Office of Inspector General

Audit Report

FRA NEEDS TO EXPAND ITS GUIDANCE ON HIGH SPEED RAIL PROJECT VIABILITY ASSESSMENTS

Federal Railroad Administration

Report Number: CR-2012-083

Date Issued: March 28, 2012

Memorandum

U.S. Department of Transportation
Office of the Secretary of Transportation
Office of Inspector General

Subject: ACTION: FRA Needs to Expand Its Guidance on High Speed Rail Project Viability Assessments
Federal Railroad Administration
Report Number: CR-2012-083

Date: March 28, 2012

From: Mitchell Behm
Assistant Inspector General for Rail, Maritime and Economic Analysis

Reply to Attn. of: JA-50

To: Federal Railroad Administrator

The Passenger Rail Investment and Improvement Act of 2008[1] (PRIIA) directed the Secretary to establish a high-speed and intercity passenger rail (HSIPR) program, and authorized approximately $4 billion over a 5-year period for HSIPR investments. The statute allowed the Secretary 2 years to develop program rules. However, four months after PRIIA's enactment, the American Recovery and Reinvestment Act of 2009[2] (ARRA) appropriated another $8 billion for HSIPR to be allocated under significantly compressed timelines, and included a requirement to develop interim program rules within 120 days of ARRA's passage.

The Federal Railroad Administration (FRA) is responsible for implementing the HSIPR program. As part of this responsibility, the Agency assesses the economic viability of each proposed HSIPR project and decides which projects to fund. The Administration's Fiscal Year 2013 budget allocates $47 billion for HSIPR over six years. Consequently, potential grantees will need to develop their HSIPR projects' viability analyses if they are to justify additional funding needs.

We initiated this audit to (1) identify key focus areas for analyses of HSIPR project economic viability, and (2) assess FRA's requirements and guidance for HSIPR grant applicants on the information they must provide to FRA on project viability.

[1] P.L. No.110-432, Div. B.
[2] P.L. No. 111-5.

To conduct our audit, we reviewed FRA's requirements and guidance, met with FRA officials, and worked with consultants at Steer Davies Gleave and Charles River Associates, noted experts in HSIPR economic viability analyses. Our work with the consultants included guiding the development and organizational framework of the analysis, and reviewing and commenting on the same. Steer Davies Gleave and Charles River Associates conducted a review of HSIPR project forecasting practices in the U.S. and around the world. They relied upon the results of this review, along with their extensive knowledge of the preparation, review, and development of guidance for HSIPR viability analyses to create the documents that support this report. We conducted our audit from June 2010 through December 2011 in accordance with generally accepted Government auditing standards. Exhibit A details our scope and methodology.

BACKGROUND

Economic viability analyses evolve as a project proposal proceeds through the development process. For instance, a State agency applying for rail funding might conduct a preliminary analysis to determine which among a set of project alternatives would likely succeed. Preliminary viability analyses require relatively little time and funding, and produce results with a relatively large margin of error. For alternatives that clear the preliminary analysis hurdle, the agency could conduct further viability analyses, each more accurate, detailed and resource intensive than the previous one.

In every analysis phase, a HSIPR project proposal must include each of the following three main economic viability analysis components:[3]

1. **Revenue forecast.** The revenue forecast process involves multiple steps that focus primarily on the development of an underlying ridership forecast. First, analysts collect and compile data on current travel patterns into files known as "trip tables." They then apply growth factors,[4] or similar methods, to the trip tables to obtain estimates of future travel in the absence of the proposed HSIPR service. After these calculations, they develop a model—known as a mode choice model—to predict the percentage of future travelers expected to divert to the new HSIPR service. Analysts develop these mode choice models from data on observed traveler behavior or traveler responses to surveys. Analysts also estimate induced travel—trips that would only occur if the new HSIPR service becomes available. Finally, they estimate the expected fare revenue based on the number of diverted and induced travelers forecast to use the new service.

[3] *Federal Register*: Vol. 75. No. 126, Thursday, July 1, 2010; and Vol. 76, No. 51, Wednesday, March 16, 2011.
[4] A growth factor determines a quantity's rate of increase over time.

