SHOW-ME INSTITUTE

ADVANCING LIBERTY WITH RESPONSIBILITY BY PROMOTING MARKET SOLUTIONS FOR MISSOURI PUBLIC POLICY

POLICY STUDY

NUMBER 21 SEPTEMBER 29, 2009

WHY MISSOURI TAXPAYERS SHOULD NOT BUILD HIGH-SPEED RAIL

By Randal O'Toole

EXECUTIVE SUMMARY

In February 2009, Congress dedicated $8 billion of stimulus funds to high-speed rail projects. In April 2009, President Barack Obama released his high-speed rail "vision" for America, which includes 8,500 miles that the Federal Railroad Administration had identified as potential high-speed rail routes in 2001. In June, the FRA announced its criteria for Missouri and other states to apply for high-speed rail grants out of the $8 billion in stimulus funds.

Yet the FRA has no estimates of how much high-speed rail would ultimately cost, who would ride it, who would pay for it, and whether the benefits can justify the costs. A realistic review shows that high-speed rail would be extremely costly and would add little to American mobility or environmental quality.

The best available data indicate that the FRA plan would cost about $90 billion, or roughly one fifth the inflation-adjusted cost of the Interstate Highway System. This plan would provide trains with average speeds of 140–150 miles per hour (mph) in California, 75–85 mph in Florida, and moderate-speed trains averaging 55–75 mph in Missouri and 30 other states.

The average American would ride these trains less than 60 miles per year, or about one seventieth as much as the average American travels on interstate freeways. In fact, most of the taxpayers who pay for high-speed trains would rarely, if ever, use them. Because of a premium fare structure and downtown orientation, the main patrons of high-speed trains would be the wealthy and downtown workers, such as bankers, lawyers, and government officials, whose employers pay the fare.

A true high-speed rail system, with average speeds of 140–150 mph connecting major cities in 33 states, would cost well over $500 billion. Meeting political demands to close gaps in the system could bring the cost

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close to $1 trillion. At twice the cost of the Interstate Highway System, such a true high-speed rail system would provide less than one tenth the mobility offered by the interstates.

These costs include only the projected capital costs. If Missouri decides to build moderate- or high-speed rail, it may be responsible for cost overruns, operating losses, and the costs of replacing and rehabilitating equipment about every 30 years.

Upgrading the 250 miles of Missouri tracks in the FRA plan to run trains at 110 mph would cost taxpayers at least $875 million, or nearly $150 for every Missouri man, woman and child. Subsidizing passenger trains over those routes would cost millions more per year, yet the typical Missourian would take a round trip on such trains only once every six years.

Far from being environmental saviors, high- and moderate-speed trains are likely to do more harm to the environment than good. In intercity travel, automobiles are already as energy efficient as Amtrak, and the energy efficiencies of both autos and airliners are growing faster than trains. The energy cost of constructing new high-speed rail lines would dwarf any operational savings. As the state of Florida concluded in 2005, "the environmentally preferred alternative is the No Build Alternative."

To add insult to injury, the administration is likely to require states that accept high-speed rail funds to regulate property rights in a futile effort to discourage driving and promote rail travel. These regulations would deny rural landowners the right to develop their land while they make urban housing unaffordable and disrupt neighborhoods through the construction of high-density housing.

A recent study for the Missouri Department of Transportation identified several enhancements to the current Amtrak route connecting Kansas City and Saint Louis that could significantly improve the current rail service between the cities for substantially less cost than the high-speed rail proposal.

For all of these reasons — high costs, tiny benefits, and interference with property rights — Missouri taxpayers would not be well-served by the government's provision of high-speed passenger rail service. A better plan would be to use the state's share of the $8 billion stimulus funds solely for incremental upgrades, such as safer grade crossings, longer track sidings, and signaling systems, that do not obligate state taxpayers to pay future operations and maintenance costs.

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INTRODUCTION

In February 2009, President Obama asked Congress to include $8 billion for high-speed trains in the American Recovery and Reinvestment Act. High-speed rail, he said, would be his "signature issue" in the stimulus program.[1] Later that month, Obama's 2010 budget proposed to spend an additional $1 billion per year for five years on high-speed rail.[2]

In April, Obama presented his national high-speed rail vision to the public. Under the plan, about 8,500 route-miles of high-speed trains would connect key cities in 33 states along the eastern and Gulf Coast seaboards, in the Midwest, Texas-

Oklahoma-Arkansas, California, and the Pacific Northwest.[3] In June, the Federal Railroad Administration (FRA) published its guidelines for state applications for a share of the stimulus funds for local rail projects.[4]

The White House claims the high-speed rail plan "mirrors that of President [Dwight] Eisenhower, the father of the Interstate Highway System, which revolutionized the way Americans traveled."[5] Just as Eisenhower borrowed his 40,000-mile interstate highway plan from an existing proposal developed years before by the Bureau of Public Roads, Obama's 8,500-mile high-speed rail network was identical to one proposed by the FRA in 2001.[6]

However, there are four crucial differences between interstate highways and high-speed rail. First, the Bureau of Public Roads gave President Eisenhower a reasonable estimate of how much the interstates would cost. But the FRA has not offered anyone an estimate of how much its high-speed rail network would cost.

Second, the Bureau of Public Roads had a plan for paying for interstate highways: through gas taxes and other highway user fees. In fact, the entire system was built on a pay-as-you-go basis out of such user fees; not a single dollar of general taxpayer money was spent on the roads. In contrast, the FRA has no financial plan for high-speed rail, no source of funds, and no expectation that passenger fares would cover all of the operating costs — much less any of the capital costs.

The third key difference is that the interstates truly did revolutionize American travel, while high-speed rail would never be more than a tiny, but expensive, part of the American transportation network. In 2007, the average American traveled 4,000 miles — more than 20 percent of all passenger travel — and shipped 2,000 ton-miles of freight over the interstates.[7] Finally, given that interstate highways serve all major cities in all 50 states, it is likely that the majority of Americans travel over an interstate at least once if not several times a week. In contrast, high-speed trains would mainly be used by a relatively wealthy elite.

The most optimistic analysis projects that, if the FRA high-speed rail network is completely built by 2025, the average American would ride this system just 58 miles per year — about one seventieth as much as the Interstate Highway System.[8] That is hardly revolutionary. Moreover, considering the premium fares for riding high-speed trains and the fact that trains will mainly serve downtown areas, most of that use would be by the wealthy and by bankers, lawyers, government workers, and other downtown employees whose employers pay the fare, while all other taxpayers would share the cost.

The FRA is not proposing to build 200-mph bullet trains throughout the United States. Instead, in most instances it is proposing to upgrade existing freight lines to allow passenger trains to run as fast as 110 mph — which means average speeds of only 55–75 mph. This would actually be slower than driving for anyone whose origin and destination are not both right next to a train station.

Even worse, it may not be practical to run 110-mph passenger trains on the same tracks as freight trains. According to Matt Rose, the chief executive officer

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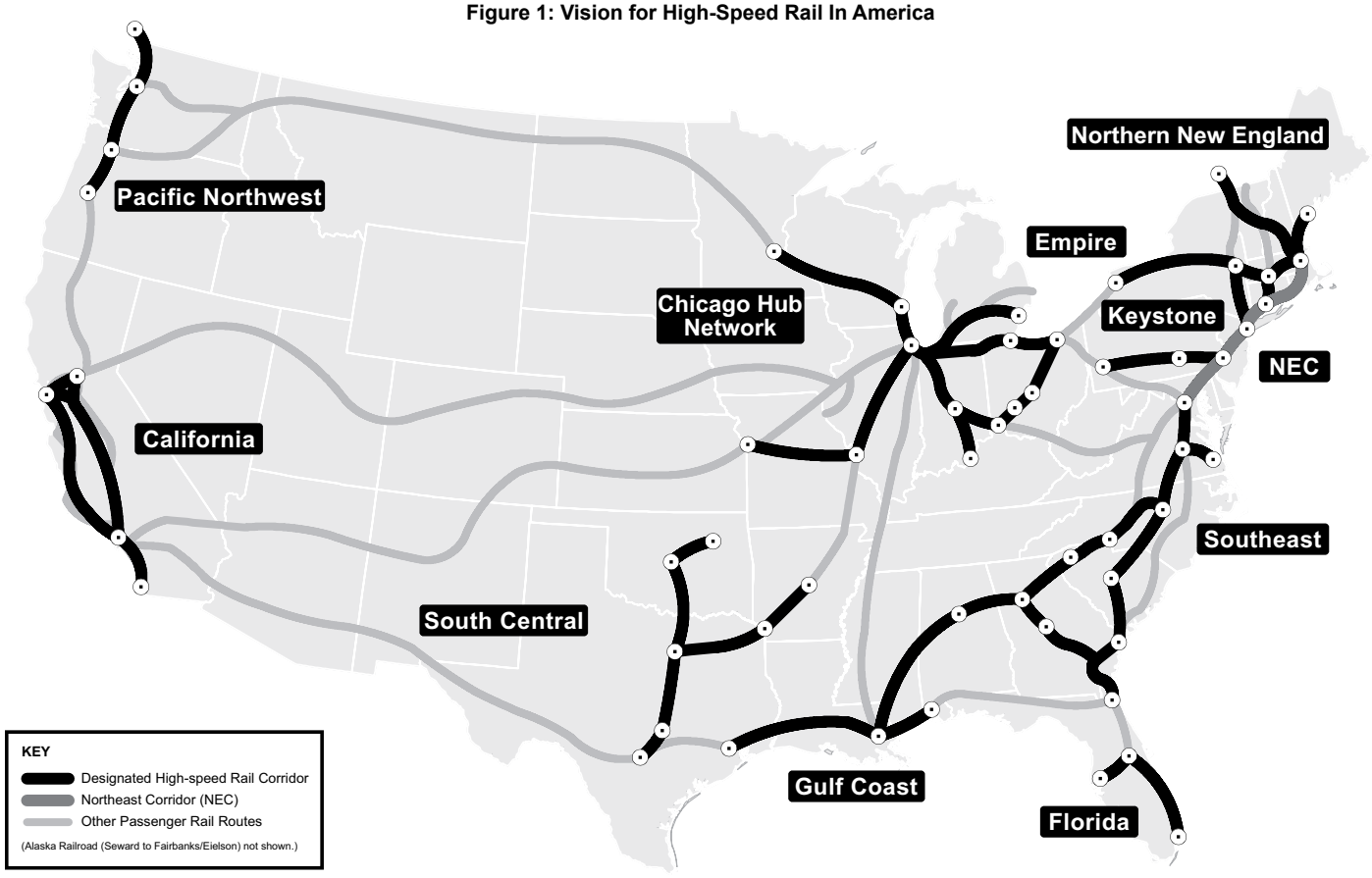
of Burlington Northern Santa Fe Railway, passenger trains that run faster than 90 mph are not compatible with freight trains because "managing the flow of train traffic with such differences in speeds would make the joint use of track uneconomic and impracticable."[9] Trains with a top speed of 90 mph would only be 11 mph faster than today's Amtrak trains, and their average speeds of about 60 mph would not be enough to entice many people out of their cars.

