High-Speed Intercity Passenger Rail

SPEEDLINES

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The Surfliner, Metrolink and Coaster are in talks discussing possible run through trains of Metrolink and Coaster trains from Los Angeles Union Station to San Diego operating as all stop local trains as Surfliner becomes a limited stop express. Now that's an integrated intercity network!

GOTTHARD BASE TUNNEL

Boring through the Alps, a total of 28.2 million tons of excavated material was removed to build the tunnel.

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SPEEDLINES MAGAZINE


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ABOVE: *Richard A. White takes charge at APTA Rail Conference in his new role as the Acting CEO of APTA. He is pictured with APTA Chair, Valarie J. McCall.*

On the front cover:

Metrolink unveils new Tier 4 locomotive The state-of-the-art environmentally-friendly locomotives will reduce particulate matter and nitrogen oxide emissions by up to 85 percent. The engines will have 57 percent more horsepower allowing Metrolink reliability to move passengers quickly.

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Dear HS&IPR Committee & Friends:

I want to thank all of you who were able to join us at the APTA Rail Conference last month. Peter Gertler's leadership of his last meeting as Chair of our Committee gave us a jam-packed two hours of substantive discussion and action. I hope many of you were able to enjoy our well-received panels organized by Dominic Spaethling and our Programs Committee later in the conference.

Our Committee meeting included the Report of the Nominating Committee and the election of your leadership team. As your new Chair, I am excited to work with our new Secretary Jennifer Bergener, and continuing Vice Chair Al Engel and Member-at-Large David Cameron. Together, working with all of you, we can continue the progress of this Committee, building on the very solid foundation Peter left us.

Peter's transition to Immediate Past Chair does not come without some strings attached. He has agreed to continue as the APTA representative on the on UIC Scientific Committee. Thank you Peter, for your continuing service and support.

Over the last two years, Peter led our Committee to focus on and clarify its vision and mission in the APTA family and in the industry. Our Strategic Plan developed programs to promote our identity and thought leadership, communication and education and membership and partnerships.

Over the next two years, I want to extend and build on those programs. Our leadership Team will develop the next phase of the Strategic Plan. In particular, I want to continue and expand our work with industry partners on education and advocacy. This will include defining and refining the role of our Corridors Subcommittee. Further, as we discussed in our Legislative and Committee meetings, we need to develop the story of the High-Speed Rail Program as a tool for effective advocacy in Congress and elsewhere.

I thank you for your confidence in your new leadership team, and promise that we will do our very best to make the next two years rewarding – and fun!

Anna M. Barry

APTA RAIL CONFERENCE

HIGHLIGHTS OF HS&IPR SESSIONS

Contributors: Dominick Spaethling and Kenneth Sislak

At the APTA Rail Conference held in smoldering Phoenix, the High-Speed and Intercity Passenger Rail committee sponsored two sessions on Tuesday, June 21st. The first was New and Improved Intercity & High-Speed Corridors and the second was International Lessons Learned in Intercity & High-Speed Rail and Application to the U.S. Both sessions were very well attended with the rooms at capacity. Below is a re-cap of the two sessions. Thanks again to our moderators and our fabulous presenters!

NEW AND IMPROVED INTERCITY & HIGH-SPEED CORRIDORS

Charles "Chuck" A. Spitulnik, Partner, Kaplan Kirsch & Rockwell LLP introduced the session and the panelists and described how the panelists bring a wealth of experience in planning, developing and implementing rail service across the U.S.

Darrell Johnson, Chief Executive Officer, Orange County Transportation Authority, focused on the Pacific Surfliner operations and how it serves the Los Angeles to San Diego super-region of 18 million people. The LOSSAN joint powers authority is focusing on marketing rail as a new way to travel in the auto focused Los Angeles region. The corridor is 351 miles from San Luis Obispo to San Diego serving 41 stations and approximately 8 million Amtrak and commuter rail riders a year. One of the LOSSAN JPA's and the corridor's greatest challenges is coordinating the timetables and fare and schedule information across the different operating agencies. This requires coordination between Caltrans, Amtrak, Coaster and Metrolink. This is one of the LOSSAN JPA's goals: make the four work better together.

All of the service providers need to integrate operations, capital and marketing efforts. This includes coordinating construction work windows up and down the corridor and also reaching across traditional geographic boundaries to recognize true system benefits.

Darrell closed showing a video of recent marketing efforts which have been very effective in growing winter Surfliner ridership.

Marla L. Lien, Partner, Kaplan Kirsch & Rockwell LLP, gave a presentation on Passenger Rail Development in Freight Rail Rights of Way. She focused on the development of passenger service in freight corridors noting that assembled rights of way are incredibly valuable for getting rail services going. But in very few cases can a public agency condemn a freight railroad for passenger service. Instead you need to negotiate with the freight railroads for access.

While some freight railroads are open to discussing bringing passenger rail services onto their property, it is important not to confuse expression of willingness to negotiate with their interest in paying for the project. Often times what a passenger agency sees as a betterment, a railroad may see as being kept whole. It is very important for public agencies in their planning work to adhere to all current railroad technical requirements.

Remarkable Partnerships

Finally, Marla suggested that to get an idea of rights of way costs, get appraisals as early as project planning and design will allow. As a rule of thumb, you can double your "over the fence" costs to get a more realistic cost of right of way for your project.

Philip G. Pasterak, P.E., Vice President, WSP | Parsons Brinckerhoff, gave a presentation on the Illinois DOT Chicago St. Louis to Chicago project which is well underway. One of the client's top priorities is to meet the ARRA deadlines. As a large, $1.96 billion, project it faced numerous challenges such as fulfilling the NEPA process, getting through institutional processes and approvals, and getting grade crossing improvements in place. All of these factors contributed to delays to the project, but overall they are getting done and nearing completion.

There were also challenges in getting the PTC system in place and specifically the definition and separation of vital and non-vital PTC was a challenge for the railroads. Grade crossing improvements were needed throughout the corridor and writing the agreements with all the cities was quite a bit of work, but again, it got done.

In spite of the project challenges, it is well underway and Phil credits the Union Pacific Railroad with being an excellent partner in the negotiating process, allowing the project to move forward towards success.

Eddie McFalls, P.E., NCDOT Strategic Initiatives Consultant (AECOM), North Carolina Department of Transportation, described how NCDOT is working on getting enhanced passenger service between Raleigh and Richmond environmentally cleared by the spring of 2016. They don't have the funding for the enhanced service but are working on securing it. On the corridor they are looking to reduce travel time by an hour and twenty minutes to become competitive with auto travel with a travel time of less than three hours. The service could have upwards of two million riders a year. They are working on a legislative compact between Virginia and North Carolina in order to work the multi-state relationships to create a working rail corridor. They are also looking to acquire the "S" line between Petersburg,VA and Raleigh, NC as another important component of the project.

INTERNATIONAL LESSONS LEARNED IN INTERCITY & HIGH-SPEED RAIL AND APPLICATION TO THE U.S.

Kenneth G. Sislak, Vice President, AECOM, was the moderator of this session and introduced the panelists. He also gave his insights on how various European countries planned and developed their systems incrementally and that they continue to make changes to their systems to create a better passenger experience. Ken emphasized that many of the lessons from overseas could be applied here in the United States.

Eduardo Romo Urroz, President, Fundacion Caminos de Hierro para la Invertigacion y la Ingenieria Ferroviaria, stated that regardless of location in the world, the beginning of a high-speed train system is always challenging. Spain was no exception. The current high-speed network grew from the existing conventional network, and today trains operate on both new high-speed train corridors and existing intercity and commuter networks. Integrated commuter, regional and high-speed systems allow people to have seamless trips throughout major metros and the country. Major stations have expanded (Madrid) over time to accommodate new services, but a lesson learned from the Spanish experience would be to plan for the ultimate station footprint instead of piece-mealing the station development.

Dr. Marc André Klemenz, Head International Projects, Region America & Team leader Transport and Operational Consulting, Region Germany South, DB International

GmbH, Munich, Germany: Marc André described how Deutsche Bahn is the second largest provider of rail services in Europe and that he has seen a variety of ways to upgrade a rail system from conventional speeds to high-speed. High-speed bypasses of urban centers can help with travel time, have fewer impacts on existing rail service and provide new opportunities for station development around the new bypass stations. These bypasses can be designed for systems up to 350kph. Overall, the focus for DB is to continue to reduce travel time. For example, DB invested six billion Euros in upgrading the rail system between Hamburg and Berlin creating a service that was so competitive with the air market that there are no more scheduled flights between the two cities.

Martin Ritter, President & CEO, Stadler US, Inc., described how Switzerland is a dense urban country with 8.3 million inhabitants and 75% of the population living in cities. Service integration and utilization of timed transfers at hubs is how they make their system work and dictates the planning priorities for infrastructure and rolling stock. All planning focuses on meeting the timetable needs.

Services are planned to arrive at hubs at the same time (12:55 PM), so that passengers can switch and catch another train at (1:00 PM) and be on their way. Infrastructure required to make the timetable is what is prioritized. The realization of the timed transfer concept has made the Swiss rail system one of the most efficient systems in the world.

Chad Edison, Deputy Secretary, Passenger Rail, California State Transportation Agency, Sacramento, CA: Chad described how 8% of all passenger miles traveled in the state are on transit and that the state is looking to create a multimodal plan with integrated intercity, commuter rail, bus and transit services to increase that percentage. Not unlike the Swiss, California is looking at rail networks and schedule and fare system integration to maximize utility of the network. Chad described how it is important to tailor services to market demand while also minimizing freight interference. As the state moves forward with investments in infrastructure, there is a continued emphasis on making sure there is no "throw away" work and that the infrastructure is used to its best and highest utility.

Chad went on to describe recent research by the State of California that shows that there is potential for explosive passenger growth with new and enhanced services throughout the state. To this end, the State has placed the funding priority on rail and transit integration and continuing to improve the customer experience.

There were great questions asked of the panels and both sessions had lively discussions!

The HS&IPRC looks forward to sponsoring another panel at the APTA annual conference in Los Angeles in September! SO STAY TUNED!

> *Trains - passenger, light-rail, and freight - offer among the most efficient transportation available to move us into the 21st century. U.S. Department of Transportation projections calling for substantial increases in rail transport over the next three decades mean that we, along with rail safety partners in the rail industry and at the federal, state and local levels, must work together to meet the safety challenges that accompany a rail renaissance.*

CALIFORNIA

FRA REALIGNS HSR GRANT

By: David Cameron

CAP AND TRADE FUNDS FALL SHORT. CALIFORNIA IS STARTING TO DOLE OUT NEARLY $2.2 BILLION GENERATED BY ITS CAP-AND-TRADE PROGRAM TO CUT CARBON EMISSIONS, ALLOCATING FUNDS TO HUNDREDS OF PROJECTS. WINNERS INCLUDE REGIONAL RAIL, ELECTRIC CAR REBATES AND ROOFTOP SOLAR FOR LOW-INCOME RESIDENTS.

In May 2016, the FRA extended the deadline for the construction of the first 118 miles of rail through the Central Valley by four years. The extension came through modification of a $2.5-billion grant under the American Recovery and Reinvestment Act that originally required completion of a segment of rail structures from Madera, north of Fresno, to Shafter, north of Bakersfield, in California's Central Valley by 2017.

The Obama administration has made five previous modifications of the grant in recent years, including one that allowed the state to provide required matching funds after first using the federal money. Normally, grants require states to match federal funds on a dollar-for-dollar basis as they are spent.