2. **Public benefits valuations.** The public benefits valuation process requires two steps: quantifying project impacts—such as travel time savings and safety improvements—on travelers and the service area's general population and monetizing or converting those impacts to dollar values. A project's public benefits assessment depends heavily on the forecasts of the number of riders and of the values those riders place on time. The revenue forecasting process generates both of these. HSIPR project public benefits fall into three broad categories: (1) user benefits, including reductions in travel expenses, lower in-vehicle travel time, less time spent waiting, and reductions in the time spent traveling to and from the travel mode terminal, such as a train station or airport;[5] (2) non-user benefits, including reduced automobile congestion and costs, increased highway speeds, reduced auto emissions, and improved transportation safety; and (3) wider economic impacts, including businesses' access to larger labor pools and increased productivity.

3. **Operations & Maintenance (O&M) cost estimations.**[6] O&M cost estimates depend on HSIPR service characteristics, such as the frequency of service, the stations served, trip times, and how the service will be delivered. Examples of service delivery decisions include whether service providers will purchase or lease trains, how they will maintain trains, how they will sell tickets and dispatch trains, and who will manage the railroad.[7] Total O&M costs fall into three categories: (1) O&M costs for infrastructure, including track, bridges and facilities; (2) O&M costs for equipment, including trains; and (3) energy costs. Each category typically accounts for 20 to 30 percent of total operating costs. Staff to operate trains and stations and to provide general and administrative services account for roughly 10 percent each. However, cost shares can vary considerably with individual system specifications. For example, shares accounted for by energy costs vary with train speed, terrain traveled, and number of station stops.

RESULTS IN BRIEF

Relying on the consultants' research and guidance, we identified three key focus areas in assessing project viability.

- The first focus area is the set of elements with the greatest impact on the three analysis components—revenue forecasts, public benefits valuations, and O&M

[5] A reduction in the time spent traveling to the travel mode terminal would occur, for example, for a traveler diverting to the new HSIPR service from airline travel if the time required to reach the train station is less than the time required to reach the airport

[6] Capital or construction costs also play an important role in project valuation, but because the capital cost estimation process tends to be project-specific, we do not address it in this report.

[7] The railroad manager owns and is responsible for the operation and maintenance of railroad infrastructure.

cost estimates. Current trip tracking and projections of future travel in the absence of a HSIPR option provide the foundation for HSIPR ridership projections. Along with models that estimate how many travelers would choose the HSIPR option—called mode choice models—they exert the greatest influence on revenue forecasts. Model structure and survey data used in mode choice model development, in turn, significantly affect model results. Passengers' travel time savings generally make up the bulk of public benefits associated with HSIPR projects. Environmental benefits and impacts on other modes, such as congestion reduction, contribute to public benefits, but to a lesser extent. The number of annual train-miles and train-hours operated, and the number and size of stations served are the most important drivers of operating costs

- The second focus area is the level of analytical detail required at the preliminary, intermediate, and final phases in the development of a HSIPR proposal.[8] Furthermore, the tradeoffs made between the amounts of resources employed to conduct the analysis and accuracy of analysis results also depend on proposal phase. Preliminary phase revenue analyses tend to rely on previously developed data and models to quickly assess multiple service alternatives. Preliminary phase public benefits analyses identify "show stoppers," or critical components that may render a project infeasible or cause costs to greatly exceed benefits, while preliminary O&M cost estimates rely mostly on values established in other analyses. Intermediate phase analyses, in comparison, examine narrower sets of potential service alternatives. They supplement information from other HSIPR analyses with more project-specific data and models. Final phase analyses often study one service alternative in detail, primarily using project-specific data and models. In this phase, ridership and revenue forecasts require extensive data on traveler preferences, while O&M cost estimates require the use of train service simulations and staffing models. Final phase analyses also determine the sensitivity of estimates to changes in critical assumptions and data values.

