Will the U.S. miss its opportunity for maglev?

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ABSTRACT: This paper discusses the U.S. High Speed Intercity Passenger Rail program, begun in 2009 under the Obama administration and managed by its federal railroad agency. Its goals have been confusing to international maglev vendors, sending signals that steel-wheel-on-rail is the preferred technology and discouraging international political support for high-speed maglev in the USA. The non-profit U.S. Maglev Coalition represents public- and private-sector groups who are interested in moving the national agenda for maglev as a transportation option. An assessment of the U.S. HSIPR program will be presented, highlighting built-in obstacles and missed opportunities for maglev projects and, finally, offering the Coalition's perspective for the future.

1 INTRODUCTION

In early 2009, President Barack Obama's administration and the U.S. Congress created the landmark US$800 billion American Recovery and Re-investment Act of 2009 (ARRA), usually called the "economic stimulus" or the "recovery act." Under ARRA and an earlier bill, the Passenger Rail Investment and Improvement Act of 2008 (PRIIA), approximately US$13 billion was allocated to fund intercity passenger rail projects during the next four years, representing an unprecedented amount of money to be targeted toward U.S. rail transportation.

President Obama's vision called for a collaborative effort among the Federal Government, States, railroads and other key stakeholders to help transform America's transportation system through the creation of a national network of high-speed rail corridors. To achieve this vision, the U.S. Department of Transportation's Federal Railroad Administration (FRA) launched the High-Speed Intercity Passenger Rail (HSIPR) Program in June, 2009.

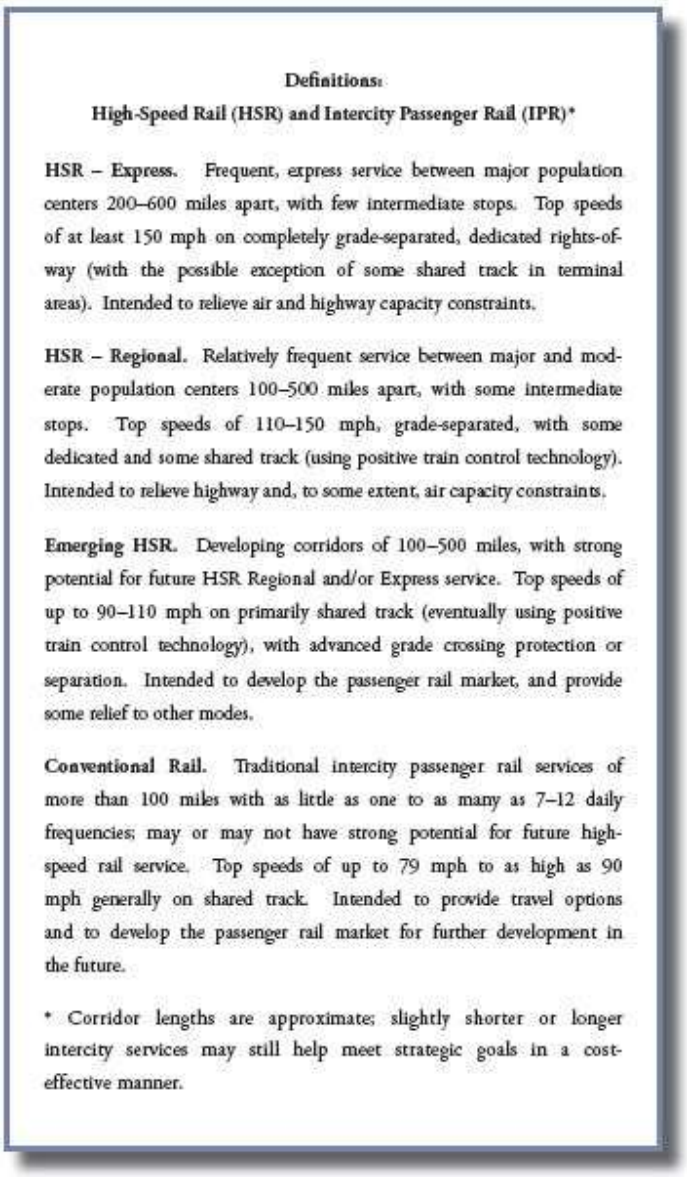
In the long term, the HSIPR Program aims to build an efficient, high-speed passenger rail network connecting major population centers from 160 to 960 kilometers (km) apart, as shown in Figure 1. In the near term, the program should aid in economic recovery and lay the foundation for this passenger rail network through targeted investments in existing intercity passenger rail infrastructure, equipment and intermodal connections.

