

Challenges in Implementing High Speed Rail: Lessons From California's Experience

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Chair Graves, Chair Nehls, Ranking Member Larsen, Ranking Member Payne, and members of the Transportation and Infrastructure Subcommittee on Railroads, Pipelines, and Hazardous Materials, thank you for inviting me to testify at the hearing “*Getting on the Right Track: Navigating the Future of Intercity Passenger Rail in America.*”

My testimony today will focus on our existing and potential future investments in *High-Speed Rail* (hereafter HSR). The goal of HSR is laudable: Provide an alternative transportation mode that offers a combination of transportation time, cost, and convenience that is competitive with auto and air travel. However, implementing HSR has been challenging in the U.S. in terms of cost and construction delays, both of which reflect the large number of risks that can accompany large-scale projects. I will discuss these challenges with a focus on California's problematic experience with building an HSR system, an experience that provides key implications and cautionary evidence for other HSR investments.

California's Problems in Building HSR

California began the process of building HSR 30 years ago, with the creation of California Intercity High-Speed Rail Commission in 1993. This commission was replaced in 1996 by California's High-Speed Rail Authority (hereafter CHSRA), which continues to manage California's HSR project.

California's HSR project has little to show over this 30-year period. The project is significantly delayed, and its budget has increased to about four times its initial cost. Some of this is due to mistakes in planning, management, oversight, and accountability. But other factors reflect more endemic challenges in building HSR, including limitations in understanding the scope and size of the problems and risks that can arise in such a major infrastructure project.

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While the magnitude of California's problems is perhaps unique, the nature and characteristics of these problems provide lessons for other HSR investments, which I will describe below.

The Importance of Identifying and Accounting for Risk and Uncertainty

California's HSR was plagued by significant problems from its inception. An early problem was inadequate planning. The CHSRA had 12 years to create a business plan before California voters approved a 2008 \$9.95 billion ballot initiative bond measure as seed money to begin the process of building an 800-mile system that would connect Los Angeles to San Francisco, and California's central valley to the coast, at a cost of about \$33 billion. Completion for the key route - San Francisco to Los Angeles – was expected around 2020.

The project's initial business plan was judged to be deficient by California's Legislative Analyst's Office², a non-partisan state agency that advises the state legislature on implementing cost-effective and efficient budget policies. Their evaluation of the plan found that it did not present information on several key issues, including train capacity, forecasts of segment service levels, how funds would be secured, how costs would be distributed by system segment, an operating break-even point, what analytical methods were used to forecast ridership, expected completion dates for environmental reviews, and how risks would be mitigated.

The plan was legally required to have been delivered to the California Senate in September 2008, about two months prior to the state's general election. However, the plan was not provided until after the election. Had it been presented to state senators on time as legally required, then the project's planning deficiencies and omissions could have been identified and this information could have been provided to Californians before they voted on whether to approve bond funding. And that information may have been enough to change the outcome of the \$9.95 billion bond issue, which passed with 52.6 percent of the vote in the general election.

The omissions and deficiencies in the 2008 business plan are significant and unacceptable. But at the same time, one can imagine similar omissions/mistakes occurring with other HSR systems, particularly issues such as the failure to address the mitigation of risks. One reason is because there are so many risks involved with such a large project that it becomes nearly impossible to itemize and address them, including some that may simply be unknown.

This is not an excuse for CHSRA's failure to address the fundamental issue of risk mitigation. Rather, it is an acknowledgement that the substantial uncertainties and risks associated with such massive projects should be communicated to stakeholders, which in my opinion was not done by the CHSRA.

It now seems clear that such a large-scale project should not have been pursued. The first hint of this can be seen in the Legislative Analyst's report, which identified not just omissions in the original business plan, but a plan that realistically could not provide what was needed. The project was too big, with far too many uncertainties and risks to address, and with too many forecasts that may have been little more than assumptions.

² https://lao.ca.gov/handouts/transportation/2010/2009_High_Speed_Rail_01_12_10.pdf

An important lesson from California's experience is that the uncertainties and risks of a project need to be soberly confronted and built into how such a project is discounted regarding its present value evaluation. However, honestly acknowledging these risks and uncertainties will be resisted by those who are advocates of such projects, because once stakeholders understand the enormous uncertainties that accompany these investments, they may no longer be willing to commit resources to them.

Note that a reasonable acknowledgment of risks – which was omitted from California's HSR business plan - may reverse the conclusion of standard benefit-cost analyses that use discount rates that are too low for such risky/uncertain projects. California's HSR necessitates a higher present value discount rate, which in turn reduces the value of its benefits, because project benefits are not realized until well into the future, while the bulk of project costs are paid up front.

