The Right Track

Building a 21st Century High-Speed Rail System for America

OSPIRG Foundation

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Executive Summary

America's highways and airports are increasingly congested. Our nation's transportation system remains dependent on oil. And our existing transportation infrastructure is inadequate to the demands of the 21st century.

Intercity passenger rail can help America address each of these challenges. Most major industrialized countries have (or are now building) well-functioning intercity rail systems. High-speed trains traveling from 125 mph to 200 mph or more have long served residents of Europe and Japan, and China is currently in the midst of building a $293 billion, 10,000-mile high-speed rail system.[1]

Now, for the first time, the federal government has invested significant resources toward the development of high-speed rail in the United States, with an $8 billion allocation in the American Recovery and Reinvestment Act (ARRA) and $2.5 billion more in Congress' fiscal year 2010 budget.

States across the country are hungry for improved passenger rail. Indeed, **states have requested seven times more money for passenger rail improvements than was allocated** under ARRA. And that figure does not include many other important and worthwhile projects that were not requested because they were further away from being "shovel-ready."

State requests for passenger rail funding under ARRA—coupled with the broader agenda for high-speed rail development articulated by the Obama administration—present a powerful vision for the future of transportation in America, touching virtually every region of the country.

Passenger rail can help address America's toughest transportation challenges.

- Passenger rail **curbs congestion** on highways and in airports, saving travelers time, money and aggravation. The Center for Clean Air Policy and the Center for Neighborhood Technology estimate that completion of a national high-speed rail network would reduce car travel by 29 million trips and air travel by nearly 500,000 flights annually. That is more flights than depart each year from Atlanta's Hartsfield-Jackson Airport, the nation's busiest.

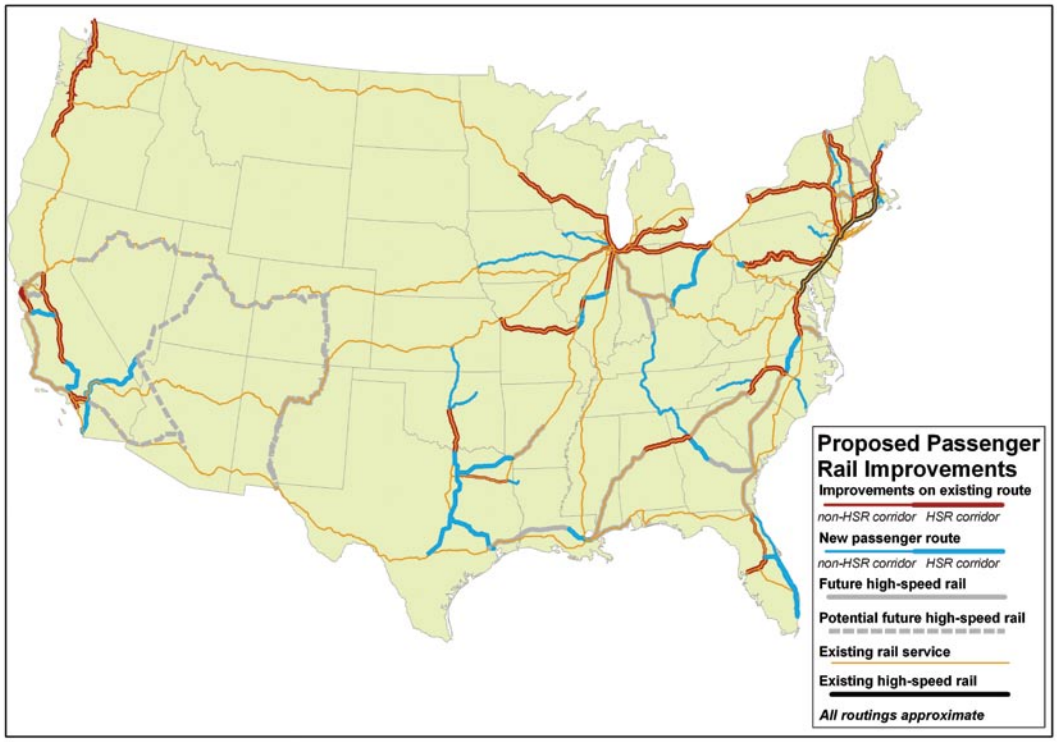
- Passenger rail **reduces our dependence on oil**. On average, an Amtrak passenger uses 23 percent less energy per mile than an airplane passenger, 40 percent less than a car passenger, and 57 percent less than a passenger in an SUV or pickup truck. Newer locomotives are becoming far more efficient, and switching rail lines from diesel to electric power can curb America's oil dependence even further.

- Passenger rail will **boost America's economy**. The task of building out the nation's high-speed passenger rail network is estimated to create up to 1.6 million construction jobs, and can provide a needed shot in the arm for America's struggling manufacturing sector. Economic growth is also spurred by making travel easier between cities, fostering regional business connections and encouraging exchanges of information in the emerging "knowledge economy." Investments in passenger rail can also reduce the need for costly investments in highways and airport capacity.

- Passenger rail can provide **convenient, efficient travel**, where riders can work, relax, enjoy greater legroom, and travel directly from downtown to downtown, even in inclement weather—avoiding the need to drive to outlying airports, wait in long security lines, or jostle for parking in congested center cities.

- Passenger rail **protects the environment**. The Center for Clean Air Policy and the Center for Neighborhood Technology

Figure ES-1. Proposed Passenger Rail Improvements, United States



estimate that a national high-speed rail network would reduce global warming pollution by 6 billion pounds, the equivalent of taking almost 500,000 cars off the road.

Investments in passenger rail can benefit virtually every region of the United States. State requests for funding under ARRA would begin to deliver many of those benefits.

- In the **Northeast**, proposed investments would extend the region's already successful rail network to new locations, such as Scranton, Brunswick, Maine, and the cities of Massachusetts' South Coast. Planned investments would also speed up trips on New York state's important Empire Corridor from Buffalo to Albany, and Pennsylvania's east-west Keystone Corridor from Pittsburgh to Philadelphia, providing important links in a regional high-speed rail network and serving as an effective alternative to flying or driving along those routes.

- The **Southeast** would benefit from extending successful near-high-speed service along Amtrak's Northeast Corridor further south, to Virginia and North Carolina. North Carolina also plans to improve and expand rail service between Charlotte and Raleigh—reducing congestion in one of the fastest-growing regions of the country. Finally, the Southeast's plan for high-speed rail would restore Atlanta to its historic status as a passenger rail hub, linking the city with rail lines running northwest to Nashville, northeast to Charlotte and Washington, D.C., west to Birmingham, and southeast to Savannah and Jacksonville.

- **Florida** is seeking to build the first truly high-speed rail system in the United States, with an initial network linking Tampa, Orlando and Miami. Trains traveling at 165 mph or more would bypass traffic on the state's congested highways and link together many of the state's biggest attractions. Florida is also seeking to restore rail service along its east eoast, providing new service to important coastal destinations.

- The **Gulf Coast** states are pursuing the restoration of passenger rail service east of New Orleans that was disrupted after Hurricane Katrina. Over the long term, the states are looking to build a modern passenger rail network with links between New Orleans and Baton Rouge to the north, Houston to the west, Birmingham to the northeast, and the Florida Panhandle to the east.

- The proposed Texas "T-Bone" high-speed rail network would serve as a core for improved passenger rail service throughout the **South Central** region. The "T-Bone" network—running from Dallas to San Antonio and east to Houston—would serve fast-growing metropolitan areas with more than 15 million residents. Additional connections would include high-speed service between Texas, Oklahoma City and Tulsa, and an eventual high-speed rail connection with Little Rock.

- The rapidly growing **Southwest** trails other regions in planning for high-speed rail, but has several potential corridors for new service, including potential lines serving Denver, Colorado's Front Range, Phoenix, Tucson and Las Vegas.

- The **Midwest** already has extensive rail lines, which states are seeking to modernize, creating a regional network of efficient passenger rail routes with Chicago as the hub. St. Louis, Kansas City, Cleveland, Detroit, Milwaukee, Madison and Minneapolis-St. Paul would all enjoy convenient connections with Chicago—and each other—with a revitalized regional rail system. Building the system is estimated to create over 152,000 person-years of work and 57,000 permanent jobs.

- In the **Pacific Northwest**, ridership on Amtrak's Cascades line between Eugene, Portland, Seattle and Vancouver, B.C., has increased eightfold over the past 15 years. Further improvements to the line will reduce travel time and add round trips, attracting more than 3 million passengers a year and relieving congestion on crowded Interstate 5.

- **California**'s high-speed rail system, one of the most comprehensive and modern networks planned in the United States, will be a big step forward in addressing the state's problems with traffic and air pollution. The network will provide the efficient travel between California's major cities that the state's large population and economy require, with multiple trains per hour stopping in all of the state's largest cities and traveling at top speeds over 200 mph.

Recent investments in passenger rail have already paid off in higher ridership.

- Over the last decade, Amtrak ridership has increased by 26 percent, with an additional 5.6 million passengers per year riding intercity rail. Despite the economic downturn, Amtrak served a record number of riders in the last three months of 2009. Ridership on regional commuter rail lines has increased as well.

- The creation of near-high-speed service between Boston and Washington, D.C., has resulted in rail capturing nearly half of the air/rail travel market in the Northeast Corridor.

- Initiation of 110-mph service along the Keystone Corridor between Harrisburg and Philadelphia has contributed to a tripling of ridership on that line over the last decade.

- Faster service along the Chicago to Detroit corridor has led to a 24 percent increase in ridership over the past five years, despite the region's severe economic downturn.

- Similarly, increases in frequency of service along the Chicago to St. Louis line contributed to a doubling of ridership over a five-year span.

- Americans are hungry for access to more and better rail service. A 2009 survey found that if the cost and travel time were equal, 54 percent of Americans would prefer to travel to cities in their region by high-speed rail, with only 33 percent preferring car travel and 13 preferring air travel. Of Americans who had actually ridden high-speed rail, an overwhelming 82 percent preferred it to air travel.

The United States should build an efficient and fast passenger rail network, with high-speed rail as a central component, to help address the nation's transportation challenges in the 21st century. Eleven key steps toward achieving that goal are as follows:

- **Investing the necessary resources**—America must reverse the half-century-long trend of underinvestment in passenger rail by creating a reliable funding source and channeling the necessary resources toward making passenger rail a convenient choice for more travelers and building the high-speed rail networks that will be necessary to meet the nation's travel needs in the decades to come.

- **Maximizing "bang for the buck"** by investing in lines with the greatest ridership potential and using incremental, short-term improvements in passenger rail to help lay the groundwork for eventual faster high-speed service.

- **Balancing private investment with public safeguards**—Harnessing private investment can help to deliver high-speed rail improvements, but the public must retain control over key infrastructure and decision-making, and any private deals should be undertaken only with full transparency and accountability. Wherever possible, new rail lines should be built on publicly owned right of way. Public investments in privately owned tracks should be tied to agreements to secure greater priority for passenger trains.

- **Investing to achieve full benefits** by refusing to cut corners in new rail investments, particularly with regard to investments that can improve energy security, environmental performance, and safety.

- **Building stations in the right places,** where passengers have access to a variety of transportation options for completing their trip and where passenger rail can provide a catalyst for transit-oriented development.

- **Assuring transparency** in all aspects of the decision-making process over passenger rail, including the expenditure of funds and contracting.

- **Managing for performance** by collecting and publicizing data on ridership, energy consumption, safety and other aspects of rail service, and setting concrete goals for the achievement of specific targets in each of these areas.

- **Encouraging domestic manufacturing** to supply the equipment needed for the build-out of the nation's passenger rail system and make America a leader in an emerging global technology.

- **Setting standards** for high-speed rail equipment so that the nation can benefit from economies of scale.

- **Encouraging cooperation among states,** and between states and the federal government, in the development of high-speed rail.

- **Measuring progress against a vision.** The nation should set an ambitious goal for the development of the nation's rail system. We call for linking all major cities within 100 to 500 miles of one another with true high-speed rail by mid-century. Whatever the goal, it should be set and progress measured against its attainment.

Introduction

In 1919, a young Dwight D. Eisenhower traveled across the United States in an Army convoy to test whether the nation's roads were adequate for its defense. At an average pace of 6 miles per hour, 81 vehicles made their way from Washington, D.C., through the Midwest, across the Rocky Mountains, and down to San Francisco, taking more than two months to cross the country. The convoy had more than 230 accidents along the way, as heavy trucks sank into mud or ran into other problems on the dirt roads and trails that made up half the route.[2]

Eisenhower's experience was typical of the time and the poor quality of the nation's roads brought businesses and civic leaders together in a "good roads" movement that eventually led to a strong federal role in road construction. As president, Eisenhower took that federal commitment even farther, pushing for the creation of the Interstate Highway System to solve the country's road transportation problems. Requiring more than three decades of effort, and $425 billion of the nation's wealth, the Interstate Highway System transformed American life, making long-distance road travel faster, safer and more convenient than ever.

Similarly, the federal government played a key role in building out the nation's air transportation system. Indirectly at first, and then, after World War II, through direct subsidies, the federal government sought to take advantage of the potential of air travel to link distant U.S. cities together with each other and with the world. The federal government subsidized the construction of airports and built and operated the air traffic control system that allowed for the massive expansion of air traffic while keeping the flying public safe. Recently, the federal government has made similar investments to ensure the security of air travel. These investments helped ensure that America would be able to compete and collaborate effectively in the emerging global economy.

Meanwhile, however, the third key portion of America's intercity transportation system—our passenger rail network—was virtually left to die. During the pivotal Depression and postwar years, passenger rail service remained the responsibility of the nation's private railroads, which provided

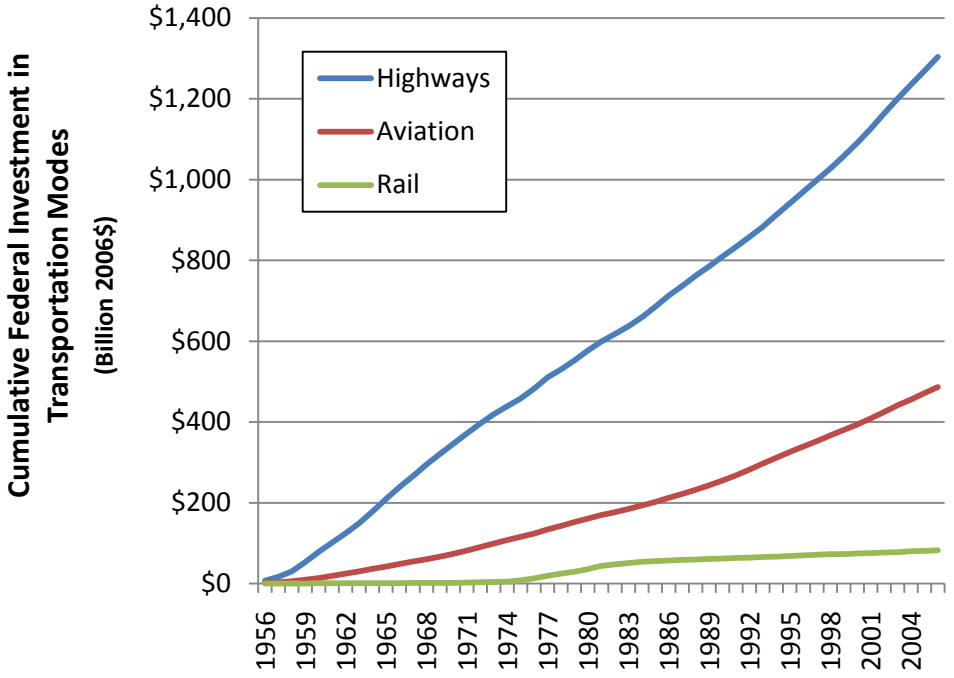
it as a low-profit adjunct to profitable freight rail service, often seeking to abandon passenger service whenever federal regulators would allow. Unlike highways and airports, rail infrastructure did not benefit from federal investment. Between 1956 and the creation of Amtrak in 1971, the federal government invested a mere $2.4 billion in the nation's rail system—33 times less than it invested in aviation and 150 times less than it invested in highways during the same period.[3]

The creation of Amtrak to provide the passenger rail service formerly operated by freight railroads represented an increase in the federal commitment to rail. Amtrak, however, was saddled from the start with a system in bad repair. Federal investment in rail transportation since the early 1970s has never caught up with the decades of disinvestment in the system of the postwar years. Over the half-century ending in 2006, the nation invested $16 in the highway system and $6 in aviation for every dollar invested in rail.[4] Moreover, funding for Amtrak has been inconsistent, varying year by year based on congressional appropriations and making it impossible for the railroad to invest and plan for the long term.

As a result of that legacy of disinvestment, a train rider seeking to cross the country today would likely experience some of the same frustrations Eisenhower did in his cross-country drive—most notably the sense that the world's most powerful and economically advanced nation can surely do better.

In a few key corridors of the United States—particularly the Northeast—passenger rail already works well (though not up to its full potential). But in most of the United States, including many corridors well-suited for rail service, passenger rail remains more of a novelty than a viable and convenient transportation option. As

Figure 1. Cumulative Federal Capital and Operating Investment in Highways, Aviation and Rail[5]



airports and highways have become more crowded and our nation's dependence on oil more vexing, America's need for a viable passenger rail system has never been greater.

The inclusion of $8 billion in funding for high-speed rail projects in the American Recovery and Reinvestment Act (ARRA), enacted in early 2009, signaled that finally—after decades of half-steps and false starts—the nation stood ready to reinvest in its passenger rail system. States have poured forth with ideas and requests for how to spend that money. Many of those proposals have been geared not toward building the truly "high-speed" passenger rail systems that America will need in the decades to come, but simply toward restoring passenger rail service to a basic level of adequacy. Congress' additional authorization of $2.5 billion for fiscal year 2010 extends that momentum.

But even if all $57 billion in final state requests for ARRA funding were to be fulfilled, it would only represent a down payment on a long-term program of repair, expansion, and modernization that would create a passenger rail system worthy of the 21st century.

This paper reviews the state requests for high-speed rail funding under ARRA, as well as the larger vision for high-speed rail presented by the Obama administration, to paint a picture of the benefits a revitalized passenger rail network would deliver to regions across the country.

Why Intercity Passenger Rail?

America's intercity transportation system has three main components: airlines, trains and highways (including car and bus travel). For decades, the nation has invested lavishly on highways and airports, while passenger rail service has languished.

Passenger rail service can help solve many of the problems that afflict our current transportation network—including traffic congestion and dependence on oil. Rail can provide safer, more comfortable, and often faster travel for many trips. And investments in passenger rail can help reinvigorate America's manufacturing sector, while improving the economic competitiveness of America's growing "megaregions."

Reducing Congestion

An effective intercity transportation system carries business travelers, tourists, and others reliably and efficiently from one city to another. America relies almost entirely on airplanes and roads for intercity transportation, including trips that could be better served by rail. The lack of effective passenger rail service in much of the country adds to congestion on our roads and in our airports—leading to frustration, delay and large losses to the economy.

Over the past three decades, the number of miles driven on U.S. roads has almost doubled.[6] Over the same period, traffic congestion has skyrocketed. In 2007, congestion cost the country 4.16 billion hours of lost time. Long-distance trips add to this congestion: the U.S. Department of Transportation estimates that Americans take more than 2 billion trips by car of 50 miles or more annually.[7]

Similarly, the number of miles Americans travel by plane has more than tripled in the past three decades.[8] The resulting crowding of airports and airspace has led to more delays and increasingly frustrated passengers. Air travelers wasted more than 2 million hours in airline delays in 2007, with the problem significantly worse at some of the nation's most frequently used airports.[9]

Passenger rail can alleviate congestion on highways and in airports—making all aspects of the transportation system more efficient. The Center for Clean Air

Policy and the Center for Neighborhood Technology estimate that building out a national high-speed rail network would reduce car travel by 29 million trips and air travel by nearly 500,000 flights—more flights than currently depart each year from Atlanta's Hartsfield-Jackson Airport, the nation's busiest.[10] The availability of additional options for intercity travel will become even more important in the years ahead as congestion on roadways and in airports increases.