Yet even true high-speed trains have not been particularly successful in France or Japan. While the trains may be enjoyed by tourists who do not want to rent a car, the average residents of France and Japan ride them less than 400 miles per year — about one round trip between Saint Louis and Kansas City — and barely 2 percent as much as the average American travels each year.[10] The expenditure of tens and even hundreds of billions of dollars on high-speed rail has not relieved traffic congestion on any highways or prevented the continuing decline of rail's importance as a mode of passenger transportation.

Moreover, the environmental benefits of high-speed rail are greatly exaggerated.

Figure 1: Vision for High-Speed Rail In America



The Federal Railroad Administration's "vision" for high-speed rail includes nearly 800 miles of very-high-speed (top speed of 220 mph, average speed of 140–145 mph) lines in California, about 350 miles of high-speed (top speed of 125 mph, average speed of 80–85 mph) lines in Florida, and about 7,500 miles of moderate-speed (top speed of 110 mph, average speed of 55–75 mph) lines in other parts of the country. It is only a vision, not a real plan, because the FRA has no idea how much it would cost, how to pay for it, who would ride it, or whether the benefits justify the costs. Source: FRA, 2009. Online here: tinyurl.com/cvw8s6

Table 1: FRA High-Speed Rail Corridors

CORRIDOR	END-POINT CITIES	MILES	TOP SPEED
California	Sacramento–San Diego	785	220
Empire	New York–Buffalo	440	125
Florida	Tampa–Orlando-Miami	355	125
Gulf Coast	Houston–Atlanta New Orleans–Mobile	940	110
Keystone	Philadelphia–Pittsburgh	350	110
Midwest	**Minneapolis–Chicago–Saint Louis, Detroit–Chicago–Cleveland–Cincinnati–Chicago**	**1,805**	**110**
	Saint Louis–Kansas City	**285**	**90**
	Indianapolis–Louisville	**110**	**79**
New England	Portland-Boston–Montreal	705	110
Pacific Northwest	Eugene–Vancouver	465	110
South Central	San Antonio–Little Rock–Tulsa	915	
Southeast	Washington–Atlanta, Atlanta–Jacksonville, Raleigh–Jacksonville Richmond–Hampton Roads	1,490	110

Mileage figures are approximate. Because 95 miles of the New England corridor and 55 miles of the Pacific Northwest corridor are in Canada, they are not counted in the 8,500-mile total mentioned in this report. In some cases, miles are estimated using Google maps. Source: "High-Speed Rail Corridor Designations," Federal Railroad Administration, 2005. Online here: tinyurl.com/6s94zd

Amtrak today is only a little more energy efficient than flying, and about the same as intercity driving. But airline and auto energy efficiencies have both grown much faster than Amtrak's, so by the time any high-speed rail lines are open for business, any energy savings they provide would be negligible. The FRA's moderate-speed trains would be powered by diesels, and because greenhouse emissions from petroleum-powered vehicles are almost exactly proportional to energy consumptions, the greenhouse-gas savings would also be negligible.

To make matters worse, high-speed rail is likely to be accompanied by land-use regulation with dubious benefits and high costs. High-speed rail, various urban transit programs, and transit-oriented housing programs are all a part of the presidential administration's so-called "livability" campaign. As Transportation Secretary Ray LaHood recently admitted, the purpose of this campaign is to "coerce people out of their cars."[11]

I. HIGH-SPEED RAIL'S EXPENSIVE SLIPPERY SLOPE

President Obama's high-speed rail vision was greeted with euphoria by rail advocates and members of Congress eager to stimulate the economy and distribute pork to their states and districts.

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For safety reasons, passenger trains running faster than 110 mph are incompatible with slower freight trains.

As a result, few have asked critical questions about the plan, such as: How much will it cost to build? How much will it cost to operate? Who will ride it? What share of operating and capital costs will be recovered by passenger fares?

The Federal Railroad Administration's vision for high-speed rail makes no attempt to answer any of these questions. Instead, it merely designates corridors (Table 1) and leaves to states like Missouri the job of doing cost and financial forecasts.[12]

The actual costs will depend heavily on what kind of high-speed rail is built. As Table 1 shows, most of the proposed routes would have top speeds of 110 mph. This would entail improving existing freight lines to allow moderately fast passenger trains.

This is hardly a new technology. In an effort to attract people out of their cars, the Burlington, Milwaukee Road, Pennsylvania, Santa Fe, Union Pacific, and other railroads all began running passenger trains at more than 100 mph during the 1930s. The Milwaukee Hiawatha, for example, routinely reached 110 mph on its route from Chicago to Minneapolis.[13] These fast trains were thrilling to watch but failed to stop the decline of passenger trains after World War II.

Amtrak today runs trains at top speeds of 100 mph or more in several corridors. Trains reach 150 mph between New York and Boston, 135 mph between New York and Washington, 110 mph between New York and Albany, Philadelphia and Harrisburg, and Chicago and Detroit, and 90 mph between Los Angeles and San Diego. On other routes, Amtrak trains are limited to at most 79 mph.[14] Of course, top speeds are far greater than average speeds; the average speed in the Boston-to-Washington corridor is less than 85 mph; averages in the 110-mph corridors range from 55–65 mph.

Upgrading freight lines to run faster passenger trains would also allow the railroads to increase their freight speeds and capacities, which planners hope would allow them to capture traffic from truckers. Historically, freight railroads have received very little federal aid: only 18,700 of 260,000 miles of rail lines built in the United States received federal subsidies.[15] At least some congressional Democrats see federal aid to railroads as a means of re-regulating the industry, which was deregulated in 1979. For example, if a railroad wants to close an unprofitable branch line, the federal government can use past aid to the railroad to justify a mandate that the line be kept open.[16]

High-speed train aficionados do not consider 110-mph trains to be true high-speed rail. The California legislature defined "high-speed rail" as lines with a top speed of greater than 125 mph. "The reason for the 125 miles per hour threshold," says the California Senate Transportation Committee, "is that existing passenger rail equipment can operate at this speed if the appropriate signaling technology is installed and the right-of-way meets a variety of design and safety standards."[17]

For safety reasons, passenger trains running faster than 110 mph are incompatible with slower freight trains. True high-speed rail cars tend to be very lightweight, and would be easily crushed in a collision with loaded freight cars.[18]

Such trains could be dangerous to operate on the same tracks as freight trains, as is done with the primary Amtrak route in Missouri.

This means that any corridors calling for higher speeds require tracks dedicated to passenger trains, which usually means new construction. True high-speed rail is therefore far more expensive than 110-mph moderate-speed rail.

Various states have developed cost estimates for individual corridors. In 2004, the Midwest High Speed Rail Initiative estimated that bringing 3,150 miles of Midwest routes up to moderate-speed standards would cost $7.7 billion, or $2.4 million per mile.[19] (All of these costs include locomotives, rail cars, and stations, as well as new tracks or upgrades to existing tracks.)

In 2005, the New York High Speed Rail Task Force estimated that upgrading the track in the Empire Corridor between New York City and Buffalo — a small portion of which currently supports 110-mph trains, but most of which is limited to 79 mph — to consistent 110-mph standards (with a small portion as fast as 125 mph) would cost $1.8 billion, or $3.9 million per mile.[20]

New tracks are far more expensive. In 2005, the Florida High Speed Rail Authority estimated that a new 92-mile line capable of running gas-turbine trains at 125 mph between Tampa and Orlando would cost from about $2.05 billion to $2.47 billion, or $22 million to $27 million per mile.[21]

In 2008, the California High-Speed Rail Authority estimated that a 490-mile initial segment from San Francisco to Anaheim would cost $33 billion, or about $67 million a mile.[22] At this average rate, planned branches to Sacramento, Riverside, and San Diego would cost another $19 billion. These costs are higher than Florida's because the terrain is more mountainous, electric-powered trains require extra infrastructure, and California plans to run trains at 220 mph instead of 125 mph.

