

High-Speed Intercity Passenger Rail

SPEEDLINES

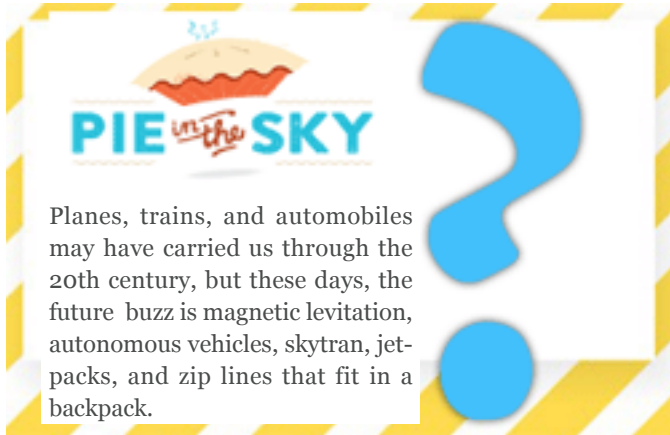
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LOOKING TO THE *FUTURE* OF TRANSPORTATION



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SPEEDLINES MAGAZINE



» p.15

On the front cover:

Futuristic visions of transport systems are unlikely to solve our current challenges, it's always good to dream. Technology promises cleaner transportation systems for busy metropolitan cities where residents don't have much time to spend in traffic jams.

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"The purpose of SPEEDLINES is to keep our members and friends apprised of the high performance passenger rail environment by covering project and technology developments domestically and globally, along with policy/financing breakthroughs. Opinions expressed represent the views of the authors, and do not necessarily represent the views of APTA nor its High-Speed and Intercity Passenger Rail Committee."



Dear
HS&IPR Committee
& Friends:

I am pleased to continue to the newest issue of our Committee publication, the acclaimed SPEEDLINES.

We have been very busy since our last issue. The Committee met at our new time of 7:30 a.m. at the Legislative Conference on March 12, 2017. Despite some grumbling about the hour, the meeting was well attended and the agenda filled the entire two and a half hours. In addition to the usual Subcommittee reports, we enjoyed several presentations – including NEC Futures by FRA’s David Valenstein and the Return on Investment Study by Charlie Quandel, P.S. Sriraj of the University of Illinois, and Glen Weisbrod of the Economic Development Research Group. A Washington D.C. Advocacy Partner Roundtable also provided valuable insights. The Committee approved the Work Plan for the year, and there was just a little time for some updates from the assembled members.

Your Committee Leadership continues to meet monthly on conference calls in order to progress the Work Plan and our projects. In addition, we conducted a facilitated leadership retreat on May 15, 2017 at the APTA offices. Our purpose was to refresh our view of our mission and priorities in light of changes in the federal and state governments and new developments in the industry. We determined that our priorities remain sound, except that a new emphasis on advocacy is required. It was a very productive day. Facilitator John Morgan of Autodesk, Inc. did an excellent job of moving the discussion along and we are appreciative that he personally donated his services.

In March and June, I represented our Committee at the meetings of the APTA Board of Directors. Most of the news from these meetings has been distributed by the leadership. But I can assure you, the meetings are comprehensive exercises and the organization’s leadership is robust and inclusive.

In other news, HS&IPR Committee now has one of APTA’s seats on the Rail Safety Advisory Committee (RSAC). We conducted a brief selection process and on June 9, announced that Jennifer Hu, Director of Legal and Regulatory Affairs for Texas Central Railway, will be the Committee designate for a seat on RSAC. Michael Loehr of CH2M has agreed to be an alternate.

Sunday morning at the Rail Conference opened with a capacity crowd at our Committee meeting. The room stayed full as we worked our way through a diverse and very informative agenda. Karen Hedlund, our co-chair on the Commuter and Intercity Legislative Sub-committee led a long and lively discussion on federal legislative and regulatory developments and prospects. Trevor Gibson of FRA presented a detailed update on the agency. Phil Pasterak’s corridor update on Chicago-St. Louis was a great summary of this Program. Our two panels on Tuesday were well-attended and well-received.

You may notice that some of the articles in this issue address technologies, policies and visions may be viewed as advanced or disruptive and maybe controversial. This is all part of our mission to provide our members, friends and readers the latest developments in the high performance passenger rail environment. We welcome your feedback on all that we publish.

As always, I thank the Speedlines team leaders Al Engel, Ken Sislak and Wendy Wenner of Amtrak for their hard work in bringing you another great edition.

And I thank you for your interest in the High-Speed & Intercity Passenger Rail Committee.

Anna M. Barry

ROI FRAMEWORK

APTA'S HS&IPR STUDY IS COMPLETE

ONCE UPON A TIME, THE RAILROAD IN NORTH AMERICA WAS THE PROUD AND PROGRESSIVE MEANS FOR CONQUERING AND SETTLING THE WILD WEST. FOR MANY DECADES, THE RAILROAD WENT THROUGH A GOLDEN ERA AS THE UNCHALLENGED LEADER IN TRANSPORTATION, THEN EXPERIENCED A DECLINE IN POPULARITY AS AUTOMOBILES TOOK OVER. RAILROAD'S FATE AS A PASSENGER MODE SEEMED SEALED, BUT IN RECENT DECADES THERE'S BEEN A REMARKABLE REVIVAL OF RAIL IN THE U.S. AND CANADA – HIGHLIGHTED BY A GROWING NUMBER OF SUCCESS STORIES. RIDING TRAINS IN NORTH AMERICA IS "IN" AGAIN, PARTICULARLY IN THE MEGACITIES AND LARGE METROPOLITAN AREAS. YEAR AFTER YEAR, THE VOLUME OF PASSENGERS IS RISING, THE NUMBER OF RAIL ROUTES AND NETWORKS IS GROWING, ROLLING STOCK AND INFRASTRUCTURE IS BEING MODERNIZED, AND POLITICIANS ARE REDISCOVERING THE ADVANTAGES OF PASSENGER RAIL. FOR THE RAIL INDUSTRY, THE NORTH AMERICAN MARKET IS ONCE AGAIN FULL OF ATTRACTIVE POTENTIAL AND PERSPECTIVES.

Last year the APTA HS&IPR Committee embarked on process to commission a study to develop a framework for determining the total return on investment high-performance passenger projects. There was a lot of interest in this endeavor and the committee was fortunate to receive several excellent proposals to undertake this assignment. The study was recently concluded and results will be published shortly in an executive summary brochure that can be used by our members in interacting with both the public and privates as part of the committee's education and advocacy activities. Watch the APTA HSR resource page on the website for its release. A notice will also be sent to the committee members.

Intercity passenger rail demand in the U.S. has shown an unprecedented surge in the new millennium. Amtrak, the primary intercity rail service provider in the country, reported an annual ridership of more than 31 million in 2016, which is 1.5 times what it was in 2000. To accommodate increasing rail passenger demand and to meet the rising

expectations of riders for quality rail travel experience, active efforts to develop new high-speed and intercity passenger rail (HS&IPR) services are now underway. Prominent examples include the California, Texas, Midwest, Florida, and North Carolina to Virginia initiatives.

While there is continuing interest in HS&IPR projects, there are also wide disparities in how project investment benefits are measured. A number of prior studies have looked at the public benefits of HS&IPR projects from varying angles, such as the benefit-cost ratio, the economic impact, or the social impact of a project. However, there is a lack of consensus among these studies as to what benefit and cost elements to consider. As a result, much remains unclear or unknown about the true returns on investment in HS&IPR projects. Without a systematic methodology, the decision-making aspect associated with high-speed and intercity rail could be deemed subjective.

A reason for the difficulty measuring benefits of HS&IPR investments is that these projects and systems have broad economic, social, and environmental impacts that vary

in both geographical scale (including local, regional, state, and ultimately national effects) and temporal scale (including short, intermediate, and long term effects). While HSIPR systems are extensively in operation worldwide, HS&IPR in the US is a relatively untested mode associated with potentially high levels of public investment, which means that proposed projects must demonstrate a broad spectrum of benefits and returns in order to meet intense public and political scrutiny. A review of experience with projects proposed to-date indicates that while certain types of benefits of HSIPR have been evaluated and documented, many of the effects have been unreported and/or under-reported, leading overall to an underestimation of the potential significance of this mode nationwide. This report was prepared to assist project sponsors in providing a more complete understanding of the effects of HSIPR projects with respect to return on investment, geographically and temporally. To fully capture the range of effects, the methodological approach proposed calls for a blending of methods and perspectives.

The foundation of this report, and its core motivation, is to provide a framework for assessing what is commonly referred to as the public “return on investment” (ROI) associated with HS&IPR projects. It seeks to go beyond the confines of classic “benefit cost analysis”, which focuses on travel time and cost efficiency impacts, to also considering the full range of local community effects, regional connectivity and global competitiveness effects, and broader consideration of the public’s desire to meet and exceed longer term environmental, economic and mobility goals for future generations. The reason for this approach is simple – much of our public policy recognizes the multi-faceted nature of benefits - including transformative and distributional effects - that occur at different spatial scales (national, regional and local), affect various sub-groups of the population, and occur at different times. This calls for a framework that can represent the business case for HS&IPR investment by portraying the diverse value of benefits from multiple perspectives.

We are indebted to APTA, the Business Member Board of Governors, The Capital Corridor and various businesses for providing the funding to undertake this study. We are also grateful to Charlie Quandel, the study team and those serving on various review subcommittees for getting us to this point.



**TRENDING
#NOW!**

AMTRAK NAMES NEW CEO

Richard Anderson

Amtrak announced that it has named Richard Anderson, a 25-year veteran of the aviation industry, as its next President and Chief Executive Officer. Anderson, former chief executive officer of both Delta and Northwest Airlines, served in the legal division at Continental Airlines and was a former county prosecutor. Anderson officially begins his role on July 12, 2017.

VIRGINIA VIEW



HIGHER EXPECTATIONS BRINGS IMPROVEMENTS

By: Jennifer L. Mitchell, Director, Virginia Department of Rail & Public Transportation (DRPT)

Virginia's rich history is ingrained in the landscape visible through rail windows traveling through the Commonwealth along the former Richmond, Fredericksburg, and Potomac (RF&P) Railroad. Since 1834, this corridor has served as a critical connection between Virginia and its southern connections and Washington, DC. Today, it is owned and operated by CSX Transportation, Inc. (CSXT) and is the northernmost link for passenger rail service in the southeast to Amtrak's Northeast Corridor (NEC). CSX's RF&P subdivision also hosts the Virginia Railway Express (VRE) commuter service.

The Virginia Department of Rail and Public Transportation (DRPT) is planning for a higher-speed rail system that links the southeast with the NEC to meet the needs of Virginia's growing population and increasingly urbanized land use patterns.

In 1992, the US Department of Transportation designated the Southeast High-Speed Rail Corridor (SEHSR), as its vision for an interstate high-speed rail system linking the southeast United States to the northeast corridor. Initially connecting Charlotte, NC, Richmond, VA, and Washington, D.C., SEHSR was later extended as far south as Florida and across to Atlanta. Since its inception, Virginia has been an integral part of this vision and the state participated in several environmental and planning studies including the recently completed Tier II National Environmental Policy Act (NEPA) study for Richmond to Raleigh and the 2012 Tier I Environmental

Impact Statement (EIS) from Richmond to Hampton Roads.

In 2009, the American Recovery and Reinvestment Act (ARRA) reinvigorated the federal government's high-speed rail program, authorizing \$8 billion in stimulus funds to the High-Speed Intercity Passenger Rail Program (HSIPR). A year later, following an additional \$5 billion federal appropriation for high-speed rail, Virginia received approximately \$40 million for a Tier II NEPA study and preliminary engineering for high-speed rail between Washington, D.C. and Richmond. Formally initiated in 2014, and known as DC2RVA, this project is currently underway.

DC2RVA will enable passenger rail to be a competitive transportation choice for one of the most heavily traveled corridors in the United States. Paralleling I-95 and extending 123 miles along CSX's existing Class I main line from south of Richmond to the Long Bridge over the Potomac River, DC2RVA recommends specific rail infrastructure improvements and service upgrades to deliver higher speed passenger rail, improve conventional speed passenger service, expand commuter rail, and accommodate growth of freight rail service in the corridor.

In December, 2016 DRPT presented to the Federal Railroad Administration its initial findings and recommendations regarding the Richmond, Fredericksburg, and Northern Virginia segments of the project; it eagerly anticipates a July, 2017 Draft EIS release. A 60 day public comment period, as well as input from the Commonwealth Transportation Board (CTB) will follow, enabling DRPT to

return its final recommendations to the FRA this fall.

Though momentum and public support for projects like DC2RVA remains high, they are nonetheless not without their challenges, similar to other major infrastructure studies and projects: engaging the local communities most impacted by the study and its findings, navigating the complex and often challenging federal processes, managing expectations on higher speed intercity passenger rail, and working closely with the host railroad.

While sections of the SEHSR network are well-suited for new or future high-speed rail objectives, Virginia is taking an incremental approach, working within existing host railroad rights of way to extract maximum benefits with minimal impacts to cultural and natural resources.

This strategy includes plans for substantial rail improvements in partnership with host railroads to deliver freight and passenger benefits. Plans focus on taking trucks off the road and delivering more reliable and frequent passenger rail service to the parts of the Commonwealth that need it most. DRPT also works to validate improvement plans through operations modeling that pinpoints capacity improvements with maximum results for freight and passenger rail.

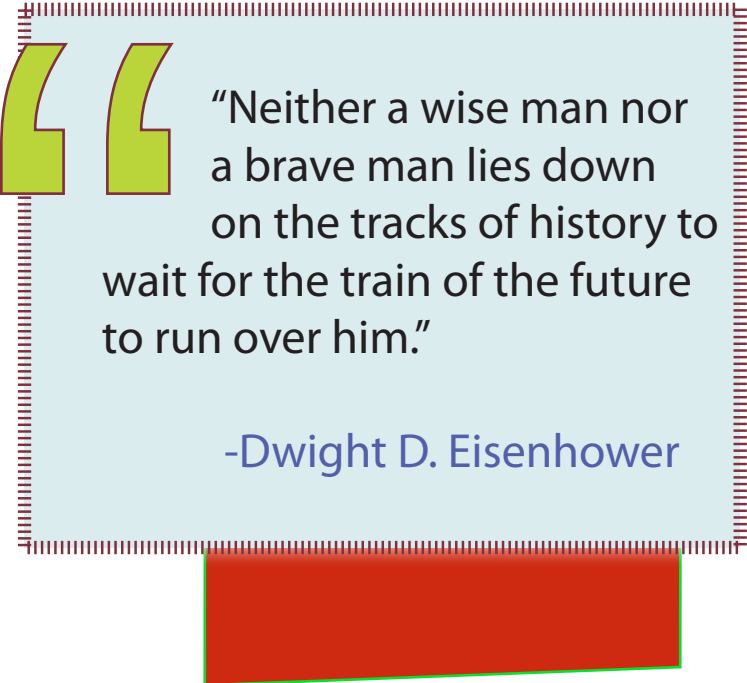
Virginia continues to be a national leader in its multi-modal approach to delivering real travel options to its citizens. In addition to being one of the 23 states that took on the challenge of funding regional intercity passenger rail corridors under the Passenger Rail Investment and Improvement Act of 2008 (PRIIA), Virginia is one of the only states to secure dedicated state funding for passenger rail capital and operating expenses. Known as the Intercity Passenger Rail Operating and Capital Fund (IPROC), this state funding source provides over \$55 million in annual funding for major infrastructure projects and studies like DC2RVA.

