Mile High Maglev: Development Trends in Colorado

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ABSTRACT: Colorado has long been considered a prime location for development of a Maglev system, in part because Maglev can scale inclines and has other technical advantages. Colorado's Governor Ritter has instigated a "New Energy Economy" which includes advancement of clean alternative transportation and infrastructure improvements. Faced with a worsening gridlock problem along the I-70 Corridor, which shuttles travelers to world-famous recreation in the Rockies, many in Colorado see Maglev as the ticket to integrating the "New Energy Economy" into the transportation sector. Yet, Colorado faces the same basic conundrum as California—green energy and environmental protection are paramount, but the state's budget is strapped. Recognizing these constraints, this paper will survey various initiatives in Colorado which could help turn Maglev into a reality.

1. INTRODUCTION

This paper discusses the potential for Maglev project development in Colorado, surveying various studies and initiatives relevant to creating a high-speed rail system in the state, with the prospect that Maglev would ultimately be designated as the lead candidate among various high-speed technologies. These initiatives point to growing momentum and consideration of Maglev transportation in Colorado.

As is generally true nationwide, Colorado's transportation infrastructure is in dire straits. Colorado's population continues to expand much more rapidly than other parts of the country, due to the state's scenic beauty and appealing climate, its tremendously educated and skilled workforce, and overall high quality of life (CDOT 2007). The state's population is projected to grow from about five million today to 7.8 million by 2035, and while much of that growth will occur in the urban "Front Range" communities, rural mountain communities are projected to grow by 81%; adding over a half-million people and causing congestion problems typically found in urban areas (CDOT 2007).

Colorado's section of Interstate 70 serves as the life blood of east-west travel within the state. The Interstate 70 mountain corridor ("I-70 Corridor") stretches from Denver in the east to beyond Grand Junction in the west, and climbs through some of the most scenic, yet rugged, terrain in the country. Beginning at just over 5,000 feet of elevation in Denver, the I-70 Corridor navigates a series of tight curves, steep grades and tunnels, climbing to nearly 12,000 feet over two large mountain passes, before descending to roughly 4,000 feet in the western plateau region near Grand Junction. In the winter months, ice, snow, freezing rain, fog and avalanche hazards reek havoc on motor vehicle travel, resulting in countless road closures and accidents.

The Corridor is an essential link to the majority of Colorado's major recreation and tourism destinations, and thus supports a large portion of Colorado's economy. However, due to a combination of factors —including population growth and increased tourism —congestion along the Corridor is severely degrading the accessibility of mountain travel for Colorado residents, tourists, and businesses, impeding freight traffic, creating unsafe travel conditions, and reducing overall quality of life. (CDOT 2004).

Population booms and traffic congestion have persistently plagued Colorado's urban areas as well.

Colorado's "Front Range" cities—extending from Ft. Collins in the north, through Boulder and Denver, to Colorado Springs and Pueblo in the south—have experienced explosive growth and are expected to see an increase of 2.2 million people by 2035 (CDOT 2007). In response to unprecedented use of Colorado's roads, Colorado's Regional Transportation District ("RTD") has implemented a series of light rail transit projects that have proven to be a tremendous success. The latest addition, an 19.1 mile light rail line completed in November of 2006 connecting the outer-tier suburbs with major sporting stadiums and downtown, has already exceeded its projected ridership by over 8,000 riders per week. (Rocky Mountain News 2007). This is a part of a 122 mile multi-city line in the Denver area now in the works, with many spurs currently under construction/ development. One planned line will connect Denver's Union Station and the Denver International Airport (RTD 2008). Recently, however, this component of the project has encountered financial difficulties, and its final outcome remains uncertain.

Maglev technology has specific advantages over other potential transit technologies in Colorado. Able to scale 7% grades without losing performance and 18% grades overall, Maglev trains would be unparalleled in moving people and freight through Colorado's mountainous terrain (FTA 2004). This climbing ability could make Maglev technology more cost effective than other forms of transportation, as it allows trains to climb up steep grades, avoiding the need to construct expensive tunnels needed for traditional rail and automotive uses (FTA 2004). Yet, as discussed herein, there are no tangible Maglev projects afield yet in Colorado, and a variety of other high-speed technologies are being studied.

2. ROLE OF PUBLIC/PRIVATE PARTNERSHIPS IN TRIGGERING MODEL PROJECTS

The intent of this survey is not to discuss financing issues in any detail. However, to understand the potential climate for development of Maglev in Colorado, a brief survey of one financing method, Public/Private Partnerships ("PPP"), is useful, as many believe that this is by far the most likely vehicle for Maglev development in Colorado.

