

DUBIOUS RIDERSHIP FORECASTS

– A Briefing Paper Based on Section 2 of –

The Financial Risks of California's Proposed High-Speed Rail Project

**A Review And Assessment Of Publicly Available
Materials On
The California High-Speed Rail Authority's
Financial Plans**

October 18th 2010

"We do not oppose high-speed rail in concept. It seems to work in parts of Europe and Japan and possibly elsewhere. The 2008 Prop 1A promise that captured many voters was that the California High-Speed Rail (CHSR) would not cost the taxpayer a penny. After months of work on this report, we are forced to conclude that the Authority's promise seems an impossible goal."

We are grateful to the Community Coalition on High Speed Rail for providing a virtual 'home' for this review. For downloadable copies of the entire report and appendices, visit their website www.cc-hsr.org The following Table of Contents of the full report is provided as a guide to the context of this paper.

TABLE OF CONTENTS OF THE FULL REPORT

	Page #
CONTEXT-SENSITIVE OVERVIEW	4
PEER REVIEW & VALIDATION	5
EXECUTIVE SUMMARY	14
INTRODUCTION	22
BACKGROUND OF HIGH-SPEED RAIL IN CALIFORNIA	24
CONCLUSIONS & RECOMMENDATIONS	25
1.0 Broken Promises And Unmet Demands From The Legislature Diminish The CHSR Project's Credibility	38
2.0 CHSRA's Ridership Forecasts – Central To The System's Financial Outcome – Are Far Too Optimistic. .	45
3.0 CHSRA's Estimated Phase I Capital Costs Should Be Significantly Higher	52
4.0 CHSRA's Revenue Assumptions Are Too High And Its Operating Expenses Too Low	56
5.0 Using The CHSRA's Data On Revenues And Expenses, The System Will Never Achieve Positive Cash Flow Without The Assumed Federal Grants	64
6.0 Complete CHSR Funding Has Not Materialized, Nor Is Likely To Be Forthcoming	74
7.0 CHSRA's Job Creation Forecasts Are Too Vague And Too Large To Be Credible	85
REFERENCES	89

THE AUTHORS AND PRINCIPAL REVIEWERS

The Authors and Principal Reviewers of this document worked without corporate, government or private sponsorship. They read considerable materials from both proponents and opponents of the proposed California High-Speed Rail (CHSR) project. The authors shared drafts with professionals who understand finance and comprehend the implications of the analyses. They met individually and in groups to give direction for the paper and reviewed and commented on drafts. Over several months of mid-to-Q3 2010, the paper came together to reflect the common themes and conclusions that arose in these discussions.

Over seventy Principal Reviewers have read the report and agree with the Authors' findings and endorse their conclusions.

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CHSRA'S RIDERSHIP FORECASTS – CENTRAL TO THE FINANCIAL OUTCOME – ARE FAR TOO OPTIMISTIC

Overview Of This Briefing Paper – At the heart of any financial forecast for a high-speed train are two issues: how many riders will there be, and what each is expected to pay. Ridership forecasting techniques are not an exact science. However, one should expect that plausible estimates be made on the basis of surrogates or prior experience. But the Authority's ridership assumptions drive many of our questions on financial sustainability. Forecasts.

Empirical precedents from the USA and Europe suggest CHSR ridership by the tenth operating year (2030) should be 5-10 million, not the 39 million annual passengers claimed in the CHSRA models. Three independent economists and transportation groups have found significant flaws in the CHSRA consultant's ridership model involving uses of coefficients and inappropriate data series. These findings have already produced calls for even more independent reviews of this critical planning element.