Even accounting for the current recession, construction costs have grown significantly since some of these estimates were made. In much of the country, construction costs have increased by nearly 50 percent since 2004.[23] To be conservative, this study will assume that costs estimated in 2004 have increased by 35 percent, and costs estimated in 2005 have increased by 25 percent. Based on the estimates for the Midwest corridor, upgrading track to support 110-mph trains would cost $3.5 million per mile. If applied to the Federal Railroad Administration's entire 8,500-mile system, that would total nearly $30 billion, or close to four times the amount of money Congress has approved for high-speed rail.

However, some places are not satisfied with 110-mph trains. California voters approved a $9 billion down payment on its $33 billion trunk line from San Francisco to Los Angeles, and the state's rail authority fully expects the federal government to pay half of the total cost. Florida's 125-mph Orlando-to-Tampa line is only one quarter of the Miami-Orlando-Tampa route in the FRA plan. Assuming an average cost of $31 million per mile (the midpoint between $22 and $27, adjusted for recent increases in construction costs), this entire line would cost more than $11 billion (Table 2).

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The 8,500-mile FRA network only reaches 33 states. Arizona, Colorado, Nevada, and Tennessee are among the fast-growing states left out of the network, and every excluded state is represented by senators and representatives who will wonder why their constituents have to pay for rail lines that only serve other states.

Table 2
Estimated Costs of High-Speed Rail, by Corridor
(billions of dollars)

	FRA PLAN		AMENDED PLAN	
	MILES	COST	MILES	COST
California	785	$52.0	785	$52.0
Empire	440	$2.1	440	$2.1
Florida	355	$11.1	355	$11.1
Gulf Coast	940	$3.3	1,020	$3.6
Keystone	350	$1.2	350	$1.2
Midwest	**2,190**	**$7.7**	**3,150**	**$11.0**
New England	705	$2.5	705	$2.5
Pacific Northwest	465	$1.6	465	$1.6
South Central	915	$3.2	1,235	$4.3
Southeast	1,490	$5.2	1,630	$5.7
Rocky Mountain	0	$0.0	950	$3.3
Las Vegas	0	$0.0	250	$0.9
Total	8,635	$89.9	11,335	$98.6

The amended network includes frequently mentioned high-speed rail corridors left out of the FRA plan, including Dallas–Houston, Jacksonville–Orlando, Los Angeles–Las Vegas, and Albuquerque–Cheyenne.

At minimum, then, the FRA plan would cost at least $90 billion. About 90 million people file federal income tax forms and pay income taxes each year, so the FRA plan will cost each income tax payer about $1,000.[24]

One indication that the $90 billion figure is conservative comes from the states themselves, which collectively submitted $102 billion in grant applications to the FRA in July.[25] This $102 billion is only for the federal share of high-speed rail projects; the state shares will be tens of billions of dollars more.

One reason the states are asking for more than $90 billion in grants is that many are going beyond the FRA system by adding routes or increasing speeds above 110 mph. The 8,500-mile system proposed by the FRA has some significant gaps. The Midwest High-Speed Rail Initiative proposed several hundred miles of routes not included in the FRA plan. Other notable absences include proposed lines from Dallas to Houston, Jacksonville to Orlando, and Los Angeles to Las Vegas. Altogether, these represent about 1,750 route miles with a cost, if brought to 110-mph standards, of $6.1 billion.

The nature of politics means that the costs are not likely to stop there. The 8,500-mile FRA network only reaches 33 states. Arizona, Colorado, Nevada, and Tennessee are among the fast-growing states left out of the network, and every excluded state is represented by senators and representatives who will wonder why their constituents have to pay for rail lines that only serve other states.

A particularly large hole in the system can be found in the Rocky Mountains, which are ignored by the FRA plan even

though Phoenix and Denver are two of America's largest urban areas. Although Congress authorized the FRA to designate 11 high-speed rail corridors, it has identified only 10. The Rocky Mountain Rail Authority, which is funded by the Colorado Department of Transportation, has proposed an 11th corridor consisting of a high-speed line from Albuquerque to Cheyenne, extending west to Grand Junction, Aspen, and Craig, Colorado.[26] At 110-mph standards, that would add another $3.3 billion.

These additions would bring the total to nearly $100 billion. For comparison, the Interstate Highway System cost about $425 billion after adjusting for inflation to today's dollars.[27]

More than half of the total cost of the FRA plan would go toward the California lines, which make up less than 10 percent of the route miles. For this reason, the California High-Speed Rail Authority believes it has "every right to think we would receive the lion's share of the" $8 billion that Congress has approved for high-speed rail.[28] However, if California does receive a significant share of federal funds, elected officials from other states are likely to demand that the federal government build them true high-speed lines as well.

As if to forestall this possibility, Amtrak's president, Joseph Boardman, told Illinois legislators in May 2009 that a complete network of true high-speed rail lines would be "prohibitively expensive."[29] But people in the Midwest, Texas, and other places are likely to ask, "Why is it prohibitively expensive for us to have true high-speed rail, but not for California?"

For example, most proposals for the Texas, Las Vegas, and Rocky Mountain corridors call for true high-speed rail. Based on estimates in the California plan, which is $67 million per mile, building the entire network to true high-speed rail standards would cost between $550 billion and $700 billion.[30] Adding service to some or all of the 13 other states not included in the FRA plan would drive the cost even higher.

Of course, once high-speed rail is built connecting trendy cities all over the country, they will want the federal government to help them build streetcars and light-rail lines so that high-speed rail travelers won't have to sully themselves by riding buses or taxis to their final destinations. Light rail and streetcars are, after all, a part of the administration's "livability" agenda. This would add hundreds of billions to the cost of the nation's passenger rail system.

All politics is local, so every member of Congress will want a piece of the high-speed rail pie. Initial funding of $8 billion effectively commits the nation to a $99 billion program, which eventually turns into a $700 billion program, with actual costs eventually exceeding $1 trillion. This doesn't count cost overruns, operating subsidies, and rail rehabilitation every 30 or so years. These are not imaginary numbers; even BNSF CEO Matt Rose says that a national system of true high-speed rail "is a trillion dollar funding project."[31]

Cost overruns are almost a certainty with large-scale public works projects, partly because project proponents tend to offer initially low cost estimates in order to gain public acceptance. Danish planning professor Bent Flyvbjerg argues that megaproject cost estimates should be increased by the proportion by which similar projects have gone over

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Despite optimistic forecasts by rail proponents, passenger fares would rarely if ever cover high-speed operating costs. Amtrak operations currently cost federal and state taxpayers more than $1 billion per year.

their originally projected budgets.[32] No high-speed rail line has ever been built from scratch in the United States, but historically, urban passenger rail projects have gone an average of 40 percent over their projected costs.[33]

Despite optimistic forecasts by rail proponents, passenger fares would rarely if ever cover high-speed operating costs. Amtrak operations currently cost federal and state taxpayers more than $1 billion per year.[34] According to the bipartisan Amtrak Reform Council, Amtrak's trains between Boston and Washington lost nearly $2.30 per passenger in 2001.[35] If trains in the most heavily populated corridor in the United States cannot cover their costs, no other trains will come close.

The Amtrak Reform Council also estimated that 110-mph trains between Chicago and Detroit lost $72 per passenger; 110-mph trains between New York and Albany lost $28 per passenger; and 90-mph trains between Los Angeles and San Diego lost $28 per passenger. Outside of the Boston-to-Washington and Philadelphia-to-Harrisburg routes, Amtrak short-distance trains lost an average of $37 per passenger.[36] Amtrak typically expects state funding to cover most of the operating losses in regional corridors. In recent years, Missouri's annual operating subsidy for Amtrak has hovered around $8 million per year.[37]

Another hidden cost of rail transportation is that rail lines must be largely and expensively rebuilt about every 30 years. The Federal Transit Administration (FTA) recently estimated that the nation's older rail transit systems are suffering from a $50 billion backlog of unfunded maintenance needs.[38] Congress tends to fund "ribbons, not brooms" — that is, to fund new projects (over which they can cut ribbons) instead of maintaining existing projects. This means that construction of moderate- or high-speed rail lines could leave states obligated to fund billions of dollars of rehabilitation costs.

What will American taxpayers get for this money? To answer that question, it is important to scrutinize the highly touted high-speed trains in Europe and Japan.

II. HIGH-SPEED RAIL IN JAPAN: BULLET TRAINS TO BANKRUPTCY

In 1964, Japanese National Railways began operating the world's first high-speed train, the 135-mph Tokaido Shinkansen, or bullet train, between Tokyo and Osaka. This is also the only high-speed train in the world that has paid for itself, and for good reasons.

First, it was built across flat land at a time when Japan's property values and construction costs were far lower than today. The total cost of the 320-mile line was ¥380 billion, which (adjusting for inflation) equates to about $17 billion, or $53 million per mile.[39]

More important, the Tokaido line connects three of the world's largest and densest metropolitan areas: Tokyo, with 21 million people in 1965 and 33 million today; Osaka, with 13 million in 1965 and 17 million today; and Nagoya, with 6 million people in 1965 and 9 million today.[40] Few other places in the developed world have such concentrations of people located a few hundred miles apart.

