



California High Speed Rail:

An Updated Due Diligence Report



By Joseph Vranich and Wendell Cox
Project Director: Adrian T. Moore, Ph.D.

Reason Foundation



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Executive Summary

Reason Foundation's 2008 report, *The California High Speed Rail Proposal: A Due Diligence Report*, warned that plans by the California High-Speed Rail Authority (CHSRA or Authority) issued prior to and during 2008 were inaccurate, misleading and not in compliance with California statutes. As well, it found that the Authority's financing plan overstated projected revenues and private financing, and understated capital requirements and operating subsidies needed from taxpayers. Subsequent independent studies and new Authority documentation have proven virtually every characterization in Reason's 2008 *Due Diligence Report* to be accurate or understated.

This report updates Reason's 2008 *Due Diligence Report* by addressing and evaluating numerous changes in California's plan to build a high speed rail (HSR) system between San Francisco and Los Angeles via the San Joaquin Valley. This *Due Diligence Update* addresses the Authority's revised documentation, business plans and public statements issued between 2008 and late-2012, which are found to be similarly inaccurate, misleading and in violation of the laws guiding the project. Additional analysis is warranted to respond to the Authority's newer yet illusory capital cost reductions, likely capital cost escalations, need for operating subsidies, slower train schedules, high ridership projections, and the inability to meet the statutory requirement to link Los Angeles and San Francisco in 2 hours and 40 minutes or less.

The primary focus of this *Due Diligence Update* is the CHSRA's *Draft Revised Business Plan* issued in April 2012 that outlines how high speed trains will operate on the same tracks as local commuter trains ("blended systems") into San Francisco and Los Angeles, which now are called the "bookends" of the system. The blended system replaced the cost-prohibitive Full Phase 1 system that had new rail lines dedicated exclusively to high speed trains into San Francisco and Los Angeles. Despite the characteristics of the blended system that slow train-speed and shorten lines, which makes the system less high speed and less competitive, CHSRA continues to use the ridership and train-speed data from the Full Phase I system in its original plan in its analysis of the blended plan's viability.

Figure ES1: California High Speed Train Map, Statewide Overview



Source: <http://www.cahighspeedrail.ca.gov/assets/0/152/198/81ea4dd6-afe8-4dee-bc13-a49899fc7df6.pdf>

Current plans are now identified as “Phase 1 Blended,” which the CHSRA estimates will cost as much as \$63.2 billion in 2011 inflation-adjusted dollars (\$78.0 billion in year-of-expenditure dollars) with the only sources of funding being \$9 billion in California Proposition 1A general obligation bonds and \$3.5 billion in federal grants. Further funding is highly speculative if not outright non-existent for the remaining capital needed, which may exceed \$50 billion.

As will be shown in this *Due Diligence Update*, the CHSRA April 2012 *Business Plan* is so deficient that it is inconceivable that policymakers would continue to rely on its assertions to evaluate the program. This report is not alone in identifying shortcomings in CHSRA’s plans and documentation, and will include findings from other state agencies and independent reviewers.

Table ES 1: Summary of CHSRA 2012 *Business Plan* Failings

A summary of the problems with the *Business Plan*: where its projections and predictions may go wrong and how that might lead to consequences for Californians.

Unachievable Train Speed Assumption	<ul style="list-style-type: none"> Current <i>Business Plan</i> does not include the promised, and legislatively mandated, 2:40 non-stop travel time Los Angeles to San Francisco.
	<ul style="list-style-type: none"> CHSRA plan says the train will on average be faster than any train in existence, and faster than the Transportation Research Board says is safe.
	<ul style="list-style-type: none"> The “blended system” approach in the Business Plan requires shared tracks and slower speeds in the Los Angeles and San Francisco metro areas.
	<ul style="list-style-type: none"> Reason’s <i>Due Diligence Update</i> projects likely fastest travel times of between 3:50 and 4:40.
Implausible Ridership Projections	<ul style="list-style-type: none"> Independent reviews of CHSRA ridership projections by the Legislative Analyst’s Office, California State Auditor, UC Berkeley Institute of Transportation Studies, legislative Peer Review Group, and Reason Foundation have repeatedly pointed out that CHSRA’s ridership projections are “unreliable” and “inflated.”
	<ul style="list-style-type: none"> Experience from European high speed trains suggests that the shift of riders from cars to the high speed train will likely be 90% less than CHSRA predicts.
	<ul style="list-style-type: none"> When realistic and generally accepted costs of driving are compared to high speed train fares, ridership from automobiles will likely fall 50%.
	<ul style="list-style-type: none"> When realistic travel times are used rather than the 2:40 trip originally promised, ridership likely falls by 25–50%.
	<ul style="list-style-type: none"> CHSRA predicts a medium case of 21.1 million riders/year by 2035. Reason’s <i>Due Diligence Update</i> predicts 4.8 to 6.9 million.
Spiraling Costs Misrepresented to Voters	<ul style="list-style-type: none"> Costs in the current plan for Phase 1 are \$58 billion, 60% higher than the cost told to taxpayers when voting to fund the project.
	<ul style="list-style-type: none"> Those higher costs pay for a smaller system than was promised to voters.
No Funding Plan	<ul style="list-style-type: none"> To pay for Phase 1, the CHSRA only has \$3.5 billion in federal grants and the ability to borrow \$9 billion in state bonds.
	<ul style="list-style-type: none"> The remaining \$45 billion has not yet been found. The plan calls for it to come from the federal government and private sector.
	<ul style="list-style-type: none"> Federal spending on high speed rail has been cut.
	<ul style="list-style-type: none"> Since this train will not make money and will require significant subsidy, the private sector will not invest its money.
Incorrect Assumptions About Alternatives to High Speed Rail	<ul style="list-style-type: none"> The CHSRA plan argues that the cost of expanding the roads and airports to accommodate predicted growth in intercity travel are \$171 billion.
	<ul style="list-style-type: none"> Several independent analyses have refuted that number. The Legislative Analyst pointed out that the CHSRA methodology is flawed and the figure they use is “not what the state would otherwise spend to address the growth in inter-city transportation demand.”
	<ul style="list-style-type: none"> The CHSRA’s alternatives cost estimates greatly exaggerate train capacities and frequencies, and the costs of highway construction and need for more airport space. For example, they assume you can only increase flight capacity by more planes, and ignore the more common approach of using bigger planes.
Fares Keep Going Up	<ul style="list-style-type: none"> In 2008 voters were promised fares of “about \$50 a person”. That has gone up to \$81 already.
	<ul style="list-style-type: none"> CHSRA’s comparison of car vs. train cost to the rider assumes only individual travelers, omitting that if more than 1 is travelling by car, with costs shared between travelers, it will be vastly cheaper.

A. Not-So-Fast Train Schedules

The Authority has continually made questionable claims about speeds and travel times. Based upon a review of the international experience and CHSRA plans, it appears likely that California’s high speed trains will operate at slower speeds than promised and travel times will be longer than promised.

The CHSRA *Draft 2011 Business Plan* stated that an “express/non-stop” can operate from Los Angeles to San Francisco in 2 hours and 40 minutes. CHSRA’s April 2012 *Business Plan* truncates the HSR infrastructure in the Los Angeles Basin and between San Jose and San Francisco, and the result can only increase non-stop travel times. Documentation for the 2012 *Business Plan* indicates a 3-hour minimum *one-stop* travel time for San Francisco to Los Angeles. The plan fails to cite a non-stop travel time for the Phase 1 Blended System, a noticeable omission. With no apparent justification, the CHSRA continues to represent a 2:40 non-stop travel time to the public.

This *Due Diligence Update* finds that the 2:40 travel time is not achievable under the Phase 1 Blended system. That is because the CHSRA trains are slated to operate at peak speeds of 220 mph (354 kph)—speeds that are not attained today anywhere in the world.

Under the blended system high speed trains will need to operate more slowly on the “bookends” as they share tracks with commuter trains and, in some locations, freight trains. An example is the Peninsula line where the CHSRA claims its trains will connect San Francisco and San Jose in 30 minutes. This matches the Authority’s previous estimate, which was based on running trains on low-obstruction, no at-grade rail/highway crossings, elevated, four-track structures at speeds of between 100 and 150 mph. Such speeds are unattainable over the “blended” system, on which high speed trains would compete along a two-track alignment with multiple at-grade street crossings with three levels of Caltrain commuter trains (from Baby Bullet expresses to locals) and slower freight trains. Similar conditions will apply where high speed trains would co-exist with commuter trains in the Los Angeles Basin.

Other conditions will contribute to slower speeds including the inability to operate at 200 mph in urban areas; safety concerns of non-stop trains passing at high speeds in two-track stations where commuters are gathered on platforms; additional safety concerns of traversing railroad/street crossings used by vehicles and pedestrians; and potential demands to reduce excessive noise by operating at slower (quieter) speeds.

The non-stop *average* speed between Gilroy and Bakersfield as indicated by CHSRA under the Phase 1 Blended system is 198 mph, nearly equal to the present *peak* speed of the fastest high speed trains in the world (France), at 199 mph. Such an aggressive average speed seems impossible to achieve, especially because the trains would be routed through urban areas, the largest of which is Fresno.

The Transportation Research Board speed estimates of 60-to-100 mph are assumed as low scenario and high scenario speeds for urban areas. Therefore, the fastest non-stop San Francisco-Los Angeles trains over the Phase 1 Blended system are estimated to operate at from 3:50 to 4:40 (higher-speed scenario v. lower-speed scenario).

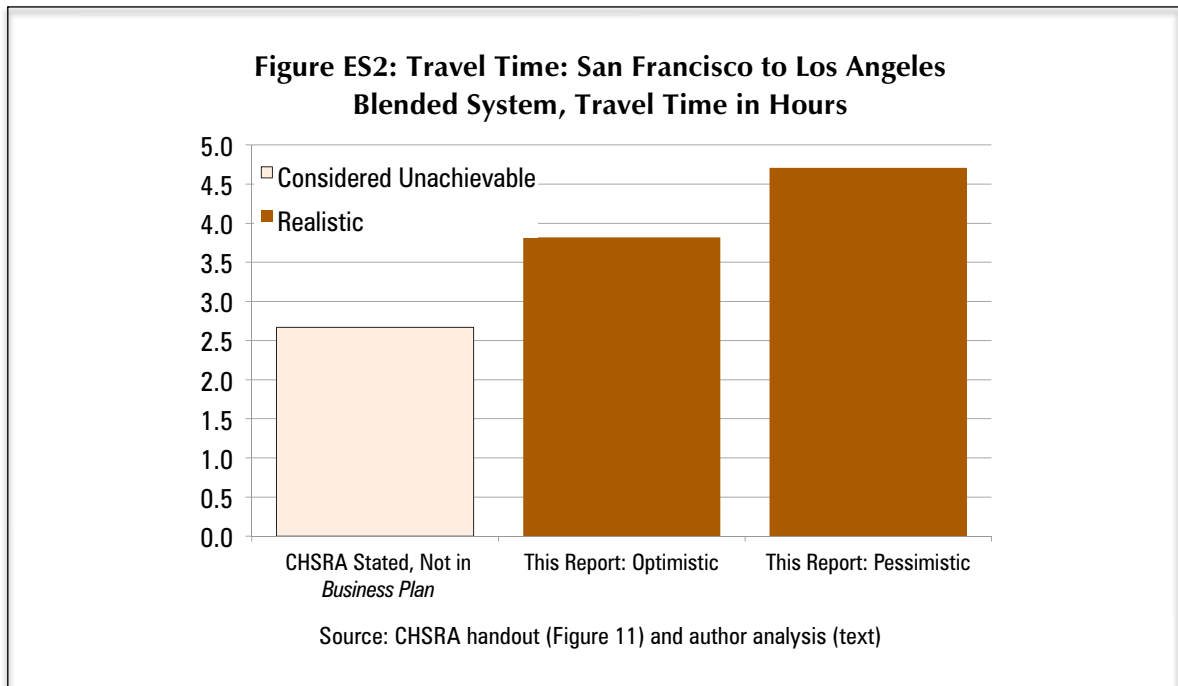
The more frequent trains stopping at intermediate stations would have longer travel times, estimated at from 4:35 to 5:25 (higher-speed scenario v. lower-speed scenario), with four

intermediate stops between San Francisco and Los Angeles, and from 5:10 to 6:00 (higher-speed scenario v. lower-speed scenario) with seven intermediate stops.

The CHSRA's travel times may be lengthened further because safety is a concern when high speed trains share tracks with commuter trains and freight trains. Track-sharing complicates designing a train to meet Federal Railroad Administration crash-safety standards, which are considered the toughest in the world. These aspects are addressed more completely in Reason's 2008 *Due Diligence* report.

Sharing busy tracks with other trains raises the issue of frequency—perhaps only two high speed trains in each direction will operate per hour for a total of four trains. But high speed rail revenue projections were based on operating trains every five or six minutes.

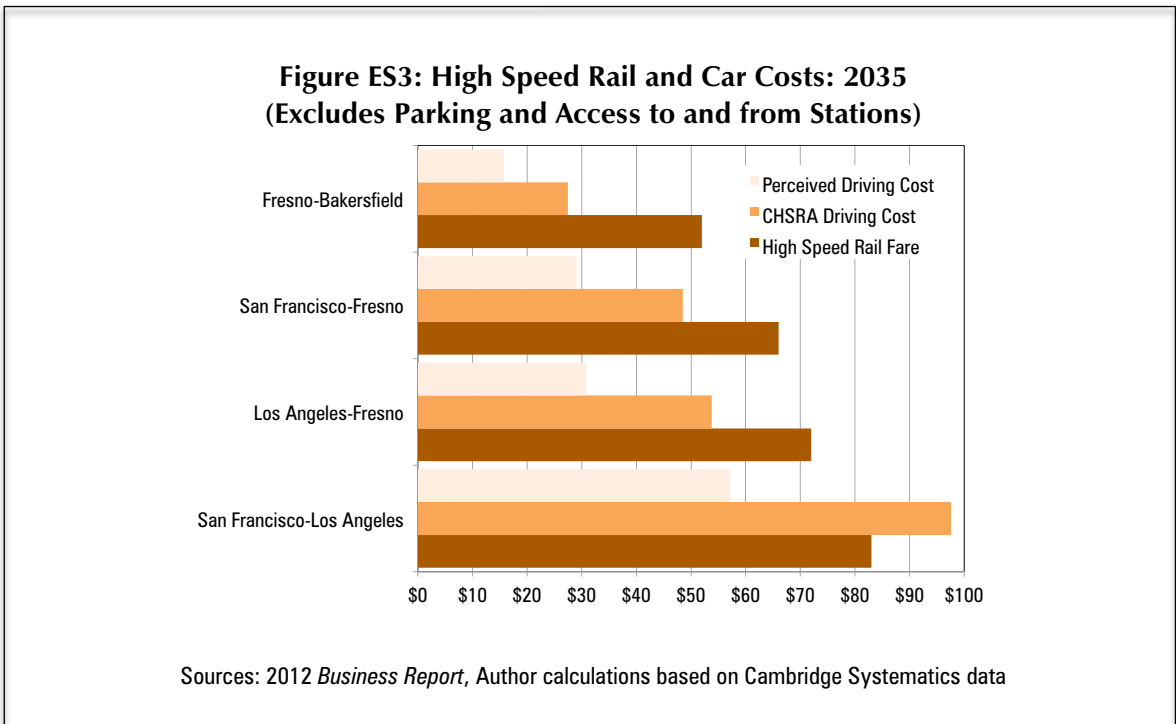
The CHSRA continues to claim the fastest San Francisco-Los Angeles nonstop schedule at 2:40 even though current plans will fail to bring about such service. Even the suggestion of a 3 hour schedule with one stop seems well beyond any reasonable hope of achievement.



B. Ridership Projections and Realities

Excessively optimistic and erroneous ridership forecasts have plagued high speed rail mega-projects similar to California's, resulting in overly optimistic revenue projections. CHSRA's ridership and revenue projections have been criticized by other agencies, university researchers, a peer review group and Reason's 2008 *Due Diligence Report*. Reviewers have outlined how ridership projections are unrealistically high because they are based on faulty models and flawed

assumptions, mainly about automobile travel costs. This report finds that the CHSRA has made consumer cost assumptions that unrealistically skew the cost of automobile travel to be high. In reality the out-of-pocket automobile costs would be approximately one-third to one-half less than high speed rail fares depending upon distance traveled and how many people are riding in a car. Hence, auto diversion to high speed rail will be lower than projected by the Authority. The Institute of Transportation Studies at the University of California Berkeley found that the CHSRA’s ridership forecasts were “not reliable enough to support the expenditure of billions of dollars.”

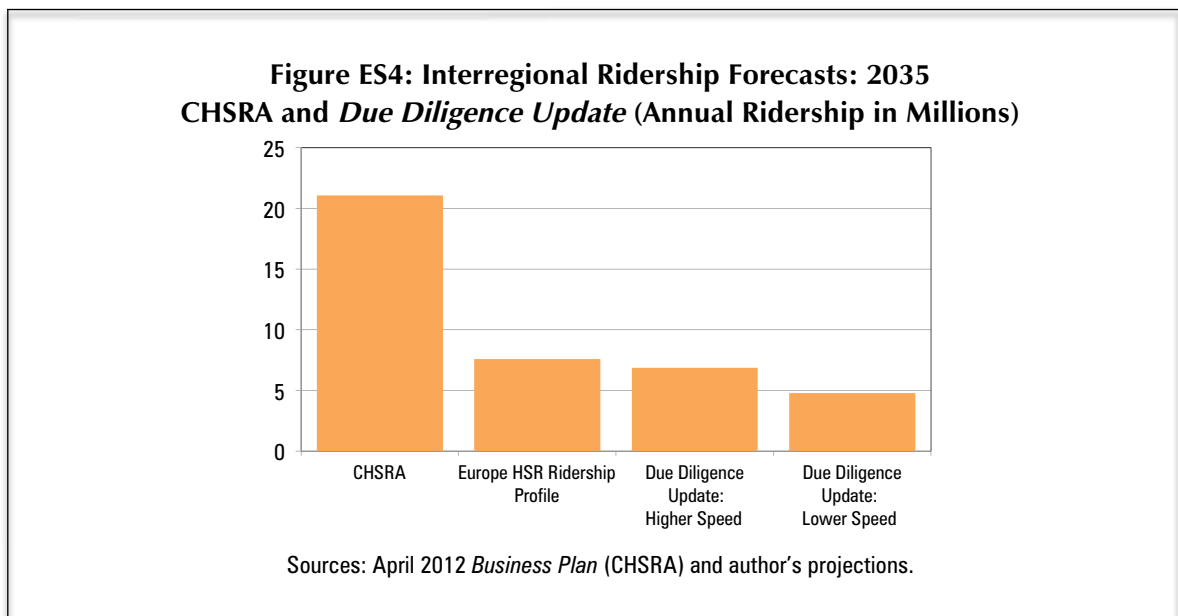


Reason’s 2008 *Due Diligence Report* concluded that the CHSRA ridership projections could be as much as 200% high. Analysis of the data in the CHSRA 2012 *Business Plan* in this report finds the new ridership projections similarly optimistic. This report estimates that with appropriate modeling the ridership attraction from automobiles would fall by nearly 50%, while interregional ridership would lower by more than 35%—estimates that reflect international experience and which demonstrate that the California high speed rail auto attraction forecasts are implausibly high.

Likely travel times along the Phase 1 corridor will be considerably longer than projected. For example, non-stop San Francisco to Los Angeles “one-seat” travel times will most likely be in the range of 3:50 to 4:40, compared to the often-repeated claim of 2:40. Any increase in travel time can be expected to make HSR less competitive with airlines, reducing its ridership and revenue. At the optimistic 3:50 travel time, inter-regional ridership should be forecast at approximately 25% lower than at the CHSRA projected 3:00. The pessimistic 4:40 travel time would likely cause a nearly 50% reduction in the ridership forecast.

CHSRA forecasts indicate a material percentage of the inter-regional ridership, at nearly 25% of the total, will originate outside the metropolitan areas that will have stations in Phase 1. This is far higher—by a factor of 3.5 times—share than was projected in a previous “investment-grade” ridership projection and may not materialize (the current ridership projection is not labeled as investment-grade by CHSRA).

This *Due Diligence Update* estimates that the cumulative effect of ridership projection irregularities and other factors could be substantial. For example, assuming the optimistic travel time projection of 3:50, the 2035 interregional ridership would be approximately two-thirds (67%) below CHSRA projected levels at 6.9 million annually. Assuming realistic automobile costs and more-plausible outside-the-corridor ridership, the 2035 interregional ridership would be 77% below the CHSRA forecast, at 4.8 million annually. Even if the number of automobile drivers switching to rail equals the European experience, ridership would still fall nearly 65% short of the CHSRA projection.

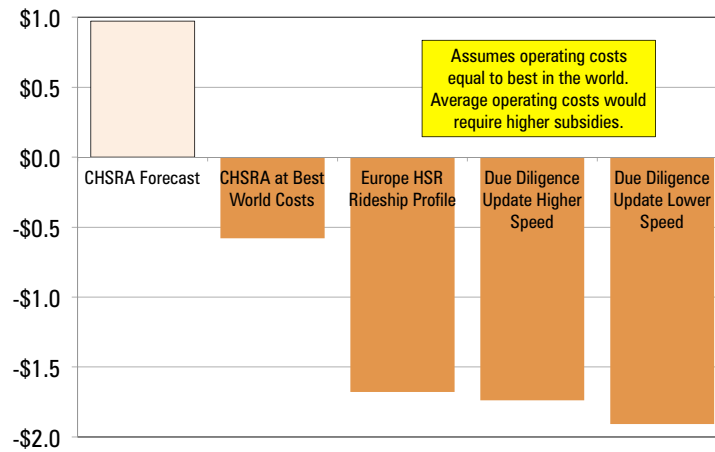


Additional factors could lead to a larger gap between the forecasts and actual ridership, such as slower population growth and excessive air travel delay bias in forecasts. When all factors are combined, they skew high speed rail ridership much higher than is likely to occur.

C. Revenues and Operating Subsidies

Based upon the more realistic ridership projections above, it appears likely that the California high speed rail system will require operating subsidies to cover its day-to-day financial losses. Reason's *Due Diligence Report Update* projects these losses to be between \$124,000,000 and \$373,000,000 annually at the operating cost midpoint projected by CHSRA for 2035.

