10 year timeframe at a cost that is increasingly within reach.

3.4 Shift Passengers & Freight to Rail to Unclog Highways

A passenger modeshift will occur concurrently with freight. The clogged and unreliable U.S. freight system directly impacts passenger rail transport. Creating tracks dedicated to mixed rapid freight and passenger service, investing in grade separation, and deploying rapid freight

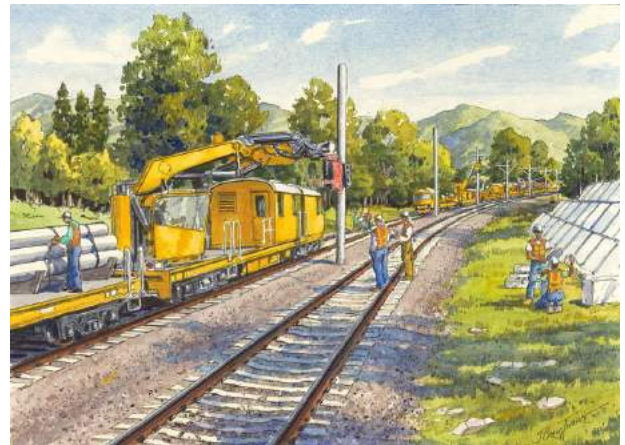
¹⁸ TTI Report: Nationwide Gridlock Costs \$166 Billion Per Year
<https://today.tamu.edu/2019/08/22/tti-report-nationwide-gridlock-costs-166-billion-per-year/>

technologies will unclog both railroad and (through modeshift) highway infrastructure. Along with attracting freight, these improvements will draw people out of cars (and planes), putting both shipments and travel back onto highly efficient tracks. This cascading benefit will boost even more the reduction of transportation sector emissions.

3.5 Synergy with Rail Electrification During the 10-year Span

As a related effort, whatever railway electrification can be accomplished within the ten-year timeframe will speed progress and increase system capacity for the **2030 Moonshot Modeshift**. Though this strategy prioritizes mode shifting of freight to trains regardless of the energy source for locomotives, rail electrification will be a boon to the **Moonshot Modeshift** and deliver multiple other benefits:

- Rail electrification adds capacity and efficiency to the system. Faster acceleration and deceleration is estimated to add 15% more capacity, allowing greater utilization, i.e. more trains on the same infrastructure.
- Electrification of trains reduces propulsive-energy and maintenance costs.
- Because batteries and charging are not needed, rail electrification is easier to accomplish than electrifying trucks, and there are no range limitations.



- Electrification of a fixed infrastructure requires additional resources, but it reduces dependence on mineral extraction for batteries, avoids the inefficiencies of charging, and eliminates a large portion of the massive future battery waste stream.

Studies have long shown that where there is sufficient traffic volume/utilization, rail electrification rapidly pays for itself.

3.6 Synergy with Short-haul Electrified Trucking

For battery-powered trucks, overhead catenary wires for periodic charging while underway on local highways – or alternatively trucks powered by fuel cells – may allow our freight system to approach nearly 100% electrification within 10 years, in combination with the railway efforts already described. This makes 100% carbon free land transportation a reasonable goal, accomplishable on a timeline commensurate with the overlapping economic, public health, and climate crises that confront us.

3.7 Piggy-Backing Long-Distance Power Transmission Along Tracks

Opening railroad rights-of way for renewable energy transmission connects the dots on transportation and energy goals. Powering trains and other transportation with electricity generated from renewable energy sources is in the public interest. Renewable energy generation is increasingly more affordable than any other source. The major constraint on renewable energy development is lack of transmission. **Utilizing railroad corridors for**



renewable energy transmission will unlock stranded assets to power trains and transmit to markets. Utilizing some corridors for HVDC inter-regional transmission will address the variability of renewable energy.

