The Steel Interstate System
A 21st Century Railroad Network for the United States*

*Testimony for the Panel on 21st Century Freight Transportation, Committee on Transportation and Infrastructure, U.S. House of Representatives,
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Executive Summary

The Steel Interstate System (SIS) is proposed as a modernized, privately-owned American core freight rail network. The SIS would employ currently available rail technology to allow the U.S to build capacity more than sufficient to fulfill future national freight requirements, operate more efficiently and reliably, utilize 100% domestically generated motive power, and achieve point to point speeds from 60 to 115 mph for various classes of freight and passenger trains.

As envisioned the national SIS would involve about 40,000 miles of high capacity, multi-line track built on present rights-of-way that parallel the existing highway interstate, as well as selective use of new track lines. Total cost, to be principally borne by the private sector is estimated to be $500-1,000 billion.

Higher efficiency and capacity of the national SIS can be accomplished by using the following technologies:

- **Electrified rail**, to permit interstate freight shipments powered by domestically-produced, and more efficient electric motive power, rather by liquid fuels derived from imported oil or natural gas.
- **Grade separation** similar to the U.S. Interstate System and the Washington Metro Line - the system would be designed to have no junctions with automotive roads, thereby

¹ RAIL Solution is a 501(c)(3) non-profit organization that has developed the Steel Interstate System concept. ([www.steelinterstate.org](http://www.steelinterstate.org))
allowing higher speeds and improved energy efficiency.
- Improved rail alignment and other modern engineering features.
- Regional intermodal terminals at periodic intervals to increase access of smaller truck
  and shorter distance operators to the benefits of the system.

Benefits would be a 50% reduction in the liquid fuels consumed by the SIS compared to
transportation of the same freight volume by trucks, representing a 6% decline in total
national oil consumption, with proportional reduction of pollution and green house gases.
Fatalities for the 40,000 miles will decrease by 30% because of grade separation and
reduction of truck traffic volume. The cost to American taxpayers and businesses will be as
much as 60% less by providing increased rail capacity rather than increased highway
capacity for trucks. Other benefits would include improved national defense security,
energy security, and balance of payments, as well as increased productivity.

A specific proposal for a demonstration project of an SIS system, called the Valley Corridor
project, would modernize an under-utilized rail line between Memphis, TN and Harrisburg,
PA, built in the 1800s. This Steel Interstate prototype would yield significant social and
economic benefits by reducing freight truck traffic along the route (e.g., Huntsville,
Chattanooga, Knoxville, Bristol, Roanoke and Hagerstown) and by offering the option of
passenger rail for the first time since 1968 to most of the region. Trucks per day carried by
the Valley Corridor SIS demonstration would increase from 4000 in 2023 to more than 8000
in 2035.
1. INTRODUCTION

The freight rail system of the United States is in need of a broad range of improvements to bring it up to standards that will allow the system to contribute significantly to meeting the transportation needs of the future. RAIL Solution proposes that the U.S. Government lead a set of policies and enact legislation as required to enable a public-private effort to modernize the American freight rail system, creating the Steel Interstate System.

The American freight rail system is mostly privately owned. We do not advocate any change of ownership. We are recommending that significant incentives be given to encourage the accelerated improvement of the freight rail system to enable it to offer very competitive services for all classes of freight, especially to enable rail to realize the new market potential for intermodal and passenger service. Failure to attract additional capital to greatly increase the bare bones construction capital that U.S. railroad companies are capable of generating will result in erosion of freight market share from the rail mode, placing far higher and untenable burdens in the long run upon taxpayers, businesses, highway users, and the entire national economy. The Steel Interstate will be developed using a combination of sustainable technologies that do not require major innovations or scientific breakthroughs - just the willingness to make the investment and use American engineering and labor to get it done.

2. STEEL INTERSTATE CONCEPT

The Steel Interstate should be developed by the railroad companies undertaking phased improvement of the existing freight railroad infrastructure, starting with the location of best opportunity for improved efficiency and increased market potential for transportation services. The Steel Interstate System would utilize mostly existing rail lines that parallel existing interstate roadways, mostly choosing those paired road and rail systems that already have heavy freight traffic. The system would consist of approximately 40,000 route miles of railroad, containing a multiple-tracked high capacity system. See Figure 1 for the flow of truck and intermodal rail freight in the U.S. in 2008. (Average daily intermodal service is the annual tonnage moved by container-on-flatcar and trailer-on-flatcar service divided by 365 days per year and 16 tons per average truck payload.) The rail intermodal service is service on rail lines parallel to highway interstate routes. The system would, of course, need to be derived from analysis of the actual freight volumes anticipated in the future.

The Steel Interstate System (SIS) concept is a core national network of high capacity, grade separated, electrified railroad mainlines. The system would realize for railroads what the Eisenhower Interstate Highway System achieved for roads, and would become the backbone for movement of both goods and people in the 21st Century. Many more trains of all kinds would be accommodated, and these could move much faster, providing truck-competitive speeds for movement of freight, and auto-competitive speeds for movement of passengers. This section describes what such a rail system

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2 The Steel Interstate System concept is described on this website: http://steelinterstate.org
would look like, how the SIS would transport all kinds of goods as well as people, and how the concept fits into the evolution of rail transportation in America.

The many benefits of the SIS include benefits in such areas as energy conservation, national security, health and safety, pollution reduction, greenhouse gas emission abatement, economic competitiveness, energy independence, infrastructure investment, and preparing the nation to cope with diminishing oil reserves in the future.

2.1. **Description of the SIS**

The SIS would be high capacity, electrified, and grade separated, resulting in speed, reliability, and safe operation. These design features are depicted in Figure 2.
2.1.1. High Capacity. The SIS would be high-capacity, meaning that these main lines would have at least two through tracks, so that trains can be handled in both directions without having to stop to meet oncoming trains. Because the nation’s rail system has stagnated and declined over the five decades that the Interstate Highway System has been built out, many places where rail lines once featured multiple tracks today have only one, although the rights-of-way, in many cases remain, such as the one depicted near Knoxville, TN in Figure 3.
Modern signaling systems permit trains to operate in both directions on a single track with periodic passing sidings, but this drastically reduces capacity and fluidity of movement because trains inevitably have to stop and wait at the sidings for oncoming trains to pass. The Steel Interstate will require the capacity and speed afforded by multiple tracks. In some places a second track can be added rather easily on rights-of-way that once had two or more tracks. In other places the added track capacity will be more difficult to install, requiring new grading, bridges, and relocation of equipment.

A view of what the multi-tracked system might look like in Virginia’s Shenandoah Valley is shown in Figure 4.
2.1.2. **Electrified System.** Electrified means that the SIS network will be powered by electricity, provided to electric locomotives from a system of overhead wires called catenaries. A spring-tensioned device on top of the locomotive, called a pantograph, presses against the catenary wire making a solid contact for the electric current to flow. Today in North America, only Amtrak’s Northeast Corridor passenger operation uses such an electrified system. Trains in the rest of the country are powered by diesel locomotives, where fuel is burned on board to generate electricity to power the locomotive’s traction motors. Electrified rail operations are not technically new or complex. Railroads throughout much of the world are powered this way today. Many rail systems in the U.S. were electrified up until the middle of the last century. Electric operation is a key part of the SIS because of certain efficiencies offered versus diesel-powered trains. But most importantly because domestically generated electric power can be substituted for foreign oil. This produces enormous economic benefits that accrue year after year and can help pay for the Steel Interstate System. Of course the system can be operated with diesel power while phasing in electrical motive power.

2.1.3. **Grade Separation.** Grade-separated means that rail lines of the Steel Interstate will not cross roads and highways at grade, but will pass over or under using bridges or underpasses. This is analogous to the design advancement brought about in Interstate Highways. Rail operations will be substantially expedited by having all major grade crossings eliminated. Increased train frequencies and speeds will not adversely affect the driving public, and safety will be greatly improved by removing a major cause of
vehicle/train collisions. Figure 5 shows a railroad trench used for grade crossings for roadways and also for noise abatement.

![Railway trench to avoid grade crossings by vehicles](image)

**2.1.4. Alignment of the Steel Interstate.** Core network means that there will be a backbone of SIS-caliber railroad main lines, just as there is today a backbone structure of Interstate Highways. In both cases the core network of main routes supports and feeds traffic to and from a larger network of secondary routes. The rail system alignment would need to be improved to allow the speeds and capacity necessary; that is, curves restricting speed would need to be eliminated, and super-elevation of alignments changed to accommodate higher speeds. In addition, because of the volume of rail traffic in many towns and cities, where the old routes run parallel to the main street, rerouting on new rights-of-way may be required, just as interstate highways often bypass urban centers.

To illustrate what would need to be done, the pictures of Figures 6 and 7 show the before and after alignment.
2.1.5. Speed of the SIS.

The Steel Interstate System would be designed to be capable of point-to-point average speeds of
- **Freight**: 60 mph
- **Intermodal**: 70 mph
- **Passenger**: 90 mph - passenger service for high travel density
- **Passenger top speed**: ~115 mph

Speed is greatly improved because there is room on the SIS for through trains in both directions to run without having to stop for trains traveling in the opposite direction. Extra tracks would be constructed where needed for faster trains to pass slower ones, or to permit separate passenger train operations. Furthermore, trains can move on the core network over long distances, avoiding the congestion of yards and terminals. Trains would exit from the SIS network, just as we exit from the Interstate Highways today, to interface with local rail operations such as yards, terminals, and local industrial switching. The SIS is not a “high speed” rail system for passenger trains; rather it is a vastly upgraded network of key rail corridors that can serve both freight and passenger trains on shared infrastructure, operating in a range of speeds up to 115 mph on shared right-of-way, with a typical low speed target of 60 mph. The Steel Interstate range of speeds is sometimes called “higher speed” rail, high performance rail, or highway competitive rail. (The term High Speed Rail (HSR) describes passenger trains operating on HSR-dedicated tracks at speeds of 125 mph and above. The SIS is distinguished from HSR by serving as system for both freight and passenger trains.)