- The third focus area is the set of issues central to methodological soundness. These differ by analysis component and project development phase. Trip table development is central to assessments of ridership and revenue forecast reliability, but the development process and, consequently, key steps to monitor, differ according to study phase. The validity of public benefits valuations in all analysis phases depends upon avoidance of double-counting, which can occur when benefit categories overlap. Measures required to safeguard the soundness of cost estimates include ensuring analysts understand the services to be provided in preliminary phase studies and appropriately

[8] This particular differentiation of proposal phases is introduced to facilitate discussion; it is not meant to be prescriptive.

quantify risks in final phase analyses. In all analysis phases, analysts and reviewers must check assumptions made in cost estimates and ridership and revenue forecasts for consistency.

FRA has established only minimal requirements and guidance on the information HSIPR grant applicants must provide to FRA on project viability. The guidance states that FRA looks at the "quality and reasonableness of revenue and operating and maintenance forecasts [and] the reasonableness of estimates for user and non-user benefits."[9] However, the guidance contains no information on what constitutes sound forecasts, valuations, and estimates. Furthermore, the guidance makes no reference to many of the complex issues that need to be addressed in the preparation and review of HSIPR project viability analyses. As a result, it allows for wide variation in the level of detail and methodologies used by grant applicants in the preparation of revenue forecasts, benefits valuations, and cost estimates, and, consequently, in the quality of project viability analyses, hampering FRA's proposal assessments.

We are recommending that FRA expand its guidance for HISPR grant applicants to include information on the key areas of HSIPR forecasts, valuations, and estimates.

THREE FOCUS AREAS ARE KEY TO SOUND PROJECT VIABILITY ASSESSMENT

In our work with the expert consultants, we identified three key areas to focus on in assessing project viability: (1) the elements with the greatest impact on the components of the analyses—revenue forecasts, public benefits valuations, and O&M cost estimates; (2) the level of analytical detail required for these components at the preliminary, intermediate, and final phases in the development of a HSIPR proposal; and (3) issues central to methodological soundness.

Certain Elements of Forecast, Valuation, and Estimation Processes Affect Results More Than Others

Each component of a viability analysis for a proposed rail project includes elements that affect results more heavily than others. Trip tables, which depend on the data and growth rates used in their development, and mode choice models, which depend on the methods and survey data used to construct them, have the greatest impact on ridership and revenue forecasts. Travel time savings most strongly affect public benefits valuations, while environmental benefits and impacts on other modes, such as congestion reduction, have less influence. The

[9] *Federal Register*: Vol. 75. No. 126, Thursday, July 1, 2010; and Vol. 76, No. 51, Wednesday, March 16, 2011.

number of annual train-miles and train-hours operated, and number and size of stations served have the greatest influence on operating cost estimates.

Trip Tables and Mode Choice Model Estimations Have the Greatest Influence on Revenue Forecasts

Revenue forecasts' accuracy depends heavily on trip tables' quality, since all other steps rely on these tables. The quality of auto trip tables particularly impacts the accuracy of the underlying ridership forecasts because, typically, a large share of potential HSIPR travelers is diverted from automobiles. Currently, there is no standard source of information on intercity auto travel of sufficient detail and quality for project-level forecasting. Given the large volumes of intercity auto trips, errors in auto trip table preparation can result in significant discrepancies in estimated HSIPR ridership and revenue numbers, even if only a small percentage of auto travelers divert to rail. Similarly, trip table growth rates used to generate projections of future travel demand—the potential sources of future HSIPR ridership—also heavily influence revenue forecasts.

Mode choice model structure substantially impacts estimates of whether travelers will choose the new HSIPR service over existing modes. There is no standard model structure, and determination of the most suitable structure for a particular study depends on the context. In addition, mode choice model estimates' reliability depends heavily on the quality of data used in model construction. Data on service characteristics and methods used to design and collect travel surveys greatly influence model estimates of users' value of time and willingness to pay for travel services.

In contrast, induced travelers—those who would not travel without the new high-speed rail services—usually account for only a small share of total HSIPR ridership and revenue. Induced travel can be modeled directly, which requires the development of a separate model, or calculated as a percentage of the estimated diversions to HSIPR.