Figure 1. FRA's High-Speed Intercity Passenger Rail Program

Of all the proposals that have been submitted for HSIPR funding, the majority are modest in scope, dedicated to upgrading existing freight or commuter rail lines with incremental improvements ─ improving track quality and signaling and control systems, reducing at-grade highway crossings ─ with the goal of improving the top speeds of existing passenger trains up to about 180 kilometers an hour (km/h), meaning average speeds on the order of 120 km/h. In fact, only two proposals envisioned the use of truly international-class running speeds of at least 240 km/h: California and Florida, and Florida's new governor rejected the Federal funding only weeks after taking office in 2010, leaving California as the only remaining candidate for implementing such technologies.

In most cases, then, the term "high speed" in the US these days ─ at least from the current federal

perspective ― refers to operating speeds much lower than is traditionally talked about for European or Asian rail. The FRA's *High-Speed Rail Strategic Plan* of April, 2009 contains the official terms, as summarized in Figure 2.



Definitions:

High-Speed Rail (HSR) and Intercity Passenger Rail (IPR)*

HSR – Express. Frequent, express service between major population centers 200–600 miles apart, with few intermediate stops. Top speeds of at least 150 mph on completely grade-separated, dedicated rights-of-way (with the possible exception of some shared track in terminal areas). Intended to relieve air and highway capacity constraints.

HSR – Regional. Relatively frequent service between major and moderate population centers 100–500 miles apart, with some intermediate stops. Top speeds of 110–150 mph, grade-separated, with some dedicated and some shared track (using positive train control technology). Intended to relieve highway and, to some extent, air capacity constraints.

Emerging HSR. Developing corridors of 100–500 miles, with strong potential for future HSR Regional and/or Express service. Top speeds of up to 90–110 mph on primarily shared track (eventually using positive train control technology), with advanced grade crossing protection or separation. Intended to develop the passenger rail market, and provide some relief to other modes.

Conventional Rail. Traditional intercity passenger rail services of more than 100 miles with as little as one to as many as 7–12 daily frequencies; may or may not have strong potential for future high-speed rail service. Top speeds of up to 79 mph to as high as 90 mph generally on shared track. Intended to provide travel options and to develop the passenger rail market for further development in the future.

* Corridor lengths are approximate; slightly shorter or longer intercity services may still help meet strategic goals in a cost-effective manner.

Figure 2. Definitions of high-speed rail terms in America

It was not always the case that "high speed" was interpreted in the current way. As far back as the late 1980s, feasibility studies were being done to stimulate interest in the future use of magnetic levitation (maglev) technology, specifically those maglevs designed in the United States. While the U.S. has failed to build its own high-speed maglev, Germany and Japan have steadily evolved their own systems ― Transrapid and the Superconducting Maglev (SCMaglev), respectively ― and both are capable of running at world-class operating speeds of up to 500 km/h.

In 2002, the non-profit US Maglev Coalition (USMC) was formed to support the development of maglev transportation technology in the United States. Coalition members include architect-engineering firms, public agencies, labor unions and project sponsors from around the USA. Individual projects include Atlanta, GA to Chattanooga, TN; Washington, DC to Baltimore, MD; and Las Vegas, NV to Anaheim, CA. The Coalition monitors Congressional and federal maglev actions, holds meetings to advance maglev systems throughout the USA, and provides opportunities for Coalition members to meet with their public representatives.

Even so, there are no high-speed maglev proposals represented anywhere in the HSIPR program. That is the point of this paper.

2 CONDITIONS

To understand how the US high-speed ground transportation (HSGT) initiative has come up short, one must examine four basic "conditions:"

1. US geography;
2. the current state of passenger rail in the US;
3. the impetus for the current HSR initiative;
4. the cost and 'scale' of the industry; and
5. a fifth factor, not a condition, really, but instead some facts: our own past mistakes.