### 2.1.6. Reliability of the SIS.
Reliability is very important to rail operations, both passenger and freight. Today, the nation’s rail system is characterized by much lower capacity compared to recent decades, and rapidly rising traffic. This combination preordains congestion, and congestion kills system reliability. The Steel Interstate will provide adequate capacity so that all trains, both passenger and freight, can move fluidly over the network without getting in each other’s way or having to stop and wait. This will enable freight to be more truck competitive and move much better on just-in-time schedules that shippers want. Passenger trains will be able to maintain published schedules and not be delayed frequently by freight trains blocking the lines.

### 2.1.7. Capacity of the SIS.
Capacity of the key SIS corridors would be much greater than today’s existing lines, primarily due to the use of multiple tracks. Trains of all kinds could be accommodated – conventional freight, unit trains, double-stack container trains, open-intermodal trains such as rolling highway (truck ferry), mail and express, perishable cargoes, and passenger trains. Railroads would not have to turn away business desiring to shift to rail because of highway congestion, driver shortages, or skyrocketing fuel costs. This is an important benefit to the nation, because from an energy security, an economic productivity, a health and safety, or an environmental standpoint, it should be national policy to maximize freight movement by rail. The SIS makes this possible. Rail traffic will have room to grow again. And every ton or passenger switched from the highway to electrified rail will lessen our chronic dependence on oil to power the transportation sector of our economy.

In a study of capacity Cambridge Systematics analyzed the maximum capacity of multi-tracked systems\(^4\). Their conclusions follow:

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\(^4\) 1- Table 6-1, National Rail Freight Infrastructure Capacity and Investment Study, Cambridge Systematics, Sept. 07
Table 1. Capacity of systems with computerized train control

<table>
<thead>
<tr>
<th>Capacity of System with CTC</th>
<th>trains/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 track multi-type trains</td>
<td>75</td>
</tr>
<tr>
<td>3 track multi-type trains</td>
<td>133</td>
</tr>
<tr>
<td>Average Trains per day on system</td>
<td>104</td>
</tr>
</tbody>
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2.1.8. Open intermodal features. Open intermodal system design should be considered as an option so that regional, smaller terminals can make intermodal rail more accessible and increase significantly freight that can be diverted to rail. If a large number of trains were leaving major end terminals, which will be the case in high density freight corridors, some could be made up to allow stops at intermediate locations. For example, shipments in containers of goods from China destined for a distribution center 400 miles distant could be assembled into a regional train that would be stopping to unload at small intermodal terminals located at approximate 200 mile intervals along its route, which in total might be 1000 miles or more in length. The attractiveness of this system is that small trucking operators, even those operating a single truck, can easily use such a system, thus providing small operators and businesses entry into the intermodal market while still maintaining control over their loads.

There are several open modal systems that can be used. All of them feature small footprints for the terminals, load without requiring cranes, and some allow the tractor to go with the trailer. The Modalohr system used in Europe (Figure 8), or similar system, works for quick loading without cranes. While the Modalohr has the down side of having to carry an articulated platform, it has the advantage of being able to accommodate multiple loading and unloading all at the same time. This is just an example of a new type of system that should be considered.
Figure 8. modalohr System used in Europe is an example of a quick loading open modal system.

Many other intermodal services have been and are being offered through open modal systems, including RoadRailer and roll-on-roll-off or rolling highway, which do not require lifting cranes and accommodate the whole tractor-trailer rig. Historically and even now, the trailer on flat car (TOFC) concept is being used, but this requires a crane for loading the trailer, thereby making loading a significant number of train cars time-consuming.

2.1.9. Rationale for the SIS.

Why do we need a national rail system for the Twenty-first Century with more speed, reliability, and capacity?

The railroad industry’s capacity had been in steady decline, but capacity has increased in recent years because of selected track and signal improvements and increased capacity of railroad car and engines. Historically, however, the interstate highway network diverted large amounts of freight, especially time-sensitive and high-value products, away from the railroads and onto the highway. That method of transport is more expensive because of the capital and maintenance costs of roads relative to rail and because of the higher truck operational costs compared to rail over intermediate to long haul distances. Because of the competition from and public financing of the interstate highways, railroads have responded by abandoning many miles of light density lines,
taking up double-track on many routes, removing sidings, scrapping freight cars, and otherwise making difficult downward capacity adjustments. In addition to declining business, the steady impact of paying property taxes on every mile of track and piece of rolling stock and equipment provided a further catalyst to downsize wherever possible. These events have created a system that is far from optimized to provide modern, high speed, reliable fast rail service. The SIS concept reverses these trends.

2.1.10. State of the Technology for the Steel Interstate System

The Steel Interstate System is not an invention. It is a description of how transportation policies can be crafted to take advantage of existing rail technologies—specifically along corridors of national significance. This rail technology is in place and being used elsewhere in the world. It should be in place and used here. One of the first to suggest the steel interstate idea was Gil Carmichael, who at the time was head of the Federal Railroad Administration. In 2011, he said that "Interstate 2.0, a rail-based North American transportation network, represents the new transportation paradigm for the 21st century".5

Technologically, rail is capable of economically moving the world’s citizens and essential goods without oil, using renewable energy sources.

Electrified streetcars, light rail, subways; and commuter, intercity and high speed rail trains can transport us:

- Around city centers
- Between neighborhoods
- Across metropolitan areas
- From bedroom communities to regional work centers
- From small towns to cities
- Between midsize cities
- Across and between mega-regions
- To long-distance flights

Electrified rail can also transport our goods:

- In bulk shipments on unit trains
- From domestic manufacturers to urban markets via high volume merchandise carload trains
- From seaports to regional distribution centers on double-stack "land barge" intermodal trains
- In long distance domestic-market lanes on double/single-stack intermodal trains
- Between mid-range domestic markets on higher-speed, open-technology (iterations of "piggyback") intermodal trains
- At the head end of conventional intercity and true high speed passenger trains, in airline cargo containers or other modern equivalents of Railway Express and Railway Post Office.

The Steel Interstate System is the common thread that weaves these rail services into a seamless, multi-modal, transcontinental transportation system. It would consist of a core network of high-capacity, electrified, grade separated railroad lines capable of providing all of the services above except high speed trains.

2.2. Railroads build the infrastructure

The new infrastructure would be built by the railroad companies using present system infrastructure for the major part of the eventual national route system. It will be necessary to obtain new rights-of-way in locations where existing ROW is not wide enough or does not have adequate configuration, where the system needs to be rerouted, such as away from the center of towns in many cases, or to shorten routes substantially. In some cases, inadequate bridges and tunnels restrict traffic. Some main line rail routes cross each other at grade level. These parts of the infrastructure need significant work. Figure 9 depicts the manner in which bridges restrict speed and therefore, capacity of the system.

![Figure 9. Such speed reduction infrastructure as depicted by this bridge would need to be replaced.](image)

2.3. Service provisions of the Steel Interstate System

To summarize the service provisions, the ideal Steel Interstate System provides high capacity for all classes of traffic except High Speed Rail (greater than 125 mph which must be built on systems dedicated to passenger rail). The system would maintain the ability to transport bulk freight - only faster - and would offer very competitive speed and reliability for intermodal freight and passenger rail.

Examples of these trains are bulk freight (coal train) in Figure 10, intermodal freight in Figure 11, and passenger service in Figure 12.
Figure 10. BNSF Coal Train - Steel Interstate design speed - 60 mph (Photo courtesy of Doug Wertman)

Figure 11. Intermodal Freight Train - Steel Interstate design speed point-to-point - 70 mph (Photo courtesy of Doug Wertman)
2.4. **Steel Interstate System should parallel key highway routes**

To facilitate the optimum use of the U.S. highway and the railroad systems, the railroad must be brought up to Steel Interstate standards along high density rail lines that parallel similarly dense Interstate highway corridors, so that the two become a paired corridor. Examples of this are: 1) the Norfolk Southern paralleling I-75, I-40, and I-81 between the Mid-south region and the Northeast, 2) the CSX from Florida to Chicago paralleling I-75, I-24, and I-65, 3) the CSX paralleling I-95 from Florida to the Northeast, 4) several railroad lines (Union Pacific, CSX, and Ohio Central) in series which taken together parallel I-70 from Denver to Pennsylvania and Maryland, and 5) I-40 and BNSF from Los Angeles to Memphis.

2.5. **Phased implementation**

The Steel Interstate System would be phased in over a period of 30 years to obtain the complete 40,000 mile system. The phasing would give priority to high density freight corridors. (See Figures 13 and 14 for graphic depiction of truck freight volume in 2002 and 2035. In addition to phasing the upgrading of track infrastructure, various features can also be phased, such as electrification of high density corridor to replace diesel (or gas) and passenger service, both of which are capital intensive.)
Figure 12. Average daily long haul truck traffic in 2002. (FHWA)
The task of deciding where the emphasis should be placed in phasing improvements requires an assessment of the present state of the rail system and comparing it with the truck freight statistics.

The map of the Federal Railroad Administration for tons of intermodal freight (Figure 14) shows that intermodal rail east of the Mississippi River is not such a large amount\(^6\). This is thought to be due to short hauls, but that is not necessarily the case. Much of the lack of competition by rail is because it is not competitive in terms of capacity, reliability, and speed. Much of the eastern systems were laid out in the 1800s, when the excavation was done by animal and manual labor. For rail to be competitive and compete in intermodal transportation, the system must be improved. Priority will need to be given to the eastern systems, where heavy dependence is now on highways.
Figure 14. Tonnage of intermodal rail moves in 2010

Some Projections for freight rail volume are given in Figures 15, 16, and 17.
Figure 15. Figure of AAR Study showing low volumes of freight and passenger, prior to the Recession, in the Southeast (between Southwest and Northeast) by rail
In Figure 17, Norfolk Southern compiled figures to show freight-hauling market share between various city pairs. The comparison shows that in corridors between southeastern (and southwestern) cities and northeastern city pairs, rail averaged about 20% market share and truck almost 80%, while in the New York City-Chicago corridor rail market share is over 50%. In the Norfolk-Chicago or Los Angeles-Chicago corridors rail market share exceeds 80%. Much of this successful rail volume is containerized international port traffic. That rail infrastructure and its interface with port cargo handling facilities had to be upgraded to support that intermodal success story. Similar upgrades are vital to the success of domestic rail intermodal.