**Figure ES5: Operating Subsidy Forecast 2035
CHSRA and *Due Diligence Update* (Operating Subsidies or Surplus in \$Billions)**



Sources: Author calculations from CHSRA reports

D. Costs to Build

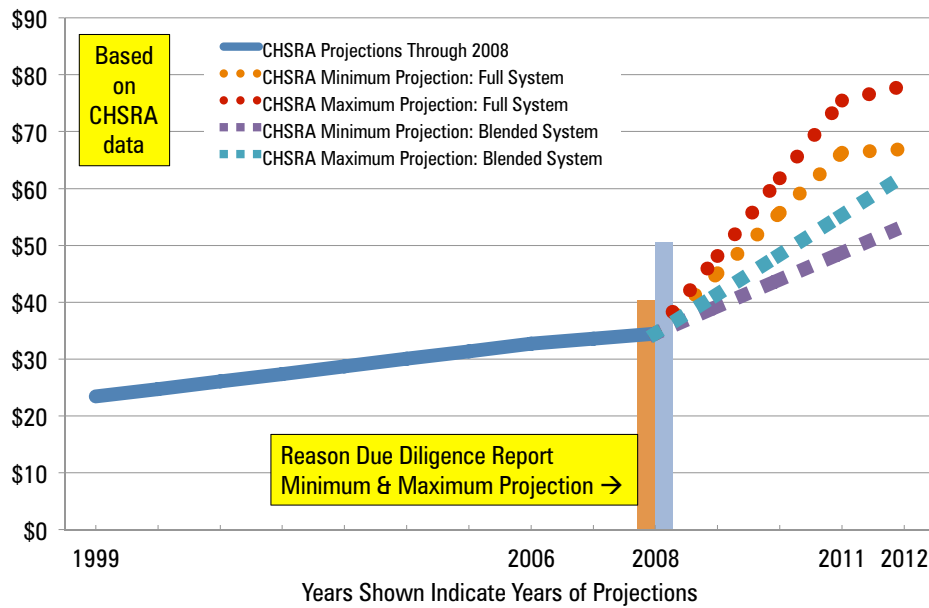
Associated with the new blended system are higher costs. The midpoint between the low and high cost estimate is \$58 billion (\$53 billion to \$62 billion), approximately two-thirds more costly than the projections that were publicized during the 2008 campaign for approval of the bonds through Proposition 1A.

The blended system's cost exceeds the highest cost escalation projection in Reason's 2008 *Due Diligence Report*, which forecast a capital cost of between \$40 billion and \$50 billion for the Full Build Phase 1 of the system. The CHSRA's 2012 projected midpoint cost for the Full Phase 1 system was 60% above Reason's 2008 *Due Diligence Report* projection and the cost of the blended system was nearly 30% higher.

More Cost Increases and a Skeletal System

Affidavits filed by CHSRA indicate that it will be challenging for CHSRA to complete the first segment in the San Joaquin Valley in time to obtain full reimbursement of the federal funding share. Absent from the CHSRA 2012 *Revised Business Plan* is any even speculative identification of capital funding to cover the cost for Phase 2, which would include lines to the major metropolitan areas of San Diego, Riverside-San Bernardino (the Inland Empire) and Sacramento. It is possible those lines will never be constructed, even though voters in November 2008 approved Proposition 1A based on a promise of service to those metropolitan areas.

Figure ES6: California High Speed Rail Capital Costs
Phase 1: History in 2011 Project Capital Cost \$Billions (Inflation Adjusted)



Source: Author calculations from CHSRA reports.

Reason’s 2008 *Due Diligence Report* warned, in a Chapter entitled “If the CHSRA Runs Out of Money,” that funding may only be possible for what was termed the “skeletal” system. CHSRA’s “blended system” of a dedicated high speed line from Palmdale to Gilroy, with entry to Los Angeles and San Francisco over existing tracks (although upgraded), is quite similar to the “skeletal system.”

For example, the blended system, with full high speed service from San Jose to the Los Angeles Basin, could be further truncated by requiring operation over commuter rail tracks over longer distances, as far as from Gilroy to San Francisco and from Palmdale (or even Lancaster) to Los Angeles and Anaheim. Similarly, the potential remains for additional cost escalation system-wide, particularly on the San Jose to San Francisco and Los Angeles Basin segments (which involve upgrades to commuter rail systems). California would thus have the “form” of high speed rail (in a partial system), but not the substance (in high speed rail travel times).

E. Funding the Plan

The ever-changing cost projections to build the California high speed rail system have one common element: The funding plans have virtually no basis in fact. Warnings and criticisms have been issued on many occasions by a variety of state agencies and independent reviewers.

“Astounding” is the only word to describe the manner in which the Authority has ignored reviews ranging from constructive analysis to censure. Rail officials have done so despite the credibility of the studies, investigations and recommendations.

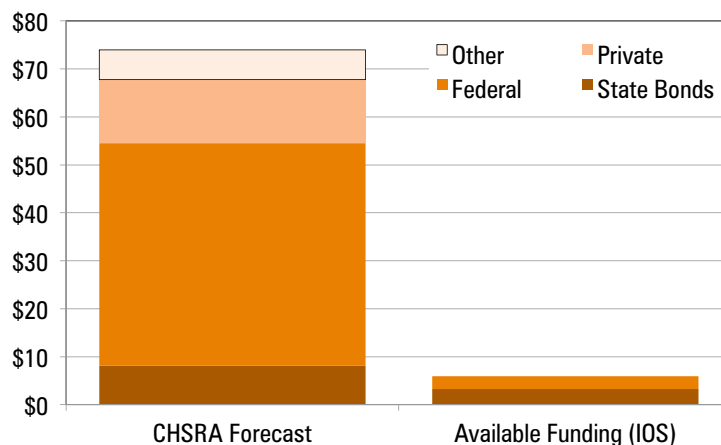
The CHSRA claims it will need \$53 billion to \$62 billion (in 2011\$, or \$68 billion to \$80 billion cost in “year-of-expenditure” dollars) to complete the Phase 1 blended system. While the Authority may have access to \$9 billion in funds from General Obligation bonds (should the legislature approve) from Proposition 1A and \$3.5 billion in federal grants, additional funding sources are elusive or non-existent.

This report provides a chronological listing of assessments issued by the independent and nonpartisan Legislative Analyst’s Office (LAO), Committees in the U.S. Congress, the State Auditor, the independent California High Speed Rail Review Group, the State Treasurer, the California Senate Transportation and Housing Committee, reviewers with extensive financial experience and Reason’s 2008 *Due Diligence Report*. These reviews have universally found the funding plan to be speculative and virtually unachievable. CHSRA expects to obtain 62% of its funding from the federal government and state “cap-and-trade” revenues. These scenarios are unlikely to happen.

The CHSRA suggests that profits earned will induce 18% of its funding to come from private investment. However, ridership is likely to fall far short of the forecasts and there is likely to be little in profit potential to attract private investment.

The Authority’s financing assertions are virtual fantasy and represent additional evidence that its April 2012 submission to the legislature and to the public fails the test of what constitutes a credible business plan. The Authority’s failure to heed findings and recommendations by respected independent researchers could lead to California taxpayers’ paying many billions in unanticipated costs despite specific promises to the contrary.

Figure ES7: CHSRA Funding Plan: Theory and Reality
Forecast and Actual Funding Available: 2012 (\$Billions of \$YOE)



Sources: April 2012 *Business Plan* (CHSRA) and author’s projections.

F. The Costs of Alternatives to High Speed Rail

For some time the CHSRA and high speed rail promoters have claimed that it will cost the state more to expand highways and airports if the rail system isn't built. The assertion is that such alternatives would cost \$171 billion (year-of-expenditure dollars, \$98 billion to \$118 billion in 2010\$) to expand highways and airports to equal high speed rail's claimed capacity.

Such an analysis is irrelevant to public policy. The rail project's impact on infrastructure costs is limited to the amount of new highway and airport capacity that is not required as a result of travel that is diverted from each mode to the train. The purported capacity of the high speed rail system itself is of no consequence and fails to support the need to expand highways or airports should the rail system not be built. Moreover, if ridership on the high speed rail fails to live up to the CHSRA's very rosy predictions, as this study predicts, then it will not reduce the need for these alternatives to the extent CHSRA predicts.

Highway Expansion

For example, the CHSRA highway alternative cost analysis assumes that:

- (1) Trains will have twice as many seats as planned.
- (2) Many times more trains will operate than planned.
- (3) At least 65% more highway miles would need expanding than the length of the high speed rail route between San Francisco and Los Angeles
- (4) Highway construction costs would be well above Federal Highway Administration cost factors for California.

If these exaggerations are corrected, the highway capacity analysis would yield a cost that is a mere fraction of CHSRA's claim.

Airport Expansion

The airport expansion analysis is at least as flawed. CHSRA assumes that the average number of seats on a plane capacity is 70 (though in another document CHSRA shows the average plane capacity at 135). However, much larger short-haul jets are now being introduced that would triple capacity relative to the CHSRA claim.

Further, while the cost of *required* alternate highway and airport capacity is small or virtually non-existent compared to CHSRA claims, users (drivers and airline passengers) pay virtually all of the cost of these expansions through fuel taxes and airport fees and taxes. In contrast, all of the costs of building the high speed rail system and providing operating subsidies will be paid by taxpayers in general.

Several independent analyses of the costs of alternatives used by the CHSRA have been very critical. The Legislative Analyst pointed out that the CHSRA methodology is flawed and the figure they use is “not what the state would otherwise spend to address the growth in inter-city transportation demand.” CHSRA is still using old population growth estimates that indicate more need for future infrastructure than current population trends would indicate. The CHSRA’s alternatives cost estimates exaggerate train capacities and frequencies, and the costs of highway construction and need for more airport space. They are so deficient as to be irrelevant to any policy discussion about California’s future transportation needs.

G. Greenhouse Gas Reductions and Use of Cap-and-Trade Revenue

The Authority has claimed that HSR would substantially reduce greenhouse gas (GHG) emissions. Hence, Governor Brown and the CHSRA have proposed using “cap-and-trade” revenues under Assembly Bill 32 (the Global Warming Solutions Act) to help finance system construction.

Yet, HSR would likely be an inefficient use of cap-and-trade revenues. The United Nations has estimated that sufficient GHG emission reductions can be achieved at a cost of \$20 to \$50 per ton. Using CHSRA data, Reason’s 2008 *Due Diligence Report* estimated that the cost for GHG emissions removed by HSR would be approximately \$1,800 per ton. This estimate was considered conservative since it did not include the GHG emissions that would have been produced in system construction. Meanwhile, the system cost has more than doubled and ridership projections have been scaled back. It is thus likely that an updated estimate of the cost per ton of GHG removed would be considerably higher.

Moreover, research at the University of California, Berkeley concluded that it would take 71 years for high speed rail to save enough GHG emissions to negate the emissions from construction. This is a clear indication that high speed rail is an ineffective means for reducing GHG emissions. As well, claims that the HSR system will further reduce GHG emissions by using electricity generated by greener alternatives (renewable power) are fallacious. Such energy used by HSR would simply displace green energy use by others, resulting in no net reduction in GHG emissions.

Policy makers should consider the Legislative Analyst’s Office (LAO) recommendation that “rather than allocate billions of dollars in cap-and-trade auctions revenues for the construction of a new transportation system that would not reduce GHG emissions for many years, the state could make targeted investments in programs that are actually designed to reduce GHG emissions and would do so at a much faster rate and at a significantly lower cost.”

Under these circumstances, the proposal to use cap-and-trade revenues raises considerable doubt about the state’s (and Brown Administration’s) commitment under the Global Warming Solutions Act (AB 32) to reduce GHGs.

H. Proposition 1A – What California Voters Were Led to Believe

From the beginning, the voters were denied impartial information on the ballot measure, as the legislature dictated the wording in the ballot summary in AB3034 that read like a proponent's argument in favor of the project. In January 2011, a state appeals court ruled that the legislature acted improperly in circumventing the legal requirement for impartial language. Despite the false pretences found by the court, the approval of Proposition 1A was allowed to stand.

Voters were led to believe that Sacramento and San Diego would be included in the system (they are not part of the new “blended plan”); that private investors would participate (legitimate offers of private equity remain elusive); that tickets between Los Angeles and San Francisco would be “about \$50 a person” (now it is \$81); that ridership would be between 65.5 and 117 million annually (now it is a range of 19.6 to 31.8 million); that Phase 1 San Francisco-Los Angeles/Anaheim was projected to cost \$35 billion (2011\$) (it escalated to between \$66 and \$76 billion by late 2011 and has since dropped to a range of \$53 to \$62 billion—but the “savings” are illusory because they result from removing major sections at both ends of the line and not using inflation-adjusted dollars); that operating subsidies will not be required (this report finds a likelihood of \$124 to \$373 million in annual subsidies); and that the fastest Los Angeles-San Francisco non-stop travel time would be 2:38 (this report estimates a time no faster than 3:50).

The proposed system fails to meet Proposition 1A requirements in numerous ways. Nevertheless, the CHSRA continues with plans that fail to meet statutory requirements and will cost taxpayers billions of dollars more than they were told in their voter pamphlet. The Authority is breaching its obligations to those who voted for Proposition 1A.

What the public voted for in Proposition 1A is not what will be delivered. The LAO found that CHSRA's Draft 2011 *Business Plan* “does not meet the requirements of Proposition 1A.” The 2012 *Business Plan* contains the same or similar shortcomings. Hence, the California high speed rail program appears to be vulnerable to a wave of litigation.

A corporation could not unilaterally change what it promised to customers without facing possible prosecution. The view that public agencies should be held to at least as high a standard as applies to businesses is partially behind the campaign to allow voters to reassess the 2008 high speed rail bond issue.

Reconsideration may occur through a new ballot proposition entitled “Stop the \$100 Billion High Speed Train Act” that may appear on the November 2014 ballot. If voters approve, the provision would stop all federal, state and local funding for the program, terminate all contracts, and require that unspent proceeds from bond sales be redirected to retire debt incurred from the issuance and sale of the high speed rail bonds.

Conclusion

This *Due Diligence Update* concludes that the Authority's 2012 *Business Plan* appears to be no more credible than CHSRA's prior reports. A danger exists that the project will impose many billions of dollars of additional taxation on California taxpayers. This would be a concern in the best of times, but these are more like the worst of times considering California's dismal fiscal condition, budget shortfalls and enormous debt obligations.

Numerous realistic reviews of the Authority's plan and documentation find they come up short. Particularly noteworthy is the review of the plan issued in late 2011 by the senior academic and business professionals associated with the Community Coalition on High Speed Rail, which clarified the general deficiencies of the CHSRA's business plans:

Business Plans in the private sector are produced by men and women who have invested, and will invest, their time, intellectual capital, and normally a tremendous amount of their personal financial capital into making the future venture a success. For private enterprises that have outside shareholders, there is also a group of committed investors who press to maximize efficiency and opportunity for the business. Unfortunately, for an enterprise like High Speed Rail that aspires to be treated like a business but run by the public sector, what is missing is the lack of a strong personal financial stake in turning a profit. Because of this difference, financial commitments become promises; forecasts become guesses, and statement of facts become estimates. This is due to the consultants and managers having "no skin in the game." Given this tremendous difference, elected officials need to take what is told to them, or provided to them in a Business Plan, with a large grain of salt – and to think through . . . the consequences to the State if the [CHSRA] goes ahead but does not meet its proponents' financial assertions and expectations.

Richard Tolmach of the California Rail Foundation was more succinct in his conclusion about the 2012 *Business Plan*, saying, "This time, more than last time, is a sales job. It doesn't have actual facts, but it must have 20 pictures of [rail] boosters and parades."

That is less of a harsh statement than it might at first appear because legislators, particularly in the State Assembly, appear to have bought into what Tolmach called the "sales job." California veteran journalist Dan Walters noted during April 18, 2012 hearings:

This is the largest state public works project in U.S. history, one that would cost tens of billions of dollars and divert money from a deficit-ridden state budget. Independent reviewers, including the Legislature's own budget analyst, have expressed serious doubts as to its financial viability. The Assembly subcommittee's members, however, treated it just like another routine budget request. Several were downright gushy over the bullet train, unwilling to delve into the very serious questions about its efficacy.

Such an approach by the Assembly appears to fall short of the attention required for such an expensive project, one with significant long-term consequences.

A state Senate Committee has taken a less charitable view and has become frustrated with the Authority's unrelenting advocacy. Again, journalist Dan Walters noted that during an April 18, 2012 Senate budget subcommittee hearing, that Chair Joe Simitian said, "Our job is oversight, not cheerleading."

A project as flawed as the California high speed rail program would be unwise at any time, but is even more so in the present difficult times. The California high speed rail project cannot be delivered at the cost promised to taxpayers, is based upon a business plan incapable of delivering on its legal requirements, and is justified by proponents based upon unachievable benefits. The taxpayers and the state of California would be best served by its immediate cancellation.

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Part 1

Introduction

The California High-Speed Rail Authority (CHSRA) drafted a plan in 2008 for an ambitious high speed rail system that would link many of the state's communities. Reason Foundation's 2008 review of the Authority's plan, called *The California High Speed Rail Proposal: A Due Diligence Report*, acknowledged that for travelers the idea of taking quick train trips within California can be attractive, but found the Authority's plans to be inaccurate, misleading and not in compliance with California statutes, as well as cost-prohibitive. In 2012 CHSRA issued a revised *Business Plan* in an effort to keep within costs. This report forms Reason Foundation's assessment of the Authority's revised plans finding them similarly inaccurate, misleading and in violation of the laws guiding the project.

The *Due Diligence Report* also warned that the Authority's financing plan overstated projected revenues from passengers and private financing from investors, and understated capital requirements and subsidies needed from state and federal taxpayers. Subsequent independent studies and Authority documentation have proven virtually every characterization in Reason's 2008 *Due Diligence Report* to be accurate or understated. Indeed, Reason Foundation's study findings have been shown to be conservative compared with later findings by others—e.g., California Legislative Analyst's Office, State Treasurer, California High-Speed Rail Peer Review Group, State Auditor, a State Senate Committee and independent reviews by academic experts, business executives, attorneys, and domestic and international financial experts.

The CHSRA's April 2012 draft final *Business Plan* outlined a "blended system" where high speed trains would operate in conjunction with commuter trains into San Francisco and Los Angeles—these segments are referred to as the "bookends" of the system. In other words the system will only be fully high speed from the outskirts of the greater Los Angeles area to the outskirts of San Jose.

The estimated cost of the initial program, known as Phase 1 Blended, is between \$53.4 billion and \$63.2 billion in 2011 inflation-adjusted dollars (\$68.4 billion to \$78.0 billion in year-of-expenditure dollars) with the only sources of funding being \$9 billion in Proposition 1A bonds and \$3.5 billion in federal grants. Sources for the remaining \$40 billion to more than \$50 billion in capital funding (for construction of the line and purchase of the trains) are highly speculative if not outright non-existent. Meanwhile, the total cost for Phase 2, which presumably would include lines to the major metropolitan areas of San Diego, Riverside-San Bernardino (the Inland Empire) and Sacramento, is unidentified in the Authority's documentation, even though voters approved Proposition 1A based on a promise of service to those metropolitan areas.

Public officials and citizens have criticized the April 2012 *Business Plan*. Its deficiencies include highly challengeable assertions regarding ridership, construction costs, the use of cap-and-trade fees to subsidize construction, and reliance on additional federal grants and private financing.

The Legislative Analyst's Office provided a valuable summary of the current situation in its April 2012 review, which stated:

Based on our review of the 2012 business plan and the Governor's related budget proposals, we find that the HSRA has not provided sufficient detail and justification to the Legislature regarding its plan to build a high-speed rail system. Specifically, we find that (1) most of the funding for the project remains highly speculative, including the possible use of cap-and-trade revenues; and (2) important details regarding the very recent, significant changes in the scope and delivery of the project have not been sorted out.

The LAO also expressed these concerns about the 2012 *Business Plan*:

We are concerned that ... changes have been rushed with many important details not having been sorted out. While the HSRA has been planning for the project over the past 15 years, the proposed modifications, which substantially change how the project would proceed, were developed within the last couple of months (and in only the last few days with regards to the inclusion of Anaheim). As a result, it is unclear how some of the changes would be implemented, further adding to the risk of the project.

