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High Speed Rail (HSR) in the United States

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Summary

Congress has been interested in high speed rail (HSR) since the 1960s, but the provision of $8 billion for intercity passenger rail and high speed rail projects in the American Recovery and Reinvestment Act (ARRA; P.L. 111-5), enacted in February 2009, has catalyzed enthusiasm for high speed rail in Congress and the nation. One consequence has been a proposed authorization of $50 billion for intercity passenger rail development (including high speed rail) as part of new surface transportation authorization legislation. There have been other periods of interest in HSR on the part of Congress and various states over the past few decades; they largely faded in the face of obstacles such as the high cost of HSR and policies supporting other modes of transportation. Comparing the costs and benefits of investing in one mode versus another is typically not a part of transportation funding decisions.

There are two approaches to HSR: improving existing tracks and signaling to allow trains to travel somewhat faster, typically to as much as 110 miles per hour (mph), generally on track shared with freight trains; and building new tracks dedicated exclusively to high speed passenger rail service, to allow trains to travel at speeds of 200 mph or more. The potential costs, and benefits, are relatively lower with the first approach and higher with the second approach. Current discussions of high speed rail programs and policies sometimes fail to clearly distinguish between these two approaches.

There are a handful of routes in the United States where track has been improved to allow service at up to 110 mph, and there are a few places along Amtrak's Northeast Corridor where speeds of up to 150 mph are achieved for a relatively short distance. But there are no dedicated high speed lines in the United States comparable to those in Europe and Asia, on which trains travel at sustained speeds of over 150 mph.

Estimates of the cost of constructing HSR vary according to the speed sought, the geography of the corridor, the cost of right-of-way, and other factors. Construction costs likely increase with population density, but this high fixed-cost technology depends on density for higher usage rates. Experts say that virtually no HSR lines anywhere in the world have earned enough revenue to cover both their construction and operating costs, even where population density is far greater than anywhere in the United States. Typically, governments have paid the construction costs, and in many cases have subsidized the operating costs as well.

Proponents of HSR contend that it offers benefits to society at large, not just to its passengers: that it can be a more energy efficient and less polluting transportation alternative compared to aviation and highway travel (and is safer than driving). They also cite its potential to relieve congestion on highways and in the aviation system; its potential contribution to economic development; and the potential job-creating impact of constructing high speed lines. Others question whether these potential social benefits are commensurate with the likely costs, and whether a national HSR network is a practical transportation option for the United States, given the nation's large size and relatively low population density.

In light of the lack of experience with high speed rail development in the United States, HSR projects are likely to face many challenges, including securing adequate funding over the long term and complexity of implementation. Given the variety of arguments both for and against high speed rail, and the costs of high speed rail in light of the constrained federal budget, Congress may wish to carefully consider further investment in high speed rail.

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Introduction

While Congress has been interested in high speed rail (HSR) since the 1960s, the provision of $8 billion for intercity passenger rail projects in the American Recovery and Reinvestment Act (ARRA; P.L. 111-5), enacted in February 2009, has invigorated the prospect of high speed passenger rail transportation in the United States. As one industry observer has noted, "it is impossible to overstate how big a sea change this represents ... [the] $8 billion is seventeen times as much money as Congress has provided for these programs over the past 10 fiscal years."[1] The $8 billion was included in ARRA largely at the behest of President Obama, and a subsequent announcement in April 2009 made it clear that the development of high speed rail is to be a priority of his Administration. At the April announcement, the Obama Administration released a strategic plan for high speed rail, including a proposal for budgeting an additional $1 billion a year for five years. The plan identifies the funding as "a down payment to jump-start a potential world-class passenger rail system and sets the direction of transportation policy for the future."[2] In addition to the work being done by the Administration, there has been a flurry of activity within Congress and in the transportation community to define what such a system should look like, where it should go, how much should be spent on it, and where that funding should come from. Leadership of the House Transportation and Infrastructure Committee, for example, has suggested including $50 billion for high speed rail in a six-year reauthorization of the surface transportation programs.[3]

This report provides an overview of high speed rail in the United States. It discusses definitions of high speed rail, looks at high speed rail in selected other countries, and describes congressional initiatives to promote HSR, including provisions in the Passenger Rail Investment and Improvement Act of 2008 (P.L. 110-432) and ARRA. The report then surveys rationales for developing HSR, cost estimates for HSR, and some of the challenges expected in implementing HSR.

What is High Speed Rail?

There is no authoritative definition of what constitutes high speed rail. The European Union defines HSR as

- Separate lines built for speeds of 250 kilometers per hour (kph) (150 mph), or
- Existing lines upgraded to speeds of 200 kph (125 mph), or
- Upgraded lines whose speeds are constrained by circumstances such as topography or urban development.[4]

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[1] *Transportation Weekly*, "President to Sign Stimulus Bill Today," February 17, 2009, p. 5.

[2] U.S. Department of Transportation, "President Obama, Vice President Biden, Secretary LaHood Call for U.S. High-Speed Passenger Trains," Press Release, Thursday April 16, 2009, DOT 51-09, http://www.fra.dot.gov/Downloads/RRdev/hsrpressrelease.pdf.

[3] For information about surface transportation authorization proposals, see CRS Report R40780, *Surface Transportation Reauthorization Legislation in the 111th Congress: Summary of Selected Major Provisions*, coordinated by John W. Fischer.

[4] International Union of Railways, "General Definitions of Highspeed," available at http://www.uic.asso.fr/gv/article.php3?id_article=14.

The U.S. government also has several definitions of what constitutes high speed rail. The Department of Transportation's (DOT) Federal Railroad Administration (FRA) has defined high speed rail as service "that is time-competitive with air and/or auto for travel markets in the approximate range of 100 to 500 miles."[5] As FRA notes, this is a market-driven definition which recognizes that, in choosing a transportation mode, travelers are more interested in total trip time than in top speed, and that travelers evaluate transportation modes not in isolation, but by how those modes compare to each other.

Congress has, at different times, established high speed rail funding programs using different speed-based definitions and eligibility criteria (see **Table 1**).

Table 1. Statutory Definitions of High Speed Rail

Statute	Speed Component of Definition
High Speed Rail Assistance (enacted 1994)	"reasonably expected to reach sustained speeds of more than 125 miles per hour" (49 USC §26105)
High speed rail corridor development program (enacted 2008)	"reasonably expected to reach speeds of at least 110 miles per hour" (49 USC §26106(b)(4))
Railway-highway crossing hazard elimination in high speed rail corridors program (enacted 1991)	"where railroad speeds of 90 miles or more per hour are occurring or can reasonably be expected to occur in the future" (23 USC §104(d)(2)(C)

Source: CRS.

In its strategic plan for high speed rail, which Congress required to be issued within 60 days of passage of ARRA, FRA defines three categories of high speed rail corridors. These categories are defined in terms of top speeds as well as track characteristics and service frequency (see **Table 2**).

Table 2. Categories of High Speed Rail in FRA's "Vision for High-Speed Rail in America"

Category	Speed Characteristics
Emerging High Speed Rail	Top speeds of 90-110 mph.
Regional High Speed Rail	Top speeds of 110-150 mph on grade-separated track.
Express High Speed Rail	Top speeds of at least 150 mph on grade-separated track dedicated to passenger service.

Source: Federal Railroad Administration, Vision for High-Speed Rail in America, April 2009, p. 2, http://www.fra.dot.gov/Downloads/Final%20FRA%20HSR%20Strat%20Plan.pdf.

As the various definitions of high speed rail show, discussions of high speed rail in the United States can refer to trains traveling at speeds of 90 mph on tracks shared with freight trains or trains traveling over 200 mph on dedicated track, or both, and it is not always clear from the context what category of high speed rail is meant. To try to distinguish between the different categories of high speed rail, in this report the term "higher speed rail" will refer to HSR on shared tracks with speeds up to 150 mph (encompassing both FRA's "Emerging HSR" and

[5] Department of Transportation, Federal Railroad Administration, *High-Speed Ground Transportation for America,* September 1997, p. 2-2.

"Regional HSR" classifications), and "very high speed rail" will refer to HSR on dedicated tracks with speeds over 150 mph (equivalent to FRA's "Express HSR" classification).

High Speed Rail Options

There are two options to developing high speed rail service; the option chosen determines the level of high speed service that can be attained:

- Upgrading existing track, signaling systems, and equipment (e.g., tilting trains) to enable trains to travel somewhat faster over the existing rail network, or
- Building new rail lines enabling trains to travel at much higher speeds than are possible over the existing rail network, which is shared with freight rail.

The advantage of upgrading existing track is its lower cost; one estimate puts the average cost of such upgrades at around $7 million per mile.[6] One limitation of that approach is that the existing network usually has many limitations on train speed—curves, at-grade road crossings, etc.—that limit the potential speed improvements. For example, in the 1990s Amtrak (and commuter railroads[7]) spent around $2 billion—an average of around $9 million per mile, in 2003 dollars—to upgrade the 229-mile north end of the Northeast Corridor (connecting Boston to New York City), including electrifying the route and replacing a bridge.[8] This reduced rail travel time between Boston and New York City from 4 hours to 3 hours and 24 minutes—an increase in average speed over the route from 57 mph to 67 mph.

Conversely, building new rail lines makes much higher speeds possible—up to 200 mph or more. One limitation of that approach is the cost, which is estimated to average $35 million per mile,[9] or more in densely populated areas or difficult terrain.

Components of a High Speed Rail System

High speed rail is correctly viewed as a system made up of several components, including the train, the track, and the signal and communications network. High speed rail can use either conventional steel wheel on steel rail technology, or magnetic levitation (in which superconducting magnets levitate a train above a guide rail), commonly referred to as "maglev."

[6] Passenger Rail Working Group of the National Surface Transportation Policy and Revenue Study Commission, *Vision for the Future: U.S. Intercity Passenger Rail Network Through 2050*, December 6, 2007, p. 31.

[7] Amtrak owns only 363 of the 457 miles of the Northeast Corridor; the remainder is owned by a number of states and commuter rail agencies. Douglas John Bowen, "Amtrak's NEC: healthy hybrid: the Western Hemisphere's busiest passenger rail route delivers a dazzling array of service unequalled by more glamorous global counterparts," *Railway Age*, August 2008.

[8] Government Accountability Office, *Intercity Passenger Rail: Amtrak's Management of Northeast Corridor Improvements Demonstrates Need for Applying Best Practices*, GAO-04-94, February 27, 2004, pps. 19-20.

[9] Passenger Rail Working Group, op. cit., p 31.