Furthermore, in the early 1960s, Japan did not have the problem of attracting people out of their automobiles. As of 1960, when Shinkansen construction began, trains provided 77 percent of all passenger travel while autos provided just 5 percent.[41] Instead, the problem was keeping people from buying and driving autos — and in this, the Shinkansen failed miserably. Between 1965 and 2005, per-capita driving increased by more than 900 percent, while per-capita rail travel increased by a meager 19 percent.

Although the Tokaido line earned a profit, subsequent Shinkansen lines did not. In 1960, the Japanese National Railways was a government-owned corporation that actually made money. But the success of the Tokaido line led politicians in other less densely populated parts of Japan to demand that the company build more high-speed trains to their regions. For example, when Kakuei Tanaka (who was later convicted of accepting a bribe involving the airline industry) was prime minister, he made sure that a high-speed rail line was built into the prefecture he represented, although the line, says the University of Arizona's Louis Hayes, "served very few passengers."[42]

High-speed trains "took on a life of their own as the ultimate pork barrel beloved of politicians," writes an American author now living in Japan, "with the result that gigantic new lines continue to expand across the nation regardless of economic need or environmental impact."[43] To date, at least eight other lines have been built, each more expensive and serving fewer people than the last.

For example, the 167-mile Joetsu line between Omiya and Niigata — cities of less than half a million people each — cost ¥1.7 trillion, which (adjusting for inflation) comes to more than $140 million per mile. Even worse was the 73-mile Nagano line between Takasaki and Nagano, each smaller than 350,000 people. It was built through the mountains at a cost of ¥8.4 trillion, which works out to more than $1 billion per mile.[44]

These, along with other politically driven losses, put the Japanese National Railways in the red for the first time in its history. JNR responded by raising passenger fares, but this only pushed more people off trains and into automobiles. Despite — or because of — the bullet trains, auto travel surpassed rail travel in 1977.

By 1987, expansion of bullet-train service and other below-cost operations had swelled Japanese National Railways' debt to more than $350 billion.[45] (By comparison, General Motors' debt shortly before its recent bankruptcy stood at a mere $35 billion.[46]) This led to a financial crisis that significantly contributed to the nation's economic woes of the last two decades. To understand this crisis, it is important to understand Japan's corporate system, which seemed unbeatable during the 1980s.

Although American investors traditionally judge a company by its profits, Japanese investors judged companies based on their assets. This created an asset bubble and credit crisis that led to Japan's "lost decade" — now on the verge of becoming two lost decades.

Japan effectively created urban-growth boundaries around cities by instituting a 150 percent tax on short-term capital gains of land improvements.[47]

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Japanese travel by train more than the people of any other nation in the world — about 1,950 miles per person per year. But high-speed rail carries only about 20 percent of that travel, or less than 400 miles per person.

This drove up land prices in the cities, increasing the asset value of corporations that owned that land. By the 1980s, most of the assets of major corporations were concentrated in the land they owned, rather than in the things they produced. Even such major companies as Toyota and Sharp were earning more profits on land speculation than on manufacturing.[48]

This created a dangerous feedback loop: As land prices increased, company assets grew — and so did stock prices. Companies issued more stock to buy more land, pushing up land prices still further. Eventually, Japanese real estate was supposedly worth four times the entire United States, and the land in the Imperial Palace in Tokyo was estimated to be worth more than all the real estate in California.[49]

In this situation, the $350 billion debt of the Japanese National Railways did not seem unreasonable, because the company owned lots of land supposedly worth at least that much money. But assets do not pay mortgages, and by 1987 the railroad was in virtual bankruptcy because it could not meet its interest payments.

The government's solution was to privatize the company. Selling the railway lines did not come close to covering the debt. In particular, the government sold the then-operating Shinkansen lines for less than half a penny for every dollar spent building them, even without adjusting for inflation.[50]

The government expected to make up the difference by selling land owned by the railway company. But soon it realized that putting that much land on the market would burst the real estate bubble, which in turn would shake the very foundations of the Japanese economy. So the government decided to absorb the remaining debt. As it turned out, deciding not to sell the land out of a fear it would burst the bubble had the effect of bursting the bubble anyway, and by 1991, Japan's economy was in a shambles.

The government's solution to the economic crisis was to stimulate the economy by building things like more Shinkansen lines.[51] Newer lines have been built at government expense and leased to the private railway companies at rates that will never recover the construction costs.[52] The subsidy to new construction in 2008 alone was ¥307 billion, or almost $30 billion.[53] However, this policy has failed to bring about economic recovery, and Japan is still in the doldrums.

Meanwhile, as attractive as the bullet trains are to American tourists, residents of Japan hardly use them. Japanese travel by train more than the people of any other nation in the world — about 1,950 miles per person per year. But high-speed rail carries only about 20 percent of that travel, or less than 400 miles per person.[54] Japanese travel as much on domestic airlines and almost as much by bus as by high-speed rail, and they travel by car (including tiny cars known as "light motor vehicles") 10 times as many miles per year as by high-speed rail.

III. HIGH-SPEED RAIL IN EUROPE: HIGH-SPEED FAIL

Inspired by the Shinkansen, Italy introduced the high-speed train to Europe in 1978 with its 160-mph *Direttissima* between Rome and Florence. France

followed with the Paris-Lyon *train à grande vitesse* (TGV) of the same speed in 1981. Germany and other countries followed a few years later, and today nine of the EU-15 — the 15 western European countries that made up the European Union in 2000 — have some form of high-speed rail.

Since then, France has been the European leader of the high-speed rail movement and is now running trains with top speeds of 185 mph. French trains carry 54 percent of Europe's high-speed rail passenger-kilometers, followed by Germany at 26 percent, and Italy at 10 percent. More than half of all rail travel in France occurs on high-speed trains, but three out of four rail passengers in the EU-15 still travel at conventional speeds.

American tourists who visit Europe and ride the TGV, the Paris metro, Germany's ICE trains, or the London underground often come home wishing that the United States had a similar transportation system. Of course, the United States isn't Europe; our population densities are lower, and our incomes are higher, so fewer people would ride transit even in dense areas.

More importantly, Europe isn't Europe either — at least not the Europe that many Americans fantasize about. For example, as of 2007, at least 150 European urban areas had some form of rail transit, compared with just 30 in the United States.[55] Yet the average resident of the EU-15 travels just 95 miles per year on urban rail transit, compared with 87 for the average American.[56] This trivial difference hardly justifies the huge amount Europe spends subsidizing urban transit.[57]

Europeans ride high-speed rail more than Americans, but not a lot more. In 2004, the average resident of the EU-15 rode high-speed rail about 125 miles, compared with about 10 miles for the average American. That is 12 times as much, but the 115-mile difference is insignificant compared with total annual EU-15 travel of more than 9,000 miles per person.[58] Residents of the EU-15 fly domestically (that is, within Europe) more than eight times as many miles each year, take buses more than five times as many miles, and drive more than 50 times as many miles as they ride high-speed rail.[59]

Although France has Europe's best-developed high-speed rail network, the average resident of France rides high-speed rail less than 400 miles per year, about the same as the average resident of Japan. The French travel more than the Japanese (or most other Europeans), so high-speed rail carries less than 4 percent of French passenger travel.[60]

Just as in Japan, high-speed rail has not perceptibly slowed the growth of auto driving in Europe. In 1980, when only a few high-speed rail lines were in operation, intercity rail accounted for 8.2 percent of passenger travel in the EU-15. By 2000, it had declined to 6.3 percent, and has continued to decline since then. Meanwhile, the share of European travel using automobiles increased from 76.4 percent to 78.3 percent and the share flying increased from 2.5 to 5.8 percent.[61]

Rail's declining importance in Europe has come about despite onerous taxes on driving and huge subsidies to rail transportation. Much of the revenue from those taxes is effectively used to subsidize rail. "Rail is heavily subsidized," said French economist Rémy Prud'Homme, adding that taxpayers "pay about half

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Table 3
Passenger Travel Mix in 2004

	EU-25	UNITED STATES	JAPAN
Air	8.3%	10.8%	6.3%
Auto	76.3%	86.2%	57.5%
Bus	8.6%	2.7%	6.5%
Rail	5.8%	0.3%	29.3%
Water	0.8%	0.0%	0.3%

"Air" is limited to domestic (within EU-25 in Europe) travel; "auto" includes motorcycles; "bus" includes both intercity and urban buses; "rail" includes both intercity and urban rail. Source: *Panorama of Transport*, European Commission, 2007, p. 103.

Table 4
Freight Travel Mix in 2004

	EU-25	UNITED STATES	JAPAN
Air	0.1%	0.4%	0.2%
Highway	72.5%	28.2%	59.9%
Rail	16.5%	37.9%	4.0%
Pipeline	5.5%	20.6%	0.0%
Waterway	5.4%	12.9%	35.9%

"Water" includes domestic shipping only. Source: National Transportation Statistics, Bureau of Transportation Statistics, 2008, table 1-46b; *Panorama of Transport,* European Commission, 2007, p. 69.