A Federal Railroad Administration agreement will not amend the 2017 deadline for spending the grant, but would allow the state to make its required match several years later.

CAP AND TRADE PROBLEMS

In addition to ARRA grant, the California project is receiving about $500 million a year from state greenhouse gas fees and an additional $1 billion federal grant approved in 2010. Its current business plan is heavily reliant on cap and trade funds to complete the initial operating segment. However, at the most recent Cap and Trade auction in May, only 2% of carbon credits were sold. The auction brought in $10 million, compared to $150 million that the state was expecting. The reason for the low auction reports is unclear but this paltry sum pose risks not just to California's High-Speed Rail project but to the electrification of Caltrain, San Jose to San Francisco, on which HSR is depending, as well.

High-Speed Rail's budget depends on a 25% earmark of Cap and Trade funds, and Caltrain is seeking $225 million from state Cap and Trade funds this summer to be able to move ahead with the electrification project. The budget has a $500 million reserve in case of auction shortfalls, but cuts are expected to spending for programs that had been depending on the funds.

ALTERNATIVE TRANSPORTATION POSSIBILITIES

The fact that others are investing in technologies to capture a portion of the California

> "Getting people from point A to point B as quickly and efficiently as possible is the basic goal of mass transit, and, generally speaking, faster is better. Much of the world, however, is far outpacing the United States in high-speed rail adoption.

intercity passenger market validates the premise that consumers are seeking alternatives to the automobile. A couple examples are discussed below:

HYPERLOOP

In 2013, billionaire inventor Elon Musk unveiled a proposed 760 mph Hyperloop between Los Angeles and San Francisco as an alternative to the conventional 220 mph high-speed train operating on conventional electrified track that California is currently building. Musk open-sourced his idea and two separate groups are pursuing it. Hyperloop One, in central Los Angeles, is a startup venture, with 30 or so full-time employees and $10m of seed money. Hyperloop Transportation Technologies (HTT), based on the west side of Los Angeles, is a crowd-sourced community of 450 volunteers scattered around the country, who devote ten hours a week to the project in exchange for stock options.

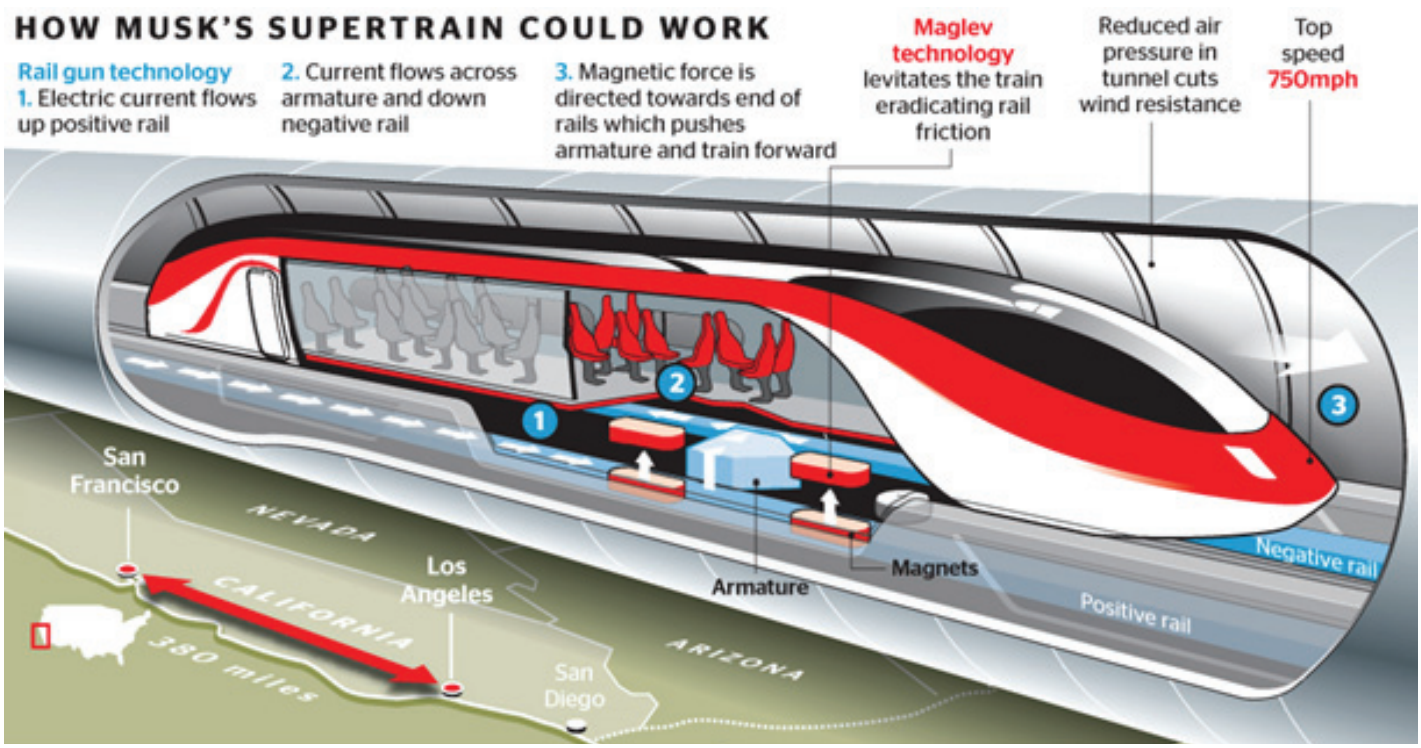
What chance does Hyperloop have of becoming the transportation mode in the near future? Practically none.

"As a science fiction idea, it clearly works, but as a business, I'm not sure," says John Hansman, a professor of aeronautics and astronautics at MIT. "In order to do it, you'll have to do it safely, and that's what will be expensive."

Hyperloop One was in the news for conducting a test of some initial systems in the Nevada desert but the vast host of logistical, political, financial and engineering challenges is daunting.

The Hyperloop technology uses a steel tube containing a near-vacuum that would sit on stilts above the ground and must traverse a virtually straight path. Given the "passenger pods" within the tube will be traveling at 740 mph, the slightest variation in the alignment - left, right, up, down - will throw the passengers violently. Another hurdle is overcoming the "pistoning" effect, caused by air in the tube piling up in front of the pod and slowing it down. Though the air would be at only a thousandth the pressure of that outside the tube, any air in front of the pods will compact and slow it down. It is reported that NASA has done calculations which determine the tube would have to be at least four times wider than the pod to prevent even the tiny amount of residual air within from blocking the pod achieving the desired speeds. Current plans budgeted for tubes only twice as wide.

Additionally, as currently envisioned, Hyperloop fails to meet one of the state's primary objectives: connecting California's economically depressed and isolated Central Valley cities with the successful economic engines of the San Francisco Bay area and the



Los Angeles Basin. High-speed rail will provide fast, easy, safe, environmentally sound transportation for all Californians as it threads through the major population centers from San Francisco through the San Joaquin Valley to Los Angeles – 24 stations in all. Hyperloop, going directly from Los Angeles to San Francisco, bypasses the Central Valley communities entirely. The Central Valley is the fastest growing region of California, is the most economically depressed, has the worst air quality not just in California but in the nation, and suffers from high unemployment. California's high-speed rail project addresses the needs of those communities; Hyperloop does not.

HYPERLOOP'S ESTIMATED COST? $100-$200 BILLION

Musk said the Hyperloop could be built for no more than $6 billion—a tenth the cost of the California high-speed train. Everyone involved now believes Musk seriously under-estimated the cost of building a Hyperloop between Los Angeles and San Francisco.

Michael L. Anderson, an associate professor of agricultural and resource economics at the University of California, Berkeley, commented that beyond land-purchase issues, any realistic estimate of the costs would say Musk and his team are underestimating them "by at least a factor of 10 to 20." "You're talking $100 billion to build what they're proposing," Anderson said. Also, Anderson said the more realistic price for a one-way ticket would reach about $1,000, based on his own projections of construction costs and Musk's proposed capacity of 840 riders per hour.

HOW WOULD PASSENGERS BE EVACUATED IN AN EMERGENCY?

Because the Hyperloop's capsules would travel within a depressurized tube, getting passengers out between stations would be tricky, to say the least. "If a vehicle becomes disabled and stops, you can't get out of it without basically raising the pressure in the tube or having a pressure suit," MIT Professor Hansman says. "You can design ways to do it, but it's going to be complicated and expensive."

CAN YOU RELIABLY PREVENT PASSENGER INJURIES?

Then there are the engineering challenges involved in transporting human beings through an air-tight steel tube hundreds of miles long. One of the most intractable problems facing Hyperloop designers is how to deal with the g-forces involved, not just forward motion when launching from zero to 740 mph but the jostling side to side at high speeds as a result of slight variations in alignment caused by the tube's supports flexing and settling.

Though Prof. Hansman says the human body can comfortably withstand the acceleration levels that would come with traveling in the Hyperloop, creating a safe environment for passengers would require designing extremely smooth inner walls for the tube without any rough edges because when traveling at speeds approaching 800 miles per hour, the tiniest irregularity could cause significant damage. "It would create a lot of sideways or up and down forces that would break the capsule," Hansman says.

SLEEPBUS

Overnight sleeper "Bus" shuttles between LA and San Francisco - Got all night? Sleepbus is a startup that's a bus, well, sort of. It's really a cross between a bus and a semi-trailer that is outfitted with Pullman-style berths and work areas. Like Amtrak, it offers

free wifi, and free coffee and tea as well. It promises that you can go to bed at one end, wake up at the other, with no missed work time. The "bus" leaves at 11 PM and arrives around 6 AM but travelers are allowed to continue sleeping until 7:30 AM.

Tickets are $100-200, which is pricier than the $38 Greyhound, but much cheaper than a hotel at either end -- so if you have a morning meeting, you can sleep the night away, arrive rested, and come out ahead.

SleepBus was launched with a prototype bus in late April 2016 and SleepBus claims the response was overwhelming, with initial reservations selling out. SleepBus says it is working with its manufacturer to build 10 brand new buses, and expects to have more capacity available by August 15th.

LONE STAR RAIL

MOVES FULL STEAM AHEAD

ENVIRONMENTAL STUDY PRESSES AHEAD WITH A RANGE OF ALTERNATIVES

By Joseph Black, Deputy Executive Director, Lone Star Rail District

The Lone Star Rail District Board of Directors convened a Special Meeting on April 15, 2016 to discuss new project developments and a plan for moving the Lone Star Regional Rail Project forward. Ultimately, the Board voted to continue and complete the ongoing environmental impact statement (EIS) to enable future funding availability for the project.

"Our regional mobility challenges are growing and the purpose of and need for Lone Star Rail are still front and center," said Joe Black, Deputy Executive Director for the Rail District. "The recent decisions of Union Pacific do not change the need for a congestion-proof alternative to Interstate 35 in Central and South Texas."

The announcement comes two months after the Union Pacific Railroad (UPRR) terminated its Memorandum of Understanding (MOU) for planning with the Rail District. One of the several alternatives being explored for Lone Star Rail service involves repurposing the existing UPRR freight line through the corridor for passenger services and potentially building a new freight rail line to the east. Following UPRR's action, the district has paused work on that alternative and is exploring other options.

"The UPRR alternative had the most perceived benefits to the most people in the region," said Lone Star Rail District Chairman Sid Covington. "It not only provided suitable locations for passenger rail stations, but also helped solve problems related to freight rail traffic. But the action of one entity can't dictate alternatives considered in the EIS process."