Conventional High Speed Rail

With one minor exception, all current high speed rail systems use conventional steel wheel on steel rail technology. At speeds up to around 125 mph, these trains can be pulled by diesel-electric locomotives. For higher speeds, trains powered by externally supplied electricity become necessary. These trains' engines draw power from electricity transferred from overhead wires (catenary). This technology allows for lighter-weight trains, in part because they do not have to carry fuel. Because of their lighter weight, these trains can stop and start more quickly and produce less wear on the track. While these trains typically operate at speeds of up to 210 mph, their potential speed is much greater. In 2007 a French electric-powered train set a new speed record for a train on conventional tracks, traveling 357 mph.[10] That is only slightly below the speed record for any type of train, 361 mph, set by a Japanese maglev train in 2003. Because of the greater costs, and relatively minor benefits,[11] of operating at extremely high speeds, the top operating speed of most conventional high speed trains is limited to around 210 mph.

There are two main reasons why such trains are not widely available in the United States. First, only a small portion of the U.S. rail network is electrified, so most passenger trains must use diesel-electric locomotives. Second, because passenger trains typically use the same tracks as freight trains (and neither generally use the most advanced collision avoidance systems), federal regulations require that passenger trains have a variety of design features to protect passengers in the event of a train crash. This results in relatively heavy passenger trains, which are thus slower to get up to speed and take longer to stop.

Track

To make high speed operation possible, rail track must be substantially flat and straight, with shallow curves and gentle changes in elevation. As train speeds increase, the risk of crashes at intersections where roads cross the rail line ("at-grade crossings") increases, so safety dictates that higher speed tracks not have any at-grade crossings.[12] This is the standard to which new high speed lines in other countries are usually built. The result is the rail equivalent of the Interstate Highway System, allowing trains to operate at high average speeds without risk from crossing traffic. Such lines are usually restricted to the use of high speed passenger trains, so that the trains do not conflict with slower passenger or freight trains.

A high speed rail system using dedicated track can handle many trains at one time without compromising safety. For example, the Japanese high speed rail network, which began operation in 1964, now has trains running at speeds up to 200 mph, with as little as three minutes of headway (the time separating trains operating on the same track) during peak periods. In more than 40 years of operation, there has never been a fatality due to a train crash on the Japanese high speed network.[13]

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[10] Ariane Bernard, "French Train Breaks Rail Speed Record," *New York Times*, April 4, 2007.

[11] As train speeds increase, the benefit of even greater speeds diminishes. For example, increasing the average speed on a 240-mile route from 60 mph to 120 mph reduces the trip time by 2 hours, from 4 hours to 2; the next 60-mph increase, from 120 mph to 180 mph, only reduces the trip time by 40 minutes; the next 60 mph increase beyond that, from 180 mph to 240 mph, would only reduce the trip time by 20 minutes.

[12] Federal Railway Administration regulations require that rail lines rated for speeds above 150 mph have no at-grade crossings. 49 CFR 213.347(a).

[13] Christopher P. Hood, "Biting the Bullet: What We Can Learn from the Shinkansen," *Electronic Journal of* (continued...)

Signal and Communications Networks

Because trains operate on a fixed track, and generally at speeds that do not allow them to stop within the sight distance of the train operator, the risk of collision is ever-present, and safety requires some way to track and communicate with many trains at once. The prevailing train control system on the U.S. rail network is based on train dispatchers at central locations who track the location of trains and signal to train operators when it is safe to proceed onto a stretch of track. This system is somewhat analogous to the air traffic control system, in that the dispatchers can see the location of trains but cannot directly control those trains. Thus, when a train operator does not respond correctly to an operational signal, a collision may occur.

High speed rail networks use electronic train control systems (often referred to as "positive train control," or PTC). This technology is intended to increase the efficiency of operation and reduce the risk of crashes by providing better signal performance and protecting against human error in the operation of the trains. Outside of the NEC, almost none of the nation's rail network is equipped with positive train control. However, the Rail Safety Improvement Act of 2008 requires that rail carriers implement positive train control by December 31, 2015, on main lines over which passengers or poison- or toxic-by-inhalation hazardous materials are transported.[14]

Magnetic Levitation (Maglev)

Maglev train technology was developed in the United States in the 1960s. It uses electromagnets to suspend (levitate) the train above a guideway, as well as to propel the train. By eliminating contact (and hence friction) between the train and the guideway, maglev trains can go very fast, and the trains and tracks are expected to experience less wear and tear, thus reducing maintenance costs, though there is not enough experience with maglev in commercial operations to verify this.

People have talked about the potential of maglev trains for decades, but maglev projects face a number of obstacles. One is that maglev lines are not compatible with conventional train technology, so a maglev line cannot be added as part of an existing rail network. Also, although the costs of constructing and maintaining a maglev line are not clear, as very few maglev projects have ever been built, it is generally believed that such projects are very expensive. Japan and Germany have both had maglev test tracks in operation since the 1970s and 1980s, respectively, but neither country has gone on to build the commercial maglev lines that were envisioned. Congress established a program to promote the development of maglev lines in the United States in the 1990s, but none of the projects that received support from the program have advanced beyond the planning stage. As of 2009 there is only one commercial maglev system in operation in the world, a 19-mile line completed in 2004 in China, connecting an outlying station on Shanghai's subway network to the Pudong International Airport. That train, based on German maglev technology, reaches 268 mph in normal operation, though it has a demonstrated top speed of 311 mph.

(...continued)

Contemporary Japanese Studies, May 23, 2001.

[14] P.L. 110-432, Division A, §104.

Since conventional train technology is capable of speeds comparable to maglev technology, and the costs of maglev implementation are uncertain, but probably very high, there is little impetus to adopt maglev technology. Moreover, as a different type of rail technology, maglev would not connect to the existing rail network, but would involve creating an entirely separate rail network. China reportedly built the Shanghai line in part to examine maglev technology as a candidate for high speed lines it planned; it subsequently decided to use conventional train technology for its high speed rail network. However, the Central Japan Railway Company (JR Central) has announced that it will expand the capacity on its aging high speed line between Tokyo and Osaka, the most heavily traveled intercity rail segment in the world, by building a maglev line between Tokyo and Nagoya, which is approximately two-thirds of the way to Osaka. The planned train would travel at 300 mph over the 175-mile route. Due in part to the geographic constraints—as the line would pass through mountainous areas, as well as densely populated areas, about 80% of the line would be located underground or in tunnels—JR Central estimated the cost of building the guideway alone at 5.1 trillion yen (around $50 billion), or a little less than $300 million per mile. It is not certain that the line will be built; observers have cautioned that the costs could rise, and that the need for the new line is unclear, given forecasts that Japan's population may begin to decline in coming years.[15]

High Speed Rail In Other Countries

One of the basic obstacles facing development of high speed rail lines is that the direct economic benefits of such lines rarely exceed the direct costs.[16] Nevertheless, Japan, France, Germany, Spain, and China are among the countries that have built very high speed rail networks with trains operating at speeds of over 150 mph.

Proponents of HSR often cite the networks in these countries, with the implication that their adoption of HSR makes the feasibility and desirability of building HSR lines in the United States unquestionable. But to extrapolate from the adoption of HSR in other countries to the conclusion that the United States should follow a similar path may not be warranted. The motives that led other countries to implement very high speed rail lines are varied; some, like Japan and China, did so originally in part to meet the demand on already overcrowded conventional rail lines, while others did so in part to try to preserve rail's declining mode share in the face of the growing role of car and air travel. In most cases, the regions served were more densely populated than most areas in the United States.

In Europe and Japan, HSR has had success in capturing market share from commercial aviation. For example, rail has captured 90% of the air/rail market between Paris and Lyon (a distance of 267 miles, with a fastest scheduled rail trip time of 1 hour 55 minutes), 85% of the air/rail market between Tokyo and Osaka (a distance of 320 miles, with a fastest scheduled rail travel time of 2

[15] Philip Brasor, "Japan's maglev on track for financial crash," *The Japan Times Online*, July 26, 2009, http://search.japantimes.co.jp/cgi-bin/fd20090726pb.html.

[16] In a 2009 *New York Times* article, Inaki Barron de Angoiti, director of high speed rail at the International Railways Association, said it is estimated that only two high speed routes in the world have broken even (that is, covered both their construction and operating costs): the Tokyo-Osaka and Paris-Lyon routes. Victoria Burnett, "Europe's High-Speed Trains Holds Lessons for U.S.," *New York Times*, May 29, 2009.

hours 25 minutes), and 74% of the air/rail market between Rome and Bologna (a distance of 222 miles, with a fastest schedule rail travel time of 2 hours 44 minutes).[17]

The relative efficiency of HSR as a transportation investment varies among countries, as its level of usage is likely to depend on the interplay of many factors, including geography, economics, and government policies. For example, compared to the United States, countries with HSR have higher population densities, smaller land areas, lower per capita levels of car ownership, higher gas prices, lower levels of car use (measured both by number of trips per day and average distance per trip), and higher levels of public transportation availability and use. Also, there is a significant difference in the structure of the rail industry in these countries compared to the United States. In virtually all of those countries, high speed rail was implemented and is operated by state-owned rail companies that operate over a state-owned rail network, a network on which passenger rail service was far more prominent than freight service even before the introduction of high speed rail. By contrast, in the United States the rail network is almost entirely privately owned, and freight service is far more prominent than is passenger service. Yet even with the introduction of HSR, and with other factors that are more conducive to intercity passenger rail use than in the United States, in most of these countries intercity rail travel (including both conventional and high speed rail) represents less than 10% of all passenger miles traveled on land.[18]

Following are brief accounts of high speed rail networks in selected countries; except where otherwise indicated, these countries have very high speed lines that currently enable trains to operate at speeds of 186 mph or more.

Japan

Japan may be the ideal country, geographically, for high speed rail; its main island is relatively long and narrow, so that its relatively large population is concentrated in cities arrayed along a corridor. Japan opened its first high speed rail line, between Tokyo and Osaka, in 1964. That line, known as the *Shinkansen*,[19] was built in a corridor which is well-suited to rail travel, and was built to expand capacity on an overcrowded rail corridor. From its inception it earned enough revenue to cover its operating costs, and reportedly earned enough money within its first few years to pay back its construction costs. The success of that line encouraged expansion, and the Japanese government continued to build high speed lines throughout the nation until the privatization of Japan National Railways, which began in 1987. According to government figures, none of the additional lines generated enough passenger revenue to even cover their operating costs.[20] Critics of the expansion of the high speed rail network contended that the new lines were

[17] Prospects for High Speed Rail in the U.S., presentation prepared by Mercer Management Consulting before the House Committee on Transportation and Infrastructure, March 20, 2007.