Solutionary Rail’s combination of modeshift, electrification and transmission provides a feasible, rapidly-achievable decarbonization strategy. It tackles some of the most difficult challenges of the transportation and energy sectors’ 60% share of U.S. GHG emissions. Solutionary Rail recruits a broad set of unlikely but essential allies by addressing multiple other negative impacts and deficiencies of our goods movement and energy systems. Leveraging the efficiencies of rail transport and better utilization of rail corridors to deliver societal benefits and cost savings, Solutionary Rail builds the political will for systemic change and liberates revenue to invest in a just transition to a decarbonized energy and transportation future.

4 Threats & Opportunities

4.1 Predatory Practices Threaten this Common Sense Solution

Policy and market failures have stunted and impeded the evolution of a truly sustainable transportation ecosystem. Trains, trucks, and automobiles have not found their rational niches. Counter-productive public policies continue to subsidize the trucks that damage infrastructure, harm public health, and inefficiently transport far too much of our long haul freight.



Wall Street predation over railroad assets threatens long term vitality and capacity of U.S. railroads. Wall Street now controls much of the railroad industry and seems determined to mine rail assets for short term profit, without concern for long term viability or safety. The deceptively named “Precision Scheduled Railroading” (PSR) business model has captured nearly every Class 1 railroad. Once famous for reinvesting in capacity and long term vitality, when railroads adopt PSR they have an incentive to sell-off or abandon infrastructural capacity that was built-up over the last 170 years through both public and private initiatives. The U.S. has already lost more than 50% of its once 300,000 miles of track. The 140,000 remaining are in jeopardy as Wall Street pressures the railroads to inflate short term profits by reducing operating costs by paring low-margin services and capacity. A leading rail expert characterizes Wall Street’s treatment of U.S. railroads as “a going out of business sale.” Railroads show zero impetus for self-correction, no ability to resist Wall Street predation, and they simply go along with and embrace shrinking market share. But railroad experts, labor organizations such as the AFL-CIO¹⁹, and corporate shippers²⁰ are finding common ground, raising the alarm about “PSR.” It is time the U.S. public and policymakers heed their warnings.

U.S. railroads were our first common carriers – that is, regulated monopolies. They were designated as common carriers to afford them the privilege of existing as transportation monopolies, in exchange for serving important public interests. Railroads are currently exempt

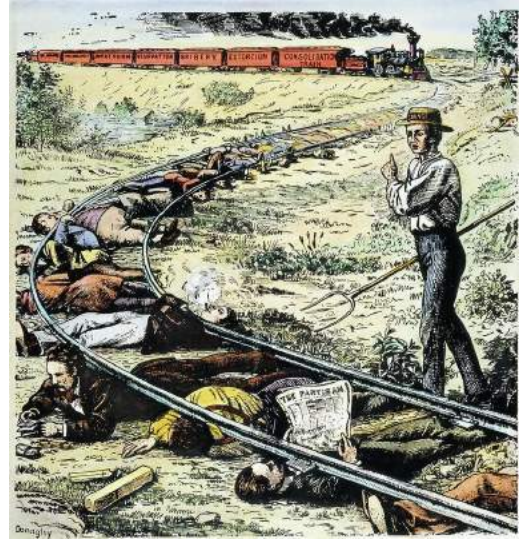
¹⁹Transportation Trades Department, AFL-CIO, October 29, 2019 Policy Statement “PRECISION SCHEDULED RAILROADING THREATENS TO GUT AMERICA’S FREIGHT RAIL SYSTEM” at

<https://ttdd.org/policy/precision-scheduled-railroading-threatens-to-gut-americas-freight-rail-system/>

²⁰ Rail service is at an all-time low, shippers tell House committee

<https://www.supplychaindive.com/news/rail-service-low-shippers-PSR/559619/> Video of July 2019 roundtable before House Transportation subcommittee on Railroads, Pipelines and Hazardous Materials available at <https://youtu.be/Et0dtE4yEh4?t=580>

from antitrust laws and only the bi-partisan Surface Transportation Board can adjudicate disputes on their pricing and service. It is long past time that agencies charged with overseeing these common carriers guide them into alignment with contemporary public interests. Continuing to neglect this will allow industry and Wall Street's predatory practices to undermine infrastructural capacity and to squander this critical national resource – just when the nation needs it the most.