In certain areas of the United States, passenger rail service already plays an important role in easing congestion. When the near-high-speed Acela service was introduced in 2000, passenger rail's share of the travel between Boston, New York and Washington, D.C., rose dramatically while airlines' portion fell. In 1999, 18 percent of travelers in the air/rail market between Boston and New York took the train; by 2008, this had risen to 47 percent, with only 53 percent flying.[11]

Curbing Oil Dependence

Cars and airplanes are almost exclusively powered by oil—increasing America's dependence on a limited supply of fossil fuel largely controlled by other nations. Spikes in oil prices in recent years have had dramatic effects on Americans' willingness to drive or fly to their destinations. Expanding and improving passenger rail service can reduce the nation's dependence on oil and insulate travelers from the impact of fuel price spikes.

America's existing intercity passenger rail network already contributes to reducing America's oil dependence, removing an estimated 8 million cars from the road and eliminating the need for 50,000 passenger airplane trips each year.[12]

Intercity passenger rail—even when powered by diesel fuel—is more fuel-efficient than car or air travel, particularly for trips in the 100 to 500-mile range. On average, an Amtrak passenger uses 23 per-

Passenger rail is an energy-efficient mode of travel, with Amtrak trains consuming 23 percent less energy per passenger-mile than airplanes. Credit: Jim Frazier, jimfrazier.com

cent less energy per mile than an airplane passenger, 40 percent less than a car passenger, and 57 percent less than a passenger in an SUV or pickup truck.[13]

These numbers underestimate rail's oil savings compared with airplanes. In terms of travel time, rail is most competitive against oil-intensive short airplane flights with trip distances of 500 miles or less—a traveler is much more likely to choose rail over air travel from Chicago to Minneapolis than from Chicago to Miami. Short flights use more fuel per mile than longer flights, since a plane uses much of its fuel in takeoff.

A modernized passenger rail network in the future will also likely use less oil than American passenger rail service does today. As a high-speed rail network is developed in the United States, it will rely more on electricity and less on diesel fuel. Currently, about 40 percent of American intercity passenger rail is powered by electricity, while 80 percent of European rail service is electric.[14]

As train service becomes faster, more reliable and more frequent it will also likely draw more passengers, further lowering per-passenger fuel usage. The more seats on a train that are filled, the less fuel that is used per passenger. Amtrak trains are typically about 50 percent full, compared with 70 percent for European high-speed trains.[15] As rail travel in America improves and draws more passengers, it is likely that trains will be carrying larger loads of travelers, raising the fuel efficiency of a trip on a train.

Finally, the location of passenger rail hubs in downtown areas can encourage and support land-use patterns that reduce the need to drive, further curbing oil use. Placing a passenger rail station in a downtown area provides an inducement for businesses to locate nearby—just as airports spur development of office parks for businesses seeking close proximity to transportation and the construction of hotels and other traveler services. Unlike airports, however, passenger rail hubs would likely be located in existing downtown areas, where workers would be more likely to get to work via transit or other transportation alternatives.

Boosting the Economy

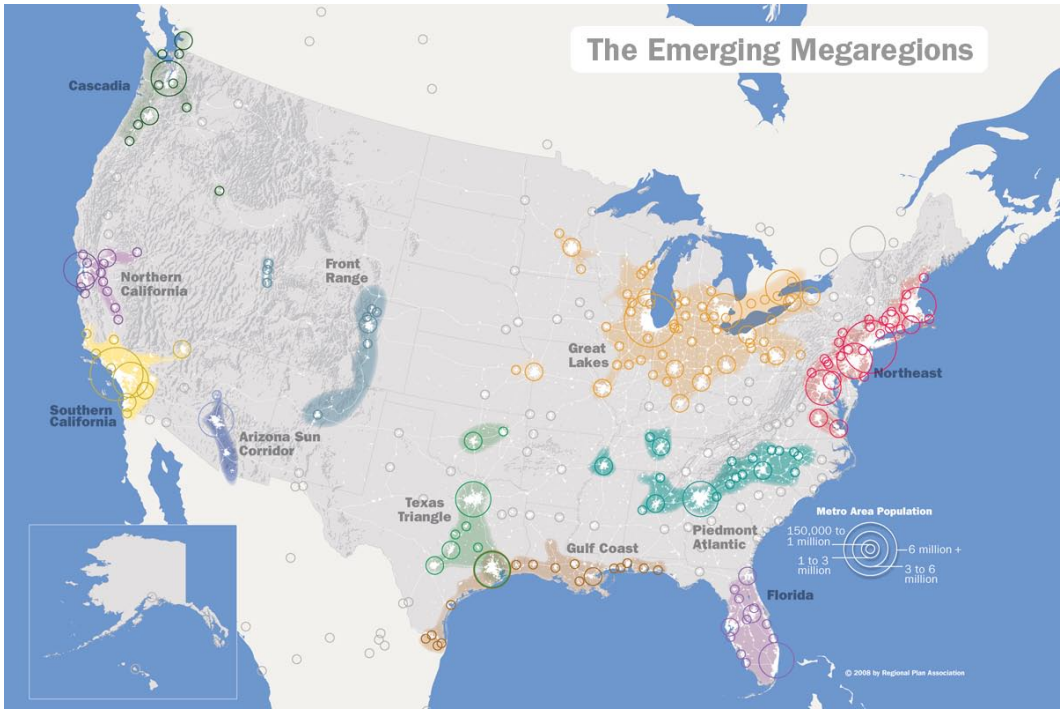
Building a modern passenger rail network will be a boost to America's economy. Besides the jobs created in upgrading our railways, making connections between our cities quicker and more convenient will better equip the country for the 21st century economy.

The 19th century was characterized by the phenomenal growth of America's cities. Chicago, a town of less than a thousand people in the 1830s, grew to be the fifth-largest city in the world by 1900.[16] Other cities, from New York to St. Louis, experienced similar meteoric rises. The 20th century, on the other hand, was characterized by the growth of suburbia and the development of metropolitan areas, which were knitted together by mass transit and, later, by highways. Today, many American metropolitan areas have far more people living in their suburbs than in the central city.

Some analysts see the 21st century as the era of the "megaregion"—areas of the country in which formerly distinct metropolitan areas are now merging into contiguous zones of integrated economic activity. The Boston-New York-Philadelphia-Baltimore-Washington, D.C.-Richmond corridor along the East Coast is the most well-known of these regions, but experts have identified roughly 10 others (see Figure 2, next page).[17] These 11 regions include more than 70 percent of the nation's population and the vast bulk of its economic activity.[18]

The development of economically successful regions depends upon the ability to

Figure 2. Megaregions in the United States[19]



share information and insights quickly and conveniently. The growth of the Internet and other forms of telecommunication has not replaced the vital role of face-to-face interactions in generating new ideas and increasing economic productivity. In-person business and technology meetings are considered essential for building relationships and trust. Consider the benefits gained by students in Cleveland who come to hear a lecture from a university professor in Chicago, or of employees from throughout the Southeast called in for a one-day sales training in Atlanta.

Our current transportation system, unfortunately, does a poor job of connecting residents and workers in the nation's megaregions. The main highways linking cities within megaregions tend to be congested—think of Interstate 95 in the Northeast or Interstate 5 in the Pacific Northwest or Southern California. Air travel for short trips within a megaregion can be challenging as well. For many short flights, the amount of time that it takes to travel to the airport and go through security can be greater than the amount of time actually spent in flight.

Passenger rail—particularly high-speed rail—has the potential to link cities within megaregions together in a faster and more efficient way. Easier travel within megaregions means that businesses and organizations will effectively be closer together, making it easier to travel between branches, meet with potential employees and clients, and make the other connections that strengthen an economy. It will also make the United States a more attractive location internationally, attracting potential economic boosts such as tourism and international meetings.

Downtown train stations in a high-speed rail network would also help to revitalize downtown areas, including those in declining smaller cities, by bringing

thousands of passengers straight to town and city centers, reducing the pressure for new sprawling development in regions where land is often scarce. Similar opportunities for in-fill development exist around airports served by direct high-speed rail links.

Between this economic benefit, and the work required to build and operate the trains, an American high-speed rail system could create millions of jobs. According to an analysis by the Midwest High Speed Rail Association (MHSRA), building the national system will create up to 1.6 million construction jobs. The economic boost from the system could translate into up to 4.5 million additional permanent jobs. Manufacturing the trains will require additional workers—the MHSRA estimates up to 100,000 new jobs.[20]

Creating this network will require a large investment. But solving our infrastructure problems will be expensive regardless of what types of travel are prioritized. Expanding highways can range from under $10 million to over $70 million per mile of additional lanes, and often is only a temporary fix for congestion.[21] Moreover, in some of the most densely developed regions, expanding highways is even more expensive, or virtually impossible. The reconstruction and reconfiguration of the deteriorating elevated highway through downtown Boston—known as the Big Dig—cost nearly $2 billion per mile.[22] Expanding airports is also very expensive—a program to reconfigure runways and add one terminal at Chicago's O'Hare Airport, for example, will cost $6.6 billion.[23]

There is growing agreement that America must make large investments in its transportation infrastructure if it is to grow and thrive in the 21st century. Unlike the infrastructure development strategies of the last half-century, passenger rail needs to be a central focus of this new wave of investment.

Increasing Transportation Options

Americans are eager for alternatives to driving and flying. The dramatic growth of ridership on Amtrak illustrates the demand for intercity rail service. Over the last decade, Amtrak ridership has increased by 26 percent, with an additional 5.6 million passengers per year riding intercity rail.[24] Despite the economic downturn, Amtrak served a record number of riders in the last three months of 2009.[25]

For many residents of smaller cities around the United States, there is only one practical way to get from city to city: driving. Since deregulation of the airline industry in the 1970s, and especially since the terrorist attacks of 2001, regional air service to smaller cities has fallen sharply.[26] Residents of smaller cities seeking to make long-distance flights must now often drive longer distances to major regional airports instead of hopping on a plane closer to home. A similar trend has taken place with intercity bus service, with Greyhound cutting service to hundreds of communities during the past decade.[27]

Passenger rail service can provide a new transportation option to residents of smaller cities and towns, linking them with regional centers. And by creating air-rail links at major airports, passenger rail can reduce the need for inefficient short-haul flights while, at the same time, providing a better option for getting to the airport for those residents of small cities that have lost regularly scheduled air service.

Providing Comfortable, Efficient Travel

Americans' growing frustration with driving and flying are so prevalent that our culture has even coined names to describe them: "road rage" and "air

rage." Long-distance highway travel can be exhausting, frustrating, and subject to unanticipated delays due to weather, construction or accidents. Air travel can be just as frustrating, with delays, crowded planes and airports, and new fees on everything from blankets to luggage adding to travelers' ire. Passenger rail service in the United States is certainly not perfect—particularly given the nation's antiquated rail infrastructure and conflicts between passenger and freight rail. But rail travel does have several inherent advantages over flying and driving.

Work while you ride – Unlike driving, time spent on a train can safely be used for productive work or for relaxing. Unlike flying, the use of electronic devices is not restricted for take-off and landing, many trains are equipped with electrical outlets at every seat, and Amtrak and several commuter rail providers are beginning to roll out on-board wireless Internet services for customers. As a result, rail passengers can stay in touch with the outside world.

Creature comforts – Trains generally have more leg room than airplanes and allow passengers to walk around during the entire trip. Rail travelers don't worry about dehydrating air, their ears "popping" from pressure, restricted access to bathrooms during take-off and landing, or seizure of shampoo bottles and nail clippers. Riders can spend time in lounge cars or dining cars for a change of scenery during the ride and generally have access to a wider range of food and beverage options.

Downtown rail stations, such as Boston's South Station (above), allow for convenient downtown-to-downtown travel and connections with public transportation.

Downtown-to-downtown travel – Traveling to and from the airport can be an ordeal in and of itself for air travelers. Most airports are located far from city centers, requiring an extra drive or taxi ride, and passengers must check in at least one hour before takeoff. Trains, on the other hand, go from downtown to downtown and generally require passengers to arrive a half-hour or less before departure.

All-weather, reliable transportation – Severe storms can disrupt the entire air passenger network for days—affecting even travelers in cities where the weather has been perfect—while also making driving time-consuming, dangerous or impossible. Passenger rail service is not immune to weather-related delays, but trains generally operate in a wider variety of weather conditions than airplanes or cars. Weather accounted for only 1.4 percent of the delays reported by Amtrak during its 2007 fiscal year.[28]

Trains are often a preferred mode of travel, especially for distances between 100 and 500 miles. A 2009 survey found that if fare and travel time were equal, 54 percent of Americans would prefer to travel to cities in their region by high-speed rail, with only 33 percent preferring car travel and 13 preferring air travel. Of Americans who had actually ridden high-speed rail, an overwhelming 82 percent preferred it to air travel.[29]

Protecting the Environment

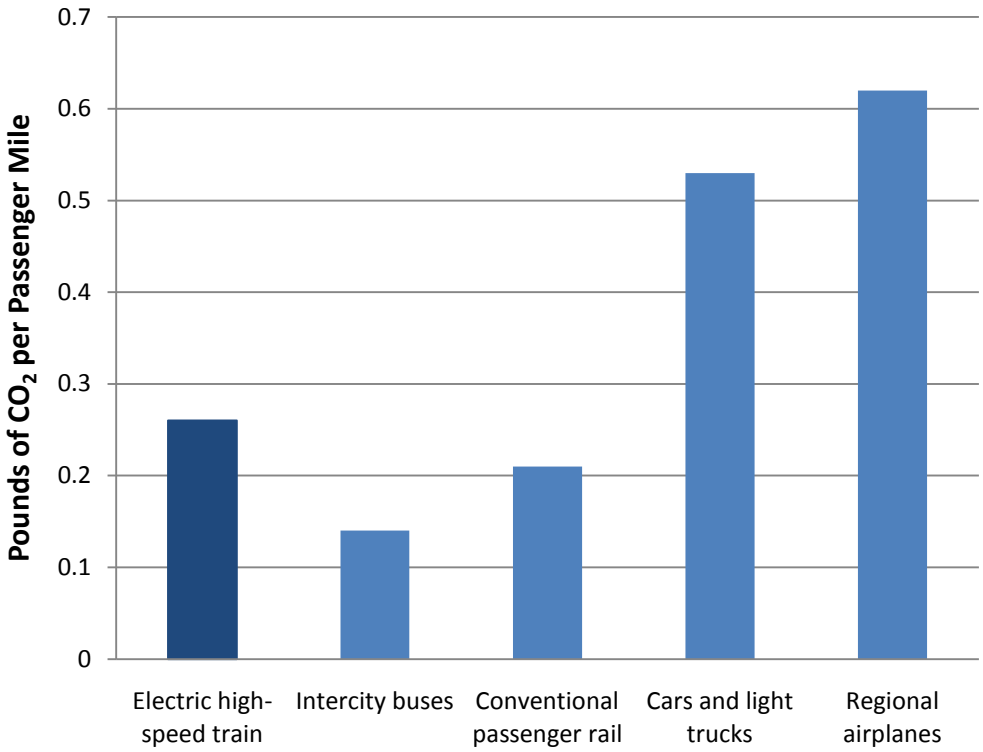
Passenger rail is a cleaner form of transportation than car or air travel, emitting less global warming pollution and less health-threatening air pollution. Building a high-speed rail network in the United States would attract passengers who otherwise would have taken cars or planes, reducing the country's global warming emissions and cleaning up our air. Modernizing our tracks would also benefit freight trains, taking large trucks off of highways and adding to the environmental and health benefits of investment in rail.

Passenger rail already emits less global warming pollution than cars or planes, and these savings will increase as the United States develops a high-speed rail network. The Center for Clean Air Policy (CCAP)/Center for Neighborhood Technology (CNT) study showed that today, passenger rail travel emits 60 percent less carbon dioxide per passenger mile then cars and 66 percent less than planes. The faster diesel trains that would likely be used to upgrade current service would emit slightly more emissions, but would still emit much less than cars and planes and would draw more passengers than current passenger rail.[30] (See Figure 3, next page.)

Electric trains show the most potential for global warming emission reductions, even using today's carbon-intensive electricity grid. The CCAP/CNT study surveyed the technology used on three different popular electric train lines, in France, Germany and Japan, and found that all would produce lower carbon dioxide emissions per passenger mile than a fast diesel train when powered by the U.S. electric grid. One train, used on the German ICE line, would produce about half the emissions of America's current passenger rail system.[31] Electric trains are not only more energy efficient, but they are faster, and could eventually be powered at least partially with emission-free renewable energy.

By attracting travelers who otherwise would have taken cars or planes, building a high-speed rail network would be much more effective at reducing global warming emissions than our current passenger rail system. The CCAP/CNT study estimated that building the high-speed rail corridors

Figure 3. Carbon Dioxide Emissions per Passenger Mile by Travel Mode[32]



planned by the federal government using fast diesel trains, with top speeds of 99 mph, would attract enough passengers to reduce U.S. global warming emissions by 6.1 billion pounds, the equivalent of taking almost 500,000 cars off the road.[33]

Passenger rail reduces harmful air pollution as well, especially when it is powered by electricity. For example, a passenger on an electric train in Germany produces about 93 percent less air pollution than someone traveling by car, and 91 percent less than someone making the same trip by plane.[34] Although the electricity produced in the United States would create more emissions, electric trains would still be much cleaner than diesel trains, cars or planes.

When tracks are upgraded for better passenger rail service, freight traffic needs are considered as well, allowing more freight trains to travel faster and with fewer delays and adding to the environmental benefits. Rail transport is much more fuel efficient than truck transport for freight—various studies estimate that train transport is three to nine times as efficient as truck transport for the same amount of freight.[35] The resulting fuel savings add to the emissions reductions from improving passenger rail.

An Emerging Vision for American Passenger Rail

After more than a half-century of underinvestment in America's passenger rail network, the inclusion of $8 billion of funding for high-speed rail projects in the American Recovery and Reinvestment Act of 2009 (ARRA) provoked a flurry of requests from states eager to improve their passenger rail infrastructure and lay the groundwork for high-speed rail.

When states filed pre-applications for high-speed rail funding under ARRA in the spring of 2009, the amount of funding requests totaled $102 billion for 278 projects in 40 different states and the District of Columbia. These applications outstripped the available funding by a ratio of more than 12 to 1.[36] (See Figure 4, next page.) For the final round of applications, states weeded out projects that were further from being ready to start or were of lower priority, narrowing their requests to $57 billion.[37] In some cases, states that filed pre-applications but not final applications did so with the expectation that they would seek federal funds in future rounds of high-speed rail funding.