2.1 What are Public/Private Partnerships?

A PPP is a contractual agreement between a government agency and a private sector entity allowing for greater private sector participation in the delivery of public infrastructure projects (Dovey and Eggers 2007). PPPs allow the private sector to assume a greater role in the planning, financing, design, construction, and maintenance of public facilities, and in exchange shoulder a greater share of the project's risks and costs. (Dovey and Eggers 2007). PPP arrangements can be structured in a variety of ways:

- Design-Build (DB): Here, the government contracts with a private partner to design and build a facility in accordance with the requirements set by the government. When the project is completed, the government assumes responsibility for operating and maintaining the facility.
-Build-Transfer-Operate (BTO): Under this model, the private sector designs and builds a facility. Once the facility is completed, the title for the new facility is transferred to the public sector at no additional cost.
- Build-Lease-Transfer (BLT): This is similar to BTO, except after the project is completed the asset is leased to the public sector until the lease is fully paid, at which time it is fully transferred to the pubic sector at no additional cost. The public sector retains responsibility for operations during the lease period.
- Design-Build-Operate-Maintain (DBOM): Under this model, a private partner builds, operates and maintains a project for a specified period. At the end of the period, the public sector assumes operating responsibility.
- Build-Own-Operate-Transfer (BOOT): Under this model, the government grants a private partner a franchise to finance, design, build and operate a project for a specific period of time. Upon termination of the specified time period, ownership transfers to the public sector.

2.2 Advantages of PPPs

PPPs allow governmental entities to tap into the private sector's wealth of technical, management and financial resources to achieve the highest levels of efficiency (HNTB 2006). PPPs have a proven track record of completing projects on time, ahead of schedule, and significantly under budget (Dovey and Eggers 2007). In Canada, for example, Terminal 3 at the Toronto Pearson Airport was completed 18 months ahead of schedule under a PPP contract (Padova 2005). Here in Colorado, the costs of completing construction on segments of the E-470 Toll Road using a PPP model came in $189 million dollars below the original cost estimate of $597 million dollars (Dovey and Eggers 2007).

2.3 Potential Application to Maglev Projects

The use of PPPs in transit projects has been somewhat more limited than other types of transportation projects (Mallett 2008). This is largely because most transit projects are "revenue negative," that is they require some kind of ongoing financial support in addition to passenger fares and other system-related revenues (Mallett 2008). In order to attract private investment, a revenue stream must be generated or paid to the developer as a reasonable return on its investment. This is more difficult in a transit setting, as the fares charged rarely fully cover the operating costs, unlike a toll road facility (HNTB 2006).

A key question going forward is how environmental considerations might shift the financing dynamics. With the emergence of carbon offsets and trading proposals, one can envision increased ability to leverage PPP transit investments over time, especially for projects like Maglev that emphasize energy minimization.

2.4 PPP Feasibility

A 'bond quality' ridership study and economic analysis of the I-70 Corridor has not been conducted. Without this crucial analysis, MagLev providers cannot prepare an estimate of costs and revenues that would be responsive to an RFI/RFP from the state of Colorado. However, in light of the rapidly changing economics of transportation infrastructure construction and maintenance, this data is an absolutely essential next step. The rapidly escalating costs of road construction are likely to support the choice of transit within the corridor as the most cost effective alternative. In fact, a cost avoidance argument is likely to prove the most compelling factor favoring a MagLev solution for I-70 congestion.

3. INITIATIVES IN COLORADO

3.1 *Background*

The first major impetus for Maglev transit in Colorado was the creation of the Colorado Intermountain Fixed Guideway Authority ("CIFGA") in 1998. The Colorado state legislature created CIFGA to investigate the feasibility of a high-speed fixed guideway to relieve congestion along the I-70 Corridor. CIFGA received nearly $4 million dollars in federal funding to investigate the application of existing Maglev technology, and were met with a less than enthusiastic response. (Summit Daily News 2004). In the late 1990s, Maglev trains were only able to climb a maximum of a 3% grade; not nearly enough power to scale the steep mountainous terrain in the I-70 Corridor. As a result, and in response to the turmoil following the 9/11 attacks, voters killed a ballot initiative in 2001 that would have provided $50 million dollars to fund a monorail from Denver to Vail (Summit Daily News 2004).