Figure 17 reinforces the fact that the penetration by rail intermodal service between the southeastern U.S and the Northeast is weak. Clearly, some areas have good competition, but others not so much. When examined in detail, what the data show are trucks occupying routes that have adequate, direct interstate highways vastly out-compete parallel archaic, slow rail corridors. For example, there is almost no predicted future traffic on the rail lines paralleling I-95 in the Southeast. Why is this? This type of data needs much more detailed examination to determine where incentives should be developed for more and better rail service. Compilations based on simple extrapolation of present truck and rail patterns, which is often practiced in studies, are not adequate analyses on which to base policy for future decades.
3. BENEFITS

Modernizing the U.S. freight railroad system to meet the standard of the Steel Interstate System will provide many benefits to American life. The Steel Interstate System will bring with it significant benefits to the economy, to the environment, to the health of the American people, and to national security. The SIS will provide the infrastructure for the addition of passenger rail throughout the country. The improvements will reduce the overall cost to transport goods and people, will reduce the cost of transportation infrastructure, and will reduce the amount of taxes that must be raised to accommodate growth of transportation requirements.

3.1. Cost of Transportation

The cost of transportation would be reduced by the implementation of the Steel Interstate System. Primarily this would be due to the avoided capital costs for additional highway lanes and replacement of worn out lanes and maintenance costs required to accommodate increased truck volume. The addition of truck climbing lanes and lanes to
reduce congestion are very expensive. In addition, much of the rail infrastructure is financed and maintained by the railroad companies, thus reducing taxes that would be paid by the American people.

The construction cost from improving 40,000 miles of interstate roads to standards that meet those of truck thruways, such as the one proposed by Star Solutions for Virginia, would be on the order of $2 trillion. Assuming that such capital costs are not needed in more than half of the U.S., the cost would be about $1 trillion (2013 dollars). The cost for engineering and constructing the national Steel Interstate System, not including rolling stock and engines, may be in the range of $500 billion. Even assuming that the $500 billion estimate is low, and that construction cost for the Steel Interstate will be $1 Trillion, still the cost to the American tax payers will be less than $150 billion, because 85% of the capital cost comes from private sources. Thus, the capital cost for accommodating future freight load is probably much less with rail; significant cost is borne by private companies; and high capital costs and additional maintenance cost is avoided by the public.

The diversion of trucks to rail will enable the avoidance of additional costs for maintenance of the roads. A study done for the Commonwealth of Virginia showed that in Virginia, heavy trucks on I-81 are being subsidized by the public at a rate of by $.086 per mile for maintenance alone. Based on traffic volumes, additional truck-induced maintenance cost, not paid by trucking, in Virginia on I-81 would be approximately $50 million annually. At projected 2035 truck traffic volumes and assuming no rail improvements, the subsidy to the trucking industry for maintenance on I-81 in Virginia increases to $70 million annually. For national trucking, the maintenance costs, not paid by the trucking industry, will be a much larger figure, perhaps on the order of $5 billion. Depreciation costs for truck contribution to total replacement of worn-out highway infrastructure are additional to this cost.

For medium to higher density rail passenger routes less than 500 miles, passenger rail should be cheaper than automobile travel or plane.

3.2. Economic Benefits and Impact

Economic benefits accrue to the railroads, the trucking industry, the logistics industry, the users of transportation (all businesses and people), and the economy in general.

3.2.1. Railroads

The railroads are limited in business sectors that assure growth. Some sectors may decrease, such as coal volume. Where growth in rail business volume can be increased is in intermodal transportation of consumer goods and packaged freight and in passenger rail. However, to realize the potential, the railroads much become more competitive in speed, reliability, and overall performance, including cost. For example, Norfolk Southern has the potential for up to 30 intermodal trains per day on the western part of their Crescent Corridor (paralleling I-40, I-75, and I-81), if

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7 When environmental and health and safety costs were included, Virginians are subsidizing every truck on I-81 at the whopping rate of more than $.33 per truck mile traveled. All figures in 2010 dollars. "The Virginia Statewide Multimodal Freight Study," Cambridge Systematics, Final Report 2010, Page 34 Table 1.6, Selected Monetized Transportation Benefits.
the company can get 60% or more of the longer distance trucks diverted to their system. This number would grow to 60 by 2035. Right now, in 2013, the NS is operating one train each way on this same section of their Crescent Corridor. These larger numbers cannot be attained now because the Crescent Corridor is slow and capacity limited---in need of reconstruction to Steel Interstate standards.

With the Steel Interstate System, passenger rail can be offered for operation on a system that is fast, reliable, safe, and comfortable. The speeds of passenger trains will be fast enough to be very desirable for short to intermediate distances. The Steel Interstate will make passenger rail a reasonable alternative for most small to large cities throughout the United States. The fact that trains can be operated profitably and provide revenue for freight railways has been proven recently in Virginia with the success of trains operated by Virginia Rail under contract with Norfolk Southern and Amtrak. The Steel Interstate will provide an alternative to short flights, such as from Knoxville to Atlanta, or to driving round trip. Wick Moorman, President of Norfolk Southern, says that, if you want passenger rail, cover the operating costs, the liabilities, and the extra capital. We would add also a reasonable profit.

3.2.2. Trucking industry

The trucking industry will be enhanced with the Steel Interstate System. The rail system will never replace the use of trucks for short distance and for delivery to and from the doors of businesses and homes. What it will do is change the mode of operation for the drivers. Most long distance moves of trailers, trucks, or containers would be by rail to local intermodal terminals. The drivers for trucks to and from these terminals would be able to complete their round trips in a day or much less. This would help the trucking industry for lowering transport cost and making driving profession more attractive, addressing the national driver turn-over rate and shortage. However, the Steel Interstate System must be implemented in such a way to assure that it is as fast as highways, as reliable in terms of on-time delivery, and is not obstructed by interface problems between rail lines and roadways.

3.2.3. Logistics industry

The logistics industry is now coping with a very complicated network of roads and rail lines with widely varying efficiencies and performance. The Steel Interstate will help bring order and higher level capacity and performance to the freight transportation network, reducing inventories and supporting just-in-time delivery goals.

3.2.4. Transportation users

Users of transportation services will see better service overall from various elements of the system. Because of enhanced efficiency, transportation costs would be less than they would be without implementation of the SIS. Elderly and disabled citizens and mid-distance business travelers will especially benefit from an extended, affordable passenger rail service alternative to auto and air travel.

3.2.5. The Economy of the United States

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8 Paraphrase of public comments of Wick Moorman in a speech to the Joint Rail Conference, Knoxville, TN, April 17, 2013
Electrified, the Steel Interstate will be more efficient and will significantly reduce consumption of oil\(^9\). As oil consumption for moving freight declines, so do national oil import requirements, allowing more money to remain in the U.S. growing our economy and improving our balance of payments. Rail service options will increase transportation productivity, and since transportation is a significant component of every American product, transportation productivity increases will improve productivity across the national economy. The rail rights of way will also be used to carry electricity by high efficiency technology, connecting regional grids all along the Steel Interstate and transmitting energy generated by remotely sited wind, solar, hydro, and sustainable biomass to market. Where an individual wind turbine or solar panel farm’s output is variable, the more arrays that get connected over a larger area, the more reliable/predictable the overall power production becomes. This is how sustainable power technologies can be harnessed to produce a system capable of meeting the base and peak demands we currently have. And, what about high speed, high capacity data networks too? We need more bandwidth and higher speeds, and the Steel Interstate would enable access all over the country.\(^{10}\)

3.2.6. Business and regional development

The SIS should help stimulate business along it routes, rebuilding the economies of older “fly-over” cities and attracting businesses internationally. Why? Any business within a distance of 100 miles or even more of a Steel Interstate rail line will have access to the world through a modern, fast transportation system. Business imperatives such as fulfilling production input materials and components and shipping products will be fast, extremely reliable, and reasonably priced.

Development will be possible around regional terminals located at distances of perhaps 150 to 200 miles apart. This is a different idea from what exists on American railroads today, where terminals may be as much as 500 to 1000 miles or more apart. Businesses will tend to locate as close to comprehensive rail and highway transportation as possible.

3.2.7. Rural development implications

The Steel Interstate System will bring excellent rail service to America through reasonably close access to freight terminals and, when provided, close access to passenger rail. For example, in Knoxville, the closest intermodal rail terminal on the Norfolk Southern is in Atlanta or in Birmingham. The closest intercity passenger rail is in Atlanta, Cincinnati, Greenville, SC, Charleston, WV, or Memphis. Access to freight and passenger service by rural Americans depends on the development of small, open access terminals and passenger service where volume is sufficient.

To illustrate this point, Figure 18 shows an overlay of the part of the Crescent Corridor of the Norfolk Southern over the legislated service area of the Appalachian Regional Commission. The Valley Route parallels the backbone I-40, the I-75, and I-81 highways, all of which have important feeder Interstate highways, such as I-59.

\(^9\) Alan Drake, "A 10% reduction in America's oil use in 10-12 years", http://www2.energybulletin.net/node/16682

\(^{10}\) Bruce McFadden Blog, http://www.dailykos.com/story/2012/09/02/1127109/-Sunday-Train-Powering-the-Steel-Interstate

Steel Interstate Concept for 21st Century Railroad System in the United States, Testimony for the Panel on 21st Century Freight Transportation, Committee on Transportation and Infrastructure, U.S. House of Representatives
I-26, and I-77. With terminals properly located, most of this region could be served by both intermodal and passenger rail from this part of the Crescent Corridor (the Valley Route).

Figure 18. Appalachian service region for the Valley Route of the Norfolk Southern Railroad

3.3. Social Benefits

Social benefits of the Steel Interstate System included increased transportation safety, improved health, more transportation choices, and less crowded highways.