The LAO concluded:

We recommend the Legislature not approve the Governor's various budget proposals to provide additional funding for the project.¹

Considering all that has transpired, additional analysis through an update to the 2008 *Due Diligence Report* is warranted. This report analyzes the CHSRA's 2012 *Business Plan* in the areas of:

- Fast train schedules
- Ridership
- Revenue and operating subsidies
- Cost to build
- Funding plans
- Cost of alternatives to high speed rail (expanding highways and airports)
- Greenhouse gas reductions and use of cap & trade revenues
- Compliance with Proposition 1A

Part 2

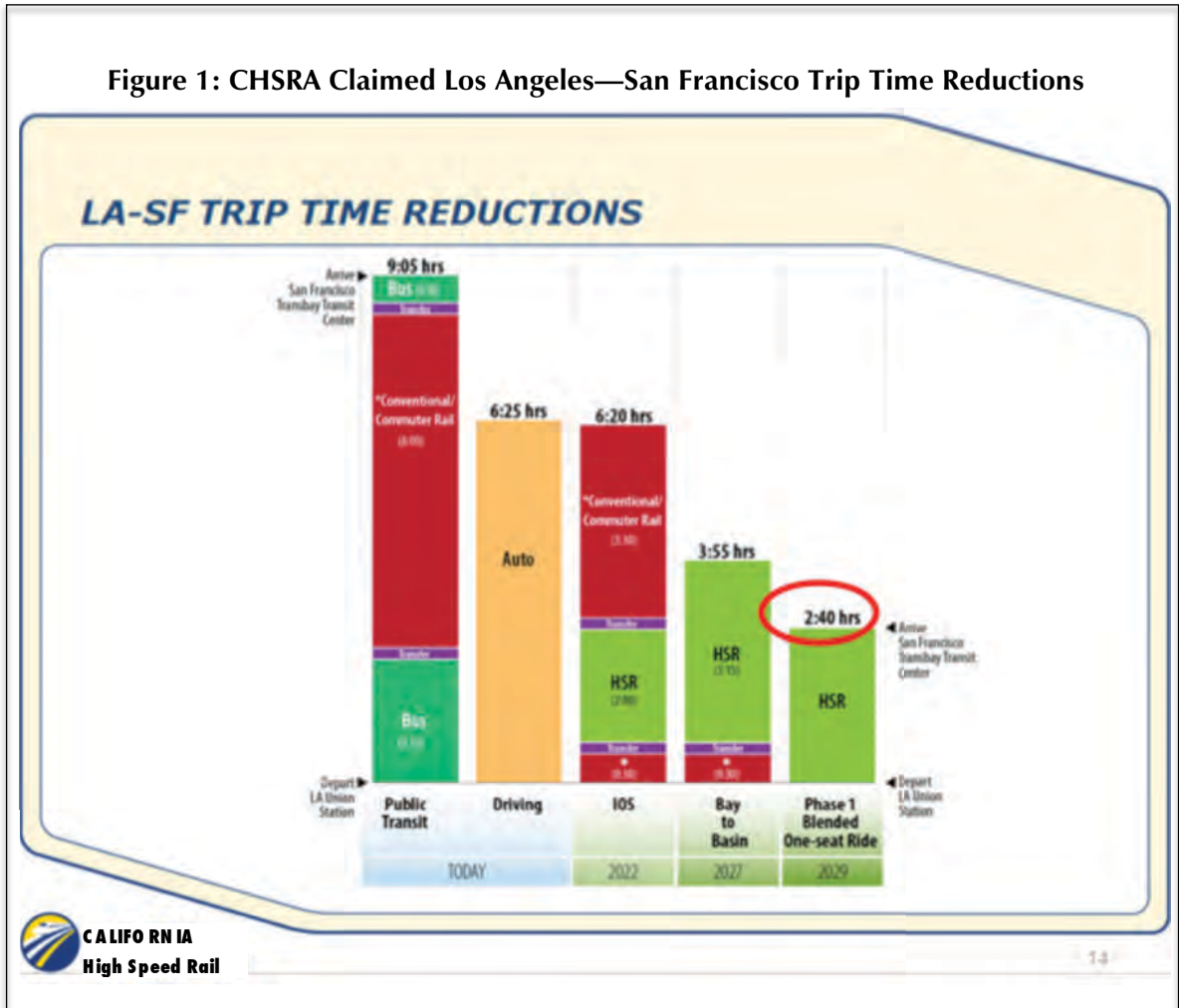
Not So Fast Trains

Based upon a review of the international experience and CHSRA plans, it appears likely that trains on the California high speed rail system will operate at slower speeds than claimed. The schedule outlined in the November draft 2011 business plan claimed to allow “one train per hour to operate as an ‘express/non-stop’ with a trip time of two hours and forty minutes from Los Angeles to San Francisco.”² The April 2012 *Business Plan* truncates the high speed rail infrastructure, eliminating exclusive tracks built just for high speed trains in the Los Angeles Basin and between San Jose and San Francisco. Instead, in those areas the high speed trains will share tracks with conventional rail, with the lines upgraded a bit to allow somewhat faster travel. But the result is inevitably slower travel and thus longer travel times between the two cities. Consistent with that change, supporting documentation for the April 2012 *Business Plan* indicates a 3 hour minimum *one-stop* travel time for San Francisco to Los Angeles. The plan fails to cite a non-stop travel time for the Phase 1 Blended System, not even in its section entitled “HSR schedules and travel times.”

In contrast with the supporting documentation cited above, the CHSRA continues to represent a 2:40 non-stop travel time to the general public. CHSRA Chairman Dan Richard has repeated the claim in media interviews that have received widespread coverage throughout the state.³

Californians Advocating Responsible Rail Design (CARRD) has also noted that a CHSRA supporting document shows 3 hours (180 minutes) for a one-stop San Francisco-Los Angeles train⁴, while a presentation handout at the CHSRA April 12, 2012 board meeting indicated a 2:40 travel time for the Phase 1 Blended system in 2029 (Figure 1). That CHSRA claims a 2:40 travel time can be achieved with the blended system by 2029 raises a fundamental question about why the much more expensive Full Build option had been promoted for so many years, given that its fastest travel time would have been virtually the same. In fact, however, the 2:40 travel time is not achievable under the Phase 1 Blended system.

Figure 1: CHSRA Claimed Los Angeles—San Francisco Trip Time Reductions



CHSRA trains are supposed to operate at peak speeds of 220 mph (354 kph). However, such speeds are not attained today anywhere in the world. Indeed many trains have been slowed down in recent years for safety and operating reasons.⁵ Currently, the world’s fastest trains are French TGV’s, which reach peak speeds of 199 mph (320 kph), 21 mph less than 220 mph (354 KPH). These speeds are over infrastructure built for 217 mph (350 kph). See Table 1.

Table 1: Fastest Planned and Actual Peak Speeds: High Speed Rail Examples

	Miles per Hour		Kilometers per Hour	
	Planned	Actual	Planned	Actual
China (Shanghai-Beijing)	236	186	380	300
Korea	217	189	350	305
Spain (Madrid-Barcelona)	217	193	350	310
France (Paris-Strasbourg)	217	199	350	320
Average	222	192	358	309

Note: Various trains in China operated up to 217 miles per hour until 2011 when maximum speeds were slowed to 186 miles per hour for safety, energy conservation and other reasons. This speed reduction preceded the Wenzhou crash.

Source: Author calculations of from CHSRA reports and *Due Diligence Report* (2008)

A. Case Study: Running Times San Francisco—San Jose

An illustration of slower schedules is found by examining the Peninsula line. The CHSRA claims that high speed trains will connect San Francisco and San Jose in 30 minutes (slightly faster than the 31 minute statutory requirement). This matches the Authority's previous estimate, which was based on running trains on low-obstruction, no at-grade rail/highway crossings, elevated, four-track structures at top speeds of between 100 and 150 mph. Such speeds are unattainable over the newly proposed "blended" system, on which high speed rail trains would compete along a two-track alignment with multiple at-grade street crossings with three levels of Caltrain commuter trains (from Baby Bullet expresses to locals) and much slower freight trains.

However, the line's speed and frequency capacity has become obfuscated with the Authority's unclear Blended plan. The situation is explained by Attorney Stuart Flashman, who is representing cities and a coalition of nonprofits⁶ in CHSRA-related lawsuits. He said:

*That's a really big issue. On the one hand, you have the business plan saying we're doing the blended system. On the other hand, you have the newest EIR still talking about the four-track system. There is a real disconnect.*⁷

It is doubtful that the Authority will have four tracks on the Peninsula, although it is possible that funds will be expended north of San Jose to build some portions of passing tracks to allow for somewhat faster travel. Nonetheless, numerous conditions will contribute to slower speeds on the "bookend" blended system:

- Average speeds for the high speed trains will likely be lower than CHSRA claims. According to the National Research Council's Transportation Research Board, high speed rail systems with top operating speeds of 200 miles per hour would average 150 miles per hour in rural areas while average speeds are much lower in urban areas, such as the San Jose to San Francisco corridor and the Los Angeles Basin. The Transportation Research Board studied HSR potential in the United States and indicated that the trains would have maximum average speeds in urban areas from 60 mph to 100 mph.⁸
- High speed trains passing non-stop through two-track stations, where at times Caltrain Peninsula or Los Angeles Basin commuters are gathered on platforms, will require much slower speeds for safety.
- Between San Francisco and San Jose, and in the Los Angeles Basin—in places where the infrastructure will not be upgraded to high speed rail standards—railroad/street crossings will remain in areas where residents oppose elevated structures or the closing of crossings or where funding constraints do not permit building grade separations. Hence, vehicular and pedestrian cross-traffic will remain causes for concern.
- To control noise the CHSRA may propose construction of sound walls, but how many would be built remains a question because of community opposition to such visual intrusion. Where absent, excessive noise is likely to lead to political pressure that could cause trains to operate at slower (quieter) speeds.

- The greater the frequency of HSR and commuter trains, the greater the likelihood that a fast train will eventually catch up to a slower commuter train or freight train ahead and be required to trundle along at the slower train's speed. This could seriously retard the reliability of high speed rail schedules along the entire line.
- Freight service is provided over the San Francisco–San Jose line by the Union Pacific Railroad and along the Los Angeles Basin in different segments by the Union Pacific and the Burlington Northern Santa Fe railroads. It is possible that the “super-elevation” needed for high speed trains on curves will be unacceptable. This is a common concern in the United States because the same tracks are used by diesel locomotives pulling heavy, large-sized freight cars, all of which serves to limit speeds.⁹
- Such operational, safety, noise and engineering factors combined make it likely that the top speed will be substantially slower along the Peninsula line than would be the case if the high speed rail infrastructure were completed north of San Jose.

B. Realistic Travel Times

The proposed CHSRA travel time and speeds, even when the Phase 1 Blended system is fully operational, appear to be unrealistic. For example, under the 3 hour schedule, trains are indicated as traveling between San Francisco and San Jose in 42 minutes (with one stop and not stopping in San Jose). However, the high speed rail service would be sharing the newly electrified Peninsula commuter rail line, still principally two tracks and with multiple at-grade crossings, along with an increased volume of Caltrain service.

Today, the fastest Caltrain service, the *Baby Bullets*, travel from San Francisco to San Jose in 57 minutes. Caltrain's environmental impact statement indicates that the electrification project will only marginally increase the speed of these fastest trains.¹⁰ It would be difficult for high speed rail trains to traverse the corridor faster than the *Baby Bullets*. It seems likely that the travel time between San Francisco and San Jose on the one-stop service could be as great as 57 minutes.¹¹ A detailed operational plan has not yet been released, in the absence of which a ten-minute improvement, to 47 minutes would reflect the most optimistic possible schedule on the Caltrain right of way. Of course, speeds could be materially increased in the unlikely event that sufficient funding is found to complete the Full Build system, as trains would operate over an expanded–four-track main line, fully grade separated, and elevated through the Peninsula communities.

In the Gilroy to Palmdale segment, speeds up to 220 mph are vital to both the 2 hour, 40 minute schedule and the 3 hour schedule. However, such peak speeds have not been achieved anywhere in the world. As outlined earlier, the Chinese trains that had approached 220 mph (217 mph) have been slowed to 186 mph.¹² The slowdown occurred to address safety concerns, excessive electricity consumption, higher GHG emissions and other issues. A Chinese rail executive said that at the higher speeds, “wheels slip so much that you need bigger motors and significantly more electricity to operate. There is also so much wear on the tracks that costs for daily inspections, maintenance

and repairs go up sharply. That's why in Europe, Japan and Korea no operators run trains above 320 kilometers an hour [199 mph]."¹³

It seems unlikely that train speeds in California will reach the claimed 220 miles per hour. In addition to the technical concerns, en-route communities have begun to object to the high speeds. Mitigation construction such as tunnels could materially raise costs. Without this mitigation, political pressure could result in lowering speeds. This would be a particular risk after service has begun, because failure to achieve the planned speeds could result in an even greater shortfall in ridership (and revenue) compared to forecasts.¹⁴

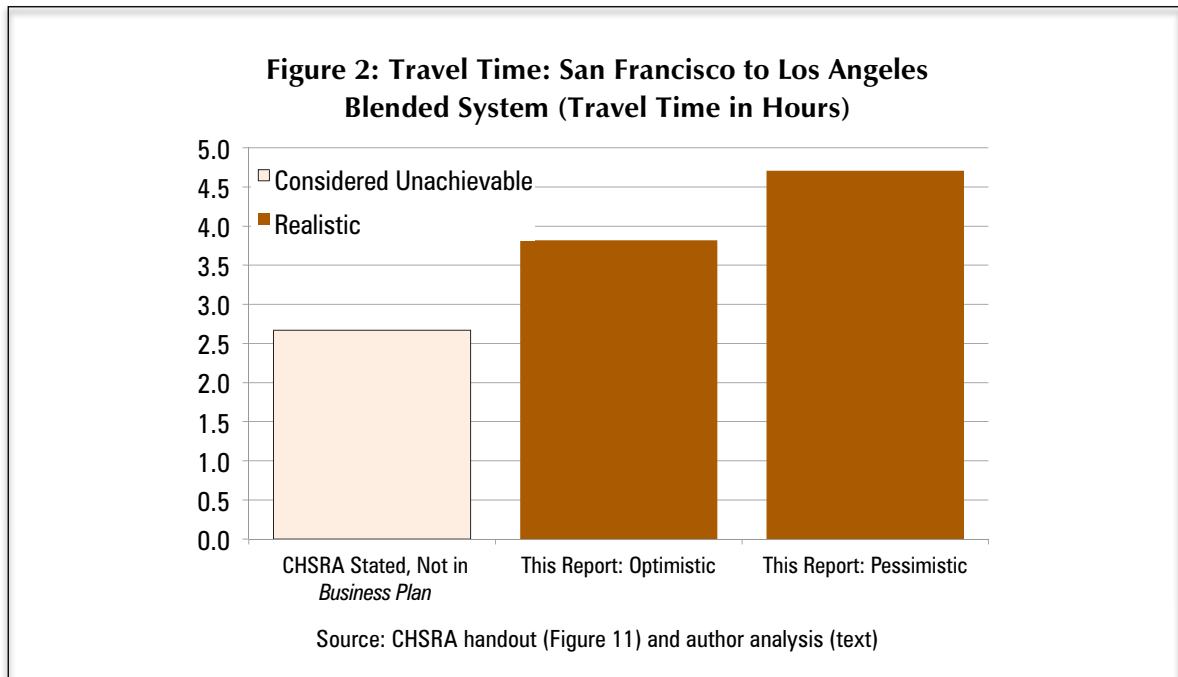
The non-stop *average* speed between Gilroy and Bakersfield as indicated by CHSRA under the Phase 1 Blended system is 198 mph. This is nearly equal to the present *peak* speed of the fastest high speed trains in the world (France), at 199 miles per hour. These are exceedingly aggressive speeds, and well above the 150 mph average speed identified by the Transportation Research Board research for rural operations peaking at 200 mph. A 199 mph average speed seems impossible to achieve, not only theoretically, but also because the routing operates through urban areas, the largest of which is Fresno.¹⁵

We assume that the top speed for trains along the fully developed high speed rail corridor (San Jose to the Los Angeles Basin) would be 200 mph, slightly more than the fastest operation of today's trains, which is 199 mph. Consistent with the Transportation Research Board, it is assumed that average speeds in rural areas would be approximately 150 mph.

For urban operations, the Transportation Research Board speed estimates of 60 to 100 mph are assumed as low scenario and high scenario speeds for urban-area operations.¹⁶ Based upon these figures, it is estimated that the fastest non-stop trains from San Francisco to Los Angeles over the Phase 1 Blended system would operate at from 3:50 to 4:40 (higher-speed scenario v. lower-speed scenario). This range is composed of the difference between the high and low urban speed assumptions of 100 mph and 60 mph and the difference in operating time assumptions between San Jose and San Francisco (Figure 2).

The more frequent trains stopping at intermediate stations would have longer travel times, estimated at from 4:35 to 5:25 (higher-speed scenario v. lower-speed scenario) with four intermediate stops between San Francisco and Los Angeles, and from 5:10 to 6:00 (higher-speed scenario v. lower-speed scenario) with seven intermediate stops.¹⁷

In the future, the CHSRA's travel times may be lengthened further because of factors such as potential longer routings and political demands to add stops to the system. Also, safety is a concern when HSR trains share tracks with commuter trains and freight trains. Track-sharing complicates designing a train to meet Federal Railroad Administration crash-safety standards, which are considered the toughest in the world, or potentially obtaining waivers from such standards. As stated earlier, longer travel times, which would make high speed rail less time competitive, would result in lower ridership and reduced revenue. These aspects are addressed more completely in Reason's 2008 *Due Diligence Report*.¹⁸



Reason’s 2008 *Due Diligence Report* also warned of the possibility that lack of funds could lead to shortened or eliminated train routes. The chapter entitled “If the CHSRA Runs Out of Money” stated that it is possible that funding will only be possible for what was termed as the “skeletal” system, which would involve a dedicated high speed system from Palmdale to Gilroy, with entry to Los Angeles and San Francisco over existing tracks (although upgraded) that handle commuter rail and freight trains. The 2008 report warned that, with such track-sharing, minimum non-stop travel times would be 5:30, double the statutory requirement of 2:42.

Even one of the strongest supporters of high speed rail in California has expressed consternation at the new plan. *California Watch* reported that Quentin Kopp, who as a state senator carried the legislation to create the CHSRA and later served as its chairman, called the revised 2012 *Business Plan* “the great train robbery” He said transit advocates have been trying for years to “pick the pocket” of the bullet train by using that project’s funds for commuter rail improvements. He stated, “Sharing the tracks with Caltrain [on the Peninsula] and with Metrolink and Amtrak between Los Angeles and Anaheim bars operating more than maybe two trains per hour of high speed rail.” But high speed rail revenue projections were based on operating trains every five or six minutes.¹⁹ In addition, Kopp thinks that the blended plan could violate Proposition 1A, the voter-approved bond to fund the project, because the current plan does not provide what was then promised to voters in the letter of the law.

To put into perspective Kopp’s comment about train frequency, the Peer Review Group indicated that a “blended” approach would result in a limited number of high speed trains—specifically two to four per hour—that could operate in conjunction with San Francisco and Los Angeles commuter rail services.²⁰ At this time, it is unclear to what degree frequency could be increased, considering that details of how the commuter rail system would be upgraded remain unknown. “They fooled the

voters,” said Kopp. “The voters didn’t vote to borrow money for two commuter train services; they voted money for a high speed statewide system.”²¹

The CHSRA continues to misrepresent the fastest San Francisco–Los Angeles nonstop schedule at 2:40 even though current plans will fail to bring about such service. Even the suggestion of a 3 hour schedule with one stop seems well beyond any reasonable hope of achievement.

Part 3

Ridership Projections and Realities

The benefits of the high speed rail project only occur if ridership goals are realized.

A. Background on Ridership Projections

High speed rail worldwide has been plagued by erroneous ridership projections. As a result, revenue projections have routinely been excessively optimistic. In the case of the California high speed rail project, a combination of optimistic ridership and revenue forecasts could cause ongoing and substantial operating subsidies by California taxpayers, which is described below.

The optimistic forecasting of ridership (and revenue) is illustrated in the leading international research by European academics Bent Flyvbjerg, Nils Bruzelius and Werner Rothengatter.²² In an extensive examination of 258 transportation infrastructure “megaprojects” covering 70 years in North America, Europe and elsewhere,²³ they have noted significant, recurring and even gross projection errors in capital cost projections.

Flyvbjerg et al also identified serious errors in projecting ridership and revenue.

...the problem with cost overrun is exacerbated by the fact that often this problem comes hand in hand with lower-than-estimated revenues. The consequence is projects that are risky to the second degree.²⁴

Flyvbjerg et al found that projected ridership on passenger rail projects averaged 65% above actual patronage. In particular, they noted:

There is a massive and highly significant problem with inflated forecasts for rail projects. For two-thirds of the projects, forecasts are overestimated by more than two-thirds.²⁵

Eurostar, the London to Paris and Brussels high speed train, has experienced an even larger gap between forecast and annual ridership. Eurostar was projected in 1996 to reach nearly 25 million riders by 2006.²⁶ In 2011, ridership remained under 10 million (9.7 million²⁷), more than 60% below the forecast. Interestingly, CHSRA predicts about 25 million riders in 2035, and there is little reason to expect that estimate to be more accurate than Eurostar’s.

There is no indication that the industry has taken steps to make its ridership projections sufficiently reliable. Flyvbjerg et al also found that despite the rampant forecasting errors, there has been virtually no improvement in accuracy in recent years. Firms and organizations making inaccurate forecasts incur no sanctions or penalties.

The projections were consistently erroneous, with Flyvbjerg et al characterizing them as exhibiting “optimism bias” and “strategic misrepresentation,”²⁸ a phenomenon the researchers also referred to as “lying.” “Strategic misrepresentation” occurs as consultants and project promoters seek to obtain approval for projects that might not be allowed to proceed with more modest and realistic projections.

Accurate ridership and revenue projections are crucial to the financial success of any high speed rail project. Like any computer model or statistical calculation, if any of the assumptions are wrong, material forecasting errors can be the result. As the research noted above indicates, ridership forecasting errors are predominantly the result of overly optimistic assumptions. Should ridership projections be too high, revenue will be lower and financial losses can occur, with taxpayers picking up the tab. Optimistic ridership projection is routine, as World Bank research has indicated:

*... high speed projects have rarely met the full ridership forecasts asserted by their promoters and in some cases have fallen far short.*²⁹

Typical errors responsible for forecasting miscalculations cited by Flyvbjerg include assumptions that the proposed project will save travelers more time or more money than alternatives. In this case, that would assume that high speed rail would be more attractive than travel by plane or cars, with the result that excessively high ridership forecasts are produced. Also, the size of the potential ridership market (the base market) can be exaggerated, such as by using higher than reasonable population projections or assuming more trips than are genuinely likely to occur. Both of these kinds of errors appear to be inherent in the CHSRA ridership forecasts.

B. Previous Criticisms of CHSRA’s Ridership Projections

CHSRA’s ridership and revenue projections have been the subject of considerable criticism. Reviewers have suggested that ridership, and thus the revenue projections, are unrealistically high and that the capital cost projections are unrealistically low. This is ominous for California taxpayers, who could be required to pay for any cost escalation and subsidies that would occur because revenues are less than projected.

These criticisms have surfaced in reports by the California State Auditor, the Institute of Transportation Studies at the University of California, Berkeley, the legislatively established independent Peer Review Group and Reason’s 2008 *Due Diligence Report*.

The California State Auditor evaluated CHSRA’s plans and in January 2012 concluded:

*The success of the program hinges largely on the accuracy of its ridership projections—fundamental to the revenue projections and to private investors’ interest in the program. However, the Authority has not fully addressed questions about the accuracy of the model’s long-term projections.*³⁰

The California legislature created an independent California High-Speed Rail Peer Review Group which in a January 2012 letter to the legislature pointed out that

*[D]espite strong recommendation from this group, the demand forecasts remain an internal product of the CHSRA and its internal peer review panel. The forecasts have not be subjected to external and public review, and many of the internal workings of the model, especially as applied to the IOS [Initial Operating Segment] and the Bay to Basin scenarios, remain unclear.*³¹

The Peer Review Group followed up with a letter in May 2012 in which they stated that the CHSRA April *Business Plan* made more conservative ridership estimates, but used a methodology that “yields estimates with a larger range of potential error” and “given the international experience with demand forecasting experience for HSR, we remain cautious.”³²

A 2010 report by the Institute of Transportation Studies (ITS-Berkeley) at the University of California, Berkeley is particularly significant, given the concerns it raised, the rejection of its findings by the California High-Speed Rail Authority and the recommendation by the Peer Review Group that its concerns be addressed. ITS conducted its study at the request of the California Senate Committee on Transportation and Housing and concluded that there were:³³

... some significant problems that render the key demand forecasting models unreliable for policy analysis.