Rail's underutilized performance at carrying freight in both Japan and Europe suggests that the hope of getting both people and freight off the highways and onto trains may be a pipe dream.

the total cost of providing the service." Prud'Homme estimated that rail service in the EU-15 receives about 68 billion euros — or about $100 billion — of subsidies each year.[62]

Nor has the introduction of new high-speed rail service helped relieve highway congestion. "Not a single high-speed track built to date has had any perceptible impact on the road traffic carried by parallel motorways," said Ari Vatanen, a member of the European Parliament.[63] However, the introduction of subsidized high-speed rail has caused some for-profit airlines to end service on parallel routes, which should hardly be a cause for joy.[64]

Europe's passenger travel mix is similar to that of the United States (Table 3). The big difference is that European intercity rail carries a 5.8-percent share of the travel market, compared with Amtrak's 0.1-percent share. However, it is not even clear that this can be attributed to the massive subsidies that Europe is pouring into high-speed rail, given that rail's percentage is steadily declining despite those subsidies. Instead, it may be that Europe's lower incomes and high taxes on autos and fuel has simply slowed the growth of driving. European planners predict that the combined share for rail and buses will continue to decline between now and 2030.[65]

On the other hand, in both Europe and Japan, the emphasis on using rails for moving passengers has had a profound effect on the movement of freight. A little more than a quarter of American freight goes on the highway and well over a third goes by rail, but nearly three-fourths of European freight goes on the road and just one sixth goes by rail (Table 4). Moreover, rail's share of freight movement is declining in Europe — it stood at 22 percent in 1980 — while it increased in the United States from 27 percent in 1980 to 40 percent in 2006.[66]

Rail's underutilized performance at carrying freight in both Japan and Europe suggests that the hope of getting both people and freight off the highways and onto trains may be a pipe dream; a country or region can apparently use its rail system efficiently for either passengers or freight, but not both. The fact that American freight railroads are profitable while European passenger lines are not suggests that freight, not passenger, is the highest and best use of a modern railroad in most places. Spending tens of billions

of dollars per year on passenger rail might provide enough of an incentive for a small percentage of cars to leave the road — but one possible consequence would be to greatly increase the number of trucks on the road.

IV. THE ENVIRONMENTAL COST OF HIGH-SPEED RAIL

When announcing his high-speed rail vision, President Obama promised that high-speed rail would provide "clean, energy-efficient transportation."[67] Many people take it for granted that trains use significantly less energy and produce less pollution and greenhouse gas emissions than other forms of travel. In fact, however, passenger rail's environmental benefits are negligible and costly.

Automobiles consume a huge amount of energy, but that's because they provide so much travel: more than 4 trillion passenger miles a year, and about 85 percent of all passenger travel in the United States.[68] When considered on a per-passenger-mile basis, automobiles are very close to passenger trains.

Many analyses presume that the average auto on the road carries 1.6 people; based on this, Amtrak is more energy efficient than cars. In fact, 1.6 people per car is an average of urban and intercity travel, while intercity autos tend to carry more people. An independent analysis for the California High-Speed Rail Authority found that intercity autos average 2.4 people.[69]

At 2.4 people per vehicle, Amtrak is only 8 percent more energy efficient than light trucks and 15 percent *less* energy efficient than cars (table 5). Amtrak doesn't come close to fuel-efficient cars like the Toyota Prius — even one carrying only 1.6 people.

As an analysis by the Department of Energy concluded, "intercity auto trips tend to be relatively efficient highway trips with higher-than-average vehicle occupancy rates — on average, they are as energy-efficient as rail intercity trips."[70] Those who really want to save energy using mass transportation should consider intercity buses, which use far less energy per passenger mile than passenger trains.

Not only are autos as energy-efficient as Amtrak today, long-term trends favor autos and airlines over trains. Since 1975, airlines have cut the energy they use per passenger mile by more than half, while Amtrak's energy efficiency has grown by just 25 percent (Table 6). Automobile energy efficiencies grew rapidly when gas prices were high, more slowly when prices were low. But even when prices were low, auto manufacturers improved the energy efficiencies of engines so that the number of ton-miles per gallon continued to increase.[71]

Both the airline industry and auto manufacturers expect their energy efficiencies to continue to increase. Boeing promises its 787 plane will be 20 percent more fuel efficient than comparable planes today.[72] Jet engine makers expect to double fuel efficiency by 2020.[73] Automakers signed on to President Obama's 2016 fuel-efficiency targets.[74] If they meet those targets, the average cars and light trucks on the road in 2025 will be 30 percent more energy efficient than they are today, even if the fuel-efficiencies of new cars do not increase after 2016.[75]

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It is unlikely that moderate-speed train operations will save any energy at all. Such trains would mostly be diesel-powered, and increasing speeds from 79 to 110 mph would significantly increase the energy consumption and greenhouse gas emissions of those trains.

Steven Polzin, of the University of South Florida's Center for Urban Transportation Research, points out that autos and buses have relatively short life cycles, so they can readily adapt to the need to save energy or reduce pollution. Rail systems "may be far more difficult or expensive to upgrade to newer, more efficient technologies," Polzin adds.[76]

In other words, the American auto fleet almost completely turns over every 18 years, and the airline fleet turns over every 21 years, so both can quickly become more fuel-efficient. But builders of rail lines are stuck with whatever technology they select for at least three to four decades. This means that any energy comparisons of moderate- or high-speed rail with air or auto travel must compare rails with airline or auto efficiencies in 15 to 20 years, not those today.

It is unlikely that moderate-speed train operations will save any energy at all. Such trains would mostly be diesel-powered, and increasing speeds from 79 to 110 mph would significantly increase the energy consumption and greenhouse gas emissions of those trains. Saving energy requires that trains accelerate slowly and coast into stations rather than brake heavily, but such practices reduce the time savings offered by higher top speeds.

True high-speed trains save energy by using lighter equipment, but the energy cost of higher speeds partly offsets the savings attained from hauling less weight. Whether the remaining operational savings would be sufficient to recover the huge amounts of energy consumed and greenhouse gases released during construction of new rail lines is unknown, but unlikely.[77]

After studying high-speed rail proposals in Britain, Professor Roger Kemp of Lancaster University concluded that the construction costs dwarf any savings in operations unless the rail lines are used to their full capacity.[78] With a round-the-clock average of just one train per hour in each direction, and no more than two trains per hour during the busiest times of day, even Amtrak's New York-to-Washington corridor operates at far from full capacity.

Electrically powered high-speed trains produce less greenhouse gases only if the electricity used is generated from renewable power sources. Most electricity in the United States comes from fossil fuels, with the result that urban rail transit systems in such cities as Baltimore, Denver, Cleveland, Miami, and Washington generate as much or more greenhouse gases, per passenger mile, as driving an SUV — much less an ordinary car.[79]

Table 5
2006 Energy Consumption and CO_2 Emissions Per Passenger Mile

	BTUS	POUNDS CO2
Light trucks (1.73 people)	3,990	0.63
Cars (1.57 people)	3,512	0.55
Light trucks (2.4 people)	2,876	0.45
Cars (2.4 people)	2,297	0.36
Airlines	3,228	0.50
Amtrak	2,650	0.43
Prius (1.57 people)	1,659	0.26
Prius (2.4 people)	1,085	0.17
Intercity bus	200	0.03

Sources: BTUs from Stacy C. Davis and Susan W. Diegel, *Transportation Energy Data Book: Edition 27*, Department of Energy, 2008, tables 2.12, 2.13, and 2.14; CO_2 calculations based on coefficients from: "Fuel and Energy Emission Coefficients," Energy Information Administration, Department of Energy. Online here: tinyurl.com/smdrm ; Prius information from: *Model Year 2008 Fuel Economy Guide*, Environmental Protection Agency, 2007. Online here: tinyurl.com/25y3ce

For the sake of comparison, it is far more cost effective to save energy by encouraging people to drive more fuel-efficient cars than it is to build and operate high-speed rail. Moreover, in places that do generate electricity from renewable sources, it would be more cost-effective to use that electricity to power electric or plug-in hybrid cars than to use high-speed rail.

Given all these facts, the Florida High Speed Rail Authority concluded that "the environmentally preferred alternative is the No Build Alternative" because it "would result in less direct and indirect impact to the environment."[80]

The California High-Speed Rail Authority claims that high-speed rail would save energy and reduce greenhouse gas emissions.[81] But claims such as these are rarely objective, based instead on highly optimistic assumptions for rail and pessimistic assumptions for autos and airlines:

- The Los Angeles-to-San Francisco line would carry more than more than three times as many passengers in 2025 as Amtrak now carries in the Boston-to-Washington corridor, even though that corridor serves more people than the California corridor is expected to have in 2025.[82]
- Neither automobiles nor airplanes will become more energy efficient or cleaner than they are today.[83]
- The authority never mentions the energy and pollution cost of replacing trains and reconstructing track and electrical facilities every 30 years.
- The authority calculates the energy cost of building high-speed rail, but not the greenhouse gas emissions.

Table 6
Improvements in Energy Efficiency Through 2006

	SINCE 1975	SINCE 1985
Passenger Cars	25.8%	14.5%
Light Trucks	41.9%	20.9%
Airlines	58.8%	36.1%
Amtrak	25.3%	2.0%

Source: Davis, Stacy C., and Susan W. Diegel, *Transportation Energy Data Book: Edition 27*, Department of Energy, 2008, tables 2.13 and 2.14.

These assumptions are all examples of what Danish planning professor Bent Flyvbjerg calls "optimism bias."[84] Such bias, according to Flyvbjerg, typically afflicts proponents of megaprojects, which is why large public works projects almost inevitably cost more and produce smaller benefits than originally promised.