[18] The European Commission, Directorate-General for Energy and Transport, *EU Energy and Transport in Figures 2009*, Luxembourg, 2009, p. 119, http://ec.europa.eu/energy/publications/statistics/doc/2009_energy_transport_figures.pdf; *Statistical Handbook of Japan 2009*, Table 9-1: Domestic Passenger Transport; http://www.stat.go.jp/english/data/handbook/c09cont.htm.

[19] Literally, “New Trunk Line.” The trains are often called “bullet trains” because of their shape and speed, though the term *Shinkansen* is often used to refer to the trains as well as the railway.

[20] Government figures go only through 1987; since that time, the lines have been operated by private companies, and separate financial results for the individual high speed lines are not available.

not economically efficient, and were built in response to political pressure to extend the benefits of high speed service to other parts of the nation.

Since 1987, extension of high speed lines has continued, in part supported by government efforts to stimulate the economy with infrastructure spending during the economic slowdown of the 1990s. As of 2007, the high speed rail network was 1,360 miles in length, with more under construction.[21] Currently, new lines are funded by a public-private partnership, with part of the funding coming from the now-privatized regional rail companies, and the rest from the national and local governments.

France

France opened its first high speed rail line in 1981, between Paris and Lyon. Its high speed trains are referred to as TGVs (*Train à Grande Vitesse*). As of 2009, the system has approximately 1,160 miles of high speed rail line, with more under construction.[22] Because of the relatively low population density of France, and the central role of Paris (the nation's capital and largest population center), the French high speed rail network has been developed as spokes radiating outward from the hub of Paris. The French rail operating company, SNCF, reports that its TGVs have taken the dominant share of the air-rail travel market in several of the high speed corridors, taking over 90% in the Paris-Lyon market (with a TGV travel time of less than two hours) and about 60% in corridors where the TGV travel time is around three hours.[23]

Germany

Article 87 of the German Constitution makes rail transport a government responsibility.[24] Germany opened its first high speed rail line in 1991. Its high speed trains are called InterCityExpress (ICE). Its network varies significantly from that of its neighbor, France. Due in part to the more geographically distributed political demands of a federal system of government, and to its denser and more evenly distributed population, Germany's high speed rail service has been developed to connect many hubs, compared to France's hub-with-many-spokes network. Germany's high speed trains also have more stops than those of France, whose system emphasizes connecting distant city-pairs with few intermediate stops. These considerations have led Germany to put more emphasis on upgrading existing rail lines to accommodate higher speed service, and less emphasis on building new high speed lines. One result is that Germany's high speed trains have longer average trip times than do those of France over comparable distances.

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[21] "The Shinkansen," supplementary material provided by Hiroki Matsumoto, Transportation Counselor, Embassy of Japan, as part of his testimony before the House of Representatives, Transportation and Infrastructure Committee, Subcommittee on Railroads, Pipelines, and Hazardous Materials, *Hearing on International High Speed Rail Systems*, April 19, 2007.

[22] Réseau Ferré de France, *[Rail] Network Inventory*, http://www.rff.fr/pages/reseau/inventaire_reseau.asp?lg=en.

[23] Takashi Endo, "Aiming at Higher Speeds for *Shinkansen*," *Japan Rail & Transport Review*, no. 36 (September 2003), p. 33.

[24] Heike Link, "German Railway Reform: Chances and Risks," *Japan Railway & Transport Review*, June 1994, p. 22.

Spain

Spain opened its first high speed rail line in 1992. Like France, its population density is relatively low by European standards, and, except for Madrid, the capital and largest city, which is located in the center of the country, the population is largely concentrated near the coasts. Spain's conventional rail network was built using a wider gauge (i.e., the distance between the two parallel rails) than the international standard. Its high speed rail network is being built to the international standard, producing two separate rail networks. Many trains have special equipment to allow them to operate on both networks.

Government spending on rail infrastructure (both high speed and conventional) surpassed spending on roads in 2003. The Spanish government's Ministry of Public Works has a Strategic Plan for Infrastructure and Transport for the period 2005-2020.[25] The largest portion of the spending in the Plan—€109 billion (44% of the total)—is for railways, primarily for increasing the size of the high speed rail network to 6,200 miles by the year 2020, and putting 90% of the population within 30 miles of a station.[26] The high speed rail network is seen as a way of improving mobility with less environmental impact than automobile or air travel, and as a way of promoting the development of Spain's regions, as well as creating transportation-related employment.

China

China is developing an extensive high speed rail system in part to relieve the pressure of both passenger and freight demand on its overcrowded existing rail system,[27] in part to improve transportation connections between its different regions, and in part to promote the economy of less developed regions. China is upgrading parts of its existing rail network to achieve speeds of 120-150 mph, and is building new dedicated electrified lines to enable speeds of 180 mph or more. The national government has announced plans to have approximately 10,000 miles of high speed lines (including both upgraded existing lines and new dedicated electrified lines) in operation by 2020.[28]

Background of Intercity Passenger Rail in the United States

Prior to 1970, private railroad companies provided both freight and passenger service. While rail had been the dominant mode of intercity transportation since the latter part of the 19th century, by the mid-20th century competition from motor vehicles using the rapidly growing network of public roads, and a growing aviation system, was creating difficulties for the rail carriers. In 1970, to preserve a nationwide network of passenger rail service, while trying to help rail

[25] Available at http://www.fomento.es/MFOMWeb/paginas/buscar.aspx.

[26] Giles Tremlett, "Spain's high-speed trains win over fed-up flyers," *The Guardian*, January 13, 2009.

[27] Though its population is approximately four times larger than that of the United States, China's railway network is less than half the size of the U.S. rail network (the same is true of its highway network). *EU Energy and Transport in Figures 2009*, p. 105, http://ec.europa.eu/energy/publications/statistics/doc/2009_energy_transport_figures.pdf.

[28] "China to operate 16,000-km passenger-dedicated lines by 2020," *Xinhua News Agency*, November 27, 2008.

companies by freeing them from the burden of their money-losing passenger service, Congress created the National Railroad Passenger Corporation (Amtrak), a government-owned corporation. The creation of Amtrak preserved a small portion of the formerly dense nationwide intercity passenger rail system, while helping the private rail companies by allowing them to transfer their passenger rail services to Amtrak. Like the private rail companies before it (as well as virtually all intercity passenger rail operators in other countries), Amtrak has continued to lose money on passenger rail service, necessitating ongoing financial support from Congress.

Since Amtrak's creation, it has been a continuing source of controversy, with advocates of passenger rail service urging more funding for it, and critics urging an end to federal support for passenger rail service. In the absence of a decisive outcome to this debate over whether the level of passenger rail service should be determined by the market or by federal transportation policy, Congress has generally provided Amtrak enough funding to survive, but not enough to make significant improvements in its service, or to maintain all of its infrastructure in a state of good repair.

Previous High Speed Rail Efforts in the United States

Congress has long been interested in the potential benefits of high speed rail. It passed a high speed rail bill in 1965. That act contributed to the establishment of the nation's fastest rail service, the Metroliner on the Washington, DC, to New York City portion of the Northeast Corridor (NEC), when that line was still operated by a private rail company. In the 1970s, ownership of the NEC was transferred from the bankrupt Pennsylvania Central Railroad to Amtrak, and Congress initiated the Northeast Corridor Improvement Program, which has provided billions of dollars since the 1970s for improvements to the infrastructure of the Corridor and, in the late 1990s, for purchase of new high speed trains (Amtrak's Acela trains).

Congress has also supported research into maglev and other high speed technologies.[29] In the 1980s, Congress funded studies of potential high speed corridors outside of the NEC. In addition to providing funding for planning studies, in the 1990s Congress created programs to promote the development of maglev lines (none of which have yet advanced to the construction stage) and conventional high speed rail lines (through eliminating at-grade highway crossings from existing rail lines). The FRA has calculated that Congress provided a total of $4.17 billion to various high speed rail projects during the 18 years between 1990 and 2007, an average of $232 million annually (not adjusted for inflation).[30] Most of that money went to improvements on the NEC.[31]

There have also been state and private sector efforts to develop dedicated high speed rail lines in the United States without federal support. In the 1980s, at least six states formed entities to develop high speed rail, and five states awarded franchises to private-sector groups to build and

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[29] Federal Railroad Administration, United States Department of Transportation, *High-Speed Ground Transportation for America*, Washington, DC, September 1997, pp. 1-1, http://www.fra.dot.gov/Downloads/RRDev/cfs0997all2.pdf.

[30] E-mail from Neil Moyer, Chief, Intercity Passenger Rail Analysis Division, FRA, February 1, 2008.

[31] U.S. Government Accountability Office, High Speed Passenger Rail: Future Development Will Depend on Addressing Financial and Other Challenges and Establishing a Clear Federal Role, GAO-09-317, March 2009, p. 10, http://www.gao.gov/new.items/d09317.pdf.

operate high speed rail or maglev lines.[32] Those efforts faltered in the face of the high up-front development costs of building new high speed lines. In 2000, Florida voters approved a constitutional amendment requiring the state to build a high speed rail line, but as the project planning advanced and costs became clearer, a new state administration successfully campaigned to have voters overturn the requirement. In 2008, voters in California authorized the issuance of $9.95 billion in bonds to help finance the construction of a very high speed rail line and improvements to existing rail lines.

Several factors have constrained the development of high speed rail. The financial support from the federal government for lines outside the NEC has been modest, and primarily for planning. Developing high speed rail lines involves high upfront costs over a long period of time before revenue operations begin (it took about a decade to build France's first high speed line and almost two decades for Germany's, which was slowed by legal challenges). States, which could get federal matching grants for their spending on highways and transit, were reluctant to spend vast sums on developing high speed rail, for which there was no significant federal funding assistance, and so looked to the private sector to take the lead. But there is little evidence that high speed rail lines could be profitable. That, combined with the high upfront costs and the long period before any revenue would begin to flow, poses a problem for private investors. Consequently, in spite of decades of discussion about the potential of high speed rail, as of 2009 there are still no exclusive high speed rail lines in the United States. There is only one rail line in the nation where trains can attain speeds of over 110 mph (the Northeast Corridor), and only four other corridors where trains can currently reach top speeds greater than 79 mph (see **Table 3**).

Table 3. High Speed Rail Corridors in the United States

Corridor	Length (Miles)	Motive Power	Current Top Speed (mph)	Current Average Speed (mph)
Los Angeles – San Diego, CA	130	Diesel-electric	90	55
Chicago, IL – Detroit/Pontiac, MI	304	Diesel-electric	95	53
New York City – Albany/Schenectady, NY	158	Diesel-electric	110	56
Philadelphia – Harrisburg, PA	104	Electric	110	66
Northeast Corridor (NEC)	454	Electric		
Boston, MA – New York City, NY, segment	229		150	68
New York City, NY – Washington, DC, segment	225		135	82

Source: Adapted from Government Accountability Office, *High Speed Passenger Rail*, GAO-09-317. March 2009, Table 1; Average speeds from Appendix II, except Chicago-Detroit, Philadelphia-Harrisburg, and New York City-Albany calculated by CRS based on those corridors' fastest scheduled trips.

