RSG
the science of insight

Peer Review of Side-by-Side Study Results

California High Speed Rail Authority

January 2021

Study Objectives

- Review the reasonableness of the results from the Side-by-Side Study
  - Review the ridership model inputs, assumptions, and results
  - Model reviewed at a high level
  - Review of a comparative study amongst the three corridors
- Evaluated operations and Maintenance (O&M) costs for SoCal corridor
- Benchmarking of peer systems in the US and Europe
- Key finding: the ETO team's assumptions were applied reasonably as inputs to the State Rail Plan Model

Key Findings

Review of Assumptions

- A number of both conservative and optimistic assumptions were used when estimating ridership and revenues on the CVS

- Conservative assumptions:
  - HSR mode not given additional 'intangible' benefit
  - No reliability benefit
  - Optimal (revenue maximizing) fares not used
  - San Francisco and some other parts of the Bay Area not included as productions or attractions for potential rail trips

*Conservative assumptions would result in **more** ridership in the CVS than forecasted*

- Optimistic assumptions:
  - Bus services considered the same as rail (typically rail given a benefit)
  - Transfers expected to be well-timed, resulting in short wait times
    - Actual on-time performance may cause issues with timed transfers
    - If some expected services are not fully funded, it could affect transfer times and ridership negatively

*Optimistic assumptions would result in **less** ridership in the CVS than forecasted*

Key Findings

Review of Modeling Inputs

- Looked at all LOS changes in each corridor
  - Changes in frequency
  - Changes in travel time
  - Trip growth rates applied
- Most everything looks reasonable and appears to be applied correctly

Key Findings

Review of Modeling Outputs – Sensitivity Tests

- RSG performed a sensitivity analysis of service level changes between the build and no-build scenarios in each of the corridors
  - Sensitivities based on RSG's experience with other intercity and commuter rail modeling efforts
  - Focused on changes in frequency and travel time only
- Ridership within range for NorCal and CVS
- Ridership above the expected range for SoCal

Annual Change in Ridership (in Millions of Riders)

CORRIDOR	BASE PASSENGERS (MIL)	LOW EXPECTED CHANGE	HIGH EXPECTED CHANGE	ETO TEAM STUDY FORECAST OF CHANGE	ETO TEAM PASSENGER CHANGE (MIL)	RESULT
NoCal	27.10	6%	28%	7%	1.98	Within range
CVS	3.97	42%	144%	121%	4.81	Within range
SoCal	16.51	2%	11%	15%	2.50	Above range

Based on frequency and travel time changes

Key Findings

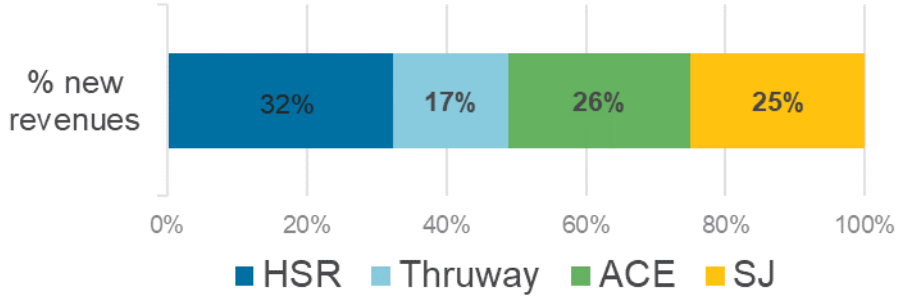
Review of Modeling Outputs – HSR Benefits

- 23% of trips in the CVS system will use HSR
- All other trips benefit from the investment in HSR
- HSR accounts for ~45% of revenues (incl. transfers)
- CVS corridor operates as a system that includes linked trips

Ridership (in Thousands of Riders)

SEGMENT	2029 BUILD (RIDERS)	2029 BUILD % OF LINKED TRIPS
Both trip ends in HSR corridor (Merced to Bakersfield)	1,093	**12%**
One trip-end North of Merced and the other within HSR corridor (Merced to Bakersfield)	956	**11%**
Both trip ends north of Merced (no HSR usage)	6,727	77%
Total LINKED trips on CVS corridor	***8,776***	***100%***
Thruway Bus	2,109	–
Total UNLINKED trips	*10,885*	–