As a result, Virginia's diverse rail project portfolio includes a mix of freight and passenger projects with contributions from state and federal sources, along with matching funding and equity from the railroads. In 2016, Virginia announced its Atlantic Gateway program of multi-modal transportation investments designed to unlock the I-95 corridor from congestion. This \$1.4

billion investment includes nearly \$500 million dedicated to enhancing freight, passenger, and commuter rail capacity on the northern end of the DC2RVA corridor. This investment is also augmented by a \$165 million federal FASTLANE grant, also awarded in 2016, with \$45 million dedicated to the rail enhancement elements of the project. The Atlantic Gateway rail projects will benefit passenger and commuter rail service in the entire southeast corridor, including the state-sponsored trains originating in Norfolk, Newport News, Richmond and Lynchburg.

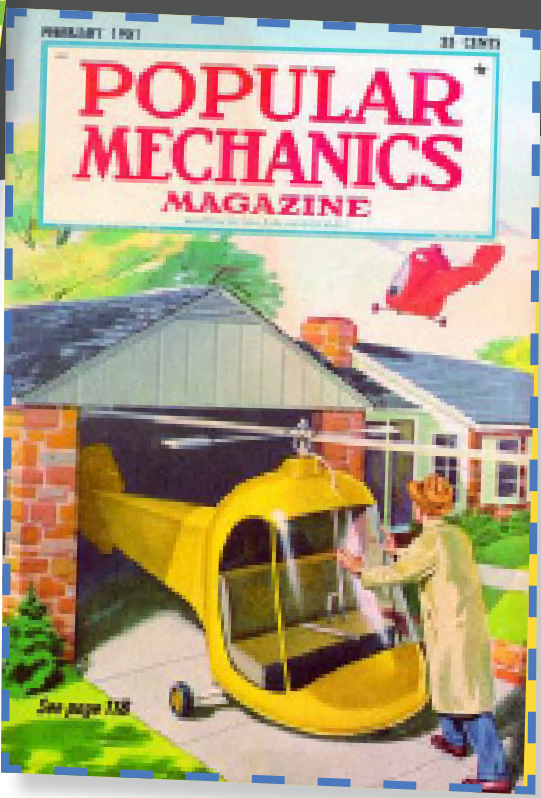
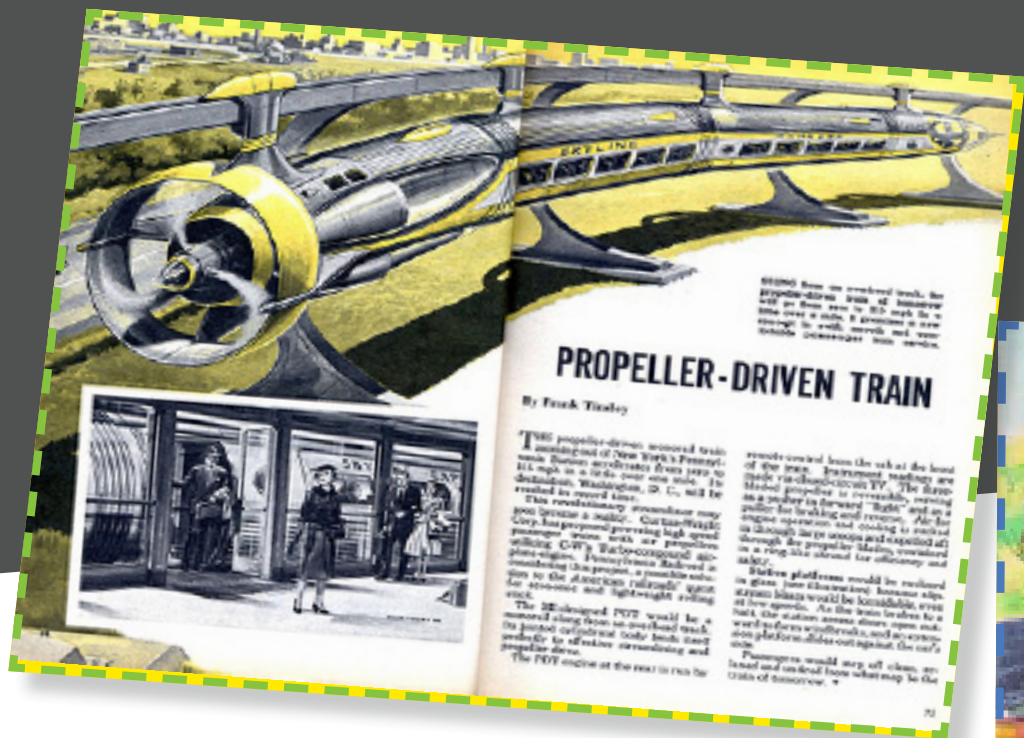
Since 2013, Virginia has also added new state-supported intercity passenger rail frequencies to Richmond, Lynchburg, and re-instated Amtrak service to Norfolk, which had not operated since 1973. In 2017, the Commonwealth will extend passenger rail service to Roanoke for the first time in four decades.

When complete, these critical rail investments will allow Virginia to cement its place as the leader of the transportation crossroads between north and south.



“Neither a wise man nor a brave man lies down on the tracks of history to wait for the train of the future to run over him.”

-Dwight D. Eisenhower



Retro-futurism is a trend of artistic creativity that boomed after the two World Wars, as break through technology began to reach people's daily lives.

The transportation systems were designed to incorporate scientific discoveries to maximize the capitalist experience; making rides faster, easier, and sleeker. Unlike today's modern design pictures, these illustrations have a very human feel, portraying leisure activities that paint an emotional depiction of the desire for a perfect world.

During this era, thousands of ideas were born and continue to awe, fascinate, and inspire and influence us to this day.



AUTONOMOUS VEHICLES

INTEGRATING WITH INTERCITY PASSENGER RAIL

By: Matt Hardison, Principal at HCG, specializes in transportation and technology and recently served as EVP and Chief Marketing and Sales Officer at Amtrak

SYNOPSIS: THE EMERGENCE OF AUTONOMOUS VEHICLES PRESENTS VERY REAL RISKS TO THE PASSENGER RAIL INDUSTRY. GIVEN THE LONG LEAD TIMES FOR INVESTMENTS IN RAIL, OPERATORS SHOULD BEGIN NOW TO EXPLORE THOSE RISKS AND CONSIDER POSSIBLE RESPONSES.

Introduction

An autonomous vehicle (AV) is not a “car” – at least not as we think of one today. In fact, it represents a new mode of transportation that in certain cases may look like a car. Perhaps in part because of this as well as uncertainty regarding when AVs will appear and how they might be used, analysis of how they might affect our transportation systems is imprecise at best. Even so, what is clear is that AVs will be the most disruptive technological change to transportation since the advent of the automobile itself.

As with any new technology, rumors, misunderstandings, and unrealistic expectations abound regarding

what AVs can and cannot do and by when. Complicating matters further, a number of factors beyond the evolution of the underlying technology influence the introduction and adoption of AVs, including the nature and timing of government regulations, requirements for public investment in infrastructure (e.g., real-time condition data, roadside communication, and better lane markings), the willingness of individuals to change their travel behavior, and how the automotive industry adapts.

For the passenger transportation industry, and, in particular, for passenger rail with its significant long-term fixed investments, it is important to sort fact from myth, to understand how soon AVs will start to have a meaningful commercial impact, and then to consider the likely effect on the demand for rail travel.

The good news is that despite the many uncertainties, sufficient information exists that, if organized logically, can help operators begin to assess their risks and to adjust their investments and operations in a way to mitigate these risks – and even perhaps to capitalize on the change and help generate

new business.

Facts about Autonomous Vehicles

As a starting point to consider the nature of the competitive impacts, it is important to understand some basic parameters about AVs, such as what they are, how they will be used, who will own them, and when they will begin to emerge in a way that can shape the market.

There is no single type of autonomous vehicle. Most of the press focuses on driverless automobiles that ultimately will be able to operate in dynamic environments and conditions (“all roads, all the time”). But beyond autos, the technology can and already is extending to other forms of passenger and freight transportation, including buses and trucks.

Today, cars are generally owned by individuals, with the single-occupant vehicle still by far the most common form of urban travel. Yet AVs can achieve important savings on this conventional model for a number of basic reasons. AVs reduce the likelihood of



crashes; permit productive use of the vehicle while driving (and thus decrease the cost of traveling); allow more intensive use of capital (particularly as part of shared use systems); offer the potential to reduce traffic congestion and increase capacity of the existing system; and allow smoother flow of traffic with positive impacts on energy use and the environment.

The potential to make transportation systems operate more efficiently is particularly important because –subject to technology maturity – it influences where AVs have the greatest market potential, who will own and operate them, and how quickly they will appear.

In densely populated areas, for example, AV fleet operators will eventually be able to achieve important cost savings via shared mobility services. This means that there is a strong incentive for them to appear in these markets as soon as the

technology is available. Today, with technology still advancing, automation is focused on the less complex expressway environment, but that will change soon.

Ultimately, shared use will drive up average vehicle occupancy and drive down the number of vehicles required to meet demand.

Because of these cost advantages, AVs will be less expensive to hire than to own, much like Uber or Lyft are generally less expensive than traditional taxis. Consequently, within the next 20-30 years, those needing local transportation in an urban region are expected to prefer to hire AVs rather than own a car. AVs are thus likewise expected to be owned and operated by fleet operators, which may include manufacturers such as Ford and GM, rather than by individuals. Private ownership of vehicles will continue,

particularly in rural and lower density suburbs.

So when will all of this change happen? It already has begun. Consider, for example, that Tesla already offers a degree of automation for its drivers when in a highway environment, Uber is operating self-driving taxi in parts of downtown Pittsburgh today (initially with a driver ready to step in, just in case), and Google (Waymo) just made 500 self-driving vehicles available in Phoenix for individuals to use (for now also with a stand-by driver). Today, every auto manufacturer is working to develop AV functionality.

Nonetheless, because of the evolutionary nature of the technology, the time required for fleet turnover, and diverse market needs, AVs will neither instantaneously nor completely replace other forms (modes) of passenger and freight transportation. Instead, there

will be a period, certainly measured in years and some believe in decades, during which AVs will be phased in.

While no consensus exists regarding the pace of deployment, vehicles capable of self-driving (with an alert human ready to take over when needed) on major roads in good weather will be on sale within the next year. Several automobile manufacturers have also announced they will have self-driving vehicles for sale by 2021 (early sales may be limited to shared mobility firms and may still require a driver on standby). Some industry forecasts call for driverless vehicles in wide use by 2045 (or 28 years).

Ultimately, AVs will dramatically alter the transportation landscape, with the scale of these changes depending in large part on the degree to which AVs integrate with other transport changes – shared mobility, access to real-time information via smart phones, and changing public attitudes towards auto ownership. The impacts of these changes on existing modes will vary, but every mode can expect some important change. How much each traditional mode changes – or, more directly, how much market share any modes loses (or gains) – depends on the markets it serves and how it prepares for that change.

Impacts on markets

Ideally, one could determine market impacts by using existing travel and modal demand forecasting models, treating AV as simply a new mode of travel, and simply plugging in key AV cost factors to project the outcome. Long-term trends in travel demand have, after all, been reasonably predictable historically. AVs, however, represent a non-linear change, meaning that traditional factors used to forecast demand will shift in rapid, unpredictable ways.

Further, as noted above, this change is starting within the next 5 years. That combination makes existing models of limited, if any, utility.

In addition to economic trends, key determinants of long-term travel demand include the relative standing of a service compared to other modes with respect to:

- Total trip time, with AVs making it possible to integrate door-to-door travel time into a line-haul trip;
- Cost of travel, as measured by both the actual cost of the trip as well as the value of the time required for that trip;
- Convenience, which for rail may have been measured in departure frequencies; and
- Reliability, with improvements on the roadway side possible as AVs alleviate congestion.

AVs will alter the competitive landscape for each of these factors in unpredictable ways. Perhaps most importantly, for example, AVs hold the potential to change an individual's perceived value of time. An individual whose time can be devoted to something other than driving is going to value that time more highly (thus reducing the cost of spending time in the car), whether it be to work or to spend more time with the family. That means that even the traditionally stable measure of the value of travel time will change, improving the relative value of AVs over conventional vehicles and further changing the balance of demand.

These are each fundamental changes, and yet AVs will change them all simultaneously to one degree or another.

This is precisely why AVs will disrupt travel markets.

It is thus inevitable that AVs will alter the shares of demand by traditional modes, including for all forms of passenger rail.

Impacts on Intercity Passenger Rail

“Passenger rail” is not a single, uniform product. It encompasses local services, such as light rail, subways, and commuter rail; intercity (sometimes also called “regional”) services; and intercity high-speed rail. Passengers use each type of service for many different purposes, such as commuting, personal/leisure travel, and business travel. Any analysis of the impacts on passenger rail must consider both the nature of the service as well as which use or combination of uses is being considered.

Recent research by the Boston Consulting Group focused on demand for rail among commuters and concluded that AVs could take away 40 percent of that market's demand. Could the same be true for intercity passenger rail and, more specifically, for high-speed intercity passenger rail?

The short answer is that these markets will also be affected, though to a lesser degree than demand for rail used for commuting.

Light rail, subway, and commuter rail users are generally located in the more densely populated regions that will favor AVs and shared mobility services. In addition, trips on these services tend to be shorter distance – typically from suburban or urban markets to urban markets. In these cases, AV capabilities are well suited as substitutes, depending on pricing and government subsidies for commuter rail.

Range of Possible Impacts on Passenger Rail Demand

Markets	Impact Range	Notes
Local/Short-haul markets within ~50 miles (for commuters and local travel). <i>(Automobile travel of under ~1.5 hours)</i>	High (>25%)	Any passenger rail serving this market segment is at risk, particularly including local transit commuter services (light rail, subway and other local heavy rail), as AVs progress technologically to allow for suburban and urban operations.
Intercity/Mid-range markets of ~50-150 miles. <i>(Automobile travel of under ~3 hours)</i>	Medium (10%-25%)	Intercity passenger rail is today competitive in many mid-distance markets, particularly where road congestion makes driving unattractive. Low-cost buses have challenged rail's market standing over the last 10 years, and AVs will further erode remaining market share.
Intercity/Long-haul markets of ~150-250 miles. <i>(Automobile travel of ~3+ hours)</i>	Low (5%-10%) for high-speed services Medium (10%-25%) for slower, regional services	Impacts will depend on service speed and road congestion in the market. Slower regional rail services, such as Seattle-Portland, will be impacted more heavily, and high-speed services, such as that between New York and Washington, affected less.

While intercity passenger demand includes commuters, the primary markets are for leisure and – particularly in the case of high-speed services – business travelers. Leisure travelers of any rail system tend to be very price sensitive, so naturally the market share commuter or regional rail holds is subject to risk from lower-cost AV travel.

Business travelers generally are those with the least flexibility or price sensitivity. They are willing to pay a premium to travel when they need to travel for speed and reliability. That combination is what high-speed rail offers, which is why business travelers are the primary users of existing U.S. high-speed services

in the northeastern U.S.

For the foreseeable future, AVs will be increasingly trip-time competitive as the total travel distance (or time, if congestion exists) gets shorter. They will not, however, be able to offer the same speed as HSR on longer-haul congested markets, such as exists in the northeast corridor between New York and Washington. Consequently, AVs will be less of a threat to business travel on high-speed rail initially, though leisure travel on those same services will be at risk. Even the competitive advantage of high-speed rail for intercity services, however, can change over time if the advent of AVs also eventually brings

with it the increased efficiency and reduced congestion on the highway system that many predict.