Other alternatives being evaluated involve using the I-35 corridor, the SH130 corridor, abandoned MoKan rail alignment and a new right-of-way parallel to the Union Pacific mainline. Hybrids of these options also would be considered. In addition, moving from the UPRR right-of-way opens the possibility to use different technological approaches to rail equipment and service planning not available with a purely UPRR approach. Finally, the costs of the project will potentially decrease due to the removal of the new freight rail line which had been planned for UPRR east of the Interstate 35 corridor.

Meanwhile, the Lone Star Rail project will continue to coordinate with the ongoing TxDOT Texas-Oklahoma Passenger Rail Study (TOPRS), which is looking at options to connect Oklahoma City with the Austin-San Antonio region via Dallas-Fort Worth.

The Rail District estimates that the Lone Star Rail project is approximately halfway through its project implementation process; the development of the EIS, which is part of that process, is on pace with other major transportation projects nationally and regionally. The District expects to complete the EIS process with a Record of Decision by 2018.

"We remain committed to our mission to provide reliable, predictable and safe regional transportation," said Black. "Over the next few months, we will continue to engage with our stakeholders and work cooperatively with our transportation partners to keep moving the project forward."

Those partners include the Austin and San Antonio-based metropolitan planning organizations, cities and counties, transportation authorities, and the Texas Department of Transportation and Federal Highway Administration, the co-lead agencies for the EIS process.

CLEVELAND, OH

A NEW MULTI-MODAL SYSTEM

By Timothy Rosenberger

CLEVELAND MULTIMODAL TRANSPORTATION CENTER: A NEW INTERCITY TRANSPORTATION GATEWAY FOR DOWNTOWN CLEVELAND. *THE TRANSPORTATION NETWORK IS A REGION'S LIFE BLOOD AND QUALITY TRANSPORTATION FACILITIES CAN ENHANCE ITS ECONOMIC VITALITY. FORTUNATELY, CLEVELAND HAS DEVELOPED A MULTI-MODAL TRANSPORTATION NETWORK THAT PROVIDES ACCESS TO ITS COMMERCIAL, INDUSTRIAL, AND RESIDENTIAL AREAS.*

Cleveland's primary inter-city mass transportation facilities, the Greyhound Terminal on Chester Avenue and the Amtrak Station near Cleveland's Lakefront, are located nearly a mile apart in different parts of downtown Cleveland. The two facilities are nearing the end of their useful lives, and neither provides the kind of passenger experience fitting for the transportation gateway of a great city. In 2015, the City of Cleveland began a planning process that sought to examine ways to create a new multimodal facility near Cleveland's Lakefront. This new facility was meant to better connect downtown to the Lakefront area and promote development of under-utilized land near the Lakefront, while providing the growing number of inter-city bus and rail travelers with a 21st century facility that provides a welcome worthy of Cleveland.

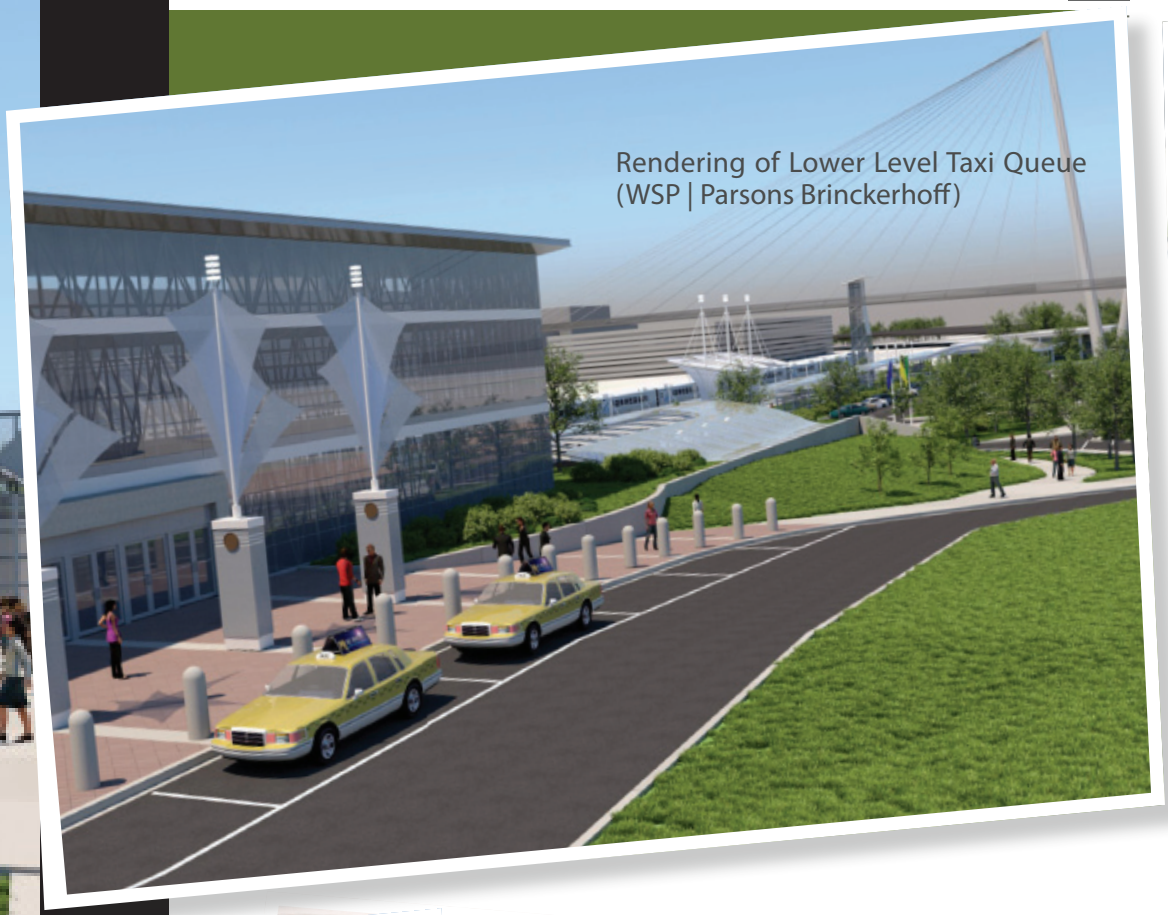
Cleveland's existing Amtrak Station, located on the south side of State Route 2 (the Shoreway) between West 3rd and East 9th Streets, was built in the 1970s. Upgrades to lighting and platforms were performed in the 2000s, but the station building itself has not been significantly updated since it was built. Standing on the station platform, one is surrounded by many of Cleveland's most iconic buildings: Cleveland's City Hall, the Convention Center and County Courthouse to the south, First Energy (Cleveland Browns) Stadium, the Great Lakes Science Center, the Rock and Roll Hall of Fame and Museum, and Burke Lakefront Airport to the north. However, the station is separated from these destinations by railroad tracks to the south and the Shoreway to the north. These barriers, a grade separation between downtown Cleveland and the Lakefront, and poor pedestrian connections between the sites limit connections between the station and these regional destinations. In addition, the station's undistinguished architecture and the poor condition of some elements of the facility limit its attractiveness to potential Amtrak users.

The Cleveland Greyhound Terminal (located on Chester Avenue east of East 13th Street), built in 1948, is among the oldest continuously operating Greyhound facilities in the country. Serving Greyhound routes operating on I-71 and I-90 as well as serving as the terminus for routes using I-77, it is also among the busiest Greyhound facilities. An excellent example of late Art Deco architecture, the terminal is a National Register historic site and was refurbished by Greyhound in the 2000s. Located between downtown Cleveland and the fast-growing Cleveland State University area, the Greyhound Terminal is part of one of the largest remaining underdeveloped sites near downtown Cleveland. The property has been targeted by private developers as part of a larger mixed-use redevelopment that would bridge the Cleveland State area and downtown. Suggestions have been made that the Greyhound Station's art deco façade would remain, while the remaining Greyhound site and several surrounding surface parking lots would be merged into the redevelopment.

The potential for relocating the Greyhound Terminal offered Amtrak, Greyhound, Greater Cleveland RTA (whose North Coast station on the Waterfront line is adjacent to the existing Amtrak station), the City of Cleveland and other regional transportation stakeholders the opportunity to evaluate potential designs for a multi-modal transportation center in the Lakefront area. The center would combine Greyhound

Greyhound historical facility, - a National Register Station constructed in 1947.

Driveways and platform area. Reuse of some existing internal roadway and platform elements, as well as the shell of the Amtrak building, lowered the cost of the proposed facility.



Rendering of Lower Level Taxi Queue
(WSP | Parsons Brinckerhoff)

Rendering of E. 9th Street Entrance.

Rendering of the proposed Multimodal Center, showing the Lakefront Pedestrian Bridge on the right.

(PHOTOS COMPLIMENTS OF: WSP | Parsons Brinckerhoff)

and Amtrak operations while improving pedestrian connections to downtown Cleveland and Lakefront attractions, complementing and potentially connecting to the Lakefront Pedestrian Bridge, currently in design, which is to connect the Convention Center and Lakefront area. The facility is also to improve connections to RTA's Waterfront Line and other downtown transit assets, upgrading facilities for inter-city transit users, and creating an architectural landmark in the Lakefront area to serve as a fitting transportation gateway to the city.

CLEVELAND CITY PLANNING TAKES THE LEAD

Charged by Mayor Frank Jackson to find a way to integrate the Amtrak and Greyhound activities in the Lakefront Area, City Planning Director Freddy Collier and Planning Commission staff secured a Transportation for Livable Communities Initiative (TLCI) Grant from NOACA to create a station concept and perform initial site investigation for the potential multimodal facility. A steering committee for the project was formed that included various City departments, ODOT, Greater Cleveland RTA, Cuyahoga County Engineering and Planning, and other transportation and planning agencies. Surrounding property owners and downtown interests also were brought into the process to insure that the resulting facility complemented surrounding regional destinations and would be an asset to downtown Cleveland.

A FIRST CLASS STATION FOR A FIRST CLASS CITY

The City of Cleveland and their consultant team, led by WSP Parsons Brinckerhoff and AECOM, met with Amtrak, Greyhound, Greater Cleveland RTA and dozens of downtown Cleveland and Lakefront area stakeholders to identify goals and review proposed conceptual plans for the proposed facility. Besides being safe and cost-efficient, the stakeholders wanted to insure that the new facility would work well for existing inter-city travelers and attract new users to these services, and generate increased interest in all sorts of alternative transportation modes, from inter-city transit to greater use of RTA to facilitating active transportation modes including walking and bicycling, which promote public health. Given the facility's highly visible location and the large number of architecturally significant buildings nearby, the City and stakeholders desired an iconic building that would be memorable and fit the context of the Lakefront area. Finally, the City wanted the facility to promote transit-oriented development, particularly redevelopment of the underutilized Muni Lot site east of East 9th Street.

The proposed multi-modal transportation facility project is to include the following elements:

-Consolidation of Greyhound, Amtrak, and Greater Cleveland Regional Transit Authority (GCRTA) into one campus to allow for better connection to multiple forms of transportation throughout the city

-Consolidation of these mass transit facilities in a location with easy freeway access.

-Features that will enhance the

surrounding area and nearby development, such as small scale retail and public gathering space.

-Promotion of bicycling and other alternate forms of mass transportation, including location of bike sharing, a bike station (showers, bike storage) and improved connections to RTA's Waterfront Line light rail and downtown trolley system.