However, Colorado continued to consider Maglev transit options as the technology vastly improved. In June of 2004, the U.S. Department of Transportation and the Federal Transit Administration ("FTA") completed a study for the "Colorado Maglev Project," a 247-page detailed analysis of a proposed Maglev system stretching 155 miles from Denver International Airport up the I-70 Corridor to the Eagle County Airport, stopping at major ski resorts and other recreation and commuter destinations along the way (FTA 2004). This study included an analysis of Colorado-specific Maglev requirements such as snow, ice, avalanche, landslide and corrosion management, the ability to scale steep grades, and the possible need to bore tunnels (FTA 2004). In December of 2004, the Colorado Department of Transportation ("CDOT") and the Federal Highway Authority ("FHWA") released a Draft Programmatic Environmental Impact Statement ("PEIS") for the I-70 Corridor, which evaluated the environmental impacts and costs of an Advanced Guideway System ("AGS") against more traditional transportation improvements such as additional highway lanes or bus guideways (CDOT 2004).

3.2 *The Colorado Maglev Project Costs*

As with any transportation project of this magnitude, there will be substantial costs involved. However, in the case of the I-70 Corridor, Maglev transportation may actually be cost competitive with other traditional transportation improvements such as road widening or more traditional rail systems.

In 2004, The FTA estimated that the cost of deploying a 155 mile Colorado Maglev System through the I-70 Corridor would be roughly $4.6 billion or about $30 million dollars per mile (FTA 2004). The operations and maintenance costs were estimated at approximately $43 million per year, based on a particular operating model chosen for the Colorado Maglev System capable of transporting 40,000 trips per day. (FTA 2004).

While this certainly requires a daunting capital investment, Maglev technology is actually cost competitive with other transportation improvements

including road widening and designated bus lanes (CDOT 2004). In a study conducted the same year, the costs of an AGS were weighed against other traditional alternatives, such as widening the highway to six lanes or creating a bus only guideway. While capital costs for implementing an AGS were substantially higher than highway improvements, it was projected that a transit system could earn up to $86 million dollars in fare box revenue by the year 2025; which highway improvement cannot accomplish (CDOT 2004). The ability of Maglev trains to scale steep grades could avoid the need to drill a new tunnel, with an estimated cost savings of $155 million dollars (FTA 2004). Further, this 2004 study did not include the recent skyrocketing of fuel, asphalt, and other construction costs which could substantially alter these cost estimates.

3.3 *Recent Developments*

In the spring of 2007, Colorado Governor Bill Ritter appointed a Blue Ribbon Transportation Finance and Implementation Panel ("Panel") with the purpose of identifying long-term sustainable transportation programs and funding sources (CDOT 2008). Colorado's gasoline tax is the primary source of transportation funding in the state, and since this tax has not increased since 1991, the first objective of the Panel was to determine how to generate increased funding. (Panel Recommendations 2007). In November of 2007, the 32-member Panel released its first wave of recommendations, which included five new potential sources of funding totaling $1.5 billion dollars (Panel Recommendations 2007). The Panel put forth a general recommendation for increased investment in urban and rural transit systems, but did not address specific transit projects or Maglev directly (Panel Recommendations 2007).

In June of 2008, the Collaborative Effort, a 27-member group representing varied interests along the Corridor, released a "Consensus Recommendation" for the I-70 Corridor (I-70 Coalition 2008). The Collaborative Effort called for a multi-modal solution combining road improvements and an AGS high speed rail passenger and freight service (I-70 Coalition 2008). The group continues to meet and gather information regarding the future of the I-70 Corridor and mass transit projects.

3.4 *Legislative Proposals*

In part because of the emphasis on the Panel as described above, and in part because of the state's efforts to raise revenues through other initiatives, there have been no significant legislative proposals recently that have had a major impact on the availability of Maglev. Instead, many of the ongoing initiatives stem from advisory panel discussions and other informal intergovernmental processes that continue to work toward development of a mass transportation system. However, it is expected that an attempt will be made in the 2008 session to create an established governmental authority to provide state line-to-state line service for high-speed passenger rail services in Colorado. Discussion centers on use of existing Class 1 railroad right-of-ways for major thoroughfares across the state and raising money through taxes along the corridors to be serviced by the established rail authority. This would basically consist of the I-70 and I-25 corridors which criss-cross the state. If such legislation passes, it will need to be supported by ballot tax initiatives within the geographical areas to be served by the high speed rail authority.