The table below summarizes the relative, generalized impact scenarios by type of passenger rail service for a mature deployment of AVs. The magnitude and timing of impacts will vary widely and depend on local market conditions and rail operator response and detailed, market-level analysis is required to improve precision and understanding.

Range of Possible Impacts on Passenger miles (for commuters and

local travel).

Rail Operator Response

So AVs present some degree of market threat to all forms of passenger rail. Is it possible to counter or mitigate some of this risk?

The answer is yes, but the potential for success depends on the characteristics of the rail system, such as network design, customer use, and the timing of any actions considered. For the immediate term, for example, the distribution of trips in a given system is a key determinant of market impacts. For the longer term many other questions rise in importance, such as: When do AVs improve the efficiency of the urban and suburban road system enough to offset urban congestion risks that favor transit? Will regulation of vehicle use within cities change the competitive dynamics? Can the rail operator improve the relative economics of the service? Can rail use AVs to solve the “first-mile, last-mile” access problem?

Some local transit and intercity operators have already begun to test how to bridge in emerging systems, teaming with companies such as Uber and Lyft to carry passengers to or from the station. This combines the competitive advantage of rail – speed through congestion or over distance – with that of AVs – cost savings, convenience and flexibility within the last mile of dense areas. In the long term, transit operators could also capitalize on AV technology itself, fielding autonomous buses, developing dedicated autonomous bus lanes, or offering AVs for paratransit services, to drive down costs and increase capacity.

Given the complexity and risks, rail operators’ planning and response must include the following actions:

- Build a Baseline Market View:

Any pragmatic view of demand impacts has to start with a review of the services, markets, and customer profiles specific to a given operator. Most operators have this information already. The goal of this phase is to frame system use and lay the groundwork to answer the most fundamental questions operators face today: what demand is at risk and what could the impact be on financials?

- Examine Station/Asset Outlook: Beyond the core network, operations must also consider owned assets, particularly including stations and parking, to evaluate possible long-term impacts – will a drop in commuter rail demand adversely affect station traffic and related commercial revenues? Is parking an important share of station revenue and what are the scenarios for parking demand? Can station parking be repurposed to other commercial uses or repositioned competitively to capitalize on AV support requirements (as they have been in certain cases for car sharing services)?

- Develop a Plan: Building on market and asset analyses, operators next need to consider how their mission evolves and how to position in the marketplace. Scenario analysis to test plan direction with differing futures as well as pilot programs can be especially helpful to frame and drive decisions, ultimately helping to understand the range of outcomes for questions such as: How will AVs penetrate my market and over what period of time? Can I partner with an operator or otherwise capitalize on AV technology to drive long-term share and success?

- Reprioritize Investments: Refocusing investments to improve competitive positioning is ultimately the most challenging and important step. Naturally this includes options

such as changes to network design, improvements to frequencies and operating speeds, improvements to underlying technologies, and changes to rolling stock. For intercity rail, that may mean focusing on longer-distance markets (greater than 150 miles). This key strategic phase of the review must ultimately answer the question: Which investment options align with new technology use, and which will improve actual and perceived quality of service or reduce costs in this new era?

With these actions, passenger rail operators can start to target actions and investments that protect market share and, more to the point, sustain and improve competitive standing.

“We should not be scrimping on investments in public safety. The lack of infrastructure spending is costing us lives in America. It’s costing every commuter.”

-U.S. Senator Cory Booker

BRINGING HIGH-SPEED RAIL TO USA

MAGLEV BELIEVES WE'RE CLOSER THAN YOU THINK

By: Wayne L. Rogers, Chairman and CEO, The Northeast Maglev, LLC

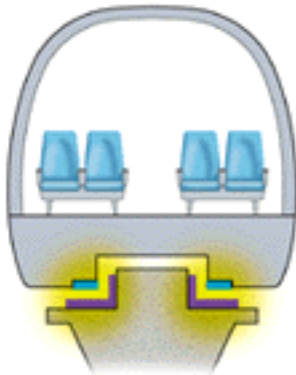
The Northeast Maglev is a U.S.-owned company based in Washington, DC. They are committed to bringing the Superconducting Maglev technology to the United States' Northeast Corridor, the most congested transportation region in the country. TNEM is working closely with JR Central to utilize this technology in the United States.

Across the country, from commuter light rail projects to high-speed passenger trains, rail projects have become political lightning rods, getting bogged down in partisan bickering while road and bridge improvements remain priority projects for most federal and state authorities.



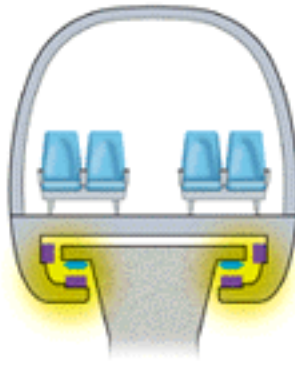
Levitation Techniques

ELECTRODYNAMIC



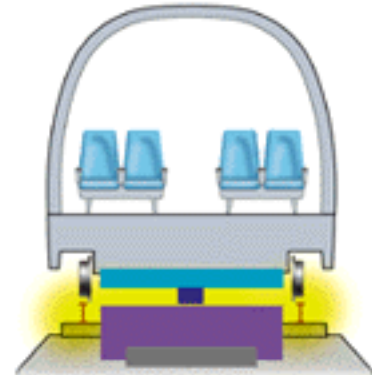
Electromagnets on the guideway levitate the car.

ELECTROMAGNETIC



Electromagnets on the cars lift the cars.

INDUCTRACK



Permanent magnets levitate over passive coils.

America's railway system has transformed our nation into the thriving, interconnected, industrial power it is today. Yet, as we've invested in other transportation technologies like airplanes and automobiles, other nations surpassed our rail infrastructure decades ago. High-speed rail has been a viable transportation option for many around the world for a generation, but not in the United States.

As our population has continued to grow, America's rail and transportation infrastructure has lagged farther and farther behind. To address these challenges, U.S. policymakers are looking at solutions to address the growing population of the Northeast Corridor, the nation's economic powerhouse. By 2050, the population in this region is expected to increase by 27 percent, reaching nearly 65 million people. The region's current transportation system is already at capacity, and with a growing population, we will not be able to meet

future travel demand without significant investments and improvements.

The Trump administration has expressed interest in building high-speed rail systems to tackle America's congestion issues. As the Administration and Congress begin crafting an infrastructure spending bill, one of the most promising transportation projects currently under development is The Northeast Maglev (TNEM). As a private U.S. company, we are working to bring the world's fastest train – the Superconducting Maglev (SCMAGLEV) system – to the U.S. Northeast Corridor.

SCMAGLEV will transport passengers from D.C. to Baltimore in 15 minutes and from D.C. to New York City in an hour. Revolutionizing travel throughout the corridor, SCMAGLEV would provide an additional transportation option that would ease the burden on existing rail lines shared by Amtrak, regional and freight

rail carriers. Aside from reducing growing congestion in the region, SCMAGLEV would create more than 205,000 new jobs, and reduce greenhouse gas emissions by more than 2 million tons across the region.

The concept for this revolutionary technology came from American physicists in the 1960s. SCMAGLEV uses magnetic forces to smoothly and rapidly accelerate trains to speeds of more than 300 miles per hour while levitating inches from the ground. Rather than running on standard railroad tracks, SCMAGLEV trains levitate without friction between the walls of a U-shaped guideway that contains electromagnetic coils. Strong magnetic forces between these coils and superconducting magnets on the train are used for efficient and super-high-speed operation while remaining secure and free from derailment. SCMAGLEV has no wheel-rail contact, so it has minimal noise and vibration compared with conventional high-speed rail.

After more than 50 years of study, development and testing, the Central Japan Railway Company (JRC), one of the world's most reliable rail operators, is currently expanding their SCMAGLEV project to connect Tokyo, Nagoya and Osaka. The region is one of the most highly traveled corridors in the world, and JRC's reasoning for investment in this area is synonymous to TNEM's investment in the Northeast Corridor – to expand capacity in the most efficient and forward-looking way possible.

That's why TNEM is working with JRC to bring SCMAGLEV to America. JRC has spearheaded more than half a century of research and progress. To tackle our nation's current transportation challenges, we must work with the most knowledgeable partner and invest in the safest, fastest and most efficient system. Japan is so confident about the power of SCMAGLEV in the Northeast Corridor, they've pledged support for the project. While delivering remarks at the White House in February, Prime Minister Abe reiterated Japan's desire to bring SCMAGLEV technology to the U.S. as part of expanded Japanese investment in this country.

SCMAGLEV has already made great strides thanks to continued support from government leaders, policymakers, industry leaders and - most importantly - the large and small communities throughout the corridor.

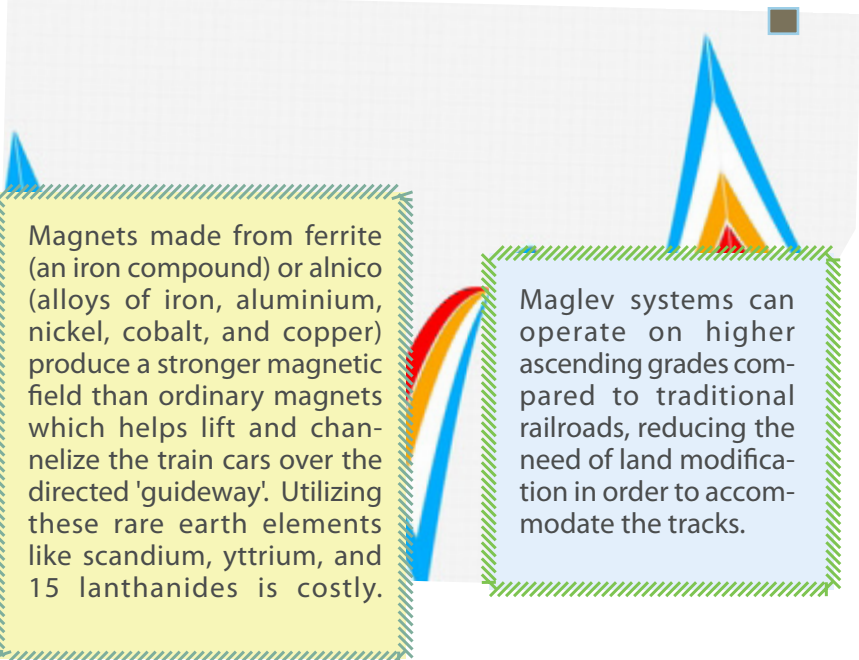
Over the past five years a solid foundation has been put in place to bring SCMAGLEV to the nation's most traveled and congested corridor. As a signal of the coming investments and economic growth spurred by SCMAGLEV presence in the Northeast Corridor, TNEM and an affiliated company, Baltimore Washington Rapid Rail (BWRR), opened a new headquarters in the heart of Baltimore's central business district in September 2015. We like to say the move proved to be a symbolic catalyst for all other progress. Two months after the move, the

Maryland Public Service Commission approved BWRR's application to acquire a passenger railroad franchise.

August 2016 proved to be a month that marked further financial investment from U.S. stakeholders, further proof high-speed rail is feasible—and wanted—in the Northeast Corridor. The U.S. Department of Transportation awarded the Maryland Department of Transportation a \$28 million grant dedicated to environmental and engineering studies for the project. And the government of Japan pledged \$2 million for additional engineering work for the project.

We are meeting with local communities, focusing on conducting an Environmental Impact Statement that will determine the routes, Federal Railroad Administration safety reviews, and Surface Transportation Board construction reviews. Completing each task brings us one step closer to transforming transportation in the Northeast Corridor.

America is a world leader, a country where innovation has always been an impetus to tackling major issues. Deploying this world-class, next-generation transportation technology will not only transform one of the most important corridors, but revolutionize our nation's future. It won't be just a train, it will shrink geography to bring Washington DC to New York City, and the cities in between, to within a one hour trip.



Magnets made from ferrite (an iron compound) or alnico (alloys of iron, aluminium, nickel, cobalt, and copper) produce a stronger magnetic field than ordinary magnets which helps lift and channelize the train cars over the directed 'guideway'. Utilizing these rare earth elements like scandium, yttrium, and 15 lanthanides is costly.

Maglev systems can operate on higher ascending grades compared to traditional railroads, reducing the need of land modification in order to accommodate the tracks.

HYPERLOOP

THE FUTURE OF INTERCITY TRANSPORTATION

By: Dan Katz, Transportation Policy Counsel, Hyperloop One

Technological breakthroughs in transportation are advancing new possibilities for safety, efficiency and speed. In a system beset with congestion and aging infrastructure, innovation will be key to tackling the challenges we face. These innovations are additional tools for our toolbox – they don't necessarily replace existing tools. We are going to need all options – innovative and traditional – on the table to meet the demands of the coming decades.

Hyperloop is one of those options. That's why Hyperloop One has joined APTA – to work together with our colleagues to advance American transportation.

Hyperloop will soon be a new mode of transportation. Following Elon Musk's release of the "Hyperloop Alpha" white-paper, our company started with four people in a Los Angeles garage in the summer of 2014. The team is now more than 280 employees in three locations in the U.S., and offices in Dubai and London. We operate a 3.5-acre innovation campus in LA, a 100,000 square foot machine shop in Las Vegas and a 50-acre test site in the Nevada desert.

The fundamentals of Hyperloop are straightforward: high-speed travel in a low-pressure tube to reduce resistance and drag, and the use of pods rather than trainsets, for on-demand, point to point travel. The result is an extremely



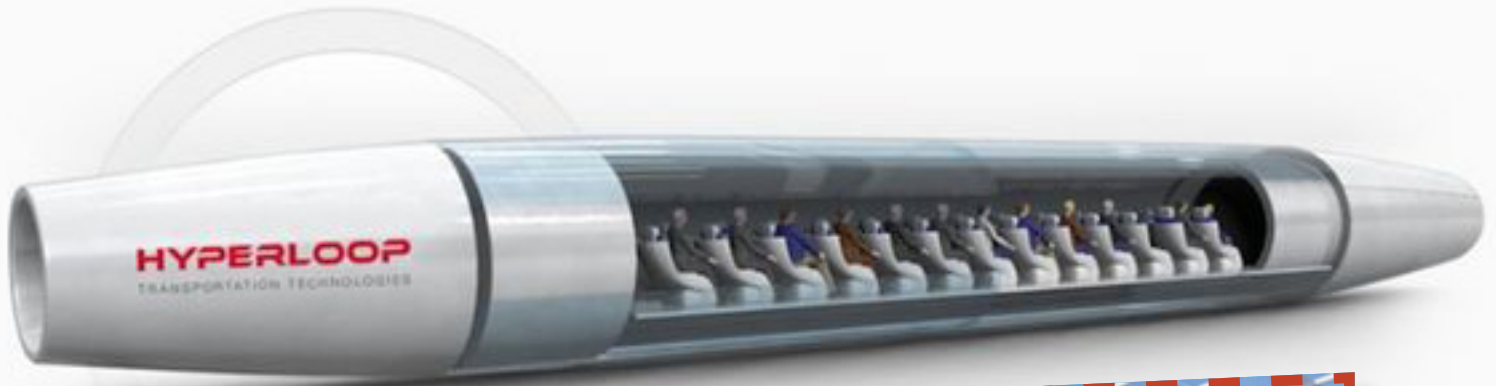
high-speed, energy-efficient and versatile system. At Hyperloop One, we are working to perfect the design and bring it to market.