Notes: The top speeds listed for these corridors are currently attainable only on portions of the routes, not over their entire length; for example, on the NEC the top speed of 150 mph is attainable on less than 10% of the total route. The NYC-Albany trains rely on electric power while passing through a long tunnel departing New York City.

[32] Ibid, 1-2.

Recent Congressional Initiatives to Promote High Speed Rail

There have been several recent congressional initiatives supporting high speed rail. In the summer of 2008, Congress passed the SAFETEA-LU Technical Corrections Act (P.L. 110-244), which provided $90 million for maglev projects that had been authorized but not funded in SAFETEA-LU. In the fall of 2008, Congress passed the Passenger Rail Investment and Improvement Act of 2008 (Division B of P.L. 110-432). Among other things, this act created a new high speed rail development grant program and authorized a total of $1.5 billion over FY2009-FY2013 for this program. The act also authorized additional funding for Amtrak to address some of the backlog of maintenance needed to bring the Northeast Corridor up to a state of good repair. And the act included a provision directing the DOT to seek private companies to build and operate one or more high speed lines.

In February 2009, Congress passed the American Recovery and Reinvestment Act (P.L. 111-5), in which $8 billion was provided specifically for intercity passenger rail projects, including high speed rail projects. Intercity rail projects are also eligible uses for the $27 billion provided for highways (the states have the discretion as to whether to use any of that funding for rail projects) and for the $1.5 billion provided for discretionary grants for surface transportation projects "that will have a significant impact on the Nation, a metropolitan area, or a region." In March 2009, the Administration announced that it would ask Congress to provide $1 billion annually specifically for high speed rail projects.[33] See **Table 4** for a summary of these initiatives.

[33] The Administration did request $1 billion for high speed rail in their budget request for FY2010. The House approved $4 billion for high speed rail; the Senate approved $1.2 billion. Congress has not yet determined what the amount for FY2010 will be.

Table 4. Recent Congressional Initiatives Related to High Speed Rail

Programs created and/or amended in the 109^{th} - 110^{th} Congresses

Initiative	Source	Funding	Status
Maglev Deployment Program	Authorized in SAFETEA (§1307, P.L. 109-59); funding provided in SAFETEA Technical Corrections Act (P.L. 110-244)	$90 million provided over FY2008-FY2009. $45 million is for a line from Primm, NV, to Las Vegas; $45 million is for one or more of three eligible projects: the Pittsburgh area, from Baltimore to DC, and from Atlanta to Chattanooga.	Deadline for applications was February 13, 2009. All three eligible projects east of the Mississippi applied for funding. FRA selected the Pittsburgh and Georgia projects to receive funding, in addition to the Nevada project.
Amtrak Capital Grants	Passenger Rail Investment and Improvement Act of 2008 (PRIIA) (Division B of P.L. 110-432), §101(c)	$5.315 billion authorized over FY2009-FY2013.	$655 million provided in FY2009 DOT appropriations bill (Title XII, P.L. 111-8); $1.3 billion provided in ARRA.
NEC High Speed Service Study	PRIIA §212(d)	Not specified.	Amtrak to submit report to Congress by October 16, 2009, on what would be required to reduce trip times on NEC to certain thresholds.
Intercity Passenger Rail Service Corridor Capital Assistance Program	PRIIA §301 (49 USC §24402)	$1.9 billion authorized over FY2009-FY2013.	These three programs were provided a total of $8 billion in ARRA. The allocation of that funding among the programs is to be determined by DOT. DOT provided a strategic plan for implementing these programs to Congress on April 16, 2009,[a] and issued interim guidance to prospective applicants for these grants on June 17, 2009.[b] The application deadlines varied by program; the final deadline was October 2, 2009.
High Speed Rail Corridor Development Program	PRIIA §501 (49 USC §26106)	$1.5 billion authorized over FY2009-FY2013.	
Congestion Grant Program (to alleviate congestion on passenger rail corridors)	PRIIA §302 (49 USC §24105)	$325 million authorized over FY2010-FY2013.	
Solicitation for new high speed intercity passenger rail system	PRIIA §502	$5 million authorized for planning and preliminary engineering activities for projects selected by DOT.	FRA issued a request for expressions of interest on December 16, 2008. Deadline for response was September 14, 2009.
Requirement for implementation of Positive Train Control on main lines where passenger rail service is regularly provided by December 2015	Rail Safety Improvement Act of 2008 (Division A of P.L. 110-432), §104 (49 USC §20157)	$250 million authorized for grants over FY2009-FY2013.	Affected rail operators must submit a plan for meeting this requirement to FRA by April 2010.

Source: CRS.

Notes: ARRA is the American Recovery and Reinvestment Act of 2009 (P.L. 111-5).

a. The Department of Transportation released its "Vision for High-Speed Rail in America" on April 16, 2009. The plan lays out general selection criteria for projects and corridors, and notes that it is only the first of several steps in developing a high speed rail vision, including the program guidance (published June 17, 2009), the President's 2010 budget request, the National Rail Plan (the preliminary version, which describes how FRA will prepare the final National Rail Plan, was published October 15, 2009), and the upcoming surface transportation reauthorization. The rail documents are available at http://www.fra.dot.gov/.

b. The interim program guidance and associated information is available at http://www.fra.dot.gov/us/content/2243.

Potential Benefits of High Speed Passenger Rail

With decades of experience from around the world, HSR can be considered a proven technology that potentially offers a convenient and comfortable way for Americans to travel between major urban centers. Supporters argue that the United States should avail itself of this technology in a much more comprehensive way in the near future because most of our major competitors have heavily invested or are heavily investing in this mode of passenger transportation, because the population is expected to significantly increase over the next few decades, and because it will take several decades to build a HSR network. In this view, the inability to travel quickly by rail between most major urban centers might not currently appear to be a major deficiency, but it will by 2050 when the U.S population is expected to have grown by another 130 million people. Some believe, therefore, that future intercity passenger mobility will be dependent on fully utilizing all of the available options. However, much of the criticism of HSR is based on concerns about its cost-effectiveness in the near to medium term. This is of particular concern since HSR is likely to rely more heavily than other modes (automobile, air, and intercity bus) on general tax revenues as opposed to user fees/taxes, although the user fees/taxes that support those other modes may not cover their so-called externality costs (that is, costs that those modes impose on other people, such as environmental pollution and deaths and injuries due to crashes). The poor cost-effectiveness of HSR, according to critics, rests in large part on the nation's geography, with lower-density urban areas that are much more widely spaced than are urban areas in much of Europe and Asia.

A number of benefits are typically cited in support of developing HSR. The ones most often discussed are: its potential role in alleviating highway and airport congestion; reducing pollution and energy use in the transportation sector; promoting economic development; improving transportation safety; providing more options for travelers; and making transportation more reliable by increasing redundancy in the national transportation system. Critics question the extent of these benefits, and whether they are sufficiently large to justify the costs, particularly since some of these benefits are produced primarily by the most expensive form of high speed rail—200 mph trains on dedicated tracks.

Alleviating Highway and Airport Congestion

In heavily traveled and congested corridors, proponents contend that HSR will relieve highway and air traffic congestion, and, if on a separate right-of-way, may also benefit freight rail and commuter rail movements where such services share track with existing intercity passenger rail service.[34] By alleviating congestion, the notion is that HSR potentially reduces the need to pay for capacity expansions in other modes. On the question of highway congestion relief, many studies estimate that HSR will have little positive effect because most highway traffic is local and the diversion of intercity trips from highway to rail will be small. In a study of HSR published in 1997, the Federal Railroad Administration (FRA) estimated that in most cases rail improvements would divert only 3%-6% of intercity automobile trips. FRA noted that corridors with short average trip lengths, those under 150 miles, showed the lowest diversion rates.[35] The U.S.

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[34] See for example, California High Speed Rail Authority, "Moving California Forward: California's High-Speed Train System," http://www.cahighspeedrail.ca.gov/news/MOBILITY_lr.pdf.

[35] U.S. Department of Transportation, Federal Railroad Administration, *High-Speed Ground Transportation for America*, Washington, DC, September 1997, p. 7-8, http://www.fra.dot.gov/Downloads/RRDev/cfs0997all2.pdf.

Department of Transportation's Inspector General (IG) found much the same thing in a more recent analysis of HSR in the Northeast Corridor. The IG examined two scenarios: Scenario 1 involved cutting rail trip times from Boston to New York from 3 ½ hours to 3 hours and from New York to Washington from 3 hours to 2 ½; Scenario 2 involved cutting trip times on both legs by another ½ hour over scenario 1. In both scenarios, the IG found that the improvements reduced automobile ridership along the NEC by less than 1%.[36] The IG noted "automobile travel differs from air or rail travel in that it generally involves door-to-door service, offers greater flexibility in time of departure, and does not require travelers to share space with strangers. Consequently, rail travel must be extremely competitive in other dimensions, such as speed or cost, to attract automobile travelers."[37]

Planners of a high speed rail link in Florida between Orlando and Tampa, a distance of about 84 miles, estimated that it would shift 11% of those driving between the two cities to the train, as well as 9% of those driving from Lakeland to either Orlando (54 miles) or Tampa (33 miles). However, because most of the traffic on the main highway linking the two cities, I-4, is not travelling between these cities, it was estimated that HSR would reduce traffic on the busiest sections of I-4 by less than 2%.[38] The final environmental impact statement for the project states that the reduction in the number of vehicles resulting from the HSR system "would not be sufficient to significantly improve the LOS [level of service] on I-4, as many segments of the roadway would still be over capacity."[39] The estimated cost of the HSR line was $2.0 billion to $2.5 billion,[40] or $22 million to $27 million per mile.

The effect of HSR on air traffic congestion is less clear. Since HSR is more comparable to commercial air travel than it is to automobile travel, it is likely that in the right circumstances a significant share of air travelers would switch to HSR. In its 1997 study, FRA estimated that generally between 20% and 50% might be expected to divert from air to HSR, with higher diversion rates associated with faster forms of HSR.[41] The IG's study of the NEC estimated that 11% of flyers would take the train in scenario 1 and 20% would take the train in scenario 2, concluding, therefore, that "this would provide congestion relief at NEC airports and in NEC airspace."[42]

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[36] U.S. Department of Transportation, Office of the Secretary of Transportation, Office of the Inspector General, *Analysis of the Benefits of High Speed Rail on the Northeast Corridor*, Washington, DC, June 26, 2008, http://www.oig.dot.gov/StreamFile?file=/data/pdfdocs/HSR_Final_7-1-08.pdf.