Based on these optimistic assumptions, the authority estimates that operational energy savings will repay the energy cost of building high-speed rail in 13 years, after which the rail line will save 11.75 trillion British thermal units (BTUs) per year.[85] The rail line is also projected to save 7.5 million metric tons of carbon dioxide emissions per year, or about 1.4 percent of the state's projected output in 2025.[86]

Even with these optimistic assumptions, high-speed rail reduces corridor transportation energy consumption by only 8.3 percent. This means that the operational energy and greenhouse gas savings fall to zero if we assume instead that automobiles and airplanes will be, by 2025, just 8.3 percent more energy efficient than they are today. If automakers meet Obama's fuel-efficiency standards, autos will be more than 30 percent more efficient in 2025 than they are today, and high-speed rail will actually waste energy.

It is far more cost effective to save energy by encouraging people to drive more fuel-efficient cars than it is to build and operate high-speed rail.

When considering the energy required for construction and reconstruction of high-speed rail lines, improvements in auto and airline energy efficiencies, and the high energy cost required to move trains at higher speeds, it appears unlikely that high-speed rail would have any environmental benefits at all.

Meanwhile, the FRA's high-speed rail vision claimed that its plan would reduce carbon dioxide (CO_2) emissions by 6 billion pounds per year.[87] The first clue that there is something wrong with this number is the fact that it is expressed in pounds instead of metric tons, which are the more usual unit for national CO_2 emissions. In 2007, energy-related CO_2 emissions in the United States totaled 6.0 trillion metric tons, of which 6 billion pounds, or 2.7 million metric tons, represents less than 0.05 percent.[88]

The second clue something is wrong with the claimed figure of 6 billion pounds is that the number came from a study by the pro-rail Center for Clean Air Policy and Center for Neighborhood Technology. Without any documentation or attribution, the report's first paragraph claims that high-speed rail "can reduce congestion on roads and at airports, is cost effective and convenient, improves mobility and has environmental benefits."[89]

To calculate the annual CO_2 savings of the FRA plan, the study made the following questionable assumptions:

- "Relatively low fuel prices and a continuing trend of drivers switching to sport utility vehicles" means that the average car on the road in 2025 will get 23 miles per gallon (compared with about 20 mpg today).[90] Under Obama's new fuel-economy standards, however, the average car on the road in 2025 would get almost 30 mpg.[91]
- The average automobile on the road carries 1.6 people.[92] As previously noted, occupancies for the intercity travel with which high-speed rail would compete are closer to 2.4.
- For rail vehicles, the study assumed Amtrak would replace its existing diesel trains with a Danish diesel whose top speed is only 99 mph.[93] Most FRA routes call for trains going up to 110 mph, and energy consumption is very sensitive to speed, so this was the wrong choice.
- The study relied on optimistic rail ridership assumptions, including California's 32 million trips (plus 10 million more "high-speed commuter" trips) per year. In the Pacific Northwest corridor, for example, the study optimistically assumed that raising top speeds from 79 mph to 99 mph would boost annual ridership from its current level of less than 1 million trips per year to 3.2 million per year.[94]
- The study counted only operational emissions, implicitly assuming that emissions from construction (and periodic reconstruction) of high-speed rail would be zero.

In addition, nearly 1 million pounds of the projected annual reduction of CO_2 came from the Northeast Corridor, which is not part of the FRA plan and so should have been deducted by the FRA in its announcement.[95] That means that the plan itself is projected to save only 2.3 million metric tons per year.

In the unlikely event that all of these assumptions turn out to be correct, and high-speed rail does save 2.3 million metric tons of CO_2 per year, it is still not a cost-effective way of reducing greenhouse gas emissions. McKinsey & Company estimates the United States can cut its greenhouse gas emissions in half by

2030 by investing in technologies that cost no more than $50 per metric ton of abated emissions. Many technologies, McKinsey reported, would actually save money because the fuel savings would repay the capital investment. Significantly, none of the technologies that McKinsey considered cost-effective had anything to do with urban transit or intercity rail, through several included improvements in automobile design.[96]

If the FRA high-speed rail plan costs $90 billion, as estimated in Table 2, then the annualized cost would be about $7.2 billion plus operational subsidies.[97] This means that high-speed rail would cost more than $3,100 per ton of abated greenhouse gas emissions. For every ton abated, more than 60 tons of abatement would be foregone because the money was not invested in programs that could reduce CO_2 at a cost of $50 a ton or less. Correcting any of the study's assumptions, of course, would significantly reduce CO_2 savings and increase the cost per ton of CO_2 abated. (For comparison, estimates of the cost of CO_2 abated by the California high-speed rail project range from $2,000 to $10,000 per ton.[98])

When considering the energy required for construction and reconstruction of high-speed rail lines, improvements in auto and airline energy efficiencies, and the high energy cost required to move trains at higher speeds, it appears unlikely that high-speed rail would have any environmental benefits at all. Instead of trying to change people's lifestyles, the nation would do better by making existing lifestyles more energy efficient and environmentally friendly. That is not, however, the Obama plan.

V. REGULATING PROPERTY RIGHTS

High-speed rail is only one part of the Obama administration's "livability" campaign to completely reshape American lifestyles. In addition to high-speed rail, this program includes more urban transit (particularly rail transit), bicycle and walking paths, encouragement of high-density housing, and discouragement of single-family housing and driving. As Transportation Secretary Ray LaHood recently admitted, the ultimate purpose of this campaign is to "coerce people out of their cars."[99]

Despite the terms "livability" and "smart growth," unless you are rich, athletic, and have no children, the government programs in question create cities that are neither smart nor livable. Even though there are far more effective and less expensive ways to reduce the environmental costs of driving, smart growth is accepted without question by many policymakers, reporters, and urban leaders.

High-speed rail contributes to the livability agenda by providing people with a supposedly environmentally friendly alternative to driving for intercity travel. But proponents believe high-speed rail will attract more riders if people also live in higher-density urban areas. Many cities in California, Oregon, and a few other states have attempted to increase densities through the use of urban-growth boundaries, greenbelts, and similar techniques.[100]

In March 2009, the secretaries of transportation and housing and urban development agreed to promote "sustainable communities," by which

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Statistically, the correlation between changes in urban densities and changes in per-capita driving is very low, and to the extent there is a correlation, a doubling of urban densities reduces per-capita driving by just 3.4 percent.

they mean denser communities. The two departments "will help metropolitan areas set a vision for growth and apply federal transportation, housing and other investments in an integrated approach to support that vision."[101] Such "visioning" inevitably means more multi-family housing, fewer new single-family homes, more mass transit, and less congestion relief for motorists. Through the process of distributing federal transportation and housing funds, these ideas will be imposed on the nation's 385 metropolitan areas.

Such density programs are already a requirement for urban areas obtaining federal funds for urban rail transit. Under FTA policies, urban areas with strong "transit supportive land-use policies" are more likely to get federal funds.[102] It seems probable that similar requirements would be imposed on Missouri if the state were to receive high-speed rail funding.

At minimum, this would entail rezoning areas near rail stations to much higher densities. To achieve such densities, places such as Portland, Ore., use minimum-density zoning: If someone's house burns down, they cannot simply replace it; they must build to the zoned density.

The administration, however, will pressure metropolitan areas to go far beyond such local rezoning by adopting regional plans that use urban-growth boundaries or similar tools to limit construction of single-family homes. Owners of property outside the boundary would be prohibited from developing their land; in Oregon, rural landowners cannot even build a house on their own land unless they own 80 acres and earn $40,000 to $80,000 a year (depending on soil productivity) from farming it. Inside the boundary, property owners will earn windfall profits as land prices rise, but neighborhood characters will dramatically change as developers replace single-family homes with mid-rise or high-rise apartments and condominiums.

The experiences of cities that have adopted these policies reveal two things. First, such policies do not significantly reduce driving. Second, the policies impose very high costs on the cities and urban areas that adopt them.

Within the range of densities found in American urban areas, density alone has trivial effects on the amount of driving people do. Statistically, the correlation between changes in urban densities and changes in per-capita driving is very low, and to the extent there is a correlation, a doubling of urban densities reduces per-capita driving by just 3.4 percent.[103]

Nor do so-called transit-oriented developments — high-density, mixed-use developments near transit stations — significantly reduce driving. To the extent that people living in these developments drive less than others, it is because those people want to drive less; consequently, they decided to live near a transit line. After that market has been saturated, however, people living in such developments tend to drive as much as anyone else. Surveys have found that people living in Portland-area transit-oriented developments do not use transit significantly more than people in other Portland neighborhoods.[104] Similar results have been found with transit-oriented developments in other cities.[105]

The failure of these policies to have much of an effect on driving might not be important were it not for the fact that

the policies impose huge costs on urban residents. Numerous surveys show that the vast majority of Americans say they want to live in a single-family home with a yard.[106] Yet livability policies deliberately make this type of housing unaffordable to low- and even middle-income families.[107]

Indeed, the housing bubble that contributed to our current economic crisis was primarily focused in states and urban areas that use smart growth or some other form of growth-management planning.[108] Not coincidentally, a similar property bubble led to Japan's economic crisis in 1990. The administration's livability policies are likely to make America's next housing bubble even worse than the recent one.