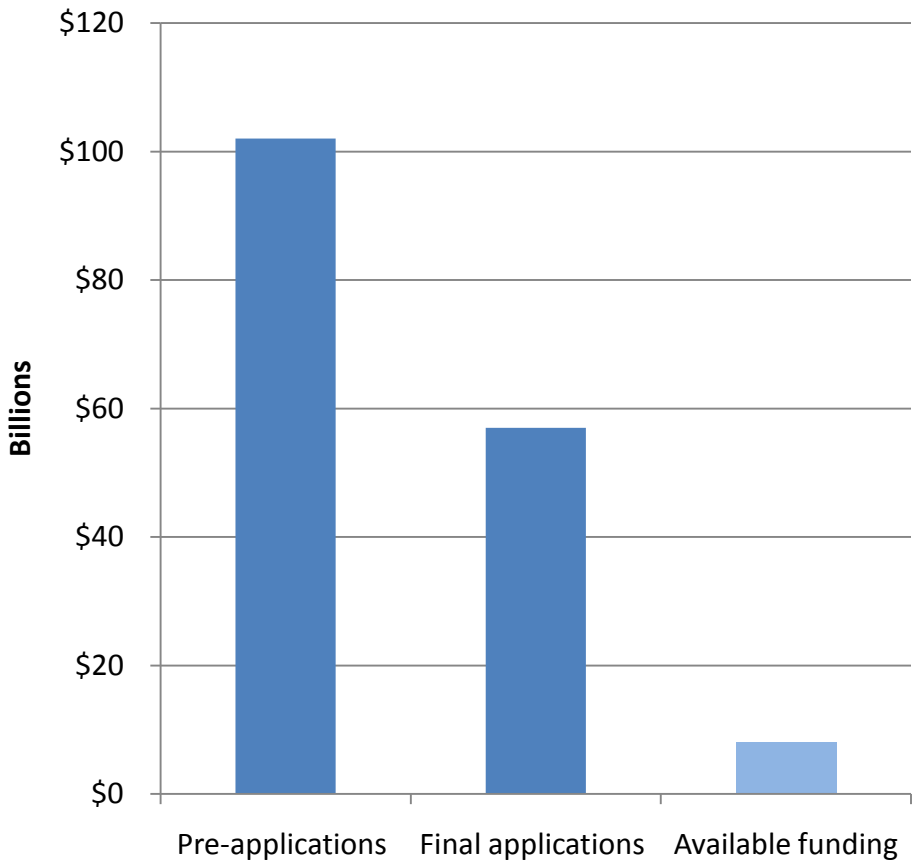
The outpouring of state interest in high-speed rail funding reflects the tremendous pent-up demand for improvements in the nation's passenger rail infrastructure. It also begins to paint a picture of what an improved national passenger rail system would look like … if we invest the resources to make it a reality.

In the following sections, we describe what such a system would look like for various regions of the country, based largely on the states' requests for funding under ARRA and the national high-speed rail vision articulated by the Obama administration, as well as other ideas for rail expansion that have been proposed by various states.

The vision that is emerging is of a two-step process toward the construction of an efficient and effective passenger rail system for America in the 21st century. The

The outpouring of state interest in high-speed rail funding reflects the tremendous pent-up demand for improvements in the nation's passenger rail infrastructure.

Figure 4. Pre-applications and Applications for ARRA High-Speed Rail Funds versus Available Funding



first step—expressed in many of the state proposals for "high-speed" rail funding under ARRA—is to restore passenger rail to the basic level of adequacy that it lacks in most of the country through incremental investments in improving the current system. Simple steps such as rebuilding bridges, adding additional tracks, installing improved signaling equipment and increasing the frequency of rail service can have dramatic effects on the viability of passenger rail service, as the examples of Amtrak's Downeaster (page 20) and service between Chicago and St. Louis (page 45) illustrate.

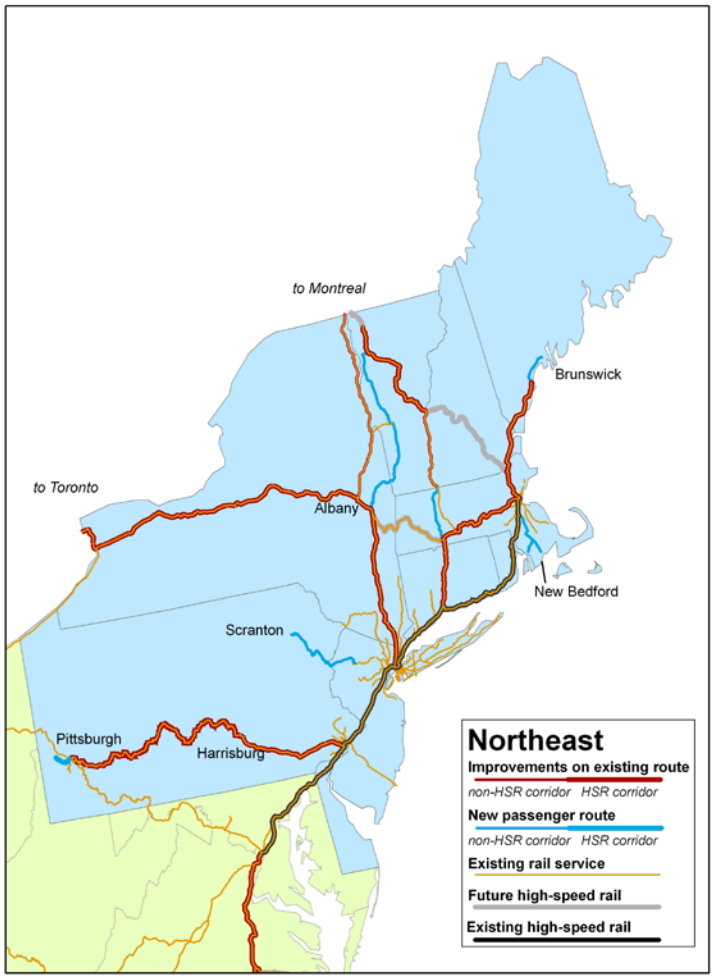
The second step—articulated in the national high-speed rail vision and several state requests for planning funding—is the creation of what is sometimes called "true high-speed rail" or "express high-speed rail," with trains traveling over 150 miles per hour, in key regions of the country. Achieving this national vision of high-speed rail will take decades, but is necessary to ensure an effective transportation system for the nation in the 21st century.

The Northeast

If there's one region in the United States perfectly suited for a robust passenger rail network, it's the Northeast. With several large, closely spaced metropolitan areas, along with many mid-sized cities—as well as horrendous traffic—passenger rail can play a major role in moving people around the region.

The Northeast already boasts many of the nation's best-traveled rail lines, including the Northeast Corridor between Boston and Washington, D.C., (which carries approximately 10 million passengers per year) and the vast webs of commuter rail lines extending from Boston, New York City, Philadelphia and Baltimore/Washington.[38] But in many places in the Northeast, trains still trundle along bridges built a century or more ago, while in much of the region, trains simply don't run anymore at all. Even the Acela Express—the technological crown jewel of the American rail system—is hampered by aging infrastructure to the point where it barely qualifies as a "high-speed" rail line by international standards.

Northeastern states are eager to expand and improve rail service—speeding up travel on existing lines, restoring service to areas that have been without it for decades, and laying the groundwork for the establishment of a true high-speed rail network that will knit the region together, alleviating traffic, spurring new growth, and curbing transportation's impact on oil dependency and the environment.



Connecting New England's Mid-Sized Cities

When non-residents think of New England, rocky shorelines, quaint small towns, bold fall colors, and perhaps the history and vitality of Boston are the first things that come to mind. Less often remembered are the many mid-sized cities that are at the core of the region's economic vitality: former mill towns such as Manchester, Lowell and New Bedford; educational centers such as New Haven and Burlington; centers of government and finance such as Hartford and Providence; and many more. There are 11 cities in New England with population between 100,000 and 200,000, and many others that serve as important regional centers.

An effective regional rail network for New England, therefore, can't just be built around the need to move people between Boston and New York City—or to connect those cities with their adjoining suburbs. Rather, it must be a web, providing convenient travel options that link the region's

many small cities together, and with the booming metropolises of the Northeast Corridor.

Amtrak's Downeaster provides an example of the promise of linking mid-sized cities into the vibrant Northeast Corridor network. Launched in 2001, the Downeaster revived passenger rail service between Boston and Portland, Maine, that had been abandoned in 1965. The arrival of the Downeaster was greeted with skepticism from some quarters, but the Downeaster quickly proved to be a convenient and reliable alternative for travelers who previously had to rely on buses and frustrating trips along I-95.

The real breakthrough for the Downeaster came in 2005, when track improvements reduced travel time from 2 hours and 45 minutes to 2 hours and 30 minutes. The next year, ridership increased 31 percent.[39] With the Downeaster now fast enough to compete with driving, and with new service added along the line, the train was able to help travelers deal with the spike in gasoline prices in 2008. In the fiscal year ending June 2008, the Downeaster had the largest ridership gain of any passenger rail line in the country.[40] Many trains could barely meet the demand—the first trains of the morning were 95 percent full.[41]

Now an established part of the region's transportation network, the Downeaster is spurring new development in cities and towns along the line. In Saco, Maine, for example, a mill building adjacent to the station is being renovated to house retail shops, condominiums and conference space, and the new downtown station, powered by its own wind turbine, has become a gathering place for town residents.[42] The Center for Neighborhood Technology estimates that by 2030 current Downeaster service will bring $982 million in construction investment, create

Amtrak's Downeaster has seen dramatic increases in ridership since it began carrying passengers between Boston and Maine in 2001. Credit: Northern New England Passenger Rail Authority

about 2,400 new jobs, save $21 million in transportation costs, and generate approximately $16 million a year in additional tax revenue for Maine.[43]

The train line has also relieved pressure on crowded local highways. A study by the University of New Hampshire (UNH) found that the Downeaster has already reduced global warming emissions and gas expenditures from reduced car travel between UNH and Boston.[44]

The Downeaster's success—as well as the pressing need for new transportation options in the region—has led New England's governors to propose a variety of rail projects designed to knit the region's cities together and provide quicker access to the metropolitan hubs of Boston and New York.

Cities such as Fall River, New Bedford and Springfield, Massachusetts, and Manchester, New Hampshire, were once industrial powerhouses—their great brick mill buildings producing textiles and other products to supply the nation. For the last half century, however, many of these old mill cities have fallen on hard times. While some, such as Lowell and Providence, have rebounded, with the restoration of many former mill buildings, others have continued to struggle. Improving transportation connections—including restoring passenger rail service—is one of many ways local officials are hoping to bring new vitality to New England's mid-sized cities.

Fall River and New Bedford, Massachusetts

The cities of Fall River and New Bedford, on Massachusetts' "South Coast," are a little more than an hour away from Boston, but have no direct rail connection to the city. Massachusetts is working to extend commuter rail service to the region and has applied for ARRA funds for an express passenger rail service between New Bedford and Boston. The South Coast line would operate partly over the route that Acela takes between Boston and New York, and would be fully electrified, reaching speeds between 100 and 130 miles per hour. It would bring commuters between the largest cities on the line and Boston, stopping only in New Bedford, Fall River, and Taunton before reaching Boston's Back Bay and South stations in 50 minutes, over 30 percent faster than the commuter rail service and generally faster than driving.[45] Speeding travel along the new line would provide a convenient alternative to travel along several congested highways, and also provide for a rail connection with ferries to Martha's Vineyard, allowing tourists visiting the island to leave their cars at home.

Concord and Manchester, New Hampshire

In recent decades, the towns of southern New Hampshire have increasingly become bedroom communities for greater Boston. A 2006 report found that 13 percent of commuters in the entire state of New Hampshire work in Massachusetts, with the vast majority of those commuters traveling alone.[46] That influx of commuters has created real problems—particularly growing congestion on the region's highways. That has led state officials to take another look at expanded rail service.

Today, only a small corner of the state is served by rail, where the Downeaster passes through New Hampshire on its way to Maine. But a 2007 poll found that 87 percent of New Hampshire residents support the extension of passenger rail in the state.[47] New Hampshire is exploring the extension of rail service north from Lowell, Massachusetts, (the terminus of a Boston-area commuter rail line) to Nashua, Manchester and the state capital of Concord. New Hampshire opted not to apply for ARRA funding for the project, as a result of a dispute with the freight railroad that owns the tracks. But restoration of rail service in the area could be part of creating a longer, high-speed route that connects Boston and Montreal.[48]

The proposed New Hampshire service is projected to attract more than one million riders in its first year, cutting down on traffic in the congested corridor and reducing air pollution. The connection to Manchester Airport would create new options for travelers from eastern Massachusetts as well.[49]

Eventually, this service could be continued to White River Junction, Montpelier and Burlington, Vermont, on a high-speed route to Montreal.[50] High-speed rail could connect Boston and Montreal in as little as four hours, making the two cities as close as Boston and New York are today and providing an important link to the economic, educational and recreational resources of northern New England.[51] Track repairs that Vermont is making to its current passenger rail line will also help pave the way for this high-speed rail line.[52]

Portland and Brunswick, Maine

The Downeaster line between Boston and Portland, Maine, has been one of the most successful rail lines in the country. Now Maine is moving forward on plans to expand and further improve the Downeaster.

The full plan adds two daily round-trips, cuts travel time by an additional 10 minutes, extends the route north to Brunswick, and improves on-time performance. Maine has applied for ARRA funds to achieve these goals, totaling just over $90 million.[53]

Extending and improving the Downeaster would make it a convenient option for even more travelers and commuters, with the proposed improvements projected to increase ridership by 62 percent by the time the project is completed in 2014.[54] The additional two round-trips would take enough cars off the road to reduce traffic on the highways between Portland and Boston by 81,000 vehicle miles traveled a day, with a net reduction in air pollution and global warming emissions.[55]

In Brunswick, the new station located in the center of town is adjacent to new residential and commercial space, will be walkable from Bowdoin College, and will connect to local bus service. There is also the potential to expand train service between Brunswick and Rockland, today a seasonal tourist service, and to connect with ferries that bring visitors and residents to coastal islands.[56]

Revitalizing the "Inland Route"

The coastal rail corridor linking Boston and New York City is among the busiest in the country, carrying Amtrak's Regional and Acela service, as well as frequent commuter rail trains serving eastern Massachusetts, Rhode Island and Connecticut. Congestion along the line reduces the potential for future expansion of service. For example, Shore Line East, the commuter railroad serving eastern Connecticut, ceased service to New London because increased Amtrak service in the area used up the remaining capacity on a series of antiquated moveable bridges that must remain open for parts of the day to accommodate boat traffic.

But there is another way to get from Boston to New York City—along the "Inland Route" from Boston through Worcester, Springfield, Hartford, and New Haven. Currently, only portions of the route are served by infrequent Amtrak service, with new commuter rail service between New Haven and Springfield on the horizon as well. Revitalized rail service along the corridor would better connect cities such as Worcester, Springfield and Hartford to Boston and New York, while providing an alternative to travel along the congested coastal corridor.

Connecticut and Massachusetts have applied for funding to start improving the tracks and stations on this route, the first step in upgrading the route for high-speed trains. Ultimately, the states hope to achieve rail service along the corridor

that is comparable in speed to that on the Northeast Corridor—a step that would add new flexibility to the northeast's rail network. Improvements along the line would also help other trains run faster, including the passenger rail line from New York City to western Massachusetts and Vermont, and the route from Boston to Albany.[57]

Improving Service in Western Massachusetts and Vermont

Western Massachusetts and Vermont are dotted with vibrant small cities and towns, major colleges and universities, and ski areas and other popular weekend destinations. Projects planned by Vermont, Massachusetts and Connecticut would speed up and expand passenger rail service in western New England, making passenger rail a viable travel option for more New Englanders and strengthening connections to the region's towns and cities.

Today, one train a day slowly makes its way up this corridor from New York City, stopping in Connecticut's major cities, the college-heavy Pioneer Valley of Massachusetts, and the small towns of eastern Vermont before reaching Vermont's largest city, Burlington. Proposals from Vermont, Massachusetts and Connecticut would speed up the Vermonter line and add another line serving the western part of Vermont, providing more frequent and efficient rail connections to more people in western New England.

A big part of speeding the trip between New York City and Vermont involves realigning tracks in Massachusetts to cut a straight line between Springfield and points north, taking 10 miles off the current route. This would reduce the trip time on the Vermonter by 25 minutes, reduce delays, and improve on-time performance from 55 percent today to 90 percent when the realignment is complete. These improvements are estimated to increase ridership by 23 percent, and could be completed by 2012.[58] These better connections would bring more economic activity to Vermont and Massachusetts.

Meanwhile, a new line connecting Burlington with other towns in western Vermont would connect with a line between Albany and Montreal, and the better regional connectivity would help towns and cities both in Vermont and New York. That line will also cost less than other proposed transportation options in that corridor—one project to improve highway travel around Rutland, for example, was estimated to cost $7.6 million per mile, while the improvements necessary to continue train service north and south of Rutland will cost approximately $500,000 per mile, for a total of $75 million.[59]

New York

New York City is the center of the largest metropolitan area in the country, and the epicenter of passenger rail on the East Coast.[60] New York's Penn Station—one of two massive train stations in Manhattan—is not just the nation's busiest rail station, but the busiest transportation terminal of any kind.

The Empire Corridor, traversing upstate and western New York and continuing on to New York City, is a key rail freight link and one of only two passenger rail lines directly connecting the Northeast with the Midwest. Projects proposed for ARRA funding would bring long-overdue improvements to rail service in the Empire Corridor and lay the groundwork for a national high-speed rail network.

Upstate and western New York's largest cities—Buffalo, Rochester, Utica, Syracuse and Albany—are aligned like beads on a string. The "string" was once the Erie Canal; today, it is the New York Thruway. But for more than a century, the rail line connecting these cities, which follows roughly the same route, has been a key part of the

region's transportation network.

A regular and fast train, with speeds up to 110 mph, already connects Albany with New York City. But passenger rail service west of Albany is infrequent and often slow. New York's proposal to upgrade its passenger rail service would give cities north and west of Albany access to the same reliable and fast trains, and upgrade travel between Albany and New York. The state's goal is to upgrade its passenger rail so that it is the preferred mode of travel between New York's major cities.[61]

New York's proposal for ARRA funding focuses on track and signal improvements that will allow trains to travel faster, more frequently, and more reliably. These improvements include projects such as building a new track between Albany and Buffalo exclusively for passenger rail, buying new trains and fixing older ones to increase frequency of service, and building new maintenance facilities to keep trains and tracks in good repair.[62]

These improvements will increase top train speeds west of Albany to 110 mph, taking nearly 70 minutes off the trip between Buffalo and Albany, and 90 minutes off the trip between Buffalo and New York. Today, low track capacity delays many trains on the corridor. The track and signal upgrades in New York's plan would allow on-time performance to increase from 64 percent to 90 percent. The state also plans to make track improvements to increase speed and reliability between Albany and Montreal, better connecting the towns of the Adirondacks with the rest of the state. New York plans to increase train frequencies so that by 2018, 12 trains a day are making the roundtrip between Buffalo and New York and the cities in between.[63]

These improvements are projected to double ridership on New York's intercity passenger rail lines.[64] In addition to spurring economic activity and taking cars off the road, improvements in the Empire Corridor would contribute to the eventual creation of a vibrant, high-speed rail network with the potential to provide quick and efficient links among many of the largest cities in the United States and Canada—including Chicago, Cleveland, Buffalo, Toronto, Montreal, Boston and New York City.

Pennsylvania

Southeastern Pennsylvania has an extensive rail network. From Philadelphia's 30th Street Station, travelers can take advantage of frequent and fast service to Boston, New York, Atlantic City, Baltimore, Washington, D.C., and Harrisburg, as well as commuter rail trains to many parts of the Philadelphia metro region.

Historically, rail travel was central to the development and economy of other regions of the Keystone State as well. The city of Altoona in southwestern Pennsylvania, for example, owed its existence to the Pennsylvania Railroad, which built the world's largest rail shop in the city and once employed 15,000 workers there.[65]

Passenger trains still travel along the historic train route from Philadelphia to Pittsburgh, which traverses the Allegheny Mountains. But current passenger rail service is infrequent and slow. And no passenger rail connection exists to the cities of Pennsylvania's northeast, including Scranton. People traveling between Pennsylvania's largest cities must rely on the increasingly congested Pennsylvania Turnpike or fly.