2.1 Evidence-Based Analyses Contradict CHSRA's Forecasts

Perhaps the first alarm that something was questionable about the ridership forecasts on which CHSR income projections were based was the 2008 assertion that about 94 million riders annually would board the CHSR by the system's completion date in 2020.¹

Since California's population in 2030 is projected to be about 46 million, that CHSRA ridership forecast suggested that every man, woman and child in the state would ride the train at least two times each year, whether they lived near or hundreds of miles from a CHSR station.² This 2008 CHSRA ridership projection for its tenth operating year constituted slightly less than one-third of the 2008 United States population. Even a year later, when CHSRA downward-adjusted its 2030 ridership number to 39 million, something still seemed amiss.

The U.S. experience with accelerated rail service is telling. In 2009, about twenty years after its inception, the combined ridership on all segments of the Boston-NYC-PHL-WDC Acela route was 3.02 million.³ Acela draws riders from combined metropolitan populations over 28 million, attracting about 11% of the residents of its market catchment area.⁴ If the CHSR were to achieve after a decade what Acela has attracted in a generation, it might draw 11% of all of California's residents – about 5 million, not 39 million riders.

CHSRA claims that population and employment growth in California will *"increase interregional travel by 65 percent to 911 million trips a year . . .*

*.including a nearly five-fold increase in conventional rail trips”.*⁵ Even starting from the miniscule basis of California’s interregional rail trips today, such a percentage increase is difficult to understand.

2.1.1 CHSRA’s forecasts don’t account for technology changes that are diminishing commuting and business travel.

Nowhere do the Authority’s ridership forecasts account for relative downward shifts in commuting due to technologies such as telecommuting, video conferencing, etc. These technologies have increased productivity and lowered capital costs, with fewer dollars spent on space for offices, office equipment (HVAC, office furniture, etc) and parking areas. Today, fewer and fewer corporations have ‘fixed’ offices for their sales forces, or dedicated workspaces for those who spend only part of their time at a ‘home’ site. And because fewer on-site employees require less office space, these innovations have also decreased operating expenses through lower utility bills, lower physical plant maintenance charges, and fewer administrative support and security personnel.

Likewise, such technologies have already decreased both short-haul and long range business air travel, even without the presence of high-speed rail. Business travel represents the second or third largest operating expense for many medium and large corporations. Corporate finance officers are keen to see that expense category decrease in relative importance. Relatively fewer business trips per employee also suggest that the CHSRA’s extrapolation from the growth of air and auto-based travel over the past few decades may itself be a logical fallacy. Both commuting and business travel are undergoing radical changes. Deploying these new technologies – regionally and globally – is and has been a priority. But nowhere does the CHSRA report on this shift in paradigms about where and how work gets done.

Nor does the Authority address the ramp-up of corporate social responsibility – shown in the annual reports of Cisco, Symantec, Intel, etc – to decrease the environmental impacts of business travel by all modes. This includes the growing importance of hybrid and soon-to-be electric autos as part of Californians’ options. To assume Californians will travel to work in autos or vans with today’s mileage and at dramatically increased percentages in an age of telecommuting and environmental sensitivity is a questionable proposition.⁶

2.1.2 The CHSRA’s ridership forecasts also fail to take into account the absence of a history of rail travel in California or the impact of low population densities on use of the CHSR.

These urban geography factors could easily make or break the system. The only train currently operating between the two metropolises (San Francisco and Los Angeles) is an Amtrak coastal route service, a leisurely and partly scenic ride, but not one that has generated enthusiasm for train travel. More importantly, any successful rail system depends on significant densities per square mile to help its fare box revenues. While much can be said about the

importance of trains and high-speed trains in Europe and Japan, those nations' densities per mile are higher than California's. In Japan, density is 880 people per square mile; it's 653 in Britain and 611 in Germany. By contrast, plentiful land in California has led to suburbanized homes, offices and factories. Density in the Golden State is 236 per square mile.⁷ Thinking that safer, faster and reliable high-speed rail will attract riders is not the same as actually getting them out of their autos or reducing their need to use autos once they arrive at a CHSR destination.⁸

