

## The Steel Interstate System— A Uniquely Sustainable and Synergistic National Transportation Policy Initiative



### What is the Steel Interstate System?

Analogous to the vision, scope, courage, and function of its highway forerunner, it would do for the nation's railroads what the Eisenhower Interstate System did for roads. Think of the Steel Interstate System as a core national network of high-volume rail corridors, the backbone for movement of both goods and people in the 21st Century. They would be multi-tracked, grade-separated, higher speed, electrified, employ state of the art signaling and safety, bypass congested terminals and densely populated urban areas, and move trains quickly and efficiently.

By concentrating heavy flows of through traffic in such designated corridors, electrification of the Steel Interstate System can be justified. *By substituting domestically generated electricity for imported foreign oil as the main power for the nation's transportation sector, we can lower cost, improve security, and keep billions of dollars here at home to fuel jobs, economic growth, and infrastructure.*

The Steel Interstate System ***is the only national infrastructure program that can help pay for itself.*** Though federal investment is required as a catalyst to begin the commitment, as the network expands and a greater and greater percent of the nation's freight moves on the electrified Steel Interstate, the savings likewise grow. *And they continue year after year. As will be detailed below, with less than a 1% increase in electric generation, we can displace 7% of total U.S. oil consumption.*

### A Bit of Background.

In many ways the nation's railroads today are where the highway network was in the 1950s. Railroads' lack both speed and capacity. Atrophy brought on by truck competition and loss of high-value freight during the decades of the build-out of the Interstate Highway System are proximate causes. Faced with steadily declining volumes and high property taxes, railroad managements took every opportunity to pull up track and retire facilities.

As a result, once the Interstate Highway System became congested and sometimes gridlocked, and truckers faced chronic driver shortages and huge fuel price increases, there is no extra rail capacity to absorb freight that shippers may want to divert from trucks to rail. Demand in excess of supply is good for the



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railroads, because for the first time in decades they have pricing power, can pick and choose the business to handle, and make consistent profits.

But it is not as good from a public policy standpoint. Moving freight by rail takes only a third of the energy per ton-mile of trucking. Greater fuel efficiency translates directly to lower pollution generated, including CO<sub>2</sub> and other greenhouse gases. Adding equivalent freight-carrying capacity on rail requires a much smaller footprint on the land than highway construction, and is lower in cost, both environmentally and economically. Roughly 20% of freight land transportation is now by more efficient rail; the challenge is the other 80%.

As a nation our public policy position should be to encourage freight (and passengers) to be carried by rail wherever possible. The Steel Interstate System is the way to do this. Even long distance trucks can be carried aboard trains. Used in Europe but not in the U.S., this concept goes by various names, including rolling highway, truck ferry, and generically as “open intermodal” because it can handle all trucks, not just van trailers or shipping containers.

Gil Carmichael , former Federal Railroad Administrator and current Senior Chairman of Intermodal Transportation Institute, University of Denver is the father of the Steel Interstate System. He first promulgated what he termed “Interstate II” in a Washington, DC paper presented May 20, 1999:

<http://www.varprail.org/Interst2.htm>

### **Why the Steel Interstate System is a Win/Win/Win from so many perspectives.**

This section explains in greater detail the Steel Interstate System’s many benefits and interrelationship to so many current national high-priority issues. Much more detail, documentation, and analysis is at [www.steelinterstate.org](http://www.steelinterstate.org)

#### → Electrification & Energy Independence

Substituting domestically generated electricity for foreign oil has immense implications for energy independence. The transportation sector of our economy is the largest energy consumer. At this time, with the small exception of Amtrak in the Boston – Washington corridor, it is entirely dependent on oil, most if it imported, much of it from nations unfriendly to the U.S. Not only could the U.S. stop sending billions of dollars annually to these nations, but this money could be retained at home, creating jobs and boosting economic activity in the electric generation and transmission industries, strengthening our national power grid, and broadening the production and market development for renewables.



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Many proposals have been advanced to enhance America's energy independence, ranging from more rigorous building codes to tougher CAFE mileage standards for automobiles. All pale in comparison to the oil and energy savings from an electrified Steel Interstate System. U.S. railroads used over 84 million barrels of diesel fuel in 2006. Much of that could be saved by main-line electrification. Medium and long distance trucks should all move in the future aboard speedy and reliable electric-powered trains. This could boost oil savings ten-fold. Currently oil provides more than 40% of all energy consumed in the U.S. and 97% of the oil-based energy is used for transportation. So the Steel Interstate System has a huge potential to alter significantly the current national energy use patterns.