3.3.1. Safety

Improved safety comes from several features and effects of the SIS. With fewer grade crossings, there will be fewer deaths and injuries and less damage from crossing accidents. With reduced truck volume on the highways, there will be fewer deaths and injuries and less costs from auto-truck collisions. With SIS rail service there will be no economic benefit to increasing the size and weight of interstate trucks which would consequently increase the number and severity of truck accidents. With the use of passenger rail, there will be a reduction in passenger
deaths (0.8 deaths per 100 million passenger-miles vs. 0.03 for rail). Statistics on U.S transportation fatalities are given on the Steel Interstate website

3.3.2. Health

Health of the American people will be improved, especially in areas already challenged by emissions from trucks, trains, and fossil-fueled power plants (e.g. Knoxville, TN). Reduced use of diesel for transportation would lower human exposure to smog-inducing nitrous oxide and to particulate emissions responsible for increased asthma attacks and other respiratory problems. Health benefits are covered in detail at the Steel Interstate website

3.3.3. More transportation choice

People and businesses will have more modal transportation choice, especially for passenger and intermodal service. National productivity will be enhanced through increased transportation competition and lower transportation prices.

3.3.4. Less crowded highways

A not so intangible benefit is reduced highway congestion, a huge social benefit. Many recent studies have sought to quantify the cost to the driving public and businesses of time lost due to congestion delays and failing just-in-time reliability.

3.4. Environmental

3.4.1. Air (Greenhouse gases)

The Steel Interstate will reduce emission of greenhouse gases by substituting: 1) the higher efficiency of rail over trucks for transportation of freight and 2) the higher efficiency of electric locomotive power in place of diesel power. Rail is approximately 10 times more fuel efficient than heavy trucks in transporting freight over mid-long distances. The efficiency of electric power advantage (approximate 2.75 over diesel) comes from regenerative braking and the higher efficiency of the electrical generation for the electrified system. We calculate that the total effect of the implementation of the Steel Interstate on 40,000 miles is estimated conservatively would be a reduction of approximately 50% of greenhouse gases that would be produced by trucks that would be required to move the same freight. That reduction of the impact of exhaust gases is important is substantiated by statistics from the Tennessee Department of Transportation. See Figure 19.

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Figure 19. Annual growth rates in Vehicle Miles Traveled (VMT), actual and estimated, by the Tennessee Department of Transportation.

Vehicle Miles Traveled growth rates of heavy duty diesel vehicles are 50% greater than for all other vehicles. Already many areas of the country (including Knoxville, Chattanooga, Birmingham, the Northeast, and Southern California) exceed the standards for an acceptable atmosphere from the standpoint of particulate matter in the atmosphere, including that from diesel exhaust. See Figure 20.
3.4.2. Land Impact

The footprint of rail is actually considerably smaller than that of highways, so the impact on use of land is less for rail. Thus, providing for more of the transportation by rail will reduce the impact on land use. In many cases a second or third track can be added to existing railroad rights of way with no new land needed. This contrasts sharply with the voracious requirement for real estate where expanded highways are relied on for new freight capacity.

3.4.3. Water

Because trains have a far better safety record hauling toxic substances than trucks, risk to water contamination from crashes and spills drop significantly when those same materials are carried by trains. Further, there is considerable and increasing damage to underground water resources and surface streams, rivers, lakes and oceans. From headline grabbing crude oil spills--Exxon in Prince Edward Sound, BP in the Gulf--to daily mishaps all along the "stream" of production--drilling, transporting, refining, and to the gas pump and oil change, our precious water supply and its living creatures are at risk.
Water quality damage can be reduced significantly along this supply chain by diverting freight and passenger traffic to the electrified Steel Interstate.

3.5. **Government**

Besides all of the other advantages realized in various areas, the Steel Interstate provides some benefits that might be classified as benefits to the government, although the benefits are accrued to Americans, as a people.

3.5.1. **National Security**

The Steel Interstate System will provide a reliable, modern backbone to serve as a backup for any time that a national emergency calls for increased production and transport of very much larger volumes of material and personnel. The Steel Interstate, makes the U.S. much less dependent on oil in times of national emergency. Transportation could still be carried out by rail with only a portion of the oil required by trucks. Reducing dependence of the transport sector on oil reduces the vulnerability of the economy to petroleum price spikes and production disruptions.

3.5.2. **Encouragement of competition**

The Steel Interstate System will assure more active competition in the transportation arena. Everybody wins with this solution: the railroads, the trucking industry, the logistics industry, businesses, and the people. The government does its job by providing the encouragement and support for public-private partnerships that will enhance productivity and competition across the economy.

3.5.3. **Reduction of government infrastructure**

The Steel Interstate System will enable the federal and state governments to reduce the amount of highway infrastructure required and thus enable reduced outlays for transportation capital projects and maintenance. Clearly, encouraging the expansion of private, for profit, tax-paying railroads offers a better return on investment than sinking more public funds into highway infrastructure and maintenance to accommodate freight mobility growth. We believe that life-cycle costs for private rail infrastructure are lower than the public’s investment in equivalent highway infrastructure required to satisfy future freight transportation demands. Both the interstate highway system and the railroad system are showing limitations that will have to be fixed. Railroads are still using infrastructure largely built decades – and for some routes, even a century – ago. This needs to be recognized when government policies are considered for having railroads shoulder more of the transportation load of the future, especially intermodal freight and passengers.

4. **FINANCIAL PLAN**

Financing the aggressive improvement called for by the Steel Interstate standards is challenging because it calls for outlays of capital that are considerably beyond what the rail industry currently can muster. In general, some of capital required will need to be financed on a long term basis (25 to 30 years)

4.1. **Budgetary Estimate for the National System (40,000 miles)**
Rail Solution has prepared a budgetary estimate, or an estimate of the order of magnitude of the cost of the total Steel Interstate- 40,000 miles of multi-tracked, grade-separated, higher speed rail (top speed 115 mph). This estimate is based on factors and costs compiled from various literature sources to estimate the cost of a 1000 mile prototype system (the Valley Corridor), which is discussed later in this document. The cost per mile was then applied to the complete 40,000 mile system. The total estimate on for the National system would be $535 billion.

<table>
<thead>
<tr>
<th></th>
<th>$ Billions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rail Trackage</td>
<td>275</td>
</tr>
<tr>
<td>Added Railroad Right of Way</td>
<td>30</td>
</tr>
<tr>
<td>Buildings and Stations</td>
<td>10</td>
</tr>
<tr>
<td>Grade Crossings</td>
<td>35</td>
</tr>
<tr>
<td>Electrification (Optional)</td>
<td>115</td>
</tr>
<tr>
<td>Engineering and Project Management</td>
<td>70</td>
</tr>
<tr>
<td><strong>Total for National Steel Interstate System</strong></td>
<td><strong>$535</strong></td>
</tr>
</tbody>
</table>

The outlay for the U.S. railroads was approximately $15 billion for capital expenses. However, much of the capital expenditures were for replacement of equipment and infrastructure. The portion that was allocated to improving capacity and speed would be lower - perhaps one-half of the capital outlay (on the order of $7 to $8 billion). If one chooses a 25-year period for completing the Steel Interstate, the outlay must be on the order of $20 to $40 billion per year. So, the deficit in capital that must be made up is in the range of $13 to $33 billion per year.

### 4.2. Financing

Financing the Steel Interstate System is problematic when the present tax base, practices, and laws apply. Still, the mix of financing instruments that might be used to remedy the financing problem are wide, indeed. Corporate loans, leases, bonds, and equity investment are all of possible use. Government direct subsidy and payment for certain categories of capital expense would seem appropriate. We advise that the government structure the development of the Steel Interstate so the government underwrites the cost of what might be called social benefits- benefits more closely associated with the desires and well being of the public and the business community. Thus, government would pay for elimination of grade crossings at public roads, rights-of-way to relocate rail lines away from urban development and to improve urban street traffic flow, incremental investment devoted to facilitating passenger travel, and for participation in feasibility studies of regional corridors and routes. Private capital underwrites the direct costs of rail rolling stock and infrastructure, such as multiple tracking and alignment changes, bridges, widened rights-of-way, signaling, electrification, and design and engineering costs for those.

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13 RAIL Solution is seeking support for a preliminary engineering study of an SIS prototype in the Valley Corridor. This study will supply firm cost/benefit estimates for implementing SIS infrastructure and technology on the ground across the nation.
We have looked at two cases for financing that represents the extremes of how to finance the improvements required to build the 40,000 mile Steel Interstate. The extremes are: 1) High government support financing, and 2) High private investment for financing. Those are discussed subsequently.

4.2.1. Government guaranteed support program alternative
Table 3 shows a split of financing the National Steel Interstate based on a large amount of government support though loan guarantees.

<table>
<thead>
<tr>
<th>Percent Total Annual</th>
<th>$ Billions</th>
<th>$ Millions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grants from Federal Government</td>
<td>1.7</td>
<td>9</td>
</tr>
<tr>
<td>Loans guaranteed by Federal Government</td>
<td>48.6</td>
<td>260</td>
</tr>
<tr>
<td>State Governments (90 percent from Fed. Gov.)</td>
<td>8.1</td>
<td>43</td>
</tr>
<tr>
<td>Local Governments (80 percent from Fed. Gov.)</td>
<td>2.0</td>
<td>11</td>
</tr>
<tr>
<td>Railroad Company Resources</td>
<td>7.8</td>
<td>42</td>
</tr>
<tr>
<td>Private Capital (bonds)</td>
<td>30.1</td>
<td>161</td>
</tr>
<tr>
<td>Private Capital - direct invest</td>
<td>1.7</td>
<td>9</td>
</tr>
</tbody>
</table>

Total for National Steel Interstate System | 100.0 | $535 | $21,400 |

In this financing arrangement, the private capital pays for 88 percent of the Steel Interstate capitalization. The government, mostly the federal government, pays for 12 percent. Legislation would be required, at a minimum, to increase availability of targeted loan guarantees and for Federal grants primarily for feasibility and preliminary engineering analyses.

4.2.2. Government Corporate tax incentive program for the Steel Interstate System
The second arrangement is for the preponderance of capital to be raised privately without government guarantees. The allocation of costs are as given in Table 4.