The Importance of Third-Party Project Evaluations

The evolution of California's HSR in the last 15 years illustrates how projects of such size and scope can be significantly delayed and can substantially exceed their budgets. The significant concerns expressed by California's Legislative Analyst's Office roughly 15 years ago regarding risk mitigation, lack of funding sources, and lack of details about key aspects of the project, have proven to be remarkably prescient in understanding why California's HSR is so delayed and why costs have increased so much. To date, not one train segment is close to completion, and the system's delay is accompanied by a roughly four-fold increase in the system's projected cost, which now likely exceeds \$120 billion, and which pencils out to over \$200 million per mile.

To put California's HSR delays and cost increases in perspective, the projected cost of building a 171-mile segment between the towns of Bakersfield and Merced, the latter of which has a population of around 90,000 (California's 86th largest city) exceeds the 2008 projected cost of the entire system. Moreover, the projected completion date for this first segment may extend to 2033, roughly 25 years after voters passed the \$9.95 billion bond issue.

A \$35 billion, single HSR route between Bakersfield and Merced would have been rejected by voters in 2008. Yet this is the status of California's HSR today, with well over \$30 billion to be invested in a single route that is far from a priority transportation corridor within the state.

California's HSR system did not break ground until 2016, eight years after the bond issue, and 20 years after the formation of CHSRA. Construction delays reflect delays in acquiring land, delays in environmental reviews, and several lawsuits. All these problems were explicitly or implicitly recognized by the Legislative Analyst's Office in 2008. By the time construction had begun in 2016, the cost for the system had already doubled. Today, the cost has nearly quadrupled, and will almost certainly rise in the future.

Lack of funding, another key deficiency identified by the Legislative Analyst's Office, has also turned out to be a major problem with California HSR. The original vision of the project marketed to Californians was that the system would attract considerable private funding, which

in turn would help pay for the up-front capital costs. To date, there has been no private funding and there appears to be no current possibility of private funding.

The system's funding deficiency is a key reason why California is building Bakerfield-Merced route first, a segment that is far from a priority route, because construction costs on that segment are relatively low. This route is flat, and thus construction does not have to deal with tunneling, building viaducts, and other high-cost features that are present on other routes, including the Los Angeles-San Francisco route, which includes the complication of considerable seismic issues.

This is the consequence of forcing a project when it should never have been initiated. And if there was any doubt about its viability when it was initiated, it could have been stopped long ago when it became apparent that it was not economically sensible. The forcing of HSR after bond approval has been in place since at least 2013, when a judge ruled that he would not validate the bond because the project did not have a valid financing plan, which was required under the bond measure. Michael Tennenbaum, the first chair of CHSRA noted just last year "I was totally naïve when I took the job...I (ultimately) realized the system didn't work. I just wasn't smart enough. I don't know how they can build it now³."

The failure to develop a funding pathway for this project was a key error on the part of California's political leaders, and a violation of voter trust. However, funding deficiencies, and the challenges associated with such deficiencies, could arise even for HSR projects that have funding pathways, but that may confront higher costs than planned. This important issue is connected to an honest assessment of risks and uncertainties that can delay a project or increase project cost.

Other third-party studies of California HSR expressed significant concerns about the project around the time of the bond issue, including an analysis performed by the Reason Foundation⁴. The *Reason* study identified a separate set of concerns to those raised by the Legislative Analyst's Office. These include overly optimistic ridership projections, underestimated cost projections, overestimated impact on greenhouse gas emissions, overstated average travel speeds, and overestimated profitability.

One of the most striking points made by the *Reason* study is the remarkably optimistic CHSRA assumptions regarding ridership intensity (passenger miles/route mile) for California HSR. Specifically, CHSRA assumed that ridership intensity would substantially exceed that in Japan and Europe, countries that make far greater use of rapid transit than the U.S., which have less auto ownership, and which have more densely populated cities. The ridership intensity forecast also exceeded that of Amtrak's Acela line, one of the highest speed lines in the country, by a factor of nearly 40. It is noteworthy that since the original business plan, CHSRA has scaled back projected ridership by about 25 percent.

Another key point in the *Reason* study was addressing the amount of greenhouse gas emission reductions resulting from California's HSR. The challenge with any argument made for

³ <https://www.nytimes.com/2022/10/09/us/california-high-speed-rail-politics.html>

⁴ <https://reason.org/wp-content/uploads/2008/09/9633e4725acf8bc75c1c4929c43e4ac1.pdf>

a project based on greenhouse gas emissions must confront the fact that greenhouse gases are a global issue, with China now contributing about 30 percent of the global total. California contributes less than one percent of global emissions. There is virtually nothing that California on its own can feasibly do to move the carbon emissions needle. The *Reason* study calculated that if implemented, California HSR would reduce California carbon emissions by less than two percent. This means that California HSR would have a miniscule impact on climate change.

More broadly, the California economy has evolved in ways that could not have been predicted back in 2008, and these evolutions suggest that HSR may be considerably less important now. This includes the state's mandate that only electrical vehicles will be sold after 2034, that the state's population is shrinking, and the rising importance of remote work, which now accounts for about 30 percent of employees⁵.