Pennsylvania now hopes to provide new passenger rail service to more parts of the state and improving existing service.

New York City to Scranton

The Lackawanna Cutoff was a modern engineering marvel when it opened in the early part of the 20th century. But for the last three decades the line—which connects northern New Jersey with northeastern Pennsylvania—has been dormant.

Now, however, Pennsylvania and New Jersey are collaborating to restore passenger rail service along the line from Scranton, Pennsylvania, to Hoboken, New Jersey, with connections to New York City.

The new line would have stops in Tobyhanna, Mt. Pocono, Analomink, and East Stroudsburg in Pennsylvania, and the Delaware Water Gap, Andover, and Blairstown in New Jersey. From Andover, passengers could transfer to service into New York's Penn Station. The line would be operated by New Jersey Transit, and provide nine roundtrips a day to Hoboken, with 10 a day from Andover, New Jersey, to New York's Penn Station.[66]

The Lackawanna Cutoff would serve several needs. First, it would provide a connection between the Scranton-Wilkes Barre region and the jobs and economic opportunities of metropolitan New York. The restoration of rail service would provide a new transportation option for the stream of long-distance commuters who have increasingly been settling in Pennsylvania's Delaware River Valley. Pike and Monroe counties, which sit along the Delaware River, were two of the three fastest-growing counties in Pennsylvania from 2000 to 2008, due largely to their relative proximity to New York.[67] Rail service could entice many of these commuters out of their cars and off of increasingly congested highways and on to the train (although it is critical that station areas be developed, and local land-use plans be put in place, to ensure that the extension of rail service does not feed additional suburban sprawl).

Well-designed rail service in the corridor could also give workers traveling to downtown Scranton a new alternative to the area's congested highways and, if accompanied by sound planning, could help encourage Scranton's revitalization. Extended rail service could give residents of northeastern Pennsylvania and northwestern New Jersey new transportation options, providing convenient links with rail service in the Northeast and with a variety of airports.[68] Passenger rail service could even provide residents of metropolitan New York with greater access to the recreational opportunities provided by the Delaware Water Gap and the Pocono Mountains.

Pennsylvania has applied for funds for the first two phases of the project, which would build the line as far as Analomink, Pennsylvania. Frequent and reliable service on the newly-restored tracks would have top speeds of 90 mph, and 1.7 million riders are projected for this section of the line in its tenth year of service. Planned stations will be designed to allow passengers to access the trains and their destinations easily, from the downtown business district in East Stroudsburg to the Delaware Water Gap Visitors Center.[69]

The Keystone Corridor: Pittsburgh to Philadelphia

The Keystone Corridor is a prime example of the benefits of investing in rail infrastructure. In 2006, Pennsylvania upgraded rail service between Harrisburg and Philadelphia to reach top speeds of 110 mph, with continuing service to New York. Today, there are 14 weekday round trips between the two cities, with trip times competitive with driving at 1 hour and 35 minutes, and 1.2 million people ride this route every year, three times as many as a decade ago.[70]

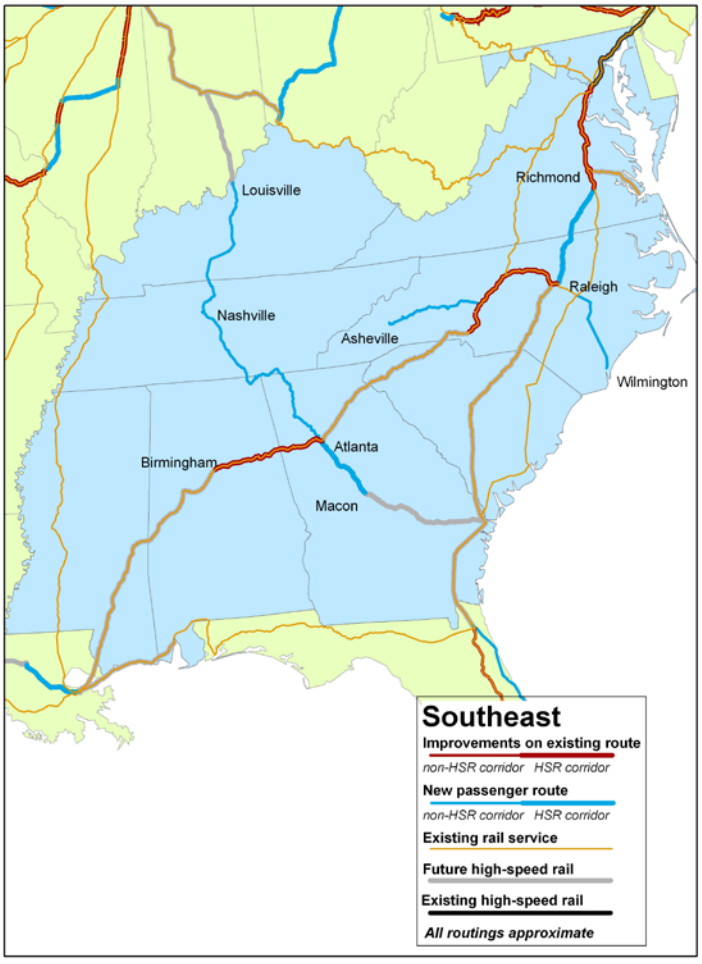
To build on that success, Pennsylvania has applied for ARRA funding to improve service on this line even further, cutting travel time by an additional 15 minutes by increasing top speeds to 125 mph and adding one more roundtrip a day. These improvements are projected to increase ridership by 25 percent in the first year the project is complete, scheduled now for 2018.[71]

In addition, Pennsylvania is seeking funding to plan for improving service on

the line as far west as Pittsburgh.[72] Faster and more frequent service on that route could make travel along the Keystone Corridor a better alternative to the congested Pennsylvania Turnpike, while also breathing new life into economically challenged cities in central and western Pennsylvania.

The proposed service would boost train speeds from the current top speed of 79 mph to 110 mph, and could cut trip times by as much as two hours, making it competitive with car and plane travel times. It would increase train frequencies from one roundtrip to eight a day. It also will likely extend the electric system that powers trains to Harrisburg all the way to Pittsburgh, reducing air pollution and global warming emissions from transportation in Pennsylvania. To make this possible, Pennsylvania is considering adding a track solely for passenger train service, improving the tracks and signals, and buying new trains.[73]

Although ridership numbers have not yet been estimated for the Pittsburgh extension, Pennsylvania expects that, like the current service to Harrisburg, making rail travel an attractive option in western Pennsylvania will attract many riders who otherwise would have driven or flown to their destinations.[74]



The Southeast

The Southeast is among the fastest-growing regions of the country. The Raleigh-Cary metropolitan area in North Carolina was the fastest-growing metropolitan area in the United States between 2007 and 2008, and more than a quarter of the 100 fastest-growing metro areas in the nation are in the southeastern states (excluding Florida). Over the last few decades, Raleigh, Charlotte, Birmingham and other southeastern cities have emerged as nationally important centers of business, technology and education. By 2050, the population of the Southeast is expected to grow another 70 percent.[75]

The region's transportation network is already straining to meet the increased demand. Traffic congestion throughout the Southeast has increased in recent years, despite the construction of new highways. Rail service in the region is minimal—only one train a day passes through Atlanta and the region's other largest centers of population, with most connecting stops in other Southern cities scheduled for the middle of the night.[76]

In recent years, however, some southern leaders have come to recognize that

passenger rail can alleviate congestion on highways and at airports and facilitate the region's future growth. North Carolina provides state support for two Amtrak trains: the Piedmont (which connects Charlotte and Raleigh) and the Carolinian (which connects Charlotte and Raleigh to the Northeast Corridor). Together, the two lines carry more than 330,000 riders per year, with ridership on the North Carolina-only Piedmont line increasing by 35 percent between fiscal year 2007 and fiscal year 2009.[77]

Virginia, North Carolina, South Carolina and Georgia are now developing plans for a southeast high-speed rail network. The first steps toward achieving that vision are improving existing rail service and extending passenger rail service to parts of the region that are currently without it.

Extending the Northeast Corridor South

In the 1990s, Amtrak and the northeastern states moved to create high-speed rail service in that region by improving existing rail service. That investment has paid off. Since the introduction of Acela Express service in 2000, ridership has boomed, with nearly 10 million riders now traveling on trains in the Northeast Corridor.[78]

Like the Northeast in the 1990s, the Southeast has existing intercity train service that fails to meet its full potential. Currently, Amtrak operates intercity service on three corridors that serve Washington, D.C. However, the Acela Express does not continue beyond Washington, and frequent Northeast Regional service continues only as far south as Virginia Beach and Lynchburg, Virginia.

Extending frequent and fast service further south would create near-high-speed rail service reaching as far south as Atlanta and Jacksonville, providing new transportation options to residents throughout the South Atlantic states and critical connections to the Mid-Atlantic region and Northeast.

Ridership on the North Carolina-only Piedmont line increased by 35 percent between fiscal year 2007 and fiscal year 2009.

Virginia

The first step in extending fast and frequent rail into the Southeast is improving rail service between Richmond, Virginia, and Washington, D.C. Today, commuters and other travelers from Richmond add to the congestion on the highways leading into D.C.

Currently, six trains a day travel between Richmond and D.C., with most continuing on to other northeastern cities. However, most trains each day stop at a suburban station just outside Richmond, with only two reaching the downtown station, making train travel less convenient for many travelers. The trains are capable of traveling up to 110 mph, but in Virginia must slow down to average speeds of 45 mph due to rail congestion and limited capacity.[79]

Virginia's goal is to extend current Northeast express service to downtown Richmond, with 10 round-trips a day to Washington, D.C., at top speeds of 90 mph by 2017, cutting travel time by 45 minutes. This $1.8 billion project includes adding third and fourth tracks to increase capacity on the line, as well as building bridges over roads and straightening curves to allow travel at high speeds all the way to Petersburg, south of Richmond. By 2030, the next phase of the project would increase top speeds to 110 mph.[80]

The increased frequencies, shorter travel times, and reduced delays are projected

to increase ridership more than three-fold from today during the first decade of service, with more than 1.6 million riders in the first year of 90 mph service and over 2.5 million riders by year 10. The traffic this would divert from highways would reduce congestion costs for travelers by at least $99.8 million and save 467 million gallons of fuel over the next 30 years (enough to fuel 800,000 of today's cars for a year) while generating $2.9 billion in public benefits.[81]

North Carolina

North Carolina is one of the fastest-growing states in the country, and by 2030 is projected to have the seventh highest population of any state.[82] North Carolina does not have one dominant city, but rather several areas of commerce, education and culture, including metropolitan Charlotte, the Triangle (Raleigh, Durham and Chapel Hill), and the Triad (Greensboro, Winston-Salem and High Point), as well as smaller cities such as Asheville and Wilmington. The state's economy—and its reputation as a national center of technological innovation—depend on convenient connections linking the state's major centers of employment and population.

As far back as the 1990s, when congestion first began to emerge as a significant regional problem, North Carolina got a jump start on developing passenger rail with its popular Piedmont and Carolinian lines, which provide two daily roundtrips between Charlotte and Raleigh. Ridership on North Carolina's rail lines has grown by over 50 percent since this service started, and these lines had record ridership in 2008.[83]

North Carolina has extensive plans for new and expanded passenger rail lines throughout the state, but developing a high-speed rail line between the state's major population centers is a central piece. The planned line would extend the Northeast Corridor south from Richmond through Raleigh, Durham, the Triad and Charlotte. The North Carolina metropolitan areas it will serve are home to 60 percent of the state's population today, and the location of 60 percent of the state's projected population growth.[84]

By 2017, North Carolina plans to add eight daily roundtrips between the state's major cities, with four continuing on to Washington, D.C. These frequencies would be added incrementally, beginning with the in-state round-trips.[85]

While in-state service is being improved, North Carolina intends to buy a rail right-of-way between Raleigh and Petersburg, Virginia, previously a major passenger rail route, and refurbish it for high-speed use. Because the line does not have daily traffic, the state could rebuild it to high-speed standards at low expense, and intends to build bridges and underpasses so that it would not intersect with any roads, a prerequisite for true high-speed rail. North Carolina has applied for ARRA funding for engineering work on the line, which would cut 31 miles off the trip and would allow for faster connections to the Northeast Corridor.[86] When the full line is complete, it would operate at speeds of up to 110 mph for most of the route, reducing travel time between Charlotte and Richmond to 4 hours and 25 minutes, faster than car travel.[87]

On the other end of the line, a new multi-modal station in downtown Charlotte will pave the way for further passenger rail expansion. The new station would also bring passengers directly into the city center, replacing the current station which is in an industrial zone far from population centers, allowing the city to take full advantage of new development potential from the rail lines.[88]

This improved service is expected to attract a steady increase in ridership, almost doubling by the time a fifth train is introduced. When the near-high-speed service to Washington, D.C., is introduced, it

is expected to add a million riders to the train line in its first year, bringing total ridership to more than 1.6 million. In this first year, this high ridership is projected to divert 690,000 car trips on the highways between Charlotte and Washington, D.C., or 2 percent of all intercity car trips, and 255,000 air trips, or 4 percent of total intercity air trips in this corridor.

In the future, high-speed rail could continue through North Carolina on two corridors, with one extending to Atlanta, and a separate route splitting at Raleigh to continue south to Jacksonville, Florida. This would allow continuous, fast rail travel all the way from Atlanta and Florida to Boston, linking the major cities of the East Coast—both north and south.

To make passenger rail service available to even more riders, North Carolina has applied for funds to plan several new passenger lines into other regions of the state. These would not be high-speed lines, but they would link residents of western and southeastern North Carolina to the high-speed system serving the rest of the state. The proposed Asheville line would have a string of stops in smaller western North Carolina cities before reaching the Salisbury stop on the main line to D.C. The southeastern line would have two branches extending from Raleigh, one reaching Pembroke by way of Selma and Fayetteville along a corridor already in use for long-distance Amtrak service, and the other breaking off at Selma to continue to Goldsboro and Wilmington on the coast. These lines would give outlying parts of the state better connections with Raleigh, and also give visitors to North Carolina's beautiful mountains and stunning coastline new options for car-free travel.[89]

Atlanta as a Passenger Rail Hub

Atlanta first sprang up around a rail intersection, with businesses developing outward from Union Depot as increased rail traffic moved a growing volume of people and goods through the city center. Within 50 years of the city's founding, 10 major railway lines passed through Atlanta.[90] Its status as a railroad hub enabled Atlanta to quickly surpass older cities such as Charleston and New Orleans.

Atlanta's rail lines withered as the country staked its future on the car as the transportation mode of the 20th century. However, Georgians are eager for passenger trains once again. A comprehensive study found that a passenger rail network in Georgia would attract 7 to 10 million riders a year if service were frequent, reliable and reasonably priced.[91] Atlanta's history also positions it as an ideal hub for the new interstate and inter-regional high-speed rail networks that have the potential to become the transportation mode of the 21st century.

Atlanta has a central place in a future high-speed rail network for the Southeast. Georgia has sought funding to explore high-speed rail service extending from Atlanta in several directions—south to Macon and Jacksonville, Florida; west to Birmingham, Alabama; and north to Louisville, Kentucky, via Chattanooga and Nashville, Tennessee. Atlanta would also be connected to Charlotte and linked to the high-speed rail network traveling up the East Coast. In addition to linking Atlanta with other southeastern cities, the envisioned rail network would provide high-speed connections serving most of the state of Georgia.

The first spoke, reaching toward Florida by way of Savannah, is also in the path of a much-anticipated commuter rail line between Atlanta and Macon. There is currently no rail service between these cities, although many commuters clog the highways between them during rush hour every day. Travel along this corridor is projected to double by 2020.[92]

Georgia has applied for ARRA funds to begin its high-speed rail network with this

line. The first steps toward high-speed service between Atlanta and Macon include increasing rail speeds to 79 mph and providing three daily roundtrips by 2015, while helping to start commuter rail service between the cities. Eventually, speeds would be increased to 110 mph, consistent with the rest of the Southeast, with six daily round-trips by 2020.[93] Georgia has also applied for funding to study options for continuing the service to Savannah and Jacksonville.[94]

Continuing this line beyond Atlanta to the north would create a second "spoke" of the Atlanta-centered network reaching Charlotte. A comprehensive study conducted by the Departments of Transportation in Georgia, North Carolina and South Carolina recommended six daily round trips between Charlotte, Atlanta and Macon, with 11 additional stops and top speeds of 125 or 150 mph.[95]

The third spoke, connecting Atlanta with Birmingham, Alabama, could eventually connect with high-speed rail service along the Gulf Coast in a network extending all the way to Texas. Although Birmingham and Atlanta are two of the largest cities in the Southeast, today only one train a day travels between them, with speeds limited to 50 mph. A high-speed link, however, would allow fast and convenient travel from Atlanta to cities such as New Orleans, Houston and Mobile.[96]

Georgia and Alabama have applied for ARRA funding to plan a high-speed link between them, evaluating the options for increasing speeds on this route with the eventual goal of 200 mph service. Improved service could begin as early as 2019 if studies are begun soon.[97]

The fourth spoke would travel north to Louisville, stopping in Chattanooga and Nashville on the way. While not a federal high-speed rail corridor, this line could eventually create a key connection between the rail networks of the Southeast and Midwest. Georgia, Tennessee and Kentucky have applied for funding to plan a high-speed rail corridor between the cities, identifying a specific route as well as the costs and benefits of different initial speeds, with the eventual goal of 200 mph service.[98]

Florida

Florida has gained an international reputation as a showcase for the marvels of modern innovation. Millions of tourists every year come from all over to visit larger-than-life attractions at theme parks like Disney's Magic Kingdom and Epcot Center, and NASA's launch center on Cape Canaveral sent the first humans to the moon.

Florida is currently in the running to boast the first truly high-speed rail system in the United States. This line would provide easy travel options for tourists between the state's main destinations, while also helping to cut down on traffic and provide alternatives to travel on the state's congested highways and through increasingly jammed airports.