-Prioritization transit and pedestrian/bicycle connections over taxis and private cars.

-Connections to the pedestrian bridge that serves to span the disconnect between Downtown Cleveland and the lakefront and its amenities.

PUTTING IT ALL TOGETHER

After gaining and understanding of the goals of the transportation providers and the downtown community, the consultants from WSP | Parsons Brinckerhoff and AECOM analyzed the local and regional transportation network in which the multimodal facility would operate, considering how Greyhound buses and drivers of motor vehicles would access the site and drop off and pick up passengers, and how these movements would affect, and be affected by, traffic on the Shoreway and E. 9th Street, a major access point for commuter and special event traffic in downtown Cleveland. Pedestrian movements among the Greyhound, Amtrak and RTA operations within the facility, and between the facility and downtown Cleveland and the Lakefront area also were examined. The consultants also worked closely with Amtrak, Greyhound, RTA and the City to develop an internal space program to determine the space requirements of the users and the required relationships and interactions among those spaces.

The City and consultants held a series of workshops with the City of Cleveland, Greyhound, Amtrak, RTA and other key stakeholders to develop concepts for the multimodal facility and connections to adjacent uses. In those meetings, the team's architects, including James Gast of AECOM and Jennifer McMasters Wirtz of WSP | Parsons Brinckerhoff, presented sketches showing how the facility would relate to surrounding uses, including Cleveland's new Lakefront Pedestrian Bridge, an iconic structure designed by architect Miguel Rosales, that will pass over the site and whose support structure will be positioned within the site. The architects also showed how a proposed program for internal space, the connections among passenger waiting areas, Greyhound and Amtrak operations, and external connections to adjacent pedestrian and roadway networks, would be managed within the site area.

A NEW LANDMARK ON THE LAKEFRONT

The ultimate concept included a new, iconic structure to be located along E. 9th Street and the Shoreway ramps, that would serve as the grand entrance to the facility and would be highly visible from the Shoreway and nearby downtown and Lakefront attractions. The new facility would house Greyhound operations and serve as the primary entrance to the entire site. Pedestrians and auto drop-off passengers would access the site from an upper level adjacent to E. 9th Street, while Greyhound bus parking and taxi services would park on a lower ground level. On-site parking would be accommodated in the existing Amtrak parking lot, with additional parking available at nearby parking decks accessible from E. 9th Street.

The existing Amtrak station would be refurbished and reclad to architecturally match the new Greyhound facility, and canopies and landscaped paths would pull the two buildings together into a single functional facility. Connections at the lower ground level also would connect the facility to the adjacent RTA Waterfront Transit Line Station. Reusing the existing Amtrak and RTA facilities allowed the estimated facility cost to remain below $50 million

MAKING PLANS FOR 2017 AND BEYOND

The City of Cleveland is working with NOACA and other Federal, State and local agencies to seek funding for the proposed facility, citing the facility's potential transportation, economic development and livability benefits of the project based on its benefits to the growing inter-city mass transit market and improved connections between downtown Cleveland and the Lakefront. The City will begin further design on the project in 2017 to insure that the facility can be constructed immediately upon completing its funding package.

With the growth of downtown Cleveland as an urban neighborhood and increasing numbers of Clevelanders and other Americans embracing a car-free lifestyle, Cleveland's market for inter-city mass transportation services like Greyhound and Amtrak will continue to grow. The Multimodal Center will provide an iconic building that will enhance Cleveland's Lakefront skyline and improve connections between the Lakefront downtown, while preparing the city for the further growth of inter-city mass transit in the 21st Century.

GOTTHARD BASE TUNNEL

ONE OF THE GREAT ENGINEERING WONDERS OF THE WORLD

Discover Switzerland's Gotthard Base Tunnel *which is the longest tunnel in the world and opened on June 1, 2016. A record-breaking construction, it took 17 years to build through the Swiss Alps. In twenty minutes you can travel the flat-track route from the north to south axis; a smoother, easier, quicker and more comfortable journey through the Swiss Alps than ever before. Regions and neighboring countries on both sides of the tunnel will move closer together, and journey time from Zurich to Milan will be just two hours and 50 minutes, cutting an hour off current time.*

> *Men of sense often learn from their enemies. It is from their foes, not their friends, that cities learn the lesson of building high walls and ships of war.*
>
> -Aristophanes

It took over 50 years to plan, more than 17 years to build, and it won't open for revenue service until December, but the Gotthard Base Tunnel – 57 kilometers in length with over 152 kilometers of tunnels, shafts, and galleries – is the longest railroad tunnel in the world connecting northern and southern Europe through the Swiss Alps. The tunnel is the heart of the New Alpine Transversal (NEAT), bringing Switzerland and Europe closer together at a cost of $12.5 billion.

ONE OF THE ENGINEERING WONDERS OF THE WORLD

This is not the first tunnel to be built through the Gotthard Base. The first rail tunnel through the Gotthard opened in 1882 and was proclaimed by then president of Switzerland, Simeon Bavier to be, "A triumph of art and science, a monument to work and diligence! The barrier which divided nations has fallen, the [Swiss Alps] have been breached. Countries have moved closer to each other, the world market is open!"

But the old tunnel was a single lane rail and truck tunnel that zigged and zagged around the edge and up and down the Alps. Travel in the tunnel was congested and dangerous and took hours to complete. Over the years many people died from accidents within the old tunnel, caused primarily from the furnace effect of air rushing through the unventilated structure.

The new Gotthard Base Tunnel is a two-tunnel complex with a third "escape tunnel" and safety doors throughout the tunnel to prevent the spread of fire should one occur. A total of 176 cross galleries dot the tunnel, serving various functions, including two emergency stations at Faido and Sedrun where trains can stop in case of an incident. Every tunnel crossover has a separate air-conditioned technical room filled with building control systems, cables for the railway systems and a water pipeline for the multifunction station.

The tunnel plows straight through Alps with barely any grade change, making it ideal for future high-speed passenger train operation, putting an end to travel that was so slow, passengers could almost pick the flowers along the line, and the need for double locomotives to drive freight trains up steep gradients will be a thing of the past.

BORING TECHNOLOGY

According to Herrenknecht Tunneling Systems, the company that provided the massive boring equipment that drilled the tunnel, when the tunnel opens for revenue service, "the journey time from Zurich to Milan will be cut by one hour to 2 hours and 40 minutes."
The firm also noted that Swiss Railways is expecting to cut freight transport times – yet another important improvement in traffic logistics between Germany and Italy.

The plan for the tunnel was ambitious, costly to the Swiss taxpayers who had agreed to pay for it, and fraught with engineering challenges. The first geologists surveying the proposed route suggested it might be impossible to bore a tunnel straight through the Gotthard, because of the unpredictable quality of the rock.

Once work began, those challenges soon became apparent. In some areas the rock, one engineer remembers, was "as soft as butter" meaning excavation inched along at no more than half a meter a day. In other places things went more smoothly (See Tunneling 101).

To address these challenges, Herrenknecht Tunneling Systems

activated four massive 10m (30ft) diameter tunnel-boring machines (TBM) – affectionately called Gabi 1 and Gabi 2 boring south from Amsteg, and Sissi and Heidi boring north from Bodio – that on a good day could dig out 40m of tunnel a day - a world record. Each of the machines was 410 m long – the length of a football field.

The Gotthard is the world's deepest tunnel. With 2.3km (1.4 miles) of mountain pressing down on it, gravity constantly tried to close up the space that had been excavated. And so, along the tunnel's length, reinforced steel rings had to be inserted, to prevent it collapsing in on itself.

For more than 17 years, 365 days a year, 24 hours a day, 2,600 people worked on the tunnel. They poured more than 4 million cubic meters of concrete, and laid more than 3,200 km (the distance from New York to London) of copper cable.

Though the official opening of the GBT occurred on June 1st, work will continue on improvements to the rest of the rail line with the maximum benefits of the GBT won't be realized until another tunnel at Ceneri, to the south, is opened in 2020, completing the NEAT, and allowing freight trains to haul tractor-trailers with a height of up to 13 feet according to the Rail Journal.

COULD RAIL TUNNELING IN THE U.S. BENEFIT?

Commenting to NBC News, Claire Smith, a former geotechnical engineer who is now editor of Britain's Ground Engineering magazine, commented, "This isn't like a [subway] line running a few meters below the surface, we're talking depths that are measured in kilometers. Working down there is like going down a mine, it gets warmer as you go further in."

In fact, it is the deepest rail tunnel in the world and the longest of its kind. (One wholly underground subway line in Guangzhou, China covers a total of 37.5 miles.) It exceeds the 33.5-mile Seikan tunnel in Japan and the 31.3-mile underwater Channel Tunnel linking England with France. It is 10 times longer than Boston's Thomas P. "Tip" O'Neill, Jr. Tunnel. Yet there may be many important lessons that could bring new perspective on the feasibility of several possible tunneling projects in the United States like the proposed Hudson River tunnel linking New York and New Jersey; the proposed rail link between North and South Stations in Boston; plans of the California High-Speed Rail Authority to breach the San Gabriel Mountains; and, perhaps many others that may lie ahead as the United States experiences a renaissance in passenger and freight rail.

Certainly if the Herrenknecht Tunneling System and the risk management efforts made with the Gotthard Base Tunnel had been considered in the U.S. over the past decade, the Seattle Viaduct Tunnel might have been completed more quickly and at less expense. The Red Line in Baltimore might have received a green light, a second Potomac River crossing for Washington's Metro might be closer to reality, and significant sections of Washington's Metro extension through Tysons and at Dulles International Airport in Northern Virginia might have been constructed underground.

> "Love it or hate it, we are living through a new age of the railway.

The Swiss firm Lombardi Consulting Engineers Ltd. In a paper by T. Bachmann and I. Vicenzi observed that the Gotthard Base Tunnel is actually two rail tunnels that are about 40 meters apart and joined approximately every 312,5 meters by connecting galleries. Two double crossovers allow trains to change from one tunnel to the other – which may be necessary to allow maintenance work if an accident occurs. Trains can switch tunnels in the multifunction stations which also house ventilation and technical equipment, safety and signaling systems, as well as two emergency stop stations which are directly linked by separate access tunnels. Other then the two portals, intermediate headings provide additional accesses to the tunnel from above (shafts) and from the sides, shortening also the construction time and dividing the tunnel into five sections.

In their paper, "Gotthard Base Tunnel Risk Management for the World's Longest Railway Tunnel: Lessons Learnt," Dr. Rupert H. Lieb, Head of Construction Management and Heinz Ehrbar, Chief Construction Officer Gotthard Base Tunnel AlpTransit Gotthard Ltd, observed that all major underground projects face geological risks that must be precisely analyzed and localized. Lieb and Ehrbar note that in the case of the GBT, these challenges included unknown geological and hydrological conditions at depths of up to 2,500 meters below the earth's surface. Based on the geological investigations, two zones were identified that threatened the feasibility of the project: in the Faido section the Piora syncline; and in the area of the Sedrun intermediate heading, the Tavetsch intermediate massif, as well as the adjoining Clavaniev zone to the north, and the Urseren-Gavera zone to the south.

Risk-reduction measures in these two areas appear to have been successfully planned. The highly elaborate explorations of the geology were a major success factor.