[37] Ibid., pp. 6-7.

[38] U.S. Department of Transportation, Federal Railroad Administration and Florida High Speed Rail Authority, *Final Environmental Impact Statement: Florida High Speed Rail, Tampa to Orlando*, May 2005, p. 1-7, 4-119, http://www.fra.dot.gov/downloads/RRDev/florida_tampa-orlando_feis.pdf

[39] Ibid., p. 4-119.

[40] Ibid., p. S-24.

[41] FRA, 1997, p. 7-9.

[42] IG, 2008, p. 3.

With relatively high diversion rates from air to HSR there is likely to be some reduction in the number of flights in certain corridors, although it might not reduce them proportionally as air carriers might substitute smaller planes to accommodate less demand. Consequently, HSR might not necessarily reduce congestion at certain high demand airports as slots are taken over by these smaller aircraft, or by flights that were flying into or out of other nearby airports and flights added to and from other locations. This is not necessarily a zero-sum change, as this may improve accessibility to other locations by air and to the overall level of accessibility when taken together with HSR. However, a HSR station in a smaller city, such as Fresno in the California rail project, might result in a disproportionate loss of its air service.[43]

While HSR may provide some relief at congested airports, an unintended effect may be to reduce the profitability of air service, a business that on routes with high demand is largely self-supporting through fares. By contrast, most studies show that to be competitive HSR fares will need to be substantially subsidized when both capital and operating costs are taken into account. Even in heavily congested areas, it is likely that it would be more effective, and possibly cheaper per passenger, to relieve air traffic congestion by some combination of things such as expanding airport capacity, applying congestion pricing to takeoff and landing slots, and implementing an enhanced air traffic control system, such as the Federal Aviation Administration's Next Generation or "NextGen" system.[44]

Alleviating Pollution and Reducing Energy Consumption by the Transportation Sector

Another major benefit of HSR according to supporters is that it uses less energy and is relatively less polluting than other modes of intercity transportation.[45] For example, the California High Speed Rail Authority contends that HSR uses one-third the energy of air travel and one-fifth the energy of automobile travel.[46] While the physics of rail do generally provide favorable energy intensity and carbon emission attributes in comparison with highway and air travel, such claims tend to rest heavily on assumed high passenger loads. Moreover, they also tend to ignore the energy and carbon emission of building, maintaining, and rebuilding the infrastructure that supports each mode. Some argue that this omission tends to bias the analysis in favor of high speed rail, whereas in reality, these critics contend, the relatively small ridership of intercity rail will result in relatively high energy and emissions per passenger mile traveled.[47] Another problem with these comparisons, according to critics, is that they tend to assume automotive and airplane engine technology will not become more energy efficient in the future.

[43] Randal O' Toole, *High-Speed Rail: the Wrong Road for America*, Cato Institute, Policy Analysis, No. 625, October 31, 2008, p. 8, http://www.cato.org/pubs/pas/pa-625.pdf.

[44] See, for example, the cost estimates for NextGen in Government Accountability Office, Next Generation Air Transportation System: Status of Systems Acquisition and the Transition to the Next Generation Air Transportation System, GAO-08-1078, Washington, DC, September 2008, p.7, http://www.gao.gov/new.items/d081078.pdf.

[45] See, for example, Center for Clean Air Policy and Center for Neighborhood Technology, *High Speed Rail and Greenhouse Gas Emissions in the U.S.*, January 2006, http://www.cnt.org/repository/HighSpeedRailEmissions.pdf.

[46] California High Speed Rail Authority, "California High-Speed Train System Environmental Protection," http://www.cahighspeedrail.ca.gov/news/Factsheetenviro.pdf.

[47] O' Toole, 2008.

Completed as part of a wide-ranging review of transportation policy in the United Kingdom, an analysis of building a high speed rail system connecting London with Glasgow and Edinburgh (distances of approximately 350 miles and 330 miles, respectively), including its energy use and carbon emissions profile, concluded:

> high level analysis of the potential carbon benefits from modal shift from air to high speed rail suggests that these benefits would be small relative to the very high cost of constructing and operating such a scheme, and that under current assumptions a high speed line connecting London to Scotland is unlikely to be a cost-effective policy for achieving reductions in carbon emissions compared to other policy measures.[48]

Because HSR will only capture a relatively small share of total passenger trips, it is also unlikely to make much difference in achieving greenhouse gas reduction targets, nor for that matter in the amount of oil imported. A critical analysis of HSR in California estimates that it might account for 1.5% of the state's goal for reducing carbon emissions, and that would be at a very substantial cost.[49] A study of the potential benefits of HSR in Sweden concluded that investment in rail networks is not a cost-effective climate policy instrument; general policies, such as increased fuel taxes, would be more effective.[50] Similarly, in the UK's analysis of a line from London to Scotland, they estimated the carbon savings would be 0.2% of the UK's current carbon emissions, and this assumed that all flyers take the train and the HSR is zero-carbon.[51] As this suggests, another important factor in HSR's impact on greenhouse gas reduction is the source of its electricity, as using electricity generated from coal will provide less benefit than electricity from nuclear, hydro-electric, or other renewable sources.[52]

Promoting Economic Development

HSR, according to supporters, promotes economic development, as well as potentially beneficial changes in land use and employment. In the short term, it is argued, jobs will be created in planning, designing, and building HSR. By improving accessibility, HSR, it is thought, will spur economic development and the creation of long-term jobs, particularly around high speed rail stations. For example, the California High Speed Rail Authority argues that its proposal for a HSR connecting northern and southern Californian cities will create 160,000 short-term construction-related jobs, and 450,000 long-term jobs.[53]

[48] HM Treasury and Department for Transport, *The Eddington Transport Study: Main Report, Volume 3*, London, 2006, p. 213, http://www.dft.gov.uk/about/strategy/transportstrategy/eddingtonstudy/.

[49] Wendell Cox and Joseph Vranich, *The California High Speed Rail Proposal: A Due Diligence Report*, Reason Foundation, September 2008, chapter 7, http://www.reason.org/files/1b544eba6f1d5f9e8012a8c36676ea7e.pdf.

[50] Jan-Eric Nilsson and Roger Pyddoke, *High-Speed Railways—A Climate Policy Sidetrack*. VTI (Swedish National Road and Transport Research) #655, 2009, p. 13, http://www.vti.se/EPiBrowser/Publikationer%20-%20English/R655Eng.pdf.

[51] Eddington Transport Study, 2006, p. 211.

[52] Mikhail V. Chester and Arpad Horvath, "Environmental Assessment of Passenger Transportation Should Include Infrastructure and Supply Chains," *Environmental Research Letters*, vol. 4 (2009), http://www.iop.org/EJ/abstract/1748-9326/4/2/024008/.

[53] California High Speed Rail Authority, "Nearly 160,000 Construction-Related Jobs, 450,000 Permanent Jobs," http://www.cahighspeedrail.ca.gov/news/JOBS_lr.pdf.

Although skeptics point out that increasing spending on anything will create short-term jobs, some research shows that infrastructure spending tends to create more jobs than other types of spending.[54] In terms of longer-term benefits, however, the U.S. Government Accountability Office (GAO) notes that quantifying these benefits can be difficult, and "while benefits such as improvements in economic development and employment may represent real benefits for the jurisdiction in which a new high speed rail service is located, from another jurisdiction's perspective or from a national view they may represent a transfer or relocation of benefits."[55] On the question of whether HSR can provide economic benefits for the national economy as a whole by increasing depth of labor markets and improving business travel, the UK transportation policy study discussed earlier notes that "such effects are quite limited in mature economies with well developed infrastructure."[56] This study notes that building a HSR line between London and Scotland would probably provide modest economic benefits at best because air carriers already provide fast and frequent service at a reasonable cost for business and other travelers.

Improving Transportation Safety

Safety is another benefit of HSR that is sometimes mentioned by its advocates. Intercity passenger rail transport is relatively safe, at least compared with highway travel. And HSR in other countries generally has a very good safety record. France's TGV, for example, boasts that it has never had a single on-board fatality running at high speed in over two decades of operation. However, it is unlikely that HSR will significantly reduce the number of transportation-related deaths and injuries in this country. As noted above, the ability of HSR to divert highway travelers to rail is likely to be limited, and the diversion of flyers will make little difference because air transportation is also very safe. Moreover, some have pointed out that high-profile HSR trains and facilities may become a target for terrorists that may end up requiring airport-like security procedures. If this occurs, the mobility benefits of competitive travel times with air travel will also be diminished.

Providing Travelers a Choice of Modes

There is some value in providing travelers with a choice of modes, particularly for those unable or unwilling to fly or drive. In congested corridors, frequent and reliable HSR could provide travelers an attractive alternative to dealing with the frustrations of traffic bottlenecks and airline delays. Intercity rail can also be a relatively comfortable way to travel, with more seating room than on airplanes, affording travelers the opportunity to walk around, and the availability of food in café cars (though critics contend that some of these comforts are due to government subsidization of the costs of intercity passenger rail travel, and that commercial airlines could provide more seating room and food if they did not have to maximize passenger revenues to stay in business).

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[54] CRS Report R40104, *Economic Stimulus: Issues and Policies*, by Jane G. Gravelle, Thomas L. Hungerford, and Marc Labonte.

[55] U.S. Government Accountability Office, *High Speed Passenger Rail*, GAO-09-317, March 2009, Washington, DC, p. 29, http://www.gao.gov/new.items/d09317.pdf.

[56] Eddington Transport Study, 2006, p. 208.

Making the Transportation System More Reliable

Many different types of events can dramatically disrupt a transportation system. These include floods, snowstorms, hurricanes, earthquakes, fires, and terrorism. During such events, it can be very valuable to have extra capacity to handle extra demand or an alternative means of travel when other means fail. For example, rail service often continues when bad weather grounds air service.[57] Building in redundancy to any system entails added costs, but the availability of alternatives tends to make the system as a whole more reliable during unusual events and emergencies.[58]

High Speed Rail Cost Issues

The costs of HSR can be divided into two general categories: infrastructure costs, including the costs of building the line and maintaining it, and operating costs, such as labor and fuel, which tend to vary according to the amount of train service offered. Of the many high speed routes in the world, it is thought that only two have earned enough revenue to cover both their infrastructure and operating costs.[59]

Infrastructure Costs

High speed rail requires a significant up-front capital outlay for development of the fixed infrastructure (right-of-way, track, signals, and stations) and for its upkeep. However, system costs are highly site- and project-specific. A leading determinant of cost is whether a new right-of-way is planned or if an existing railroad right-of-way is going to be improved. Another key cost determinant is speed. Generally, as speed increases, the cost of providing the infrastructure to attain that speed rises at an increasing rate. The highest speeds will require grade-separated corridors, reduced curvature and reduced gradients (otherwise passengers will experience extreme discomfort at high speeds), and a possible shift from diesel-electric power to electric power that will require installation of catenary over the entire route as well as electric power sub-stations. As speed increases, the type of train signaling and communication system must be more advanced (and costly) to ensure safe operations. Building a route through mountainous terrain is more costly than construction on level terrain, and building a route through an urban area is costlier than construction in a rural area.