The need for new transportation options in Florida has been evident for decades. As early as 1984, the state created a commission to move high-speed rail forward in the state. In 2000, Florida voters approved a constitutional amendment requiring that the state build a high-speed rail system. Four years later, then-Governor Jeb Bush led a successful drive to repeal the constitutional mandate, but legislation enabling the creation of the system remained on the books.[99]

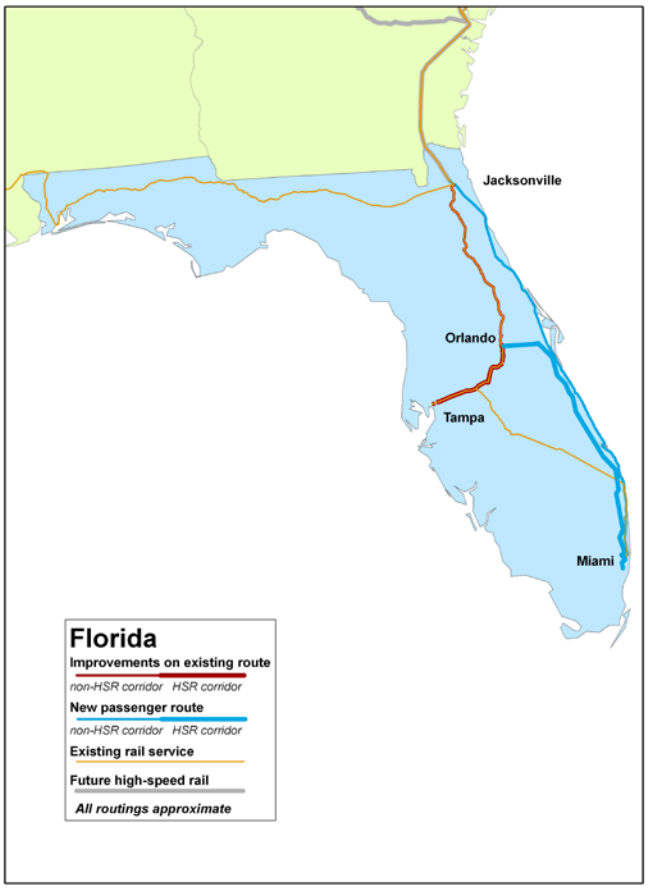
After a quarter-century of false starts, however, Florida hopes that the availability of funding under the ARRA will provide the jump start needed to get high-speed rail off the ground. The first leg of the network will be shovel-ready in October 2010, and Florida hopes that ARRA fund-

ing will enable it to start high-speed service on an Orlando-Tampa route by 2015 and an Orlando-Miami route by 2018.[100]

The Florida High-Speed Rail System would initially consist of lines linking Tampa, Orlando and Miami. The plan for the system envisions 16-20 daily roundtrips between the cities, with 8 additional trips between Orlando International Airport and the nearby Orange County Convention Center and Walt Disney World. Trip times would be under an hour between Tampa and Orlando (a third less time than driving), and just over two hours between Orlando and Miami (half the time of driving). At those speeds, the rail system would be competitive with air travel between the cities. The system would have additional stops in Polk County, Fort Pierce, West Palm Beach, and Fort Lauderdale, with potential stops in Melbourne/Palm Bay and Cape Canaveral/Cocoa Beach.[101]

The trains would be completely electric and would travel on dedicated corridors, some of which have already been preserved for this purpose in highway median strips. Between Orlando and Tampa, the train would travel most of the way on the median of I-4 at top speeds of 168 mph and average speeds of 100 mph. As trains continued to Miami, the route would take them along either the Florida Turnpike or I-95, and top speeds would increase to 186 mph, with average speeds of 113 mph. Because the train would travel on new tracks with no other traffic for almost its entire length, on-time performance is expected to be very high.[102]

The major stations on the line would be well-connected with other modes of transit. The rail system would connect to numerous airports and cruise ship terminals along the coast. Miami's existing Metrorail is being extended to connect with the Miami Intermodal Center under construction at the airport, which will give Miami residents direct access to the high-speed rail service, and allow visitors to continue their



journey by plane, commuter rail, light rail, bus or rental car. The new Tampa Intermodal Center would be built to connect the rail terminal with commuter and light rail planned for the area, and would be bikeable and walkable from nearby residential developments planned for the downtown. The rail line would also connect with Orlando's planned "SunRail" commuter rail at the airport, and with Tri-Rail in Fort Lauderdale and West Palm Beach.[103]

The Florida High-Speed Rail System would be in demand from many different types of riders. In addition to the millions of tourists seeking to travel between Florida's theme parks, beaches, and other attractions—many of whom are used to riding high-speed rail lines in their home countries—Floridians need more travel options between the state's most populous

areas. While Florida's population is growing, highways between the state's major cities are nearly at capacity and are increasingly congested during rush hours. Tampa and Orlando, only 85 miles apart, are growing towards each other and are increasingly part of the same metropolitan area.[104] High-speed rail would also provide another travel option for the state's many elderly residents.

The many sources of demand for high-speed rail in Florida have led analysts to conclude that ridership on the system would be very high. Ridership on the Orlando-Tampa line is projected at 2.7 million passengers in the first year of service, rising to 3.6 million in the tenth year. On the Orlando-Miami segment, 6.7 million passengers are projected for the first year and 11.8 million in the tenth.[105] Those nearly 12 million trips per year would be similar to the number of trips taken on Amtrak's Northeast Corridor trains today.

Most of these trips would replace car travel along the state's busiest highways—decreasing congestion and reducing air pollution. Florida estimates that the high-speed rail system would save the state more than 8.5 million gallons of fuel and reduce carbon dioxide emissions by over 75,000 metric tons, the equivalent of taking almost 13,800 cars off the road.[106]

The oil savings and emission reductions would be even greater if the state uses electric power over the entire rail network. The state's own studies showed that electric rail would use less than half the energy of high-speed diesel trains.[107]

In addition to the proposed high-speed rail line, Florida has applied for funds to restore passenger rail service at top speeds of 90 mph along the state's East Coast route between Miami and Jacksonville, and to improve passenger rail service between Orlando and Jacksonville. The East Coast route saw its last passenger service in 1968 and runs along the densely populated coast through such destinations as St. Augustine and Daytona Beach, where it could provide convenient service for residents of the area as well as tourists.[108] Florida has also applied for funding to help build Orlando's commuter rail service and the Miami Intermodal Center.[109]

The Gulf Coast

The Gulf Coast is still recovering in many ways from the devastating hurricanes of 2005. Hurricanes Katrina and Rita caused tremendous loss of life and property in the region, but they also gave the region an opportunity to envision a new future. A modern passenger rail system that connects Gulf Coast communities with each other and with the rest of the nation is increasingly being seen as part of that future.

Restoring the minimal passenger service that existed before Hurricane Katrina from New Orleans east to the Florida Panhandle is a critical first step in the process. But Louisiana, Mississippi and Alabama are hoping to go beyond returning service to pre-Katrina levels. The Southern High-Speed Rail Commission (SHSRC), formed by the states to plan the network, has developed a route that would connect the region's cities with each other and with other large cities nearby. Three modern train lines would branch out from New Orleans, one traveling to Houston by way of Baton Rouge, one to Atlanta by way of Meridian, Mississippi, and Birmingham, Alabama, and the last to Mobile (and ultimately the Florida Panhandle) by way of Biloxi.

The states plan to establish high-speed rail incrementally, beginning with more frequent and faster passenger rail between the cities. The SHSRC has already completed studies of the routes between New Orleans and Meridian, Mobile and Lake Charles (on the way to Houston), identifying

projects that could increase capacity and speed between the cities.

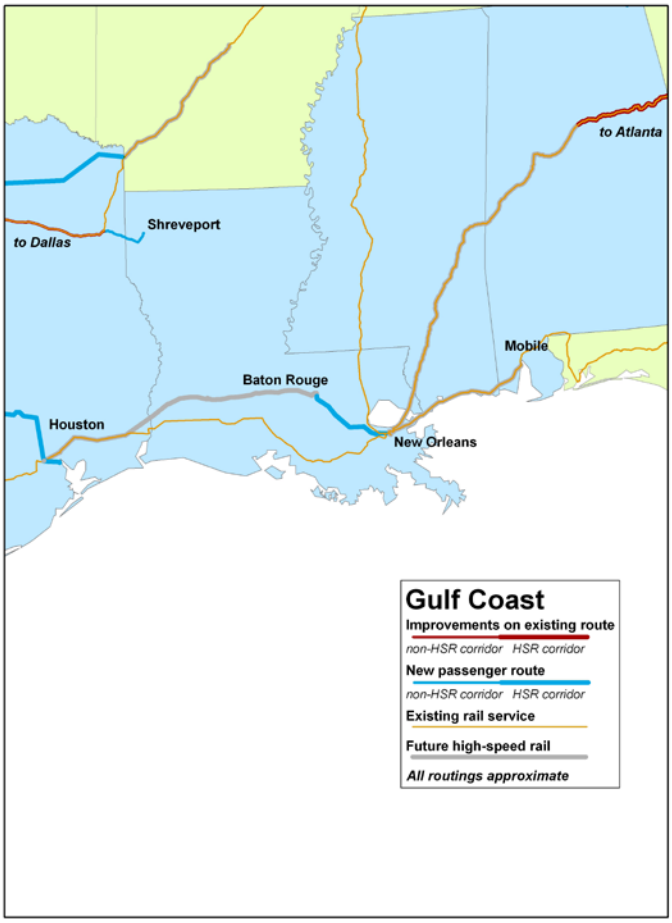
The first new passenger rail service to be implemented in the region would likely be the route between New Orleans and Baton Rouge. This route is important not only for visitors, but also as an important commuter corridor between the state's largest city and its capital. The two cities are only 80 miles apart, and after Hurricane Katrina many New Orleans residents were displaced to Baton Rouge or places between the two cities. Those who still have jobs in the city have been adding to congestion on the highway between the two cities.[110]

An efficient rail link between the two cities would provide four round-trips a day, with buses connecting at either end to business and residential districts. Trains would go at speeds up to 79 mph.[111] Long-term plans raise commuter service to six roundtrips a day at top speeds of 90 mph.[112] While Louisiana filed a pre-application for ARRA funds to build the New Orleans-Baton Rouge link, Gov. Bobby Jindal opted not to submit a final application for the project due to concerns about long-term operating costs.[113]

Ultimately, efficient trains could not only link the communities of the Gulf Coast with one another, but could also connect the region to other centers of economic activity. A Gulf Coast network with a New Orleans hub could provide convenient connections with Houston, Atlanta and other cities in Texas, Florida and the Southeast as a whole. A 2007 study identified track improvements that would allow travel times of five hours between New Orleans and Houston, and under eight hours between New Orleans and Atlanta, faster than driving. The study projected that six daily roundtrips at top speeds of 90 mph on these routes would attract nearly 1.7 million passengers in the first year of service.[114]

A well-planned high-speed rail system could also help residents of the Gulf Coast connect with other destinations across the nation and around the world. Linking the high-speed line to New Orleans' Louis Armstrong International Airport would enable residents throughout the Gulf Coast to have easier access to the region's most important airport.

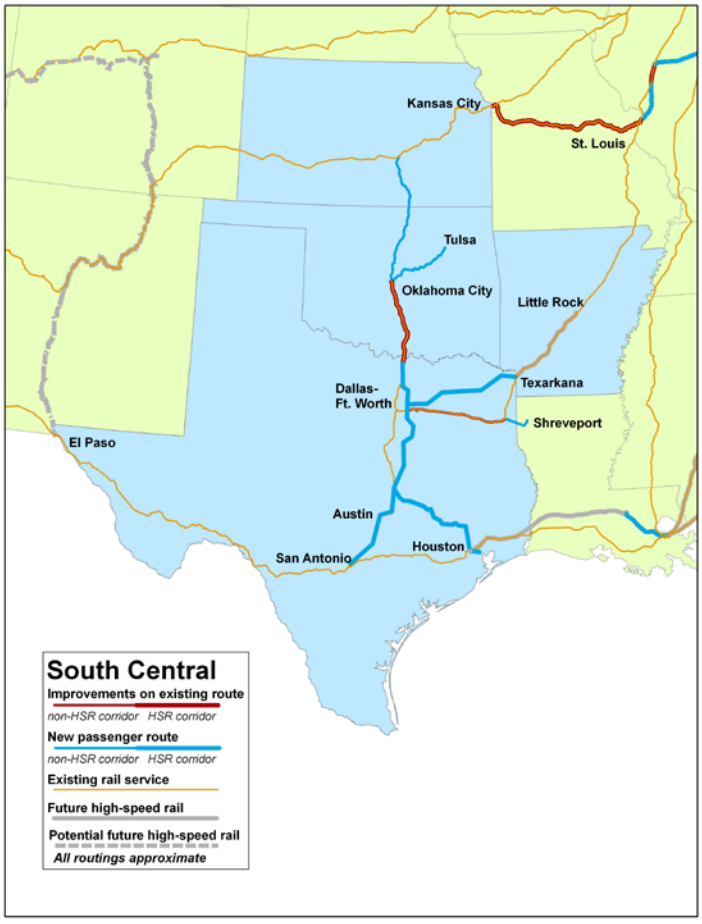
Increasing train speeds and service frequency on these lines will require significant work on tracks, signals and stations. These lines are used heavily by freight, and for the most part have only one track, so adding passenger trains will require building new tracks for long lengths to allow trains to pass each other. Initiating 90 mph service with six daily roundtrips on all of these lines would cost



a total of about $3 billion.[115] Such an investment would, however, provide new transportation options for residents and businesses in the region as well as providing a resource for the many tourists who visit New Orleans and the casinos and beaches of the Gulf Coast.

South Central

Texas just keeps getting bigger. The Lone Star State, already the second-most populous in the country, is also one of the fastest-growing—particularly in its major metropolitan areas. The Dallas-Fort Worth, Houston and Austin metropolitan areas ranked first, second and eighth in the United States for the number of new residents added between 2007 and 2008. Those three areas plus San Antonio added more than 380,000 new residents in a single year—an amount equal to more than two-thirds the total population of Wyoming.[116]



To accommodate these new arrivals, the state has engaged in a Texas-sized transportation building spree. Between 1997 and 2007, Texas added more than 1,000 lane-miles of expressways—the equivalent of building a new four-lane highway from Dallas to San Antonio.[117] At the same time, $2.6 billion was invested in a new terminal and other improvements at Dallas-Ft. Worth International Airport, a brand-new airport was built in Austin, and a $1.2 billion expansion drive was launched at Houston's George Bush Intercontinental Airport.[118]

Still, despite these massive investments, travel between Texas' main cities remains difficult. The Dallas-Fort Worth and Houston areas suffer from some of the worst traffic congestion in the nation—and cities such as San Antonio and Austin aren't too far behind. The state also needs effective transportation links with nearby destinations such as Oklahoma, Arkansas and the Gulf Coast.

Texas has long talked about building high-speed rail between its largest cities, and a new proposal promises an alternative to crowded roads and airports for Texas's intercity travelers. Oklahoma also has its sights set on faster and more regular rail service to Dallas, as well as a high-speed line between its own two largest cities. Another line may someday connect Dallas with Texarkana and Little Rock in Arkansas.

This network would create an attractive travel alternative for residents of Texas's large cities, helping to ease congestion and support the state's growing economy. And it would help the economies of nearby states as well, by connecting their largest cities to each other and with the regional center of economic activity.

Texas

High-speed rail is not a new idea in the Lone Star State. In 1989, the Legislature established the Texas High-Speed Rail Authority, which concluded that high-speed rail was needed in Texas. The state had even selected a consortium to finance and build the system. However, Southwest Airlines, which dominates the in-state air travel market, filed a series of lawsuits and campaigned hard against the proposal, ultimately leading to the project's demise.[119]

Now, a new plan for high-speed rail in Texas is moving once again. The "Texas T-Bone" network would connect Dallas, Austin and San Antonio in a straight line, extending to the border with Oklahoma, with another line connecting the main line to Houston from Fort Hood, and a branch between Dallas and Texarkana on the Arkansas border. The line to Houston would also stop in College Station, the location of Texas A&M University, and could eventually connect with a Gulf Coast high-speed rail line to New Orleans and other Southern cities.[120]

With a combined population of more than 15 million, the major metropolitan areas to be served by the T-Bone system represent a massive potential market for rail service. Texas has applied for funding to begin planning the T-Bone system. The state envisions a network that could transport Texans between the major cities in a fraction of today's driving time, with fully electric trains traveling on elevated tracks at speeds over 185 mph. Once planning is complete, Texas can apply for funding to construct the network.[121]

The high-speed network would be integrated with other modes of transit, beginning with the state's large airports and increasingly with commuter rail and light rail as those modes are built out in Texas's cities. Dallas-Fort Worth International Airport would serve as a multi-modal transportation hub, allowing travelers arriving in Texas to switch directly to high-speed trains to reach the state's major cities, universities and military bases. An extension to the area's light rail system currently under construction will also connect with the airport by the time the high-speed rail system is built, allowing train passengers arriving from other cities to easily reach their final destinations in the Dallas-Fort Worth area.[122]

The Texas T-Bone high-speed rail system could start construction by 2013; in the meantime, the state has also applied for funding to improve its current passenger rail between Austin and San Antonio, which could be complete by 2011. The project would raise top speeds between the cities to at least 90 mph, and increase today's single roundtrip to three by renovating a parallel route so that a portion of the freight traffic that currently clogs the line could be rerouted. In the future, Texas plans to add stations to this route and possibly extend it to better serve commuters into the cities.[123]

Finally, Texas has applied for funding to study improvements on the Texas Eagle line linking Dallas-Fort Worth with Texarkana, and for a study of whether to bring new service to Shreveport, Louisiana.

Oklahoma

Oklahoma City and Tulsa, Oklahoma's two largest cities, are dual centers of economic activity in the state, and almost 60 percent of the state's population lives in the two metropolitan areas.[124] Today, the cities are directly connected by a highway that follows the route of the historic U.S. Route 66 and a regular bus route, but have no passenger rail connection. Oklahoma plans to build a high-speed rail line between the two cities, to strengthen the economic connections between the cities and to provide an alternative means of travel.

Oklahoma has applied for ARRA funding to begin building a high-speed rail line

between Tulsa and Oklahoma City, which would have six round-trips a day going at top speeds of 150 mph. At either end, the train would connect with the extensive local bus routes in the city centers. Both cities are considering building new transit lines as well, so the line could potentially link with streetcars or other fixed public transit in the downtown areas, and with commuter rail services to surrounding towns.[125] The planned route uses a freight track along the highway between the cities, which would require some realignment to allow travel at high speeds. If funded by 2010, the line could be running by 2017.[126]

The high-speed rail line would connect with rail service in North Texas, potentially creating a seamless high-speed corridor running from Austin to Tulsa. A high-speed rail system between Dallas and Tulsa is projected to attract nearly 690,000 riders by its tenth year of service, when daily roundtrips would be increased to nine. By diverting car trips to the train, the train would save an estimated 1.8 million gallons of fuel in its tenth year, and reduce carbon dioxide emissions by 17,000 tons. Building the system would create more than 2,000 jobs during construction, and more than 680 permanent jobs.[127]

Oklahoma also stands to benefit from a proposal by Kansas and Amtrak to extend the Heartland Flyer line, which currently serves Oklahoma City, northward to Newton, Kansas, where it would connect with Amtrak's Southwest Chief line, running from Chicago to Los Angeles. The state also hopes to eventually extend high-speed service to Kansas City, Missouri, where it would connect with the Midwest Regional Rail System to St. Louis and Chicago.

Arkansas

While Arkansas is not aggressively pursuing passenger rail funding through ARRA, the state is considering expansion of rail service and includes a federally designated high-speed rail corridor that would connect Dallas to Little Rock. This line could potentially be extended to Memphis. Arkansas's legislature approved $100,000 for a feasibility study for this line in its most recent legislative session through a measure championed by the House Majority Leader, so that the state could apply for federal high-speed rail funding in the future.

The initial plan for this line would have top speeds between 80 and 100 mph, allowing travel times competitive with driving, and is estimated to cost only $1.3 million per mile, much less than Interstate highways. The feasibility study will determine the exact route of the line and establish a more specific plan.[128]

The Southwest

Since 1991, when the federal government began designating high-speed rail corridors, the cities of the Southwest have undergone a profound transformation. Population in the region has skyrocketed. Cities such as Denver, Las Vegas, Phoenix, Salt Lake City and Albuquerque are among the fastest-growing in the country. And formerly distinct metropolitan areas—such as those along the Rocky Mountain Front Range between Cheyenne, Wyoming, and Albuquerque—have begun to merge.

The rapid pace of growth has left the southwestern states a few steps behind other regions in planning for high-speed rail and there remains only one federally designated high-speed rail corridor in the region. But the Southwest is already proving that passenger rail can be an effective transportation alternative. Albuquerque and Salt Lake City have both initiated commuter rail service, with Denver soon to follow.

The region still lacks effective intercity rail service, however. While a few passenger rail lines cross the Southwest, they are all long-distance lines aimed at connecting California and Chicago rather than connecting the major cities of the Southwest. None have more than one daily round-trip, and a few major cities such as Phoenix and Las Vegas have no service at all.