The United States' near total dependence on diminishing oil resources for its transportation sector threatens the mobility of people and goods on which we are so heavily dependent for our quality of life. Oil production worldwide likely has peaked. The Hirsh Report surveyed opinions on this from many petroleum geologists, and the majority said peak world production had occurred or would occur by 2010. [Peaking of World Oil Production: Impacts, Mitigation, & Risk Management, by Robert L. Hirsch, Roger Bezdek, and Robert Wendling, U. S. Department of Energy, February, 2005. See: [http://www.netl.doe.gov/publications/others/pdf/Oil\\_Peaking\\_NETL.pdf](http://www.netl.doe.gov/publications/others/pdf/Oil_Peaking_NETL.pdf) ]

Some of the Hirsh Report's findings have direct relevance to the Steel Interstate System:

"Oil peaking will create a severe liquid fuels problem for the transportation sector"

"As peaking is approached, liquid fuel prices and price volatility will increase dramatically, and, without timely mitigation, the economic, social, and political costs will be unprecedented. Viable mitigation options exist, but to have substantial impact, they must be initiated more than a decade in advance of peaking."

"Aggressive, appropriately timed fuel efficiency and substitute fuel production could provide substantial mitigation."

Of course, there is no better way to substitute fuel than through electrification. Other commonly mentioned methods, such as shale oil, tar sands, and coal liquefaction face production bottlenecks, environmental problems, or both, making them unsuitable candidates for widespread oil substitution.

World population, and oil consumers, continue to grow. On a per-capita basis world oil production peaked several decades ago. New emerging demand from nations such as India and China, and resulting upward price pressures in recent years, exacerbate this international dilemma.



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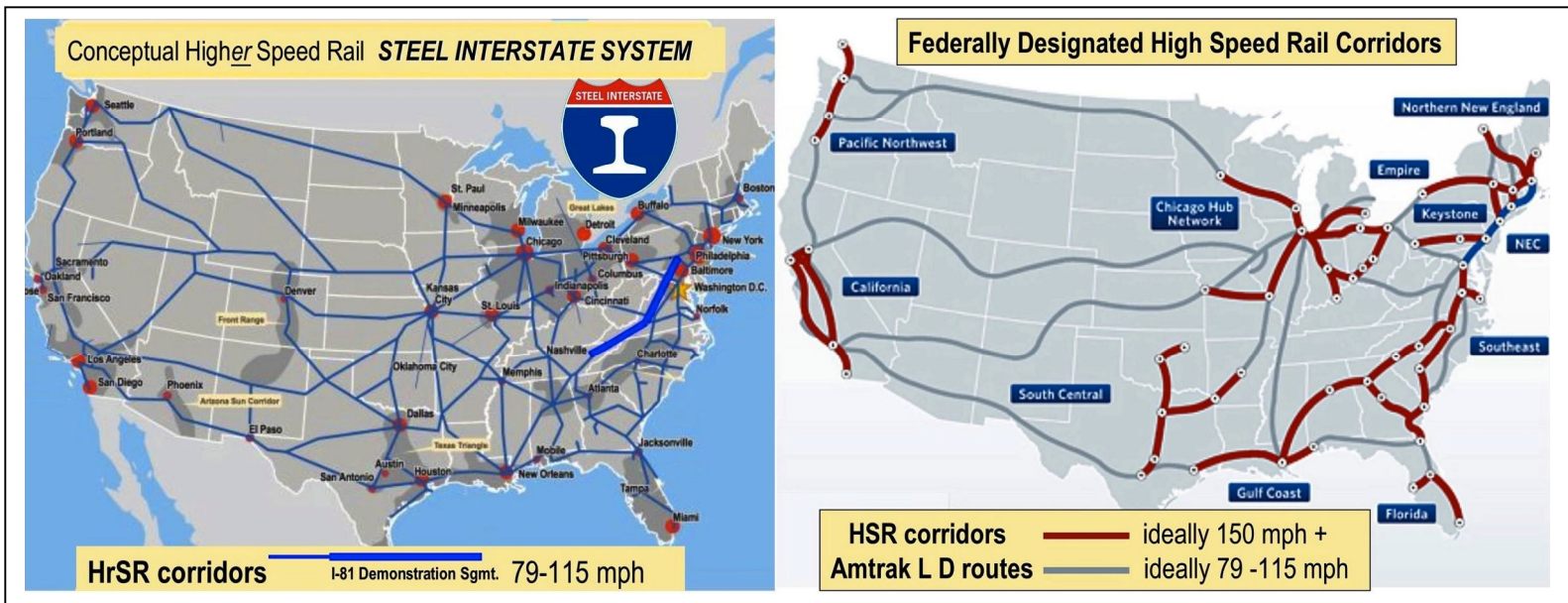
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We need to wean ourselves from imported oil. We need to begin now the critical national planning required to move goods and people in coming decades when oil becomes prohibitively expensive and ultimately non-available as a transportation fuel. Substituting domestically produced electricity is the key. There are no technical barriers to railroad electrification. The technology is available today and in widespread use around the world. So the Steel Interstate System stands ready to address this need.