A second cost is the higher taxes, or declining urban services, that residents must pay in order to subsidize rail transit and transit-oriented developments. Portland, for example, has spent more than $2 billion on rail transit and nearly $2 billion subsidizing developments near transit stations. A large share of these subsidies has come from tax-increment financing, utilizing property taxes that would otherwise go to schools, fire, police, and other essential services. These programs have all suffered major budget cuts so that the city can continue to subsidize its rail fantasies.[109]

Portland's density policies and rail transit have done little to change the region's travel patterns. For example, between 2000 and 2007, Portland opened two new light-rail lines and a streetcar line. By 2007, high fuel prices would supposedly lead to less driving and booming transit ridership.

Yet census figures show that, between 2000 and 2007, the number of Portland-area commuters who usually take a car to work increased from 664,300 to 730,500, meaning that roughly 60,000 more cars were going to work each day. Meanwhile, the number of commuters who usually take transit to work actually declined slightly, from 58,600 to 57,900.[110] These numbers are supported by censuses of downtown employers, showing that the number of downtown workers taking transit to work declined between 2001 and 2007.[111]

Partly at the expense of transit commuting, Portland has seen an increase in the number of people walking and cycling to work. The downtown censuses found a 50-percent increase in commuters walking to work and a 100-percent increase in cyclists between 2001 and 2007. The regional census found more than a doubling of cyclists, but only a 3-percent increase in walking commuters, between 2000 and 2007.

Portland's policies have led to a sorting of the population. Subsidized but expensive inner-city housing is increasingly occupied by young singles and childless couples, while lower- and middle-income families with children are pushed out to or beyond the region's periphery.

The diaspora of low-income families from inner-city neighborhoods to suburban areas — often into subsidized high-density housing along transit lines — has been well documented by a smart-growth group called Coalition for a Livable Future.[112] Portland's school district is painfully aware of the loss of families with children; even though the city's population is twice what it was in 1928, it has fewer school-age children.[113] Meanwhile, families with children have moved to such places as Vancouver, Wash., which is outside

The housing bubble that contributed to our current economic crisis was primarily focused in states and urban areas that use smart growth or some other form of growth-management planning.

In the unlikely event that per-capita driving and flying do not increase, the FRA system would carry just 0.3 percent of passenger travel.

Portland's urban-growth boundary, and Salem, Ore., which has a less-restrictive urban-growth boundary than Portland's.

This means that young, athletic commuters live in relatively high-priced housing close to downtown to such an extent that bicycling has increased — at the expense of a loss of community diversity. While many more bicycles can be seen downtown than in the past, regional bicycle commuting has only increased from 0.9 to 1.8 percent.

Amtrak carries between 5 billion and 6 billion passenger miles each year, which is roughly 0.1 percent of all passenger travel in the United States.[114] The optimistic analysis prepared by the Center for Clean Air Policy predicts that, if the FRA high-speed rail plan were completed before 2025, it would carry 25.5 billion passenger miles per year (5.5 billion of which would be taken from conventional Amtrak trains). However, 4.8 billion of these passenger miles would be on the existing Boston-to-Washington corridor, so the FRA plan would increase high-speed rail travel by 20.6 billion passenger miles.[115]

The Census Bureau projects that the U.S. population will be 357 million people in 2025, which means the FRA system will carry each person an average of 58 miles per year.[116] In the unlikely event that per-capita driving and flying do not increase, the FRA system would then carry just 0.3 percent of passenger travel.

The Center for Clean Air Policy projects that the average high-speed rail trip would be about 225 miles long, which means that the average American would take a round trip on high-speed trains only once every seven to eight years.

Who would be among the lucky few to enjoy heavily subsidized high-speed train rides? One answer can be found by comparing fares in Amtrak's New York-to-Washington corridor.

At the time of this writing, $99 will get you from Washington to New York in two hours and 50 minutes on Amtrak's high-speed train, while $49 pays for a moderate-speed train ride that takes three hours and 15 minutes. Meanwhile, relatively unsubsidized and energy-efficient buses cost $20 for a trip lasting four hours and 15 minutes, with leather seats, free Wi-Fi, and a choice of several midtown or downtown stops in New York City. Airfares start at $119 for a one-hour flight.

High-speed rail plans in other parts of the country propose similar fare premiums. Midwest train "fares will be competitive with air travel," says the Midwest High Speed Rail Initiative. Average "fares are estimated to be up to 50 percent higher than current Amtrak fares to reflect improved services."[117]

Table 7 shows an analysis of the cost and travel times between Saint Louis, Kansas City, and Chicago that high-speed rail will have to compete with.[118] In particular, it seems unlikely that anyone traveling from Kansas City to Chicago would benefit from a high-speed rail route that takes them through Saint Louis. The fare for any future high-speed rail is unknown, but adding 50 percent to the cost of Amtrak, for trip segments of about four hours each, is a reasonable estimate.

Few people who pay their own way would spend an extra $79 to save an hour and 25 minutes of their time. But anyone who values their time that highly would be willing to pay an extra $20 to save an

Table 7
Travel Price Comparisons

	SAINT LOUIS–KANSAS CITY		SAINT LOUIS–CHICAGO		KANSAS CITY–CHICAGO	
	TIME (HR)	PRICE*	TIME (HR)	PRICE*	TIME (HR)	PRICE*
Southwest	1:00	$59.00	1:00	$69.00	1:20	$69.00
Greyhound	4:25	$20.00	6:30	$18.00	11:30	$33.00
Amtrak	5:40	$26.00	5:40	$23.00	7:35	$50.00
Megabus	4:50	$25.00	5:30	$19.00	-	-

*Prices are standard fare rates for travel July 20–21, 2009

hour by taking the plane. Rail advocates respond that high-speed trains have an advantage over flying when adding the time it takes to get between downtowns and airports. Yet less than 8 percent of Americans work downtown.[119]

According to the Brookings Institution, 70 percent of jobs in Chicago, 60 percent of jobs in Saint Louis, and 50 percent of jobs in Kansas City are located more than 10 miles from the central downtown area in each city.[120] Conversely, 19 percent of jobs are within three miles of downtown in both Kansas City and Chicago, while just 15 percent of jobs in Saint Louis are within three miles of the central business district. Who still generally works downtown? Bankers and lawyers — high-income people who hardly need taxpayer-supported transportation — and bureaucrats who already travel entirely at taxpayer expense.

(Security screening also adds to flying time, but if any American high-speed train suffers an incident similar to the March 2004 attacks on trains in Spain, the Transportation Security Administration will probably require screening for high-speed trains as well as airplanes.)

A tiny but growing number of people also live in many downtown areas, but these too tend to be wealthy or high-income people able to afford downtown property prices. In short, not only will most taxpayers have to subsidize the rides of the few who take high-speed rail, those subsidies will tend to go mainly to people who are already well off and have plenty of other mobility choices.

VI. STATE-BY-STATE ANALYSIS

Table 8 reveals that high-speed rail will have an insignificant effect on the lives of most state residents, except to the extent that they notice their higher tax bills required to pay for it. Outside of Boston-to-Washington, the California corridor is the most heavily populated, and California wants to build the fastest trains. Yet the state's extremely optimistic projections still show that the average Californian will take a round trip on high-speed rail less than once every two years.

The estimate that rail would remove 4.5 percent of rural traffic from the highways is higher than the California High-Speed Rail Authority itself projects; it estimates that rail would reduce traffic on parallel highways by only 3.8 percent.[121] Traffic on rural California freeways grows by about by 1.9 percent per year, so what little congestion relief high-speed rail provides would be gone in two years.[122]

Upgrading the 250 miles between Kansas City and Saint Louis would cost

Not only will most taxpayers have to subsidize the rides of the few who take high-speed rail, those subsidies will tend to go mainly to people who are already well off and have plenty of other mobility choices.

taxpayers at least $875 million, or nearly $150 per Missouri resident. In the unlikely event that Amtrak can keep losses per passenger as low as those in the New York-Buffalo or Los Angeles-San Diego corridors, Missouri's portion of high-speed rail would have operating losses of $60 million per year, or $10 per resident — and that is very optimistic.

Missouri taxpayers would get little for their initial investment of $150, plus at least $10 more every year. The average Missourian would take a round trip on high-speed rail once every six years. In actual practice, for every Missouri resident who rides high-speed rail once per month, 70 Missourians would never ride it.

Significant improvements can be made to the existing Saint Louis to Kansas City Amtrak route without the need for high-speed rail. The current Amtrak route is plagued by delays because it shares the line with freight. A recent University of Missouri study[123] for the Missouri Department of Transportation recommended various ways to improve the current route, and work on one of those improvements began in April 2009.[124] If the report's three primary recommendations are funded and built, the average time between Kansas City and Saint Louis would be reduced by 20 minutes and delays would be cut by 36 percent, all for a total cost of between $29.5 million and $42.5 million.

Instead of spending $90 billion to reduce auto and air travel by three tenths of a percent, a fraction of that money could reduce the environmental costs of driving and flying by far more.

VII. ALTERNATIVES TO HIGH-SPEED RAIL

In 1970, the federal Environmental Protection Agency began addressing toxic air pollution in two ways. First, it encouraged cities to adopt behavioral solutions such as public transit and disincentives to driving aimed at getting people to drive less. Second, it required technical improvements to automobiles, such as catalytic converters. The behavioral solutions failed miserably: between 1970 and 2006, total driving increased by 170 percent and per-capita driving nearly doubled.[125] The technical solutions, however, were incredibly successful: despite the increase in driving, total automotive emissions of most pollutants declined by well over 50 percent.[126]

Despite this clear record of success and failure, some people still want to modify behavior in order to change American single-family home and automotive lifestyles. The administration's livability agenda relies almost exclusively on such behavioral solutions, including high-speed rail.