Travel Time Savings Heavily Influence Public Benefits Valuations

Travel time savings typically account for the largest share of public benefits valuations. Travel time savings include reductions in waiting, time getting to and from the travel mode, and in-vehicle travel times. The introduction of a high-speed rail service may affect some or all of these. The monetary value of travel time savings is calculated as the product of the number of each type of HSIPR traveler

with their value of time,[10] summed over every traveler type. The revenue forecast process provides the inputs to this calculation.

Service quality also contributes significantly to user benefits when a project provides additional capacity, as does safety valuation when significant diversions from highways occur. Environmental benefits usually reach significant levels, but tend to be smaller than other public benefits. Reductions in highway maintenance and expansion costs due to diversion of travelers to high-speed rail also tend to have smaller impacts on net public benefits valuations.

The Number of Annual Train-Miles and Train-Hours Operated Greatly Influence O&M Cost Estimates

The number of annual train-miles and train-hours operated, and the number and size of stations served have the greatest impact on O&M costs. These elements determine the resources needed to provide the service, including the numbers of trains, train crews, station staff, train inspections, spare components, and units of energy required. Other elements such as on-board services and amenities assume lesser importance.

Levels of Analytical Detail Vary According to Phase of Project Proposal Development

The level of analytical detail appropriate for revenue forecasts, public benefit valuations, and cost estimates varies according to the phase of HSIPR project proposal development. From the preliminary to the final phase, revenue forecasts narrow the set of alternatives considered and increase the level of detail at which each alternative is examined. Public benefits valuations increase the categories of benefits analyzed as the project proposal moves through development, producing ever more detailed results. Operating cost estimates move from rough cost identification in preliminary phases to complex modeling in final phases.

Revenue Forecasts Narrow the Set of Alternatives Considered Between the Preliminary and Final Phase

In the preliminary phase of HSIPR proposal development, revenue forecasts assess multiple service alternatives within short timelines and limited budgets. Generally, these forecasts have insufficient scope to develop travel demand models from scratch and, consequently, rely heavily on readily available models and data. These forecasts also have sizeable margins of error.

[10] Different values of time may apply depending on some or all of the following trip characteristics: (1) mode, such as bus, train, air, or auto; (2) trip purpose, including business and leisure; and (3) trip length, such as local or long distance.

In the intermediate development phase, revenue forecasts combine readily available and project-specific data and produce more accurate results than preliminary forecasts. They also examine a narrower set of service alternatives. Some primary data collection—including travel surveys in the study area—is usually required in this phase. The analysis may involve large numbers of assumptions but focuses on a smaller set of project alternatives.

A revenue forecast in the final phase of proposal development generally includes extensive collection of project-specific data that focus on a single project alternative. During this forecast process, analysts also collect original data on traveler preferences, HSIPR service characteristics, and characteristics of competing modes. These forecasts do not rely on third-party models and data unless they are thoroughly reviewed for accuracy and applicability. The final phase forecast process also identifies key risks and involves extensive sensitivity analyses.

Public Benefits Valuations Expand the Categories of Benefits Analyzed Between the Preliminary and Final Phase

Preliminary phase public benefits valuations balance each impact's expected importance with the resources spent to quantify and monetize it. They may base impacts on previous analyses when appropriate. Importantly, preliminary valuations identify "show stoppers"—critical components that may render a project infeasible or cause costs to greatly exceed benefits. The level of analysis of public benefits possible in this and all phases depends on the quality of the ridership and revenue forecasts' results.

Intermediate phase public benefits valuations focus on the benefit categories in which the service alternatives under consideration are likely to produce substantially different results. Consequently, these analyses primarily serve to differentiate between alternatives. Intermediate phase valuations quantify benefits' impacts based on project-specific analyses but may use evidence from other similar projects to monetize them. Furthermore, they analyze and quantify critical elements identified by previous analyses. They also calculate the value of user benefits separately for business and leisure travelers.