### → National Security Implications

Because of the huge dependence of our transportation sector on oil, the nation is enormously vulnerable to any disruption in the supply of oil. The USA has 177,000 miles of railroads, with the Department of Defense classifying 32,421 miles as strategic (STRACNET). An electrified Steel Interstate System would protect this core strategic rail network and help protect the nation from a worldwide disruption in oil production.



Alan Drake is an independent engineer and researcher who has worked for the Association for the Study of Peak Oil and Gas, a non-profit research and public education initiative to address U.S. peak oil and energy challenges [[www.aspo-usa.com](http://www.aspo-usa.com)] and the Millennium Institute [[www.millennium-institute.org](http://www.millennium-institute.org)] a foundation for world sustainability. He argues convincingly that a reduction of 6 to 7 million barrels per day over 24 to 30 months would cause U.S. food distribution to become erratic and the national economy to collapse. A nation can be defeated through economic collapse as truly as on the battlefield. International geopolitical scenarios are possible that could produce such interruptions in oil availability hypothesized by Drake, including coordinated



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action by the Arab producing nations and military interdiction of the Straits of Hormuz or Malacca.

Another likely cause is that in a post-Peak Oil world, producing nations will naturally begin to preserve more of their production for current and future domestic use, especially since the economies of many such producing nations are booming. Such hoarding can be expected to cause world oil exports to fall even more rapidly than world oil production. Energy economists refer to this as the Export Land Model, and it has been increasingly discussed and debated in recent years. Alan Drake states that in his opinion, “this is the most likely scenario and a very real threat to national security - even survival.”

While some may see such scenarios as alarmist, others will see them as realistic concerns. For the most part, the difference is not if, but when, they will hit us. A massive capital spending program on long-lived infrastructure that helps eliminate oil use is an ideal economic stimulus. The majority of spending would be for domestic goods and services. The Steel Interstate System meets this need.

This paper relies heavily on Drake’s research and writing on an electrified Steel Interstate System – [[www.theoil Drum.com/node/4301](http://www.theoil Drum.com/node/4301)] Another useful national defense prospective is offered by J. William Vargrass in his paper [A Proposed National System of Interstate and Defense RAILROADS as an infrastructure project for the next fifty years](#), for the National Surface Transportation Policy and Revenue Study Commission. Please see: [http://transportationfortomorrow.com/final\\_report/pdf/volume\\_3/blue\\_ribbon\\_panel\\_submissions/01\\_a\\_proposed\\_national\\_system\\_of\\_interstate\\_and\\_defense\\_railroads.pdf](http://transportationfortomorrow.com/final_report/pdf/volume_3/blue_ribbon_panel_submissions/01_a_proposed_national_system_of_interstate_and_defense_railroads.pdf)

#### → Energy Efficiency

Railroads are much more energy efficient in moving a ton-mile of freight than trucks. In the discussion of railroad electrification above, we mentioned the potential to save a substantial amount of the 84 million barrels annually of diesel fuel now used by the nation’s railroads. It’s hard to know what percentage is realistic. But it seems reasonable that in a core national network of Steel Interstate routes, much of the densest traffic flow would gravitate to these lines simply for speed, ease of movement, and lower cost. So let’s say two-thirds of the diesel can be saved by main-line electrification, or 56 million barrels/year. The remaining freight would still require diesels on lighter-density lines, and in yards, terminals and switching operations.