4.2 Protecting the Public Interest

The Surface Transportation Board (STB) needs strong policy direction, such as including updated mandates to safeguard and expand infrastructure capacity and attain reliable service on all distance bands above 100 miles. The STB also needs to be afforded additional capacity to enforce such standards. STB's current level of oversight is trivial compared to what is necessary to defend this infrastructure from Wall Street predation and the vision deficit of Class 1 operators. The STB is appointed by the President and confirmed by the Senate Commerce Committee. Though by law the STB is permitted five members, this important regulatory body has had as few as one serving member in recent years. It currently has only three (February 2020). Also, the STB acts to enforce, not create policy. Therefore, clear direction from Congress and the President is essential. PSR's corrosive impacts are destined to get worse rather than better without STB intervention by policy makers.

4.3 Moonshot Modeshift Needs Aggressive Partnership & Vision

Accomplishing the **Moonshot Modeshift** will require an aggressive public investment and a partnership with railroads. That level of public partnership is incompatible with current private predatory business practices that undermine the capacity of that same infrastructure. Partnership must be accompanied by increased Surface Transportation Board oversight to ensure that U.S. rail infrastructure is protected.

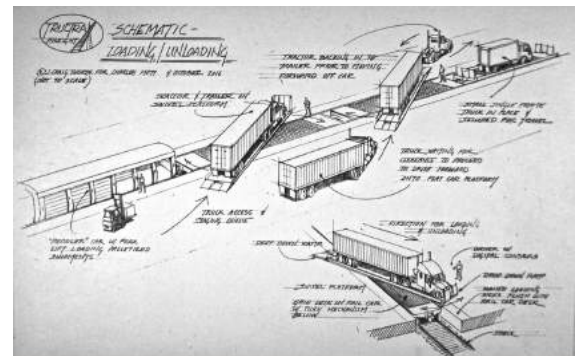


The **2030 Moonshot Modeshift** is bold but achievable with a national mobilization. Road to Rail and rapid freight technology exists. We launch the **Moonshot Modeshift** by immediately commencing the following:

- Stop subsidizing the harms inflicted by truck freight.
- Support the integration of existing and further development of rapid freight rail cars, truck-to-train roll-on/roll-off, or ro-ro technologies²¹, and rail yard innovations.

Intermodal Ramp Cars

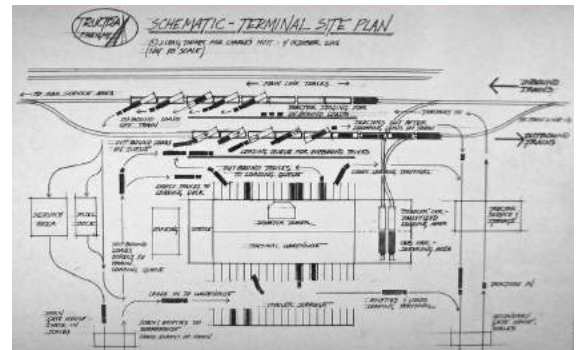
- New Concept TOFC Intermodal Trail
 - High Performance Train – up to 80 MPH
 - Soft Ride – Low center of gravity
 - Slack Free Train – No Bounce – No Roll – Premium Trucks
 - Cars can haul nearly any highway trailer
 - Any length trailer
 - Gives railroads access to 4 million + trailers / \$300 billion + intercity market
 - Hitches are pull up / knock down type – cushioned
 - Lightweight – articulated – integral loading platform car
 - Low cost efficient loading/unloading
 - Flexible – Can be loaded or unloaded at any grade crossing