The Coalition's contention is that the US HSR program fails to recognize these conditions and capitalize upon them in a way that will lead to a robust HSGT program where it makes sense in the US.

2.1 US Geography

The US is a large, populous country with about 10 million square kilometers of territory and more than 313 million inhabitants ― second and third largest worldwide ― so it mostly lacks the dense urban corridors of other countries that are generally considered necessary to sustain HSGT. By contrast, Europe is approximately the same size ― if one pushes Europe's borders through the eastern nations and well into Russia. However, even in this same-sized area, Europe's population is roughly two-and-a-half times that of the US. And US metropolitan areas are spread out – an urban Metropolitan Statistical Area (MSA) in the US can be the size of some European states – and separated by much greater distances. For instance, one can fly from Copenhagen

to Rome and back in the time it takes to cross the US, and still have time left over.

Study after study – indeed, the US Department of Transportation's seminal 1997 study of HSR economics, "High Speed Ground Transportation for America," which became known as the "Commercial Feasibility Study," found that there are only two corridors that might reasonably sustain true HSR — a California 'north/south' system connecting San Diego, Los Angeles and San Francisco and the Northeast Corridor (NEC) that links Washington, DC with New York City and Boston. Of note, the speeds laid out for HSR in this document were much higher than those incorporated in ARRA.

Despite these facts, the USDOT continues to look at HSGT nationally, not regionally, segmenting travel options by market advantage, as shown in Figure 3.

		Intercity Distance (in miles)		
		0-100	100-600	600-3,000
Population Density	Light	1) Auto	1) Auto 2) Conventional Rail	1) Auto 2) Air
	Moderate	1) Auto 2) Commuter Rail	1) High-Speed Rail 2) Auto	1) Auto 2) Air
	High	1) Commuter Rail 2) Auto	1) High-Speed Rail 2) Air	1) Air

Figure 3. Potential Modal Comparative Advantage by Market

The US is better able to capitalize on its strengths when it examines metrics on a regional basis. The four geographical areas of the country come closer to replicating the conditions needed to sustain HSR networks than the nation as a whole: NEC, States of California and Florida, Midwest Region and the Southeast Region. We recognize that California and Florida are not 'regions,' but their sizes and configurations have more in common with regions than with other states. Both could be subdivided into multiple smaller states.

Yet our national transportation policy does not view HSR on a regional basis.

2.2 Current state of passenger rail in the US

The second condition is related to the condition of HSR in the US.

Except for the Northeast Corridor from Washington, DC to Boston, Massachusetts, there is no true international-class high-speed rail in the US. With few exceptions, rail in America is freight rail, and operating passenger services on freight tracks is fraught with costs and risk. Since the US is considered to have the best freight rail system in the world, the freight operators are reluctant to risk the profitability of their operations to increase passenger operations on tracks that they own and pay to maintain.

Further, the national passenger train system, Amtrak, does not operate the NEC in a manner which optimizes NEC operations or revenues, and to make matters worse, it routinely provides mediocre service to its users. Amtrak, in the name of being a 'national' system, takes profits from the NEC – indeed, the only profits it generates – and uses them to subsidize long-distance routes that continually suffer from inadequate ridership. While characterized by romantic-sounding names – Coast Starlight, Empire Builder, Hiawatha, Sunset Limited, Zephyr – these long-distance routes make no economic sense. The Zephyr travels from Chicago to Emeryville, California; the Sunset Limited from New Orleans, Louisiana to San Antonio, Texas and then on to Los Angeles, California.

Who rides these trains? Virtually nobody, because of a lack of frequent, reliable service. And yet we keep Amtrak's NEC at its current substandard condition by siphoning off money to support these long-distance routes, most of which hark back at least five decades, to a day prior to jet airplane travel and the creation of the Interstate Highway System. Why they are still in existence? It's is a mystery, with only one possible answer: Politics.

It is axiomatic of political systems that it takes far more energy to repeal a program than to start one. Who wants to be the United States Senator who 'lost' Amtrak service for his state?

The political nature of transportation deftly avoids any true cost-benefit analysis: Members of Congress are credited for attracting services and jobs, irrespective of the costs that those services or jobs place on the economy as a whole.