According to ITS-Berkeley “our main conclusion is that the true confidence bands around the estimates from these models must be very wide. They are probably wide enough to include demand scenarios where HSR will lose substantial amounts of money as well as those where it will make a hefty profit.” Given the inaccurate history of high speed rail projections, the loss of “substantial amounts of money” seems the more likely outcome.

The independent Peer Review Group noted that “The issues identified by the University of California at Berkeley, the Legislative Analyst’s office and the State Auditor’s office have raised sufficient concerns with the demand model so as to call into question the project’s fundamental basis for going forward. The group recommends that the Authority work with UC Berkeley, the Legislative Analyst’s office and the State Auditor’s office to complete an analysis of any issues regarding the demand models so that a mutually agreed estimate can be reached along the ranges of uncertainty. Failure to arrive at such an agreement will put the project’s forward progress in jeopardy.”³⁴

This advice appears to have been rejected by CHSRA. In a letter to Senator Alan Lowenthal, Chairman of the Senate Transportation and Housing Committee, CHSRA Executive Director Roelof Van Ark indicated no intention to follow the recommendation of the independent Peer Review group to achieve agreement with ITS-Berkeley, indicating that:³⁵

In the Authority's view the professional opinions of the industry practitioner carry more weight in this particular "real world" context.

This "pulling rank" dismissal, which suggests that the work of an "industry practitioner" should carry more weight than that of an independent academic assessment, would seem to be particularly inappropriate in view of the dismal record of such practitioners in forecasting high speed rail ridership.

ITS-Berkeley stood by its original criticisms and more in April 11, 2011 testimony before the Assembly Transportation Committee. Report co-author Professor Mark Hansen said the ridership forecasts were:

*...not reliable enough to support the expenditure of billions of dollars.*³⁶

The issues raised by ITS-Berkeley remain unresolved, which in turn continue to cast doubt on the CHSRA ridership forecasts. In view of all such ridership factors, the CHSRA's dismissal of the Peer Review group's recommendation to work with UC Berkeley is unfortunate. The Authority's decisions to proceed based upon the disputed higher ridership and revenue projections could be very expensive for California taxpayers.

Reason's 2008 *Due Diligence* analysis of the CHSRA's initial plan concluded, based upon an analysis of high speed rail demand around the world and other factors, that the CHSRA ridership projections could be as much as 200% high. Analysis of the data in the April 2012 *Business Plan* confirms that the new ridership projections could be similarly optimistic. This report finds a number of ridership forecast problems with the Phase 1 Blended high speed rail proposal, each of which has the potential to reduce ridership and revenue from projected levels. This would increase the financial obligations of California taxpayers.

C. Review of Phase 1 Blended System Ridership Forecasts

Under the blended system, high speed rail trains would complete the trips to San Francisco and Los Angeles using the slower speed conventional trackage of the Peninsula and Metrolink commuter rail lines, which would be upgraded for somewhat higher speeds. In the early years, transfers would be required between high speed rail trains in San Jose and San Fernando to complete a San Francisco to Los Angeles trip. If, as in the past, unanticipated cost increases occur, it is possible that this *double transfer (three-ride trip)* between San Francisco and Los Angeles could be necessary for many more years, or even permanently.

This report evaluated the new ridership forecasts as contained in the April 2012 *Business Plan*. The CHSRA's new ridership range for 2035 is 19.6 to 31.8 million annually, with a medium projection of 25.7 million.³⁷ Because that figure includes both interregional and intra-regional (commuter) ridership, this *Due Diligence Update* focuses on the medium projection of 21.1 million interregional ridership because such traffic results in findings that are more useful in relationship to the overall system. Recall that Eurostar projected 25 million riders in 10 years on the London to Paris high speed train and achieved only 10 million.

The analysis in this *Due Diligence Update* is based upon the midpoint 2035 projections, which are reflective of ridership following the five-year "ramp up" period. The issues identified follow.

1. Consumer Cost Assumption Biased Against Automobiles

One of the most fundamental factors in accurate ridership projections is accurate consumer cost comparisons between high speed rail and other modes of travel. This is particularly important in California, because such a large share of high speed rail riders are forecast to be attracted from cars. The CHSRA ridership forecast uses unreasonably high automobile operating costs that skew the modeling results higher than are likely to be achieved.

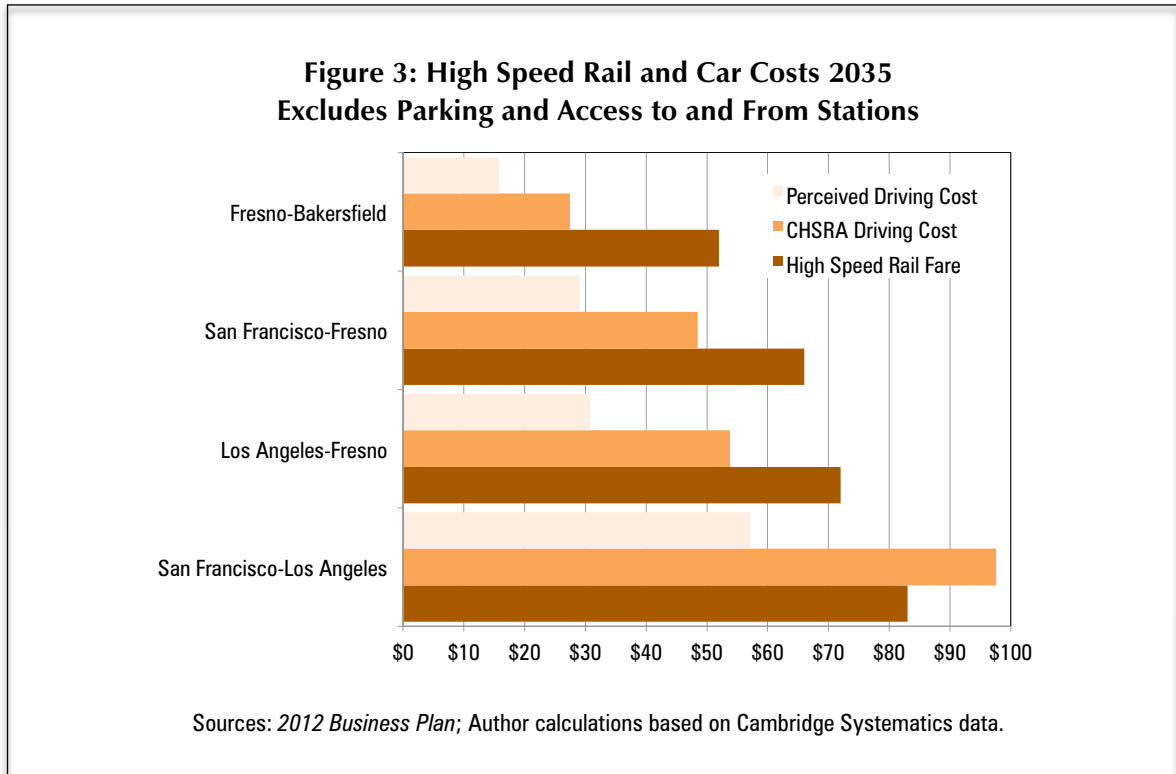
Generally, people consider only the out-of-pocket cost of gasoline as the cost of driving. This reality was noted by CHSRA consultant Cambridge Systematics in its peer review of the ridership modeling performed for the proposed Victorville to Las Vegas high speed rail line ("DesertXpress"). According to Cambridge Systematics: "travelers will rarely consider the full range of auto operating costs in their trip decisions" and that they tend to "consider their cost of [automobile] travel to be only their out-of-pocket gas costs."³⁸

By contrast, Cambridge Systematics' ridership modeling performed for the California High-Speed Rail Authority uses automobile costs that are higher than the out-of-pocket costs of gasoline. The company assumed 2030 gasoline costs per mile of travel at between \$0.10 and \$0.18 and then nearly double it by adding another \$0.10 for "non-gasoline" operating costs. The result is automobile costs higher than the average high speed rail fare on a San Francisco to Los Angeles trip, one quarter less on trips to the San Joaquin Valley (Fresno) and approximately one-half less within the San Joaquin Valley (Fresno to Bakersfield).

In fact, the out-of-pocket automobile costs would be nearly one-third less than the high speed rail fare for the San Francisco to Los Angeles trip, more than one-half less on trips to the San Joaquin Valley and 70% less on trips within the San Joaquin Valley (Figure 3).

Because the CHSRA automobile cost assumptions assume higher costs for driving than what people generally consider in making their travel choices, diversion to high speed rail will be lower than projected.³⁹ Based upon the high and low automobile cost alternatives in CHSRA documentation, it is estimated that the more appropriate use of out-of-pocket automobile costs

(consistent with the Cambridge Systematics critique of the Victorville to Las Vegas high speed rail modeling) would reduce the ridership attraction from automobiles nearly 50%.⁴⁰ Overall, this would reduce interregional ridership by more than 35%.



2. Implausibly High Rider Attraction from Automobiles

The international experience indicates that most high speed rail ridership comes from two sources, former rail passengers and former airline passengers. This is illustrated by the two examples cited in the April 2012 Business Plan:⁴¹

In France, the Paris to Lyon and Marseille intercity travel market had a rail market share of 40% before high speed rail service. High speed rail increased the rail market share to 72%, Most of the high speed rail ridership was transferred from the previous train service and the airlines. Only 11% of the ridership was from automobiles (Figure 4).

In Spain, the Madrid to Seville intercity travel market had a rail market share of 16% before high speed rail service. High speed rail increased the rail market share to 51%. Most of the high speed rail ridership was transferred from the previous train service and the airlines. Only 16% of the ridership was from automobiles (Figure 5).

Figure 4: Paris-Lyon-Marseille: Source of Ridership Market Share Transferred to High Speed Rail

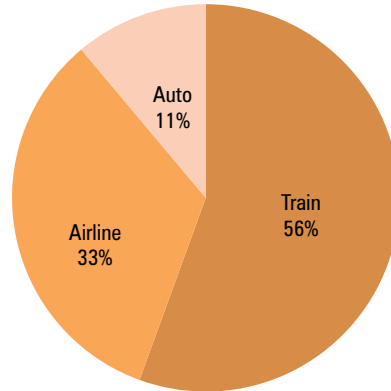


Figure 5: Madrid-Seville: Source of Ridership Market Share Transferred to High Speed Rail

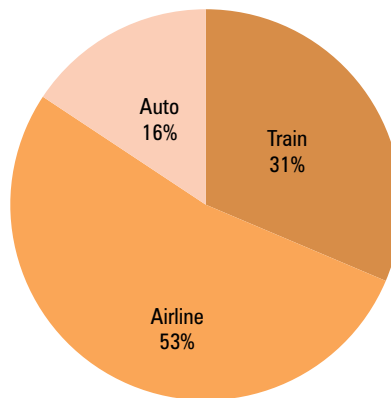
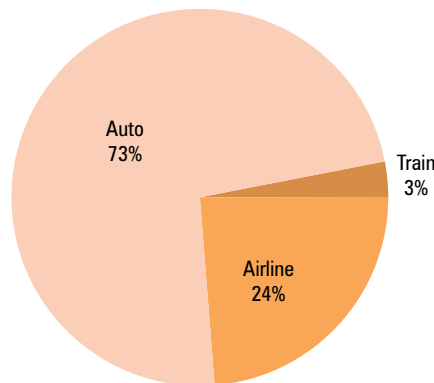


Figure 6: California Forecast: Source of Ridership Market Share Transferred to High Speed Rail



Sources for Figures 4, 5 and 6: Calculated from data in April 2012 *Business Plan* (CHSRA) and <http://www.cahighspeedrail.ca.gov/assets/0/152/431/7b890372-19c0-4ba7-aa98-aa1d49dea11b.pdf>

In both cases, a substantial share of the new high speed rail ridership was attracted from the already well-patronized rail services. Further, the number of riders attracted from airlines was three times or more greater than those attracted from cars.

These two international high speed train experiences highlight a fundamental difference from the San Francisco to Los Angeles market—existing rail services in California have only a miniscule market share and so this important source of ridership is absent in the state. Notice that in France 40% of the travel along the high speed train route was already by conventional train before they upgraded to high speed. In Spain it was 16%. In California it is just 3%. Those numbers say a lot about the interest of travelers in each place to travel by train.

The California high speed rail projections indicate virtually the opposite relationship between air and automobile passenger attraction as the European experience. In California, forecasts call for three or more times as many riders to be attracted from cars as from the airlines, virtually the reverse of the ratio of automobile to air passenger attraction in Europe (Figure 6).

3. Why High Speed Rail Attracts Fewer Passengers from Automobiles.

High speed rail can compete well with airlines in markets of 500 miles or less. This is because high speed rail can provide competitive travel times and fares are likely to be competitive with airlines. In California, for example, it is planned that high speed rail would have a 17% cost advantage compared to airline fares in the San Francisco to Los Angeles market. High speed rail and airline trip characteristics are also similar. Neither provides door-to-door service. Usually, at one or both ends of the trip, it is necessary to arrange for local transportation to the final destination, such as by personal car, taxi, rental car, or by transit. The difficulty of attracting ridership from automobiles to more costly high speed transportation is illustrated by recent experience in California.⁴² Another indication of the overly optimistic share of high speed rail ridership to be attracted from cars is illustrated by an example of recent airline market trends.

Generally, door-to-door travel can be expected to be faster by airline than by high speed rail.⁴³ The principal advantage of high speed rail that might attract automobile passengers is its lower price compared to airlines. The CHSRA plan claims the average San Francisco Bay area to Los Angeles area high speed rail fare will be 17% below the average air fare. It projects that a sizeable number of riders will be attracted from cars in this market (an amount equal to from nearly 25% to more than 40% of the total air market in 2035).⁴⁴

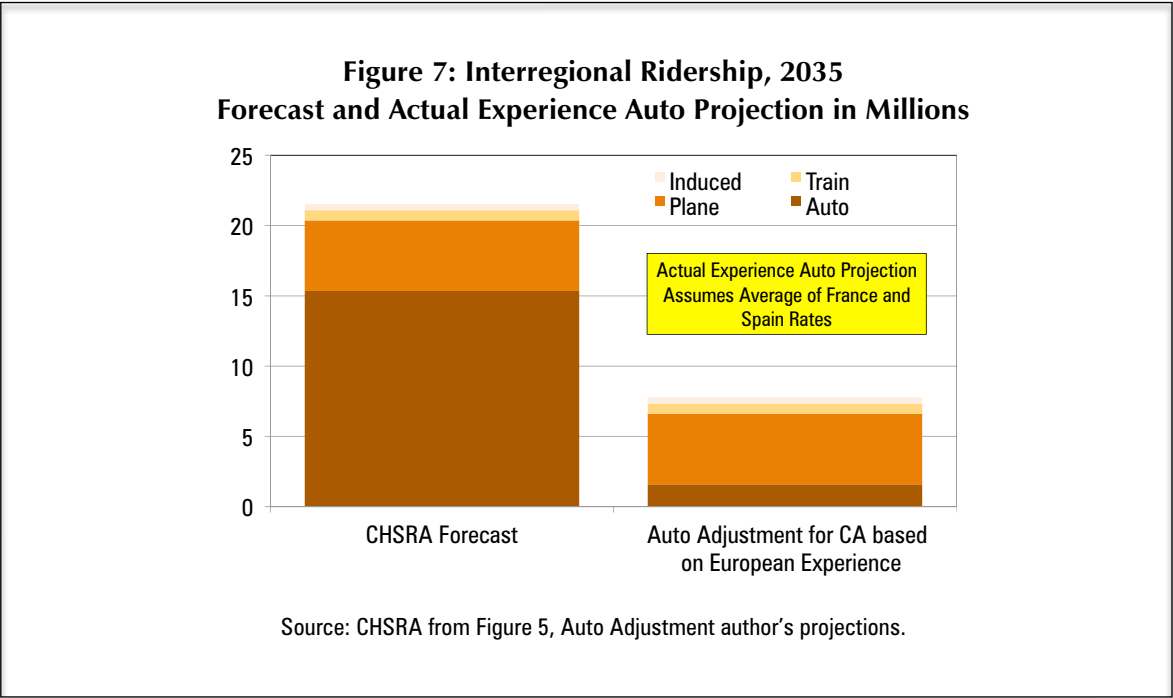
If the CHSRA is right and car users can be attracted in such high numbers to high speed rail (which is slower than airline travel), by 17% lower fares, it would seem likely that a similar airfares reduction relative to driving cost would attract a similar number of automobile passengers to the airlines. A review of recent experience suggests otherwise. Between the third quarter of 2004 and the third quarter of 2007, air fares declined 32% relative to the cost of car travel between the San

Francisco Bay Area and the Los Angeles area. Yet, air travel in these markets increased by only 2%.⁴⁵

Thus, the comparable airline experience indicates little potential for attracting riders from cars, which is consistent with the experience on the high speed rail systems of France and Spain.

High speed rail does not effectively compete with cars. Door-to-door travel times can be faster on high speed rail for longer trips, but people who take longer trips by car have air travel options in larger markets. However, most such travel is by car. Costs are a principal driver of this. The perceived cost of driving is far less than the cost of a high speed rail fare. The car’s cost advantage is increased by its advantage of door-to-door travel, so there is no need to arrange transportation from the high speed rail station to the final destination. Often, it will be necessary to pay parking costs at one end of a high speed rail trip. This cost is avoided by car travel. Finally, the high speed rail cost disadvantage compared to automobiles would be even higher where more than one person is traveling by car, thereby sharing the cost of operating the vehicle (compared with each person having to buy a ticket for the train).

The CHSRA California high speed rail automobile attraction forecasts are considered implausibly high. Based upon the experience in France and Spain, the passenger attraction from cars would be far less than forecast, at 90% lower. If the ridership model were adjusted to reflect this experience, intercity ridership in 2035 would fall from 21.1 million to 7.6 million, a reduction of 64% (Figure 7).⁴⁶ Even this forecast could be considered optimistic, because the higher cost of fuel in Europe would tend to result in a *higher* rate of diversion from automobiles than in California.



4. Lower Ridership from Slower Travel Times

It is likely that the travel times along the Phase 1 corridor will be considerably longer than currently projected. We estimate elsewhere in this *Due Diligence Update* that non-stop San Francisco to Los Angeles “one-seat” travel times will be in the range of 3:50 to 4:40, compared to the claimed 2:40.⁴⁷ Any increase in travel time can be expected to make high speed rail less competitive compared to airlines, reducing its ridership and revenue.

At the optimistic 3:50 travel time, based on analysis of the CHSRA ridership model, commuter ridership would be approximately 25% lower than at the CHSRA projected. The pessimistic 4:40 travel time would result in a nearly 50% reduction from the CHSRA ridership forecast.

5. Excessive Outside-the-Corridor Ridership Assumption

CHSRA ridership forecasts indicate that about 25% of ridership will be from cities farther out from the cities that have stations in the Phase 1 corridor, meaning they will drive across their region to the train stations. This is far higher than was projected in a year 2000 Charles River Associates “investment-grade” ridership projection and may not materialize (the current ridership projection is not labeled as investment-grade by CHSRA).⁴⁸ This factor would appear to represent an unjustified expansion of the ridership base, which could have the effect of forecasting a higher high speed rail ridership than is likely to occur.

Markets outside Phase 1 (those not located on the line between Los Angeles and San Francisco) are projected to account for nearly 25% of the total inter-regional ridership. This includes markets that will be served in Phase 2 (the San Diego and Sacramento extensions) as well as parts of the state that will not be directly served in either Phase 1 or Phase 2. Even with the slower blended system, the out-of-corridor markets account for 3.5 times the share that was estimated in the Charles River Associates investment-grade⁴⁹ ridership projection in 2000.

Travel from outside the corridor on high speed rail, such as from Sacramento to Fresno, Sacramento to Los Angeles, San Diego to Fresno or San Diego to Bakersfield would not provide cost advantages relative to driving (as noted above). Nor would it provide material time advantages. The less aggressive investment-grade ridership level seems likely to be more reliable.

6. Additional Factors

Additional factors could lead to an even larger gap between the ridership forecasts and the eventual actual ridership.

a) Slower Population Growth Rates

Overall population growth is an important element in future travel growth and is thus a significant factor in the long-term ridership potential of high speed rail. California's population growth has slowed substantially, and was considerably less between 2000 and 2010 than forecast by the state. The state Department of Finance projected that the counties in the metropolitan areas with high speed rail stations in Phase 1 would grow 10.0% from 2000 to 2010. However, the actual growth rate was 5.1%, or half the projection. If growth continues to be less than projected, travel demand will grow less and the market from which high speed rail would draw its customers would be smaller. More recently, the Sol Price School of Public Policy at the University of Southern California issued population projections⁵⁰ for the state, which scaled back the previous 2050 state Department of Finance forecast (released in 2007) from 60 million to 51 million.⁵¹ New population projections are to be issued by the state Department of Finance in 2013. Finally, in view of the more recently released data indicating that international migration from Mexico has fallen to a net zero, California's growth rate could fall even more in the future.⁵²

b) Optimistic Commuter Travel Forecast

CHSRA projects strong intra-regional (commuter or local) ridership in the Los Angeles and San Francisco areas, despite much higher fares than are available on existing commuter rail services.

In Los Angeles, Metrolink carries approximately 4.5 million annual intra-regional trips on its Antelope Valley and Orange County lines, at a maximum undiscounted fare of approximately \$20 (Anaheim to Palmdale).⁵³ High speed rail is projected to carry an *additional* 2.8 million annual intra-regional riders⁵⁴ over virtually the same route in 2035 on its trains, at fares of up to \$34.00.

In the San Francisco Bay Area, Caltrain carries approximately 11 million annual riders at a maximum fare of \$13.00 (six zones).⁵⁵ High speed rail is projected to carry another 1.7 million trips over the same route, at fare of up to \$23.00.

This *Due Diligence Update* does not estimate how much intra-regional ridership would be affected by such factors because focus on the interregional data results in more useful findings relating to the overall system. Nonetheless, it is not likely that there would be substantial demand for such higher-cost service either in the San Francisco Bay area or the Los Angeles area.

c). Excessive Air Travel Delay Bias

CHSRA forecasts that airline passengers will be the second largest source of high speed rail ridership. It reached this conclusion by using a formula for passenger waiting times that is identical to that of urban transit modes. People are more likely to travel by transit the less time they have to wait to depart. So more people will ride a bus that comes every 10 minutes than one that comes every 30 minutes. Bizarrely, the CHSRA assumes people use the same approach to flying and that they arrive at the airport a greater time before a flight departs if the flights are further apart in time.