The GBT demonstrated that even with extensive advance explorations, the geological risk cannot be ruled out entirely. Several times during the excavations the experience was made that in the one tube no driving difficulties occurred, but in the other tube, which was excavated at an axis distance of 40 meters, rock falls occurred which caused months-long interruptions. On the other hand, more favorable conditions than were forecast also created opportunities. These were actively exploited, as the repeated relocation of the lot boundary between Sedrun and Faido illustrates.

In the GBT the risk management system has proved itself. Where risks were identified, the necessary measures were initiated promptly. Despite extensive advance investigations and exploratory work, until the drives have been completely excavated they are subject to major risks associated with the geology. As far as possible and practicable, the measures required to master these risks should be included in the work contracts. In the overall time schedule, it is advantageous to work with ranges.

PAST PRESENT FUTURE

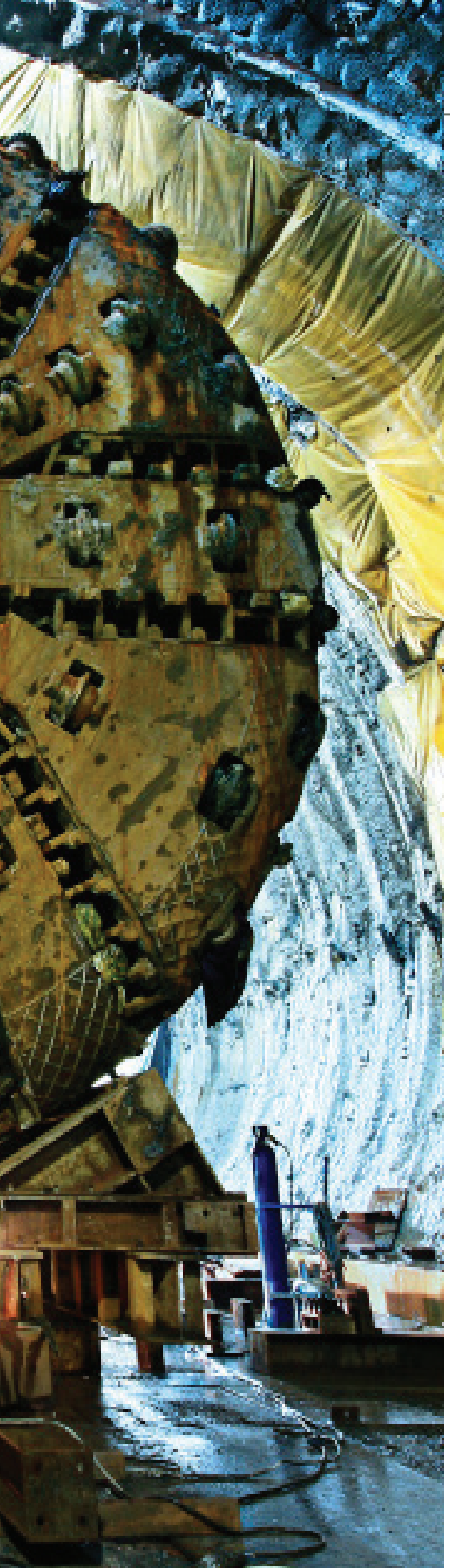
THE HISTORY Gotthard Tunnels

TUNNELS HAVE BEEN BUILT THROUGH THE GOTTHARD-RANGE FOR MORE THAN THREE CENTURIES, MAKING THIS AN EPOCH-MAKING PROJECT.

June 1, 2016 -	The centerpiece of the new Alpine transversals – is scheduled to go into operation.
March 23, 2011 -	Main breakthrough in the Western tunnel between Sedrun and Faido.
October 15, 2010 -	Main breakthrough Tunnel in the Eastern tunnel between Sedrun and Faido.
2009 -	Mechanized tunneling is successfully completed in the north.
2008 -	The dreaded Piora Basin is successfully crossed by the S-210.
2006 -	The Herrenknecht TBMs on the northern and southern sections of the Base Tunnel reach their first target –up to nine months ahead of schedule.
2003 -	Tunneling work with the four Herrenknecht Gripper TBMs begins.
2001 -	The first machine orders are awarded to Herrenknecht.
1999 -	Excavating activities begin in Sedrun with the first blasting works.
1998 -	The Swiss government approves financing for the New Alpine Transversal (NEAT).
1996 -	The first preparatory and exploratory work for the Tunnels begins in Sedrun.
1993 -	Exploratory drills begin at the Piora Basin.
1980 -	The first road tunnel is opened to traffic and connects Göschenen with Airolo.
1969 -	Construction of the first road tunnel through the Gotthard begins.
1882 -	The longest railway tunnel in the world at the time, with a length of 15 kilometers, goes into operation.
1880 -	Breakthrough is achieved on February 29, with impressive precision for that time.
1872 -	Construction of the first rail tunnel through the Gotthard begins, under the direction of the Swiss engineer Louis Favre.
1707 -	The master builder Morettini from Ticino chipped and blasted a 64-m-long tunnel through the Chilchberg mountain – it is known as the 'Urner Loch'.

(https://www.herrenknecht.com/en/references/case-studies/gotthard-base-tunnel.html)

After nearly two decades of construction work, the world's longest and deepest rail tunnel has officially opened in Switzerland.



TUNNELING 101

MASSIVE EARTHWORMS

Contributed By: Peter Allibone, C.Eng., P.E. Assistant Vice President, Transit and Rail Systems, WSP | Parsons Brinckerhoff

After 20 years of construction activity and at a cost of $10.3 billion, the June 1, 2016 opening of the 35-mile Gotthard Base Tunnel in Switzerland was an historic moment in the history of tunneling and a milestone in the expansion of the European HSR network. But it can also be seen as a precursor of the future of HSR. As the remaining HSR lines over moderate topography or across rural territory get built, we can expect future HSR programs to require more extensive tunneled segments, which will take longer to implement and be more expensive. Therefore, it is increasingly important for HSR advocates to grasp why those tunnels are necessary and what it takes to build them.

What is a tunnel? It may seem rather obvious, but a majority of passengers on the New York Subway, Paris Metro, and London Underground think of themselves as riding through tunnels when, for most of the time, they are traveling through cut-and-cover structures. A cut-and-cover structure is not a tunnel, it's a trench excavated from the surface and filled with a box structure. The space above the box is then backfilled, usually to form a street or avenue. In comparison, a real tunnel is a more or less "horizontal" hole, excavated through the native ground without breaking the surface except at the ends of the tunnel or at intermediate construction shafts. Of the three transit systems mentioned above, only London has a significant proportion of real tunnels; the London Underground lines known as the "tube." And even then, most of the "tube" lines come to the surface when they reach the suburbs.

The fact that the tunnels in London stop when they reach the suburbs gives away the first reason why we need tunnels at all. It can be politically impossible or at least unreasonably expensive, to construct surface or elevated rail lines through highly developed areas with very valuable real estate. Additionally, most of the streets and avenues in the inner cities are crammed so full of underground utilities that cut-and-cover

construction is no longer viable. Real tunnels are the only remaining option. Fortunately, modern tunneling methods have made it feasible to construct real tunnels beneath the existing underground infrastructure (foundations and utilities) and through ground that could not have been tunneled cost-effectively a few decades ago.

The second reason why we need tunnels takes us back to the Gotthard Base Tunnel. Steel wheels on steel rails don't do well on steep grades, so very hilly or mountainous topography requires tunnels to avoid impractically circuitous surface alignments. The Gotthard Base Tunnel isn't just the longest rail tunnel ever built; it's the deepest, at 7,500 feet under the highest mountain peak.

Why are tunnels so expensive? Tunnels are expensive because they are slow to build and they are slow to build because tunnel construction is inherently risky. As a sweeping generalization, tunneling can be divided into two types: hard ground tunneling and soft ground tunneling. Each tunneling type requires a different set of construction techniques and management of a different set of risks. Hard ground can be defined as material that is largely self-supporting after a tunnel is excavated through it. Soft ground can be defined as material that will collapse if it is left unsupported. This collapse can happen almost instantly or over a period of time, depending upon the specific properties of the soft ground in question. In other words, hard ground is what we generally think of as solid rock and soft ground is soil-like materials such as clays, silts, and sands.

At first glance, hard ground tunneling appears much simpler than soft ground tunneling, but a material that is inherently strong enough to be self-supporting is also much more difficult to excavate. So difficult, in fact, that until recently the standard methodology for hard tunneling through rock was to use explosives. The wall of undisturbed rock or soil at the limit of advance of a tunnel under construction is called the face. Drill-and-blast tunneling requires drilling into the tunnel face, packing the drilled holes with explosives, and letting off the charges simultaneously to break up a short length of rock ahead of the face into manageable pieces that can be transported out of the tunnel. This process hasn't changed much over the last 150 years except for the improved effectiveness of the drills and the safety of the explosives. The difficulty of tunneling through rock has meant that the construction of hard ground tunnels has generally been restricted to avoiding topographical obstacles… mountains are always made of rock. Urban locations with bedrock close to the surface, such as much of Manhattan, conventionally require construction of subways using cut-and-cover instead of tunnels to reduce the amount of drill-and-blast rock excavation.

Tunneling in soft ground is the exact opposite. The material is easy to excavate, but requires continuous construction of a lining structure around the full tunnel cross-section to prevent it from collapsing. In the nineteenth century a technique for soft ground tunneling was developed that used a tunnel shield to support the tunnel face area while the lining was installed. The shield was an iron or steel box the shape of the tunnel cross-section, open at the rear and with the face divided into small cells that could be blocked off with timber lagging. Some of the cells would be opened and the exposed sections of the face would be excavated, while the continuous brick liner structure was constructed forward into the rear of the shield. The shield would then be jacked forward to fill the void at the face and the continuous liner structure would be left behind the shield to effectively contain any collapse. An advance on this process, using a lining of cast iron segments bolted together into rings, was used with great success to construct the early "tube" lines in London. This was possible because much of London happens to be located on a stratum of consolidated blue clay that is self-supporting for long enough to maintain a safe tunnel face.

For construction of tunnels in very soft materials, such as wet silts and sands, it was necessary to take the additional measure of including a sealed face chamber in the shield and pumping compressed air into the face chamber to balance the ground water head pressure. Unfortunately, working in compressed air came with significant safety hazards and an air lock was required in the shield for the face workers to decompress at shift's end.

The second half of the twentieth century saw a tunneling revolution with the widespread introduction of mechanized tunneling using tunnel boring machines (TBMs). A TBM is essentially a tunnel shield with the addition of a mechanical cutting head at the face and machinery to assist in liner installation at the rear. Precast concrete liner segments usually replace cast iron for the liner segments and the TBM liner machinery keeps the rate of liner ring construction up with the speed of advance of the TBM. Trailing behind the TBM is a train of machinery that pumps grout into the void between the liner rings and the native ground, handles the incoming liner segments, and loads the excavated material either onto a belt system or into rail mounted hoppers for transport back down the constructed tunnel.

Pictured to Right: New York City's Underground Monster!

The biggest public transit infrastructure effort in the US is almost completely invisible — unless you're 160 feet underground. The East Side Access project will connect the Long Island Railroad to New York's Grand Central Terminal via a massive tunnel under the East River. For most of the East Side Access's length, four, six or eight smaller tunnels run parallel. The project is expected to be fully operational in 2019 and will make a big difference for commuters in Long Island and Manhattan. During peak morning hours, 24 LIRR trains will arrive at the new station beneath Grand Central Terminal every hour, for an average of 162,000 daily passenger trips. Travel to John F. Kennedy International from Manhattan's East Side will also be greatly simplified.