<table>
<thead>
<tr>
<th>Percent Total Annual</th>
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<th>$ Millions</th>
</tr>
</thead>
<tbody>
<tr>
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<td>11</td>
</tr>
<tr>
<td>Railroad Company Resources</td>
<td>7.8</td>
<td>42</td>
</tr>
<tr>
<td>Private Capital - equity investment</td>
<td>80.4</td>
<td>430</td>
</tr>
</tbody>
</table>

Total for National Steel Interstate System | 100.0 | $535 | $21,400 |

Government incentives such as those listed below will be required to assist in attracting private capital.
4.2.3. **Reduction of Taxes on Profits repatriated and invested in the Steel Interstate.** The first suggested initiative is to grant a reduction in taxes on profits of American corporations held overseas when repatriated to the United States, provided that the proceeds of the repatriated profits are invested for the long term in Steel Interstate improvements in the U.S. The estimates for profits held overseas vary wildly, but there is almost certainly $5 trillion that can be repatriated. A part of that sum would provide the financing necessary, and the implementation of the improvements could be accelerated into a 10-15 year program.

This idea is discussed fully in this reference by independent researcher Alan Drake.\(^{14}\)

4.2.3. **Tariff on imports for transportation infrastructure**

The U.S. could impose a tariff on imports if the tariff is used in the economy to decrease the imbalance of in international trade for the U.S. The U.S. is a net importer, so it would qualify under World Trade Organization rules. Increasing the efficiency of the transportation system would make the U.S. more efficient and productive making American goods more competitive in the world market. Also, the implementation of electrification will directly reduce oil import volume, directly improving the U.S. balance of payments. A number of products could be exempted, such as food products, pharmaceuticals, and medical devices. The imbalance in 2012 was over $700 billion.\(^ {15}\) The imports for 2012 less an allowance for the exempted products ($700 million) would be approximately $2 trillion. If an import tax of one percent were applied to this amount, the tax raised would be $20 billion, a number within the range required annually for financing the Steel Interstate System.

This method of financing is also discussed in more detail by Alan Drake.\(^ {16}\) In the case of implementing the tariff on imports, the U.S. Government on behalf of the citizens would take an equity interest in rail companies. Legislation would be required to set up an authority with the power to invest directly in rail companies, or indirectly through underwriting leases for equipment and facilities. This public interest could be sold off to private railroad shareholders over a period of years.

4.2.4. **Tax credits for investment by railroads in speed and capacity increases.**

Another way to incentivize the building of the Steel Interstate System is to enact tax credits to railroad companies and other companies for investing in expansion of rail corridor infrastructure to meet Steel Interstate standards. The railroad companies are already investing back into their systems a very high percentage of their earnings. But, tax credits would increase the level of investment, and companies not even involved in the rail industry would be attracted to invest in Steel Interstate corridors with excellent future potential. Improved corridor facilities would be leased back to the railroads.

\(^{14}\) Alan Drake, http://oilfreetransport.blogspot.com/2012/06/building-oil-free-cross-country.html

\(^{15}\) All foreign trade statistics from U.S. Census Bureau, http://www.census.gov/foreign-trade/index.html

\(^{16}\) Alan Drake, http://oilfreetransport.blogspot.com/2012/06/that-fellow-behind-tree.html?view=magazine
4.2.5. Other issues on financing and financial management

Other issues that are involved with constructing the Steel Interstate that will need to be examined include:
1) Selection of location and division of finances on grade separation projects,
2) State ownership of rail lines where there is not an entity for developing a Steel Interstate route in a corridor that is designated for rail improvements to Steel Interstate standards. For example, there is an inadequate and incomplete line from Nashville to Knoxville, where there is no railroad existing for part of the route. This route parallels I-40 which has a heavy flow of truck traffic, but no close rail line for diversion of trucks from I-40.
3) Eminent domain issues could arise where authority is not clear.
4) Passenger service guarantees regarding capital costs, operating deficits, and liability for operations will need resolution.
5. STEEL INTERSTATE DEMONSTRATION- the Valley Corridor between Harrisburg and Memphis

RAIL Solution has been discussing with various governmental entities and the Norfolk Southern Corporation a proposal to undertake a feasibility study and preliminary engineering analysis of a project for a prototype demonstration of the Steel Interstate concepts. This project would provide both freight and passenger service on the same system at speeds in the 60 to 115 mph range, the exact range depending on the type of traffic, whether general freight, intermodal freight, or passenger traffic. At this point, Norfolk Southern has not endorsed this project. The project, to be known as the Valley Corridor Route Steel Interstate Prototype, would upgrade the western half of the Norfolk Southern Corporation’s Crescent Corridor to meet the required standards to operate rail service according to the requirements of the National Rail Plan and the outline of specifications of the Steel Interstate System which has been proposed by RAIL Solution.

The Steel Interstate System addresses most of the elements of the vision of the 2010 National Rail Plan. The specific ways in which it addresses the Rail Plan vision for service to cities, towns, and regions follows:

- **Regional Corridors:** The SIS network, as conceived by RAIL Solution, connects all sizes of communities across America. The SIS serves both freight and passenger traffic on the same systems at speeds from 60 to 115 mph. Thus, both freight and passenger traffic will be served on a national network connecting all cities because of the fact that rail freight must connect most American towns and cities. The system will interconnect with the high speed passenger rail systems. However, these will be a separate system from the SIS.

- **Emerging/Feeder Routes:** The SIS network will utilize much of the existing rail system to connect smaller communities and more distant areas, thus providing access of these areas and communities to the larger network.

- **Community Connections:** The SIS will provide a lower cost option for higher speed passenger rail, for quicker and safer travel from outlying areas to major hubs for air traffic, and compete head-to-head with airlines and automobiles for intermediate distance passengers, traveling distances between cities up to 500 miles.

The SIS Prototype Demo will show the viability and economics of the total system by demonstrating these features in the selected rail corridor, a part of the Norfolk Southern Crescent Corridor.

5.1. Valley Corridor Route

The route RAIL Solution has chosen for the demonstration of the Prototype of the SIS is a part of the existing Crescent Corridor of the Norfolk Southern Corporation, which covers the territory from the Southeast to the edge of the Northeastern Mega-region. That route is

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17 National Rail Plan, September 2010, U.S. Department of Transportation, Federal Railroad Administration. This is the shortest route of the two parallel rail lines of the Crescent Corridor that one can take between the Mid-South (Memphis and Birmingham and Harrisburg, PA).

18 RAIL Solution is a non-profit organization that has developed the Steel Interstate System concept. ([www.steelinterstate.org](http://www.steelinterstate.org))
depicted in Figure 21. This is an underserved rail corridor despite the fact that it has some of the highest levels of heavy truck traffic in the United States. Much of this is due to the fact that much of the rail system was laid out in the 1800s and is single-track and winds through the center of villages, towns, and cities. There are 15 grade crossings in Morristown, TN, (pop. 29,000) and five in Abingdon, VA, (pop. 8200), for example.

Figure 21. Map of the Route for the Steel Interstate Prototype System

The Valley Corridor Prototype Demonstration route southern terminus is near Memphis, Tennessee at the Norfolk Southern Memphis Regional Intermodal Terminal in Rossville, in Fayette County, Tennessee. The route links consecutively South to North the following cities:

- Huntsville, Alabama
- Chattanooga, Tennessee - links to Birmingham, Shreveport, Dallas, Nuevo Laredo, Mexico and Atlanta
- Knoxville, Tennessee - links to Lexington, KY; Cincinnati, Louisville and Asheville, NC
- Bristol, TN-VA - links to Kingsport, TN and I-26 which links to Asheville, NC
- Roanoke, Virginia- link to Heartland Corridor which runs east and west through Roanoke to the port of Norfolk and to Richmond, VA (mid-way between Bristol and Roanoke, I-77 at Wytheville, VA, links to Charlotte, Winston-Salem, Greensboro, Durham, and Raleigh to the southeast and Charleston, WV, to the north.
- Front Royal, VA- link to Manassas, VA with service to Washington, Baltimore
- Hagerstown, MD- rail and highway links to multiple directions from intermodal terminal at Greencastle, PA, serving New York City, New Jersey, Albany, and New England and Montreal, Canada, Philadelphia, Wilmington, and Trenton.
- Harrisburg, PA- similar links to Greencastle, PA, facility

The route will parallel as closely as feasible the Interstate Highway System routes 1-40, Ii-75, and I-81, which carry some of the heaviest loads of truck freight traffic in the U.S.
The chosen route, superimposed on the interstate highway routes, is shown in Figure 22. Figure 23 shows the region overlay that includes all of geographic region served by the proposed Valley Corridor.

The rail lines will be upgraded to at least two tracks providing bi-directional train traffic, elimination of grade crossing, frequent crossovers from highways and other modes to accommodate general freight, intermodal rail, and passenger traffic at highway-competitive speeds, and positive train control to ensure safe operation. Intermodal freight terminals are being built and planned for the route, and additional loading locations will be provided for loading of trucks onto trains at closer intervals.

The operating speed design criteria will be as follows:

- Freight train speed range:  60 to 75 MPH, with target average point-to-point speed of 60 MPH
- Intermodal train speed range:  70 to 90 MPH, with target average point-to-point speed of 70 MPH
- Passenger train speed range:  79- 115 MPH, with target average point-to-point speed of 90 MPH

The target average point-to-point speed includes the time for stops, changing tracks, and other operational slow-downs that decrease the overall system average speed.

Features that make the route attractive for demonstration include: its service to a region that is underserved by intermodal freight, parallel interstate highways that are crowded with truck freight, a large volume of potential truck freight that can be attracted to intermodal rail, 1000 mile length, and intersection with other feeder lines, hubs, and highways. This provides an excellent prototype demonstration route where attractiveness to both long range and mid-range trucks can be tested.

The route chosen offers the potential for passenger service both within the demonstration route and through connections from the demonstration route to large cities and hubs at reasonably short distances.
Figure 22. Valley Prototype Demonstration Route and Interstate Highway routes\textsuperscript{19}.