In fact people arrive at the airport at a fairly consistent time before departure based on their experience with delays. By using this odd transit-based method of calculating waiting time, CHSRA assumes much longer waiting times at airports than reality, and thus longer door-to-door travel times for flying than reality, and thus contributing further to the forecasting error.

7. Due Diligence Update Ridership Projections

This examination of the CHSRA ridership projection identifies modeling irregularities that could result in an over-projection of ridership similar in scope to the already much-worse-than-average CHSRA capital cost projection errors. In fact, it seems likely that the CHSRA ridership projections could rival those of Eurostar for their inaccuracy.

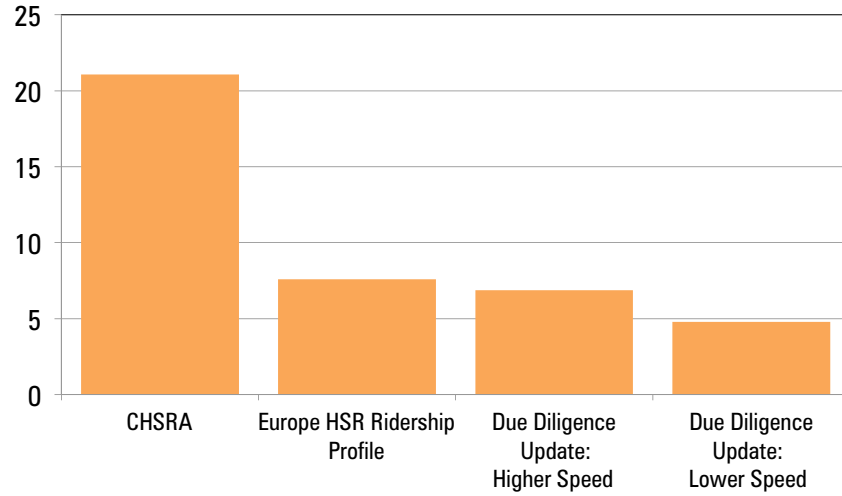
This *Due Diligence Update* estimates that the cumulative effect of the ridership miscalculations and other factors outlined above could be substantial, as follows (Table 2 and Figure 8):

- The “European Ridership Profile” assumes CHSRA-projected speeds, but applies the European ratio of car trips diverted to high speed rail. Moreover, as noted above, if the European automobile passenger attraction experience were applied to the California forecasts, ridership would be substantially lower, even assuming the likely unattainable higher CHSRA speeds. Ridership would be 64% lower (Figure 8).
- Estimated Higher Speed Ridership Projection: Assuming the optimistic travel time projection of 3:50, the 2035 interregional ridership would be approximately one-third (67%) below CHSRA-projected levels at 6.9 million annually.
- Estimated Lower Speed Ridership Projection: Assuming realistic automobile costs and more-plausible outside-the-corridor ridership, the 2035 interregional ridership would be 77% below the CHSRA-projected forecast, at 4.8 million annually.

Table 2: Interregional Ridership: 2035: CHSRA and Due Diligence Update Projections	
Scenario	Ridership (Millions of Annual Rides)
CHSRA Claim (Medium Projection)	21.1
CHSRA Speed with Europe High Speed Rail Ridership Profile	7.6
<i>Due Diligence Update: Higher Speed</i>	6.9
<i>Due Diligence Update: Lower Speed</i>	4.8

Sources: April 2012 *Business Plan* (CHSRA) and author’s projections.

**Figure 8: Interregional Ridership Forecasts: 2035 CHSRA and Due Diligence Update
Annual Ridership in Millions**



Sources: April 2012 *Business Plan* (CHSRA) and author's projections.

Part 4

Revenue and Operating Subsidies

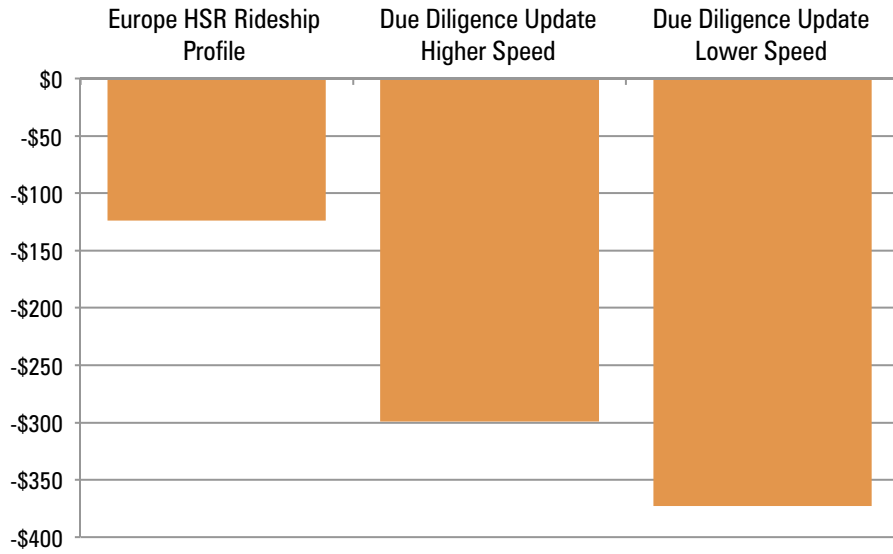
Based upon the more realistic ridership projections above, it appears likely that the California high speed rail system will require operating subsidies to cover its day-to-day financial losses. These losses are projected at \$124,000,000 to \$373,000,000 annually at the operating cost midpoint projected by CHSRA for 2035 (Table 3 and Figure 9):⁵⁶

- If the attraction of drivers from cars equals that of Europe (the European Ridership Profile Projection), annual operating subsidies are projected at \$124,000,000.
- At the *Due Diligence Update* Higher Speed Projection, annual operating subsidies are projected at \$200,000,000 annually.
- At the *Due Diligence Update* Lower Speed Projection, annual operating subsidies are projected at \$373,000,000.

These projected operating losses should be considered *optimistic*. The inaccurate financial projection record of both of the international high speed rail industry and the CHSRA suggest considerable caution with respect to anticipated operating costs.

Table 3: Projected Revenue Recovery: 2035		
	Midpoint	
Annual Operations and Maintenance Costs	\$744,000,000	
Ridership Projections	Revenue	Profit / (Loss or Subsidy)
European Ridership Projections	\$620,000,000	(\$124,000,000)
Due Diligence Higher Speed Projection	\$544,000,000	(\$200,000,000)
Due Diligence Lower Speed Projection	\$371,000,000	(\$373,000,000)

Figure 9: Operating Subsidy Forecast 2035, CHSRA and Due Diligence Update
Annual Operating Subsidies or Surplus, \$Millions



Source: Author's projections.

Part 5

Costs to Build

High speed rail capital cost projections around the world have been plagued by considerable inaccuracy. This is evident in the CHSRA projections and it appears likely that new capital cost estimates will be even higher.

A. High Speed Rail Cost Escalation: The International Experience

International research indicates that high speed rail projects often surpass their projected capital costs (costs of construction, stations, other facilities and trains). European academics Bent Flyvbjerg, Nils Bruzelius and Werner Rothengatter⁵⁷ examined 258 transportation infrastructure “megaprojects” covering 70 years in North America, Europe and elsewhere. They found that capital cost escalation on rail projects averages 45% from the point of project approval to completion. They also found that projects can exceed 100% above projections. Moreover, they found that capital cost overruns were pervasive, occurring in 9 out of 10 infrastructure projects. Flyvbjerg, et al also found that despite the rampant forecasting errors, there has been virtually no improvement in accuracy in recent years.

Flyvbjerg et al concluded:

Cost underestimation and overrun cannot be explained by error and seem to be best explained by strategic misrepresentation, namely lying, with a view to getting projects started.

B. California High Speed Rail Cost Escalation

The experience with CHSRA’s capital costs has mirrored and substantially exceeded the international cost escalation experience. The 1999 capital estimate for the equivalent Full Phase 1 system was \$23 billion in \$2011.⁵⁸ In 2008, California voters approved a \$10 billion bond issue for the line, which was then projected to cost approximately \$35 billion (all figures inflation-adjusted to 2011\$). The first round of big cost hikes came with the publication of CHSRA’s November 2011 *Business Plan*. Responding to criticism that its 2008 cost estimates were ridiculously lowball, the new business plan projected capital cost of the Full Phase I system from Los Angeles (Anaheim) to San Francisco had risen much faster than the average of 45% experienced internationally.⁵⁹ The November 2011 *Business Plan* revealed that the cost of Phase 1 had doubled in just three years, to between \$66 billion and nearly \$76 billion (\$2011). The authority also expressed the new capital costs in “year-of-expenditure dollars,” which are not inflation-adjusted,

at from \$98 billion to \$117 billion. This method of portraying costs is often not useful for comparison to other cost estimates, since it is not adjusted for inflation and can lead to unnecessary confusion.⁶⁰

At any rate, this cost escalation generated considerable controversy.⁶¹ Just a few months later CHSRA's April 2012 *Business Plan* introduced the "blended" system and substantially lowered estimates of the cost of the project. One might expect the cost of a big project to be what it really is, but the CHSRA seems able to shift costs up or down in response to public opinion.

C. The "Blended" System

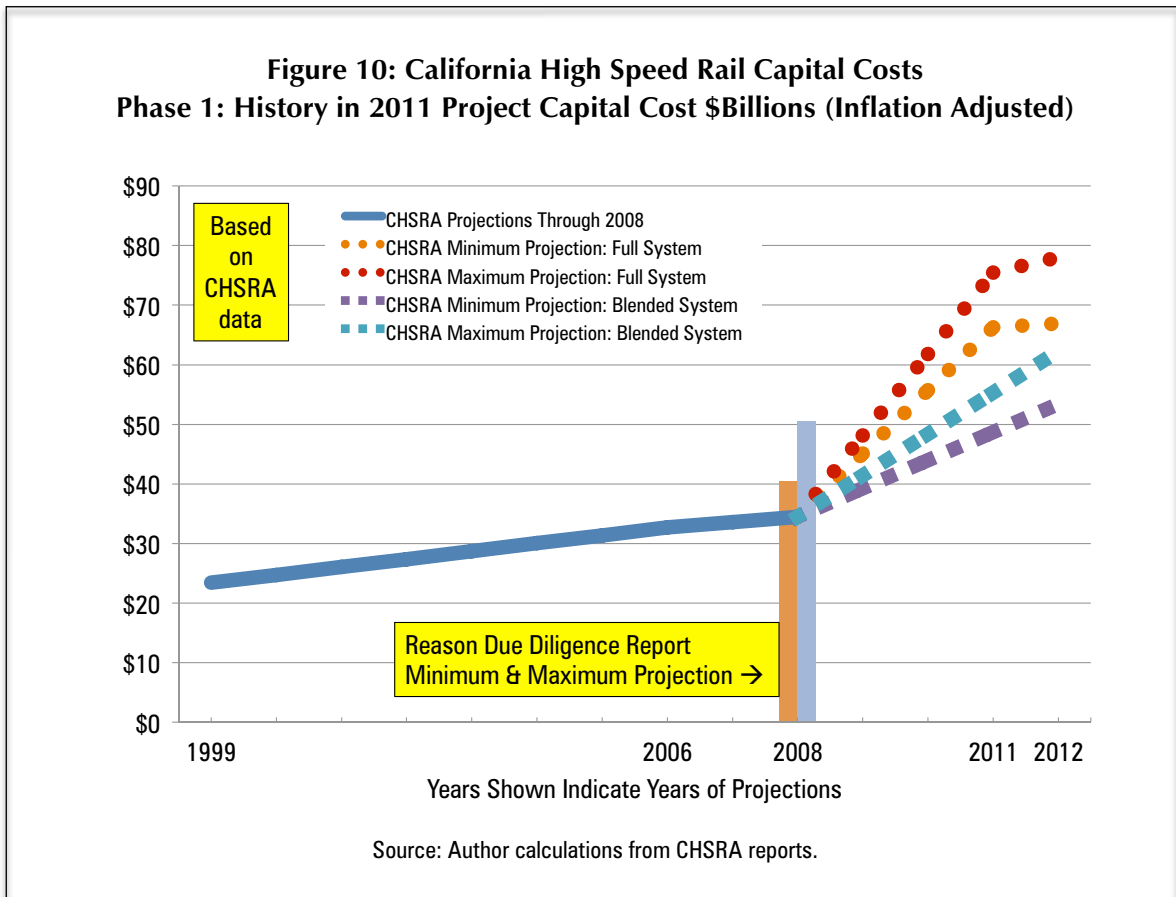
Responding to the outcry from the cost escalation, Governor Jerry Brown announced that major changes were being made to the plan and that the costs would not be nearly so high. The April 2012 *Business Plan* shifted to a "blended" system, replacing the former Full Phase 1 system. The dedicated high speed rail lines that were a part of the Full Phase 1 system were discarded between San Jose and San Francisco and in the Los Angeles Basin.

Under the blended system, as described in the April 2012 *Business Plan*, the total cost of Phase 1 dropped to between \$53 billion and \$62 billion (2011\$), a reduction of approximately \$13 billion from the cost of the Full Phase 1 system, in both the low and high cost scenario. The cost of the Full Build system, which would include high speed rail infrastructure from the Transbay Terminal in San Francisco to Anaheim, remains virtually the same as in the November 2011 *Business Plan* (at between \$66 billion and \$76 billion in 2011\$).

The cost reduction was achieved only by shortening the high speed rail line in the San Francisco Bay area and the Los Angeles Basin, which necessarily would result in slower travel times. Figure 10 illustrates the cost history of Phase 1 in 2011\$, showing the escalation of capital costs from 1999 to 2008 and the escalation of costs for both the Full Build Phase 1 (topping out at from \$66 billion to \$76 billion) and the Blended Phase 1 system (topping out at from \$53 billion to \$62 billion).

CHSRA principally used year-of-expenditure dollars in highlighting the new costs, claiming a savings of \$30 billion, with the low estimate dropping from the previous \$98 billion to \$68 billion.⁶² In fact, however, most of these "savings" were illusory, simply being the result of not using inflation-adjusted dollars.

An appropriate, apples-to-apples comparison can only be made in inflation-adjusted dollars. The genuine savings that are achieved by discarding the San Francisco Peninsula and Los Angeles Basin segments would be approximately \$13 billion, with the \$17 billion balance of the \$30 billion in savings not being genuine savings at all. Further, the \$13 billion reduction would be achieved only by shortening the high speed rail system.



D. Costliness of the Blended System

The new blended system also has costs well above the 1999 projection. The mid-point between the low and high cost estimate for the blended system is \$58 billion (\$53 billion to \$62 billion), approximately 150% above the 1999 projection. The blended system is also approximately two-thirds more costly than the cost projections that were publicized during the 2008 campaign for voter approval of the bonds.

This cost of the blended system exceeds the highest cost escalation projection in Reason’s 2008 *Due Diligence Report*. That report forecast a capital cost of between \$40 billion and \$50 billion for the Full Build Phase 1 of the California high speed rail system.⁶³ The CHSRA’s 2012 projected mid-point cost of the Full Phase 1 system was 60% above the 2008 *Due Diligence Report* projection and the cost of the blended system was nearly 30% higher (Table 4).

Table 4: California High Speed Rail Phase 1: Cost Projections (in \$Billion 2011 dollars)			
Cost Projection	Projection	Low Projection	High Projection
1. 1999 Business Plan: Full System	\$23.4		
2. 2006 Pre-Election Full System	\$33.2		
3. 2008.11 Business Plan: Full System	\$34.5		
4. 2011.11 Business Plan: Full System		\$66.3	\$75.5
5. 2012.04 Business Plan: Blended System		\$53.4	\$62.3
6. Exhibit: 2012.04 Business Plan: Phase 1 Full System		\$66.9	\$78.0
7. Due Diligence Report (2008): Phase 1 Full System		\$40.4	\$50.5
8 2012.04 Cost Above Due Diligence Report Forecast			
8A. Blended Phase 1 System		32%	23%
8B. Phase 1 Full System		66%	55%

Notes: Line 1: Adjusted to include Anaheim. Lines 1, 2 and 3: Adjusted based upon share of Full Phase 1 and 2.
Line 6: High Projection estimated from data in April 2012 *Business Plan*

E. The Future: More Cost Increases and a More Skeletal System?

At the same time, the potential remains for additional cost escalation, particularly on the San Jose to San Francisco and Los Angeles Basin segments (which involve upgrades of commuter rail systems) on which considerable additional planning is needed. There is also potential for additional cost escalation on other parts of the system. The reality of additional cost escalations is illustrated by the fact that CHSRA provides both a low and high capital cost projection.

Given the doubtful prospects for the CHSRA to obtain sufficient funding for the Phase 1 Blended system (See *Business Plan*, Funding chapter, Part I, Section 4), more degradation of the system could also be in the offing. For example, the blended system, with full high speed service from San Jose to the Los Angeles Basin, could be further truncated by requiring operation over commuter rail tracks over longer distances, as far as from Gilroy to San Francisco and from Palmdale (or even Lancaster) to Los Angeles and Anaheim. Such a system, raised as a possibility as the “Skeletal” system in Reason’s 2008 *Due Diligence Report*, was predicted to have a non-stop San Francisco to Los Angeles travel time of 5:30, more than double the statutorily required 2:40. The result would be that California would have the “form” of high speed rail (in a partial system), but not the substance (in high speed rail travel times).

Voters for the 2008 ballot Proposition 1A who relied upon the Authority’s promises that the project would cost \$35 billion can be forgiven if they have become perplexed about the ever-changing cost figures. As stated earlier, recent cost savings can be fully attributed to the failure to use inflation-adjusted figures and the fact that the two ends of the system have been literally cut off, with a corresponding increase in travel time that will make meeting the statutory travel time minimums even less achievable than the previous proposal. The Authority’s striking inability to forecast capital costs, which makes the international experience of error in high speed rail cost forecasting look modest by comparison, will cost the state’s taxpayers much more dearly than previously promised, while providing less service. Further, the hastiness of the recent plan’s development (as noted by the LAO) indicates that costs would rise even more in the future.

Part 6

Funding the Plan

The consequences of the ever-changing costs to build the California high speed rail system are more severe because the CHSRA funding plans have virtually no basis in fact. Warnings and criticisms have been issued time and again by a variety of sources, namely the California Legislative Analyst’s Office, State Treasurer, California High-Speed Rail Peer Review Group, State Auditor, a State Senate Committee, and other independent reviewers.

“Astounding” is the only word to describe the manner in which the Authority has ignored reviews ranging from constructive analysis to censure. Rail officials have done so despite the credibility of the studies, investigations and recommendations.

The CHSRA claims it will need \$53 billion to \$62 billion (in 2011\$, or \$68 billion to \$80 billion cost in “year-of-expenditure” dollars)⁶⁴ to complete the Phase 1 Blended system. While the Authority may have access to \$9 billion in funds from Proposition 1A bonds and \$3.5 billion in federal grants, additional funding sources are elusive or non-existent and may be subject to legal challenge.

Simply looking at the harsh judgment passed on the CHSRA’s funding plans by so many different groups is eye opening.

June 2008 – Demand for Prospectus-Type Documentation

The California Senate Transportation and Housing Committee defined what it wanted in future business plans and insisted on a prospectus. In every plan that it has subsequently issued, the CHSRA has failed to meet the following requirements:

The Authority must update its business plan in a format consistent with a standard financial prospectus of the type that is required to be prepared for investors in new stock or bonding offerings. A prospectus discusses the investment opportunity, its financial strategy, its benefits to the investors, as well as the types and level of risk the investors are assuming. It is essential that voters be provided with adequate financial information concerning the project.⁶⁵

September 2008 – Insufficient Public and Private Funding

Reason’s 2008 *Due Diligence Report* offered the most comprehensive review of the project as of that date and warned:

The CHSRA lacks a comprehensive financing plan. The proposed state bonds would be insufficient to build Phase I, much less the rest of the system. Little appears firm about potential matching funds from federal and local governments and from potential investors. . . . CHSRA advisor Lehman Brothers has outlined risks that can be a barrier to private investment, including cost overruns, failure to reach ridership and revenue projections and political meddling. . . . it appears unlikely that sufficient private funding and public subsidies will be found to finance the complete HSR plan.⁶⁶

April 29, 2010 – Financial Details Lacking

State Auditor Elaine M. Howle, in a report to the governor, Senate and Assembly, expressed similar dissatisfactions:

The December 2009 business plan of the High speed Rail Authority lacks detail regarding how it proposes to finance the high speed rail network and mitigate associated risks. . . . Further, the Authority estimates it will need \$10 billion to \$12 billion in private investment. Although it claims private interest is high, the Authority has not received any commitments from private investors.⁶⁷

June 28, 2011 – Danger to State’s Debt Service Obligations

State Treasurer Bill Lockyer called the project’s financing and its potential effect on state debt into question. According to *California Watch*:

I think the federal funding is too speculative [and] the likelihood of significant private capital is questionable.” . . . Lockyer said that in the next 25 years, the state will be asked to build about \$400 billion worth of infrastructure projects – everything from schools to flood control measures. “I don’t see the likelihood of public bond financing for as much as half of that number. . . . The state’s debt service obligation has been increasing rapidly.” And so, “because of the inability to finance all the needed infrastructure investments and the constraints on the growth of debt, it requires us to start allocating between the differing competing needs. . . . Is it prudent to cancel another worthwhile project and sell bonds for rail, given the project’s unsettled finances?⁶⁸

September 14, 2011 – Private Financing a Myth

Professionals with extensive financial experience addressed private-sector investment in an independent review:

The myth persists that private sector money, either ‘at risk’ or through Public Private Partnerships (PPPs), will appear after the State and Federal governments build an initial ‘proof of concept’. More than twenty years after the State began to invest in the concept, no private money has appeared. Neither the worldwide history of high speed rail, nor the Authority’s financial plans to date have proven there is sufficient profit in the project to overcome the all-too-obvious financial risks. Ask a simple question . . . “why haven’t private investors clamored for the opportunity to build California’s system at their risk?”⁶⁹

January 3, 2012 – Not Financially Feasible

The independent California High-Speed Rail Peer Review Group found a lack of financial feasibility in the Authority’s November 2011 draft *Business Plan*:

The fact that the Funding Plan fails to identify any long term funding commitments is a fundamental flaw in the program. Without committed funds, a mega-project of this nature could be forced to halt construction for many years before additional funding could be obtained. . . . Moreover, we are not optimistic that this situation will change in the foreseeable future. The legislature could, of course, rectify this by enacting a dedicated fuel tax or some other form of added user charge that would not aggravate the existing State budget deficit. Lacking this, the project as it is currently planned is not financially “feasible.”⁷⁰

January 24, 2012 – Increasingly Risky

State Auditor Elaine M. Howle declared:

[T]he program’s overall financial situation has become increasingly risky, in part because the Authority has not provided viable funding alternatives in the event that its planned funding does not materialize. In its 2012 draft business plan, the Authority more than doubles its cost estimates for phase one of the program, to between \$98.1 billion and \$117.6 billion. Of this amount, the Authority has secured approximately \$12.5 billion to date. The success or failure of the program consequently depends upon the Authority’s ability to obtain between \$85.6 billion and \$105.1 billion by 2033. In its 2012 draft business plan, the Authority identifies the federal government as by far the largest potential funding source for the program, yet the plan provides few details indicating how the Authority expects to secure this money. Further, the plan does not present viable alternatives in the event that it does not receive significant federal funds.⁷¹

April 17, 2012 – Federal Funding Disallowed

On the same day the LAO issued its report, the federal government again pulled back from high speed rail funding when the Senate Transportation Appropriations Subcommittee disallowed all of the Administration's FY 2013 request for \$4 billion for high speed rail and the House followed suit. Nor was any high speed rail funding approved in the recent extension of federal transportation spending.