[57] See, for example, U.S. Department of Transportation, Bureau of Transportation Statistics, *Transportation Statistics Annual Report 1997*, Washington, DC, 1997, pp. 22-23, http://www.bts.gov/publications/transportation_statistics_annual_report/1997/pdf/report.pdf.

[58] See, for example, U.S. Department of Transportation, Research and Special Programs Administration, Effects of Catastrophic Events on Transportation System Management and Operations: Cross Cutting Study, January 2003, http://www.itsdocs.fhwa.dot.gov//JPODOCS/REPTS_TE//13780_files/13780.pdf.

[59] They are Japan's Tokyo-Osaka route and France's Paris-Lyon route, cited by Iñaki Barrón de Angoiti, director of high-speed rail at the International Union of Railways, in Victoria Burnett, "Spain's High-Speed Rail Offers Guideposts for U.S.," *The New York Times On the Web*, May 30, 2009.

These drivers of cost are evident in the various projects to build high speed or higher speed rail in the United States. For instance, a proposed route between Los Angeles (Anaheim) and Las Vegas would utilize maglev technology, with a top speed of 311 mph, at an estimated cost of nearly $12 billion, or $48 million per route mile. A proposed alternative would use conventional steel rail, with a top speed of 150 mph, and, rather than beginning the route in Anaheim, would begin the route in Victorville, CA, which is outside of Los Angeles and east of the Cajun Pass and the mountains. The estimated cost of this alternative is nearly $4 billion or $22 million per route mile. As this line is being proposed by a private developer, there is likely more concern about minimizing cost; much of the decrease in cost is due to not bringing the line through the mountains into the Los Angeles area, which in turn may lower its attractiveness to potential riders.[60] In contrast to these projects involving acquisition of new rights-of-way, a project to increase train speed between Chicago and other Midwest cities would make improvements to existing track. These improvements involve approximately 3,000 miles of track at a total estimated cost of $7.7 billion, or about $2.5 million per route mile. A GAO review of six projects involving incremental track improvements found that per mile costs ranged from $4.1 million to $11.4 million.[61] The DOT Inspector General has estimated that to reduce train travel time between Washington, DC, and New York City and between New York City and Boston by a half hour would require corridor improvements totaling $14 billion (or about $31 million per route mile).[62]

Since the objective of building or improving a rail line is passenger mobility, rail project costs could be compared with the costs of alternative methods of increasing mobility, such as expanding a highway or airport. The cost of highway or airport expansion is also highly project- and site-specific for the same reasons cited above for rail projects. Comparing costs on a per-mile basis is not as useful as comparing costs on a per passenger-mile basis, which is the cost of moving one passenger one mile. This measure incorporates the improvement in passenger throughput expected from the construction project. However, comparing costs and benefits of modal options in this manner is not common because of institutional and organizational obstacles.[63] These include a federal DOT that is organized by modal segments, congressional authorizing committees organized by mode, earmarking of projects, prohibitions in state trust fund and federal trust fund financing, and industry advocacy that is largely organized by mode.[64]

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[60] GAO, *High Speed Passenger Rail: Future Development Will Depend on Addressing Financial and Other Challenges and Establishing a Clear Federal Role*, March 2009, GAO-09-317, p. 24.

[61] GAO, *High Speed Passenger Rail: Future Development Will Depend on Addressing Financial and Other Challenges and Establishing a Clear Federal Role*, March 2009, GAO-09-317, p. 25.

[62] DOT Inspector General, *Analysis of the Benefits of High-Speed Rail on the Northeast Corridor*, Report CC-2008-091, June 26, 2008.

[63] For further discussion of this issue, see Transportation Research Board, *Multimodal Aspects of Statewide Transportation Planning*, NCHRP Synthesis 286, 2000, http://ntl.bts.gov/lib/17000/17600/17654/PB2001102765.pdf; and GAO, *Surface Transportation: Many Factors Affect Investment Decisions*, GAO-04-744, June 2004.

[64] NCHRP Synthesis 286, p. 1.

In addition, at least one study suggests that transportation project cost estimates, especially those authored by project sponsors, should be rigorously scrutinized.[65] This study examined 258 transportation infrastructure projects around the world and found that in almost 90% of the cases costs were underestimated, that actual costs on average were 28% higher than estimated, and that rail projects in particular were the most severely underestimated, costing on average 45% more than estimated.[66]

While most U.S. railroad rights-of-way have curvature and gradients that could accommodate speeds up to 125 mph with track and signal upgrades, much work is required just to allow Amtrak trains to maintain current speed limits. Outside the NEC, most of the track over which passenger trains now operate has a maximum speed limit of 79 mph. Most of this track is owned and maintained by private freight railroad companies whose trains operate more economically at slower speeds. Improving the quality of this track to allow for higher speed passenger trains could involve rebuilding track substructure, such as replacing the ballast, improving drainage, or replacing wood ties with concrete ties, as well as upgrading signaling and communications systems. More importantly, because intercity passenger and freight trains, as well as commuter trains, share the track in many corridors where high(er) speed service is proposed, it will be necessary to increase capacity on these routes to avoid delays caused by interference from other trains. For example, while Amtrak's on-time performance on the NEC,[67] which has multiple tracks and on which Amtrak controls the scheduling, was 85% in FY2007, Amtrak's on-time performance on short-distance corridors outside the NEC,[68] where there is often only a single track, and where scheduling is controlled by freight rail companies, was only 65%.[69] According to Amtrak, much of the delay was due to interference from freight trains, and to a lesser extent, commuter trains. To increase capacity, sidings can be added to allow slower trains to pull off and allow faster trains to pass, but a better solution is to double track a route and install high speed crossovers over the length of the route. This type of track layout greatly reduces train interference because double tracking more than doubles route capacity.[70]

Amtrak's on-time-performance on short-distance corridors outside of the NEC, where most of the HSR projects are proposed, raises another issue: the current condition of the nation's rail infrastructure. If Amtrak is not currently able to operate its trains at the maximum rated track speed on many of its routes due to track congestion or the condition of the track, that suggests that significant capital investment may be required just to bring the existing network up to a state of good repair for passenger rail operation, let alone to upgrade the track to make possible higher speeds.

[65] Bent Flyvbjerg, Mette Skamris Holm, and Soren Buhl, "Underestimating Costs in Public Works Projects: Error or Lie?," *Journal of the American Planning Association,* Summer 2002, vol. 68, no. 3.

[66] Ibid. Rail projects in this study included high speed and conventional intercity rail projects as well as rail transit projects.

[67] Defined as arriving within 10 minutes of the scheduled arrival time.

[68] Defined as arriving within 20 minutes of the scheduled arrival time.

[69] DOT IG, *Amtrak's Future Outlook and Budgetary Needs*, April 3, 2008, Report CC-2008-061, p. 14

[70] Andrew Nash, "Best Practices in Shared-Use High-Speed Rail Systems," Mineta Transportation Institute, June 2003.

Operating Costs

In addition to infrastructure costs, operating costs, such as labor, fuel or electric power, and other costs that vary depending on the number of trains that are operated, can be a significant public expense if the train operator cannot generate sufficient ridership to cover these costs with ticket revenue. Unlike the airline and intercity bus (at least on some routes) industries, where competition among carriers is credited with spurring efficiencies, such as the "low-cost" carrier phenomenon, Amtrak has often been criticized for complacency in pursuing cost savings. As the DOT IG has stated, "Amtrak, as the sole provider of intercity passenger rail service has few incentives, other than the threat of budget cuts or elimination, for cost control or delivery of services in a cost-effective way."[71] However, there are some obstacles to opening up intercity passenger rail service to competition. Outside the NEC, passenger trains run mostly on freight-owned track to which Congress has given Amtrak favorable access terms; these terms of access would not necessarily transfer to an alternative operator. Also, accommodating multiple train operators over the same track is difficult because of the problem of allocating train slots fairly among competing firms. What is possible, as demonstrated by the United Kingdom, is for governments to provide concessions to train operators to provide service over particular routes for a period of several years. In this instance, competition occurs when prospective operators bid and compete amongst each other on the terms of their proposals, such as the level of service they promise to provide and the level of government subsidy (if any) they would require to provide that service.[72] In some U.S. cities, Amtrak has competed with other train operators in the provision of commuter rail service, and a handful of states have experience with concessions in the provision of short-line freight rail service.

Since labor is the single largest operating cost for Amtrak, accounting for about half of its total operating cost, policymakers may wish to consider the laws governing railroad labor-management relations. Railroad labor laws, which apply to both freight and passenger service, were enacted in the early 1900s when railroads were the dominant mode of transportation and did not face as much competition from alternative modes as they do today.[73] These laws are viewed by many observers as restricting the ability of rail operators to increase rail worker productivity.[74] About 9 out of 10 Amtrak employees are unionized and are covered by collective bargaining agreements. These collective bargaining agreements establish work rules limiting the type of work that employees can perform. Current work rules specify that most Amtrak employees cannot perform tasks outside their enumerated work duties for more than two hours per day. Amtrak officials have sought to expand this to four hours per day.[75] State officials have questioned whether a potential Amtrak competitor, who might employ the Amtrak workers if it won the contract from Amtrak, would be bound by Amtrak's labor agreements with those workers, and doubt whether a competitor could provide more efficient service if it were so bound.[76]

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[71] Statement of Mark Dayton, Senior Economist, U.S. DOT IG, Intercity Passenger Rail and Amtrak, Senate Committee on Appropriations, March 16, 2006, CC-2006-026, p. 9.

[72] This can be described as competition *for* the tracks, as opposed to competition *on* the tracks.

[73] These laws are Railway Labor Act of 1926, the Federal Employers Liability Act of 1908, and the Railroad Retirement Act of 1934.

[74] See GAO, *Railroad Competitiveness: Federal Laws and Policies Affect Railroad Competitiveness*, RCED-92-16, November 1991.

[75] GAO, *Intercity Passenger Rail*, November 2006, GAO-07-15, Appendix VI, pp. 150-156.

[76] GAO, *Intercity Passenger Rail*, November 2006, GAO-07-15, Appendix VI, p. 79.