New Mexico, Arizona, Nevada and Colorado all submitted pre-applications for ARRA rail funds. Plans for passenger rail lines are already underway in most of these states. Regional planning agencies in Las Vegas, Reno, Phoenix, Salt Lake City and Denver have also formed the Western High-Speed Rail Alliance, which has proposed five routes for the Southwest: Los Angeles to Phoenix, Las Vegas to Phoenix, Las Vegas to Salt Lake City, Salt Lake City to Denver, and Salt Lake City to Reno.[129]

Colorado and New Mexico

Colorado is bisected by two major Interstate highways: I-25, which runs from north to south along the Rocky Mountain "Front Range," and I-70, which runs from east to west and links Denver's airport with the recreational opportunities of the Rocky Mountains. Congestion on both highways can be severe. And with population growth projected to continue to skyrocket along the Front Range, new transportation options are sorely needed.

Colorado is exploring two high-speed rail lines that would serve these important corridors. Eventually, these lines could be the core of a high-speed rail system that would stretch as far north as Cheyenne and as far south as El Paso, Texas.

Rail Service Along Colorado's Front Range

The majority of Coloradans live in the cities and towns stretching north and south along the Front Range. Over the past 30 years, Fort Collins, Boulder, Denver, Colorado Springs and the numerous towns in between have grown and spread into one nearly continuous urban area. The region's transportation system has not kept up with this growth, creating terrible congestion on I-25 and secondary roads, and offering travelers few alternatives. Tens of thousands of residents work in one city and live in another, creating huge daily commute flows.[130]

More than 2 million more residents are projected to move to the Front Range region by 2030, a 61 percent increase.[131] Growth will be especially rapid in the North Front Range region, with population more than doubling. The influx

of residents commuting to new jobs will create congestion along the entire length of I-25, from Fort Collins in the north to Pueblo in the south.[132]

Fast, reliable train service along the I-25 corridor would provide travelers an alternative to driving. Multiple surveys of northern Colorado residents reveal stronger support for improved transit, especially rail, than any other option for improving transportation.[133]

The specific route of a north-south rail line is still in the early discussion stages. A route that serves fewer stations would provide faster service, but could dampen ridership numbers. Trains could serve communities from Cheyenne, Wyoming, to Trinidad, including Fort Collins, Denver, Colorado Springs and Pueblo. The trip from Fort Collins to Denver could take as little as 40 minutes by train, compared to an hour or an hour and a half by car, depending on traffic.[134] Denver to Pueblo by train could take up to an hour and 40 minutes, half as long as driving during peak times.

This route may also serve as the first step in building a regional Southwest high-speed rail network. Colorado, New Mexico and Texas are proposing a north-south high-speed rail corridor that would extend from Denver to El Paso through Albuquerque.[135] Denver and Albuquerque are less than 500 miles apart, and El Paso is a little over 250 miles further, but today there is no passenger rail connection between either pair of cities. Building this line would strengthen regional connections in the Southwest, and bolster business and tourism in the three cities and the areas between them.

Although this route has not been recognized by the federal government as a high-speed rail corridor, the states submitted a pre-application for funding to study and design a high-speed line along this route. The feasibility study would look at speeds from 110 to 200 mph for the train.[136]

Rail Service to the Eastern Rockies

Most weekends, Coloradans and visitors from around the world flock to the Rocky Mountains to enjoy the state's natural beauty and take advantage of its recreational

Table 1. Annual Intercity Trips to Major Colorado Destinations[139]

Destination	Millions of Trips	Corridor
Denver Airport	44.0	I-25 and I-70
Denver	36.6	I-25 and I-70
Blackhawk/Central City	12.0	I-70
Breckenridge	8.2	I-70
Vail	7.9	I-70
Colorado Springs	7.3	I-25
Keystone	5.7	I-70
Copper Mountain	4.7	I-70
Avon	4.6	I-70
Fort Collins	3.6	I-25
Boulder	3.6	I-25
Pueblo	1.8	I-25
Georgetown	1.5	I-70

resources. Often, however, the trip into the Rockies is marred by heavy traffic congestion, particularly at bottlenecks or when severe weather causes accidents. Rail service along I-70, the most heavily traveled of those routes, could provide an alternative to driving and offer both residents and tourists an easier trip.

Fast and frequent passenger rail service into the mountains makes sense. Destinations along I-70 account for a surprisingly large share of intercity travel in Colorado, as shown in Table 1. Scenic and recreational sites in the Rockies draw tourists from across the country, but I-70 is nearing capacity in some locations.[137] This congestion is a problem for Coloradans on weekend excursions and for the state's tourism industry. Two-thirds of the 28 million overnight trips to Colorado in 2007 were made by out-of-state visitors.[138]

There are multiple rail alignments possible along I-70 from Denver to Avon. The most likely routing would use both existing rail right-of-way and new tracks. For example, train service with a maximum speed of 125 miles per hour could make the trip from Denver International Airport to Avon (a likely western terminus of the line) in approximately two and a half hours, the same time as a car if there is no traffic but an hour faster than a vehicle stuck in traffic congestion.[140]

Steep gradients limit train speed, as do curves in the track. These obstacles have not prevented construction and operation of freight lines along the Front Range or through the Rockies because speed matters less when moving goods. However, the speed limitations of existing rail lines, combined with the fact that freight lines are already operating at capacity, mean that high-speed rail cannot use existing freight lines unless freight traffic is rerouted (as is under consideration) and tracks are straightened.[141]

A high-speed rail line from Denver west along I-70 could eventually be extended further west to Salt Lake City, completing one leg of the potential Western high-speed rail system.

No matter how fast trains are able to run, speedy, reliable rail service along the I-25 and I-70 corridors is expected to draw significant numbers of passengers. Trains operating at 125 miles per hour along a mix of new and existing routes would carry an estimated 17 million riders, most of whom would be new transit riders who switch from driving.[142]

Arizona

Phoenix and Tucson, Arizona's two largest cities, grew up separately, but recent population growth and economic development have made the metro areas more interdependent, with connections developing between businesses, universities and residents.

As the cities grow towards each other, transportation between them is increasingly important. The two metropolitan areas and the space between them, also known as the "Sun Corridor," account for 85 percent of all jobs in Arizona and 75 percent of the state's population.[143] Each day, an average of 11,400 vehicles make the two-hour trip between Phoenix and Tucson; by 2050, that number is projected to grow to 37,000.[144] The large projected population growth for the Sun Corridor will further magnify the economic strength of the area and its demands on current transportation infrastructure. However, transportation options are limited—one highway, a few buses and many daily flights connect the cities, but there is no passenger rail line between them.

Arizona has been planning a passenger rail line along the Sun Corridor for over a decade, intending to start by improving a freight line between the cities and eventually upgrade that to high-speed service.[145] In 2008, Arizona received $1 million from the Federal Railway Administration to

begin designing the passenger rail line, which is expected to transport 1.2 million passengers each year, significantly reducing the strain on I-10.[146]

More recently, new plans have emerged to jump-start passenger rail in Arizona. One proposal that gained media attention in 2008 would create a 220 mph electric bullet train between Phoenix and Tucson using solar panels over the tracks for power. An express service could travel from one city to the other in half an hour, while a local train would take an hour.[147]

Phoenix and Tucson are roughly the same distance as several other city pairs nationwide where rail service enjoys strong ridership, including Chicago-Milwaukee and Oakland-Sacramento, suggesting that establishing high-speed service could serve an important need while reducing congestion along the corridor.

Studies by two think tanks in 2009 lend support to another possible Arizona rail line. America 2050's report recommending the top priority locations for high-speed rail lines in the United States ranked Phoenix and Los Angeles as the 15th highest city pair in the country. The Brookings Institution's report on airline traffic also identified this corridor as the third-busiest short-hop air route in the country.[148]

Nevada

Las Vegas is known for its casinos and nightlife, but there is much more to the city, which is home to one of Nevada's largest public universities, a growing arts district, parks, zoos, and other urban amenities.

As the city has grown, travel on its busiest corridors has become frustrating. The drive between Las Vegas and Los Angeles can take hours longer than expected, and air travel to the city has increased 50 percent over the past decade, with Los Angeles the most frequent air connection.[149]

A high-speed connection between Las Vegas and Los Angeles has been much talked about as the city has grown, and the corridor was recently the first in the Southwest to get a federal high-speed rail designation. Two competing proposals exist for providing high-speed rail along the route: a conventional rail line proposed by a private developer, and a super-high-speed magnetic levitation (Maglev) train line.

The Maglev proposal has been under development since the late 1980s, and would link Las Vegas and Anaheim, California. Such a line would easily be the fastest in the United States, with trains traveling at speeds up to 300 mph, and would take only 86 minutes to travel from Las Vegas to Anaheim, usually a four-hour trip.[150] The preliminary cost estimate for the project is roughly $12 billion to $15 billion.[151]

More recently, a private company has proposed a conventional high-speed rail line, dubbed the "DesertXpress," as an alternative to the Maglev project.[152] The DesertXpress would use electric trains going top speeds of 150 mph and could be complete within two or three years.[153] This line, however, would only go as far as Victorville, California, stopping before the Cajon Pass where steep grades would slow trains down.[154] From there, the line could eventually be extended to Los Angeles via a connection with California's proposed high-speed rail system.

The DesertXpress line would cost $4 billion, but the private backers of the line have said that they would not seek ARRA funding (although they may look for federal loan money to help finance the project.)[155] The Maglev project planned to request $1.8 billion to build the first leg from Las Vegas to the state line at Primm.[156] Ultimately, private funding requests in ARRA pre-applications for Nevada totaled over $12.5 billion.[157]

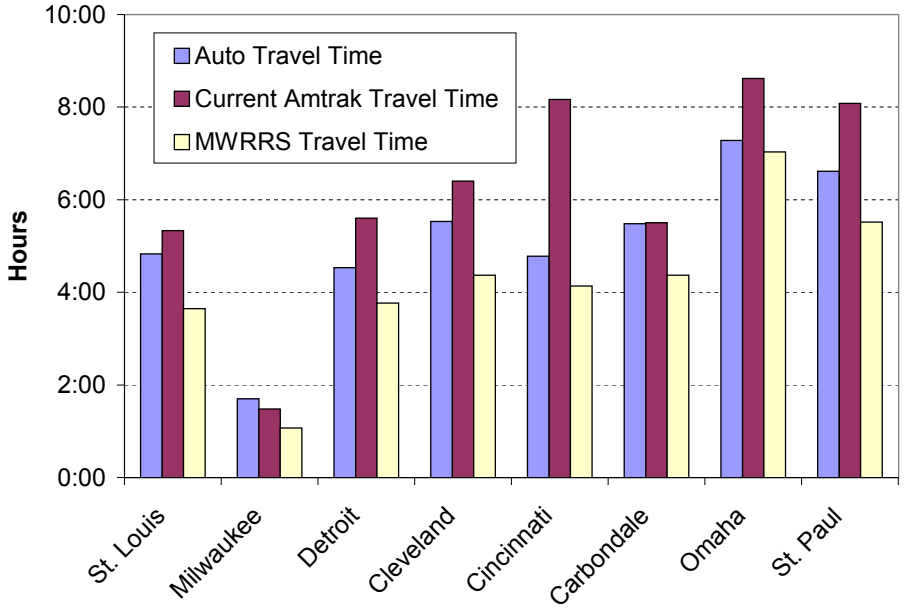
The Midwest

Chicago grew to prominence as an American city in the 19th century for one main reason: it was the hub through which much of America's rail traffic flowed. To this day Chicago has more lines of track radiating from its center than any other city in North America.[158] Many Midwestern towns and cities grew up because of rail lines that brought new immigrants to settle from the East.

Although freight rail is still important in the Midwest, air travel and the Interstate highway system have largely replaced passenger rail. Chicago remains at the forefront of these transportation systems, with O'Hare the second busiest airport in the country and many highways converging on the city.

Now, with severe congestion in major airports and on many highways and the region focused on ways to rebuild its economy, the Midwest is looking toward passenger rail as a solution, with Chicago again taking center stage.

Figure 5. Travel Time from Chicago to Midwestern Cities by Car, Current Amtrak Service, and the Proposed Midwest Regional Rail System (MWRRS)[160]



In 2004, the Midwestern states finalized a plan for a Midwest Regional Rail System (MWRRS) that would serve the region's travel needs in the 21st century. By repairing and upgrading service on current lines, and restoring lines out of use for decades, the system would provide every major city in the Midwest with fast, frequent and reliable passenger rail service on seven major branches joining in the Chicago hub. State requests for funding under ARRA would take the first steps toward building out this system.

The Midwest system would give the region's residents a travel option competitive with cars and planes. Travel times between major cities would be cut by 30 to 50 percent from current rail service, and would be faster than car travel (see Figure 5). Fares and travel times would also be competitive with air travel. The rail system would also reach all of the Midwest's major population centers—90 percent of the population of the Midwest would be within a one-hour drive or bus ride from a train station.[159]

Because of this increased convenience, ridership on the Midwest regional rail network is projected to be 13.6 million passengers a year by 2025—four times what it would be if Amtrak continued its current level of service.[161]

Besides convenience, the system would bring many additional benefits to the Midwest. According to a study conducted for the Illinois Department of Transportation, the project would deliver 1.8 times greater economic benefit than it would cost, generating $23 billion in benefits, including money saved from lowered highway and rail congestion, shorter travel time for riders, lower costs for airlines, and reduced emissions. By 2020, the system would divert about 1.3 million trips from air travel, and 5.1 million trips that would have been taken by car.[162]

In addition to these benefits, building the MWRRS would create tens of thousands of jobs, both directly in the work required to build and operate the system, and indirectly through development around train stations and other economic growth fueled by the system. One study estimated that 152,000 person-years of work would be created during the construction period, and that building the system would leave the Midwest with over 57,000 permanent jobs.[163] The Midwest's manufacturing base, which has been battered by international competition, is perfectly situated to serve the need for high-speed rail equipment, both within the region and nationally.

All the Midwestern states with rail lines in the MWRRS have applied for ARRA funding to move forward on their highest-priority projects. If funded, these projects would bring the Midwest the first major step of the way towards building the full regional system.

Michigan

Improved passenger rail service could provide an important shot in the arm to Michigan's tattered economy by making the state a more attractive place to live and do business and by tapping the state's manufacturing base to supply equipment for high-speed rail.

Michigan has already begun to see the benefits of investment in improved passenger rail service. Improved controls installed along the Detroit-Chicago corridor allowed Amtrak to increase speeds to 90 mph along parts of the line in 2002 and to 95 mph in 2005.[164] Between fiscal year 2004 and fiscal year 2009, ridership on Amtrak's Michigan trains increased by 24 percent, despite the economic downturn.[165]

The planned Midwest rail system would give businesspeople in Detroit and other cities, college students at school in Ann Arbor and Lansing, and residents in many of the state's largest towns and cities a direct

and convenient connection with Chicago and the rest of the Midwest. The full plan for the Michigan line would lower travel time between Detroit and Chicago to 3 hours and 46 minutes—faster than driving or flying—and vastly increase the number of roundtrips and the reliability of all train routes in Michigan.[166]

Michigan has applied for funds to make track improvements that would allow trains between Pontiac, Detroit and Chicago to travel at speeds up to 110 mph, with on-time performance eventually rising to 90 percent from today's 26 percent. This route also serves cities such as Ann Arbor, Dearborn, Battle Creek and Kalamazoo.[167]

New stations are planned for Dearborn, Troy/Birmingham, Ann Arbor and New Buffalo, which will be located within walking distance of downtowns or other important local destinations, and serve tens of thousands of college students. Many stations will connect to local bus systems, and the track improvements on this line will also assist proposed commuter rail lines between Ann Arbor, Detroit and Howell.[168]

The full Midwest regional rail plan for Michigan greatly increases the number of daily roundtrips and speed of the service. Eventually, 14 daily trains will stop in Kalamazoo, with four continuing up to Grand Rapids and Holland, 10 continuing on to Ann Arbor and Detroit, and four more breaking off at Battle Creek to reach Port Huron. Travel time between Detroit and Chicago will be 3 hours and 46 minutes, and about 3 hours between Holland and Chicago.[169]

Ohio

Ohio is currently served by two east-west passenger rail lines—one along the state's northern tier, linking Cleveland and Toledo to Chicago, Buffalo and Pittsburgh—and a second through Cincinnati and southwestern Ohio. However, there is currently no passenger rail line that links Ohio's three biggest cities—Cleveland, Columbus and Cincinnati—and the level of service on existing passenger rail lines fails to take advantage of Ohio's potential as the gateway from the Midwest to the East.

The first step to building the Ohio passenger rail hub is the reconnecting the state's major cities by rail. Ohio's three largest cities—Cincinnati, Columbus and Cleveland—are arrayed diagonally in a line across the state, each under 150 miles apart from the next. Ohio's priority is to connect these cities with each other with a new passenger rail service, the "3C" line, which could begin service as soon as 2012. The line would then connect with the Midwest regional rail system in Cleveland and Cincinnati, and to other planned regional passenger rail networks.[170]

The full plan for Ohio's 3C rail line would have eight daily roundtrips between Cincinnati, Columbus and Cleveland, stopping in cities such as Dayton and Springfield in between. Traveling from one end of the line to the other would take about three and a half hours, faster than car travel, and would be cheaper than flying.[171]

Ohio has applied for ARRA funding to get the train running quickly, with three roundtrips a day going top speeds of 79 mph by 2012. This first stage is projected to attract 473,000 passengers a year, reducing car traffic on Ohio's highways by nearly 320,000 vehicle miles of travel and potentially saving up to 15,000 gallons of fuel a day.[172] Indiana has also applied for funds to begin 110 mph service between Chicago, Toledo and Cleveland, which would provide eight roundtrips a day between Chicago and Toledo and nine to Cleveland.[173]

Ohio is also considering further passenger rail links that would strengthen connections with other cities in the region. From Cleveland, high-speed passenger

trains could reach Pittsburgh in about two hours, and connect from there with improved Keystone Corridor service to Philadelphia and New York. A branch of the Cleveland-Chicago line could reach Detroit in under two and a half hours. The last line from Cleveland would bring passengers to Buffalo in 2 hours, with the possibility of continuing on to Toronto to connect with rail lines in Canada, or to the Empire line across New York State.[174]

This extensive 110 mph network would give Ohioans a quick and convenient way to travel between the cities in the state and neighboring regions. The full system would attract 9.3 million riders by 2025, including passengers traveling from other states and through Ohio. It would also generate an enormous amount of economic activity. Building the main lines of the system, from Cleveland to Cincinnati, Toronto, Detroit, Pittsburgh and Buffalo, would boost the region's economy enough to create 16,700 permanent jobs, generate more than $3 billion of development near stations, and increase annual average household income by $90. It would also save about 9.4 million gallons of fuel a year.[175]

Indiana

Three major branches of the proposed Midwest rail system pass through Indiana on their way to Chicago. The line to Toledo and Cleveland crosses the northern half of the state, the line to Cincinnati crosses the state from northwest to southeast through Lafayette and Indianapolis, and the line to Michigan cuts through the northwest corner along the lake, with a stop in Porter. A designated federal high-speed rail corridor also exists between Indianapolis and Louisville, Kentucky, which could then connect with proposed rail service to Nashville and Atlanta.