1. Grand Central Terminal

"We are a stealth project when we land in Manhattan," Horodniceanu says. "No one really knows we are here." His crews are carving out a terminal beneath Grand Central (above), where twin caverns 1,050 feet long will have eight separate platforms.

2. Northern Boulevard Crossing

To keep the soft ground from collapsing, engineers snaked coils of coolant through the soil to form a protective arch of frozen earth. That let crews work safely while traffic rumbled overhead. Cost: $1 million per foot.

3. The Harold Interlocking

The busiest rail junction in the nation can't stop for construction. As trains lumber through, crews have been boring the main tunnel below, rerouting and fixing cable and wire as they go.

The completion of the Port of Miami Tunnel was marked by a ceremony in May of 2014 attended by the U.S. Secretary of Transportation. Earlier that year, U.S. President Barack Obama visited the tunnel to promote greater spending on infrastructure projects.

The use of TBMs began in clay soils, where the material was self-supporting for long enough to allow an open face, and subsequently the technology gradually evolved to become the norm for all types of soft ground. Two basic TBM types have been developed to replace the need for working in compressed air at the tunnel face: the Earth Pressure Balance (EPB) TBM and the Slurry Shield.

The EPB TBM has a chamber behind the cutter face, with an Archimedes screw device to carry excavated material from the cutter chamber back into the body of the TBM. The rate of turn of the Archimedes screw is adjusted to hold back enough excavated material in the cutter chamber to balance the ground water pressure at the tunnel face. The Slurry Shield is used where the ground water pressure at the face is too high for an EPB TBM to operate successfully. In a Slurry Shield the cutter chamber is filled with a bentonite clay slurry that is maintained under pressure to balance the ground water. A slurry of bentonite clay in water possess a property called thixotropy. Thixotropic gels or fluids are thick and viscous under static conditions and will flow (become thin and less viscous) over time when shaken, agitated, or otherwise stressed. They then take a fixed time to return to their more viscous state. In a Slurry Shield the excavated material mixes with the slurry in the cutter chamber and is pumped into the body of the TBM for transport to the surface. Along the way, the bentonite clay slurry is separated from the excavated material, cleaned, and recycled back to the face. It should be noted that soft ground TBMs also require air locks to provide for access by workers into the face chamber, where compressed air is still used when the cutter heads are being maintained or small boulders and other obstructions too hard for the cutters are broken up.

Initially, TBMs were restricted to soft ground tunneling because the available cutting heads were not hard enough to excavate rock quickly enough to be cost effective. But this limitation has changed in the last quarter-century and now hard rock TBMs can be used in almost all circumstances, even though the rate of advance is still very much slower than soft ground. Although a structural lining system may not be necessary to support a rock tunnel from collapsing, for most applications in rail, transit, or highways, a non-structural liner is installed to prevent spalled rock from falling inside the tunnel. Also, water incursion can be channeled outside the liner and into the drainage system to keep the operating space in the tunnel dry.

An alternative approach to using a hard rock TBM is the Sequential Excavation Method (SEM). SEM was developed by Austrian engineers for tunneling through the Alps and is also known as the New Austrian Tunneling Method (NATM). The SEM concept is to make the most possible use of the inherent strength of the native rock and immediately stabilize the excavation by spraying the exposed surfaces with a thin layer of concrete (shotcrete). The final excavation is then reinforced with rock bolts, wire mesh, and steel ribs. The key to successful SEM is very close monitoring of ground deformations during excavation and adapting the design in real time according to the measured deformations.

While TBM designers and manufacturers have become expert in providing machines highly-specialized for tunneling through specific types of ground, the biggest challenges in modern tunneling are where a particular tunnel must be constructed through different types of material. This is called mixed-face tunneling. It is not generally practical to remove a TBM from a tunnel in-progress and replace it with another one more suitable for the upcoming ground, so the original TBM must be able to deal with all anticipated materials. Mixed-face TBMs are usually EPB machines equipped with cutters suitable for soft ground and for hard rock. The EPB function is activated only while operating in soft ground.

We have already identified that tunnels are expensive because they are slow to construct. They are also expensive to construct because they are inherently unpredictable. Frequent geotechnical boreholes along the route of a tunnel are essential to understand what materials will be encountered, but no matter how many boreholes are taken there will

be gaps between the boreholes and the geotechnical properties in the gaps will always have to be interpolated. This means that the risk related to unanticipated conditions in those gaps must be assigned between the owner and the contractor in the contract specifications and managed accordingly. And a simple rule applies that a larger proportion of risk assigned to the contractor will be reflected in a higher contract price.

Another area of risk in shallow, soft ground tunneling, typical of urban applications, is the management of settlement. When using an EPB TBM, for example, the rate of excavated material transported through the Archimedes screw must be constantly monitored and compared with the amount of material that must have been excavated to allow the actual advance of the TBM. If the volume of material passing out of the face chamber exceeds the volume of material displaced by the advancing TBM, then a void must have been created ahead of the TBM. This void will likely result in settlement at the ground surface immediately above the TBM. A well-written tunnel construction contract should require the tunnel contractor to inspect and measure all signs of damage in the buildings along the tunnel alignment prior to starting construction and carefully monitor any changes as the tunnel proceeds through the area. The contract should also define reasonable levels of settlement for the particular tunnel in the particular soil conditions and the corresponding signs of damage.

This very brief description of the challenges of tunnel construction is intended to give some insight into why tunnels are conventionally seen as a "last resort" in planning the alignment for a rail or transit project. But the difficulties of construction are not the only expensive complexities associated with rail tunnels. Rail tunnels must contain significant infrastructure and systems to support the day-to-day operation of the trains … tracks, a traction power distribution system (catenary or third rail) and feeders, and a train control and communications system … along with means to support maintenance of these systems during allowable interruptions in train traffic. And perhaps the most vital tunnel system is ventilation. A system of fans must be included that can provide sufficient fresh air into all parts of the tunnel, keep operating temperatures at a reasonable level, and provide extraction of smoke to permit evacuation in the event of a train or equipment fire. Tunnel evacuation is part of a set of Fire Life Safety (FLS) procedures that defines how passengers and trains are to be protected or removed to safety in the event of any imaginable disaster scenario. This means that the tunnel itself must contain accessible walkways along its full length, as well as suitably spaced cross-passages between twin bore running tunnels or, perhaps, between the running tunnel(s) and a parallel service tunnel. And for a tunnel as long and as deep as the Gotthard Base Tunnel the option of getting everyone rapidly to the surface is not viable. Therefore, the tunnel ventilation system in its emergency mode must be configurable so that the smoke from whatever source, wherever it is in the tunnel complex, can be removed from particular segments of the tunnel that are in the evacuation path to a designated point of refuge.

An unfortunate recent addition to the demands of maintaining safety in rail and highway tunnels, further adding to their cost premium, is the requirement for protection against man-made disasters. The list of worst case disaster scenarios that must be addressed by the FLS procedures should now include simultaneous man-made events, or events deliberately conceived to create the maximum destruction. This begins with a potential requirement for hardening the tunnel structure against explosive devices on board vehicles transiting the tunnel or on the surface immediately above the tunnel. And where an existing tunnel crossing under a waterway cannot be retroactively hardened, the tunnel should be fitted with flood doors at the ends in case a strategically placed explosion causes a breakthrough to the tunnel from the river or sea bed.

A suitable conclusion to this brief overview of tunnel technology is acknowledgement that we appear to be on the cusp of a major realignment in what constitutes the most cost effective configuration for rail tunnels. To date, almost all TBM driven rail tunnels have been configured as twin, single-track bores, with a separate service tunnel for some very long tunnels such as the Chunnel. This was because there was minimal experience with TBMs larger than about 25 feet in diameter, which was considered the viable limit in terms of the risk of encountering unsuitable material within the bore diameter and excessive settlement. However, recent advances in TBM design and reliability are nudging the rail and transit industry towards considering the application of larger diameter TBMs, up to 40 feet. This would be large enough to contain a double-track railroad and its station platform areas. The impetus towards this change would not necessarily be saving money on the actual tunnel construction, but would be the elimination of very expensive and seriously intrusive construction of full-length cut-and-cover stations in densely developed urban areas. It is not clear yet whether this particular change will catch-on, but the real message is that tunnels and tunneling technology have been evolving for more than 150 years and there is no sign of a change in that trend.

GERMANY'S FINNE TUNNEL PROJECT IN THE SCHNECKTAL VALLEY

Finne Tunnel is just one section of a 76 mile (123 km) high-speed rail link between the cities of Leipzig and Erfurt, Germany. Initial construction on the twin-bore tunnel began in April 2008. Two tunnel boring machines (TBMs) worked at the same time boring the 35.4 ft (10.8 meter) diameter shafts. Peak TBM production rates reached up to 80 ft. (24.5 meters) per day.

The high-speed trains traveling along the route reach speeds up to 186 mph (300 kilometers per hour), capable of exerting huge pressure waves within the tunnel walls. Such high speeds and resulting pressure waves dictated the large external diameter of the tunnels. The internal, lined 31.5 ft. (9.6 meters) in diameter and were formed using precast concrete lining segments or rings. They were cast on-site and each ring was 6.6 ft (2 meters) long, 17.7 inches (450 millimeters) thick and weighed 12 tons. A total of 6822 rings were needed to line the new tunnels.

LEARN A BIT MORE ABOUT CROSSRAIL'S PROGRESS AND PLANS:
http://youtu.be/z38JlqGDZVU

CROSSRAIL'S 26 MILE TUNNELLING IN LONDON, ENGLAND

Digging the new tunnels was a 24-hour a day job, 7 days a week. Crossrail used eight tunnel boring machines (TBMs) to construct the new rail tunnels under London. The giant machines carefully weaved through the capital's congested sub-terrain, snaking between the existing Tube network, sewers, utilities, and London's hidden rivers at depths of up to 40 metres.

The machine is a remarkable and unique piece of equipment. Purpose-built for Crossrail by German firm Herrenknecht – one of a handful of TBM manufacturers in the world – it cost around $15m (£10m) and weighs close to 1,000 tons, has an external diameter of 23 ft. (7.1 metres) and from cutting-face-to-end stretches 500 ft. (150m).

Dear HS&IPR Committee and Friends:

Greetings post the heat and excitement of the APTA Rail Conference in Phoenix, AZ, June 19-22. Hopefully most of you were able to attend our very full and substantive Committee meeting Sunday AM during the Conference. In addition, to the great attendance, presentations and updates it was a milestone meeting for me as it was my last meeting that I served as Chair, and the new slate of Officers was elected unanimously.

I am excited and confident in the succession of leadership for the Committee, including our new Chair, Anna Barry, Deputy Commissioner, Connecticut DOT and Secretary Jennifer Bergener, Managing Director of LOSSAN Corridor, and returning for another term Al Engel, Vice Chair and David Cameron, Member-at-Large. With the election of this slate, the Committee has continued its legacy and the important contribution of rotating and maintaining a balance of leadership between public and business members.