April 17, 2012 – No Additional Funding Recommended

The independent and nonpartisan Legislative Analyst's Office found:

The future sources of funding to complete Phase I Blended are highly speculative. Specifically, the funding approach outlined in the 2012 revised business plan is no more certain than what was proposed in previous plans. For example, the recent plan assumes nearly \$42 billion, or 62% of the total expected cost, will be funded by the federal government. However, about \$39 billion of this amount has not been secured from the federal government. Given the federal government's current financial situation and the current focus in Washington on reducing federal spending, it is uncertain if any further funding for the high-speed rail program will become available.⁷²

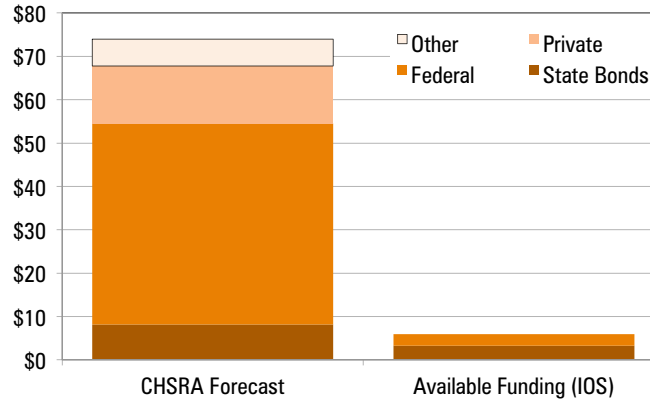
In fact, the \$42 billion cited by the LAO is the CHSRA's low estimate. The high estimate for federal funding is nearly \$51 billion (in year-of-expenditure dollars⁷³). This means that \$39 billion to \$48 billion of this amount has not been secured from the federal government.⁷⁴

The LAO continued:

We find that HSRA has not provided sufficient detail and justification to the Legislature regarding its plan to build a high speed train system. Specifically, funding for the project remains highly speculative and important details have not been sorted out. We recommend the Legislature not approve the Governor's various budget proposals to provide additional funding for the project.⁷⁵

The gap between CHSRA's theoretical funding program and reality is substantial (Figure 11). The CHSRA's financing assertions are virtual fantasy and represent additional evidence that its April 2012 *Business Plan* sorely fails the test of what constitutes a credible business plan. The understated risks could have the costly consequence outlined by Elizabeth Goldstein Alexis, co-founder of Californians Advocating Responsible Rail Design, who said, "We continue to have the risk of either stranded investments, or the even bigger risk that California is forced to spend money it does not have to salvage something."⁷⁶

Figure 11: CHSRA Funding Plan: Theory and Reality: Forecast and Actual Funding Available: 2012 \$Billions of \$YOE



Source: Estimated from April 2012 *Business Plan* (CHSRA) and author's estimates of available funding

Jon Coupal, President of the Howard Jarvis Taxpayers Association, said, “If this project were wholly within the purview of the private sector, it would have been terminated long ago. When private capital is at stake, there is a time at which responsible business managers grasp the folly of pouring good money after bad.”⁷⁷

The CHSRA’s deaf ear toward a multitude of independent findings and recommendations is an example of an insularity that could ultimately lead to California taxpayers being obligated to pay many billions in capital and operating subsidies, despite specific promises to the contrary.

This report reiterates the finding in the 2008 *Due Diligence Report*—it is possible that the system will either be built only in part or not at all.⁷⁸

A. The Federal Reimbursement Deadline

Recent investigative reporting by a Los Angeles television station⁷⁹ revealed that CHSRA faces a serious challenge in completing even the modest first segment in the San Joaquin Valley in sufficient time to obtain reimbursement for the federal share of costs. An affidavit filed on behalf of CHSRA in a lawsuit indicated that it would be necessary for the construction to be completed by February of 2017 to comply with the deadline for federal reimbursement under the American Recovery and Reinvestment Act of 2009.⁸⁰ The affidavit stated: “The schedule to complete construction by February 2017 is extremely aggressive.” It further indicated that “The large scope of the project and the short time frame in which to complete requires construction work at an unprecedented pace—the fastest rate of transportation construction known in U.S. history...” The affidavit indicated that major construction (“in earnest”) would not begin until late 2013 or even early 2014 on the short 30-mile segment between Madera and Fresno.

Following these disclosures, CHSRA amended the affidavit to indicate that “construction activities would commence no earlier than the second half of 2013 ... with construction likely commencing with more limited construction activities ramping up thereafter.” The amendment is not inconsistent with the original, but is simply less specific. The revised statement that construction would commence no earlier than the second half of 2013 allows for the possibility that it might not start until early 2014 or later. This, combined with the fact that the longer segment, south of Fresno toward Bakersfield appears to be approximately one year behind the majority of the Fresno section in construction planning could mean that it is nearly impossible for CHSRA to complete the segment in time to be fully reimbursed by the federal government.

Part 7

The Costs of Alternatives to High Speed Rail

For some time now the CHSRA and high speed rail promoters have repeatedly claimed that it will cost the state more to expand highways and airports if the rail system isn't built. The assertion is that such alternatives to high speed rail would cost \$171 billion (year-of-expenditure dollars, \$98 billion to \$118 billion in 2010\$) to expand highways and airports.

A writer for *Mother Jones* stated that the CHSRA's "unrealistic estimates of what the alternatives to high speed rail would cost" are "jaw-droppingly shameless." It added: "There's not even a pretense here of providing a reasonable, real-world traffic estimate that could be used to project the cost of alternative infrastructure. A high school sophomore who turned in work like this would get an F."⁸¹

The Legislative Analyst's Office also took issue with the CHSRA's contention:

***Alternative Cost Estimate Overstated.** The draft business plan compares the estimated \$99 billion to \$118 billion cost of constructing high speed rail with an estimated \$170 billion cost of adding equivalent capacity to airports and highways. This comparison is very problematic because \$170 billion is not what the state would otherwise spend to address the growth in inter-city transportation demand. The HSRA estimates that the high speed train system would have the capacity to carry 116 million passengers per year but their highest forecasted ridership is significantly less than that amount—44 million rides per year (roughly 40% less than capacity).⁸²*

This was an absurd argument from the start, since it was based upon theoretical capacity rather than the actual capacity that CHSRA intended to provide. Further, the genuine, practical analysis of the amount of money that would be saved in airport and highway construction as a result of high speed rail was not performed.

A new and similar analysis accompanied the April 2012 *Business Plan*. Astoundingly, the new analysis increases the "cost of alternatives," despite a significant scaling back from the Phase 1 "Full Build" system to the Phase 1 Blended system. While this new absurd contribution has received little attention, this section provides a critique of the analysis that can be used should promoters raise the issue anew.

A. Highway Analysis

Putting aside for the moment the CHSRA's fundamentally flawed methodology, the highway expansion costs are greatly exaggerated. CHSRA starts with the assumption that capacity is determined by infrastructure (tracks), not trains on tracks.

The CHSRA claims that duplicating the carrying capacity of the Phase 1 Blended high speed rail line would cost \$93.3 billion (2011\$). This calculation is based upon the *theoretical* right-of-way or track capacity, rather than on the *actual* capacity being planned (the seats on the trains). The following discussion outlines the exaggerations inherent in this method compared to the actual Phase 1 Blended system capacity planned for 2040 (as indicated in the April 2012 *Business Plan* and supporting documentation). In general, CHSRA claims a need to add six lanes on parallel highways (three lanes in each direction) to equal the capacity of the high speed rail line.

Exaggerating Train Capacity: In the new highway alternative cost analysis, the CHSRA uses a train size of more than twice as many seats as it intends to operate in 2040 (1,000 seats instead of 450 seats). Correcting this exaggeration reduces the actual capacity by 55%.

Exaggerating Train Frequencies: The Authority used more trains with more capacity in its capacity analysis than it actually plans to operate in 2040. Correction of this exaggeration would reduce the revised capacity by another 87%.

Exaggerating Highway Construction: The CHSRA claims that it would be necessary to add the high speed rail capacity in duplicate (the longest being the parallel SR-99 and I-5 routes in the San Joaquin Valley). Each route segment would require an additional six lanes. Correction of this exaggerated build capacity on only one highway (since there will be only one high speed rail line) would reduce the revised capacity by another 41%. The duplicated routes include:

- (1) US-101 on the San Francisco Peninsula and I-880 in the East Bay from San Francisco to San Jose.
- (2) Altamont Pass to SR-58 in Bakersfield (principally I-580 and SR-99) and San Jose to SR-99, to SR-58 west of Bakersfield (on US-101 to Gilroy, SR-152 east to the I-5 junction to SR-58).
- (3) The "Grapevine" (I-5) and Palmdale to the I-5 junction, on the northern edge of the San Fernando Valley (SR-14).

The cumulative effect of correcting these exaggerations is significant. Overall, it would take 97% less (\$3.3 billion, instead of \$93.3 billion) than the CHSRA projection to provide the expanded highways to match the 2040 high speed rail capacity (Table 5). Even this figure could be exaggerated. The highway costs used by CHSRA are generally higher than indicated by the Federal Highway Administration for California (Table 6).

Table 5: Comparison of CHSRA Alternative Capacity Costs v. 2040 Planned HSR Capacity (\$Billions of 2011 dollars)

	Capacity Claim	2040 Capacity	Adjusted to 2040 Capacity	Revised Cost
CHSRA Claim				93.3
CHSRA Claim Adjusted				
Train Seats (70% of Load Factor)	700	315	(55.0%)	\$42.0
Daily Trains	456	62	(93.9%)	\$5.7
Miles of Highway to Expand	750	439	(96.4%)	\$3.3

Table 6: Highway Construction Costs per Lane Mile: FHWA & CHSRA (In \$Millions of 2011 dollars; Estimated from FHWA Data)

	FHWA	CHSRA	Additional CHSRA Cost
Rural: Flat	\$3.3	\$6.0	83%
Rural Mountainous	\$10.2	\$6.0	(41%)
Urban (Under 5,000 Population)	\$9.5	\$40.0	320%
Urban (50,000 – 200,000)	\$10.5	\$40.0	282%
Urban (200,000 – 1,000,000)	\$17.7	\$40.0	126%
Urban (Over 1,000,000)	\$42.3	\$40.0	-5%

Finally, a useful analysis for business and policy planning would estimate the actual savings in infrastructure costs that would occur from cars that are removed from the road by high speed rail. Even then, high speed rail would be appropriately credited for only its attributable share of any expansion that is avoided. As the analysis of the more generous and irrelevant CHSRA capacity analysis above indicates, this would be a very small number.

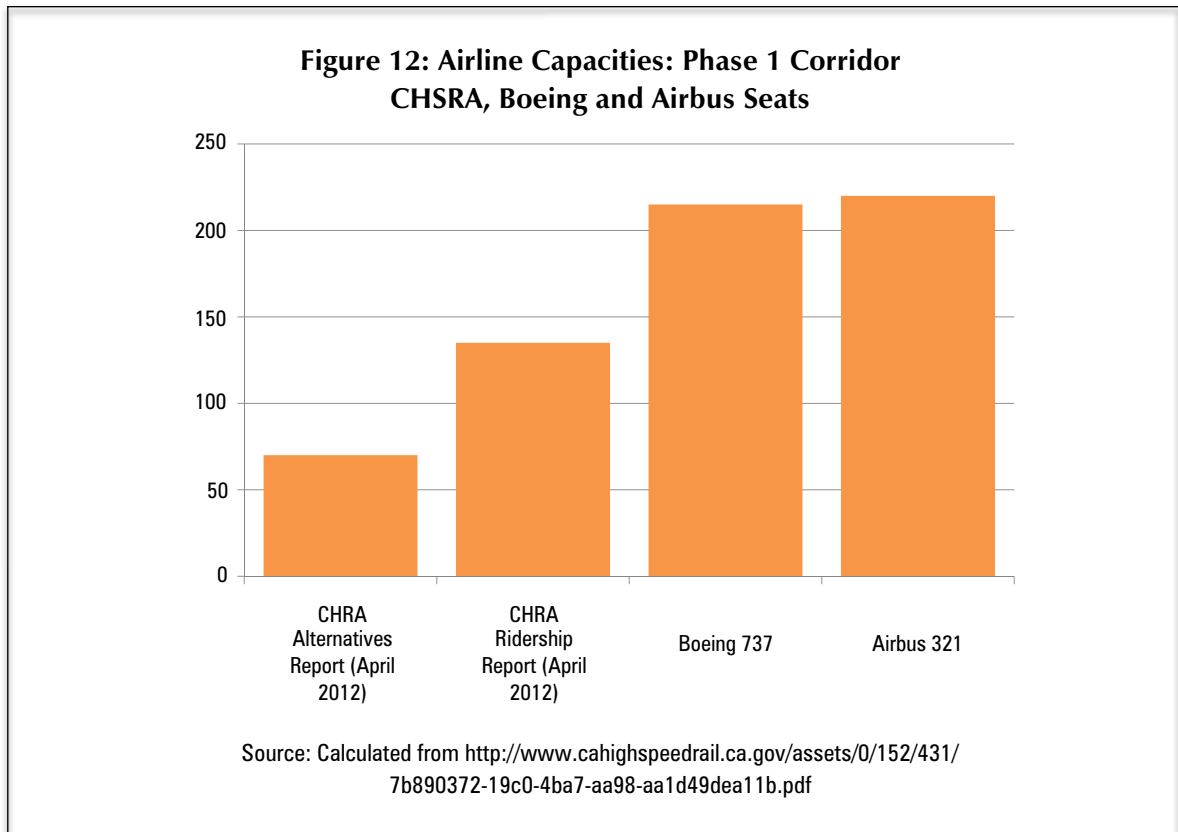
B. Airport Expansion

The Authority concludes that equivalent airport capacity would cost \$30.3 billion (2011\$). CHSRA's analysis assumes substantial terminal and runway expansion that would be required based upon an average airplane capacity of 70 passengers.

This capacity is far below the current average capacity for airlines in the California according to the Authority's own *Ridership and Revenue Forecasting Memorandum: Final Technical Memorandum*⁸³ where Table B-1's average capacity of airliners whose destinations are within California is 135.⁸⁴ For the CHSRA to concurrently publish documentation with such radically different data (a nearly 50% understatement in the average airliner capacity) is concerning and is the type of inconsistency that would not be expected from a state agency with a multi-million dollar annual budget. Further, this error is not unlike others that have led to such serious errors in ridership projections in other projects.

Despite the fact that the "capacity" analysis is irrelevant from a public policy perspective, at the current airliner average capacity, all of the anticipated additional demand that is expected in the next 25 years can be accommodated by current airport capacity.

Further, should greater capacity be required, it would be a relatively simple matter to substitute aircraft up to three times as large. The latest Boeing-737 models have a maximum capacity of 215 passengers and the latest Airbus-321 carries up to 220 passengers, three times the CHSRA assumption (Figure 12).⁸⁵



Airlines routinely make adjustments in the size of aircraft based upon market demand. The substitution of larger aircraft would require no additional airport gates or runways, meaning that there would be little or no additional cost to airports to accommodate the passengers who would opt to remain air travelers instead of becoming high speed rail travelers.

C. The Difference: Who Pays?

Important distinctions exist in the manner that high speed rail, highway and airline expansions are funded. The intercity highways that CHSRA asserts would require expanding are generally paid for by users through federal and state gas taxes and tolls. Airport infrastructure is paid for by users through dedicated airport and airline taxes.⁸⁶ In contrast, high speed rail riders would not pay for the infrastructure or debt and operating subsidies (see the *Business Plan Ridership, Revenue and Operating Subsidies* chapter, Part I, Section B). While capital and operations costs for intercity travel by air and automobile are paid for almost exclusively by users, no such option is feasible for rail, including high speed rail. That is why there has never been a serious proposal to fund high

speed rail without burdening taxpayers. Auto-style or aviation-style taxes added to high speed train riders' tickets are unlikely to be feasible considering that ticket costs would rise. As a result, unlike the airport and automobile systems, high speed rail needs taxpayer subsidies, most likely out of California's general fund, to pay for construction, construction-related debt and subsidized operations.

Part 8

Greenhouse Gas Reductions and the Use of Cap-and-Trade Revenue

Throughout the history of the California high speed rail project, there have been claims that the system would substantially reduce greenhouse gas (GHG) emissions.⁸⁷ Apparently believing these assertions, Governor Brown and the California High-Speed Rail Authority have proposed using “cap-and-trade” revenues under Assembly Bill 32 (the Global Warming Solutions Act) to help finance system construction.⁸⁸ If the high speed train were able to measurably reduce GHG emission, they could sell “credits” for those reductions in the state cap-and-trade market.

But the high speed rail system would not likely be an efficient use of cap-and-trade revenues. The United Nations Intergovernmental Panel on Climate Change (IPCC) has estimated that sufficient greenhouse gas emission reductions can be achieved at a cost of \$20 to \$50 per ton. The Authority has produced no analysis of the cost efficiency of greenhouse gas reductions from the project. Using CHSRA data, Reason’s 2008 *Due Diligence Report* estimated that the cost for greenhouse gas emissions removed by the high speed rail project would be approximately \$1,800 per ton.

This estimate was considered conservative, since it did not include the GHG emissions that would have been produced in the construction of the system. Research at the University of California, Berkeley concluded that at the midpoints of vehicle occupancy for cars, airlines and high speed rail in the corridor, it would take 71 years for high speed rail to save enough greenhouse gas emissions to negate the emissions from construction.⁸⁹

Meanwhile, the cost of the system has more than doubled and ridership projections have been materially scaled back. It is thus likely that an updated estimate of the cost per ton of GHG removed would be considerably higher. This is a clear indication that high speed rail is not an effective means for reducing greenhouse gas emissions.

Reason is not alone in this conclusion. The Legislative Analyst’s Office (LAO) has reviewed this issue and recommended that:⁹⁰

...the Legislature prioritize GHG mitigation programs that have the greatest potential return on investment in terms of emission reductions per dollar invested. . . .

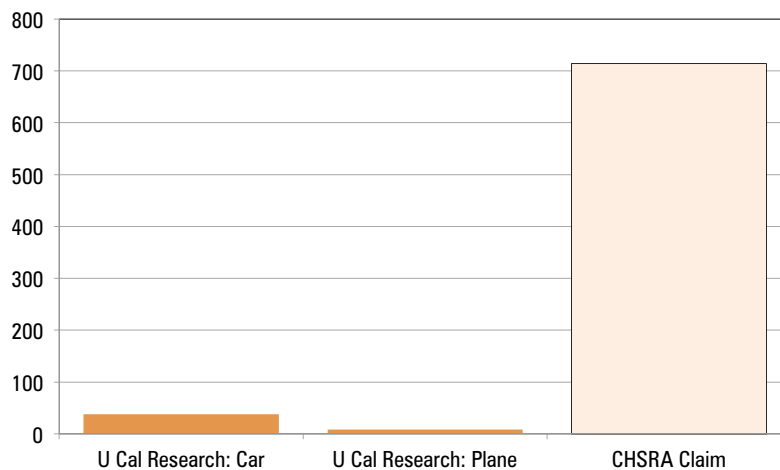
Considering the cost of a high speed rail system relative to other GHG reduction strategies (such as green building codes and energy efficiency standards), a thorough cost-benefit

analysis of all possible strategies is likely to reveal that the state has a number of other more cost-effective options. In other words, rather than allocate billions of dollars in cap-and-trade auctions revenues for the construction of a new transportation system that would not reduce GHG emissions for many years, the state could make targeted investments in programs that are actually designed to reduce GHG emissions and would do so at a much faster rate and at a significantly lower cost.

CHSRA’s April 2012 *Business Plan* fails to provide any new information on greenhouse gas emission impacts and the Authority continues to use outdated and exaggerated data. The CHSRA website indicates that a single trip between San Francisco and Los Angeles on high speed rail would reduce GHG emissions by 714 kilograms, or 324 pounds.⁹¹ This is in stark contrast to the midpoint data developed in the University of California research, which found that greenhouse gas emissions on a trip between Los Angeles and San Francisco would be reduced by 8 kilograms compared to travel by airline and 38 kilograms compared to travel by car. The CHSRA claim is thus an exaggeration of between nearly 20 and 90 times.

The University of California research uses a comparatively low load factor for airlines (67%). At an 80% load factor, which has been achieved in recent years, there would be no difference between the greenhouse gas emissions of airlines and high speed rail between Los Angeles and San Francisco (Figure 13) and thus no reduction in GHG emissions.

**Figure 13: GHG Emissions Reductions from Los Angeles to San Francisco
Midpoint: UC Berkeley Analysis (Kilograms / Passenger Trip)**



Sources: Mikhail Chester and Arpad Horvath, “Life-cycle Assessment of High speed Rail: The Case of California,” http://iopscience.iop.org/1748-9326/5/1/014003/pdf/1748-9326_5_1_014003.pdf; CHSRA “Trip Planner,” accessed April 19, 2012, http://www.cahighspeedrail.ca.gov/trip_planner.aspx

Further, the CHSRA's Strategic Energy Plan claims that the high speed rail system will reduce greenhouse gas emissions by using electricity that is generated by greener alternatives (renewable power).⁹² This would not achieve greenhouse gas emission reductions because in purchasing green power CHSRA would be displacing purchases of the same green power by other customers. In the final analysis, the use of green power for the high speed rail system would not reduce overall greenhouse gas emissions at all, since the same power would otherwise be used by other customers and the total GHG emissions would remain the same.