Ridership Potential

Given the high cost of constructing and operating high speed rail service, its cost-effectiveness depends on achieving high ridership levels. The ridership levels needed to make a high speed rail system viable vary according to the cost of the system; a high speed route with a dedicated track and electric power supporting speeds in excess of 150 mph will be much more expensive than upgrading existing track to support 110 mph service. Estimates of the level of ridership needed to justify the cost of high speed systems similar to those in other countries range from 6 million to 9 million riders in the first year.[77] To put that figure in context, Amtrak's current high speed service, the Acela, which began operating in 2000 in the most densely populated corridor in the United States, carried 3.4 million passengers in 2008.[78]

Distance and density are two key factors that can determine intercity passenger rail's ridership. Ridership levels are also likely to be higher if several cities are aligned in a linear configuration rather than in a "zig-zag" or "hub and spoke" configuration because travelers to the end-point cities are only delayed by the amount of time for station stops at intermediate cities and not by additional time required to divert to, and possibly change trains at, an intermediate city.

Many of HSR's potential customers are likely to be current air travelers. Despite an airplane's speed advantage, HSR can be time-competitive with an airplane if distances between cities are less than about 400-500 miles. This is not sufficient distance for an airplane to exploit its speed advantage because the travel time to and from the train stations (which are often located in the central area of large cities) for many passengers may be less than travel time to and from the airports (which are often located in the suburbs), assuming that a traveler's ultimate destination is in the downtown area. Also, security screening and pre-boarding wait times generally are significantly longer for air travelers than they are for train riders, as is claiming checked baggage, if applicable.[79] Amtrak has been competitive with the airlines between certain cities along the Northeast Corridor. Slightly more people take the train than fly between Washington, DC, and New York City (a distance of about 240 miles, which Amtrak's Acela covers in around 2 hours 50 minutes) and slightly fewer take the train than fly between New York City and Boston (a distance of about 210 miles, which the Acela covers in about 3 hours and 30 minutes). However, Amtrak only captures about 5% of the air/rail market share for trips from Washington, DC, to Boston (a distance of about 440 miles, which takes nearly seven hours even on the Acela). **Table 1** lists the densest city pairs for air travel that have a distance within the range where rail travel can be time competitive.

[77] Transportation Research Board, *In Pursuit of Speed: New Options for Intercity Passenger Transport* (Washington, DC: National Research Council, 1991), p. 113.; Ginés de Rus and Gustavo Nombela, "Is Investment in High Speed Rail Socially Profitable?," *Journal of Transport Economics and Policy*, vol. 41, no. 1 (January 2007), p. 15; Ginés de Rus and Chris Nash, "In What Circumstances is Investment in HSR Worthwhile?," chapter 3 of *Economic Analysis of High Speed Rail In Europe*, Ginés de Rus (ed.), Bilbao, 2009, p. 70.

[78] Amtrak, *Monthly Performance Report for September 2008*, December 8, 2008, p. A-3.5. http://www.amtrak.com/pdf/0809monthly.pdf. Amtrak's slower service in the Northeast Corridor, the Northeast Regional, carried 7.5 million passengers; fares for the Northeast Regional Service are less than half those charged for Acela service. Only three other Amtrak routes nationwide carried more than 1 million passengers in FY2008.

[79] The time advantage for rail in this case is due to the relative lack of any security screening of rail passengers and baggage; this advantage could disappear if terrorists began targeting passenger trains in the United States.

Table 5. Densest Air Travel City Pairs Within About 500 Miles Distance

(Top Twelve, 2007)

City Pair	Average Daily Air Passengers	Approximate Distance Apart (Road Miles Used as Proxy)
Los Angeles Metro Area – San Francisco Bay Area	13,838	402
Los Angeles, Burbank – Las Vegas	5,537	275
San Diego – Oakland, San Jose	4,965	505
Boston – New York City, Newark	4,550	211
Dallas – Houston	4,294	247
New York City, Newark – Washington, DC	4,166	237
Chicago – Minneapolis, St. Paul	3,527	407
Boston – Washington, DC	3,369	441
New York City, Newark – Buffalo	2,338	417
Chicago – Detroit	2,280	278
Atlanta – Orlando	2,064	440
Dallas – San Antonio	2,006	277

Source: Adapted by CRS from a list of the top 100 domestic city pairs by average daily air passengers, received from the Air Transport Association in a personal communication; road mile distance taken from Rand McNally Road Atlas.

Notes: "Los Angeles Metro Area" includes Los Angeles, Burbank, and Santa Ana; "San Francisco Bay Area" includes San Francisco, Oakland, and San Jose. Washington, DC, does not include Baltimore-Washington International Airport.

It is more difficult for rail to compete with automobile transportation, which in many situations is more attractive than rail travel. For instance, if a traveler needs to make multiple stops en route to or around the destination city, a car may be more convenient, especially if the destination city lacks an extensive mass transit system. If the traveler is carrying bulky items, a car may also be more practical. Driving is likely to be less expensive than rail if two or more people are traveling together, since the added cost of each additional traveler is virtually zero for passenger cars, while each person must purchase a ticket on the train. Yet if the travel distance is uncomfortably long to drive, significant road congestion can be expected, or high gas prices, tolls, and parking substantially raise the cost of driving, then trains may attract automobile drivers.

High speed trains are not expected to compete well against intercity buses in many instances because bus travelers are most concerned about price. Recent improvements in intercity bus service quality and frequency may reduce demand for high speed rail in some markets.

Trains depend on population density to operate efficiently. To compete with the airlines, trains must depart frequently but they also must fill, or nearly fill, their seats to generate sufficient ticket revenue if they hope to cover their operating costs. Not only is the population size of a city important but also the concentration of economic activity in the central business district or otherwise near the train station(s). For example, New York City is more suited for train travel than many other U.S. cities because of the high concentration of activity on the island of Manhattan. About 35% of the city's jobs are within three miles of Wall Street, while in other American cities, on average, about 22% of employment is within a 3-mile radius of the city's center.[80] Although the nation as a whole is becoming more urbanized, trends show that employment is steadily decentralizing in almost all U.S. cities.[81] Most other large U.S. cities have a population density that is less than one-third that of New York City. New York City is also the only city in the country where more residents (55%) do not own an automobile than do.[82] In most other large U.S. cities, the percentage is between 10% and 25%. Thus, by some measures that are indicative of support for intercity passenger rail travel, New York City is an anomaly compared to other U.S. cities. In fact, tickets to or from New York City accounted for 30% of Amtrak's total ridership in 2008, and the *Acela* trains running to and from New York City on the NEC are the only Amtrak trains that reportedly cover their operating costs.

High Speed Rail Funding Considerations

The demand for HSR funding is difficult to calculate, given the early stage of many of the proposals and the likelihood that demand will increase if more federal funding becomes available. GAO recently listed 11 current high speed rail proposals that are in the environmental review phase; cost estimates were available for 9 of the 11 projects, and the total estimated costs were around $68 billion (half of that was for Phase 1 of the California High Speed Rail proposal).[83]

In response to the $8 billion that Congress provided for intercity passenger rail capital grants in ARRA, FRA received 45 applications, representing 24 states, requesting a total of approximately $50 billion.[84] Since states had only a few months to prepare and submit these applications "for what will amount to commitments to develop specific high-speed rail corridors," it seems likely that a second round of grants might receive additional applications. And while the applications greatly exceeded the available funding, in at least one case it appears that a state held back additional applications for grants so as not to be competing with itself for the available funding.[85]

The Administration has indicated that it will ask for $1 billion for each of the next five years through the annual appropriations process for high speed rail and intercity passenger rail development.[86] The new high speed rail development program has an 80% federal share, so that

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[80] Elizabeth Kneebone, "Job Sprawl Revisited: The Changing Geography of Metropolitan Employment," Brookings Metropolitan Policy Program, April 2009.

[81] Ibid., pp. 10-14.

[82] According to U.S. Census 2005 data, 55.1% of occupied housing units in New York City do not keep a vehicle available at home for personal use. U.S. Census, *County and City Data Book: 2007*, 14th edition. The only other cities with at least a third of households not having a vehicle are also in the Northeast Corridor: Washington, DC, Boston, and Philadelphia.

[83] U.S. Government Accountability Office, *High Speed Passenger Rail: Future Development Will Depend on Addressing Financial and Other Challenges and Establishing a Clear Federal Role*, GAO-09-317, March 2009, Appendix III, http://www.gao.gov.

[84] Testimony of Joseph C. Szabo, Administrator, Federal Railroad Administration, U.S. Department of Transportation, before the U.S. Congress, House Committee on Transportation and Infrastructure, Subcommittee on Railroads, Pipelines and Hazardous Materials, *High-Speed Rail in the United States: Opportunities and Challenges*, 111th Cong., 1st sess., October 14, 2009, p. 9.

[85] California reportedly held back 29 applications totaling $1.1 billion for incremental improvements in the second-busiest rail corridor in the nation so as not to compete with its $4.7 billion application for a dedicated high speed rail line. Dan Weikel and Eric Bailey, "Schwarzenegger quietly quashed effort to improve commuter rails," *Los Angeles Times*, November 13, 2009, http://www.latimes.com/news/local/la-me-rail13-2009nov13,0,6550006.story.

[86] United States Office of Management and Budget, *FY2010 Budget of the United States of America, Overview: Department of Transportation*, p. 91, http://www.whitehouse.gov/omb/assets/fy2010_new_era/
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$5 billion could potentially support $6.25 billion or more in passenger rail spending (the $8 billion in ARRA does not require a local match), for a total of at least $14.25 billion, but that money is to be dispersed via three intercity passenger rail federal grant programs, only one of which is specifically for high speed rail. Separately, the House Transportation and Infrastructure Committee's proposal for surface transportation authorization includes $50 billion over six years for high speed rail development, an average of $8.3 billion annually.[87]

The federal budget is viewed by many as being constrained by economic challenges, ongoing wars, growth in entitlement spending (which accounts for the majority of the budget), and a shortfall in revenues. In the overall federal budget, spending on HSR must compete against other priorities, including defense, homeland security, education, and health care. Two congressionally appointed commissions have recently recommended that Congress more than double the current amount of funding going to highway and transit programs, and the leaders of the House Transportation and Infrastructure Committee have proposed nearly doubling the level of federal highway and transit spending in their surface transportation reauthorization proposal. Meanwhile, the dedicated funding source for federal highway and transit programs—the Highway Trust Fund—is unable to sustain even the current level of program funding, and had to be supplemented by $8 billion in General Fund appropriations in FY2008 and another $7 billion in FY2009.