\textsuperscript{19} Map taken from Presentation, Roger Bennett, Director or Industrial Development, Norfolk Southern Corporation, \textit{Norfolk Southern – Intermodal Future} to Transportation Research Forum, Washington, DC Chapter, October 20, 2010.
5.1.1. Features of the Valley Corridor Demonstration Route

The following are the key features of the route.

- **Density of Freight Traffic in corridor.** I-40, I-75, and I-81 all three exhibit very high volumes of truck traffic, much of which would be targeted for diversion to the SIS Prototype. Tables 5 and 6 contain estimated volumes of truck traffic existing on the SIS Prototype Demo route. Table 5 is based on Tennessee DOT projections of growth rate in Tennessee, and Table 6 is based on Virginia growth rates applied to both states. These estimates are derived from the studies of the Virginia DOT\(^{20}\) and the Tennessee DOT\(^{21}\) and are considered conservative because they are based on assumptions of stable diesel fuel price and rail service concepts that are not designed to attract a higher proportion of the truck freight market.

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\(^{20}\) Feasibility Plan for Maximum Truck to Rail Diversion in Virginia’s I-81 Corridor, Cambridge Systematics for the Virginia Department of Transportation, April 15, 2010.

\(^{21}\) TDOT Final Freight Analysis, Cambridge Systematics for Tennessee Department of Transportation- June 2010
Table 5. Estimate of Diversion of Trucks in Memphis-Knox and I-81 Corridors-TN Growth Rate for Future in Tennessee

<table>
<thead>
<tr>
<th></th>
<th>Annual Trucks</th>
<th>Low Speed (35 mph)</th>
<th>Higher Speed (60-70 Mph)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2008</td>
<td>2035</td>
<td>2020</td>
</tr>
<tr>
<td>Memphis-Knoxville Route</td>
<td>Total Thru</td>
<td>1,042,000</td>
<td>1,633,000</td>
</tr>
<tr>
<td></td>
<td>% Diverted</td>
<td>39</td>
<td>39</td>
</tr>
<tr>
<td></td>
<td>Diverted</td>
<td>406,000</td>
<td>636,000</td>
</tr>
<tr>
<td>Virginia I-81 Corridor</td>
<td>Total Thru+</td>
<td>1,762,000</td>
<td>3,713,000</td>
</tr>
<tr>
<td></td>
<td>%Diverted</td>
<td>39</td>
<td>39</td>
</tr>
<tr>
<td></td>
<td>Diverted</td>
<td>687,000</td>
<td>1,448,000</td>
</tr>
</tbody>
</table>

Table 6. Estimate of Diversion of Trucks in Memphis-Knox and I-81 Corridors- Using VA Growth Rate for Future in Tennessee

<table>
<thead>
<tr>
<th></th>
<th>Annual Trucks</th>
<th>Low Speed (35 mph)</th>
<th>Higher Speed (60-70 Mph)</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>2008</td>
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<td>2020</td>
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<tr>
<td>Memphis-Knoxville Route</td>
<td>Total Thru</td>
<td>1,042,000</td>
<td>2,196,000</td>
</tr>
<tr>
<td></td>
<td>% Diverted</td>
<td>39</td>
<td>39</td>
</tr>
<tr>
<td></td>
<td>Diverted</td>
<td>406,000</td>
<td>856,000</td>
</tr>
<tr>
<td>Virginia I-81 Corridor</td>
<td>Total Thru+</td>
<td>1,762,000</td>
<td>3,713,000</td>
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<tr>
<td></td>
<td>%Diverted</td>
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</tr>
<tr>
<td></td>
<td>Diverted</td>
<td>687,000</td>
<td>1,448,000</td>
</tr>
</tbody>
</table>

• Truck Diversion Potential Estimates by Norfolk Southern

Truck diversion potential has been estimated by Norfolk Southern, conclusions of which are shown in Figure 24. The diversion potential estimates are considerably higher than those of the state Departments of Transportation. In particular, the city pairs of the graph that are relevant to the Prototype Demonstration are Memphis-Northeast and the Birmingham-Northeast, both of which show high diversion potential.

Much of the truck traffic (possibly as much as 80 percent\(^{22}\)) on the interstate highway paralleling the Demonstration route is long haul or medium haul (400 to 500 miles). Medium and long haul would be targeted by the Valley Corridor Prototype.

\(^{22}\) I-81 Multimodal Corridor, Virginia Statewide Multimodal Freight Study, Final Report, 2010, Part III, Cambridge Systematics, Pg 27. Page 27 states that "Over 77 percent of the total freight tonnage moving within the Corridor is through traffic." That includes truck and rail traffic.
Other truck traffic and truck diversion studies of interest

There are, of course, many studies over the past 10 years of various parts of the I-40, I-75, I-81 corridor. One of the more interesting ones supports the fact that much of the heavy truck traffic in this corridor is long distance. This is illustrated by Figures 25 and 26, which are based on data for truck traffic from Chattanooga to the Virginia border. This would be over I-75 to Knoxville, I-40 to I-81 west of Knoxville, and I-81 to the Virginia border. Data show that over 90 percent of the trips from Chattanooga to the Virginia state line are over 1000 miles, and there are an average of 4500 daily trips to and from the Virginia line.

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23 From Presentation, Roger Bennett, Norfolk Southern Corporation, Norfolk Southern – Intermodal Future to Transportation Research Forum, Washington, DC Chapter, October 20, 2010.
24 Reference: TDOT I-75 Corridor Study- Task 3 Multi-modal Considerations (2010)
Over 90% of I-75 Trips from Chattanooga to VA State line are over 1000 miles.

Figure 25. Percent of Chattanooga-Virginia trucks that are long distance.

Reference: TDOT I-75 Corridor Study- Task 3 Multi-modal Considerations (2010)
Figure 26. Number of trucks daily between Chattanooga and Virginia

So how much traffic can be diverted? The Tennessee studies reference this lookup table, given in Figure 27\textsuperscript{25}. A convention is used to express how much truck traffic would be diverted. This convention is in fair agreement with part of Figure 24, the data of Norfolk Southern, but is not in agreement with parts of Figure 24 where intermodal rail is more competitive. The lookup table would not seem to have much validity for a parallel rail system built for serious intermodal competition with truck freight. Therefore, its use to determine policy about whether to invest in intermodal rail and not in more highways is suspect.

\textsuperscript{25} Reference: TDOT I-75 Corridor Study- Task 3 Multi-modal Considerations (2010)
Potential for Supporting Passenger Service

First, it should be noted that the Valley Corridor is not served by rail passenger service except for east-west crossings, and then only in Virginia, West Virginia, and Pennsylvania. There is no service south of Staunton, Virginia until Birmingham or the Chicago-New Orleans train intersecting at Memphis.

The Valley Prototype Demonstration has the potential to support SIS speed passenger traffic service to these cities within the Prototype Demonstration route:

- Memphis - Chattanooga:
  - Cities in Tennessee: Memphis, Germantown, Collierville, and Chattanooga.
  - City in Mississippi: Corinth.
  - Cities in Alabama: Sheffield (Florence, Muscle Shoals), Decatur, Huntsville, and Scottsboro.
- Chattanooga - Harrisburg:
  - Cities in Tennessee: Chattanooga, Cleveland, Athens, Sweetwater, Loudon, Lenoir City, Farragut, Knoxville, Jefferson City, Morristown, Greeneville, Johnson City (Kingsport), Bristol.
  - Cities in Virginia: Bristol, Abingdon, Marion, Wytheville, Radford, Christiansburg (Blacksburg), Roanoke, Buena Vista (Lexington),

Figure 27. Lookup table for truck diversion percentages.

What is the validity of this lookup table? Questionable!

Reference: TDOT I-75 Corridor Study- Task 3 Multi-modal Considerations (2010)
Waynesboro (Staunton), Elkton (Harrisonburg), Luray, and Berryville (Winchester).
- City in West Virginia: Charles Town
- City in Maryland: Hagerstown
- Cities in Pennsylvania: Shippensburg, Chambersburg, and Harrisburg.

The potential for connection to the following highly desired destinations will exist:

- Chattanooga to Atlanta addition, making feasible Bristol and Knoxville to Atlanta service, and Memphis and Huntsville to Atlanta Service.
- Chattanooga to Birmingham addition, making feasible Bristol and Knoxville to Birmingham service.
- Connection to Virginia Rail service, making feasible service from Bristol and Roanoke to Lynchburg, Northern Virginia, and Washington.
- Connection to Amtrak service at Staunton, VA, east to Charlottesville, Washington and the NE, and west to West Virginia, Ohio, and Chicago.
- Connection to Amtrak at Martinsburg, WV east to Washington DC and the NE and west to Pittsburgh, Cleveland, Canada, and Chicago.
- Connection to Amtrak at Harrisburg, PA east to Philadelphia, New York, New England, and Canada, and west to Pittsburgh, Cleveland, and Chicago.

The experience with Virginia Rail indicates that there is demand for rail passenger service extension in Virginia. The three-year-old daily Northeast Corridor service between Lynchburg, VA, and Boston has exceeded by double anticipated ridership from Virginia stations. This new route is the second best financially performing Amtrak-state partnership route in the nation. In Tennessee, the demand for the service has not been studied extensively. However, it is noted that there is a proposal for very high speed rail from Chattanooga to Atlanta. Steel Interstate passenger rail would probably be adequate to assure high ridership in that market. The distance is approximately 125 miles. At an average of 90 mph, which would be achieved by SIS rail, the full trip would take about 1 hour-25 minutes. From Knoxville to Atlanta, at a distance of 220 miles would take 2 hours-30 minutes. (The flying time from Knoxville to Atlanta is 1 hour, and the cost ranges from $300 to $500, with extra travel time required between airports and downtowns.)

5.2. Correlation of Valley Corridor Prototype Route to national service requirements

The vision for the National Rail Plan will be met by the Valley Corridor Prototype Demonstration of the SIS over the chosen Memphis to Harrisburg route.