²¹ Freight Transportation Modal Shares: Scenarios for a Low-Carbon Future p. 33

“While commodities shipped in containers and dry vans represent the most attractive candidates for truck or rail diversion, other types of trucks, such as liquid bulk tankers, dry bulk hoppers, and flatbeds, can be handled by rail using an operation known as roll-on/roll-off, or ro-ro, in which the trucks are driven onto and off of railcar platforms. Different types of terminals, equipment, and services are required to handle different truck

- Invest in further design innovations, applications of these technologies, and the manufacturing of equipment.
- Aggressively invest in rail-related education, research and data collection on modeshift and decarbonization of goods movement.
- Provide incentives and support for the transition to existing and emerging designs such as the Iron Highway, Flexiwagon, Intermodal Ramp Cars,²² and efforts such as Nevada’s proposed Land Ferries.²³
- Put affordable guidance technology tools in the hands of well-trained locomotive engineers and dispatchers for NextGen-like traffic management to maximize track utilization and rail transport reliability.²⁴



Switzerland is leading the way for getting trucks onto trains (photo above). The Iron Highway[®] “prototype” developed by CSX was in use by Canadian Pacific Railway for 20 years. Other rapid freight ideas include Flexiwagon[®] (photo above), TrucTrax[®], and WabTech’s Ramp Cars[®]. There is no limit to the ingenuity that can be applied at every level of this system.

types. Ro-ro loading systems can involve splitting the train into several segments to allow multiple points of loading and unloading—a process which is referred to as open technology.”

²² Freight Transport Alternative Technologies (Logistics & electrification)
<https://drive.google.com/open?id=1nlREeBmFVOjC14WffHKpc4NNRuNjxzjT>

²³ Proposed “Land Ferries” in Nevada
https://drive.google.com/file/d/1kUIMgSK8-liPK25D9m6BQtU_C88vxSRk/view?usp=sharing

²⁴ “Data Links and Planning Tools: Enhancing the Ability to Plan and Manage Train Operations,” and this work by Steven Ditmeyer lays out use of technology for managing traffic and more:
<https://drive.google.com/file/d/0B8zF72fC6S7COTM1QklnZmhPOE1Bd2RkKbHZHYWN4NjUxcmZZ/view?usp=sharing>

4.4 Iron Highway

The report *Freight Transportation Modal Shares: Scenarios for a Low-Carbon Future* has this to say about “Roll On, Roll Off” methods.

“Open technology was originally conceived as a way to make rail more competitive with trucking over short distances by reducing load and unload times and offering competitive end-to-end speeds. Ro-ro rail operations are more established in Europe than they are in North America. In North America, open technology was first introduced by CSX in the mid-1990s under the trade name ‘Iron Highway’.”

“Iron Highway technology involves a train comprised of flatcars and multiple power units at different locations, so that the train can be separated into multiple parts; loading ramps are positioned at breaks in the train, and trucks and trailers are driven on and off. The Canada Pacific Railway subsequently acquired the CSX equipment and started the ExpressWay service between Montreal and Toronto (340 miles) in 2006. The Canada Pacific Railway later extended the ExpressWay service to Detroit (adding 230 miles) in 2002. Their service now has five terminals (Montreal, two in Toronto, Windsor, and Detroit) and runs two trains per day in each direction, six days a week, with up to 90 platforms per train. The Canada Pacific Railway has reported typical loading times of less than one hour for a 90-car unit. ExpressWay carries only the truck trailers and no drivers, as there are no passenger accommodations.”²⁵

²⁵ Freight Transportation Modal Shares: Scenarios for a Low-Carbon Future p. 33
<https://www.energy.gov/eere/analysis/downloads/freight-transportation-modal-shares-scenarios-low-carbon-future>

A 2030 Moonshot Modeshift will create good jobs for American workers. Here are some photos from the Iron Highway car manufacturing plant:



An example of good work that has been accomplished at the state level is a collaboration between the Nevada Department of Transportation and the University of Nevada, Las Vegas. The quote below is from the abstract of the Phase 1 feasibility study:

“It was estimated that the Land Ferry would create over 45,788 temporary jobs in Nevada during the three-year construction period and 318 permanent jobs during operation. The majority of the benefits were attributed to savings in travel time (\$356.4 M), vehicle operating costs (\$1000.4 M), reduction of accidents (\$544.6 M), and pavement maintenance (\$503.2 M).