Indiana has applied for ARRA funds to build the full 110 mph line to Toledo and Cleveland, using modern "tilting train" technology to keep trips comfortable at the high speeds. This line would also stop at Gary Airport, Michigan City, Plymouth, Warsaw, and Fort Wayne. Today, two daily roundtrips serve this corridor, and only 45 percent of trains arrive on time. Indiana's proposal adds frequencies so that during rush hours, trains run along the line every hour, with four daily express trips and four local trips. Travel from end to end of the route would take 4 hours and 22 minutes on express trains, and local service would be only half an hour longer. Track work to increase capacity and solve other issues would make the train line much more reliable, with 95 percent of trains arriving on time.[176]

The proposed link to Gary-Chicago International Airport would allow for direct, high-speed connections with downtown Chicago, creating another practical alternative for travel to and from the Windy City that avoids the congestion of O'Hare and expands transportation options throughout the region.

Indiana has also applied for funding to make it possible for more trains to travel through the crowded tracks entering Chicago in the northwest corner of the state. This segment of track is the "single most delay-prone intercity passenger rail corridor in the country," according to the Indiana Department of Transportation, due to congestion, with 14 passenger trains already coming through this area daily in addition to a commuter rail line and almost 90 freight trains.[177] The Indiana Gateway project would solve many of today's congestion problems by making changes that allow trains to pass each other more easily, such as adding tracks for passing and improving signals. This would reduce the total amount of time a week that trains are delayed on this route from 2.3 hours to 0.9 hours. The project would also be a step towards upgrading the corridor to meet the needs of the Midwest regional rail system.[178]

Illinois and Missouri

The passenger rail line between Chicago and St. Louis has grown to be one of the most popular lines in the country, more than doubling the annual number of riders as Illinois has sped up service and added daily frequencies over the past five years.[179] Currently, more than 500,000 riders per year take Amtrak's Lincoln service between the two cities.[180] Hundreds of thousands more ride trains on other Amtrak routes within Illinois, connecting Chicago with Galesburg, Quincy, Carbondale, Champaign and other cities and towns.

Illinois has applied for ARRA funding to further improve service on the Chicago-St. Louis corridor and to explore the option of high-speed service at speeds up to 220 mph on this corridor. Missouri has applied for funding to make track improvements on the line continuing from St. Louis to Kansas City. Illinois has also applied for funding to restore a long-anticipated line to Rockford and Dubuque.

Today, five trains a day make the roundtrip between St. Louis and Chicago at top speeds of 79 mph. Track improvements have allowed the trains to become faster and more reliable over the past five years, but still only 73 percent of trains are on time. [181]

Illinois' applications would increase top speeds on the corridor to 110 mph and add three daily roundtrips by adding and fixing tracks that allow trains to pass each other, and fixing other problems. For example, in many places passing tracks are so in need of repair that trains must go extremely slowly, and at least one place on the route cannot be used at all, requiring trains being passed to roll onto the side tracks, wait for the other train to pass, and then back out again before continuing on the main tracks. By solving problems like this and making other upgrades, the projects Illinois has applied for would increase average train speeds from 50 mph to 73 mph, and allow 90 percent of trains to be on time.[182]

The passenger rail line between Chicago and St. Louis has doubled the number of annual riders as Illinois has sped up service and added daily frequencies.

If funded, these projects would allow Illinois to run eight roundtrips a day between Chicago and St. Louis, with express trip times under four hours. Illinois projects that this improved trip time would attract 1.2 million passengers in its first year of service. Construction of express high-speed service between Chicago and St. Louis would likely take longer, but would represent a quantum leap forward in the speed and efficiency of transportation in the region. The proposed line, which Illinois has applied for funding to study, would enable trains to run at speeds up to 220 mph, bringing passengers from Chicago to St. Louis in less than two hours.[183] The express high-speed line, which would be electrified, would run on a different alignment than Amtrak's current service, traveling through Kankakee, Champaign, Decatur and Springfield.[184]

Missouri has applied for funding to pave the way for future 90 or 110 mph service continuing from St. Louis to Kansas City. The projects would reduce delays on this corridor by 48 percent, increasing the number of trains arriving on time from 19 percent to over 80 percent.[185] Missouri is also planning a new Multimodal Station in downtown St. Louis to replace the current aging train station.[186] Under the full Midwest regional rail plan, trains would run six daily roundtrips between the cities, with a travel time of 4 hours 14 minutes end to end.[187] This line could eventually connect all the way down to Oklahoma and Texas through Oklahoma's planned high-speed line.

Illinois and Iowa have also applied for funds to rebuild a former passenger train line from Chicago to Rockford and Dubuque. Rockford is the largest city in Illinois that does not have passenger rail service.[188] The train would also stop in Freeport and Galena, a big tourist destination, and the train station in Dubuque has been built into plans to redevelop the downtown area along the Mississippi.[189] Initial service would provide one daily round trip between the cities, with a total travel time of just over five hours.[190]

Iowa

Today, Iowa's largest cities have no access to passenger rail—only one train passes through Iowa, bypassing all the major population centers on its way to California from Chicago. Iowa's Midwest regional rail line would restore passenger rail service between Chicago, the Quad Cities and Iowa City. Eventually, this line would be extended to Omaha through Des Moines, giving Iowa's largest cities regular and convenient passenger rail connections with each other and to Chicago.

The full Midwest regional rail plan has five daily roundtrips to the Quad Cities and Iowa City from Chicago, and four continuing on to Omaha at top speeds of 79 mph in Iowa and 90 mph for much of the Illinois route. This would take passengers the full route from Omaha to Chicago in seven hours, faster than driving.[191] Iowa and Illinois have applied for funds to establish 79 mph service to Iowa City, on tracks currently used by freight trains, and Iowa has applied for funding to plan the route continuing on to Des Moines and Omaha.[192]

The line would help revitalize downtown areas in the cities it serves. In the Quad Cities, Rock Island County and the city of Moline are planning to build a train station for the line near downtown Moline's local bus station, as part of a development that includes new downtown apartments, retail shops, and bike trails along the Mississippi River.[193] Iowa City is considering remodeling its former passenger rail station for the line.[194]

The fully developed line is expected to attract more than 500,000 passengers a year. This will reduce car travel on highways between Iowa City and Chicago by approximately 345,000 trips, saving 1.5 million gallons of gas and reducing global warming emissions by over 6,000 tons.[195]

In the future, Iowa has plans for a much more extensive passenger rail network, with another east-west line continuing from Dubuque to Iowa Falls and Nebraska, and a north-south line from Kansas City to Minneapolis through Des Moines, Ames and Iowa Falls.[196]

Wisconsin's 110 mph rail line would stop in the newly renovated Milwaukee Intermodal Station, where passengers arriving in Milwaukee can transfer to local transit to reach their final destination. Photo credit: John December

Wisconsin and Minnesota

Wisconsin has already experienced the benefit of modern passenger rail service, with its immensely popular Hiawatha line. The Hiawatha brings commuters and

other passengers from Milwaukee to Chicago in an hour and a half, as fast as driving in good traffic conditions, with seven roundtrips a day—and no need to battle traffic or look for parking in downtown Chicago.[197] Partly in response to service improvements, this line saw a 63 percent increase in ridership from 2004 to 2008, when over 766,000 passengers rode the line.[198]

Wisconsin's Midwest regional rail line would speed this service up to 110 mph, reducing trip time to about an hour, and extend it to Madison, La Crosse and the Twin Cities, with another branch eventually continuing up to Oshkosh and Green Bay. Daily roundtrips would be more than doubled, with 17 trains a day reaching Milwaukee, 10 continuing on to Madison, and six to St. Paul.[199]

Wisconsin's legislature has already allocated funds to buy new trains for the Hiawatha line, two new "tilting train" sets that can travel at high speeds and tilt to allow trains to take corners quickly.[200] Now the state has applied for ARRA funding to extend the line to Madison. This project includes track fixes and other improvements to allow fast and reliable passenger rail service between the cities, and the purchase of two additional train sets as well as eight energy-efficient locomotives.

This extension would connect the state's two largest cities, and extend the benefits of the Hiawatha line to government workers, businesses and tens of thousands of college students in the state's capital. The full 110 mph line between the cities would boost Wisconsin's economy enough to create nearly 13,000 jobs in the state by 2013, and would eliminate approximately 7.8 million car trips on Wisconsin roads over 10 years, saving 27.6 million gallons of gas.[201]

The benefits of the new line to Madison would be amplified by the commitment that city has made to local public transit and transit-oriented development. In Milwaukee, the train would continue to stop in the newly renovated Milwaukee Intermodal Station, where passengers can transfer to local transit to reach their final destinations. A planned downtown streetcar line would also stop in this station.[202]

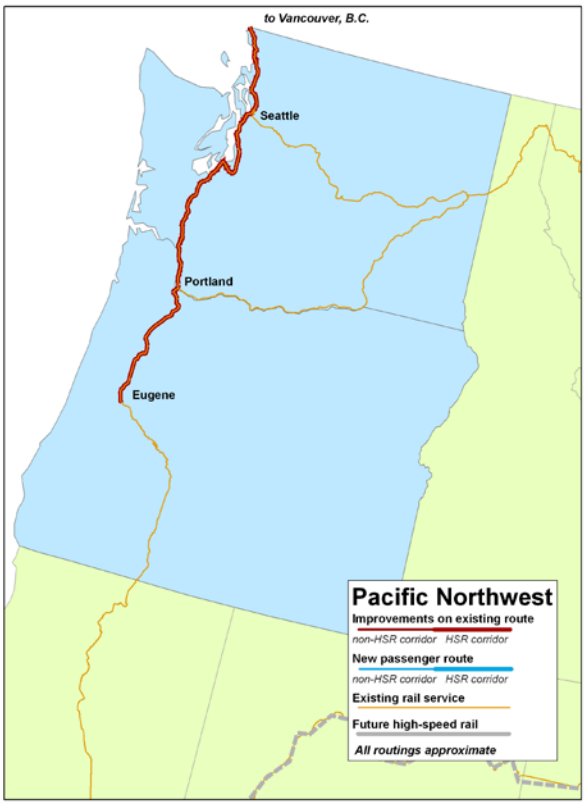
Minnesota has applied for funds to plan the next leg of the route to the Twin Cities, and to construct its own multimodal transit hub at St. Paul Union Depot, which would connect to the planned Central Corridor light rail line between Minneapolis and St. Paul. The state plans to apply for funding to begin engineering and design for this route in the next round of ARRA high-speed rail funding in the spring of 2010. At the same time, Minnesota plans to submit applications for a passenger rail line to St. Cloud, and another to Duluth, which would connect most of the state's largest cities.[203]

The Pacific Northwest

The Pacific Northwest is, in many ways, a perfect candidate for improved passenger rail service. The largest cities in the region—Vancouver, British Columbia; Seattle and Tacoma, Washington; and Portland and Eugene, Oregon—are all situated along the I-5 corridor, with less than 500 miles from end to end. The cities all have vibrant and thriving downtowns, robust public transportation networks, and residents who are eager for new solutions to the region's major transportation challenges—particularly if those solutions are eco-friendly.

Currently, Amtrak serves the Vancouver-Eugene corridor with its Cascades service. Besides serving residents of these large cities, the train also stops in a number of towns along the route, providing regular train service to the 70 percent of Washington residents who live within

Amtrak's Cascades service has experienced an eight-fold increase in ridership over the past 15 years. Credit: Washington State Department of Transportation



15 miles of this corridor, and to the quickly growing towns of the Willamette Valley between Eugene and Portland.[204]

Improvements to the Cascades line over the past 15 years have increased ridership from less than 95,000 in 1993 to more than 770,000 in 2008.[205] Today, the Cascades line goes at top speeds of 79 mph, with four daily roundtrips between Seattle and Portland, and two roundtrips to Eugene and Vancouver.

Oregon and Washington's long-term plan for the line is to raise top speeds on the corridor to 110 mph, reduce delays, and add more roundtrips. By 2030, the states aim to reduce travel time to 2 hours and 30 minutes between Seattle and Portland, 2 hours and 37 minutes between Seattle and Vancouver, and under 2 hours between Portland and Eugene. The states plan to gradually add frequencies until there are 13 daily roundtrips between

Portland and Seattle, four between Seattle and Vancouver, and six between Portland and Eugene.[206]

By making the Cascades service more competitive against car and air travel, the states predict that these improvements will attract nearly 3 million passengers a year on the section between Portland and Vancouver alone. This will relieve traffic on the crowded Interstate 5, and help the region meet its global warming emission targets. Improvements to this section of the route are expected to cost about $6.5 billion.[207]

Washington has applied for ARRA funding for three different groups of projects to improve service between Portland and Seattle. If all are funded, trip times between the cities will be reduced to 3 hours 12 minutes, and four daily roundtrips could be added for a total of eight. The projects, which range from renovating stations to buying new trains to adding tracks, would also improve on-time performance by 23 percent.[208]

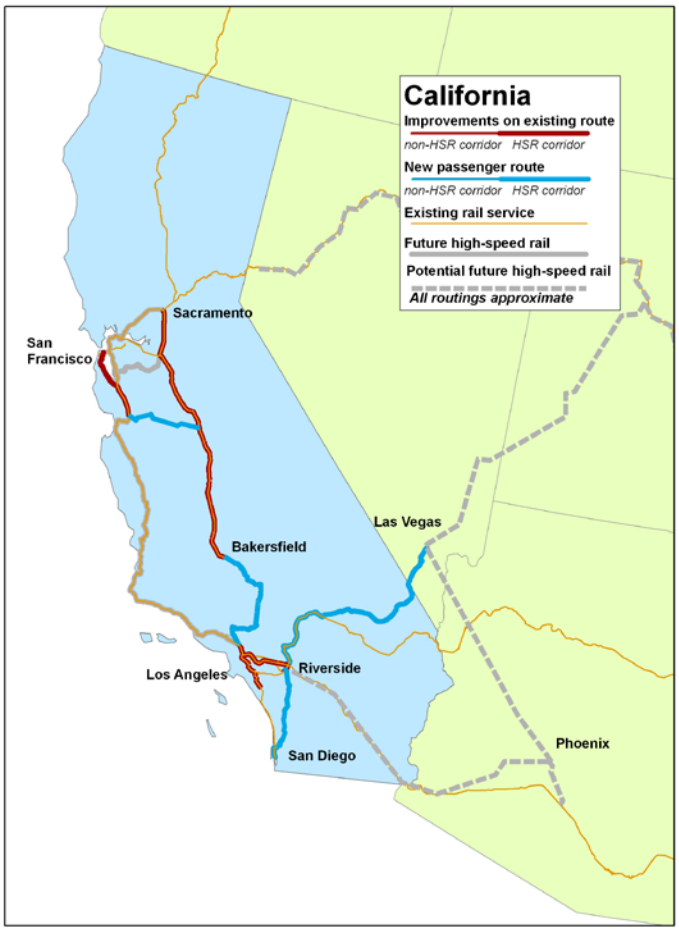
Oregon has applied for the $2.3 billion that will be necessary to increase train speeds between Portland and Eugene to 110 mph, improve on-time performance to 95 percent, and pave the way for additional daily roundtrips to be added in the future. All of these improvements could be achieved by 2017. Oregon is also planning to use some of the funds to look into the possibility of switching to electric power for the route, potentially using solar panels on the state-owned right-of-way to help provide the electricity.[209]

Ridership on the route between Portland and Eugene is expected to triple as a result of these improvements. This would take enough traffic off of Oregon's section of Interstate 5 to save an average of $1 billion a year by reducing fuel use, time wasted in congestion, car accidents, and highway maintenance. It would also reduce the state's carbon dioxide emissions by nearly 70,000 pounds a year.[210]

California

California is notorious for gridlocked highways and smoggy skies. The time and fuel wasted by drivers stuck in traffic in California's five biggest cities cost the state $16.6 billion in 2007, and almost 600 million gallons of gas.[211] A recent study by researchers at California State University in Fullerton found that air pollution above the federal clean air standards costs the most polluted areas of the state almost $28 billion, and causes nearly 4,000 premature deaths each year, with much of the pollution coming from cars.[212]

The main alternative for Californians seeking to travel between the state's largest cities has long been to fly. But congestion at the state's airports is also on the



rise, with average delays at the state's airports increasing steadily over the past five years.[213]

With the state's population continuing to grow, California has looked toward other solutions to its transportation woes. Car-crazy Los Angeles now has the third-highest light rail transit ridership in the nation.[214] And commuter rail plays an increasingly important role in linking residents of the Bay Area and Southern California with their jobs.

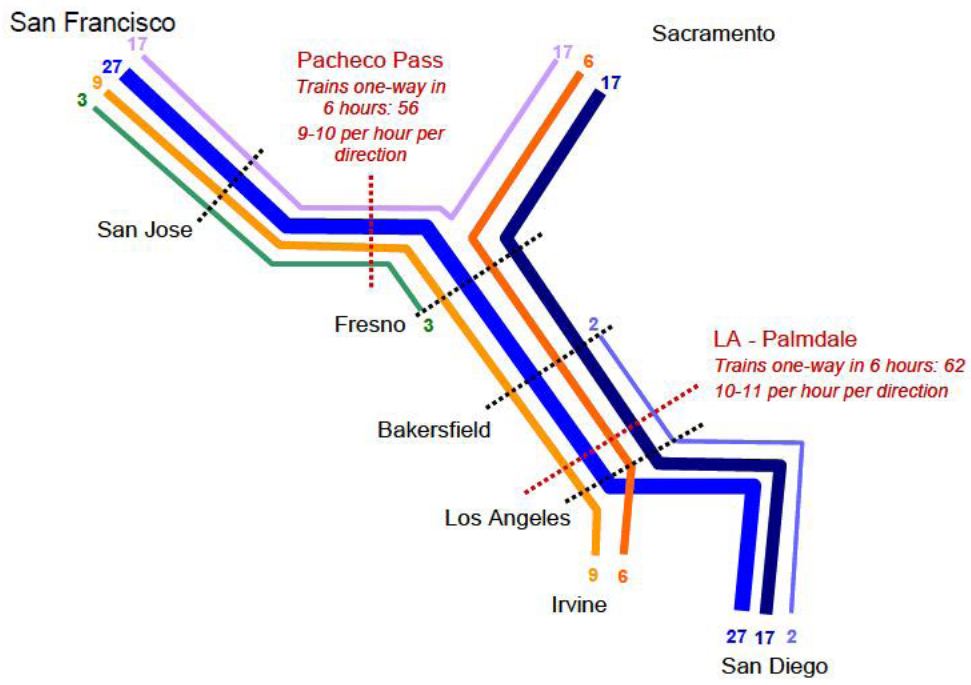
But providing convenient and fast alternatives for intercity trips within California remains a challenge. That is why California is pursuing the construction of a comprehensive and modern high-speed rail system for the nation's most populous state.

California's full plan for high-speed rail will connect most of the state's major cities with electric trains traveling over 200 mph at top speeds, and will be the second-fastest train line in the world when it is built, with average speeds of 170 mph.[215]

The network will include five separate routes, connecting San Francisco, Los Angeles, Sacramento and San Diego, and stopping in smaller cities in between, such as Santa Ana, Modesto and Fresno. In the San Francisco and Los Angeles metropolitan areas, trains will stop more frequently, including at San Francisco International Airport, assisting regional transit as well as intercity transportation.

In contrast with today's single daily roundtrip train between Oakland and Los Angeles, the high-speed rail network will have six trains an hour traveling between a new station in downtown San Francisco and Los Angeles' Union Station during peak hours, and two an hour during off-peak hours, with similar trip frequencies between other cities (see Figure 6). Travel

Figure 6. California High-speed Rail Network, Number of Trains on Each Line During the Six Peak Daily Hours[217]



California's proposed high-speed rail line is projected to carry more than 80 million passengers by 2030, serving stations such as San Francisco's forthcoming Transbay Terminal (photo illustration above). Credit: California High-Speed Rail Authority

between the two cities will take 2 hours and 38 minutes, or under four hours average door-to-door travel time, compared with about four hours by air and over nine hours driving.[216]

Ridership on the California high-speed rail network is projected at between 88 million and 117 million passengers a year by 2030. The network would reduce projected air travel in 2030 by over a third, and intercity car traffic by about 6 percent, eliminating 50 million intercity car trips as well as 25 million local trips in regions with multiple stations.[218]

By 2030, the California High-Speed Rail Authority projects that 45 percent of travel between the San Francisco and Los Angeles metropolitan areas will be by high-speed rail, with only 26 percent by plane and 29 percent by car or light truck.[219] The experience of the Acela line in the Northeast suggests that such a split is achievable.