Final phase analyses include project-specific parameters, such as the value of time, as much as possible and test the sensitivity of results to variations in significant assumptions and inputs. These valuations rely almost entirely on project-specific values and assumptions. In this phase, it may be necessary to demonstrate that certain benefits are not significant.

O&M Cost Estimations Move From Cost Identification in the Preliminary Phase to Modeling in the Final Phase

O&M cost estimations in the preliminary phase of HSIPR project development focus on quick, rough comparisons of the cost of each alternative using a "top-down," or high level approach. These estimations identify key metrics, such as track miles, annual train miles and hours driven. Analysts often use these metrics in combination with unit costs[11] from other studies to generate cost estimates. Analysts also usually add a sizable contingency allowance,[12] 40 to 50 percent, to cost estimates to account for the many uncertainties inevitably associated with project specifications and cost components in this phase.

Intermediate phase cost estimations focus on increased accuracy for fewer alternatives but still use a "top-down" approach. In this phase, analysts estimate quantities of key resources—such as trains, train crews and energy—required to meet ridership forecasts. Analysts also identify appropriately benchmarked unit cost rates[13] and general and administrative costs for different categories, possibly from other studies. Train specifications are more detailed than in the preliminary phase, with trip times and turnarounds at terminus stations verified by modeling. Contingency allowances in this phase range between 20 and 30 percent.

Final phase cost estimation often analyzes only one alternative and develops cost estimates using an element-by-element or "bottom-up" approach based on a complete railroad design plan. Analysts develop the railroad design plan from timetable modeling and train service simulation. Consequently, it includes accurate forecasts of the total amounts of miles and hours that a train operates in a single year. To develop energy and labor cost estimates, analysts use models of energy consumption, staff hours, and staff allocations. In addition, they fully specify head office staff roles and numbers, and monetize other general and administrative cost line items. Final phase labor costs represent salaries, employers' overhead, and the terms and conditions of each employee role and grade. The selection of many unit cost rates may reflect discussions with suppliers, such as train manufacturers, unions and energy suppliers, regarding likely contract terms and conditions. The final phase contingency allowance drops to 10 to 20 percent. Further, the contingency allowance varies across cost categories and is determined through identification and quantification of specific risks.

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[11] A unit cost is the cost per unit of a key metric, such as track miles, annual train miles, or hours operated.

[12] A contingency allowance effectively provides a cushion to account for factors or risks that have yet to be fully specified.

[13] For example, standard rates for the salary of each category of staff or per mile train operating costs.

Certain Issues Are Central to Methodological Soundness

The issues important to the determination of methodological soundness of revenue forecasts, public benefit valuations, and cost estimates vary by analysis component and the different phases of proposal development. The accuracy of auto trip tables is central to ridership and revenue forecast reliability, but the steps requiring attention differ according to phase. The key concerns for sound public benefit valuations are the same at each development phase, the most significant being the avoidance of double-counting. Focus areas for accurate operating cost estimates range from ensuring the analysis reflects a good understanding of the services to be provided in the preliminary proposal phase to accurately quantifying risks in the final phase. In all phases, assumptions about the service to be provided that underlay operating cost estimates must be consistent with those made in the revenue forecasts.

The Soundness of Trip Table and Mode Choice Model Development Significantly Determine Revenue Forecast Reliability

The lack of a standard source for data on intercity automobile travel requires analysts and reviewers to exercise particular care in developing and checking automobile trip tables. For preliminary phase revenue forecasts, analysts typically employ mode choice models developed in other studies. In addition, they often assert the validity of values for particular factors, such as travelers' time, derived using those models in earlier studies, rather than statistically estimate values for those factors from local data. Consequently, reviewers need to scrutinize the model's applicability to the intended study area.

Intermediate phase ridership and revenue forecasts use more project-specific factors, while preserving the ability to efficiently assess multiple project alternatives. Analysts need to trade off these opposing objectives efficiently to produce forecasts that can adequately support the selection of a single option or a small group of alternatives for final phase analysis.