It should be noted, however, that in the past two years an increasing number of renewable focused alternative energy and related efficiency measures have been passed by the Colorado Legislature. Depending on the outcome of this year's election, this recent spate of bills could help create momentum for broader legislative slate to address mass transit needs.

3.5 *RMRA 2008 Maglev Feasibility Study*

The Rocky Mountain Rail Authority ("RMRA") was established in Colorado to facilitate the development of a high speed transportation line along the key I-25/ I-70 transportation corridors. RMRA commissioned a high speed rail feasibility study to assess the technological and economic viability of a high speed rail line in these areas. The study divides vehicle technology categories into four types, depending on maximum operating speed. The Feasibility Study, which was launched in July, has included scoping meetings involving a broad array of Colorado communities and constituencies. The study team, lead by the public relations firm of GBSM in Denver, next plans to compile all input and develop a scoping report to RMRA to flesh out key considerations raised by constituencies in assessing appropriate technologies.

The study is intended to be "technology-neutral" in terms of analyzing Maglev versus other possible transportation systems. However, Maglev has been included within the general category labeled "Ultra High Speed," characterized as having maximum operating speeds of 250-300 miles per hour (of

course, the actually operating speeds would be much lower; particularly in densely populated or other sensitive areas). Some discussion has also occurred during the scoping process regarding Maglev technology options and their current status.

The study is expected to be completed in Spring 2009. The RMRA plans to then develop an implementation and financing report for potential inclusion of these lines as the 11th High Speed Rail Corridor ("HSRC") designated under the Intermodal Surface Transportation Efficiency Act of 1991 ("ISTEA"). At this stage the study may shift to the type of technology-specific review that will determine whether Maglev remains an option.

6. MAGLEV ENVIRONMENTAL CONSTRAINTS AND BENEFITS

The development of a Maglev system in Colorado poses some unusual challenges compared to other urban projects. Unlike transit lines that traverse highly developed urban transportation corridors or agricultural areas, a Colorado Maglev project on the I-70 Corridor will travel through sensitive high plateau, sub-alpine and alpine forests, and alpine tundra ecosystems. Further, any transportation project along the corridor will cross private, state, and federal lands and thus will be subject to a variety of laws mandating environmental impact considerations and analysis.

As with any construction project, a Maglev system will have impacts on vegetation, soil and wildlife. The Corridor contains a bountiful variety of threatened and endangered plant and animal species which, by federal law, require the most stringent of protections (CDOT 2004). However, Maglev may provide an additional benefit over other transportation options as its elevated track reduces overall surface impacts and would still allow wildlife to travel below the track (CDOT 2004). Another perceived factor with Maglev is noise impacts. However, compared to traditional automobile traffic, Maglev trains are virtually silent at speeds under 200km/h (Transrapid 2008).

Also unique to Maglev in Colorado is the crossing of federal public lands. The involvement of federal lands and/or federal funding for a project usually triggers a mandatory environmental analysis known as an Environmental Impact Statement or EIS. This is a fairly in-depth process which requires that a project consider all possible environmental impacts and reasonable alternatives. Further, Section 4(f) of Transportation Act of 1966 prohibits the FHWA and the DOT from approving the use of publicly owned parks, recreation areas, wildlife and waterfowl refuges, or public and private historical sites unless 1) there is no feasible and prudent alternative to the use of the land, and 2) the action includes all possible planning to minimize harm to the property resulting from use. (Transportation Act 1966). Given that the I-70 Corridor would intersect federal land and likely have a significant federal funding portion, these federal requirements must be thoroughly considered.

8. SUMMARY AND OUTLOOK: WHY COLORADO AND MAGLEV MAKE A GREAT FIT

For some years, in part because of the various studies referenced above, Colorado had been viewed as a leading candidate for the development of a commercial-scale Maglev project, either for cargo transportation or passenger service purposes. However, as in California and in other states where Maglev application has been considered, progress has been slow. Severe budget constraints and the attendant focus on basic highway upkeep are a major impediment to continuing progress.

In Colorado, as the Governor's Blue Ribbon Transportation Panel findings reflect, there is unfortunately at this juncture little tangible progress towards the implementation of Maglev or other high speed mass transit service along the I-70 corridor. The overall focus remains on overcoming the severe budget crisis to meet basic transportation needs, including mass transit systems. In turn, the necessary seed money for Maglev implementation remains elusive.