CHSRA April 2012 *Business Plan* has updated its GHG emissions analysis, indicating that reductions will be higher than previously projected. However, if anything, the present estimate should be substantially lower. The shorter system (which excludes Sacramento and San Diego), the slower, less-frequent trains, and the lower ridership projections would combine to make the GHG reduction more modest. Further, automobile fuel efficiency can be expected to improve much more than was expected in 2008, by virtue of improving vehicle technology and federal regulations that now require new cars to reach an average of 54.5 miles per gallon by 2025. This could as much as halve the GHG emissions per mile of car travel by 2035.

The new projections are not plausible and are driven, in part, by future automobile fuel economy assumptions that are far higher than projected by the United States Department of Energy. This results in a huge over-statement of GHG reductions. Environmental expert Joel Schwartz shows that CHSRA assumed that automobiles would average 21.5 miles per gallon in 2035, when a more realistic figure would be 38 miles per gallon. Schwartz estimates that the CHSRA methodology overstates GHG emissions reductions by between 130% and 190%.⁹³ Schwartz also notes that GHG reductions are likely to be even less because of overly optimistic ridership projections.

Assembly Bill 32 established significant greenhouse gas emissions reduction goals for California. This is a daunting task and the most cost-effective means should be employed to minimize economic disruption and job losses. Governor Brown and CHSRA officials have suggested that "cap-and-trade" revenues from AB 32 be used to partially finance the high speed rail system. As is indicated above, the high speed rail system is not a cost-effective strategy for reducing GHG emissions. Use of cap-and-trade funding for high speed rail would, in fact, *increase GHG emissions* compared to the levels that would be achieved if the funding were used more cost effectively.

Thus, any use of cap-and-trade funding for high speed rail would be counter to the state's GHG emission reduction policy, raising questions about the state's genuine commitment to the objective. The key to any effective use of AB 32 revenues is prioritization based upon the least cost per GHG emission ton reduced. Because of its exorbitant cost per ton, high speed rail's use of cap-and-trade revenue would be a serious breach of the intent of California policy with respect to reducing GHG emissions. The fact that GHG emission reductions from high speed rail will be exceedingly costly and contrary to the spirit of AB32 is an indicator that AB32 could be deteriorating into just another Sacramento pork-barrel program.⁹⁴

Part 9

The Plan vs. What Voters Were Told

In April 2008 the California legislature passed a law which became Proposition 1A to approve bonds for the high speed rail project stating “the Secretary of State shall use the following as the ballot title”—the “Safe, Reliable High speed Passenger Train Bond Act for the 21st Century”—and also dictated the wording in the ballot summary.⁹⁵

Unfortunately, the title and summary were deceptive in that they conveyed only highly positive attributes of the proposed system, and the legislature’s action was in violation of the 1974 Reform Act designed to promote impartiality in ballot descriptions that must be written by the Attorney General of California. In January 2011, a state appeals court ruled that the legislature lacked authority to draft the ballot language for Proposition 1A. *The Sacramento Bee* observed:

The Howard Jarvis Taxpayers Association had challenged the ballot language for Proposition 1A, arguing the Legislature used its pen to “lavish praise on its measure in language that virtually mirrored the argument in favor of the proposition.” The appeals court sided with HJTA [stating], “the Legislature cannot dictate the ballot label, title and official summary for a statewide measure unless the Legislature obtains approval of the electorate to do so prior to placement of the measure on the ballot.”⁹⁶

The decision, which came more than a year after the election, did not invalidate Proposition 1A. Nonetheless, the manipulation of ballot language is illustrative of actions taken to provide less-than-credible language to the public. In short, California voters were misled in numerous ways regarding the high speed rail plan.

“Facts” as outlined in Proposition 1A or promised in related promotions were deceptive at the time they were issued and every indication is that they are false today. As but one example, the language requires that bond funds “would be used, together with any available federal monies, private monies, and funds from other sources, to develop and construct a high speed train system that connects San Francisco Transbay Terminal to Los Angeles Union Station and Anaheim, and links the state’s major population centers, including Sacramento, the San Francisco Bay Area, the Central Valley, Los Angeles, the Inland Empire, Orange County, and San Diego.”⁹⁷ However, CHSRA has no credible plan to build the segments to Sacramento or to San Diego or the Inland Empire.

Moreover, Orange County experienced a surprising removal and rather fast restoration of the link to Anaheim. According to *The Orange County Register*:

For years, the idea of a high speed rail system in California has been sold as a line that would whisk passengers from the San Francisco Bay Area to the resort area of Anaheim.... Instead of getting to Anaheim at speeds of up to 220 mph via train, travelers would have to take slower trains to make the 30-mile trek south of Los Angeles.... State voters approved the concept of an Anaheim-to-San Francisco line with Prop 1A in 2008.”⁹⁸

Within a week of Anaheim’s removal, the 2012 *Business Plan* was revised still again and Anaheim was restored to the system.⁹⁹ Such equivocation hardly builds confidence that the system that will be delivered is the system that the voters approved.

Table 7 indicates what voters were told in 2008 and what in reality is likely to be implemented.

Table 7: What California Voters Were Told & The Reality Today		
Phase 1 System	Voters Told in 2008	Reality in 2012
Fares	The cost to travel between Los Angeles and San Francisco will be “about \$50 a person.” ¹⁰⁰	The CHSRA states that the average fare for such a trip will be \$81. ¹⁰¹
Ridership	Ridership will be between 65.5 and 117 million annually.	The CHSRA’s range for 2035 is 19.6 to 31.8 million, with a medium projection of 21.1 million. ¹⁰² This <i>Due Diligence Update</i> estimates under two scenarios are 6.9 million and 4.8 million.
Operating Subsidies	No operating subsidies will be required.	Independent studies conclude that ridership and revenue forecasts are overstated and the system will need taxpayer-funded operating subsidies in perpetuity.
Construction Cost	The Phase 1 (San Francisco-Los Angeles/Anaheim) system was to have cost \$35 billion (2011\$)	It escalated to between \$66 and \$76 billion by November 2011 and has since dropped to \$53 billion to \$62 billion. The “savings” are illusory—they result by removing major sections at both ends of the line and not using inflation-adjusted dollars.
Fastest Los Angeles-San Francisco Non Stop Train Travel Time	2:38	This report estimates that time will be no faster than 3:50.

The train proponents' inaccurate characterizations predated the vote on Proposition 1A and remain with the shortcomings in the 2012 *Business Plan*. In a pattern of activity inappropriate for an agency established to serve the public, the CHSRA continues to promote unreliable information to advance a program that will cost taxpayers billions of dollars.

The result is a virtual moral breach of contract with the voters. A home builder or car dealer could not unilaterally raise the price of a contracted house or car without facing possible prosecution. Public agencies should be held to at least as high a standard as applies to businesses.

The California high speed rail program appears to be out of compliance with state statutes, so much so that the project is vulnerable to a wave of litigation. The Legislative Analyst's Office found that CHSRA's third draft business plan, issued in November 2011, failed to demonstrate firm funding commitments and that the environmental process is incomplete. The LAO concluded that the plan "does not meet the requirements of Proposition 1A." The findings in the 2011 LAO report remain germane today:

*Proposition 1A identifies certain requirements that must be met prior to requesting an appropriation of bond proceeds for construction. These include identifying for a corridor, or a usable segment thereof, all sources of committed funds, the anticipated time of receipt of those funds, and completing all project-level environmental clearances for that segment. Our review finds that the funding plan only identifies committed funding for the ICS, which is not a usable segment, and therefore does not meet the requirements of Proposition 1A. In addition, the HSRA has not yet completed all environmental clearances for any usable segment and will not likely receive all of these approvals prior to the expected 2012 date of initiating construction.*¹⁰³

The fourth business plan (April 2012) contains the same or similar shortcomings.¹⁰⁴

Furthermore, a legal analysis submitted to the independent High speed Rail Peer Review Group by California Attorney Michael J. Brady explains why the CHSRA Central Valley project as defined in the third business plan is ineligible for Proposition 1A and AB 3034 bond funding:

*The voters were not asked to approve \$9 billion in bond funds for general railroad improvements, or new. . . railroad commuter lines, for Amtrak, or anything other than a statewide High Speed Rail Project including trains that would run at more than 200 mph. Any effort to use state bond funds for anything other than a High Speed Rail Project is simply illegal.*¹⁰⁵

The estimated travel times, which are lengthened due to slower operations over the "blended system," appear to fall sufficiently short of statutory requirements to warrant challenges to their legality under both AB 3034 and the ballot measure it created, Proposition 1A.

Recent lawsuits by communities, environmental organizations and citizens groups include plaintiffs such as cities, environmental organizations such as the Planning and Conservation League, citizens groups including the Community Coalition on High Speed Rail and the California Rail Foundation. Palo Alto, Menlo Park and Atherton have sued based on environmental grounds,

particularly that the CHSRA's business plan and program-level Environmental Impact Report are in direct contradiction regarding the type of system (two-track or four-track) that will be built as part of the "blended system" along the San Francisco Peninsula. Also, the EIRs fail to address the impact of having elevated structures along the Peninsula.¹⁰⁶ Reason's 2008 *Due Diligence* report forewarned that "Opposition could spread, particularly in communities where train speeds and noise would be considered excessive, and where massive elevated railways would create a 'Berlin Wall.'" ¹⁰⁷

The CHSRA has twice lost such suits along the Peninsula, forcing revisions in its EIRs, and Central Valley farm groups also are pursuing legal challenges based on environmental issues. Madera and Merced county farm bureaus, along with Madera County and additional plaintiffs, state that in the Merced-Fresno area alone the project would affect 1,500 acres of prime farm land and 150 agribusinesses, including a major ethanol plant.¹⁰⁸ Officials of the two bureaus say more than 500 farmers whose lands lie in the path of the route also plan to fight any attempts by the state to seize their properties.¹⁰⁹

Proposition 1A requires that trains connect San Francisco with Los Angeles Union Station in two hours and 40 minutes or less.¹¹⁰ The provision has sparked legal action south of Fresno where a Kings County lawsuit challenges the CHSRA's claim that it can meet the legal requirement. The lawsuit states that no documentation exists to verify such a high-performance system capability. After the Community Coalition on High Speed Rail filed a Public Records Act request for the data underlying the performance claim, a representative for the CHSRA acknowledged that no such document exists.¹¹¹

Additional communities may join their cause because the high speed rail system is materially scaled back so far that even the extensions to San Diego, Sacramento and Oakland, promised in law, have little or no probability of ever being built.

Potential grounds for legal challenges are the Authority's own documents, many of which contain excuses and justifications for cost increases. Other issues that would serve as the foundation for legal challenges are that legislators were seriously misled by prior testimony as were the voters prior to the 2008 election that included Proposition 1A.

Part 10

Conclusion

The 2008 *Due Diligence Report* expressed concern about the advocacy nature of the Authority's work, stating that their publications "convey more of a bias than objective analysis, and their content at times present unrealistic claims."

Just as in Reason's 2008 *Due Diligence Report*, this *Due Diligence Update* has cited numerous realistic reviews of the Authority's plan and documentation. Particularly noteworthy is the review of the plan issued in late 2011 by the senior academic and business professionals associated with the Community Coalition on High Speed Rail, which clarified the general deficiencies of the CHSRA's business plans:

Business Plans in the private sector are produced by men and women who have invested, and will invest, their time, intellectual capital, and normally a tremendous amount of their personal financial capital into making the future venture a success. For private enterprises that have outside shareholders, there is also a group of committed investors who press to maximize efficiency and opportunity for the business. Unfortunately, for an enterprise like High Speed Rail that aspires to be treated like a business but run by the public sector, what is missing is the lack of a strong personal financial stake in turning a profit. Because of this difference, financial commitments become promises; forecasts become guesses, and statement of facts become estimates. This is due to the consultants and managers having "no skin in the game." Given this tremendous difference, elected officials need to take what is told to them, or provided to them in a Business Plan, with a large grain of salt – and to think through . . . the consequences to the State if the [CHSRA] goes ahead but does not meet its proponents' financial assertions and expectations.¹¹²

Even the Sierra Club, which supports the concept of a high speed train in California, is critical of the CHSRA's current business plan, stating in a letter to the CHSRA "as currently proposed, the rail project will either not be completed, will be completed in a way that would create substantial, unmitigated environmental damage, or will be completed at the expense of other pressing transit needs."¹¹³

Richard Tolmach of the California Rail Foundation was more succinct in his conclusion about the 2012 *Business Plan*, saying, "This time, more than last time, is a sales job. It doesn't have actual facts, but it must have 20 pictures of [rail] boosters and parades."¹¹⁴

That is less of a harsh statement than it might at first appear because legislators, particularly in the State Assembly, appear to have bought into what Tolmach called the “sales job.” California veteran journalist Dan Walters noted during April 18, 2012 hearings:

*This is the largest state public works project in U.S. history, one that would cost tens of billions of dollars and divert money from a deficit-ridden state budget. Independent reviewers, including the Legislature’s own budget analyst, have expressed serious doubts as to its financial viability. The Assembly subcommittee’s members, however, treated it just like another routine budget request. Several were downright gushy over the bullet train, unwilling to delve into the very serious questions about its efficacy.*¹¹⁵

Such an approach by the Assembly appears to fall short of the attention required for such an expensive project, one with significant long-term consequences.

A state Senate Committee has taken a less charitable view and has become frustrated with the Authority’s unrelenting advocacy. Again, journalist Dan Walters noted that during an April 18, 2012 Senate budget subcommittee hearing, that Chair Joe Simitian said, “Our job is oversight, not cheerleading.”¹¹⁶

It is remarkable that the Assembly committee and past legislatures have continued to fund the agency in a business-as-usual manner despite the plethora of findings that the quality of CHSRA’s work is below par, that project risks have been under-estimated, and that the statutory requirements of AB3034 and Proposition 1A are being violated.

The CHSRA’s excuses about program flaws are similar to rationalizations used on other similar projects¹¹⁷ in which costs had been unrealistically minimized and benefits exaggerated, inducing public officials and the electorate to proceed, usually after cancellation is no longer feasible. Had genuine projections been made from the start, the project would likely have been cancelled long ago.

This *Due Diligence Update* concludes that the Authority’s 2012 *Business Plan* appears to convey no more credibility than did CHSRA’s prior reports. This would be a concern in the best of times. But as is clear to virtually everyone in California and experts who follow issues of public finance, these are more like the worst of times in California. The state continues to spend more than it takes in. Unfunded state employee pension obligations have been estimated at more than \$500 billion. The state debt load is large and concerns have been raised that the school system, the state university system and other public services, state and local, may not be sustainable in the current environment. In a word, a project as flawed as the California high speed rail line would be unwise at any time, but is even more so in the present difficult times.

Table 8: Summary of CHSRA 2012 *Business Plan* Failings
 A summary of the problems with the *Business Plan*: where its projections and predictions may go wrong and how that might lead to consequences for Californians.

Unachievable Train Speed Assumption	<ul style="list-style-type: none"> ▪ Current <i>Business Plan</i> does not include the promised, and legislatively mandated, 2:40 non-stop travel time Los Angeles to San Francisco. ▪ CHSRA plan says the train will on average be faster than any train in existence, and faster than the Transportation Research Board says is safe. ▪ The “blended system” approach in the Business Plan requires shared tracks and slower speeds in the Los Angeles and San Francisco metro areas. ▪ Reason’s <i>Due Diligence Update</i> projects likely fastest travel times of between 3:50 and 4:40.
Implausible Ridership Projections	<ul style="list-style-type: none"> ▪ Independent reviews of CHSRA ridership projections by the Legislative Analyst’s Office, California State Auditor, UC Berkeley Institute of Transportation Studies, legislative Peer Review Group, and Reason Foundation have repeatedly pointed out that CHSRA’s ridership projections are “unreliable” and “inflated.” ▪ Experience from European high speed trains suggests that the shift of riders from cars to the high speed train will likely be 90% less than CHSRA predicts. ▪ When realistic and generally accepted costs of driving are compared to high speed train fares, ridership from automobiles will likely fall 50%. ▪ When realistic travel times are used rather than the 2:40 trip originally promised, ridership likely falls by 25–50%. ▪ CHSRA predicts a medium case of 21.1 million riders/year by 2035. Reason’s <i>Due Diligence Update</i> predicts 4.8 to 6.9 million.
Spiraling Costs Misrepresented to Voters	<ul style="list-style-type: none"> ▪ Costs in the current plan for Phase 1 are \$58 billion, 60% higher than the cost told to taxpayers when voting to fund the project. ▪ Those higher costs pay for a smaller system than was promised to voters.
No Funding Plan	<ul style="list-style-type: none"> ▪ To pay for Phase 1, the CHSRA only has \$3.5 billion in federal grants and the ability to borrow \$9 billion in state bonds. ▪ The remaining \$45 billion has not yet been found. The plan calls for it to come from the federal government and private sector. ▪ Federal spending on high speed rail has been cut. ▪ Since this train will not make money and will require significant subsidy, the private sector will not invest its money.
Incorrect Assumptions About Alternatives to High Speed Rail	<ul style="list-style-type: none"> ▪ The CHSRA plan argues that the cost of expanding the roads and airports to accommodate predicted growth in intercity travel are \$171 billion. ▪ Several independent analyses have refuted that number. The Legislative Analyst pointed out that the CHSRA methodology is flawed and the figure they use is “not what the state would otherwise spend to address the growth in inter-city transportation demand.” ▪ The CHSRA’s alternatives cost estimates greatly exaggerate train capacities and frequencies, and the costs of highway construction and need for more airport space. For example, they assume you can only increase flight capacity by more planes, and ignore the more common approach of using bigger planes.
Fares Keep Going Up	<ul style="list-style-type: none"> ▪ In 2008 voters were promised fares of “about \$50 a person”. That has gone up to \$81 already. ▪ CHSRA’s comparison of car vs. train cost to the rider assumes only individual travelers, omitting that if more than 1 is travelling by car, with costs shared between travelers, it will be vastly cheaper.

Public opinion is shifting in California. Realistic projections are being heard and compared with the Authority’s unlikely projections, generating a nearly unprecedented debate about erroneous and misleading planning. Since Reason’s 2008 *Due Diligence Report* was issued, public understanding has grown about the risks of the program. The reality is that the high speed rail project will impose many billions of dollars of additional taxation on Californians, not only to build the system, but to finance it and pay the operating subsidies in perpetuity.

California voters are suffering from buyer's remorse and it appears that a majority of voters have turned against the project. Proposition 1A was approved by 53% to 47% in the 2008 election, but in 2011 a USC Dornsife/*Los Angeles Times* Poll found that with the cost of the high speed rail project rising dramatically "a clear majority of California's registered voters would reject the proposal if given a second chance to vote on it today."¹¹⁸ The finding tracks a similar poll that year by Probolsky Research that found 62.4% of respondents would vote to stop the bullet train project and nearly that number said they are unlikely ever to travel on the train between San Francisco and Los Angeles.¹¹⁹

In mid-2012, another Dornsife/*Los Angeles Times* Poll found similar results.¹²⁰ The new poll prompted Dan Schnur, director of the poll and the Unruh Institute of Politics at USC to state that "California voters have clearly reconsidered their support for high speed rail. They want the chance to vote again—and they want to vote no. The growing budget deficit is making Californians hesitant about spending so much money on a project like this one when they're seeing cuts to public education and law enforcement. But they also seem to be wary as to whether state government can run a big speed rail system effectively."¹²¹ Some political leaders are calling for a new vote on the plan.¹²²

Noted *Sacramento Bee* columnist Dan Walters points out that the need for a bullet train "exists only in the minds of its ardent backers. While California has many local transportation problems, traveling between the state's northern and southern regions isn't one of them."¹²³ It is not too late save the California economy and taxpayers the enormous costs of the California high speed rail project.

About the Authors

Wendell Cox is principal of Demographia, a St. Louis region-based public policy firm. He was appointed to three terms on the Los Angeles County Transportation Commission by Mayor Tom Bradley, where he introduced the amendment to Proposition A (1980) that established the local funding set-aside for the Los Angeles light rail and metro lines. He was also appointed to the Amtrak Reform Council by Speaker of the House Newt Gingrich to complete the unexpired term of New Jersey Governor Christine Todd Whitman. There, he was instrumental in forging the final financial self-sufficiency plan that was required by the U.S. Congress.

He has worked on numerous projects in the United States and internationally. Mr. Cox's professional endeavors on urban and intercity transport have the objective of ensuring that riders and taxpayers receive fair value in return for their funding and that scarce public resources are directed to the most beneficial projects and programs.

Mr. Cox is co-author of *The California High Speed Rail Proposal: A Due Diligence Report* published by Reason Foundation in September 2008, which anticipated many of the project's shortcomings that have recently been outlined in other studies.

He is author of the 1997 James Madison Institute evaluation report on the proposed Florida Overland Express high speed rail system, and authored reports on subsequent Florida high speed rail proposals. He is also author of Reason Foundation's *The Tampa to Orlando High Speed Rail Proposal: Taxpayer Risk Assessment*.

His analysis of the proposed Las Vegas Monorail contained accurate ridership projections, in contrast to the project-sponsored "investment grade" projections that were more than double the eventual ridership. His prediction that the Las Vegas system would ultimately be unable to service its bonded indebtedness has now been repeated by Wall Street analysts. His 2000 commentary in the *Apple Daily*, Hong Kong's largest newspaper, argued for vigorous expansion of that urban area's rail system.

He lectures widely and is a frequent op-ed commentary contributor. His regular "newgeography.com" column includes "The Evolving Urban Form" series, consisting of profiles of world urban areas.

He served for nine years as a visiting professor at the Conservatoire National des Arts et Metiers in Paris, where he lectured on transport and demographics.

Demographia's "Public Purpose" website (www.publicpurpose.com) was designated twice by the *National Journal* as a "Top Transport Internet Site." Demographia's principal website (Demographia.com) is home of the *Annual Demographia International Housing Affordability Survey*, with metropolitan area data in six nations and Hong Kong and *Demographia World Urban Areas*, the only annual compendium of population, land area and density data for identified urban areas with more than 500,000 population.

