

FINAL REPORT

Ridership Technical Advisory Panel Review of the California High-Speed Rail Ridership and Revenue Forecasting Process

Findings and Recommendations from the May-June 2014 Review Period

September 17, 2014

The Ridership Technical Advisory Panel (RTAP) held its thirteenth formal meeting on June 19-20, 2014 at the Parsons Brinckerhoff offices in San Francisco. The Panel received several draft reports and model estimation results in spreadsheet format prior to the meeting. This report covers their activities and deliberations from April through June 2014. The panelists include:

- Frank S. Koppelman, PhD, Professor Emeritus of Civil Engineering, Northwestern University (chair)
- Kay W. Axhausen, Dr.Ing., Professor, Institute for Transport Planning and Systems, ETH Zurich (Swiss Federal Institute of Technology Zurich)
- Eric Miller, PhD, Professor, Department of Civil Engineering, University of Toronto
- David Ory, PhD, Principal Planner/Analyst, Metropolitan Transportation Commission
- Kenneth A. Small, PhD, Professor Emeritus, Department of Economics, University of California-Irvine

All panelists were present in person for the meeting except for Dr. Axhausen, who attended for part of the time via videoconferencing. Rick Donnelly of Parsons Brinckerhoff (PB) served as facilitator and recorder for the Panel. Don Emerson of PB was invited to attend the meeting as a representative of the program management team. Rachel Copperman, David Kurth, and Jason Lemp from Cambridge Systematics (CS) were also invited to attend portions of the meeting. Kimon Proussaloglou from CS also attended a portion of the meeting via videoconferencing. The meeting was otherwise closed to non-members.

The Panel met with Don Emerson, who recently replaced Thierry Prate as the Authority's coordinator of the travel forecasting efforts, at the outset of the meeting. He related the current and anticipated forecasting needs of the Authority, which track with those previously identified by Mr. Prate. The remainder of the meeting was devoted to discussions of a technical nature, as described in the following sections.

1 Review of the final 2013-14 RP-SP survey results

Kimon Proussaloglou of CS made a presentation via videoconference about the 2013-14 revealed preference-stated preference (RP-SP) survey. This work has been recently completed, with the full dataset (e.g., observations for all surveyed modes of transportation) recently incorporated into on-going Version 2 (V2) model development work. This represents the first new SP data available since the 2005 survey used for the original model development, and greatly expands the number of completed SP experiments and observations. Dr. Proussaloglou presented an overview of the final survey results, which included a high-level review of mode choice patterns exhibited in the data and difference between traders and non-traders (i.e., respondents who answered all the SP questions with the same choice of mode). The findings from analyses of attitudinal questions were also discussed.

The 2013-14 survey includes 3,150 RP observations and 18,940 SP experiments. This represents slightly more data than available through the 2005 survey. A total of 2,350 RP observations and 9,340 SP experiments were conducted at that time. These data have been pooled for model estimation, along with another 18,110 RP observations for long-distance trips from the 2013 California Household Travel Survey (CHTS). Only partial preliminary data from the 2013-14 RP-SP survey have been available up until now. Collectively these data provide approximately 51,900

data points for model estimation. This is over four times the number of data points available prior to the 2013 CHTS and 2013-14 RP-SP survey.

Perhaps as important, the 2013-14 survey included surveys of passengers at Los Angeles International Airport (LAX) and aboard Caltrain, markets where surveys were not conducted in 2005. This larger and more complete survey dataset will permit more robust estimations and better differentiation of markets than previously possible. This will improve the quality of the data and models stemming from the current V2 work, as well as the upcoming V3 models.

The long-distance mode choice patterns exhibited in the 2013-14 RP-SP data appear reasonable and in line with expectations formed by experience with other intercity travel surveys and models. A more complete analysis and documentation of the survey findings is expected, but the Panel's review based on summaries available to them revealed several important patterns:

- HSR gained a lower share (42 percent) of travelers switching from other modes in the SP exercises than revealed in the 2005 survey (58 percent). This can be attributed to several factors, including better familiarity with HSR by respondents, improvements in other modes, effects of public controversy over HSR over the past several years, and possibly the result of changes in price competition and service between modes.
- Travelers appeared to be slightly less sensitive to differences in travel time and cost in 2013-14 than in 2005. Thus, mode changes are less likely to occur based only on those considerations. Newer models based on these data will show somewhat less propensity for shifting to HSR than previous models. This is thought by both the consultants and panelists to better represent likely traveler responses to the introduction of HSR service.
- It is likely that these shifts are partly the result of post-recession changes in travel behavior. Thus, they represent true market shifts that the model should be sensitive to rather than sampling anomalies.
- There are more traders than non-traders in the 2013-14 results, lending greater confidence to the data. CS and the Panel had previously expressed concern about the higher than usual number of non-traders in the 2005 survey. While some non-traders are expected because some people do have a strong preference for one mode, a very large number could indicate that some respondents are approaching the SP questions with preconceived opinions rather than evaluating each scenario objectively.