These benefits would be a consequence of the shift of trucks from the highway, thus resulting in higher speeds, decreased fuel consumption, and decreased vehicle maintenance costs. The overall benefit-cost ratio of 1.7 implies a cost-effective project.”²⁶

The Freight Transportation Modal Shares: Scenarios for a Low-Carbon Future study stated that,

“A radical increase in public investment in rail could reduce prices and improve service, allowing rail to capture more freight from trucking.” For example, a study of a \$12- billion investment program for a Norfolk Southern rail corridor parallel to I-81 in Virginia determined that the program had the potential to divert 17% of truck trips longer than 500 miles and 6% of all truck trips along the corridor to rail. We estimate that a major program to expand capacity and improve service to levels that make freight rail more competitive with trucking could increase rail tonnage by 10-20%. The cost of re-establishing rail lines, and subsidizing service to capture a large portion of freight trips shorter than 500 miles would be quite high. No national estimates of the total cost are available.”

History requires that we be far more bold than even the above study, and that we invest in meeting goals far higher than 10-20%. A 2009 Millennium Institute paper claimed that a \$250-500 billion investment in freight rail could remove as much as 83% of long haul trucks from the road.^{27 28} Regardless of whether their estimates remain accurate today, their ambition approximates that of Solutionary Rail’s **2030 Moonshot Modeshift**.

²⁶ Univ. of Nevada Las Vegas Land Ferry study page <http://tnmc.faculty.unlv.edu//LandFerry/Index.php>
Nat. Academies of Science abstract <https://trid.trb.org/view/1337796>, YouTube Land Ferry video rendering <https://www.youtube.com/watch?v=0I8iLn6MpAs>

²⁷https://web.archive.org/web/20090920224928/https://www.millenniuminstitute.net/resources/elibrary/papers/Transportation_MI09.pdf

²⁸ <https://washingtonmonthly.com/2009/01/01/back-on-tracks/>

5. How to Accomplish the 2030 Moonshot Modeshift

5.1 Option #1: Chartering the Steel Interstate Development Authority:

Solutionary Rail proposes public-private partnerships to make this national railroad modernization, electrification and energy transmission project a reality. The most efficient path forward would be for the federal government to charter a Steel Interstate Development Authority,²⁹ or SIDA, to finance and own the buildout of additional rail and transmission capacity. The SIDA would issue tax-exempt private activity bonds and leverage federal loan funds such as provided by the Transportation Infrastructure Finance and Innovation Act (TIFIA) to fund the projects. The SIDA would negotiate rights of way and oversee construction and operations. Infrastructure that is owned, maintained, or improved by the railroad companies would continue to be owned by them. Electrification and new track infrastructure and any other part of the project paid for with public dollars would be publicly owned.

A federally chartered Steel Interstate Development Authority would enforce public interest and community benefit mandates. It would bridge the work of multiple agencies from DOT, USDA, and DOE - with FRA, FHA, and FERC and STB involvement. Alternatively, Congress may create a pathway for states to collaborate to create regional SIDAs with state and tribal governments collaborating under the umbrella of a semi-public entity.