Which brings us to –

2.3 Impetus for the current HSR initiative

The third condition is related to the condition of HSR in the US.

Our terminology has now changed from HSGT to HSR, because the national program is now exclusively dealing with steel-wheel-on-rail systems.

In the past two years, we have watched as President Obama successfully persuaded Congress to appropriate US$10Billion for passenger rail, and pledged US$1B more per year in his five-year budget. Passenger rail advocates were initially, and understandably, overjoyed, having operated without a national HSR policy and struggling in the shadows of aviation and highway funding for decades, receiving less than US$1 for every $30 spent on highways, as shown in Figure 4. That excitement has turned to disappointment in many states, however, as the administration's strategies gradually emerged.

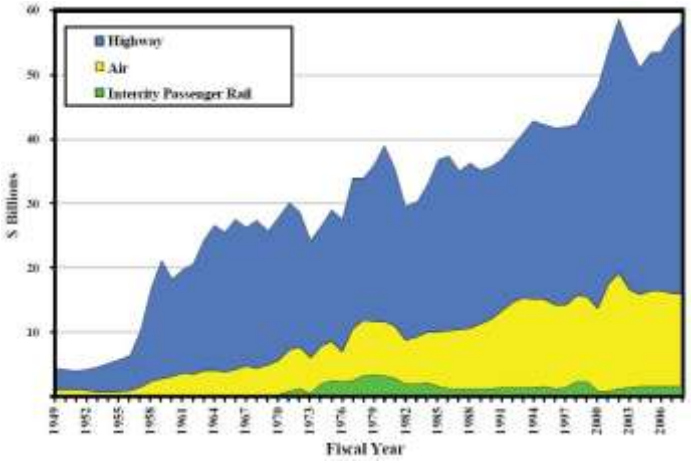


Figure 4. US Historical Investments by Travel Mode

First, it's important for outsiders to remember that the HSR program was part of the American Recovery and Reinvestment Act of 2009 – also referred to as ARRA, or the "Stimulus." Its one key goal: invest to create jobs.

The idea that transportation investment creates jobs is not new, nor is it necessarily bad. But for the first time, this administration's HSR program subordinated transportation improvements to job creation.

Some might remember the anecdote told by the American economist, statistician, academic and author Milton Friedman, who tells of visiting a Chinese public works site. Hundreds of workmen were digging a roadbed using shovels. Friedman asked, "Why not use a bulldozer?" His host answered, "Because we want to create jobs." Friedman responded, "If that's the case, why not give them soup spoons?"

Subordinating transportation investment priorities to job creation has a similar effect.

To attract HSR vendors from around the world, the US needed to make enough money available to attract attention and then — because we are a free market competitive society — it should have ensured the creation of a level playing field for all vendors to have an equal chance at securing new business. That did not happen, which led to a 'lowest-common-denominator' mindset, focused entirely on conventional high-speed rail and its existing international network of suppliers and sub-suppliers.

In the process, no 'points' were given for ingenuity, nor for introduction of new technologies. Not only that, but the definition for HSR was watered down even further.

While there has always been a dispute over the definition of what constitutes true high-speed – US law alone contains three different definitions – high-speed has always been defined as an absolute minimum operating speed of either 177, 200 or 240 kilometers per hour (km/h). In ARRA, these speed performance requirements were blurred with the addition of the words ". . . capable of reaching speeds of . . ." So all of a sudden, low-speed and so-called 'Accelerail' trains qualified as 'high-speed' options. Further, the administration wanted to make sure that in fulfilling its promise to create new jobs it did not lose any jobs, so millions of dollars that could have been invested in new technologies, new systems or planning for the next generation — which might have included high-speed intercity maglev systems — were spent on industries of the past. Unfortunately, by selecting projects that mostly aimed at incremental improvements, new jobs were not created. There was just more work for those already working on rail.

If this seems like an attack on the Obama Administration for a lack of vision in its distribution of ARRA HSR funding, the facts prove otherwise.