The Panel discussed with CS whether they should assign different weights to the two RP-SP surveys when used in model estimation. The rationale for differential weighting would be to assign greater influence to the more recent information in model estimations. There is no standard method of deriving such weights or determining the need for them. After considerable discussion it was decided to pool the data without weighting at this time, as the newer data will be implicitly given larger weight just on the basis of their larger numbers relative to the earlier 2005 data.

This final dataset is being used in current re-estimation work intended to produce a revised V2 model. Based upon its review of summaries presented to date, the Panel believes these data represent a substantial improvement in the available information about more recent travel behavior, and that all future work should be based upon this dataset.

2 Version 2 Revised (V2R) estimation and calibration results

The initial Version 2 (V2) model and the forecasts that it generated for the 2014 Business Plan were based on model parameters estimated using the 2005 RP-SP survey and partial 2012-2013 CHTS data. While the Panel found this model specification and parameter estimates to be reasonable, one concern that both the Panel and CS identified was the relatively large number of predicted HSR trips that involve long access/egress trip components for relatively short origin-destination (O-D) trip lengths. To address this concern, CS included new variables in the mode choice model that will reduce the number of such trips choosing HSR. The result is a set of “V2R” (R for “revised”) mode choice models that incorporate this new specification, combined with the use of the new combined database described in Section 1. The latter includes all of the final CHTS and 2013-14 RP-SP survey data, as well as the 2005 RP-SP survey data.

CS shared preliminary V2R estimation results, as this work was still in progress when the Panel met in San Francisco. Two issues of concern existed with respect to the results presented at the meeting: (1) lower than expected values of time, and (2) unexpected, significant increases in predicted recreational/other HSR ridership and revenue compared to previous V2 forecasts. The latter was already under active review by CS, and subsequent estimation work eliminated the issue in the final V2R model. The values of time in the final model remain lower than expected, but not enough so to warrant further delays in order to improve them.

The Panel believes that V2R represents the culmination of the original model design and implementation, especially with respect to fully utilizing the new datasets discussed in the previous section. The V2R is more credible and reliable in light of those improvements. The Panel also acknowledges improvements in run-time performance obtained through refactoring of the current code base. These improvements in the software now enable the model to be run dozens of times in order to quantify the risk and uncertainty associated with each forecast. Thus, the V2R modeling system should be capable of serving the Authority through the preparation of the next business planning cycle and supporting further system-level planning activities.

3 Design of the Version 3 Modeling System

The Panel outlined its expectations for the Version 3 modeling system in its previous report (January–March 2014). These expectations emanate from several earlier recommendations made by the Panel in previous reports, anticipating the need for the Authority to engage in more detailed planning and design studies using the modeling system. This new system is essential for providing finer levels of spatial and temporal resolution, and the market segmentation required for detailed station design, fare policy analyses, connection with local and other intercity transit systems, and explicit consideration of visitor travel. Such a modeling system will require important new functionality, such as explicit station choice, time of day, and visitor models capable of representing joint intercity travel occurring over several days, where choices made within the context of the total journey influence decisions within any given 24-hour period.

These and other requirements facing the Authority cannot be effectively and credibly met using the aggregate trip-based V2R modeling platform. Some aspects of complex choice dependencies and dynamics can arguably be accommodated with extensions to V2R, or perhaps using post-processors. Station choice models, for example, have been successfully implemented in aggregate models similar in structure to V2R. Incorporating all the required functionality as extensions

to V2R, however, will result in undesirable increases in model complexity, making the resulting system less transparent and more error-prone and difficult to interpret. Moreover, post-processing reflects behavior the model cannot represent, is often not reproducible, and can introduce inconsistencies with patterns implicit within the forecasts or assumptions underlying them. The journey-based microsimulation framework described earlier by the Panel will offer more flexibility to meet those analytical requirements, and represents emerging best practices in the field of travel demand forecasting.

The development of such a modeling system should be preceded by careful design work to ensure that all of the functional requirements are accommodated. A detailed design report should include a description of:

- The overall system design, its principal components, and the functionality that they will be designed to deliver.
- How the team will get the model up and running. This should include a discussion about what portions can be populated with V2 data and products, what portions must be synthesized, etc.
- How the model will evolve over the next several years as additional data, knowledge, and experience are gained.

The Panel believes that an operational framework should be achievable within 12 months, and a fully operational Version 3.0 model in 24 months. This is a longer timeframe than desirable, given the Authority's forecasting needs, but represents a realistically achievable compromise. The design paper should describe how these objectives will be achieved within this 24-month time frame.

4 Next steps

The Panel will continue dialogue with CS in advance of its next formal meeting planned for October. It is anticipated that initial applications of the V2R model will be completed during this time, as well as a draft of the Version 3 design.