The travel patterns portrayed in the trip tables need to make sense when consolidated into aggregate travel numbers and compared with data from other sources. Analysts should construct current-year trip tables, particularly for the automobile mode, using primary data sources such as counts, surveys, or anonymous vehicle or mobile phone tracking. For non-automotive trips, analysts can use publicly available data, such as Bureau of Transportation Statistics data on airline service. The design, execution, and analysis of any primary data collection effort supporting either the trip tables or the development of the mode choice model, especially travel surveys, require close attention. While a detailed review of such efforts remains a task for subject matter experts, a generalist can check on

certain concerns. In particular, it is important to adequately sample market segments and trip purposes and avoid language or images in survey instruments that might bias responses. In addition, survey questions have to relate to respondents' ordinary travel experiences and avoid far-fetched and ill-defined hypothetical choices.

Mode choice models used in the intermediate phase may combine original statistical analyses of travel survey data with results from other studies. Model estimates of the value of travelers' time should correlate reasonably well with local incomes and wage rates. Analysts and reviewers can assess the reasonableness of the cost or time equivalents of the mode-specific constants[14] by comparing them to results from other studies.

Assumptions about the comfort, time, and cost involved in getting to and from the different travel modes in future years can significantly affect results, particularly the relative values for rail and air if the analysis assumes substantial improvements. Assumptions about future year automobile congestion levels can also have significant impacts. The levels of service of competing modes—automobile and air—need to reflect prevailing information, as obtained, for example, from online trip planners or similar tools.

In the final analysis phase, the approaches used to develop current auto trip table data and the growth factors used to develop future year trip tables require careful consideration. Analysts should develop growth factors using location-specific estimates of anticipated population and income expansion in the project service area to the extent possible. In addition, analysts need to prepare detailed explanations of the forecasting methodologies used.

While thorough examination of the statistical analyses used to develop mode choice models from collected data requires technical expertise, non-specialists can assess the care with which analysts have checked and corrected the data collected. In this phase, the reasonableness of the model's estimates of travelers' time values for different types of travelers and trip purposes should again be determined using locality-specific data, such as information on local wage rates. In addition, the reasonableness of the monetary or time value of the mode specific constants also requires reexamination. Reviewers should especially check study methodologies and assumptions regarding future year levels of service by mode if the project is projected to significantly reduce congestion on highways, airways, or other rail facilities.

[14] Mode specific constants in mode choice models represent the average effect of all factors that influence the mode choice but are not otherwise included in the model.

Double-Counting of Benefits and Use of Inconsistent Measurements Undermine Validity of Public Benefit Valuations

Double-counting of public benefits and the use of inconsistent measurement methods are common errors in all phases of benefit valuations. The likelihood of double-counting increases when analysts include benefits whose proper use has not been well-established, such as property value appreciation and employment gains. HSIPR project-related property value appreciation, for example, partly depends upon travel time reductions. However, analysts typically incorporate the value of travel time savings in user benefits. Including both property appreciation and the value of travel time savings in a benefits calculation would therefore constitute double-counting.

The use of inconsistent measurement methods frequently occurs when analysts monetize benefits. At that juncture, analysts must choose to use either market values or resource costs. Market values are the prices paid in the marketplace. Resource costs exclude elements, such as taxes, which do not reflect the true economic costs of producing a good. Once the choice is made, analysts must measure all benefits on the same basis.

Public benefits assessments need to capture any important benefits specific to the project under consideration in addition to including benefits identified as important in studies of previous projects. At the same time, analysts must take extra care when incorporating benefits for which previous studies have not established benchmark values.

Omissions and Incorrect Assumptions Frequently Lead to Inaccurate O&M Cost Estimates

O&M cost estimates developed in preliminary phase analyses primarily serve to support comparisons of different routes and train service alternatives, such as different frequencies of service and number of station stops. However, preliminary cost estimates are often misrepresented as the likely cost of HSIPR service operations. Clear definition of the railroad route, the level and quality of train service to be offered, and the standards—such as those set by safety and labor regulations—that must be complied with are essential prerequisites for accurate cost estimation.