Independent, third-party analyses are important, yet the *Reason* study and other analyses raising concerns about California's HSR were largely dismissed at the time. It is critical that qualified experts who express concerns about such projects be given due consideration.

U.S. Rail Construction Costs Need to Be Reduced

California's 2008 \$33 billion cost estimate for the entire state HSR project was far too low, but this cost estimate was used to attract voter and other political support for the project. The cost now is about four times as high as the original estimate. This is perhaps not surprising, because building rail transportation in the United State is extremely costly, and we should understand why this is the case so that projects can be built much more cost effectively. Secretary Buttigieg acknowledged the high cost of U.S. railroad construction, but offered no explanation, noting that the issue needed further study⁶. It is imperative we understand this cost discrepancy between the U.S. and other countries.

The U.S. railway cost record compared to that of other countries suggests that there is substantial room for improvement. We rank as the sixth most expensive country out of 58 countries in terms of railway infrastructure costs, measured per kilometer of distance. Moreover, the five countries that are more expensive than the U.S. build about 80 percent of their railway infrastructure using the very costly process of tunneling. In contrast, only about 37 percent of U.S. railways are constructed using tunneling. Moreover, many countries that use tunneling much more extensively than the U.S. have much lower costs than the U.S. This includes Spain, Portugal, Finland, and South Korea, all of which have railway construction costs that are on average 80 percent less than U.S. costs.

Comparing costs of specific projects between the U.S. and Europe drives home the importance of identifying what the U.S. can do better to build railway more efficiently. This includes New York's Second Avenue Subway, at \$2.6 billion per mile, San Francisco's Central

⁵ <https://www.bostonfed.org/-/media/Documents/events/2022/labor-markets/presentations/panel-is-remote-work-here-to-stay-davis.pdf>

⁶ <https://www.vox.com/22534714/rail-roads-infrastructure-costs-america>

Subway at \$920 million per mile, and Los Angeles's Purple Line at \$800 million per mile, which stand in sharp contrast to projects in Copenhagen, Paris, and Madrid with costs of \$323 million per mile, \$160 million per mile, and \$320 million per mile, respectively.⁷

The Potential of Private Sector HSR Projects

Private sector HSR projects may offer a substantial benefit, in conjunction as partners with the public sector. Brightline Holdings, Inc. is scheduled to begin building a 228-mile route between Southern California and Las Vegas, Nevada soon. Despite a route that is more than 50 miles longer than the State's HSR leg between Bakersfield and Merced, the projected cost of the Brightline route is about \$12 billion, representing a 64 percent savings compared to California HSR. The project is expected to be completed in early 2027, less than four years after breaking ground.

Key positives regarding private sector projects is that they are incentivized to find routes where there is substantial demand. This is important because Americans have generally been reluctant to take mass transit, despite decades of state, local, and federal subsidies for this transportation model. To put this in context, the Urban Institute notes that since 1970, the U.S. economy has added about 77 million workers, but during this same 50-year period, transit commuters have only increased by one million riders.⁸ One projection by HSR proponents was that President Obama's 2009 national HSR project would have carried fewer than 0.5 percent of U.S. passenger miles.

This suggests that it is imperative to identify the routes that are truly valued by consumers and businesses, and no agency is better incentivized to do this than private operators. The private sector is similarly incentivized to build efficiently, at reasonable costs. This is evidenced by Brightline's 2/3 cost savings compared to California's HSR. This discussion suggests that private-public partnerships may be a very effective approach to strategically picking HSR where it is desired, and where it can be built efficiently.

Conclusions

Your committee provides important stewardship over our existing transportation networks and their future evolution. The goal of our future transportation investments is to provide cost-effective transportation enhancements that are highly valued by U.S. households and businesses alike, enhancements that will significantly reduce the costs of moving people and goods across our country and between our cities. These investments have historically played a key role in facilitating America's economic growth, investments ranging from the roads, turnpikes, railroads and canals of the 1800s, to the more recent interstate highway and airport investments.

⁷ Op. Cit.

⁸ <https://www.urban.org/urban-wire/us-public-transit-has-struggled-retain-riders-over-past-half-century-reversing-trend-could-advance-equity-and-sustainability>

Congress has a remarkable historical record in identifying fundamentally needed transportation infrastructure and facilitating the efficient construction of that infrastructure. Your record reflects the guiding principles of identifying investments that will deliver the greatest benefits, at reasonable costs. The investments cited here changed the face of the American economy. It is unlikely, however, that HSR will have nearly the same impact as any of these earlier investments. Indeed, California's record in trying to create a statewide HSR system provides important evidence for what can go wrong.

This does not mean that HSR can't play an important role in targeted areas where high consumer and/or business demand exists for HSR, and where construction costs can be reduced to levels much lower than they are today. Partnering strategically with the private sector appears to offer the greatest promise in realizing the benefits of HSR, as the private sector is maximally incentivized to identify routes where HSR can make the greatest impact, and to create HSR in the most efficient way. Thank you for this opportunity to contribute to your important mission. I look forward to your questions.