One year ago at that Nevada test site, we demonstrated our propulsion and power controls system. We have now completed the first 500 meters of DevLoop, our full-scale and full-system track. For several weeks we've been performing tests at DevLoop on all the major systems – propulsion,

vacuum, levitation, braking and controls. We've built a custom pod vehicle that operates autonomously with a linear electric motor and magnetic levitation.

Hyperloop One is getting ready for our first full-system public test later this year. This time, Kitty Hawk will be in the Nevada desert rather than on the beaches of North Carolina.

When I was at USDOT working under



Secretary Anthony Foxx during the Obama administration, we were determined to do all we could to modernize our practices so that we wouldn't always be playing catch up with innovation. I know the new administration is just as determined to be at the forefront of innovation.

At Hyperloop One we are moving beyond incremental changes to existing technologies, but we are eager to make multimodal connections to passenger rail, transit and aviation. In fact, integration with other modes is central to our business plans for both freight and passenger service. We can serve as a high-speed passenger link from urban transit systems. We are planning to integrate operations with autonomous vehicles for last mile passenger trips. And we are looking at systems to connect ports with inland rail terminals. One of our company's leading investors is DP World, which realizes the impact that Hyperloop can have upon freight transportation and movement of goods from ports. We've been working together to invent new cargo handling technology for its Port of Jebel Ali.

We see demand around the world. In May 2016, we launched the Hyperloop One Global Challenge to find the best routes on the planet and put real teams and stakeholders behind them. We recently narrowed it down from a couple of thousand applications to 35 semifinalists from 17 countries. Twenty of those semifinalist proposals come with real government support.

We are entering an age of "press-button transportation," with ride share and eventually drone services available to us at the tap of a phone. Hyperloop One plans to be part of that autonomous, push-button system. We're focused on building hardware, but also a new way of controlling freight and passenger traffic in a "packetized" system. Our control systems are designed to ensure that everything on the main line of the Hyperloop is moving at an optimal speed and calibrate pod entry to the

Hyperloop to prevent congestion and maximize efficiency.

As we see with autonomous cars, there is a recognition that we can make huge improvements in safety and reduce congestion by eliminating human error. Whether it's a shipping container or a passenger pod, in the Hyperloop One system, the human role will be limited to choosing the destination. That is where transportation needs to go if we are realistically going to leap forward and solve the congestion problems we face.

Advocates of traditional modes of transportation do not need to fear the entry of innovative technologies to the transportation system. We should all root for more diverse options for the traveling public and our nation's freight network.

IN THE SPOTLIGHT



GLEN WEISBROD
PRESIDENT

“There is growing appreciation that public investment decision-making should reflect long-term considerations such as maintaining a quality of life and sustainable economy for future generations, and improving local opportunities for community development. When we take these factors into account, there can be a compelling argument for fast and efficient intercity rail investments.”

**ECONOMIC
DEVELOPMENT
RESEARCH
GROUP**



P.S. SRIRAJ, PH.D.
DIRECTOR, URBAN TRANSPORTATION CENTER

“This work provides a compelling, comprehensive framework for measuring the return on investment for high-speed rail projects in a manner that takes into account the varying geographical scales as well as the world views of different stakeholder groups.”

**DIRECTOR,
METSU & RESEARCH
PROGRAMS**
RESEARCH ASSOCIATE
PROFESSOR
COLLEGE OF URBAN PLANNING
AND PUBLIC AFFAIRS (CUPPA)
UNIVERSITY OF ILLINOIS
AT CHICAGO



JASON BELOSO
STRATEGIC PLANNING MANAGER

“Washington State is exploring options that leverage 21st century technology and transportation along major economic and population hubs in the Pacific Northwest. The state’s Ultra High-Speed Ground Transportation Study seeks to advance a shared, long-term vision for high-speed transportation that would raise and promote innovation, economic vitality, and quality of life.”

**Rail, Freight, and
Ports Division**

**WASHINGTON STATE
DEPARTMENT OF
TRANSPORTATION**

THE CASCADE CORRIDOR

WASHINGTON STATE ULTRA HIGH-SPEED GROUND TRANSPORTATION STUDY

By: Kenneth Sislak and Jason Beloso

OPERATING AMTRAK CASCADES TRAINS REQUIRES FUNCTIONAL PARTNERSHIPS BETWEEN WASHINGTON, OREGON, BRITISH COLUMBIA, AMTRAK, THREE RAILROADS, INTERNATIONAL CUSTOMS AND BORDER CONTROL AGENCIES AND A TRAIN MANUFACTURER. THESE PARTNERSHIPS ARE MANAGED THROUGH CONSTANT COLLABORATION WITH FRA AND SERVICE CONTRACTS AND AGREEMENTS. THE GOAL BEING TO EXPAND AND IMPROVE WASHINGTON'S AMTRAK CASCADES SERVICE BETWEEN PORTLAND, OREGON AND VANCOUVER, BRITISH COLUMBIA.

Washington State has a long history of collaborating with Oregon and British Columbia to improve rail service in the Pacific Northwest Corridor or better known as the Cascades Corridor.

The Cascades Corridor is one of eleven federally designated high-speed rail corridors in the United States. The 466-mile (750 km) corridor extends from Eugene, Oregon to Vancouver, British Columbia via Portland, Oregon and Seattle, Washington. It was designated a high-speed rail corridor on October 20, 1992, as the fifth of five corridors called for in the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA). Washington State Department of Transportation (WSDOT) completed a high-speed ground transportation study and delivered it to the governor and legislature on October 15, 1992.

The study recommended incremental investment in higher speed train service utilizing tracks owned by Union Pacific in Oregon and BNSF in Washington and British Columbia to

reduce travel times in the Portland – Seattle segment to two hours. Since then, Washington State along with Oregon have been making investments in improving trains speeds and service reliability. New Talgo trains were purchased that allowed higher speeds on curves. Grade-crossing elimination, curve straightening and station improvements have been completed. WSDOT is completing a program of interrelated infrastructure improvements along the existing 297-mile BNSF north-south main line between the Columbia River and the Canadian border that will initially allow for operation of four additional passenger daily round trips between Seattle and Portland (for a total of eight round trips), which will help achieve greater schedule reliability and reduce the travel time between Seattle and Portland by almost 20 minutes.

The proposed infrastructure improvements will also improve reliability for existing train service operating

between Portland and Vancouver, B.C., and Seattle and Vancouver, B.C. The proposed improvements primarily follow the existing rail corridor to avoid and minimize environmental impacts. Intercity passenger stops would be maintained at Bellingham, Mt. Vernon/Burlington, Stanwood, Everett, Edmonds, Seattle, Tukwila, Tacoma, Olympia/Lacey, Centralia, Kelso/Longview, and Vancouver, Washington. WSDOT is continuing with plans to reduce scheduled run time by another 10 minutes between Seattle and Portland and achieve an 88% on-time performance. By the end of 2017, WSDOT will have completed 20 capital projects, funded by \$800 million in federal grants to improve Amtrak Cascades service.

If other improvements to the corridor are completed as proposed in Washington State's long range plan, passenger trains operating at a maximum speed of 110 miles per hour (180 km/h) would travel between Portland and Seattle in 2



A stop in Winona, Minnesota with 2 additional locomotives in the consist. A pair of new Siemens Charger engines are being deadheaded west to serve the Cascade Corridor.

hours and 30 minutes. Today, the trip from Portland to Seattle takes 3 hours 40 minutes. And the trip between Seattle and Vancouver would take 2 hours and 37 minutes by 2023. Today, the trip between Vancouver and Seattle takes about 4 hours by train. Driving takes about three hours. But what if the trip could take just one hour?

The potential benefits of a shortened trip provided by an ultra-high-speed train have gained the support of private-sector groups such as the Association of Washington Business and Washington Roundtable, along with Microsoft and others who are looking to strengthen economic ties with British Columbia. The push for an ultra-fast train is the growing desire to connect the tech industry in both regions and take advantage of agglomeration benefits.

Governor Jay Inslee sought \$1 million from the Legislature to fund a feasibility study for an ultra-high-speed

ground transportation system between Seattle and Vancouver, British Columbia. Supporting the proposal is British Columbia Premier Christy Clark. The new system would be capable of 250 MPH maximum speeds and reduce travel times between Vancouver, B.C. and Seattle to one hour. The Legislature appropriated \$300,000 to the analysis of an ultra-high-speed (250 mph or more) ground transportation system alignment between Vancouver, British Columbia and Portland, Oregon with stations in: Vancouver, British Columbia; Bellingham, Everett, Seattle, SeaTac, Tacoma, Olympia, and Vancouver, Washington; and Portland, Oregon. The study will explore systems with identified and limited station stops, including options to connect with an east-west alignment in Washington state and with a similar system in the state of California. This high-level feasibility study must be completed by December 15, 2017. WSDOT selected a consulting team led by CH2M to

conduct the study.

The study will examine high-speed transportation technologies capable of 250 mph (400 kph) maximum speeds. This would include Identification of existing highway or railroad rights-of-way that are suitable for ultra-high-speed travel, including identification of additional rights-of-way that may be needed and the process for acquiring those rights-of-way. Technologies could include high-speed rail maglev and Hyperloop. The Federal Railroad Administration will use the CONNECT model to help evaluate ridership, benefits and costs of the alignments and service strategies.

The consultant team is tasked with examining institutional arrangements for carrying out detailed system planning, construction, and operations, including international border issues; and an analysis of potential financing mechanisms for an ultra-high-speed travel system.



USDOT FUNDS CALTRAIN'S ELECTRIFICATION PROJECT

...WHILE OTHER PROJECTS REMAIN IN LIMBO

By: David Cameron

In May, US DOT Secretary Elaine Chao agreed to sign off on the Full Funding Grant Agreement (FFGA) of \$647 million for the electrification of Caltrain, the commuter service that transports 60,000 passengers a day along the Bay Area Peninsula from San Jose to San Francisco. The FFGA caused division in the state's congressional delegation with House Railroad Subcommittee Chairman Jeff Denham from Modesto and the other 13 members of the state's Republican Congressional Delegation objecting, and all 33 members of the state's Democratic Congressional Delegation, as well as Governor Brown, Senators Dianne Feinstein and Kamala Harris, supporting.

Chao's turnaround was perplexing. A week earlier in May, at the Senate Committee on Environment and Public Works Committee, Chao testified that she was holding off on signing the FFGA because the California delegation was split on the Caltrain electrification, which wasn't quite accurate - only 26% of California's congressional delegation opposed and 74 percent supported. Chao claimed she was \$115 million short of being able to sign the \$647 million full funding grant agreement and she couldn't spend money she didn't have. However, she said that the \$100 million that was included in the May Omnibus bill was available for Caltrain, which also was not accurate. The \$100 million in the 2017 omnibus could not be used until and unless the Secretary signed the FFGA. It wasn't clear if the Secretary realized that.

It wasn't looking hopeful and that was very troubling. Projects like the electrification of Caltrain seeking federal funding have to clear multiple, detailed federal hurdles to reach the moment of final decision. The grant program is a complicated, rigorous, expensive, multi-year process to gain approval.



It works something like this: in the beginning, a state (or local government or transit agency) applies for admission to the Capital Investment Grant (CIG) program. Once the project advances during the design phase, there is a second application seeking to be rated or scored by the U.S. Department of Transportation.

The DOT forwards those ratings to Congress with its recommendations for funding. The Obama administration did this for the 16 projects last year. Congress considers its current funding obligations for multi-year capital projects and selects those it feels it can afford for a program that usually is budgeted at about \$2.3 billion per year.

The final step, normally considered a formality, is the signing of a Full Funding Grant Agreement, which stipulates the percentage the federal government will pay toward the total cost of a project and how much money it will provide each year. Given that most projects take several years to complete, and the agreement binds the federal government to keep its commitment until the project is finished.

However, as is much with this nascent administration, Trump apparently is going about the process a

little bit differently. It was at this final point in the approval process that the Caltrain's project languished.

A multitude of political, community, rail labor and business interests met with the DOT and Congress to press for the signing of the FFGA. The American Public Transportation Association wrote Chao about the Caltrain delay, noting that "no project has failed to secure final signature after successfully meeting evaluation criteria." Almost 10,000 jobs in 15 states were at stake. Caltrain had approved and signed multiple contracts with construction firms and manufacturers. They were to be executed in March. When Chao decided to delay, Caltrain was able to get them extended to June 30. If the grant was not funded sometime before then, it would have had potentially devastating effects on the Caltrain's electrification project. The rail system, operated by a joint powers agency on the Peninsula, had the already signed contracts that pledged to give a formal notice to begin work by June 30. If it had failed to provide that notice, the agency could incur penalties so severe that it might not be able to do the project, to the detriment of the communities along the Peninsula and to Caltrain.

The Caltrain electrification project appeared to be an obvious one – had completed the rigorous Capitol Grants process, is shovel ready, will create 10,000 jobs in 15 states, will replace polluting, loud, inefficient diesel locomotives with quiet, efficient electric trains that can almost double the capacity on an already overburdened commuter line, and the state has in hand \$1.3 billion of the \$2 billion total.

In the omnibus bill signed by President Trump on May 4, Congress approved funding for Caltrain's \$2 billion electrification project and 15 other transit projects. All of the projects were described as either ready to start immediately or able to break ground later this year. Having secured the Caltrain funding, members are now pushing Chao to move forward with releasing the money for those other projects.

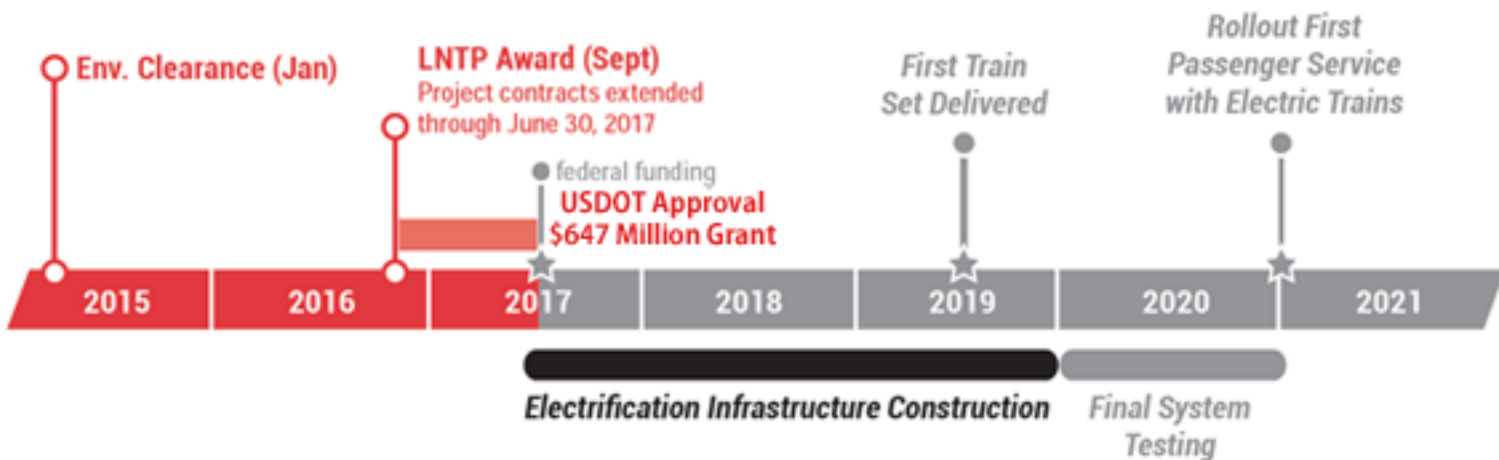
Remaining stalled are transit projects in Maryland, New York, Texas, Arizona, Florida, Indiana, Michigan, Missouri and New Mexico. It was unclear whether Chao intends to sign off on the other projects. The Trump administration has suggested it has no plans to sign off on future transit investments, saying they should be funded by the local governments that benefit from them. Which seems a fundamental misunderstanding of the role of the federal government, particularly when it comes to transportation.