Trucks carry about a quarter fewer ton-miles of freight than railroads, but use about 11 times as much total fuel. In 2006 this amounted to about 930



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million barrels of oil. Clearly if a substantial percent of truck ton-miles could be shifted to rail, a much larger amount of oil could be saved in the nation's transportation sector each year and much greater strides towards energy independence could be achieved. Most intermediate to long distance trucking ultimately should be carried aboard trains on the Steel Interstate System. Again it is speculative what percent of the total this might be, but if we use 50%, then we have another 465 million barrels of oil annual potential saving.

With the 56 million barrels from rail diesel saved through electric conversion, this indicates a reasonable target of over half a billion barrels of oil saved annually. This is in the same ballpark as estimates for drilling in the Alaska National Wildlife Refuge at its peak. ANWR of course would deplete, but the Steel Interstate savings would not. In fact they would grow as traffic grows.

This dwarfs all other sources of energy savings popularly touted in the quest for energy independence. The bulk of the savings derive from the switch from energy-intensive trucking to more energy-efficient rail, with an added boost from converting rail from oil power to domestically generated electricity. Added savings from efficient movement of passengers on trains compared to the nearly total dependence on individual automobiles have not yet been reckoned.

Converting two-thirds of rail ton-miles to electric, plus switching half of truck ton-miles to electric rail, would require an increase of less than 1% in U.S. electric generation to achieve an enormous oil savings roughly equivalent to 7% of *total* U.S. annual oil consumption. The under one percent could readily be accomplished with conservation alone, applying well-known energy efficiency technologies and pricing techniques to reduce wasteful electricity consumption; and less readily but certainly possibly through increased generation of electricity from renewables. The Steel Interstate System makes this achievable.

Alan Drake, Andrea Bassi, and others have done some good work modeling potential benefits of a Steel Interstate System in their January, 2009 paper entitled *Evaluating the Creation of a Parallel Non-Oil Transportation System in an Oil Constrained Future*. A draft version of the paper is available at: [www.millenniuminstitute.net/resources/elibrary/papers/Transportation\\_MI09.pdf](http://www.millenniuminstitute.net/resources/elibrary/papers/Transportation_MI09.pdf)

→ Pollution reduction

The foregoing discussions of energy efficiency and energy independence have shown that huge fuel savings are possible with an electrified Steel Interstate System. *The easiest and most direct way to achieve a reduction in pollution is to burn less fuel!* The half billion barrel annual oil savings at the cost of less than 1% added electric generation is huge. Again it dwarfs other means of reducing emissions, including greenhouse gases such as CO<sub>2</sub>, being



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considered and debated every day in the quest to address global warming and climate change.

Think, too, about where the emissions are generated -- fewer trucks spewing diesel exhaust along the highway, and fewer diesel locomotives spewing exhaust along the nation's rail lines. Huge reductions from these small point sources are transferred to minor increases at electric generating stations. Optimally this power would come from renewables or nuclear where there is no greenhouse gas impact. But even where that is not immediately achievable, there is a large and identifiable benefit from concentrating emissions at power plants that are far more efficient than countless smaller internal combustion engines that their new load replaces. Plus most of such emissions can be captured and treated at the origin before they are passed into the atmosphere. This massive potential to reduce air pollution and greenhouse gases is a corollary benefit of a national investment commitment to the Steel Interstate System.

Wind power is an especially promising renewable generating source, but is often hampered by being supplied far from markets and facing transmission hurdles. The rights-of-way of an ubiquitous electrified rail system can help here, too. In an important corollary benefit to powering trains, the wind energy can be moved over the Steel Interstate corridors to distant urban markets.

→ International Competitiveness

Efficient movement of goods, both internally and to and from ports, is vital to our national competitiveness in world markets. Transportation is a key price component of everything we buy, use, or export. Countries that don't have first class freight movement systems will lose markets and business to those that do. America's railroads have fallen decades behind much of the rest of the world, where fast, efficient, electrified rail lines can accommodate dozens of trains per hour. Both people and goods are moved with speed, reliability, and low cost. And in many countries this is accomplished without dependence on oil.

U.S. interstate highways are increasingly clogged and often gridlocked. Freight movement by truck is becoming difficult, unreliable, and expensive. And it is wholly dependent on oil. Our railroads lack the capacity to pick up the slack. We are long past the point where adding more lanes of highway can address every problem of congestion and growth. Environmental and economic costs are simply prohibitive. To maintain and enhance national competitiveness, we need a new, more reliable, and environmentally acceptable way to move goods and people in the 21st Century. The Steel Interstate System addresses this need.