2.1.3 CHSRA's forecasts fly in the face of real world evidence of actual versus forecasted ridership.

Actual experience with high-speed rail ridership forecasting is also instructive. Flyvbjerg, Bruzelius and Rothengatter stress the lack of reliability of those forecasts: *"(rail) forecasts were overestimated on the average by 65%."*⁹ Using the average 'overshoot' from the prior forecasts analyzed by those authors suggests the CHSR should attract about 11 million riders in 2030, its tenth operating year, not 39 million as the CHSRA forecasted.¹⁰

Eurostar's actual versus projected ridership through the Channel Tunnel provides further perspective. In 1992, the Eurostar Business Case Forecast projected *"15 million passengers per annum in 1995 and growing"*.¹¹ In 2009 Eurostar carried 9.2 million passengers, only 60% of what forecasters said it would carry at its start fourteen years earlier.¹² In *Megaprojects and Risk*, Flyvbjerg and colleagues conclude, *"Rail passenger traffic forecasts are consistently and significantly inflated."*¹³ The World Bank's recent report on high-speed rail concluded that, *"High-speed projects have rarely met the full ridership forecasts asserted by their promoters, and in some cases have fallen woefully short. A whole new area of behavioral research has been generated by the phenomenon of over-forecasting in transport, known as 'optimism bias'."*¹⁴ Whether the CHSRA's forecasts are the result of optimism bias, poor modeling methods or some unstated motive, their published results need more critical scrutiny than the Authority has been willing to concede.

2.2 Independent Experts Refute CHSRA's Ridership Model

Forensic analyses by a macro-economist and two transportation planning organizations have brought to light possible reasons for the divergence between CHSRA's ridership forecasts' and other model builders' findings and methods.

2.2.1 Findings from Californians Advocating Responsible Rail Design (CARRD) on CHSRA's ridership are disturbing.

In late 2009 and early 2010, statistician and macro-economist Elizabeth Alexis of Californians Advocating Responsible Rail Design (CARRD) analyzed why the CHSRA ridership model seemed to disproportionately favor a

Pacheco Pass routing. What she and other CARRD members found was also applicable to the general CHSRA ridership model.

After repeated attempts to obtain what was supposed to be publicly available data, Ms. Alexis secured a visit to the SF Metropolitan Transportation Commission (MTC). She later stated, "*CARRD recently made a site visit to MTC and was able to obtain what are believed to be the actual headways [time between trains] used in the analysis It is clear, however, that the headways in the publicly available documents are NOT those used in the ridership study.*"¹⁵

Other concerns expressed by CARRD concerning the ridership model include:

- *Sampling issues: There were only 27 long-distance commuters surveyed, which resulted in a decision to constrain the long distance commute market to the same coefficients as the business model.*
- *Reliance on stated preference data for main mode choice model: Stated preference data has known issues that bias estimation results. Because of this, the study design specifically stated that both revealed preference and stated preference data would be used. For some reason, only stated preference was used. In the calibration process, this resulted in very large mode specific constants that highlight the bias that in fact was present in the study sample.*
- *Frequency coefficient: The frequency coefficient was arbitrarily constrained to be the same as the time coefficient.*¹⁶

In late January 2010 CHSRA's Deputy Director, Jeff Barker emailed CARRD the final coefficients, along with a surprise -- a transmittal memo from George Mazur of Cambridge Systematics (CS). The CS memo placed direct blame on the MTC for withholding these documents from the public for the prior thirty-three months and said: "*The client, MTC, elected not to update the Task 5a report nor to include the final coefficients and constants in the final project report.*" This is a remarkable assertion for Cambridge Systematics. The final coefficients and constants were substantially changed from those peer reviewed and published. The revised coefficients and constants never had been seen by the public. Nor, according to CHSRA, had they been seen by the CHSRA's internal peer review group. Mr. Barker continued "*... this material as presented did not previously exist and significant amounts of sub-consultant staff time went into preparing it.*"¹⁷

Why the data provided to the public were different than used in the CHSRA model, why various coefficients were changed, and why stated preference data were used inappropriately are serious questions that have yet to be answered. These answers should be in the public realm before the State provides further funding for the CHSR project.