On May 19, 25 Democratic senators and Bernie Sanders sent Chao and Mick Mulvaney, director of the Office of Management and Budget, a letter urging them to "immediately advance the billions in shovel-ready public transportation projects around the country that could break ground this year."

The letter said, "Many Americans voted for the president based on his promise to rebuild our nation's infrastructure. We urge you to keep that promise by funding and advancing the billions in transit projects currently in the CIG program's pipeline."

Will those projects move forward? At this point, no one knows because the administration doesn't seem to have a coherent infrastructure strategy.

MILESTONES



APTA RAIL

HIGH-SPEED & INTERCITY PASSENGER RAIL CONFERENCE

By: Charlie Quandel and Norman A. Forde



The High-speed and Intercity Passenger Rail Committee of APTA organized two sessions at the Rail Conference this year. Both sessions were on Tuesday and conveniently scheduled back-to-back in the same room. The first session discussed the Progress of High-Speed and Intercity Corridors in the United States and the second session highlighted project development around the world.

The first session featured four speakers and was moderated by Charlie Quandel. The speakers and their topics included:

- Expanding Passenger Rail

Capacity through CREATE was presented by Beth McCluskey, Director of Intermodal Project Implementation, Illinois Department of Transportation, Chicago, IL.

- Superconducting Maglev in the Northeast Corridor presented by Robert W. Kiernan, Senior Director, The Northeast Maglev (TNEM), Washington, DC. Mr Kiernan's presentation is summarized within this article.

- Texas Central High-Speed Rail Bullet Train was presented by Chris Brady, Vice President of Federal Affairs of Texas Central

Partners.

- California High-Speed Rail Project Update was presented by Frank Vacca, Chief Program Manager for the California High-Speed Rail Authority

Expanding Passenger Rail Capacity through CREATE- The values of freight rail trade will more than double increasing the capacity constraints on the passenger rail system in Chicago, which operates mostly on freight owned corridors. Therefore, the Chicago region must improve freight movement to mitigate negative impacts on both commuter and intercity passenger rail

service. The CREATE program is a \$4.4 billion Public-Private Partnership designed to improve transportation flow through Chicago focusing on increased capacity, speed, and reliability for passenger and freight train traffic and eliminates 25 highway grade crossings. Six passenger rail/freight rail grade separations are planned, which removes freight and METRA commuter train conflicts at these junctions.

The 30 year economic benefits of the CREATE project exceed \$31.5 Billion. The rail benefits include economic growth because Chicago will be able to accommodate growth in both passenger and freight trains and, at the same time, reduce delay to passenger and freight trains. The passenger train delay will be reduced by over 1.3 million passenger hours annually. The benefits to safety result from the elimination of rail-roadway conflicts at 25 grade crossing sites. Furthermore, roadway benefits include reduced delay to vehicles from elimination of the grade crossings. The next steps include completion of the remaining rail corridor projects, the passenger-freight rail flyover projects, and the grade separation projects.

Superconducting Maglev in the Northeast Corridor - The Northeast Maglev (TNEM) is a superconducting Maglev system that operates trains that levitate between the walls of a U-shaped guideway containing coils instead of running on railroad tracks. TNEM is working closely with JR Central and its manufacturing and technology team to build the first leg of the NEC Maglev system between Baltimore and Washington. The TNEM vision is a one hour express service at 311 MPH between Washington, DC to New York City. In addition to a top operating speed of 311 MPH, the

SCMAGLEV is safe, consumes half the energy and emits a third of the CO₂ of a commercial airline plane.

JR Central is the developer of the superconducting Maglev (SCMAGLEV) and is deploying the technology in Japan as an express by-pass route for the existing Shinkansen between Tokyo and Osaka. This was the topic of the second session on global developments.

TNEM has identified feasible routes from Washington to Baltimore and found no fatal flaws in the full route to New York. Their studies have demonstrated strong ridership and revenue potential and received a rail franchise of Maryland. TNEM obtained a \$28 million federal grant to conduct an EIS which is currently underway. Service between Baltimore and Washington is planned for 2027.

Texas Central High-Speed Rail Bullet Train - Texas Central High-Speed Railway (TCR) proposes construction and operation of a private, for-profit, high-speed passenger rail system connecting Dallas and Houston using the Japanese N700-I Tokaido Shinkansen high-speed rail technology. The project encompasses an approximately 240-mile-long corridor between the two cities.

TCR's proposed high-speed rail system requires a fully sealed corridor with grade-separated crossings and dedicated right-of-way that is approximately 76 to 200 feet wide in order to accommodate a two track railroad and an access road. It requires a "closed" system, meaning that the train must run on dedicated high-speed rail tracks for passenger rail service only and cannot travel on existing or planned freight rail lines or share tracks with other passenger services, such as Amtrak.

For this Project, FRA may issue a Rule of Particular Applicability (regulations that apply to a specific railroad or a specific type of operation), a series of waivers, or another action to ensure the Project is operated safely. This future regulatory action(s) constitutes a federal action and triggered the environmental review under NEPA. AECOM is completing the environmental impact statement. The Draft EIS will be published and available for public review later in 2017 and a Record of Decision is expected in 2018.

California High-Speed Rail - Construction is moving forward nicely on the first operating segment of its planned high-speed rail system between Merced and Fresno in the Central Valley. The construction includes

There's something when technology and transit agencies unite, magic happens. There's a trend of embracing transit technology by transit agencies than ever before. Which brings rewards to riders as they can have clearer views on public transportation fitting into daily routines; bringing greater insight into how their passengers are utilizing their services.



Rail Conference

JUNE 11-14, 2017

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two major projects in Fresno: a trench taking trains 40 feet below ground under a rail spur, a canal and State Route 180, and a half-mile-long, 80-foot-tall elevated viaduct south of downtown. Court cases are being decided in favor of the project but opponents are still actively trying to block progress.

The second session focused on a global update of high-speed rail development and was well attended. The session comprised of three presentations from Masahiro Nakayama from Central Japan Railway Company, a joint presentation from Brian Hausknecht and Bruce Horowitz and a Carsten Puls from DB Engineering and Consulting, Germany.

High-Speed Rail Developments in Japan - Mr. Nakayama of Central Japan Railway spoke about the present and future of high-speed rail in Japan and discussed the latest Shinkansen product the Series N700A with a body inclining system which improves acceleration and deceleration. Mr. Nakayama also spoke of the superconducting (SC) Maglev project that will reach maximum speeds of 312mph and will run between

Tokyo- Nagoya (178 miles) with a journey time of 40 minutes and Tokyo to Osaka (273 miles) with a journey time of 67 minutes. These two projects will come onboard in 2027 and 2045 respectively.

Texas – Oklahoma – Mexico High-Speed Rail - Brian Hausknecht (CH2M) and Bruce Horowitz (ESH Consult) discussed the Texas-Oklahoma Passenger Rail Study results with a focus on potential high-speed rail serving San Antonio-Laredo, Texas to Monterrey, Mexico. They cited that the reason that this corridor was studied was to address the transportation inadequacies of existing transportation systems along the 1-35 corridor. However, the international portion of this project is driven by the fact that Monterrey is a strong magnet for industry and jobs and that there is strong cross-border travel demand. They further discussed how the successful immigration model of Vancouver BC could be applied to the project. This project's record of decision is expected any day now.

Berlin – Munich High-Speed Rail - Our final presentation was from Carsten Puls the President of

DB International USA Inc. He provided us with a very interactive presentation using Mentimeter software to ask questions to the audience and get instant feedback to his questions with the results being displayed on the big screen for all to see. Mr. Puls made a very valid case for the fact that as high-speed advocates we need to actively engage the general public in understanding the benefits of high-speed rail in their daily lives and commutes. He stressed the importance of the role that the high-speed rail station plays in being a magnet to attract passengers. Therefore, we should make the station an intermodal hub accessible to all and being walking and bike riding friendly and giving it a sense of "place." He also made the excellent point that regional rail is the backbone to a good high-speed rail network acting as the feeder system.

Common themes across all presentations were the importance of transit orientated development, the need for a reliable and long-term funding source, the importance of safety and the importance of having a strong regional rail system and the need for intermodality, which helps address the first and last mile.



HIGH-SPEED & INTERCITY PASSENGER RAIL LEGISLATIVE OUTLOOK

■ HOW DO WE GET FROM HERE TO “FAST TRAINS”?

By: Peter Peyser

“You go to China, you go to Japan, they have fast trains all over the place. I don’t want to compete with your business, but we don’t have one fast train.”

– President Donald J. Trump speaking to a group of airline executives on February 8, 2017

The Trump administration started with the President lamenting the lack of “fast trains” in the U.S. So far, that comment was the high point for high-speed and intercity passenger rail in the Trump reign. That does not mean, however, that better times will not arrive.

After uttering those words in February, President Trump released on March 16 his initial blueprint for the federal budget for fiscal 2018. In that document he suggested eliminating from Amtrak’s budget the federal support for long distance trains and zeroing out grant programs created in the FAST Act to assist states in developing and preserving intercity passenger rail service. The administration made similar proposals for the current fiscal year as Congress worked to finalize its spending bills for the year.

Congressional reaction to the president’s proposals for fiscal 2017 was essentially a shrug. The House and Senate were well along in resolving their differences for the fiscal year when the recommendations arrived and there was

no indication they were seriously considered in the final deliberations on the omnibus appropriations package that emerged on April 28. Amtrak funding was essentially held even for the year and funding was continued for the FAST Act programs.

As the fiscal 2018 spending process gets into gear on Capitol Hill, there is little evidence the administration's proposals for next fiscal year will be received any better than their proposals for the current year.

While the annual spending battle continues, Washington is also keeping an eye on the potential for a significant infrastructure package that could pump as much as \$1 trillion – with a “T” – into infrastructure over the next 10 years. President Trump made an infrastructure plan one of his top priorities in the early days of his administration – right up there with “repeal and replace” of Obamacare and tax reform. Few details of the plan were available until May 23 when the White House released a six-page concept paper on its plan.

The White House paper laid out four basic principles the administration will use in finalizing a plan it says will be released this fall.

Those principles are:

1. Target Federal investment on “transformative” projects.
2. Encourage self-help by supporting states and localities that raise their own revenues for infrastructure projects.
3. Divest the federal government from providing functions or owning

infrastructure that can be better managed by others.

4. Leverage the private sector by through P3s.

Depending on how one interprets these principles, they could provide a favorable foundation for federal support of intercity passenger rail projects. Several projects now in the pipeline could be viewed as “transformative” to their states or regions. Several pending projects also rely mostly on some combination of state, local and private funding.

The concept paper does not flesh out all of the initiatives that will flow from these principles, but it does include an “illustrative” list of some of the ideas that we will see in the final proposal. Included on the list of six actions are two of particular interest to intercity rail supporters: increasing to \$1 billion per year the amount of credit subsidy funding for the TIFIA loan program and removing the cap on the use of tax-advantaged Private Activity Bonds for infrastructure. Both of these initiatives could make additional financing available for passenger rail projects.

What the paper did NOT discuss was whether the administration will propose any direct funding in the form of grants for any infrastructure projects as part of its package. In the weeks leading up to the release of the concept paper, Secretary of Transportation Elaine Chao and other administration officials indicated that \$200 billion over 10 years of federal budgetary resources would be part of the \$1 trillion plan. It is not clear how much – if any – of that money would be in the form of grants to project

sponsors, as opposed to offsets for tax credits or support of financing programs like TIFIA. The remaining \$800 billion would presumably come from state and local funding, private funding and financing and cost savings resulting from streamlined federal approvals.

The outlook for serious congressional action this year on an infrastructure plan is cloudy at best. Congress has been unable so far to approve a new health care plan and is just barely getting started on tax reform. Both of these issues have been viewed as being ahead of infrastructure in the queue for major legislation and it looks as if Congress will be working on one or both of them well into the fall. When one considers that the congressional agenda also will include confirmation of a new FBI director by the Senate, the annual spending bills, and lifting the debt ceiling, it is clear the window for considering infrastructure in 2017 is likely to be narrow.

So what should passenger rail advocates be doing now? First of all, it is important that advocates communicate with their members of Congress about the importance of maintaining funding for Amtrak and for the FAST Act's rail programs. Second, members of Congress need to hear the message that intercity passenger rail projects should be viewed as an important part of any national infrastructure package and that legislation on such a package should include both direct funding and financing tools for passenger rail. Making these arguments over the summer months will pay dividends when Congress does its work this fall on the spending bills for fiscal 2018 and – potentially – the infrastructure package.

INFRASTRUCTURE RENEWAL

ADVANCING IMPROVEMENTS AT NY PENN STATION

Amtrak is committed to providing a safe and reliable experience for customers who pass through New York's Penn Station. On July 10th we mark the first official day of the infrastructure renewal period at New York Penn Station.

Between now and September 1st the Amtrak Engineering team will begin a series of improvements strengthening North America's busiest transportation hub. In a normal weekday, there are around 1,300 daily train movements at Penn Station with each of the station's 21 tracks in use every two minutes. Infrastructure renewal will help increase service reliability and preserve the existing operational flexibility for the users of NY Penn Station.

This project will be led by Amtrak, in partnership with NJ Transit and Long Island Railroad whereby a maintenance schedule has been crafted to accelerate our ongoing infrastructure renewal efforts and reduce impact on customers throughout the region. Much of this work will take place during weekends with little or no disruptions to weekday service, however, the more extensive work will take place during the weekdays of July and August, which will cause modifications to train schedules.

These improvements will require Amtrak to undertake switch renewal projects in Penn Station, beginning with the western portion of the station area. The first set of projects will occur in the area of tracks and switches known as "A Interlocking," which serves as the critical sorting mechanism routing trains that enter Penn Station from the Hudson River tunnels and the Long Island Railroad's West Side Yard to the various station tracks and platforms. While Amtrak has maintained and repaired this aging infrastructure, some of which dates to the 1970s, full replacement is now required to improve the reliability of this infrastructure at this critical moment in the station's history. Rather than proceed with the full replacement of these components across an extended period stretching out over several years, as originally scheduled, Amtrak now plans to advance this work through a series of major projects began in May and continues through the fall in order to quickly achieve the benefits of this renewal work for our partners and passengers.



INFRASTRUCTURE RENEWAL NY Penn Station

Shown at left: Stephen Gardner, Executive Vice President, Amtrak lends a helping hand to passengers during New York City's rush hour as we embark on a modified train schedule during the weekdays in July.