In intermediate phase analyses, estimates often incorporate inaccurate assumptions about the impact of standards and a lack of understanding about staffing needs. Analysts frequently assume that costs to meet standards will be low, or that the relevant authority will grant exemptions from standards or labor agreements. Examples include the assumption that a single driver can operate a train and

operations still comply with labor agreements, or that a European train can meet FRA safety standards without modifications. In their estimations of labor costs, analysts often incorrectly analyze all labor costs as a single category rather than develop separate estimates for staff with different competencies and responsibilities. Analysts' failure to understand different staff roles and functions often leads to underestimation of staffing needs and the application of inappropriate wage and overhead rates.

Frequently, analysts omit contingency allowances from intermediate phase cost estimates. These omissions are inappropriate since intermediate cost estimates are prepared in relatively short timeframes, on a top-down basis, and often rely on unit costs from other HSIPR services or studies.

Final phase cost estimates should include considerable analysis of cost drivers and unit costs to prevent continuations of omissions and applications of any incorrect assumptions made in intermediate-phase analyses. Omissions with respect to staffing needs tend to commonly occur. For example, expansion of on-board services may increase fare revenues. However, if the number of customer service staff is not also increased in line with the expanded services, analysts will likely underestimate train crew operating costs. Analysts also often fail to verify that discounts included in an estimate will be achievable in practice. For example, analysts may underestimate energy costs if they assume that other trains can reuse electricity returned to the system. Train service frequencies may prevent energy reuse, or it may otherwise prove impractical to use the regenerated power.

Final phase analyses need to include well-developed, quantified risk assessments. Such assessments include forecasts of the required contingency allowance size. Analysts frequently over-simplify risk assessments, both in terms of risk identification and quantification.

FRA'S GUIDANCE AND REQUIREMENTS FOR HSIPR GRANT APPLICANTS ARE INADEQUATE TO ENSURE SOUND VIABILITY ANALYSES

To date, FRA has established only minimal guidance and requirements for HSIPR grant applicants on the information they must provide to FRA on project viability. Even FRA's most specific guidance fails to discuss key considerations. Altogether, the guidance allows for wide variation in the level of detail and methodologies used by grant applicants in the preparation of revenue forecasts, benefits valuations, and cost estimates, and consequently, in the quality of project viability analyses.

FRA's guidance informs applicants to all of its HSIPR programs that the Agency looks at the "quality and reasonableness of revenue and operating and maintenance forecasts [and] the reasonableness of estimates for user and non-user benefits."[15] However, it contains no information on what constitutes sound forecasts, valuations, and estimates. FRA provides its most extensive guidance in the announcement of its second largest HSIPR funding program. That guidance outlines a model service development plan (SDP) to "assist applicants/grantees in fulfilling the objectives necessary to successfully complete each stage of project development[,]" but explicitly states that applicants and grantees are not required to follow the model. The outline indicates what would "optimally…be included in an SDP." It lists the major elements of revenue forecasts, operating cost estimates, and user and non-user benefits, and provides a limited description of the requirements for the elements of revenue forecasts and cost estimates. For operating cost estimates, for example, the outline reads as follows:

> For each different cost area, the SDP should provide the basis for estimation (application of unit costs from industry peers or a detailed resource build-up approach) of operating expenses. The SDP should include documentation of key assumptions and provide back-up data on how unit costs and quantities and cost escalation factors were derived.

The section concludes with a list of "typical cost areas." The same announcement later indicates that operating cost estimates, along with the other viability analysis components, will be "expanded and updated" as the project develops.

The announcement leaves much of the determination of what should be provided up to the applicants and grantees. It does not, for example, discuss when the use of assumptions would be reasonable, when unit costs rather than a "build-up" approach would be appropriate, or any of the pitfalls commonly encountered in the preparation of cost estimates. Furthermore, it provides no indication of what the expansion or updating of operating costs at later project stages would entail. The most specific guidance for revenue forecasts and benefits valuations similarly allows for a wide range of interpretations.