- Meets Regional Corridors requirements. The Prototype meets the criteria for regional corridors as required by the national plan. The Prototype connects mid-sized urban areas, as illustrated by the cities Memphis, Huntsville, Chattanooga, Knoxville, Bristol (Tri-Cities, TN/VA), Roanoke, and Harrisburg. Many smaller communities are served, including such towns and cities as Chambersburg, PA; Hagerstown, MD; Front Royal, VA; Luray, VA; Waynesboro, VA; Staunton, VA; Christiansburg-Blacksburg, VA; Wytheville, VA; Abingdon, VA; Morristown, TN; Sheffield, AL; Florence, AL; and Corinth, MS. This will be done with convenient, frequent 60-115 mph service on a mix of dedicated and shared track. Provisions exist for connection to core Express corridors at Memphis, Harrisburg, and any Chattanooga-Atlanta service.
• **Meets Emerging System requirements.** The Prototype connects to regional urban areas (Memphis and Harrisburg) and the mega regions of the Southeast and the Northeast at speeds up to in the range of 60-115 mph on shared track.

• **Meets Requirements for future community connection.** The Prototype is within the corridors required for connection to major hubs and regions thus meeting the requirement for provision for future community connections.

• **Meets Speed, Reliability, and Safety requirements.** Design and operational standards for the SIS Prototype demo will meet all requirements for fast rail. The SIS will provide greatly improved performance in these areas.

• **Meets requirements for fuel economy, less environmental impact, and less overall cost.** The use of electrified system will demonstrate lower costs, less environmental impact, and less use of petroleum products. Further, the overall cost of capital and operations cost will be less than competing solutions using conventional highway construction for increased freight capacity, petroleum based fuels, and less economical service for personal travel on air and private automobiles.

5.3. **Condition of Alignment and Operating Systems**

Although the current alignment of the Prototype Demonstration route is continuous, it is now mostly single track. The system accommodates speeds typically between 25 and 60 mph. In addition, it has a very high number of grade crossings and even some crossings of mainline tracks of other rail systems. In some areas, the alignments have small radius curves that will need to be removed. Other problems are high local grades that will need to be reduced. One of the main problems is the location of tracks that go through cities and towns. Many of these segments will need to be relocated, or railway berms or channels will be required for noise abatement and/or elimination of grade crossings. In addition, some rights-of-way may not be wide enough.

5.4. **Design basis for the Valley Corridor Prototype Demonstration**

The design basis for the SIS Prototype Demonstration will be based on the following criteria:

• **Multiple through tracks.** Main lines would have at least two through tracks, so that trains can be handled in both directions without having to stop and meet oncoming trains.

• **Electric motive power.** Electric motive power means that the SIS network will be powered by electricity, provided to electric locomotives from a system of overhead wires called catenaries.

• **Grade separated alignment of tracks.** Grade-separated means that rail lines of the SIS Prototype will not cross roads and highways at grade, but will pass over or under using bridges or underpasses.

• **SIS Prototype will be precursor to core network.** Core network means that the SIS prototype will be part of the future national backbone of SIS-caliber railroad main lines.

• **Speed criteria will be to meet the 60-115 mph range for the total prototype demonstration system speed range.** The operating speed design criteria will be as follows:
  - Freight train speed range: 60 to 75 MPH, with target average point-to-point speeds 60 MPH
Intermodal train speed range: 70 to 90 MPH, with target average point-to-point speeds 70 MPH
Passenger train speed range: 79-115 MPH, with target average point-to-point speeds 90 MPH
The speed will be 60 mph for some parts of the system where a general freight train is operating. The maximum will be 115 mph, and that will be when a passenger train is operating at top speed on the system.

5.5. Issues to be addressed by the Valley SIS Prototype Demonstration

The Valley SIS Prototype would demonstrate the following relative to the ability of the Steel Interstate to meet a high standard of performance goals.

- Application of the Steel Interstate concept to a system that is underserved by intermodal freight and passenger service.
- A Fast rail system operating in 60 to 115 mph range, with a target average or point-to-point speed of 90 mph for passenger, 70 mph for intermodal, and 60 mph for general freight.
- Operational control a system with a combination of traffic, including general freight, intermodal, and passenger traffic, operating at different speed ranges.
- Diversion of a high percentage of truck freight traffic to fast speed rail.
- Successful operation of freight rail service and passenger rail service on the same system.
- Reduction of environmental impact of freight transportation systems.
- Reduction of requirements for expanded interstate highway lanes and systems to accommodate trucks.
- Improved public safety.
- Reduction in energy required for transport of freight.
- Removal of impediments to investment in fast rail.
- Determination of economic viability for fast freight rail.
- Acceptance of higher speed rail as a highly desired solution to transportation of freight and passengers by rail.

5.6. Budgetary Estimate for the Valley Steel Interstate Prototype

RAIL Solution has prepared a budgetary estimate, or an estimate of the order of magnitude of the cost of the Valley Steel Interstate Prototype System - approximately 1000 miles of multi-tracked, grade-separated, fast speed rail (top speed 115 mph). The estimate, shown in Table 7, is based on factors and costs compiled from various literature sources. The total cost is $13.375 billion.
Table 7. Estimate for Construction of the Valley Steel Interstate Prototype (1000 miles)

<table>
<thead>
<tr>
<th>Description</th>
<th>$ Billions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rail Trackage</td>
<td>6.875</td>
</tr>
<tr>
<td>Added Railroad Right of Way</td>
<td>0.750</td>
</tr>
<tr>
<td>Buildings and Stations</td>
<td>0.250</td>
</tr>
<tr>
<td>Grade Crossing Elimination</td>
<td>0.875</td>
</tr>
<tr>
<td>Electrification (Optional)</td>
<td>2.875</td>
</tr>
<tr>
<td>Engineering and Project Management</td>
<td>1.75</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$13.375</strong></td>
</tr>
</tbody>
</table>

5.7. **Financing the Valley Steel Interstate Prototype System**

Financing of the Valley Steel Interstate Prototype System would need to follow the principles outlined previously in the discussion of financing the National Steel Interstate System. Financing would need to come from one or more of these sources: government guaranteed loans to Norfolk Southern, private capital, private capital from tax credits, private capital from repatriation of profits held overseas.

The distribution of costs to various entities are given in Table 8.

Table 8. Allocation of Cost to Partnership Entities (Government Guaranteed Financing)

<table>
<thead>
<tr>
<th>Description</th>
<th>Percent</th>
<th>$Millions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grants from Federal Government</td>
<td>1.7</td>
<td>227</td>
</tr>
<tr>
<td>Loans Guaranteed by Federal Government</td>
<td>48.6</td>
<td>6,500</td>
</tr>
<tr>
<td>State Governments (90% Federal, 10% State)</td>
<td>8.1</td>
<td>1,083</td>
</tr>
<tr>
<td>Local Governments (80% Federal, 20% State-Local)</td>
<td>2.0</td>
<td>268</td>
</tr>
<tr>
<td>Railroad Company Resources</td>
<td>7.8</td>
<td>1,043</td>
</tr>
<tr>
<td>Private Capital (bonds)</td>
<td>30.1</td>
<td>4,026</td>
</tr>
<tr>
<td>Private Capital - direct invest</td>
<td>1.7</td>
<td>227</td>
</tr>
</tbody>
</table>

**Total for Steel Interstate System** $13,375

Private corporations (Norfolk Southern) would pay for 88 percent of the cost, and 12 percent of the costs would be borne by governments, primarily the Federal Government. The origin of funds for local government participation (for station and terminal infrastructure) would depend on the financial sharing of each respective state. Most of the funds, however, would be funds allocated from Federal government resources.

Previously, we discussed the possibility of funding the national Steel Interstate System from various new revenue from tax credits, import tariff, and repatriation of profits. If one or more of the methods of raising additional revenue is implemented, the need for government guaranteed loans will be less or non-existent.

5.7.1. **Ability to finance the Valley Corridor Steel Interstate Prototype from current revenue of the Norfolk Southern**
The question does arise shouldn’t Norfolk Southern pay for the Valley Corridor Steel Interstate Prototype System from current revenue, and the answer is "No, Norfolk Southern cannot afford such an expense." Why? The current planned capital expenditure of the Norfolk Southern for 2013 is approximately $2 Billion. Of this, approximately $600 million is for infrastructure improvement. But, the system has 20,000 route miles in 22 states. The Valley Corridor represents just 5 percent of the system. Assuming that the construction of the Valley Corridor Steel Interstate project is 10 years in length and that the project would have higher priority in the NS system, there might be available from NS resources 20 percent of the available infrastructure budget, a demonstrably high figure for NS that would total $120 million per year or $1.2 billion total. That represents the railroad company resources in the financing Table 8, an amount of $1.043 Billion in the table. Thus, other sources must be provided.

5.7.2. Ability of the Valley Corridor Steel Interstate Prototype System to repay debt.

Will the Valley Steel Interstate Prototype System be able to pay the amount of debt incurred and give a rate of return on investment to justify the capital outlay? While we do not have access to the internal costs and analyses of Norfolk Southern, we have analyzed this issue from the standpoint of incremental differences in cost saving and increased traffic.

The basic parameters for the Valley Corridor Prototype of interest are: 1) amount of traffic increase due to the investment, 2) fuel savings from conversion to electric motive power, and 3) effect of implementing passenger traffic on the route.

- **Traffic Increase**

For the Valley Prototype, the primary traffic increase would be from intermodal service by diversion of a larger percentage of trucks from the parallel and feeder interstates. We used the data of Tennessee and Virginia for truck volume, and interpolated the data to project truck volume from 2023 to 2035, with 60% diversion of medium (500 miles) and long (1000 miles or more) distance trucks. The year 2023 would be the first year of full operation of the Valley Corridor Prototype System.

The ability to pay back indebtedness is based on the incremental increases on the route using the recent historical operating cost and earnings data of the Norfolk Southern. Revenue for passenger service was based on the Lynchburg Northeast Corridor train implementation experience.