As I did during our Committee Meeting, I think it is important to reflect on and celebrate our accomplishments over the last two years. As we all experienced, it's been a challenging time for high-speed and intercity passenger rail interests in terms of federal funding, and other matters but we can feel confident that our Committee has continued to advocate and educate decision makers, stakeholders and the public-at-large on the need for continued development and investment. Below is a brief summary of our accomplishments:

JANUARY 2015 PREPARED A STRATEGIC PLAN

- Updated our Vision
- Created a new Mission
- Identified 3 Committee objectives that were substantially completed
  - Define and advance our identity and thought leadership
  - Improve our communication and education
  - Expand our membership and partnership

OTHER ACTIVITIES

- Successful transition, succession and re-building
- Updated by-laws
- Successfully advocated for a Rail Title in the FAST Act (first ever passenger rail title)
- Significant and substantive HS&IPR sessions at APTA Rail, Legislative and Annual and a Policy Forum
- Partnership and participation with the UIC and the HSR World Congress in Tokyo, Japan
- SPEEDLINES

I am grateful to have served as Chair for the last two years, and am very proud of our accomplishments and contributions to the High-Speed and Intercity Rail community and APTA as a whole. So, I leave you in good hands and confident that the Committee will continue to leave its mark and make a difference. I am excited to continue my participation under the leadership of Anna and her team as we go forward and to continue to advocate, educate and promote high-speed and intercity passenger rail.

What's Happening

Future HS&IPR Committee Events

APTA ANNUAL MEETING, SEPTEMBER 10-14, 2016

Marriott Hotel, Los Angeles, California
Sunday, September 11th, 8:00 to 10:00 AM - Committee Meeting

Wednesday September 14th, 9:30 to 11:00 AM - Panel Session
"Partnerships and Progress with the California High-Speed Rail Project"

4th Training on High-Speed Rail Systems, October 24-28, 2016

Centro de Formación del Transporte, Madrid, Spain

HSR POLICY FORUM, NOVEMBER 30, 2016

APTA Headquarters, Washington, D.C.

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InnoTrans 2016, the international trade fair for public transport technology, is scheduled later this year for Berlin during the period September 20-23. InnoTrans provides an international forum for rail transit professionals to see and experience rail technologies, including new rail vehicles, components and systems, relevant infrastructure and services for rolling stock. This is where innovations and ground-breaking world debuts have been inspiring rail transportation managers for the past two decades. This is reflected in the growing numbers of visitors and exhibitors. There were over 2,760 exhibitors and 133,500 visitors in 2014 and the 2016 InnoTrans is expected to be even bigger.

InnoTrans is presented in five exhibition segments:

- Railway technology – Public transit rail vehicles, sub-assemblies and components, driving gears, energy/electrical engineering, propulsion and braking, couplings etc.

- Railway infrastructure – Signalling and control systems, overhead contact systems, construction works, planning and construction management.

- Tunnel construction – Tunnel boring machines, construction products and machines, finishes, communication and maintenance and safety features.

- Interiors – Vehicle equipment and finishing, seating, flooring, lighting and glazing, air conditioning systems, travel catering, security etc.

- Public transport – Communication and information technologies, traffic management and data processing, passenger fare collection, management and information systems, services and consulting and station design.

Visitors can experience new rail technologies live on over two miles of track. Rolling stock exhibits include urban, regional and long-distance trains. And for the first time, buses will be on static display in the Sommergarten along with a ½-mile demonstration course.

Tickets can be ordered on-line at www.innotrans.com/ticketshop. The cost is €45 online, and €80 on-site for a daily ticket. A permanent ticket for the entire exhibit is €65 online and €100 on-site. The entrance ticket cost includes access to free public transportation during the show dates.

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EUROPEAN RAIL SUMMIT 2016 REVEALS AMBITIOUS PLANS

MORE COLLABORATION AND FASTER INNOVATION

Contributed By: Eric Peterson

Reaching an audience in excess of 350 people, the second European Rail Summit organized by the Railway Gazette Group took place in Brussels, Belgium on April 27-28 against a backdrop of legislative progress on various elements of European rail policy.

The Keynote address was led by European Transport Commissioner Violeta Bulc. She set out her six priorities for the rail sector, of which the first was a greater drive towards digitisation of the sector. Reflecting on the market pillar of the Fourth Railway Package, she insisted that 'the break-up of monopolies would make rail companies more competitive, and stimulate the development of new business models which we have not seen for a very long time'.

While the United Kingdom braces for referendum on its membership in the European Union (EU), and other EU members complain about the multinational organization's impact on their individual national agendas, ministers of the EU, members of the European Parliament, and leaders in Europe's railroad industry came together in Brussels on April 27th and 28th for the Second European Rail Summit during which they celebrated the approval of the European Parliament's Fourth Railway Package, and prodded each other to achieve higher levels of integration of each nation's railway system into a European-wide freight and passenger network.

During the day and one-half long conference, participants were welcomed by Joachim Hermann, the Bavarian Minister of Interior and transport, and heard a variety of presentations and panel discussions on strategies for establishing a single European railway area, the need to put a greater focus on serving customers, the impact of new technology and innovation on Europe's railways, and the funding and financing needs of an integrated European rail network.

Keynoting the program, Violeta Bulc, the European Commissioner for Transport outlined six priorities she intends to pursue following approval of the Fourth Railway Package by the European Commission and Parliament. Her priorities include the digitalization of European railways, putting a larger focus on customers, railway investment, decarbonization, innovation and global leadership.

Pointing to the United States as a prime example of the kind of railway network they hope to create, each presenter at the European Rail Summit urged that the national boundaries, nationalist competitive interests, and a variety of barriers to trade that have inhibited the development of an modern, integrated railway network throughout the European Union be set aside.

Pointing to his own company's practices, Dr. Johann Niggl, CEO of Bayrische Eisenbahngesellschaft, described how the rail station at the border of the German Bavarian state and the Czech Republic is divided in the middle with German passenger and freight trains arriving on one side and Czech Republic trains arriving on the other side. Instead of being able to pass through the boarder, passengers and freight must be unloaded from one train to the other in order to complete the journey from Munich to Prague and back. Because of different insurance requirements, different regulations, different labor practices, and difference equipment specifications, through passage in the current environment is not possible. Dr. Niggl looks to the Fourth Railway Package as a means to address these and other issues.

Suggesting a new direction of Europe's railroads, David Kramer, chairman of a new railroad research group, Train2EU Foundation, urged that railroad executives should stop thinking of themselves as railroad operators and more as passenger mobility facilitators. "Our mission must be to provide travelers a seamless experience that addresses every aspect of their journey, no matter the mode, the method of payment, or the time of day."

Jean-March Garzulino of Amadeus, Keir Fitch, the interim executive director of Shift2Rail Ju, and River Tamoor Baig and Alejandro Saucedeo of Hack Train Partners all observed that disruptive technologies were coming to European rail and rail companies have an obligation to transition quickly, or lose their already dwindling market share to other transportation modes.

The anticipated cost of modernizing and integrating the various national railway companies into a European-wide network by 2030 is estimated to be around 80 billion €. While each nation as well as the EU itself is expected to pay a significant portion of this cost, other innovative strategies and funding sources will be needed including the possible use of public/private partnerships (P3). Monica Helming of the European Rail Infrastructure Managers' Association said the industry will need to make a strong business case for the advantages and benefits that will flow from a highly integrated rail network that will speed delivery of freight and passengers, reduce roadway and airway congestion, help travelers be more productive, and reduce the harmful effects to today's transportation system.

THE FOURTH RAILWAY PACKAGE OF 2013

According to the European Commission, the Fourth Railway Package is a set of six legislative proposals put forward in January 2013 and adopted by the European Parliament in February 2014. Subsequently, the Council of the European agreed on a different approach that is now reflected in the Fourth Railway Package adopted by the European Parliament and Council on April 28th.

The package aims to remove the remaining barriers to the creation of a single European rail area. It seeks to reform the EU's rail sector by encouraging competition and innovation in domestic passenger markets. It also implements structural and technical reforms. The end result should be higher levels

of safety, interoperability and reliability in the European rail network.

The package consists of three directives and three regulations, along with a general communication, three impact assessments, three reports and three staff working documents. Its overall objective is to enhance the quality and efficiency of rail services by removing any remaining legal, institutional and technical obstacles, and fostering the performance of the railway sector and its competitiveness, in order to furtherdevelop the single European railway area. Its object can be grouped in three 'pillars'.

The technical pillar covers rail interoperability and safety under the responsibility of a strengthened ERA. The liberalization pillar is meant to open the domestic passenger markets by granting access to all operators and introducing mandatory tendering from December 2019. The infrastructure pillar aims to improve the structures and governance for infrastructure managers, in particular by introducing an obligation to unbundle infrastructure managers from services operators.

WHY IS THE FOURTH RAILWAY PACKAGE NEEDED?

The 4th railway package supports the EU's new TEN-T policy, launched in January 2014. It sets out 9 core transport network corridors across the EU which aim to:

• remove bottlenecks• build missing cross-border connections

• promote integration and interoperability between different modes of transport

The current European rail network is very fragmented and driven by the interests of each nation's rail priorities. Different member states use different safety standards and technical systems. Cross-border train services, for example, have to get safety authorization from several different national authorities and deal with several different signaling systems. This makes it complicated and expensive for new rail operators and new technical equipment to enter the rail market.

By removing the remaining barriers to the single European rail area, the Fourth railway package will establish a more competitive European rail sector, with better connections between the EU and its neighboring countries.

These changes will help the EU meet targets for reduced emissions and encourage increased use of rail transport, as outlined in the Commission's 2011 Transport White Paper.

The EU says that the Fourth Railway Package has four pillars:

1. Standards and approvals that work

The changes aim to cut the administrative costs for rail companies and make it easier for new operators to enter the market. The European Railway Agency (ERA) would become the single place of issue for vehicle authorizations and safety certificates for operators.

2. A structure that delivers

The proposed changes would strengthen the role of infrastructure managers - the people responsible for running tracks - ensuring they have complete operational and financial independence from train operators. Infrastructure managers would also control all areas at the heart of the rail network, such as infrastructure planning, timetabling, and daily operations and maintenance.

3. Opening domestic passenger markets

The Fourth Railway Package seeks to open up domestic passenger railways to new entrants and services beginning in December 2019. Companies would be able either to offer competing services, such as a new train service on a particular route, or to bid for public service rail contracts through tendering. The changes would make competitive tendering mandatory for public service rail contracts in the EU.

4. Maintaining a skilled rail workforce

This pillar recognizes the importance of attracting skilled and motivated staff to the rail sector. In particular, the pillar allows member states to better protect workers when public service contracts are transferred to new contractors.

EARLIER RAILWAY PACKAGES

Three Railway packages proceeded the Fourth Railway Package. These included:

The First Railway Package of 2001

In July 1998, the Commission presented three new proposals aimed solely at making existing legislation more effective. On 26 February 2001, the Council adopted the three Directives known as the "rail infrastructure package".

The first railway package adopted in 2001 enabled rail operators to have access to the trans-European

network on a non-discriminatory basis. To improve Europe's rail freight options, the Commission proposes the creation of a one-stop-shop to market freeways. It underlines the need to improve the distribution of train paths, establish a tariff structure that reflects relevant costs, reduce delays at borders and introduce quality criteria. The Commission lists the actions to be taken with a view to setting up freeways.

The assessment of the implementation of this package conducted by the European Commission mid 2006 showed that although the practical implementation of its provisions is still ongoing, the effects already visible are encouraging. The relative position of railways towards other transport modes has stabilized, the high level of rail transport safety has been safeguarded and often improved, losses in employment have been partially offset by the creation of jobs in newly established railway undertakings, and the rail traffic performance has been best in countries where the rail freight market had been open for competition relatively early. These results have been confirmed in the Commission's Communication on monitoring development of the rail market of October 2007 that clearly demonstrated that between 2000 and 2005 Member States in which non-incumbent railway undertakings have undertaken the highest market shares achieved significantly better results in terms of rail freight traffic performance than Member States in which the market was still dominated by a monopoly.