→ Health and Safety



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Besides reducing manmade impacts on climate change, lowered pollution greatly benefits human health. Asthma and other respiratory ailments would be reduced, especially along major highway corridors and urban areas with heavy trucking density. Carrying many of the through trucks on electric railroads would immediately improve particulate emissions levels from diesel exhaust. Some troublesome non-attainment areas could achieve environmental attainment status and permit renewal of productive economic growth.

Taking through trucks off the highway would also alleviate congestion in key highway corridors, reducing collision and accident potential with cars, and making driving safer and more pleasant. Diverting hazardous materials shipments, commonly now moved by truck over the road, is yet another health and safety benefit, especially in densely populated areas. Many schemes have been debated in the highway engineering world on ways to configure highways for car/truck separation as a means of safety enhancement. The Steel Interstate System takes through trucks away, providing real separation with zero new highway investment.

→ Other Environmental & Economic Benefits

In any evaluation of comparative costs and benefits of highway and rail, a big plus for rail is its lesser footprint on the land. Often comparable new capacity can be constructed on rail with little need for the new land. The Steel Interstate System can be built mostly on existing railroad rights of way. Typically these are 50 to 100 feet wide, and one or two additional tracks can be accommodated. Sometimes grading and bridge structures are already in place where double track was removed in the past. Even where grade or curvature moderation, or congested development, will require deviating from existing right of way, the land need is modest compared with adding comparable interstate highway capacity.

Taking trucks off the highway and moving them instead on electric trains would have a very salutary impact on highway maintenance budgets. Road damage is roughly proportional to the fourth power of the axle load. A 20,000 lb axle causes 16 times as much damage as a 10,000 axle, and 160,000 times as much damage as a 1,000 lb axle, though wider tires mitigate the effect slightly. The net result is that over 95% of the traffic damage to roads and highways comes from trucks and far exceeds fuel taxes paid. Most state DOTs are finding that as highway infrastructure ages, a greater and greater portion of their annual budgets are going to maintenance, with little or nothing left for construction such as widening, interchange improvements or truck climbing lanes.

The National Association of Railroad Passengers (NARP) is promoting a core national passenger network of over 40,000 miles. It is remarkably congruent with the STRACNET main lines designated by Department of Defense. The shared infrastructure of an electrified Steel Interstate System can



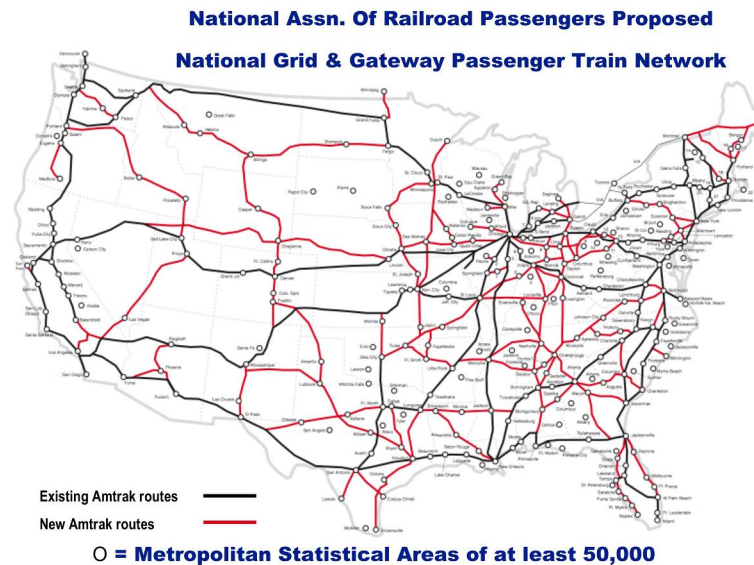
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serve multiple purposes, and serve them well – freight, passengers, and national defense.



Using electricity as a power source has price stability advantages for the Steel Interstate System versus today's dependence by rail carriers on diesel fuel. The cost per BTU today for electrical energy is much lower than a BTU from diesel, and has been far more stable, principally because it is a domestic market and not subject to vast fluctuations of international oil. This is likely to remain so.