This reduced air and car travel mean large pollution reductions and oil savings for the state. The California High-Speed Rail Authority estimates that the network will reduce global warming pollution by up to 12 billion pounds of carbon dioxide a year by 2030, the equivalent of taking almost one million cars off the road, and improve air quality in all regions.[220] It would reduce California's oil use by 12.7 million barrels of oil a year. And as the line is increasingly powered by clean electricity, such as wind turbines along the train lines, these benefits will increase.[221]

The high-speed rail network is estimated to cost $45 billion to build. However, construction of high-speed rail would alleviate the need to expand airports and highways to serve the same demand—the estimated cost of which is pegged at $82 billion. Unlike highways, once the system is built it will make money through fares, generating $1 billion a year in profits, rather than costing the state more money for repairs and maintenance.[222]

In 2008, Californians passed a ballot measure to provide $9.95 billion in bond

money to fund the first phase of the network, from Los Angeles to San Francisco.[223] The state has now applied for $4.7 billion in ARRA funding to finish planning studies for all parts of the system, begin engineering for the first phase, and to build the tracks for four sections: between San Francisco and San Jose, Merced and Fresno, Fresno and Bakersfield, and Los Angeles and Anaheim. The state also applied for funding for improvements to the current rail service in the Altamont Pass.[224]

Building the California high-speed rail network will provide Californians with the efficient travel options they need in a global economy. The network will also relieve the state of some of the burden of its current reliance on cars, reducing pollution, traffic congestion, and the pressure to expand highways.

High-Speed Passenger Rail: Going From Vision to Reality

Building a passenger rail network worthy of the 21st century will not be easy, quick or cheap. But there are many reasons—from congestion on highways and airports to the need to wean America off of oil and curb global warming pollution—why bold investment is vital.

At a time of economic challenges and budget shortfalls at all levels of government, it is critical not only that America spend what is necessary on high-speed rail, but that it also gets the greatest possible value for the investment. The following principles should guide America's investment in passenger rail to ensure that the nation gets the rail system we deserve at a price we can afford.

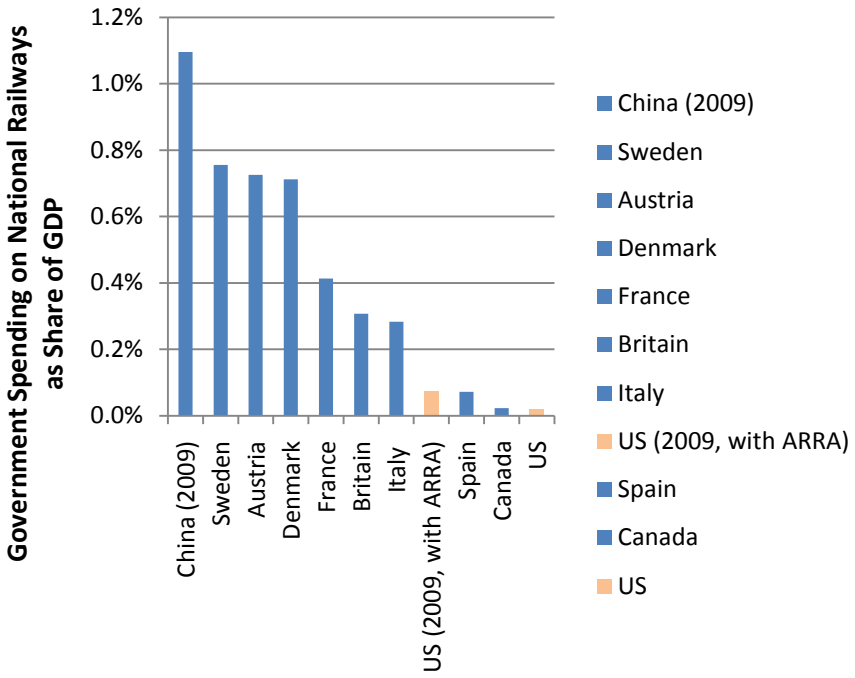
1. Invest Adequate Resources

America's passenger rail system is in its current sorry shape largely because of the failure to adequately invest in maintaining and upgrading the system over the last half century. During a postwar period in which America built tens of thousands of miles of gleaming new expressways and hundreds of airports, our rail system was allowed to deteriorate such that today, at the beginning of the 21st century, we still rely, in some places, on infrastructure dating from before the Civil War. In some cases, it takes far longer to complete a rail journey today than it did in the 1920s.[225]

The worst, most costly mistake Amer-

If the federal government had invested the same amount of money over the last half-century in rail as it had in aviation, roughly $400 billion worth of upgrades would have been possible. That amount of money would have been more than enough to build a high-speed rail network worthy of the world's most economically advanced nation.

Figure 7. Estimated Government Capital and Operating Support for National Railways (Passenger and Freight) as Share of Gross Domestic Product (2007 Unless Otherwise Noted)[226]



ica can make going into the 21st century is to *not* invest adequate resources in upgrading and expanding our passenger rail network. Failing to invest will necessitate even greater spending on highways and airports, deepen our costly dependence on foreign oil, and forestall the economic growth that can result from improved connections among people, businesses and institutions.

The first step in determining an adequate level of investment is to recognize that America is digging out of a very deep hole when it comes to our nation's rail infrastructure. If the federal government had invested the same amount of money over the last half-century in rail as it had in aviation, roughly $400 billion worth of upgrades would have been possible. That amount of money would have been more than enough to build a high-speed rail network worthy of the world's most economically advanced nation.

To begin to dig out of that hole, the federal government should invest steadily increasing levels of funding in passenger rail. We probably cannot hope to match the $300 billion China will be investing in its high-speed rail system between now and 2020, but we should endeavor to match the level of investment provided by other industrialized nations, as a share of GDP, in their rail networks.

Currently, America's public investment in inter-city rail is far lower than that of other industrialized countries. Even with the unprecedented investments in passenger rail included in the American Recovery and Reinvestment Act, the U.S. government investment in the national rail system is far below that of many European countries per capita and as a share of GDP. (See Figure 7.) These figures do not include investments made by private U.S. freight railroads, but in any case, to create a truly world-class passenger rail system,

the United States will need to invest far more than it has historically.

As imporant as the lack of funding has been the instability of funding for passenger rail in the United States, which has made it difficult to undertake long-term capital planning and to build the investor confidence necessary to establish vibrant domestic industries to supply rail equipment.

To ensure stable, continuing funding for high-speed rail, the next federal transportation bill should include a dedicated allocation of funds for passenger rail and the federal government should match state investments in rail at no less than the same 80:20 ratio it does for highways. By financing transportation projects equitably, states will be able to make rational transportation decisions based on the needs of their residents, rather than on the chances of securing a lucrative federal match.

Funding could come from a variety of sources, including a national infrastructure bank, "value capture" mechanisms to share windfalls from increased land values near rail stations, revenues from cap-and-trade programs for carbon dioxide emissions, airport surcharges, or an enhanced highway trust fund augmented through higher fuel taxes or vehicle mileage fees.

2. Maximize "Bang for the Buck"

The current federal transportation funding system does a poor job of ensuring that taxpayer money is focused on the most important projects. Federal highway spending is distributed to states with no prioritization of projects and no accountability for results. Different transportation modes are subject to different rules—transit projects seeking to qualify for funding under the New Starts program, for example, typically receive a smaller federal match than highway projects, and must meet rigorous evaluation criteria that highway projects do not. State transportation departments often effectively act as "highway" departments, or operate as separate modal fiefdoms, with little ability to coordinate, plan or fund effective multi-modal transportation strategies. Moreover, congressional earmarking bumps politically motivated projects to the head of the line, regardless of their merits.

Fixing America's transportation funding system to focus resources effectively is a critical step toward solving the nation's transportation challenges in an era of limited funding. Given the tremendous demand for high-speed rail funding, it is critical that the federal government establish clear criteria from the very beginning for the evaluation of potential projects and focus federal dollars on projects of true national interest.

The states' applications for funding under ARRA underscore the tension between investing federal dollars in the incremental upgrades needed to bring existing passenger rail service up to a basic level of adequacy and targeting resources toward "true" high-speed rail projects that compete with air travel. Ideally, we need to do both: incremental improvements in existing service can build public confidence in passenger rail while helping to solve today's transportation challenges. Moreover, because incremental improvements are generally less expensive, investments in those changes can ensure that Americans in more parts of the country see the benefits of the nation's investment in passenger rail service.

However the federal government opts to divide resources between "bullet trains" and incremental improvements in existing service, projects should be funded based on clear criteria, the foremost of which should be the project's long-term ridership potential. In addition, projects should be prioritized based on their potential to

generate economic development, their ability to reduce congestion on highways and at airports, and the degree to which cities along the line are able to maximize the impact of rail service through compact development patterns near train stations and robust local public transportation networks.

Any incremental investments in existing rail infrastructure should also be consistent with future plans for development of higher-speed rail service along those corridors.

Investments in high-speed rail should moreover be part of a broader, multimodal approach to solving transportation problems. For example, the nation should coordinate planning for its passenger rail and air transportation networks to ensure connections between air and rail and to target resources among the modes effectively. It may be more cost-effective, for example, to meet the essential transportation needs of some smaller communities through investments in rail rather than federally subsidized air service, as is the case today.

3. Encourage Private Investment, But With Strong Public Protections

The private sector will play a central role in building out the nation's passenger rail system. Privately owned freight railroads already control the vast majority of tracks in the United States, even those over which passenger service currently operates. The private sector could also bring necessary capital and experience to the project of building the rails, trains, stations and other pieces of infrastructure that make up a high-speed rail network.

However, it is critical that, as the nation taps private sources of investment, it also retains strong protections for the public interest.

Perhaps the most important source of tension between public and private sectors regards the ownership and use of right-of-way. Amtrak, for instance, owns only a small portion of the tracks over which its trains operate. Most Amtrak trains travel over tracks owned by the freight railroads and are dispatched by those railroads as well. Federal law is supposed to guarantee Amtrak preference over freight traffic on these railways, but a Federal Railroad Administration study found that certain dispatching practices by freight railroads appear to violate Amtrak's right of preference and that Amtrak's preference rights are virtually unenforceable.[227] It is no accident that there are stark differences between the high on-time performance of service on Amtrak-owned rails and performance on those owned by freight railways. On-time performance on the Amtrak-owned Northeast Corridor in fiscal year 2007 was 15 percentage points higher than other corridor trains and almost 40 percentage points better than routes on long-distance tracks owned by freight companies.[228]

There are stark differences between the high on-time performance on Amtrak-owned rails and performance on those owned by freight railways.

The nation should use its investments in high-speed rail to ensure that the public interest is factored into the operation of the nation's rail network. One way to achieve this goal is by locating new high-speed rail lines along publicly owned right-of-way, in the same way we do highways and runways. In cases where expanding or improving existing freight rail tracks will be more cost-effective than laying new tracks, the prospect of federal

investment should be used as leverage to ensure that the promise of passenger rail priority on freight tracks is finally reflected in reality.

Private-sector investment can play an important role in getting high-speed rail off the ground, particularly in areas such as developing vehicles, investing in stations, and providing amenities such as food, wireless internet, and abutting parking. In some cases, state or federal governments may consider public-private partnerships for the financing or construction of high-speed rail lines themselves. In those cases, it is critical that government evaluate such agreements against the potential value of public-sector financing, construction and operation. In other words, private sector participation should be evaluated based on the concrete value that it adds, rather than the expediency it might afford by avoiding more politically difficult revenue raising. Moreover, governments should not make promises to private sector entities that constrain the government's ability to improve service on "competing" routes or to otherwise act in the public interest. All documents related to private participation should be public record; important documents should be promptly posted online for easy accessibility; and only minimal information should be considered proprietary, such as bank account numbers.

4. Invest to Realize Full Energy and Safety Benefits

With limited available funding, and a host of high-priority projects to choose from, it will be tempting for government to cut corners. There are two areas, however, in which cutting corners is likely to be penny wise, but pound foolish. Those are on energy and sustainability issues, and on safety.

With regard to energy, one of the greatest potential national benefits of high-speed rail is its ability to help wean the United States from its dependence on oil. The use of diesel locomotives can help achieve this objective, given the greater energy efficiency of passenger rail. But given the urgent need to reduce global warming pollution from transportation and lingering questions about the long-term availability of cheap oil, electric power is a far preferable choice.

Railway electrification is expensive, but it comes with great benefits. Electric trains are more energy efficient, less noisy and produce less local air pollution than diesel trains, and the electricity used to power the trains can be obtained from clean energy sources, dramatically reducing the "carbon footprint" of rail transportation and virtually eliminating the use of oil.

Federal investments should encourage electrification of rails wherever feasible, and ensure that rail vehicles—whether electric or diesel—achieve the maximum possible energy efficiency and environmental performance. Rail investments are long-lasting—rail infrastructure investments can last for a century or more, while the average age of a locomotive in the Amtrak fleet is 20 years.[229] It is important that the investments we make in passenger rail are not just the best investments for today, but also the best investments for the future.

Similarly, investments in safety should be a top priority, particularly grade separations which, while expensive, have long-lasting benefits both for safety and for the efficiency of both rail and vehicle traffic. Investments in safer rail infrastructure should also be paired with efforts to reexamine the Federal Railroad Administration's current crash-worthiness standards for trains, which rely on bulk to protect passengers—a strategy that increases fuel consumption and wear-and-tear on vehicles and tracks. Shifting instead to an

emphasis on crash energy management (in which trains are designed with crush zones to absorb the impact of a collision) and crash avoidance could allow for faster and more energy-efficient operation, as long as such a shift is done in a way that adequately protects passengers.[230]

Investing in electrification and grade separations now can also help lay the groundwork for express high-speed rail service, since both a fully separated right-of-way and electric propulsion are needed to achieve speeds greater than 150 mph.

5. Build Stations in the Right Places

Passenger rail stations should be located in areas that are reachable by various forms of transportation (including public transit) and that support transit-oriented development in existing centers of commerce and population. Development of rail stations in existing downtowns or in intermodal terminals (such as airports) should be preferred over new "green field" development or "park-and-ride" style station areas.

6. Manage for Performance

Today, details on the performance of Amtrak and other passenger rail lines can be difficult to locate and hard to interpret. A renewed federal commitment to passenger rail should bring with it a new commitment to collecting and disseminating data on the performance of passenger rail and to managing the implementation of projects.

The public should have access to comprehensive performance measures for the high-speed rail program, with outcome measures tracked regularly using nationally standardized methodology. Among the information that should be collected and made available to the public are statistics on on-time arrivals, ridership, safety, and energy consumption. Various routes and route sections should be benchmarked and compared with one another to identify best practices, underperforming routes, and areas requiring additional investment. Data should be archived for comparison across time. Public agencies and private contractors should be held accountable for delivering projects on time and within budget. Private contracts should be subject to clawback provisions that recapture public funds in the event of underperformance.

7. Assure Transparency

A federal program of investment in passenger rail should include unprecedented levels of transparency regarding how projects are evaluated, how decisions are made, and how funds are allocated and spent. Transparency efforts should foster close public scrutiny, including prompt disclosure of performance data, budgets, bids, route choices and conflict-of-interest statements. Programs should be audited annually and overseen by an independently governed and financed public body with subpoena power. All audits should be posted publicly and all board meetings should be public meetings. Potential conflicts of interest, such as those involving contracts and land ownership, should be identified and eliminated where possible.

8. Encourage Domestic Manufacturing

Construction of high-speed rail represents a golden opportunity to rebuild the nation's manufacturing base.

The United States already has a well-established railroad equipment manufacturing industry, but those manufacturers are focused solely on the production of diesel locomotives and freight cars. More than 29,000 workers are directly employed in the manufacturing of railroad rolling stock in the United States, with thousands of others in the supply chain that provides parts and services to those manufacturers.[231] One reason that those manufacturers exist in the United States is that there is a sizeable local market for freight railroad equipment—as of 2002, North and South America accounted for 31 percent of the world's diesel locomotives and a third of the world's freight wagons.[232] By contrast, the Americas accounted for only 1.5 percent of the world's rail passenger cars and less than 1 percent of the world's electric locomotives.[233] It is little wonder that much of the expertise and manufacturing capacity for the construction of passenger rail systems lies overseas.

The single most important step the federal government can take to build a domestic passenger rail manufacturing base is to commit adequate funding to high-speed rail over the long term. In December 2009, Transportation Secretary Ray LaHood announced that 30 firms had committed to expanding their operations in the United States if they receive contracts for high-speed rail projects funded under the American Reinvestment and Recovery Act.[234] Yet, many firms will be reluctant to build plants in the United States without evidence of a sustained commitment to high-speed rail.

A good example of the impact of domestic markets is with streetcar manufacturing. In recent years, several American cities, including Seattle and Portland, Oregon, have implemented modern streetcar systems, using streetcars manufactured abroad. In fact, no streetcars had been made in America since 1952.[235] However, sensing the presence of a growing market, an American firm, Oregon Iron Works, formed a streetcar subsidiary and has won contracts to produce streetcars for Portland and Tucson, with 70 percent of the components to be made in the United States and components coming from 20 U.S. states.[236]

The United States should devise and implement a long-term strategy for building a vibrant, globally competitive passenger rail industry. Inevitably, America will need to rely on foreign firms for some of the expertise needed to get its high-speed rail network off the ground, but the United States should seek to learn from those companies to develop a domestic manufacturing base. For example, South Korea licensed the technology for its high-speed rail system from a French company, with the first trains manufactured in Europe and the rest domestically.[237] Over time, Korean companies developed their own high-speed rail technology, which they now hope to export to other nations building high-speed rail networks.[238]

Federal policy should seek to expand the capacity of American companies to produce high-speed rail systems and components by negotiating technology transfer agreements and investing in research and development. High-speed rail funding should also be used to help support a strong domestic supply chain for high-speed rail components.

Lastly, the government should explore ways to encourage conversion of idle domestic manufacturing capacity and retrain idled manufacturing workers for jobs in the passenger rail industry.

9. Set Standards

The federal government should play a central role in developing standards for high-speed rail technology and infrastructure in an effort to reduce the cost

of high-speed rail, improve replicability of successful projects, and maximize the efficiency of manufacturers. Ideally, the federal government would set technological standards for projects receiving federal funding that are specific enough to allow for the development of economies of scale, yet broad enough to allow for competition among various potential suppliers.

10. Encourage Cooperation Among States

Federal funding policies should reward states that enter into and abide by compacts with neighboring states to conduct joint projects, synchronize route schedules, and coordinate response to operational problems. Interstate cooperation is critical, particularly in cases in which investments in rail infrastructure in one state primarily benefit residents of a neighboring state.

11. Articulate a Vision and Measure Progress

Finally, the nation needs to articulate a vision for the future of America's rail network and measure progress toward the achievement of that vision. The Obama administration's efforts begin fleshing out a vision for high-speed rail in America, but a fully developed vision would include a clear and compelling national goal. Once such a goal has been articulated, the federal government should measure progress toward it, so that the public can gauge the success of the effort. An ambitious but fully achievable and desirable goal would be to link all major cities within 500 miles of one another with high-speed rail by mid-century.

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