GATEWAY

HUDSON RIVER TUNNEL PROGRAM

OVERVIEW

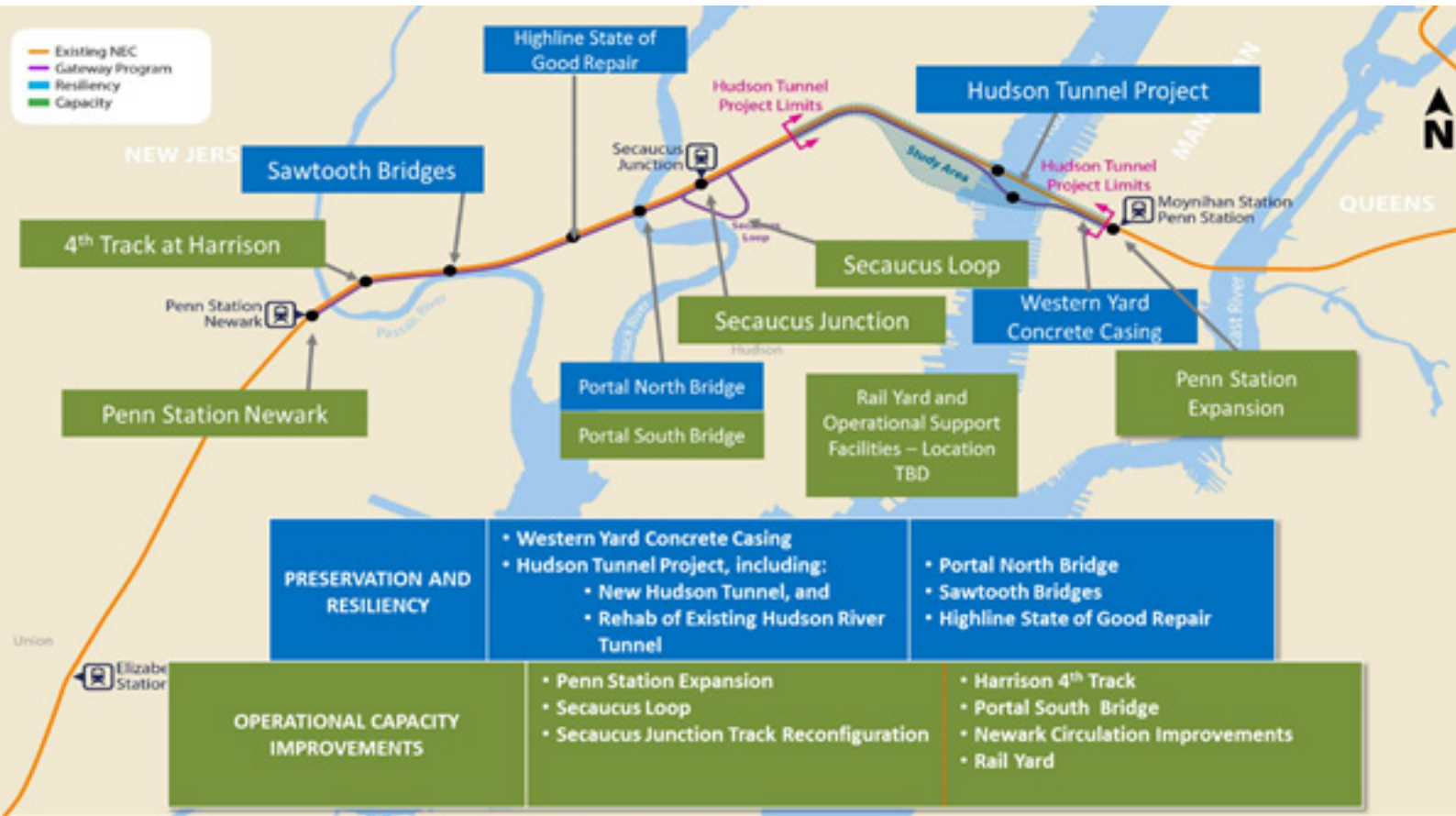
By: Karen Hedlund, VP, WSP USA



"Gateway is an absolute priority in terms of our focus. We understand what is happening there."

-Secretary Elaine Chao, May 17, 2017, testimony before Senate Environment and Public Works Committee

On November 12, 2015, Governor Andrew M. Cuomo of New York, Governor Chris Christie of New Jersey, U.S. Senator Charles E. Schumer, and U.S. Senator Cory Booker announced that they had reached an agreement on a funding framework and a governance structure to effectuate a multi-billion-dollar set of critical projects on the Northeast Corridor between Newark, New Jersey and New York City, including the Portal North Bridge and Hudson River Tunnel projects, referred to as the "Gateway Program". This framework contemplated that funds would be secured from the U.S. Department of Transportation



and Amtrak to cover no less than 50 percent of the project costs using grants and other federal funding. The states of New York and New Jersey would take responsibility for developing a funding plan to cover the other half of the project costs.

The announcement also stated that a development corporation would be established to oversee construction and execution of the Gateway Program. Consequently, in November 2016, the Gateway Program Development Corporation (GPDC) was created in accordance with the New Jersey Nonprofit Corporation Act, to facilitate the implementation of the Gateway Program. The trustees of the GPDC include Anthony Coscia, the Chairman of the Board of Amtrak, Richard Bagger, appointed by the Board of New Jersey Transit Corporation, and Steven Cohen, appointed by the Commissioner of Transportation of the State of New York. The fourth Trustee is the U.S. Secretary of Transportation.

The initial project undertaken to be undertaken by the GPDC is the construction of the Portal North Bridge to replace the existing Portal Bridge east

of Newark over the Hackensack River. The existing Portal Bridge's inefficient design and advanced age have had a detrimental impact to service on the Northeast Corridor (NEC), with frequent outages and resulting delays that have a cascading effect in the region and on the national rail network. The new bridge will have a clearance that accommodates current and forecasted maritime traffic, thereby eliminating the need for a movable bridge that results in interruptions to rail operations and delays due to mechanical failures. Additionally, the new bridge design will allow trains to cross at 90 mph, up from 60 mph today. The improved reliability achieved with a new fixed span Portal Bridge will provide NJ Transit with greater certainty of being able to access longer platforms at Pennsylvania Station in New York City (PSNY), allowing for longer trains and multilevel passenger cars that provide nearly 11 percent more commuter rail passenger capacity in the peak hour.

Planning and design of the new Portal North Bridge is being advanced by NJ Transit under agreements with Amtrak. NJ Transit has served as project

East Side Access Tunnel - June 2017



manager and been responsible for completing the National Environmental Policy Act (NEPA) process, completing final design, and will carry out the construction.

The next phase of the Gateway Program, the Hudson Tunnel project, is proceeding through project development in parallel to the Portal North Bridge project. The Hudson Tunnel project includes the construction of a new two-track Hudson River rail tunnel from the Bergen Palisades in New Jersey to Manhattan that will directly serve PSNY. This will allow the existing Hudson River tunnel to be taken out of service for necessary and extensive rehabilitation. Other major elements of the Gateway Program include the replacement of the Sawtooth Bridges in New Jersey, and the expansion of PSNY, Newark Penn Station, and Secaucus Junction.

In October 2012, Superstorm Sandy inundated the North River Tunnel and today the tunnel remains compromised. The North River Tunnel is currently safe for use by Amtrak and NJ Transit trains traveling between New Jersey and New York City and beyond. However, it is in poor condition as a result of the storm damage and has required emergency maintenance that disrupts service for hundreds of thousands of rail passengers throughout the region. Despite the ongoing maintenance, the damage caused by the storm continues to degrade systems in the tunnel and can only be addressed through a comprehensive reconstruction of the tunnel. While the tunnel was restored to service and is now safe for travel, chlorides from the seawater remain in the tunnel's concrete liner, bench walls, and ballast, causing ongoing damage to these elements as well as to embedded steel, track and third rail systems, and signaling, mechanical and electrical components.

The project would rehabilitate the North River Tunnel without disrupting existing levels of train

service, and provide redundant capability for rail service crossing the Hudson River. To perform the needed rehabilitation in the existing North River Tunnel, each tube of the tunnel will need to be closed for more than a year. If no new Hudson River rail crossing is provided, closing a tube of the existing tunnel for rehabilitation would reduce the number of trains that could serve PSNY to a fraction of current service, because the single remaining tube would have to support two way service. For that reason, to ensure rehabilitation is accomplished without notable reductions in weekday service, the project would include construction of two new rail tubes beneath the Hudson River (the "Hudson River Tunnel") that can maintain the existing level of train service while the damaged North River Tunnel tubes are taken out of service one at a time for rehabilitation. Once the North River Tunnel rehabilitation is complete, both the old and new tunnels will be in service, providing redundant capability and increased operational flexibility for Amtrak and NJ Transit.

NJ Transit carries almost 90,000 weekday passengers each day on approximately 350 trains between New York and New Jersey. Amtrak carries approximately 20,000 weekday passengers each day on more than 100 trains between New York and New Jersey.

"If we have to pull one of those tunnels out of service, that would literally cause a traffic Armageddon in the region. That's the level of urgency that we have before us."

-Senator Cory Booker told Secretary Chao at the May 17 hearing



INTERNATIONAL HIGH-SPEED RAIL DEVELOPMENTS

LATEST ACTIVITIES AND UPDATES

By: Eric Peterson

OVER THE PAST TWO YEARS MANY EXCITING HIGH-SPEED PASSENGER RAIL DEVELOPMENTS HAVE OCCURRED IN NATIONS ALL OVER THE WORLD. HERE IS A ROUND UP OF THOSE ACTIVITIES AS REPORTED BY NUMEROUS INDUSTRY AND GENERAL CIRCULATION PUBLICATIONS.

United Kingdom

The UK is searching for a supplier to design, build and maintain a fleet of HS2 trains. The value of the procurement is £2.75bn according to Transport Secretary Chris Grayling. The contract includes the delivery of up to 60 state-of-the-art trains that can travel at speeds of around 225mph and provide services capable of seating more than 1,000 passengers. The trains will need to meet HS2's design and performance needs and the highest standards internationally for passenger experience, noise reduction, and environmental sustainability, while maximizing skills, employment and growth opportunities. The contract will be awarded in 2019.

The HS2 project received a big boost in 2015 when the Chancellor of the Exchequer approved a £11.8bn bidding process for the first phase of the line's construction.

The announcement, made during an event in Chengdu in China, to kick-start the bidding process for seven new contracts. It was expected that the announcement would encourage China's biggest investors to be a part of the major construction project. The UK also announced a

Israel

Israel Railways has signed a contract for 33 TWINDEXX Vario double-deck coaches from Bombardier Transportation worth €56 million. Pulled by the new Bombardier TRAXX AC electric locomotives ordered in 2015, each eight-car train features seating capacity for 1,000 passengers. Delivery of the new coaches will be completed by February 2019.

Switzerland

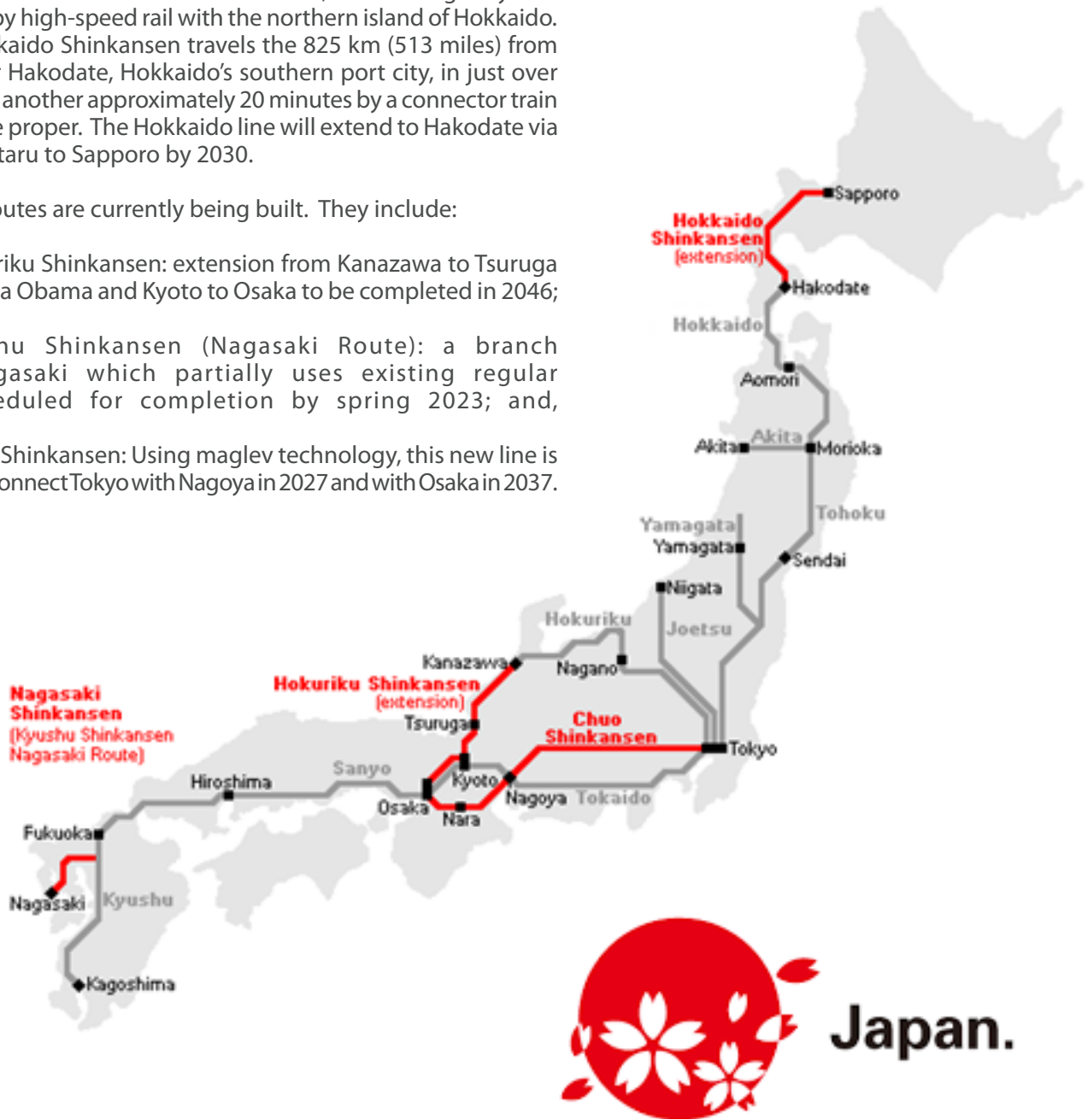
STADLER presented the first of 29 Giruno 250km/h electric trains to the Swiss Federal Railways (SBB) at a ceremony in Bussnang on May 18.

Although a five-car Giruno was on show at InnoTrans last year, this is the first 11-car train to be completed. The three-system train is designed for operation in Switzerland, Germany, Austria and Italy, although it will be deployed on the Basle - Zurich - Milan corridor that includes the new Gotthard Base Tunnel. For this reason, Giruno is designed to withstand the huge temperature fluctuations encountered when entering and leaving the tunnel in winter, with special attention being paid to air pressure inside the train, air-conditioning and thermal and acoustic insulation.

In March 2016, Japan's iconic rail network launched the newest addition to its system of shinkansen "bullet trains," connecting Tokyo for the first time by high-speed rail with the northern island of Hokkaido. The new Hokkaido Shinkansen travels the 825 km (513 miles) from Tokyo to near Hakodate, Hokkaido's southern port city, in just over four hours. It's another approximately 20 minutes by a connector train into Hakodate proper. The Hokkaido line will extend to Hakodate via Niseko and Otaru to Sapporo by 2030.

shinkansen routes are currently being built. They include:

- Hokuriku Shinkansen: extension from Kanazawa to Tsuruga in 2022 and via Obama and Kyoto to Osaka to be completed in 2046;
- Kyushu Shinkansen (Nagasaki Route): a branch line to Nagasaki which partially uses existing regular tracks. Scheduled for completion by spring 2023; and,
- Chuo Shinkansen: Using maglev technology, this new line is scheduled to connect Tokyo with Nagoya in 2027 and with Osaka in 2037.