2.2.2 Smart Mobility's work challenged both the CHSRA model's methodology and findings.

Later in the spring of 2010, Norman L. Marshall of Smart Mobility Inc, a transport planner with 25 years experience, provided expert testimony in which he challenged the CHSRA's model. He claimed the variables available

for the ridership peer review were not the same as those later used and published by the CHSRA. Specifically Mr. Marshall said:

- 1) *The model coefficients used in developing the ridership and revenue forecasts are different from those disclosed to the public during the environmental review period;*
- 2) *The final frequency (headway) coefficients used in developing the ridership and revenue forecasts are invalid;*
- 3) *The use of these invalid frequency (headway) coefficients biases the alternatives analyses in favor of the Pacheco alignment (PI) as compared to the Altamont alignment (AI);*
- 4) *Mode-specific constants were misrepresented during the public review process;*
- 5) *The mode-specific constants in the final model that were used to forecast ridership and revenue are invalid.*¹⁸

Mr. Marshall concluded, *"The California high-speed rail ridership and revenue forecasts used in the selection of a preferred alignment were based on modeling that was misrepresented and invalid."*¹⁹

2.2.3 The ITS-UC Berkeley review and report should have made those responsible for fiduciary aspects of the CHSR project suspend its funding.

In April 2010, after a critical report by the State Auditor of the CHSRA's operations and funding assumptions, the Senate Transportation Committee empowered the Institute for Transportation Studies (ITS) at UC Berkeley to analyze the CHSRA's model.

At the end of June 2010, the ITS reported, *"The forecast of ridership is unlikely to be very close to the ridership that would actually materialize if the system were built. As such, it is not possible to predict whether the proposed high-speed rail system in California will experience healthy profits or severe revenue shortfalls."*²⁰

Other problems highlighted in the ITS-UC Berkeley report include the use of inappropriate data at inappropriate points in the Cambridge Systematics (CS) model. For example the ITS says the CS model used:

- *A sample of long-distance travelers that was not sufficiently representative, and of a statistical method to adjust for that difference that has since been proven unreliable*
- *Statistical adjustments that were valid for intra-regional ridership models, but not for inter-regional ones, thereby exaggerating the importance of having frequent service*
- *A structure that predetermines which high-speed rail station travelers will choose rather than allowing travelers to make the choice themselves*
- *Restrictions that were based on professional judgment instead of on observed data"*²¹

At the July 2010 CHSRA Board meeting, Professor Brownstone, representing the ITS-UC Berkeley review, criticized the sampling procedures used in the CS projections and the failure to include a potential error range in the estimates. He said such methods have *" . . . caused, I think, a lot of problems when it turns out later on the actual ridership is way off from the forecasts. This is a problem with almost all existing work."*²² Lance Neumann, President of Cambridge Systematics, emphatically supported the methods and results in the ridership forecasts and stands behind the projections "without reservation."²³ The CHSRA Board declined to seriously question the methods or results of their consultant's ridership forecasts.

CONCLUSIONS

At best, the Cambridge Systematics (CS) model's output is not reliable for such a large investment in the CHSR. Tens of billions of dollars will be risked based on a forecast that is counter-intuitive, and that doesn't agree with common sense or with empirical and historical analyses. Nor are the CS methods in accord with recent professional methods and standards of rail transportation model experts not dependent on the Authority. It is dangerous to assume the CHSRA ridership model's outputs are not inflated and that they can be used to support financial due diligence or the requirements of AB3034.