The Second Railway Package of 2004

On 23 January 2002, the European Commission proposed a new set of measures (known as the "second railway package") aimed at revitalizing the railways through the rapid construction of an integrated European railway area. The actions presented are based on the guidelines of the transport White Paper and are aimed at improved safety, interoperability and opening up of the rail freight market. The Commission had also proposed establishing a European Railway Agency responsible for providing technical support for the safety and interoperability work.

The second railway package of 2004 has accelerated the liberalization of rail freight services by fully opening the rail freight market to competition as from 1 January 2007. In addition, the package created the European Railway Agency situated in Valenciennes (France), introduced common procedures for accident investigation and established Safety Authorities in each Member State.

The European Railway Agency is a driving force in the policy for modernizing the European railway sector. Mutually incompatible technical and security regulations in the twenty-five Member States (Malta and Cyprus do not have railways) are a major handicap to the development of the railway sector. The Agency will work to gradually align technical regulations and establish common safety objectives that all Europe's railways must achieve.

Third Railway Package of 2007

On 3 March 2004 the Commission adopted its "third rail package" containing measures to revitalize the railways in Europe. The European Commission puts forward new proposals to open up the international passenger transport market by 2010 and to regulate passenger rights and the certification of train crews. This third package should complete the European regulatory framework for the rail sector.

The third railway package adopted in October 2007 introduced open access rights for international rail passenger services including cabotage by 2010. Operators may pick up and set down passengers at any station on an international route, including at stations located in the same Member State. Furthermore, the third railway package introduced a European driver license allowing train drivers to circulate on the entire European network (the certification of cross-border drivers is foreseen as from 2009 and of all other drivers as from 2011). The drivers will have to meet basic requirements concerning their educational level, age, physical and mental health, specific knowledge and practical training of driving skills. Last but not least, the third railway package strengthened the rail passengers' rights. While long-distance travellers will enjoy a wider range of rights, minimum quality standards (non-discrimination of handicapped travellers or persons with reduced mobility, liability in case of accidents, availability of train tickets and personal security of passengers in stations) will have to be guaranteed to all passengers on all lines.

FUTURE RAIL SUMMITS

Organizers of the Second European Rail Summit anticipate there will be many more discussions and updates at the EU Council and Parliament adopt the marketing pillar of the Fourth Railway Package, and that there will be a Third European Rail Summit in the not-to-distant future.

LEGISLATIVE PERSPECTIVE

2016

CONTRIBUTED BY: Brian Tynan and Ken Sislak, AECOM

Presidential Candidates Agree on Infrastructure, But Same Challenges Remain for Advocates

Heading into the 2016 Presidential Elections, transportation advocates find themselves in a unique position of seeing the three remaining major party candidates all of whom have openly cited infrastructure as a critical priority for the nation. In previous Presidential election years, heading into the party conventions, many transportation advocacy organizations worked hard to have even the most basic references to transportation and infrastructure funding included in the party platforms, but this year, those efforts appear less necessary. Each of the candidates for president have called for major investments in infrastructure including improving the transportation system, encouraging enthusiasm in particular among advocates for high-speed and intercity passenger rail.

On the Republican side, Republican nominee for President Donald Trump has seized on opportunities to link investments in the country's infrastructure to creating jobs and revitalizing the economy. "Maybe my greatest strength is the economy, jobs, and building," Trump said in an interview with CNBC recently. "We do have to rebuild our infrastructure." In his book, "Crippled America: How to Make America Great Again," Trump states that "Fixing our infrastructure will be one of the biggest projects this country has ever undertaken. There isn't going to be a second chance to get it right." In the book, Trump refers to "a trillion dollar rebuilding program" and an estimate from that rebuilding America would create 13 million jobs — a familiar figure circulated by many Democrats.

This includes investments in high-speed rail. Trump has cited passenger rail as one place where the United States can and should be competing better with China, saying that the U.S. has let its rail system fall behind through underinvestment, while China has been investing billions in improving theirs. At a March press conference in Portland, Maine earlier this year, Trump said China has "trains that go 300 miles per hour" while "we have trains that go chug, chug, chug."

Trump's language about high-speed rail is similar to comments by President Obama in 2010 when he announced the $8 billion stimulus initiative for high-speed rail. President Obama said, "there's no reason why Europe or China should have the fastest trains when we can build them right here in America."

Trump has admitted that rebuilding American

infrastructure including investing in high-speed rail would cost a lot of money saying that, "On the federal level, this is going to be an expensive investment, no question about that. But in the long run it will more than pay for itself. It will stimulate our economy while it is being built and make it a lot easier to do business when it's done—and it can be done on time and under budget."

> "You and I come by road or rail, but, economists travel by infrastructure.
>
> *Margaret Thatcher*

Still, Trump's "policy" on infrastructure investment remains only embedded in rhetorical discourse, and has yet to appear in any detailed policy proposal or position paper. While it is reasonable to believe his support for infrastructure is strong given his statements, in the absence of details, it remains to be seen how his views will take shape if he is elected.

The Democrat nominee for President, Hillary Clinton announced her support for high-speed rail in the United States, stating she will "invest in a world-leading passenger rail system to meet rapidly growing demand and build a more mobile America." Secretary Clinton, while Senator of New York, and also during her 2007-2008 campaign for the Presidency, consistently voiced strong support for transportation investment.

As part of this current campaign, Secretary Clinton has proposed a 5-year, $275 billion plan for federal infrastructure investment on top of existing levels, including roads, bridges, transit, airports, high-speed rail, energy facilities and broadband internet access. The proposal includes $250 billion in direct spending on new and improved infrastructure and $25 billion on a national infrastructure bank to bring private capital off the sidelines. It also emphasizes cutting regulatory "red tape" that slows the construction of new projects and calls for reauthorization of the Build America Bonds program to stimulate billions of additional dollars in infrastructure investments. Clinton's plan would be fully paid for through business tax reform, according to her campaign website, but does not go into further detail. More recently, on the campaign trail in California, Clinton committed to sending "a comprehensive infrastructure proposal to Congress in her first 100 days in office," calling her plan "the biggest infrastructure investment since Dwight Eisenhower's Interstate Highway System."

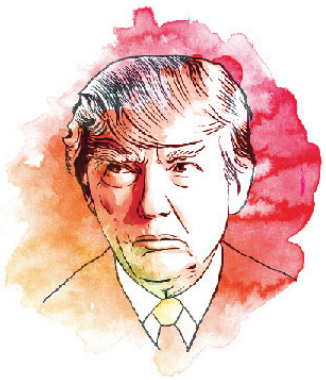
However, in 2008, amid rising gas prices and the economic slowdown, then Senator Clinton proposed suspending the 18.4-cent-per-gallon federal gas tax during the upcoming summer travel season. While the idea of suspending the very same revenue that needs to be enhanced could be seen as a concern, it is perhaps more appropriate to view that proposal in the context of the time and circumstances in which it was offered.

While there are still miles to go in this election season, and a long road for whoever wins the Presidency in November, it is certainly encouraging to head into the end of this campaign season with the knowledge that our next President will strongly value transportation and infrastructure.

Congressional Election Outlook and Infrastructure in the 115th Congress

This campaign season has defied prediction and violated typical norms, leaving analysts and pundits understandably scratching their heads. The unpredictability is certain to extend to the congressional elections where a change in the majority is possible in both Houses, but more likely in the Senate than the House of Representatives.

The current U.S. Senate has 54



Republicans and 45 Democrats, and one Independent who caucuses with the Democrats. There are 34 Senate seats up in 2016, of which 24 are held by Republicans, leaving Senate Republicans with the greater challenge of defending more seats to maintain their majority. Democrats will need to gain 4 or 5 seats to take control (depending on the Presidential results and who the tie-breaking Vice President is), making every seat count. However, whether Democrats win enough seats for a majority, or Republicans hold enough seats to maintain it, the likely scenario is that the Senate will once again be very closely split, and will either depend greatly on bipartisan compromise or will be faced with complete gridlock for the coming two years.

In the House, Republicans control the majority, with 246 seats, 28 more than the 218 needed for control. While 28 seats is not a completely insurmountable obstacle for Democrats, the nature of the current congressional districts suggests that fewer and fewer seats are truly competitive. But again, this is not your typical election season.

The 115th Congress will take office in 2017 and will not likely have many infrastructure issues to focus on, given the recent passage of the FAST Act. However, many in Congress this year continue to sound the alarm for the long-term Highway Trust Fund revenues to be addressed, and with leaders in both parties talking about the need for tax reform, there is some possibility that a tax reform bill could be considered, with revenues for transportation also a matter for consideration.

For intercity passenger rail, the initial challenge is a fight for limited funds within the Appropriations process, where the newly authorized rail programs in the FAST Act must get their funding. In order for these programs and projects to be successful in seeing increased appropriations, projects will need to garner state and local community support, much in the same way that FTA New Starts projects have generated political support sufficient to justify appropriations in excess of the FAST Act authorizations.

While capital funding for intercity passenger rail out of general fund appropriations is an appropriate interim measure; for the long-term, a dedicated revenue solution will be needed to get larger projects off the ground. That can only be achieved when Congress moves in a bipartisan manner on a comprehensive tax reform proposal.

"A total of 469 seats in the U.S. Congress (34 Senate seats and all 435 House seats) are up for election on November 8, 2016. The big story of the 2016 congressional election cycle is whether or not the Democratic Party will be able to regain control of the Senate."

Statement on GOP Platform on Public Transportation

On behalf of APTA Acting President & CEO

Richard A. White

The American Public Transportation Association (APTA) is strongly opposed to the Republican Party platform that calls for phasing out federal funding of public transportation, the association announced yesterday.

Adopted by Republicans on Monday, the GOP platform proposes to eliminate mass transit dollars from the federal Highway Trust Fund. One-fifth of the fund's money is spent on mass transit, "an inherently local affair that serves only a small portion of the population, concentrated in six big cities," the platform states.

That proposal would "undo more than 30 years of overwhelming support for dedicated federal investment in public transit," APTA Acting President and Chief Executive Officer Richard White said yesterday in a prepared statement.

Since 1983, under President Ronald Reagan, a portion of the federal gas tax revenue has been dedicated to public transit through the Mass Transit Account of the surface transportation legislation, White noted. "The public transportation industry is currently underfunded," he said. "Having no federal funds would be devastating, not only to the millions of Americans who use public transportation and to the employers who depend on it for their employees, but also for communities of all sizes that need it for a thriving economy and quality of life."

In addition, APTA is opposed to the platform's position against any increase in the federal gas tax. Congress hasn't increased the tax since 1993, "and consequently, its purchasing power has gone down by more than 37 percent," White noted.

In 2013, the annual capital spending on public transit from all levels of government was $17.7 billion, according to White. Of that figure, $7.4 billion came from the federal government. APTA and the American Association of State Highway and Transportation Officials have determined that an investment of $43 billion for public transportation is necessary to improve system performance and condition, he said.

Also, the Federal Transit Administration has estimated the public transportation system faces a one-time $86 billion backlog in deferred maintenance and replacement needs, White added. "We need a well-funded transportation system that includes public transportation," he said.

In other public transportation matters, the platform called for Amtrak service in the Northeast Corridor to be turned over to private operators. "The same holds true with regard to high-speed and intercity rail across the country," the platform states. "We reaffirm our intention to end federal support for boondoggles like California's high-speed train to nowhere."