The Steel Interstate Development Authority framework provides a path forward for Class 1 railroads to pivot away from their dependence on shipping coal without succumbing to the capacity-depleting tendencies of so-called "Precision Scheduled Railroading." Leaning on

²⁹ More on the SIDA idea at https://www.solutionaryrail.org/sida_rb6 and *Solutionary Rail* Ch 5, p 53 Free PDF with coupon code 4WRD2GTHR at <http://SolutionaryRail.org/ebook>

this public private partnership to absorb the risk of change will not be a bailout; the public interest mandates as outlined by the Solutionary Rail proposal will ensure that public investment serves the public interest and direct investments remain public assets. Class 1 railroads that funded climate change denial propaganda will have the opportunity to reset their business model, prepare for long term growth, and dramatically expand market share. This partnership offers an opportunity for a historic harmonization of the railroads' common carrier status with 21st century public interests.

5.2 Contingencies: What if Class 1 railroads refuse a Public Private Partnership?

We do not allow other regulated monopolies, i.e. common carriers such as utilities, to serve only the most profitable customers. We should not allow railroads to do that either. When profitability was an impediment to rural electricity development, Congress intervened by creating the Rural Electrification Administration - now under the USDA as the Rural Utilities Service. A network of rural electric co-ops now serve 75% of US. The resulting rural electric co-ops are non-profit entities with a public interest mandate.

Unchecked, 10-15 years of Wall Street's predation of Class 1 railroad infrastructure through "PSR" could render the infrastructure so degraded that it is unsalvageable. If private railroad companies allow the value of the infrastructure to be extracted for short-term profits and undermine the public interest of growing capacity and increased access to the rail infrastructure, some sort of intervention will be required. It is very possible that Class 1

railroads are already so completely captured by a predatory relationship with Wall Street that they will refuse to engage in the public private partnership model of the Steel Interstate Development Authority to grow market share by expanding service and capacity.

Facing this very real possibility, we have begun to form contingency plans. One option could be for the federal government to follow the formula Warren Buffett used when acquiring BNSF, i.e. purchasing one or more of the railroads by offering 35% over current market value. It is also possible that some other private entity willing to work with a SIDA could be encouraged to do so. It may be adequate for the federal government or some private entity to simply purchase a controlling share of the railroad(s). This is not an ideal scenario. The best rough estimate for the current value of the four main Class 1 railroads is between \$400-500 billion. This likely controversial option is clearly not our first choice. It would, however, avoid the more controversial option of an actual nationalization, while providing a viable mechanism for aligning the railroads with 21st century public interests and their common carrier obligations.

Over the long term, public ownership of the infrastructure might prove easier and potentially cheaper than tinkering, cajoling, and incentivizing an intransigent railroad industry that seems incapable of innovation or making the pivot to address the needs of the time. Like the public private partnership option of the SIDA, this solution opens vast possibilities for innovation in service of the public good, better passenger and freight rail service, and it provides the right-of-way for a new national transmission grid.

The least desirable and most politically fraught option, but one with historical precedent is rail nationalization. In 1917, as the US entered WWI, an agreement was struck between railroads and the federal government to temporarily nationalize US railroads in order to rapidly improve the infrastructure and their operations to answer the emergency needs of the country. The US Railroad Administration was established to reboot the system to make it work in the national interest. A federal railroad or "Steel Interstate" is the norm around the world and is arguably a perfect compliment to the current Interstate Highways. That said, the nationalization in the early 20th Century returned ownership of railroads at the end of WWI, and the companies benefited from the intervention with a much better infrastructure.

6. Conclusion

Literally and figuratively connecting us all, U.S. railroads hold tremendous value and are a monument to the struggles of those who came before us. The railroads and their rights-of-way are a gift from our past; hidden in plain sight, they provide the key to a sustainable future. Mode shifting freight from roads to rails as outlined in this paper, augments the broader *Solutionary Rail* decarbonization proposal and makes it yet more feasible, implementable, and immediate. The **2030 Moonshot Modeshift** is not dependent on electrification, and therefore ought to begin immediately. Aggressive investment in rail capacity will propel decarbonization far beyond merely electrifying railroads and is key to unlocking a just and sustainable transportation future that unites urban and rural communities, bolsters national and local economies, and propels a vibrant society.

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