Against this backdrop, what makes Colorado particularly attractive as a future prospect for Maglev implementation? For one, the political climate in Colorado has changed drastically in the last few years since the election of Governor Ritter and parallel changes in the State Legislature and other key positions. Governor Ritter has taken a very progressive view on the integration of the New Energy Economy into the fabric of Colorado's economic system; not only as a way for the state to do its part to mitigate climate change, but also to set itself apart from other states in terms of its economic infrastructure and growth base. The strategy has worked wonderfully in the energy sector, as a range of wind, solar and other renewable energy companies have moved into Colorado. In addition, many international engineering, technology and consulting firms have targeted Colorado for investment of

significant resources based on the State's user-friendly approach to green technologies. All this comes at a time when the state continues to pass some of the most progressive legislative mandates in the country for achieving renewable energy gains in the coming decades.

Beyond its political climate, reputation and its renowned natural beauty, Colorado maintains two other advantages. First, as discussed briefly above, the greatest documented need for a mass transportation system that might include Maglev is the I-70 Corridor running from the Denver metropolitan area into the major mountain resorts. Maglev now offers the advantage of being able to scale fairly significant grades without reducing speed levels below those necessary to support wide-scale passenger use. Thus, some of the remaining questions regarding Maglev's cost-effectiveness could be mitigated by its use in an area such as Colorado, where it can boast significant transport speed advantages.

The second factor that sets Colorado apart is an improved regulatory climate and a streamlined ability to obtain necessary permits—certainly as compared to a state like California. While Colorado certainly affords significant local input and control over permitting issues, there are significant differences in population density and regulatory complexity between Colorado and California. This is in part a product of the fact that much of the land along the I-70 Corridor is federally owned, and is already devoted to the highway system established by I-70 and its tributary roads. While retrofitting of the I-70 route necessary to allow for Maglev development would certainly be no simple engineering or permitting feat, such a coordinated approach between the funding agencies and public land agencies certainly would be more expeditious than trying to develop a mass system in populated corridors.

Colorado's New Energy Economy has to some degree translated into gains in mass transportation and other transportation efficiency programs, such as the FasTracks program. Yet, the influx of these technologies certainly does not match renewable energy companies as of yet. With Colorado's growing reputation as a base for these developments, and its welcoming governmental approach, along with the various studies referenced above, Colorado certainly provides a likely forum for development of future Maglev projects. If the Maglev community can continue to achieve gains in the feasibility, technology and engineering sectors, when the funds finally become available to implement these programs, the authors are confident that Colorado will be looked to as a leading candidate for the long-awaited, full-scale development of Maglev.

REFERENCES

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Colorado Department of Transportation, "2035 Statewide Transportation Plan," March 20, 2008, p.13.

Colorado Department of Transportation, "Draft Programmatic Environmental Impact Statement (DPEIS)," December 2004.

Colorado Governor's Transportation and Finance Implementation Panel Recommendations, November 20, 2007 (www.colorado.gov/governor).

Dovey T., Eggers W., "Closing America's Infrastructure Gap: The Role of Public-Private Partnerships," Deloitte Research Study, 2007

Federal Transit Administration and U.S. Department of Transportation, "Urban Maglev Technology Development Program: Colorado Maglev Project Final Report," June 2004

HNTB and PBS&J, "SANDAG Maglev Study Phase 1," March 17, 2006.

I-70 Coalition, "Consensus Recommendation," June 2008 (http://www.i70solutions.org/docs/news/CE_Consensus-based_Pref_Altern-FR_presentation_07-08.pdf).

Mallett, W., "Public-Private Partnerships in Highway Transit Infrastructure Provision," Congressional Reporting Service (July 9, 2008).

Padova A., "Federal Commercialization in Canada," Parliamentary Research and Research Services, Library of Parliament, December 20, 2005 (http://www.parl.gc.ca/information/library/PRBpubs/prb0545-e.html).

Regional Transportation Denver (RTD), "FasTracks Project Information," (www.rtd-fastracks.com/main_26).

Rocky Mountain News, "Light Rail Ridership Exceeds Projections," March 15, 2007 (www.rockymountainnews.com/drmn/local/article/0,1299,DRMN_15_5418506,00.html).

Summit Daily News, "Transit alternative would be costly," October 12, 2004 (www.summitdaily.com/article/20041012/NEWS/110120021&SearchID=73186850437656)

Transportation Act of 1966, 49 U.S.C. 1653, *codified at* 23 C.F.R. 774 *et seq.*

Transrapid, "Facts about the magnetic field and noise emissions of the Transrapid," January 17, 2008 (www.transrapid.com).