In addition to price stability, electricity has efficiency advantages for rail. Electric propulsion is about 15% more efficient than diesel, so locomotives accelerate and brake better than those dependent on their own on-board diesel generators. Regenerative braking can capture kinetic energy from trains stopping or descending grades and return the energy to the power grid. This contrasts to current diesel locomotive technology, where such energy is dissipated as waste heat. Electric locomotives can develop more sustained high power output than their diesel counterparts. The 15% increase in acceleration and braking represents a 15% throughput capacity increase for rail lines, a corollary benefit of an electrified Steel Interstate System.

### **Importance of the Interstate 81/ Interstate 40 Corridor**

The Steel Interstate System is an idea with compelling advantages for the nation. We should use transportation act reauthorization funding for a demonstration project. That can be done in the I-81/I-40 Corridor between Memphis, TN and Harrisburg, PA. Here are some factors already favoring this selection:

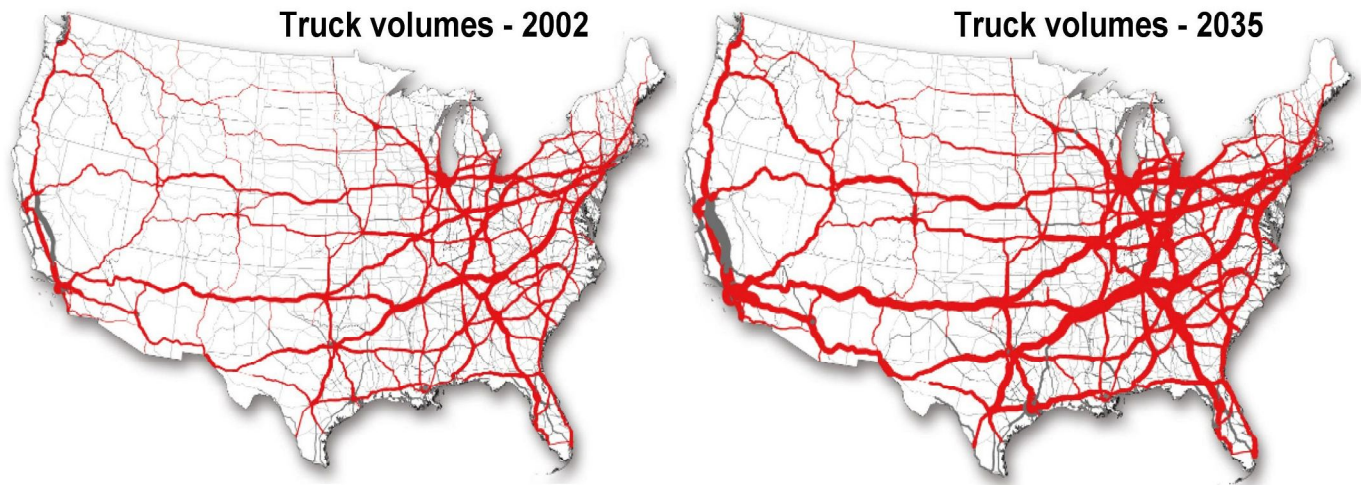


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- FHWA data show heavy, consolidated flows of through trucks in the I-40 Corridor across Tennessee to Knoxville, then via I-81 to Harrisburg, to be among the densest concentrations in the nation. See the heavy red line on the truck flow maps below. These maps are also available on our website:  
[www.railsolution.org/uploads/Presentation/truckfreightgrowthslides.ppt](http://www.railsolution.org/uploads/Presentation/truckfreightgrowthslides.ppt)



- Existing Norfolk Southern rail mainline all the way between Harrisburg and Memphis with moderate to heavy rail volumes. This segment is part of the NS “Crescent Corridor” upgrade initiative. See: [www.thefutureneedsus.com/crescent-corridor.html](http://www.thefutureneedsus.com/crescent-corridor.html)
- *Feasibility Plan for Maximum Truck to Rail Diversion in Virginia’s I-81 Corridor* by Virginia Department of Rail and Public Transportation: <http://www.drpt.virginia.gov/activities/files/I-81%20freight%20rail%20study%20final.pdf>
- A strong public push to do reduce the number of trucks on I-81 and I-40. Presence of citizens’ advocacy groups such as RAIL Solution and multi-disciplinary, multi-state I-81 Corridor Coalition; strong public and local government support for rail. For a list of support resolutions by local governments in VA and TN, please see: [www.railsolution.org/projects/steel-interstate/resolutions-endorsements.html](http://www.railsolution.org/projects/steel-interstate/resolutions-endorsements.html)