Instead of spending $90 billion to reduce auto and air travel by three tenths of a percent, a fraction of that money could reduce the environmental costs of driving and flying by far more. This is an example of what University of California, Irvine, economist Charles Lave called "the Law of Large Proportions," which he defined as "the biggest components matter most."[127] In this case, it means that, because automobiles are the dominant form of travel, followed by the airlines, small improvements in automobile and aircraft fuel economy and emissions will have a bigger effect on energy consumption and air quality than big changes in mass transportation.

States and cities can make many technical improvements to reduce the

Table 8
FRA High-Speed Rail Plan by State

	ROUTE MILES	CAP. COST MILLIONS	OP. LOSS MILLIONS	TRIPS MILLIONS	PM MILLIONS	TRIPS/ CAPITA	PM/ CAPITA	HWY. TRAFFIC DISPLACED
Alabama	235	$823	$36	1.3	209	0.27	43	0.2%
Arkansas	145	$508	$14	0.5	103	0.16	33	0.1%
California	785	$52,000	$1,176	42.0	12,727	0.95	287	4.5%
Connecticut	65	$228	$2	0.1	14	0.02	4	0.1%
Florida	385	$11,205	$98	3.5	138	0.13	5	0.4%
Georgia	510	$1,785	$37	1.3	305	0.12	27	0.1%
Illinois	360	$1,260	$86	3.1	494	0.23	37	0.3%
Indiana	530	$1,855	$127	4.6	733	0.68	110	0.3%
Kentucky	5	$18	$0	0.0	3	0.00	1	0.0%
Louisiana	280	$980	$43	1.5	248	0.33	52	0.4%
Maine	50	$175	$1	0.0	11	0.03	8	0.0%
Massachusetts	215	$753	$6	0.2	47	0.03	7	0.4%
Michigan	215	$753	$51	1.8	295	0.17	28	0.1%
Minnesota	30	$105	$7	0.3	41	0.04	7	0.0%
Mississippi	255	$893	$39	1.4	226	0.46	74	0.3%
Missouri	**250**	**$875**	**$60**	**2.1**	**343**	**0.34**	**54**	**0.2%**
New Hampshire	115	$403	$3	0.1	25	0.07	16	0.1%
New York	475	$2,323	$265	9.5	2,236	0.49	115	0.4%
North Carolina	385	$1,348	$23	0.8	215	0.07	19	0.1%
Ohio	450	$1,575	$33	1.2	112	0.10	10	0.0%
Oklahoma	240	$840	$24	0.8	171	0.22	45	0.1%
Oregon	130	$455	$25	0.9	138	0.19	30	0.1%
Pennsylvania	350	$1,225	$31	1.1	165	0.09	13	0.0%
South Carolina	340	$1,190	$21	0.7	190	0.15	38	0.1%
Texas	640	$2,240	$69	2.5	476	0.08	15	0.1%
Vermont	130	$455	$4	0.1	28	0.18	41	0.2%
Virginia	285	$998	$17	0.6	159	0.07	17	0.1%
Washington	280	$980	$54	1.9	297	0.24	36	0.2%
Wisconsin	350	$1,225	$83	3.0	480	0.49	80	0.2%
Total U.S.	8,485	$89,368	$2,436	87.0	20,628	0.24	58	0.4%
Canada	150	$525	$14	0.5	79			
Grand Total	8,635	$89,893	$2,450	87.5	20,707			

"PM" is passenger miles. A significant portion of the stated capital costs will recur every 30 years. Operating costs are annual, assuming losses averaging $28 per passenger. Sources: Route miles estimated using FRA numbers and Google Maps. Capital cost estimates for California, Florida, and New York's Empire Corridor are based on state analyses adjusted for recent increases in construction costs, as described above. Elsewhere, capital costs are estimated to average $3.5 million per mile. Annual operating losses are calculated at $28 per passenger; actual losses could go much higher, but are not likely to be any less. Trips and passenger miles are based on: "High Speed Rail and Greenhouse Gas Emissions in the U.S.," p. B-2. Online here: tinyurl.com/m4a5fs

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The last column estimates the intercity highway traffic that would be displaced by high-speed rail by comparing the Center for Clean Air Policy's estimate of vehicle miles displaced by rail with an estimate of 2025 rural vehicle miles traveled in each state. The latter estimate, in turn, is based on Highway Statistics 2007, table VM-2, online at tinyurl.com/q4ha4f ; vehicle miles of driving are increased by the projected population growth through 2025. Rural driving is used as a stand-in for intercity driving. Much intercity driving actually takes place in urban areas, so the percentages in the last column are actually an overestimate.

One low-cost technique for cities to reduce congestion significantly is to coordinate traffic signals. According to the Federal Highway Administration, three out of four traffic signals in the nation are obsolete and poorly coordinated with other signals.

environmental effects of driving. Any promotions of mass intercity transportation should focus on buses rather than rail. As Table 5 shows, buses have far lower environmental effects than trains, and also cost far less to operate.

Following the law of large proportions, however, most efforts should focus on driving rather than promoting mass transportation. The first priority should be to eliminate traffic congestion, which wastes nearly 3 billion gallons of fuel each year.[128] Ending that waste would reduce CO_2 emissions by 25 million metric tons, almost 10 times as much as the Center for Clean Air Policy's optimistic projection for high-speed rail. Relieving congestion would also save people time, improve safety, and reduce toxic air pollution.

One low-cost technique for cities to reduce congestion significantly is to coordinate traffic signals. According to the Federal Highway Administration, three out of four traffic signals in the nation are obsolete and poorly coordinated with other signals.[129] Missouri's two largest cities, Saint Louis and Kansas City,[130] have both recently instituted efforts to improve the coordination of their traffic signals. The New I-64 construction project in Saint Louis demonstrated the value of signalization improvements. Improved traffic signal coordination on collector and arterial roads is one of the reasons that, during the ongoing closure of Interstate 64, traffic congestion on alternate routes has not been nearly as bad as originally feared. In Kansas City, 60 percent of traffic signals are now synchronized on local roads, and that has played a part in the recent decrease in traffic congestion in the Kansas City area.[131]

In 2003, San Jose, Calif., coordinated 223 traffic signals on the city's most-congested streets, at a cost of about $500,000. Engineers estimate this saved 471,000 gallons of gasoline each year, which translates to a 4,200-ton reduction in CO_2 emissions.[132] The value of the fuel saved easily outweighed the initial cost, so signal coordination is far more cost-effective than passenger rail transportation.

A step Missouri could take is to pay for all new highway capacity using electronic tolling systems in which the tolls vary by the amount of congestion. Most vehicles on the road during rush hour are not carrying commuters, and variable tolls can significantly reduce congestion by encouraging people to shift their travel to less congested times of the day. Missouri would have to amend its state Constitution before tolling could become widespread, but even under current law, the use of privately funded or local government-funded toll roads is allowed. Except for one bridge over the Lake of the Ozarks, tolling is not currently used in Missouri.[133]

An even bigger step would be to accelerate the development of intelligent transportation systems. Intelligent highways and intelligent cars can significantly reduce congestion, as well as greatly improve transportation safety, without building an abundance of new capacity.[134]

Even individuals can help reduce congestion when they buy new cars. Many new cars are equipped with adaptive cruise control, in which the car senses the distance to the vehicle in front and automatically adjusts speeds to maintain safety. Computer reflexes are faster than

humans, so traffic researchers estimate that congestion would significantly decline when as few as 20 percent of drivers on the road use adaptive cruise control.[135] State governments that truly want to save energy, instead of just trying to change people's behavior, could offer tax incentives to people who buy cars equipped with such technologies.

CONCLUSIONS

High-speed rail is a technology whose time has come and gone. What might have been useful a century ago is today merely an anachronism that would cost taxpayers tens or hundreds of billions of dollars, yet contribute little to American mobility or environmental quality.

The most ardent supporters of high-speed rail predict that the FRA plan will carry the average American less than 60 miles per year, and the average Missouri resident even less than that. By comparison, the average American travels by automobile more than 15,000 miles per year. The environmental benefits of high-speed rail are similarly minuscule, and are probably negative when added to the environmental costs of building high-speed rail lines.

Given such tiny benefits, the real impetus behind high-speed rail is the desire to change Americans' lifestyles: increasing the share of families living in multi-family housing while discouraging new single-family homes, and increasing the share of travelers taking transit and intercity rail while discouraging driving. Such behavioral efforts would be costly and produce few environmental or social benefits.

Based on these findings, Missouri would best spend its share of the $8 billion in stimulus money solely on incremental improvements to existing rail lines, including safer crossing gates and better signaling. It would be inefficient and wasteful to purchase new locomotives and railcars for passenger service that would be both expensive to operate and harmful to the environment. Nor should the FRA commit the federal government to funding expensive new high-speed lines such as the proposed lines in California or Florida.

The United States can do many things to cost-effectively improve transportation networks in ways that save energy, reduce accidents, and cut toxic and greenhouse gas emissions. High-speed rail is not one of those things.

High-speed rail is a technology whose time has come and gone. What might have been useful a century ago is today merely an anachronism that would cost taxpayers tens or hundreds of billions of dollars, yet contribute little to American mobility or environmental quality.

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