The Department of Energy is spending billions to encourage new solar, wind and fuel cell industries; and the Congress is debating repealing subsidies for the oil and gas industries right now. The Department of Agriculture is funding research and development for cellulosic fuel sources, while the US Congress has voted to repeal ethanol subsidies. The Department of Defense, the world's single largest consumer of fossil fuels, is focusing on algae-based fuel for ships and planes. Even in the Department of Transportation, funds are spent on intelligent (automotive) transportation systems, including the development of

lighter batteries with higher storage capacity for a new generation of electric vehicles.

2.4 Scale and Cost of the Industry

Our fourth condition concerns scale and cost, and on this front we sympathize with the administration for looking to existing industries abroad to import and transfer work rather than face the costs of trying to create a new industry of such a large scale. Of course with 'new industry,' the Coalition is referring to maglev.

A typical criticism of introducing new maglev systems in the USA is that putting maglev into profitable corridors will "cherry pick" the best routes, stranding assets in its wake and, in the case of the NEC, leaving Amtrak unable to cross-subsidize its other operations. Yet even with a maglev operating as a premium express service, Amtrak can still provide commuter and non-premium service. And as for cross-subsidies, these should not take place anyway.

Regarding the topic of scale, we all know that the costs of maglev projects are largely in acquiring right-of-way and building infrastructure. These are mostly the same whether one builds a highway, a light- or heavy-rail system — in the end, it comes down to land, steel and concrete. So the 'cost & scale' argument is reduced by two-thirds at the outset.

2.5 Past Mistakes

Finally, an important factor, not necessarily of the US program, but of our own, is past mistakes that have been made. Maglev has been ready for deployment for years. Yet today there is only one – yes, one – high-speed maglev in commercial operation. And it's in Shanghai, not in the USA, despite candidate Barack Obama's 2008 campaign rhetoric.

We all know the old adage, "Maglev is the technology of the future – and it always will be."

Two decades of timidity brought about by ineffective public leadership has dealt maglev a near-fatal blow. By getting most its funds from government, the private sector initiative was lost in favor of regimes that by their nature had to satisfy all parties. Thus, the Berlin-Hamburg, Metrorapid and Munich Airport systems in Germany were all abandoned. Credit Germany with supporting the Shanghai maglev, but it has been no substitute for a home-country deployment. And with public institutions, there is always 'one more test' that must be done to 'reassure the public' of this or that. Imagine if every potential iPhone® application went through the same reviews before coming to market? Apple Computer stock would be selling for US$10 a share.

Maglev commercialization lagged in Japan until two things happened: Japan Central Railroad was privatized by the national government in 1987 and, 20 years later, its chairman articulated a vision that rested on high-speed maglev to augment the main Shinkansen line connecting Tokyo, Nagoya and Osaka. That initiative could well reverse years of inertia in maglev's worldwide development.

3 CONCLUSIONS

So, why does maglev get inferior consideration in the US program and what can we do about it? Why is HSR getting this favored treatment? Why do we continue to subsidize inefficient guided ground transportation systems rather than funding the possible future? There are plenty of theories, but only by going back to our four original conditions can we construct a valid response and plot a roadmap for the future.

Remember the conditions: geography, current status, jobs and costs.

As long as we focus on trying to meet all of them while ignoring the passengers' demands for fast, safe and efficient travel, the USA will have a backward-looking system rather than one more fitting with the 21st century advancements we see taking place all around the world.

Rather than try to cobble together a patchwork national system on tracks mostly owned by freight operators, the hope for the US market focuses on regional systems, and leaves air travel for the distances where it is most competitive. Rather than setting standards for all high-speed systems based on a lowest-common-denominator benchmark, we should realize that it make no sense for the national government to require that trains running between Washington, New York and Boston must be physically compatible with those running in southern California.

As the administration and Congress set about to reauthorize America's national transportation policy, they would do well to heed these examples, and

move forward with three things in mind: First, the federal revenues for the US ground transportation system have been declining with every advance in fuel economy and alternative travel mode usage. Second, the private sector and state and regional governments will need to be the co-funders of the future. And third, therefore, the best thing the federal government can do is to establish a set of performance metrics — enhanced safety, robust speed improvements, schedule reliability, environmental friendliness, energy efficiency, ease of operation and maintenance, and economic self-sustainability, for starters, and leave the rest to us.

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