Use HSR



Key Findings
Review of SoCal O&M Costs

- For the Side by Side analysis, an operating cost of $11.72 per vehicle mile was used for SoCal in the HSR build scenario
  - This is low compared to a simple average of peer commuter rail operations ($19.26)
  - Costs are also lower than the average of peer commuter rail operations when weighted by service delivered ($17.45)
- Side by Side Analysis uses an optimistic assessment of overall operating costs for SoCal scenarios
- Required public subsidies for SoCal are likely higher than predicted by the Side by Side analysis

Key Findings
Benchmarking with Peer Systems

- Other HSR systems in Europe have been built in segments (e.g., London to Paris)
- CHSRA's approach to building HSR in separate segments is consistent with other peer systems
- HSR doesn't have to run at high speeds the entire way, a hybrid electrified system of lower speeds and higher speeds can help get a more integrated rail system off the ground more quickly
- Ultimately, it's important to bring together the regional and interregional needs to improve travel for both long distance travelers and commuters

Conclusions

- The ridership estimates for the CVS and NorCal are within reason; estimates for SoCal are likely high
- The O&M costs for SoCal are likely too low
- In combination, this means SoCal likely has less ridership at greater costs than documented, making it less attractive than reported and less competitive to the CVS
- However, there is still risk: this new interconnected rail/bus system north of Merced is a paradigm shift in the CVS region's transportation
- There is margin for error. Even if demand is not fully realized, the best corridor to invest the $4.8B favors the CVS in nearly any scenario

Contacts

GREG SPITZ
SENIOR DIRECTOR
Greg.Spitz@rsginc.com
802.359.6424

www.rsginc.com

Appendix

Key Findings

Review of Modeling Outputs – Short v. Long Trips

- Model tends to overestimate short trips (e.g., Fresno to Madera) and underestimate long trips (e.g., Bakersfield to Merced)
  - This was corrected during post-processing of the model results

ADJUSTMENT FACTOR	MERCED	MADERA	FRESNO	KINGS-TULARE	BAKERSFIELD
Merced	-	0.65	1.26	0.76	2.31
Madera	0.65	-	0.01	0.71	0.45
Fresno	1.26	0.01	-	0.77	0.84
Kings-Tulare	0.76	0.71	0.77	-	0.35
Bakersfield	2.31	0.45	0.84	0.35	-

In adjusted model results, short trips (< 160 miles) account for about 75% of trips in the CVS

Key Findings
Review of O&M Costs

SOCAL OPERATING & MAINTENANCE COST ANALYSIS

- Used Operating Cost per Vehicle Mile as baseline efficiency comparison criteria
- Established peer commuter rail systems including California peers and other systems of similar operating characteristics.
- Used Federal Transit Administration's National Transit Database data to develop efficiency averages of peer operators
  - Simple average - $19.26
  - Weighted average - $17.45
- Derived CHSRA SoCal O&M costs for each class of service in each of the four scenarios based on Side-by-Side Analysis data

Key Findings
Review of O&M Costs

PEER SYSTEM (SMALLER TO LARGER)	OPERATING EXPENSES PER REVENUE MILE
Minneapolis Northstar	$26.93
San Jose Altamont Corridor Express	$17.40
San Diego Coaster	$12.05
Dallas/Fort Worth Trinity Railway Express	$18.12
Seattle Sounder	$23.39
Washington DC Virginia Railway Express	$32.49
Miami Tri-Rail	$26.68
Chicago-South Bend South Shore Line	$12.16
Salt Lake City FrontRunner	$8.00
Baltimore-Washington MARC	$24.74
San Francisco Caltrain	$17.69
Los Angeles Metrolink	$17.39
Boston MBTA	$15.14
Chicago Metra	$17.45

Key Findings
Review of O&M Costs

SoCal Scenario O&M Costs Efficiencies

SCENARIO	BLENDED OPERATING COSTS PER VEHICLE MILE	IMPROVED EFFICIENCY (PCT) VS. SCENARIO 1
SoCal Scenario 1 (LOSSAN, Metrolink)	$15.35	–
SoCal Scenario 2 (LOSSAN, Metrolink)	$13.32	13%
SoCal Scenario 3 (LOSSAN, Metrolink)	$12.30	20%
SoCal Scenario 4 (LOSSAN, Metrolink, CSHR)	$11.72	24%

NTD Peer Review Simple Average - $19.26
NTD Peer Review Weighted average - $17.45