Germany

According to a report published by SCI Verkehr, German passenger rail traffic is expected to continue its robust growth through 2025.

Urban rail will grow at an average of 5 percent per year up to 2025, although growth is expected to tail off after 2020 with the completion of many metro and light rail projects.

Network expansion, especially the construction of new lines in cities that previously have not had urban rail systems, is the main driver of urban rail development.

Eurostar

After a difficult year in 2016, Eurostar returned to growth in the first three months of this year with increasing revenues and ridership, according to the operator's first quarter results, which were published on May 10th.

Sales increased 15% compared with the first quarter of 2017, reaching £232m, with growth driven by a 6% increase in business travel and rising demand from outside Europe. The number of passengers from the United States rose 13% year-on-year.

Overall ridership increased by 2% to 2.27 million passengers.

Eurostar has introduced the first of 17 e320s for use between London and Paris in November 2015. The e320 trains will be introduced on London - Brussels services at the end of May 2017. The remainder of the order, manufactured by Siemens, is due in 2018. The e320 is a 16-car train based on Siemens' Velaro platform with distributed traction and has 20% more capacity than the original TGV based trains. Designed by Pininfarina, Italy, the e320 has Wi-Fi and can stream 300 hours of entertainment to passengers' personal devices.

Australia

Australia's Turnbull-Joyce government, the federal executive government of Australia, is investing \$20 billion in rail to cut congestion in cities, grow the regions and create thousands of new jobs. This is the latest development in an effort to engage with State and Territory governments about their priorities for rail planning, projects and investment, including faster and higher-speed rail.

A high-speed rail passenger network connecting Melbourne to Brisbane through Sydney, Canberra and other regional centers along Australia's east coast was studied between 2010 and 2013. The Australian Government has received two reports (The High Speed Rail Study Phase 1 and The High



"Travel makes one modest.

You see what a tiny place you occupy in the world."

-Gustave Flaubert

Speed Rail Study Phase 2) from the study process:

- The High-Speed Rail Study Phase 1 report identified corridors and station locations, potential patronage and provided an indicative cost to build the HSR network.
- The High-Speed Rail Study Phase 2 report built on the work of the Phase 1 report and refined many of the estimates, particularly around demand and costs, and refined the preferred HSR route identified in the Phase 1 report. This report also identified important next steps in staging a future HSR network in Australia.

Going forward, the process will involve:

- issuing a prospectus
- a call for initial proposals by September 2017
- the awarding of funding by the Commonwealth for up to three business cases
- finalized business cases assessed by Infrastructure Australia
- decisions by the Commonwealth about potential project funding in future budgets.

The prospectus will be published in mid 2017.

This long-term investment includes:

- A \$10 billion National Rail Program for urban and regional passenger rail projects that reduce travel times, connect people to jobs and opportunity and provide families and businesses with affordable options on where to live and invest
 - \$8.4 billion to build the Melbourne to Brisbane Inland Rail, the Commonwealth's biggest rail project in 100 years, that will build a dedicated high productivity rail freight corridor also saving lives by getting freight off roads and on to rail
 - \$500 million to upgrade regional rail networks in Victoria
 - \$792 million for Perth Metrone
 - \$30 million towards development of a business case for Melbourne Airport Rail Link
 - \$20.2 million for Murray Basin Rail building on our previous commitment
 - \$20 million to progress business cases for faster rail connections between major cities and their surrounding regional centers.

France

SNCF and ECR Retail Systems are deploying an on-board real-time payment solution for SNCF's entire fleet. The technology will affect every aspect of modern travel, from

on-board entertainment and Wi-Fi to travel updates and automated refunds, and consumers are increasingly expecting an enhanced customer experience as they travel. Safe and convenient on-board payment is the logical next frontier. SNCF is taking this step in their on-board retail strategy to showcase the power of technology to maximize the value for its customers.

French president Mr François Hollande attended an inauguration ceremony at Villognon in the southwestern department of Charente on February 28 to mark the official completion of infrastructure on the Sud Europe Atlantique high-speed line from Tours to Bordeaux.

The 302km line, and 39km of connections to the conventional network, were constructed by the Lisea consortium of Vinci (33.4%), Caisee des Dépôts/CDC Infrastructure (25.4%), Sojas (22%), and AXA Private Equity (19.2%) under a €7.8bn 50-year design-build-finance-operate-maintain concession, which was awarded in 2011.

When it opens on July 2nd, the line will cut Paris - Bordeaux journey times from 3h 14min to 2h 4min. The Paris - Toulouse trip will also be reduced by more than an hour from 5h 25min to 4h 9min.

Alstom is supplying a fleet of 40 TGV Océane double-deck trains for the route, 17 of which will be in service when the line opens. An order for a further 15 trains was approved by the board of SNCF Mobility on February 23 as part of a package to rescue Alstom's Belfort plant from closure.

Turkey

High-speed rail lines in Turkey will redesign the concept of accessibility

The railway network expansion projects and the liberalization of the rail sector, the latter was launched at the beginning of 2017, will reshape the entire Turkish transport sector. This project will connect major metropolitan and industrial areas by high-speed rail service. European and international railway industry suppliers are already developing innovative projects regarding urban and heavy rail transport segment. Included in the project will be the purchase of new 106 high-speed train sets, raising the attention of the rail supply industry over the life of the project.

Turkish Railways' network plays a crucial role in shaping and delivering seamless transport connections, like Baku-Tbilisi-Kars railway corridor, bypass road and maritime transport bottlenecks and provide faster passenger and freight service experience.



Russia

In April, JSC RZD International (a subsidiary of Russian Railways) announced the completion of the Pan-European Corridor X in Serbia.

This is the last of the six sections of the Pan-European Corridor X the company has worked on.

China has agreed to support the Moscow – Kazan High Speed Main Line with a loan equating to 400 billion roubles.

According to a Russian Railway's statement, 'the Chinese side will provide equity financing for the project on the Moscow – Nizhny Novgorod stretch amounting to the equivalent of 52 billion roubles in US dollars, as well as an additional amount of US 1 billion for the Nizhny Novgorod – Kazan stretch.

The Chinese will provide debt financing equivalent to 250 billion roubles for the Moscow – Nizhny Novgorod stretch and the equivalent of 150 billion roubles for the Nizhny Novgorod – Kazan stretch.

Spain

High-speed rail in Spain is now 25 years old. With more than 3,100km in commercial operation, it is not only one of the largest but also one of the best-equipped lines with the most advanced breakthroughs in innovation and design. The network's length in kilometers ranks first in Europe and second in the world, just behind China. Here, Pedro Fortea, Director of Mafex – the Spanish Railway Association, says Spain's extensive experience and continued developments with high-speed rail make the country a worldwide reference model. Since 1992, Spain's operational high-speed rail network has grown from 470km of track to more than 3,100km and this mode now reaches 47 cities. At present 67.4% of the Spanish population has access to high-speed in their province. Spain's high-speed rail success is recognized worldwide and the Spanish railway industries – including its sub-sectors that contribute to high-speed rail projects – are leading international reference points.

Renfe, the Spanish national train operator, is set to exercise an option with Talgo for 15 additional Avril high-speed trains, just six months after it awarded a contract to supply and maintain an initial batch of 15 of the 330km/h trains.

The decision to exercise the option, which is worth around €500m, is due to be approved at a meeting of the Renfe board next month.

In November 2016 Renfe awarded Talgo a €786m contract to supply 15 trains and maintain the fleet for 30 years.

Delivery of the initial batch is due to begin in 2019, with the second tranche arriving from 2021 onwards.

Each train will seat 521 passengers with 80% of seating in tourist class, where there will be a 3+2 layout, and 20% in business class, which will feature a 2+2 seating configuration. All seats will be adjustable to face the direction of travel and equipped with LED screens in the headrests.



"The U.S. spends just 2.4 percent of GDP on infrastructure. Europe spends twice that amount, and China spends close to four times our rate. It is time to rebuild our crumbling roads, bridges, water systems, dams, levees, transit and rail systems. It is time to provide jobs for millions of workers."

-Senator Bernie Sanders

China

China expands their high-speed rail so often that it's hardly news. Testing began on their first high-speed line to Inner Mongolia. This is the first of three high-speed lines that will serve cities in Inner Mongolia.

The trains are being tested at 170 mph on the initial section from Hohhot- Ulanquab, which is due to open in July. The remainder of the line from Ulanquab - Zhangjiakou will be commissioned next year.

Once construction of the line is complete journey times between Beijing - Hohhot, a 300 mile distance, travel time will be cut from around nine hours to less than three hours.

China is constructing what amounts to a high-speed line from Chicago - Detroit in just a few years. In fact this distance is comparable to many of the potential high-speed rail corridors in the U.S. What China is accomplishing with regularity, would be transformative for the United States.

China Railway says construction has begun on the 78.2km Beijing - Bazhou high-speed line, which will serve the city's new international airport at Daxing, 46km south of the capital. The line will include four new stations, including an underground station at the airport, and is expected to cost Yuan 27.4bn (\$US 4bn), including Yuan 800m for rolling stock.

The Beijing - Daxing International Airport section will have a design speed of 250km/h, with the remainder of the line south to Bazhou being constructed for 350km/h operation. Construction began on the new airport in December 2014 and the project is due to be completed in September 2019.

Construction of the first high-speed line in the Chinese autonomous region of Inner Mongolia on May 7, when high-speed testing commenced on part of the 286.8km line from Hohhot to Zhangjiakou in neighboring Hebei province.

The test train reached speeds of 250-275km/h on the Hohhot - Ulanqab section of the line, which is due to open at the end of July. The remainder of the line to Zhangjiakou will be commissioned next year.

With the completion of the Zhangjiakou - Beijing high-speed line, Hohhot - Beijing journey times will be cut from around nine hours to less than three hours.

Last year China's National Development and Reform Commission approved two more high-speed lines to

Inner Mongolia, which will serve the cities of Chifeng and Tongliao.

Construction of the 331km high-speed line between China's eastern cities of Hangzhou and Wenzhou began on March 9. The project is being implemented as public-private partnership, led by the National Development and Reform Commission. The line is scheduled for completion in 2021.

Journey times will be cut between the two cities from 2h 30min to 1h, and passengers can utilize the new line to transfer to Beijing and southern China's Guangdong province.

The line is part of China's five-year plan for an integrated transport system that began in 2016. By 2020, China's high-speed railway is expected to reach around 30,000km of track, connecting over 80 cities.

Indonesia

The China Development Bank (CDB) has signed a \$US 4.5bn loan agreement with a consortium of Chinese and Indonesian companies to finance construction of the 142.3km Jakarta - Bandung high-speed line.

The agreement between the bank and the Kereta Cepat Indonesia-China (KCIC) joint venture was signed in Beijing on May 14th, as Indonesian president Mr Joko Widodo attended a high-level forum on China's Belt and Road program.

The loan will cover 75 percent of the cost of the \$US 6bn project, with KCIC organizing the remaining 25 percent.

KCIC is a joint venture between China Railway Construction Corporation (CRCC) and a consortium of Indonesian state-owned enterprises led by Wijaya Karya.

The line is due to open in 2019, reducing the journey time between Jakarta and Bandung to around 40 minutes, compared with around three hours on the existing 173km 1067mm-gauge line.

The Baltic States

RB Rail, the company designated to set up to oversee the Rail Baltica high-speed rail project to link the three Baltic states to Poland, has appointed its management team and published the results of a cost-benefit analysis.

Mr Kaspars Rokens, formerly CEO for the Baltic states of Schneider Electric, is named chief operating officer of RB Rail; Mr Ignas Degutis, CFO with Vilniaus Kogeneracinė Jėgainė UAB - a Lithuanian energy company, becomes CFO of RB Rail; and Mr Deniss Muraško, head of the railway department with Estonian civil engineering company Lemminkäinen Eesti, is appointed chief technical officer. They report to RB Rail's CEO Ms Baiba Rubesa, who has been elected chairperson of the management board.

The Rail Baltica project foresees the construction of an 870km mixed-traffic standard-gauge railway with a design speed of 240km/h running from the Estonian capital Tallinn, via Riga and Riga Airport in Latvia, and Panevezys and Kaunas in Lithuania, to the Polish border with a branch from Kaunas to the Lithuanian capital Vilnius.

The line will be equipped with ERTMS and will provide the first standard-gauge connection between the Baltic states and the rest of the European Union (EU). Logistics hubs will be developed in each country and links will be provided to Finland across the Baltic Sea. The new railway would also re-establish direct passenger links between the three Baltic states, as only domestic passenger rail services are currently provided on the existing 1520mm-gauge network.

The cost of the project is estimated at €5.79bn with a 6.32% economic rate of return. Mr Nauris Klava, a director of Ernst & Young Baltic, which conducted the cost-benefit analysis, says this is above the 5% EU funding threshold. The EU is expected to fund €4.634bn of the cost leaving the three Baltic states to contribute €1.154bn. So far, the project has been allocated €765m from the EU's Connecting Europe Facility (CEF) and tenders have been invited for the first section from Riga to Riga Airport. Construction of Rail Baltica is expected to start in 2018-19 with commercial services commencing in 2026.

Passenger traffic is estimated at 3.6-5.5 million journeys in 2026 rising to 9.9-14.9 million in 2055. The forecast for freight traffic ranges from 12-17.5 million tonnes in 2026 to 16-26 million tonnes in 2055.

Finland

In late May, Finland arrived a step closer to building the longest undersea rail tunnel in the world.

The cities of Helsinki and Tallinn, Estonia, have signed an agreement to develop a rail line connecting the two capitals via a 92-kilometer (57.2 mile) tunnel beneath the Baltic Sea. If all goes to plan, the link could slash journey times: a trip that currently takes one hour and 40 minutes at its very shortest would last just 30 minutes.

The link, costing up to €13 billion (roughly \$14 billion), would nonetheless do more than just speed up the flow of goods and people. It would help fashion the two cities into a single metro area. From being lonely siblings waving at each other across the waves, Helsinki and Tallinn could effectively become two centers of a newly unified metropolis of 1.5 million citizens.

Italy

Italy is the only country in the world where a private open-access operator competes with the state-owned incumbent on its high-speed network. According to Italian passenger rail experts, competition has given passengers more choice and high-quality services.

NUOVO Trasporto Viaggiatori (NTV) ran its first Italo trains on the Italian high-speed network on April 28 2012 in direct competition with the incumbent Trenitalia. Competition has benefited consumers, while forcing Trenitalia to raise its game dramatically following the arrival of Italo with the result that Italy now has some of the highest quality high-speed services in Europe.

Italian State Railways' (FS) engineering subsidiary Italferr has awarded a €397m contract to a consortium comprising Salini Impregilo (60 percent) and Astaldi (40 percent) for the design and construction of the Naples - Canello section of the Naples - Bari line in Italy, which will have a maximum speed of 200km/h. The project is scheduled for completion in 2022 and will serve the new Naples Afragola station that will be an interchange between regional and high-speed services. The project also includes the construction of the Acerra, Casalnuovo and Centro Commerciale stations, and the section will extend 15.5km across Casoria, Casalnuovo, Afragola, Caivano, and Acerra.