Joseph Vranich has been involved in rail passenger issues for more than 40 years. He has advocated building high speed train systems through public-private partnerships and served as President/CEO of the High Speed Rail Association in the early 1990s, where he won the Distinguished Service Award. He has testified numerous times before the U.S. Congress on high speed rail and Amtrak—including Amtrak's high speed Acela program. Early in his career he served as an Amtrak public affairs spokesman.

Mr. Vranich is co-author of *The California High Speed Rail Proposal: A Due Diligence Report* published by Reason Foundation in September 2008, which anticipated many of the project's shortcomings that have recently come into public view.

He has spoken internationally at the invitation of Japan's Ministry of Transport, Japan's Railway Technical Research Institute, European railway suppliers, and addressed a visiting Chinese government delegation in comments that were published in *Vital Speeches*. Also, he has met with the U.S. Department of Transportation, the Office of Management and Budget, and the U.S. General Accountability Office on rail passenger issues and was a U.S. Senate appointee to the Amtrak Reform Council.

He is the author of *Supertrains* (St. Martin's Press, 1991), a book advocating construction of HSR systems in the U.S. His second work, *Derailed: What Went Wrong and What to do About America's Passenger Trains* (St. Martin's, 1997), recommended creation of public-private partnerships and competitive franchising. His most recent book, *End of the Line: The Failure of Amtrak Reform and the Future of America's Passenger Trains* (AEI Press, 2004), outlined how Amtrak failed to comply with reform laws; it also detailed development of Amtrak's high speed Acela trains and examined railway reforms in 55 nations.

He has addressed rail issues on many TV and radio programs, including the CBS Evening News, CNN News, CSPAN and National Public Radio. His work has been featured in *The New York Times*, *Newsweek* and *Railway Gazette International* and his commentaries have appeared in *The Wall Street Journal*, *Washington Post*, *Chicago Tribune*, *Orange County Register* and many other publications.

Endnotes

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- ¹ The three excerpts are from “The 2012-13 Budget: Funding Requests for High speed Rail,” Legislative Analyst’s Office, April 17, 2012, <http://www.lao.ca.gov/analysis/2012/transportation/high-speed-rail-041712.aspx>
 - ² “California High-Speed Rail Program Draft 2012 Business Plan,” California High-Speed Rail Authority, November 1, 2011, p. 6-10.
 - ³ Examples of coverage: “Interview: New California High-Speed Rail Chairman Dan Richard Makes His Case,” KQED News, March 7, 2012, <http://blogs.kqed.org/newsfix/2012/03/07/interview-with-new-california-high-speed-rail-chairman-dan-richard/> and “Calif. set to release \$68.4B high speed rail plan,” Associated Press, as published in the *Fresno Bee* (and many other publications), April 2, 2012, <http://www.fresnobee.com/2012/04/02/2784527/calif-set-to-release-684b-high.html>
 - ⁴ Californians Advocating Responsible Rail Design addressed the issue in a summary found at <http://www.calhsr.com/wp-content/uploads/2012/04/CARRD-travel-time-inconsistencies.pdf>
 - ⁵ Top high speed rail speeds have been reduced in recent years. From 2008 to 2011 some high speed trains in China reached 217 mph (350 kph). A few months *before* the tragic Wenzhou high speed rail crash, China reduced maximum speeds to 186 mph (200 kph), including on its then soon-to-be-opened Shanghai-Beijing route (which had been planned to operate at 236 mph, or 380 kph). Reports conflicted on the justification for the speed reduction, which included improved safety—see “High speed rail in China-Tracking slower” *The Economist*, June 0, 2011 <http://www.economist.com/node/18898016>—and the substantially greater energy use and higher greenhouse gas emissions that result from the higher speeds. See Brian Spegele, “China Puts Brakes on High Speed Trains,” *The Wall Street Journal*, April 15, 2011, <http://online.wsj.com/article/SB10001424052748703983104576262330447308782.html> in which a Chinese rail executive is characterized as saying that at the higher speeds, “wheels slip so much that you need bigger motors and significantly more electricity to operate. There is also so much wear on the tracks that costs for daily inspections, maintenance and repairs go up sharply. That’s why in Europe, Japan and Korea no operators run trains above 320 kilometers an hour.” In Spain and Korea, officials had intended top speeds of 217 mph (350 kph), but operate at peak speeds of 193 mph (310 kph) or less. In Japan, Taiwan and Germany, peak high speed rail speeds are 186 mph (300 kph).
 - ⁶ The communities are Palo Alto, Menlo Park and Atherton; the nonprofit groups include the California Rail Foundation, the Transportation Solutions Defense and Education Fund (TRANSDEF) and the Planning and Conservation League; the citizens’ groups are the Community Coalition on High Speed Rail and the Midpeninsula Residents for Civic Sanity. Source: Gennady Sheyner, “Palo Alto, Menlo Park, Atherton sue rail authority,” Palo Alto Online, October 4, 2010, http://www.paloaltoonline.com/news/show_story.php?id=18494
 - ⁷ Gennady Sheyner, “High speed-rail critics eye fresh legal challenges,” *Palo Alto Weekly*, April 11, 2012, http://www.paloaltoonline.com/news/show_story.php?id=24981

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- ⁸ Transportation Research Board, *In Pursuit of Speed: New Options for Intercity Passenger Transport*, National Research Council, 1991, Table A-15.
- ⁹ Super-elevation is the distance in height between the inside and outside edges of the bed of a banked road or track. The U.S. railroad system operates some of the largest freight cars and longest freight trains in the world—larger than those in Europe—which while adding to the efficiency of U.S. rail carriers also present engineering constraints in track design. The best track design for U.S. freight trains is not ideal for high speed passenger trains and the best track design for high speed passenger trains is not ideal for U.S. freight trains. One reason tracks in Europe are more compatible is that European freight cars are smaller and lighter. Even there, however, the highest-speed sections of track rarely are used by freight trains. Most true high speed systems in the world are completely freight-train free (there are some express packages or mail carried in standard HSR trains that are modified or designed for the purpose, or in special cars).
- ¹⁰ See Caltrain 2025 electrification http://www.caltrain.com/projectsplans/Projects/Caltrain_Modernization_Program/High_Speed_Rail_Coordination/peninsularailprogram/Caltrain_2025__Electrification_.html
- ¹¹ Caltrain weekday schedules in effect on April 15, 2012. Northbound timetable at <http://www.caltrain.com/Assets/schedules/Weekday+Northbound+Printer-Friendly.pdf> and southbound timetable at <http://www.caltrain.com/Assets/schedules/Weekday+Southbound+Printer-Friendly.pdf>
- ¹² “Tracking slower,” *The Economist*.
- ¹³ Spegele, “China Puts Brakes on High speed Trains.”
- ¹⁴ Chowchilla, Madera, Fresno, Hanford, Corcoran, Bakersfield and Santa Clarita have all expressed concerns about such speeds through their communities.
- ¹⁵ It is assumed that 220 mph operation, if it were achievable, would result in an average operating speed of no more than 165 mph in rural areas.
- ¹⁶ Adding up the mileage intervals between stations, the total distance from San Francisco to Los Angeles would be 448 miles, including 48 miles from San Francisco to San Jose and approximately 100 miles of urban and 300 miles of rural operation.
- ¹⁷ It is assumed that each station stop adds 11.67 minutes to the travel time. This is the result of slowing from top speed to a stop, “dwell” time in the station for passengers to disembark and board, and the time required to resume top speed (estimate based upon the average time per stop added to the Madrid—Barcelona non-stop travel time).
- ¹⁸ See particularly the *Due Diligence Report*, Section C, “Forecasting Speed” and Section D, “Federal Safety Standards.”
- ¹⁹ Ronald Campbell and Lance Williams, “New bullet train plan shaves \$30B from cost,” *California Watch*, April 3, 2012, <http://californiawatch.org/dailyreport/new-bullet-train-plan-shaves-30b-cost-15598>
- ²⁰ California High-Speed Rail Peer Review Group, letter to Senator Joe Simitian and Assemblyman Richard Gordon, August 22, 2011, p. 1, <http://www.calhsr.com/wp-content/uploads/2010/10/Response-to-Sen-Simitian-Proposal.pdf>
- ²¹ “Editorial: New train promised to be cheaper, sooner, longer, slower,” *The Orange County Register*, April 3, 2012, <http://www.ocregister.com/opinion/train-347559-voters-billion.html>

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- ²² Flyvbjerg is a professor at Oxford University in the United Kingdom. Bruzelius is an associate professor at the University of Stockholm. Rothengatter is head of the Institute of Economic Policy and Research at the University of Karlsruhe in Germany and has served as president of the World Conference on Transport Research Society (WCTRS).
- ²³ Bent Flyvbjerg, Nils Bruzelius and Werner Rothengatter, *Megaprojects and Risk: An Anatomy of Ambition*, (Cambridge, UK: Cambridge University Press, 2003)
- ²⁴ Ibid., p. 14.
- ²⁵ Ibid., p. 26.
- ²⁶ See Parliament of the United Kingdom, *Public Accounts - Thirty-Eighth Report*, <http://www.publications.parliament.uk/pa/cm200506/cmselect/cmpubacc/727/72705.htm> and BBC, *Eurostar sales up in 2009 despite travel chaos*, <http://news.bbc.co.uk/2/hi/business/8469399.stm>.
- ²⁷ Douglas John Bowen, "U.S. riders aid Eurostar 2011 ridership, revenue," *Railway Age*, March 12, 2012
<http://www.railwayage.com/index.php/passenger/high-performance/us-riders-aid-eurostar-2011-ridership-revenue.html?channel=54>
- ²⁸ Optimism bias and strategic misrepresentation are also covered in Peter W.G. Morris, Jeffrey K. Pinto and Jonas Soderlund, 2011 eds., Chapter 13 by Bent Flyvbjerg: "Over Budget, Over Time, Over and Over Again," *The Oxford Handbook of Project Management* (Oxford University Press), pp. 321-344.
<http://www.sbs.ox.ac.uk/centres/bt/Documents/Flyvbjerg11OverBudgetOverTimeOverAndOverAgainManagingMajorProjects.pdf>
- ²⁹ Paul Amos, Dick Bullock and Jitendra Sondhi, "High speed Rail: The Fast Track to Economic Development?" The World Bank.
<http://documents.worldbank.org/curated/en/2010/07/12582340/high-speed-rail-fast-track-economic-development>
- ³⁰ California State Auditor, *High-Speed Rail Authority Follow-Up*, January 2012,
<http://www.bsa.ca.gov/pdfs/reports/2011-504.pdf>
- ³¹ See <http://www.cahsrpgr.com/files/CommentsOnCHSRA2010FundingPlan.pdf>
- ³² See http://www.cahsrpgr.com/files/bus_plan.pdf
- ³³ David Brownstone, Mark Hansen and Samer Madanat, *Review of "Bay Area/California High-Speed Rail Ridership and Revenue Forecasting Study"*, ITS Berkeley, June 2010,
<http://www.its.berkeley.edu/publications/UCB/2010/RR/UCB-ITS-RR-2010-1.pdf>
- ³⁴ See <http://www.cahsrpgr.com/files/Attachment%20A.pdf>
- ³⁵ See <http://www.cahighspeedrail.ca.gov/assets/0/152/281/f7a3e966-31e6-4dd8-a4e7-55e3fbe24387.pdf>
- ³⁶ Transcribed from DVD of the hearing recorded by the California State Assembly Television office.
- ³⁷ Includes both interregional and intra-regional ridership.
- ³⁸ Cambridge Systematics (2008), *Desert Xpress Ridership Forecast Review*, p. 17, Steer Davies Gleave, *Ridership and Revenue Audit*, page 5, Federal Railroad Administration, Final

Environmental Impact Statement, Appendix B,
http://www.fra.dot.gov/downloads/rrdev/Appendix_B_Ridership_Forecast_Review.pdf

- ³⁹ No adjustment has been made for the greater fuel economy that automobiles achieve in highway driving, which would tend to reduce automobile costs further, and result in a smaller attraction from to high speed rail.
- ⁴⁰ Based upon an analysis of CHRSA ridership levels by cost of driving.
- ⁴¹ CAHSRA April 2012 *Business Plan*, p. ES-12.
- ⁴² Inexplicably, the April 2012 *Business Plan* highlights California transit ridership as substantial. Total transit ridership in the Phase 1 high speed rail corridor is a few percent of overall travel. Generally, transit's share of travel is far higher in Europe and Japan. For example, the transit ridership in any one of the urban areas of Paris, London or Madrid exceeds that of the California markets combined and the ridership in Tokyo exceeds that of the United States.
- ⁴³ Detailed estimates indicated longer travel times by high speed train than by air in the *Due Diligence Report* (starting on page 76). This time disadvantage will become longer as a result of slower train operations under the Blended Phase 1 system.
- ⁴⁴ The total air travel market projected at 10.1 million annual trips in 2035, according to data in Metropolitan Transportation Commission, *Regional Airport System Planning Regional Airport System Planning Analysis 2011 Update*, Exhibit 3-15
http://www.mtc.ca.gov/planning/air_plan/RASPA-2011_update/Volume_2-Major_Reports.pdf
- ⁴⁵ U.S. Department of Transportation passenger and average fare data for the San Francisco Bay area to Los Angeles area markets from US Department of Transportation at
http://ostpxweb.dot.gov/aviation/x-50%20Role_files/consumerairfarereport.htm
- ⁴⁶ Automobile attraction estimated by applying the ratio of automobiles to airline high speed rail attraction in the European cases to the CHSRA forecast attraction from airlines.
- ⁴⁷ This is based upon the claims of CHSRA officials and a board handout that travel time will be only 2:40.
- ⁴⁸ Charles River Associates, "Independent Ridership and Passenger Revenue Projections for High Speed Rail Alternatives in California," January 2000.
- ⁴⁹ The Cambridge Systematics ridership projection has not been classified as "investment grade," unlike the previous, more conservative projection by Charles River Associates. Further, not all "investment grade" ridership projections are reliable. For example, an "investment grade" ridership projection was produced for the Las Vegas Monorail, which formed the justification for the sale of approximately \$600 million in bonds. The eventual ridership was approximately 60% less than forecast, the project filed for bankruptcy and bond-holders are likely to lose virtually all of their investment. Wendell Cox, one of the authors of this report, published a report before the bonds were approved by the state of Nevada that accurately forecast the ridership. The Cox report also predicted the bond default. See:
<http://www.publicpurpose.com/ut-lvmono-0006.pdf>.
- ⁵⁰ John Pitkin and Dowell Myers, *Generational Projections of the California Population By Nativity and Year of Immigrant Arrival*, April 2012, <http://www.usc.edu/schools/price/futures/>
- ⁵¹ Report co-author Wendell Cox expressed reservations about the 60 million population projection upon its release in 2007 in "60 Million Californians? Don't Bet on It", *The Orange*

- County Register*, August 24, 2007. <http://www.ocregister.com/opinion/growth-23157-county-san.html>
- ⁵² “Net Migration from Mexico Falls to Zero—and Perhaps Less,” April 23, 2012. <http://www.pewhispanic.org/2012/04/23/net-migration-from-mexico-falls-to-zero-and-perhaps-less/>
- ⁵³ Average fare calculated from Federal Transit Administration, *National Transit Database*, 2010. Ridership estimated from *Metrolink Fact Sheet: September 2011*. http://www.metrolinktrains.com/pdfs/Facts&Numbers/Fact_Sheets/Sept_2011_Quarterly_Fact_Sheet.pdf
- ⁵⁴ Midpoint CHSRA projections used.
- ⁵⁵ Average fare calculated from Federal Transit Administration, *National Transit Database*, 2008. Ridership from Federal Transit Administration, *National Transit Database*, 2010.
- ⁵⁶ At the CHSRA high operating cost assumption, the annual losses would range from \$253,000,000 to \$502,000,000 under the three projections above. At the CHSRA low operating cost assumption the annual operating losses would range from \$7,000,000 to \$256,000,000.
- ⁵⁷ Bent Flyvbjerg, Nils Bruzelius and Werner Rothengatter, *Megaprojects and Risk: An Anatomy of Ambition*, (Cambridge, UK: Cambridge University Press, 2003). Flyvbjerg is a professor at Oxford University in the United Kingdom. Bruzelius is an associate professor at the University of Stockholm. Rothengatter is head of the Institute of Economic Policy and Research at the University of Karlsruhe in Germany and has served as president of the World Conference on Transport Research Society (WCTRS).
- ⁵⁸ All dollar figures in this report are expressed in 2011\$, except where noted otherwise.
- ⁵⁹ The full Phase 1 system would have operated from Anaheim in the Los Angeles area to the Trans-Bay Terminal in San Francisco on dedicated tracks reserved only for high speed rail. As used in this report, “Full Phase 1” refers to the “Full Phase 1” system as detailed in the November 2011 *Business Plan*.
- ⁶⁰ For example, in inflation-adjusted 2011 dollars, the current low estimate of \$53.4 billion is the equivalent of \$69.7 billion in 2020\$ (or year-of-expenditure dollars). In fact, the two figures are the same in today’s inflation-adjusted dollars.
- ⁶¹ Significant differences in cost estimates generated widespread media attention and critical editorials. Representative samples include “High speed rail plan is delusional,” *San Jose Mercury News*, June 8, 2012, http://www.mercurynews.com/opinion/ci_20814494/mercury-news-editorial-high-speed-rail-plan-is-delusional; Ronald Campbell and Lance Williams, “Bullet-train plan depends on speculative funding,” *Orange County Register*, Nov. 4, 2011, <http://www.ocregister.com/news/billion-325463-authority-rail.html>; David Siders, “California auditor blasts high speed rail plan,” *Sacramento Bee*, Jan. 25, 2012, <http://www.sacbee.com/2012/01/25/4212638/california-auditor-blasts-high.html>; “Brown Boosts Bullet Train While Cutting Welfare for Moms,” *Business Week*, May 18, 2012, <http://www.businessweek.com/news/2012-05-18/brown-boosts-bullet-train-while-cutting-welfare-for-moms>; “California’s high speed rail system is going nowhere fast,” *Washington Post*, Nov. 13, 2011, http://www.washingtonpost.com/opinions/californias-high-speed-rail-system-is-going-nowhere-fast/2011/11/08/gIQAkni2IN_story.html; and Jim Christie, “California high speed rail cost estimate soars,” Reuters, Nov. 2, 2011, <http://www.reuters.com/article/2011/11/02/us-california-highspeedrail-idUSTRE7A173520111102>.

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- ⁶² It is appropriate for CHSRA to use “year-of-expenditure” dollars for planning purposes. However, as is noted above, it is misleading to characterize reductions in year-of-expenditure dollars as savings except where they are attributable to changes in the project scope.
- ⁶³ Adjusted for inflation from figures in the report.
- ⁶⁴ This report uses 2011\$ (inflation-adjusted) unless otherwise indicated. Year-of-expenditure (YOE) dollars are not adjusted for inflation and thus their use can be both confusing and misleading. For example, as is shown in the Capital Costs Chapter, more than one-half of the “savings” in the \$98 billion to \$68 billion YOE change from the November 2012 *Business Plan* to the April 2012 *Business Plan* was simply the effect of inflation and was really not a savings at all. CHSRA and the press have focused only on the lower cost projection (\$52 billion in 2011\$ or \$68 billion YOE). However the April 2012 *Business Plan* makes it clear that the cost, as currently projected, could rise to \$62 billion in 2011\$ or \$80 billion YOE.
- ⁶⁵ “Oversight Hearings of the California High-Speed Rail Authority,” Committee Report, Senate Transportation and Housing Committee, June 2008, p. 5, <http://stran.senate.ca.gov/sites/stran.senate.ca.gov/files/FINALHSRREPORT.pdf>
- ⁶⁶ *Due Diligence Report*, PDF page 5.
- ⁶⁷ “High speed Rail Authority: It Risks Delays or an Incomplete System Because of Inadequate Planning, Weak Oversight, and Lax Contract Management,” California State Auditor, Bureau of State Audits, Report 2009-106, April 2010, p. 17, <http://www.bsa.ca.gov/pdfs/reports/2009-106.pdf>
- ⁶⁸ Lance Williams, “State Treasurer worries about bullet train’s finances,” *California Watch*, June 28, 2011; at <http://californiawatch.org/dailyreport/state-treasurer-worries-about-bullet-train-s-finances-11126>
- ⁶⁹ The report was prepared by retired Silicon Valley executives William H. Warren and William Grindley and Stanford Business School professor Alain Enthoven, “The Financial Risks of California’s Proposed High speed Rail Project,” September, 14, 2011, p. 10. Posted by the Community Coalition on High Speed Rail, <http://www.cc-hsr.org/assets/pdf/revisitingoctober2010report.pdf>
- ⁷⁰ Letter to Senate President Pro Tem Darrell Steinberg, et. al., California High-Speed Rail Peer Review Group, January 3, 2012, p. 4, <http://www.calhsr.com/wp-content/uploads/2010/10/CHSR-Peer-Review-Group-Comments-on-CHSRA-2010-Funding-Plan-2.pdf>
- ⁷¹ “High speed Rail Authority Follow-Up: Although the Authority Addressed Some of Our Prior Concerns, Its Funding Situation Has Become Increasingly Risky and the Authority’s Weak Oversight Persists,” California State Auditor, Bureau of State Audits, Report 2011-504, January 2012, Cover letter, <http://www.bsa.ca.gov/pdfs/reports/2011-504.pdf>
- ⁷² “The 2012-13 Budget: Funding Requests for High speed Rail,” Legislative Analyst’s Office, April 17, 2012, <http://www.lao.ca.gov/analysis/2012/transportation/high-speed-rail-041712.aspx>
- ⁷³ YOE\$ used here because the April 2012 *Business Plan* does not provide funding source details in 2011\$.
- ⁷⁴ Estimated using the \$3 billion difference between the low estimate of \$42 billion in federal funding requirements per the LAO and the \$39 billion not yet committed.

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- 75 Ibid.
- 76 Michael Doyle, “Congress poised to reject Calif. high speed rail funding,” McClatchy Newspapers, *Bakersfield Californian*, April 20, 2012, <http://www.bakersfield.com/news/business/economy/x1390185567/Congress-poised-to-reject-Calif-high-speed-rail-funding>
- 77 Jon Coupal, “Stunning Shift on High Speed Rail,” Howard Jarvis Taxpayers Association, April 1, 2012, <http://www.hjta.org/california-commentary/stunning-shift-high-speed-rail>
- 78 *Due Diligence Report*, p. 10.
- 79 KTTV, Channel 11, Los Angeles.
- 80 First Amended Declaration of John Popoff in Support of Respondent's Opposition to County of Madera et al's Motion for Preliminary Injunction.
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