The number of trains is based on conversion of trucks diverted to trains, using about one-half the maximum capability of intermodal trains, but equivalent to the size of average freight hauling trains on the Norfolk Southern. The number of trains

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27 http://www.nscorp.com/nscportal/nscorp/Media/Corporate%20Profile/


assumed are given in Table 9. The estimate of trucks is based upon the average of Tennessee and Virginia through-trucks, and assumes that 50 percent of such trucks are diverted. RAIL Solution believes that higher speeds should divert a higher percentage. Also, the open intermodal system should attract more trucks, especially opening the system for owner-operated trucks, trucks traveling medium distances, crane-lift incompatible trailers and tankers, not dry vans, and not destined for super-sized terminals at the ends of corridors.

Table 9. Number of trains assumed for the Valley Steel Interstate Prototype System

<table>
<thead>
<tr>
<th></th>
<th>Start</th>
<th>Intermediate</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freight</td>
<td>14</td>
<td>16</td>
<td>18</td>
</tr>
<tr>
<td>Intermodal</td>
<td>28</td>
<td>44</td>
<td>62</td>
</tr>
<tr>
<td>Passenger</td>
<td>8</td>
<td>14</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>50</td>
<td>74</td>
<td>100</td>
</tr>
</tbody>
</table>

Estimate of Trucks per day diverted to rail: 3920, 6300, 8680

The operating expense ratio for Norfolk Southern of 75.4 percent in 2009 was used as the basis for the availability of funds to pay off loans. Thus, 24.6 percent of the operating revenues were assumed to be available to pay off the loans guaranteed by the government. The revenue for passenger rail was based on the margin of revenue above costs for the Lynchburg train experience. The experience was extrapolated on a per mile basis to the length and number of miles of the Valley Corridor Steel Interstate Prototype. Actually, more funds than this estimate may be available as Norfolk Southern has undoubtedly built in a margin above operating expenses for the Lynchburg train.

Concerning cash flow, the margin above operating expense for the first 10 years progresses from $350 million the first year to $750 million in the 10th year. In addition, when electric systems are substituted for diesel, the fuel savings on the system progresses from $115 million the first year to $250 million in the 10th year, because of the relative efficiency of the electric motive power systems over diesel (2.75 Btu Diesel output = 1 Btu output for electric system). Thus, in the first year, as much as $465 million is available to pay off indebtedness, and in the 10th year, $1 billion. The break even point on paying off indebtedness (where cumulative margin exceeds cumulative payments on debt) is 8 years for the non-electrified Valley Steel Interstate Prototype and just 2 years for the electrified system.

The overall profitability of the investment for Norfolk Southern is quite large. Using the $1 billion actual out-of-corporate treasury investment of the NS initially, the present value of that investment, after 10 years, is projected as $2.5 billion. So, the figures, as rough as they are, indicate that the Valley Corridor Steel Interstate would certainly pay for itself and could start operating with a margin above operating expenses very quickly.

5.8. Regional Benefits of the Valley Corridor Steel Interstate Prototype

The benefits parallel the benefits discussed for the National Steel Interstate System under Section 3. We want to discuss here some of the particulars of these benefits to the Valley Corridor Steel Interstate Prototype region.
The Valley Corridor Steel Interstate Prototype will directly serve about 15 percent of the population of the United States. Here are the components of the direct service:

Appalachian Regional population: 25 Million in 2010

Service directly outside of the ARC region: a part of state populations with a total population of about 130 Million, about 40 percent of the population of the U.S. It is estimated that the Valley Corridor Steel Interstate Prototype will serve a total of about 40 million people (those within the 150 mile distance of the system) directly, which is about 13 percent of the U.S. population. It will be carrying freight between large regions of population, including Texas and Mexico on one end and New York, New Jersey, and New England states on the other end.

See the extended map (Figure 28) of the Crescent Corridor by Norfolk Southern.

![Extended Map of the Crescent Corridor showing extensions to Texas and Mexico.](http://www.arc.gov/reports/custom_report.asp?REPORT_ID=41)

Another map (Figure 29) of the Norfolk Southern shows the extension of the Crescent Corridor to New Jersey and south to New Orleans.

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5.8.1. Cost of Transportation

The cost of transportation should hold at predictable lower values than might otherwise be the case for transportation that continues almost exclusively to depend upon the provision of expanded and new highways. Lower cost should be experienced because more genuinely competitive modes will operating in parallel, and alternative transportation, such as passenger rail will be increasing available. A train ticket will cost less than travel by car and/or plane up to medium distances.

5.8.2. Economic Impact of the Valley Corridor Steel Interstate Prototype

The effect on business development in the region would be significant. Of course, there is the direct benefit of construction and building activity throughout the Valley Corridor that would occur if the prototype is implemented. One of the reasons for increase of business and regional development will be the access to distant markets provided by more closely spaced terminals along the corridor.

Figure 30 presents a layout of the proposed terminals for the Valley Corridor.
Figure 30. Plan for open intermodal terminals of the Valley Corridor Steel Interstate Prototype.

This proposal for closer spaced terminals along the Valley Corridor facilitates greater utilization of SIS services by the various cities throughout the region. Employing open intermodal services at these terminals greatly broadens potential customer base to include non-crane lift compatible classes of trucks and small operators who cannot afford to lose control of their loads and instead use their rest time to keep moving along with their trucks on the rails.

At the present time, the only terminals are at Memphis (and at Huntsville and Birmingham) and Greencastle in Pennsylvania. Front Royal in Virginia is on the Piedmont leg of the Crescent Corridor, not the Valley Corridor.

The economic impact can be seen from Figure 31 showing the geographical reach where the potential for economic activity could be generated by proximity to services offered by this state-of-the-art intermodal corridor.
The Valley Route should serve Appalachia.

Figure 31. Geographic coverage of the Valley Corridor Steel Interstate Prototype

This figure only lists the presently planned terminals. It does not show additional terminals proposed in the previous figure. The service band for 150 miles (3 hours travel time) on either side shows a large geographic footprint covering most of the Appalachian Regional Commission region, which are underdeveloped economically. The Steel Interstate will attract manufacturing and logistics industry, just as the very large mega-terminals have attracted such industry in such cities as Memphis, Atlanta, and Harrisburg. RAIL Solution has been in negotiations with transportation staff at the Appalachian Regional Commission (ARC). We anticipate that the ARC would want to be a player in helping to implement such innovative transportation services in a region characterized by being by-passed when innovative transportation technology is being implemented.

Also, the passenger service would bring this option to a region that has no North-South passenger service and East-West service only in its northern communities. The region has been almost completely neglected in planning of passenger trains for America. The services this would bring are detailed previously.

5.8.3. Social Benefits

- Health and Safety
The health and safety benefits parallel those of the national system, but these benefits are even more imperative for the region to be served by the Valley Steel Interstate Prototype. Knoxville, for example, is ranked in the top 20 for atmospheric pollution, frequently trapped in valleys by surrounding ridgelines. Much of the smog-generating nitrous oxides comes from growth in vehicular traffic, and particulate from more diesel-powered trucks. Growing vehicular movement, as shown in Figure 32, accounts for most of the growth in the state’s carbon dioxide emissions.

![Figure 32. Growth in carbon emissions across Tennessee industrial sectors, Tennessee Department of Transportation I-40/I-81 Corridor Study.](http://www.forbes.com/pictures/mef45ejdj/15-knoxville-sevierville-la-follette-tn/)

While the preponderance of airborne pollution in Tennessee is emitted from coal-fired power plants, those sources are declining rather than growing.\(^{32}\) There will be fewer deaths from respiratory diseases in Tennessee and across the region if the Valley Corridor Steel Interstate reduces growth in interstate truck miles traveled. Also the Steel Interstate will reduce accidents and fatalities by elimination of grade crossing and reduction in number of trucks on the highways.\(^{33}\)

- Environment


If the system is electrified, the reduction of oil use will amount to 20 Million barrels per year averaged over the first ten years. There will be a proportional decrease in greenhouse gases, simply by diverting hundreds of thousands of trucks to rail – even when the locomotive operates on diesel power. Converting locomotives to electric power will further reduce emissions, even employing the mix of fossil fuels generating power today. If the additional electricity required to run the Valley Corridor is generated by renewable or nuclear power sources, greenhouse gas emissions will drop even more dramatically.

There will be less road building, and the footprint of widening the rail lines because of additional tracks will not have the impact of roads. Runoff of polluted water into streams and the threat of toxic spills would be reduced because rail transportation of hazardous chemicals is considerably safer than truck. Railroads and trucks carry roughly equal hazmat ton-mileage, but trucks have 16 times more hazmat releases than railroads. Statistically, railroads are the safer form of transportation for hazardous materials.  

- **Transportation choices**

If the terminals are distributed and there is an open intermodal system, businesses and individuals throughout the Valley Corridor will have a choice of intermodal rail or long-distance trucking. This system will provide very quick access to the international air shipping terminals at Huntsville and Memphis. Additional freight service could be provided to Dulles and Baltimore-Washington International airports from the Valley route.

The passenger service capability of the Steel Interstate would bring this option to most of the communities of the region.

### 5.9. Proposed Feasibility Study

Rail Solution has been discussing with state and local government officials and Norfolk Southern officials undertaking a feasibility study for the Valley Corridor Steel Interstate Prototype. The feasibility study is estimated to cost $5 million, not including the in-kind effort of Norfolk Southern. The criteria for the proposed study is given in Appendix A.

"Proposed Multimodal Feasibility Study of the Valley Corridor, Organization and Criteria."

### 6. ACKNOWLEDGEMENTS

This work is the result of efforts of RAIL Solution, a not-for-profit, 501(c)(3) organization, that studies and advocates modernization of the North American Rail systems, primarily by implementing the concepts of the Steel Interstate System. Individuals contributing to this testimony are Rees Shearer, Chairman (Emory, Virginia); David Foster, Executive Director (Salem, Virginia); Michael Testerman, Vice Chairman (Richmond, VA), and directors of RAIL Solution, Ken Marsh (Kingsport, TN), Jeff Price (Wycombe, PA). Leslie McCarthy (Villanova, PA), Steve Sondheim (Memphis, TN), Barbara Walsh (Lexington, VA), Bob Peckman (Roanoke, VA). Rucker Keister (Lynchburg, VA), Walter Clark (Maurertown, VA), and A. L. (Pete) Lotts (Knoxville, TN).

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