Once the 146.6km Naples - Bari line is completed, the Naples - Bari journey time will be reduced from 3h 45min to two hours, while the Rome - Bari trip will be cut from 3h 59min to three hours. Tendering for the Naples - Bari project began in July 2016 and the line will cost a total of €6.2bn.

Another major development was announced in January 2017 by the SALCEF Group, an international rail construction and management company based in Rome, Italy, with the completion of the Induno tunnel, a critical link in the new Arcisate - Stabio rail line on the Italian Railway Network (RFI) linking southern Switzerland and the Malpensa Airport in Milan, Italy. Work on the line began almost eight years ago, but was suspended for a long time due to a series of delays that proved costly and extremely inconvenient for local residents. Work began again only in 2015, this time with Salcef as the new

contracting company. In just 13 months the company made up for the delays by working in partnership with local institutions and bodies, with over 200 workers busy day and night.

The new link is expected to go into revenue service in December 2017, and will run for over eight km in Italy and carrying eight passenger trains per hour. Another major development for RFI was the March 2016 announcement the network would launch a tender in June 2016 for the first application of a high-density version of The European Train Control System (ETCS) to achieve 3-minute headways on its busiest commuter lines in Rome and Milan. The first section to be equipped will be between Rome Termini and Ciampino, followed by the line from Rome Tiburtina via Ostiense and St Peter's to Monte Mario, with a third phase planned from there to Cesano. It is also planned to install the system in Milan from Porta Garibaldi to Greco and Lambrate.

ETCS is the signaling and control component of the European Rail Traffic Management System (ERTMS). It is a replacement for legacy train protection systems and designed to replace the many incompatible safety systems currently used by European railways. The standard was also adopted outside Europe and is an option for worldwide application. In technical terms it is a kind of Positive Train Control. RFI hopes to have the first section of ETCS in service by 2018. RFI has been operating ETCS Level 2 Baseline 2 without a fall back on the Turin - Milan - Florence and Rome - Naples high-speed lines for 10 years. Earlier this year, RFI opened the Rome - Naples line to Baseline 2.3.0d and will open the Treviglio - Brescia section of the Milan - Venice high-speed line with ETCS Level 2 Baseline 2.3.0d later this year. By 2018 Italy's original high-speed line between Rome and Florence will be equipped with ETCS Level 2 followed by the Brescia - Verona

section by 2020. This will give RFI 1100km of lines fitted with ETCS Level 2 Baseline 2. The first application of Baseline 3 with Levels 1 and 2 overlapped with the national signaling system was completed last year on a pilot section of the TEN-T Mediterranean Corridor. This will be followed this year by installation between Ranzo Luino and Domodossola - Iselle on the Swiss border, Iselle - Domodossola - Novara next year, Milan - Chiasso on the Swiss border by 2018 and Novara - Villa Opicina on the Slovenian border, Verona - Bolzano - Fortezza on the Austrian border, and Milan - Genoa by 2020. RFI is investing a total of €500m in ERTMS trackside equipment between 2016 and 2025.

Singapore

Singapore's Land Transport Authority (LTA) announced on February 16th that it, along with MyHSR Corporation has appointed a consortium comprising WSP Engineering Malaysia, Mott MacDonald Malaysia and Ernst & Young Advisory Services as joint development partner for the Singapore - Kuala Lumpur high-speed project.

The consortium will be responsible for project management support, technical advice on high-speed rail systems and operations, and the technical and safety standards that will be adopted for the project. It will also assist with the preparation of documents for the forthcoming tenders relating to the project including the appointment of the AssetsCo and OpCo International.

Together with the Advanced Engineering Study contract awarded earlier by LTA to carry out engineering studies for the Singapore stretch of the HSR, these two developments mark the next chapter in the journey to deliver the Kuala Lumpur - Singapore HSR project targeted to finish by the end of 2026.



Czech Republic

The Czech Republic plans to build a high-speed rail network that will greatly impact Prague, which will alone require investment of at least CZK 80 billion. Among expected projects are tunnels and an underground extension of the city's Main Station. The entire costs are expected to reach up to CZK 650 billion.

At present Prague's Main Station is already greatly stretched, with trains having to wait outside for platforms to free up. This pressure will only increase with the construction of a high-speed network.

Shorter travel times are likely to win over passengers who might otherwise travel by bus, car and even plane and in future Prague's Main Station could see high-speed trains arriving and departing every three minutes.

On top of this, there has been a sharp rise in demand for suburban trains, which require shorter intervals so more frequent access to platforms.

Around 20 kilometers of new railway, part of which will use tunnels linking Holešovice and Vršovice and Karlín and Smíchov, will be built. The lines will intersect at a new underground part of the Main Station that should be located more or less beneath the State Opera.

The Prague sections of the high-speed rail network will cost of at least CZK 4 billion a kilometer projected. The city of Prague will contribute up to CZK 104 billion to the project.

The city of Brno will invest up to CZK 45 billion in the project.

No date has been set for the start of construction, but the Ministry of Transport says it will take at least a decade for the first portion of the announced high-speed network – a line from Prague to Dresden – to become reality. The ministry suggested 2035 would be an optimistic date for completion of the project.

Poland

PKP InterCity is purchasing 20 modern high-speed Pendolino trains to improve passenger services. Express InterCity Premium trains (EIP), also called Pendolino trains, offer a totally new dimension and standard of travel in Poland. These new Pendolinos, manufactured by Alstom in the Italian city of Savigliano, are the fastest and most comfortable trains among

PKP's (Polish Railways) InterCity rolling stock fleet.

Every day 20 trains connect the north to the south of Poland. EIP trains link Warsaw with Gdańsk, Gdynia, Kraków, Katowice, Gliwice, Bielsko-Biała, Wrocław and Rzeszów. In spring 2016 the service was extended: the train that previously travelled to Wrocław now continues to Jelenia Góra; as of 29 April 2016 the train to Gdynia was extended to Kołobrzeg; and since mid-December 2016 EIP services have been running to Bochnia.

The introduction of modern trains has resulted in shorter journey times between major cities of the country. Today the journey time from the capital to Wrocław is approximately 3 hours and 30 minutes, whereas, prior to December 2014 – before Pendolino trains were put into service – the journey took more than five hours.

Taiwan

Taiwan first opened for commercial service in 2007. The country's rapid economic growth during the latter half of the twentieth century meant that a high-speed rail passage was needed to cope with a growing urban population – without it, economists predicted that future growth could have been impeded. A decade on and the 349.5km rail line along the West Coast of Taiwan has announced its highest ever ridership recorded in just one day, amounting to 252,250 passengers. In fact, last month's total ridership was 1.27 million passengers, now making it the most used mode of transport along the western corridor. The number broke the record of 250,423 passengers set in June last year which was the last day of the four-day Dragon Boat Festival holiday period, according to the Taiwan High-Speed Rail Corporation (THSRC) who operate the line. This news has been greatly received by the rail company who suffered slow demand during the start of their operation.

Also making the news earlier this year was the arrival of free wi-fi which will be fitted on-board all carriages by August this year. This announcement has come a year ahead of schedule in an attempt to satisfy passenger demands. Additionally, THSRC has been made aware of the huge potential that the 2017 university games - a major international sports event held in Taipei, will bring to their traffic. Whilst passengers are able to use their own 4G, wi-fi connectivity on board the train is very poor from the amount of tunnels along the route. As THRC begin making these changes to passenger experience, it can only be expected that the demand for its rail services will continue to rise.

“Once a year, go
someplace you’ve
never been before.”

– Dalai Lama

Austria

This year Austria will celebrate the 180th anniversary of its railways, and while many will pause to reflect on the many historical achievements that shaped the modern network, it is also a good opportunity to consider what the future might hold.

The Koralm high-speed rail project is currently underway in southeast Austria by ÖBB Infrastruktur. It is part of the 2,400km trans-European Baltic-Adriatic Corridor that stretches from Gdansk and Gdynia on the northern coast of Poland to Bologna and Ravenna in northern Italy via Warsaw and Vienna, linking the Baltic and Adriatic seas.

The Koralm line will directly link Klagenfurt and Graz, the respective capital cities of Austrian states Carinthia and Styria, while reducing the travel time between the cities from three hours to less than an hour. The project is estimated to cost €11bn (\$13.8bn) and includes 130km of double-track electrified line, 12 stations and stops, as well as a 32.9km-long tunnel, the longest railway tunnel of Austria.

The tunnel construction is divided into three main sections: KAT1, KAT2 and KAT3. The KAT1 constitutes the east entrance of the tunnel in Styria and includes a 3.2km open land route, four bridges and a 2.3km tunnel section built by drilling and blasting using the New Austrian Tunnel Method (NATM) or Sequential Excavation Method (SEM). Construction of this section began at the end of 2008 and was completed in October 2013.

Construction of the KAT2, the middle and longest section with an approximate length of 19km, began in January 2011. Two single-track main tubes, namely the North and South tubes, are being built using two 9.9m hard rock Doubleshield TBMs. The tubes will be connected by cross passages every 500m. Scheduled for completion in 2019, the KAT2 section

also involves a 900m-long underground emergency station in the central part of the tunnel.

The KAT3 involves widening of the existing 7.6km-long sounding tunnel and building an additional 3.3km of new tunnel for the South Tube. The 12.6km-long North tube will also be drilled using a TBM. Construction on this section began in 2014 and is expected to continue through 2020.

Expected to be operational by 2023, the rail line will carry up to 256 high-speed trains a day running at a maximum speed of 250km/h. More than 100,000 jobs are expected to be created during the construction phases and roughly 40,000 jobs during operation.



In total the Koralm line includes nearly 30 miles of tunnels, more than 100 bridges and underpasses, and 23 new railway stations.

Uzbekistan

On a March 22, representatives of the railway company of Uzbekistan celebrated the arrival of its first high-speed Tulpar-Talgo train set, launching international service between Almaty and Tashkent.

The "Tulpar-Talgo" is a modern train, which seats more than 400 seats. It will link major tourist centers of Almaty and Tashkent. Our citizens are interested in visiting the Alpine resorts of large local metropolis. From Kazakhstan passengers can travel to Samarkand, Bukhara, and Khiva. For now, the train will operate twice a week, in the future, assured the representatives of the passenger company of Uzbekistan, the need for more frequent running will increase.

Norway

Follo Line is a planned 22.5km (14 miles) high-speed railway line between Norway's capital city Oslo and the suburban town of Ski. The double-track line will run parallel to the Østfold Line.

Construction on the new line began in September 2015 and will be completed by 2021. The Norwegian National Rail Administration (NNRA) will own the line. Norwegian State Railways (NSB) will operate trains at a maximum speed of 250km/h on the new line.

Upon completion in 2021, the line will serve roughly 150,000 passengers a day. The estimated cost of the project is Nkr11bn (\$1.9bn).

The new line, to be laid between Oslo and Ski, is expected to increase the rush hour rail ridership by 63 percent and also significantly increase the freight on rail. It will also decrease the travel time on express and regional trains from Ski to Oslo by half, from 22 minutes to 11 minutes.

The line will reduce 5,800 car journeys a day, remove 750 trucks daily from European Route E18 and eliminate 5,500t of CO2 emissions a year. Once the new line is open, all the local trains will be restricted to the Østfold Line and faster trains will be used on the new double-track line.

Vietnam

Back in 2009, Vietnam began planning a 1,000-mile high-speed line between the capital Hanoi and Ho Chi Minh City using the Japanese technology on an elevated platform. But almost a decade after it was first announced, the project remains nothing more than an aspiration.

The strapped-for-cash Vietnamese government is waiting for funding from the World Bank and the Asian

Development Bank before it can make any progress.

Previously the project was rejected due to cost concerns, but in August 2016 the Ministry of Transport requested an update on the feasibility studies. The Ministry of Transport will conduct a pre-feasibility study that will be submitted in 2018.

The pre-feasibility report will analyze the effectiveness, scale and ability to raise funds and a more realistic timetable for construction.

Morocco

The first high-speed trains in Africa are flashing along the Atlantic coast of Morocco.

The French-made double-decker TGV is being tested ahead of the launch of a flagship new line connecting Tangier with Morocco's economic capital Casablanca in 2018.

The new trains will travel at speeds up to 200 miles per hour. They will cut the journey time between the two cities by more than half -- to just over two hours. This is double the speed of South Africa's Gautrain, launched in 2012, which falls short of the definition of high-speed rail.

The \$2 billion project has been in development for a decade, funded by the governments of Morocco, France, Saudi Arabia, Kuwait, and the UAE. King Mohammed VI and the Moroccan government expect the trains to deliver wealth and prestige for the country.

South Korea

South Korea's newest high-speed rail service, the "SRT", finally opened for commercial service from Suseo Station in Gangnam, Seoul in December 2016.

The new connection, operated by Korail subsidiary "SR" (Supreme Railways) provides a much needed rail link for the southeastern areas of Seoul and Gyeonggi-do. Up until now, residents in these areas have had to spend extra time traveling to Seoul or Yongsan stations in order to use high-speed trains. The new line also provides better access to Gangnam, a business center previously only served by bus.

There are three stations on the line at Suseo, Dongtan and Jije (Pyeongtaek). The line connects with the main high-speed line which KTXs use. SRT services don't travel to all parts of the high-speed network, and passengers must

transfer if heading to certain stations such as Yeosu or Changwon.

Construction on the project began in 2011 and features Korea's longest tunnel at 52.3km, also making it one of the longest rail tunnels in the world. Only 7 percent of the 61.1km line is above ground, and Dongtan Station is Korea's first high-speed train station to have been built completely underground, with the train platforms located six floors down.

SRT services use KTX-Sancheon rolling stock, with 10 brand new trains in operation, plus 22 trains leased from Korail that will eventually be acquired by SR before the year is over.

Over the past decade, high-speed services have become increasingly popular and the openings of the SRT means a 43% increase in the total number of high-speed services nationwide.



India

Construction of a highly ambitious bullet train in western India is slated to begin in 2018. With a loan from Japan, the \$14.5bn project aims to replicate the world-famous Japanese Shinkansen technology and dramatically slash journey times across India's territory.

On 16 April 1853, Indian Railway's first passenger train chugged out of Boree Bunder station in Mumbai on its way to nearby Thane. Carrying 400 passengers in 14 ornately decorated coaches, it was, said a British official at the time, "one of the most memorable days, if not the most memorable day, in the annals of British India... a triumph of mind of matter, of patience and perseverance".

Fast forward 165 years and work is set to start on a project of arguably comparable significance in the history of Indian Railways: a 350km per hour bullet train system running between the west Indian cities of Mumbai and Ahmedabad.

First mentioned in the election manifesto of India's ruling Bharatiya Janata Party (BJP), the country's Prime Minister Narendra Modi hopes the train will help modernize India's vast but increasingly dilapidated railway network and boost trade between the two areas.

"This enterprise will launch a revolution in Indian railways and speed up India's journey into the future," said Modi. "It will become an engine of economic transformation in India."

Eighty-one% of the line's funding, \$12bn, will be provided by Japan in the form of a loan, with the remaining amount to be covered by India.

Because of land acquisition challenges facing the project, Japan is considering building an entirely elevated line. Indian Railways is insistent on an underground corridor. Any cost overruns are to be jointly shouldered by both countries.

Proving just how keen Japan is to get the project off the ground, a training center will also be set up in India, where Japanese experts will train 4,000 Indian Railway staff to operate and maintain the future bullet trains.