The Transportation and Infrastructure Committee's proposed $50 billion authorization for high speed rail does not include a dedicated revenue source. Proponents of HSR worry that, given the length of time to develop HSR projects (typically, around 10 years or more) and the competing demands of other issues, providing a steady stream of funding for HSR from discretionary funding, through changing Congresses and Administrations, will be difficult. Without a dedicated funding source of its own, rail transportation competes with the other programs in the THUD appropriations bill which receive discretionary funding, most of which are housing programs. Only about $6 billion of DOT's funding (excluding ARRA funding) came from the General Fund in FY2008. Providing another $1 billion in General Fund money for high speed rail each year, let alone $8.3 billion, would represent a significant increase in DOT's General Fund appropriation.

One option that has often been suggested as a way of funding a federal intercity passenger rail development program is the creation of a dedicated funding source (a trust fund) for federal rail transportation. A dedicated funding source increases the predictability of future funding levels, and so makes long-term capital planning easier. This could improve the efficiency, and reduce the cost, of project development.

Advocates have repeatedly suggested dedicating a portion of the Highway Trust Fund's revenues for this purpose, but such proposals have not been accepted, and with the Highway Trust Fund's outlays to highway and transit currently exceeding its revenues, prospects for diverting a portion of those revenues to a rail trust fund appear no more favorable than in the past.

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Department_of_Transportation1.pdf.

[87] U.S. Congress, House Committee on Transportation and Infrastructure, *The Surface Transportation Authorization Act of 2009: A Blueprint for Investment and Reform*, Executive Summary, 111th Cong., 1st sess., June 18, 2009, p. 4, available at http://transportation.house.gov/Media/file/Highways/HPP/Surface%20Transportation%20Blueprint%20Executive%20Summary.pdf

Another proposed revenue source has been to add a tax onto the tickets of intercity rail passengers that would go into a rail trust fund, as the Airport and Airway Trust Fund is funded in part by a tax on airline tickets. This proposal faces several difficulties. First, such a tax is unlikely to raise revenues that are significant relative to the amount needed. In FY2008, Amtrak reported having 28.7 million riders, paying an average ticket price of $60.39.[88] Adding a 10% ($6) tax on those tickets would have raised $172 million, assuming that ridership did not decline as a result of the price increase. That is not an insignificant sum—it is more than the amount that states provided in support of Amtrak routes in 2008 ($164.5 million[89])—but in the context of multi-billion dollar high speed rail projects, it would not go far. Second, increasing the price of rail tickets by adding a tax will make rail travel relatively less competitive with other modes, and thus is likely to somewhat reduce the number of rail passengers, all else being equal. Third, critics of this proposal note that Amtrak, currently the only intercity passenger rail operator, does not earn enough revenue to cover its costs, and requires government assistance to cover the roughly $1 billion shortfall each year. So raising the cost of rail travel on Amtrak, which is subsidized by the government, then directing the additional revenue into a rail trust fund, much of which would likely be disbursed to Amtrak, would appear to provide little net increase in support for rail travel.

A third possible revenue source suggested by some is to dedicate a portion of the revenues from proposed greenhouse gas emissions reduction programs to a rail trust fund. However, there are many competing claims on the prospective revenues from such proposals, including from the public transit community.

Proponents of rail funding have also recommended the use of bonds, including tax-exempt bonds and tax-credit bonds, to fund development of high speed rail lines. However, by borrowing the money and spreading out the repayment over a long period of time, bonds increase the cost of a project compared to paying for it all upfront. On the other hand, proponents contend that since rail improvements have long lifetimes, there is a case for having the cost of those improvements paid by the people who will benefit from the improvements many years into the future, rather than having the cost paid primarily by those in the present day. Based on the costs of high speed rail development and the revenue experience of high speed lines in other countries, it appears likely that the loans would have to be repaid primarily by the federal or state governments, or both. Consequently, critics of this approach contend that it would be preferable to draw funding from the government’s general fund, since a portion of the federal budget is already being financed by the sale of bonds, which will be repaid by future taxpayers.

Prospects for significant funding from states are not promising. Most states’ budgets are constrained by current economic difficulties, and those budgets face growing demands in other areas, such as pensions and health care, as well as for highways and transit. The availability of dedicated funding sources for highway and transit in some states, and the lack of a dedicated funding source for rail, makes it more difficult for states to pursue rail as an alternative to highways or transit when evaluating the need for new transportation investment.

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[88] Amtrak, *Monthly Performance Report for September 2008*, published December 8, 2008, p. A-2.2 (available at http://www.amtrak.com/pdf/0809monthly.pdf).

[89] National Railroad Passenger Corporation and Subsidiaries (Amtrak), *Consolidated Financial Statements For the Years Ended September 30, 2008 and 2007*, p. 6 (available at http://www.amtrak.com/pdf/08financial.pdf).

Prospects for significant funding from the private sector are even less clear. Given the high up-front costs of developing a high speed line, and the uncertain prospect of a high speed line covering even its operating costs, let alone its development costs, there has not yet been a successful development of a privately financed high speed passenger rail line in the post-Amtrak era in the United States.[90] In fact, as noted earlier, some experts say that only two high speed rail lines in the world (not national systems, but individual routes) have been successful enough to cover both their development and operating costs. While partnerships between public and private entities may offer a way to develop high speed rail lines at less cost to taxpayers than having them developed entirely by public agencies, structuring such partnerships is complex, and it will take time for federal and state rail agencies to develop expertise in this area.[91]

Considerations for Congress

In considering the scope and structure of further initiatives regarding HSR, there are a number of issues Congress may wish to examine. The first of these is the rationale for building HSR. Proponents of HSR contend that it provides a number of direct and indirect benefits to travelers and the general public, some of which may not be apparent until far into the future. The extent of those benefits would depend largely on the level of ridership, which is difficult to forecast accurately. Critics of HSR contend that from a benefit-cost perspective, there are few, if any, places in the United States where ridership demand would ensure that benefits would sufficiently outweigh the costs. The level of ridership would depend, to some extent, on the adoption of policies that would encourage people to use high speed rail. High speed rail systems in other countries are part of national transportation policies which support HSR use through both incentives (e.g., widespread provision of a complementary mode, public transit) and of disincentives (e.g., policies which make automobile use more expensive, such as relatively high taxes on motor fuel). Without similar policies in place here, HSR ridership in the United States may not match expectations based on the experiences of other countries.

Many of the benefits ascribed to HSR, such as improved mobility, reductions in imported energy, reduced greenhouse gas emissions, and so forth, would come from very high speed rail lines. Yet very high speed lines are the most expensive and potentially risky investments from a cost-effectiveness perspective. Very high speed rail competes primarily with commercial aviation. Commercial aviation receives relatively little federal support from general Treasury funds compared to the level of government assistance which would likely be required to develop and operate a high speed rail network. And while very high speed rail is seen as potentially helping to relieve congestion in the aviation sector, Congress is supporting improvements to the aviation system which are expected to significantly expand the air network's capacity.

[90] There is currently one prominent proposal for a privately financed high speed line, between Victorville, CA (suburban Los Angeles) and Las Vegas, Nevada. This would be a grade separated, dedicated double-tracked passenger-only line of approximately 200 miles that would generally follow the I-15 corridor. The developer, DesertXpress Enterprises, describes the project as a public/private partnership, since it hopes to make use of the public right-of-way (http://www.desertxpress.com/economics.php). It has also been reported that while DesertXpress says it will build the project without public funding, it may ask for federal loans to help finance the $4 billion to $5 billion project ("High-speed Train Option to Victorville Advances," Las Vegas Sun, July 2, 2009, http://www.lasvegassun.com/news/2009/jul/02/high-speed-train-option-victorville-advances/).

[91] For that matter, the FRA's Preliminary National Rail Plan notes that the United States has "a dwindling pool of expertise in the field of passenger rail" in general.

Congressionally appointed study commissions, as well as the DOT, contend that the level of investment in highway and transit infrastructure needs to significantly increase. Congress may wish to consider whether to further increase overall transportation funding to include funding for HSR, or to redirect some funding from highway and transit programs to HSR.

Another issue is the allocation of the costs of high speed rail development among the federal government, state and local governments, and the private sector. Congress specified that the $8 billion provided in ARRA would be provided without requiring any local matching funds, but the high speed rail development program authorized in the PRIIA provided that the federal share of grants under that program should not exceed 80% (which is the prevailing match for most highway construction). Some contend that the federal share should be lower, as it is for rail transit construction.[92]

The allocation of grant funds among types of HSR is also something that Congress may want to consider. Some contend that what is needed to build support for high speed rail is a flagship project that demonstrates its potential. This leads to the conclusion that the relatively limited funds should be concentrated on one or two high-profile projects. Others contend that a better way to build momentum for HSR development is by funding incremental improvements to passenger routes in many parts of the country, so that the benefits of higher speed rail service are experienced by more people.

Related to those questions is the process of choosing which high speed rail projects should receive funding. In the high speed rail development program, Congress required that projects be part of a state rail plan or the national rail plan in order to receive funding. The FRA is currently developing a national rail plan,[93] but it is not clear whether that plan will be completed before the first round of high speed rail development grants are made. Some observers contend that making grants for high speed rail development in the absence of a plan for the development of high speed rail is putting the cart before the horse. Nor is it clear from the FRA's description of how it intends to develop a national rail plan the degree to which that plan will reflect the rail plans of the states as opposed to establishing a national rail vision that will lead the efforts of the states.

Beyond the development costs, Congress may wish to consider how to pay for maintaining an HSR system over the long term. Passenger revenues may not be sufficient to cover the operating costs of high speed lines. The federal government's responsibility in financing this gap versus the responsibility of state or local governments has not been determined.

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[92] While the federal share for new rail transit projects receiving funding through the Federal Transit Administration's New Starts program can, by statute, be up to 80%; in practice the average federal share is lower; FTA has encouraged applicants to provide a local match of more than 20%, and since FY2002 the Senate Committee on Appropriations has directed FTA not to provide more than a 60% federal match.

[93] FRA has published a Preliminary National Rail Plan. The preliminary plan is described as setting forth FRA's proposed approach to developing the long-range National Rail Plan, including providing background information and identifying issues that FRA believes should be considered in developing National Rail Plan. Federal Railroad Administration, *Preliminary National Rail Plan: The Groundwork for Developing Policies to Improve the United States Transportation System*, October 15, 2009, http://www.fra.dot.gov/Downloads/RailPlanPrelim10-15.pdf.

Appendix. Federally Designated High Speed Rail Corridors

Figure A-1. Map of Federally Designated High Speed Rail Corridors

Source: Federal Railroad Administration, High-Speed Rail Corridor Descriptions, available at http://www.fra.dot.gov/us/content/203.

Notes: The Northeast Corridor, from Washington DC, to Boston, is a high speed rail line, but is not a federally designated high speed rail corridor. There are no federally designated high speed rail corridors in Alaska or Hawaii.

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