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- ¹ 2008 California High-Speed Train BUSINESS PLAN November 2008; California High-Speed Rail Authority; California High-Speed Train Business Plan; November 2008; pg 7. The source document for this citation probably is: Bay Area/California High-Speed Rail Ridership and Revenue Forecasting Study; Final Report; prepared by Cambridge Systematics, Inc. August 2007; pg. 2-10, Table 2.3, the Pacheco Pass Alternative. On page 6 CS reports that total annual riders is [sic] 57 million compared to previous 37 million. On page 12 CS reports that the 2000 Business Plan ridership for 2030 was 37 million, but then shows a base of 65-69 million and a range of 65-94 million, depending on the costs of air or auto travel. By page 21, the base had somehow increased to 86-90 million riders, but depending on higher auto or airfares could range as high as 117 million riders in 2030. Why the Prop 1A claim of 93.9 million riders was chosen is not clear. Also see: Bay Area/California High-Speed Rail *Ridership and Revenue Forecasting Study*; Cambridge Systematics, March 2, 2007.
- ² Source: Center for Urban Studies: Wayne State University. http://www.michigan.gov/documents/hal_lm_census_Projections_Kurt_122858_7.pdf
- ³ Source: Table in "Amtrak Fiscal Year 2009" Oct. 2008-Sept. 2009.
- ⁴ Source: Demographica: World Urban Areas & Population Projections: 5th Edition, April 2009.
- ⁵ Op.cit. HSRA Report; December 2009; pg. 68.
- ⁶ Op.cit: Bushell: notes; pg.4.
- ⁷ US Density is 86 people per square mile. Source: World Atlas.com <http://www.worldatlas.com/aatlas/populations/usadensityh.htm>
- ⁸ State Senator Alan Lowenthal (D- Long Beach) personally criticized Governor Schwarzenegger for the Governor's decision to solely promote high-speed rail over increased rail safety. "*He told us there would be one state application for the \$8 billion in President Obama's rail stimulus program and it would include both high-speed rail and conventional rail improvements.*" See: 'Governor Schwarzenegger Put California On The Wrong Track'; California Rail News; December 2009 – February 2010' page 3. The Governor's comments came some 16 months after 25 people died in the September Chatsworth train collision. See: http://en.wikipedia.org/wiki/2008_Chatsworth_train_collision
- ⁹ Source: Flyvbjerg, Bent; Bruzelius, Nils and Rothengatter, Werner: Megaprojects And Risk, An Anatomy of Ambition; Cambridge University Press, 2003; pg. 26.
- ¹⁰ Op.cit Flyvbjerg *et al.* pg. 25.
- ¹¹ Op.cit Flyvbjerg *et al.* pg. 22.
- ¹² Private communication with Jean-Claude Guez: Non-Executive Board Director/ Administrateur de Sociétés Internationales; Senior Management Advisor/ Conseiller Expert de Directions Générale: former director of the board of SNCF.; jen-claude@guez.ws
- ¹³ Op.cit Flyvbjerg *et al.* pg. 31.

¹⁴ Paul Amos, Dick Bullock and Jitendra Sondhi; World Bank Report No 55856; July 2010; pg.14

¹⁵ CARRD Ridership Comments; April 26, 2010; pg. 3.

¹⁶ *ibid.* pg. 6

¹⁷ See: Tomlach, Richard F; "How HSRA gamed ridership data to favor Pacheco Pass route"; September 1, 2010; California Rail News.

¹⁸ Marshall to Schonbrunn Memorandum; April 26, 2010; pg. 12

¹⁹ Memorandum To David Schonbrunn, TRANSDEF; From: Norm Marshall (Smart Mobility); April 26,2010: Subject: California High-speed Rail Model Coefficients Review; pg. 13.

²⁰ Statement by Samer Madanat; Director of ITS Berkeley; found at http://www.berkeley.edu/news/media/releases/2010/07/01_high_speed_rail.shtml

²¹ *ibid* pg. 1.

²² The Economist, by NB; July 10th 2010: see: <http://www.economist.com/blogs/gulliver/2010/07/high-speed-rail-california>

²³²³ Rich Connell, Los Angeles Times; July 09, 2010: <http://articles.latimes.com/2010/jul/09/local/la-me-high-speed-rail-20100708>