The lack of clear, detailed standards in FRA's HSIPR forecasting guidance allows for viability analyses of widely varying quality. Analyses of varying quality, in turn, make it difficult for FRA to be sure that it allocates HSIPR funds to the most effective projects. Furthermore, poor quality forecasts make it difficult for FRA to accurately assess whether projects will be viable or require substantial financial

[15] *Federal Register*: Vol. 75. No. 126, Thursday, July 1, 2010; and Vol. 76, No. 51, Wednesday, March 16, 2011.

support. Projects undertaken based on flawed forecasts can ultimately require far greater financial infusions than their analyses predicted.

CONCLUSION

The Administration's FY 2013 budget allocates $47 billion over six years for further development of a HSIPR program. It is FRA's responsibility to ensure that HSIPR project plans are viable. The requirements of sound economic viability analyses are highly complex and susceptible to bias and inaccuracy. FRA's current guidance and requirements for its HSIPR grant applicants do not provide a level of detail sufficient to minimize bias and ensure accuracy in project viability assessments. Furthermore, while it is impossible to eliminate all risk from HSIPR projects, full articulation of known risks will facilitate FRA's decision-making on which projects to fund. Detailed guidance from FRA on the preparation of HSIPR ridership and revenue forecasts, public benefits valuations, and operating cost estimates could help ensure that Federal funds are invested in the projects with the greatest chance of success. Such guidance would also be useful for States that apply for these funds, since grant requirements assign responsibility for financial shortfalls to them for the life of the grants.

RECOMMENDATIONS

We recommend that FRA:

1. Develop specific, detailed guidance for the preparation of HSIPR ridership and revenue forecasts, public benefits valuations, and operating cost estimates that reflects the key considerations identified in this report.

2. Establish specific requirements for ridership and revenue forecasts, public benefits valuations, and operating cost estimates for each level of project development provided by HSIPR grant applicants.

AGENCY COMMENTS AND OFFICE OF INSPECTOR GENERAL RESPONSE

We provided a draft of our report to FRA on February 17, 2012. We received FRA's response on March 14, 2012, which can be found in its entirety in the appendix of this report. FRA fully concurred with our recommendations. Further, FRA indicated that it will produce guidance for vetting by stakeholders and appropriate technical experts by March 2013.

ACTIONS REQUIRED

We consider FRA's planned actions and target date for meeting our recommendations reasonable and therefore resolved but open pending completion of the planned actions, subject to follow-up provisions in accordance with DOT Order 8000.1C.

We appreciate the courtesies and cooperation of Federal Railroad Administration representatives during this audit. If you have any questions concerning this report, please call me at (202) 366-9970 or Betty Krier, Program Director, at (202) 366-1422.

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cc: Audit Liaison, OST, M-1
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EXHIBIT A. SCOPE AND METHODOLOGY

We conducted our work from June 2010 through February 2012 in accordance with generally accepted Government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objective.

We initiated this audit to (1) identify key focus areas for analyses of HSIPR project economic viability, and (2) assess FRA's requirements and guidance for HSIPR grant applicants on the information they must provide to FRA on project viability.

To conduct our review, we worked closely with consultants at the firms of Steer Davies Gleave and Charles River Associates. We relied on their technical expertise in identifying considerations that are key to viability assessments. We held 20 meetings with the consultants from July 2010 to April 2011 to ensure that the research and supporting documentation they provided would address our audit objectives. We engaged in an intensive and ongoing review of the technical documents underlying this report throughout their development by the consultants, in order to shape the technical information into accessible material.

Steer Davies Gleave and Charles River Associates conducted a review of financial and economic forecasting practices for HSIPR projects in the U.S. and around the world. In the U.S., they examined studies conducted for the officially designated HSIPR corridors as well as selected other "unofficial" corridors. Internationally, their review emphasized countries with experience in HSIPR operations, although countries with mature development programs were also considered. They drew upon this review, and their considerable experience and expertise, to produce analyses of the issues and characteristics of the elements of revenue forecasting, public benefits valuation, and operating cost estimation for HSIPR projects. For example, the contractors established a framework to identify issues with travel demand models, their various components and structure. This framework facilitated identification of questionable methodological practices, unusual model estimates, and other issues related to the revenue forecasting process. They ultimately condensed these analyses into a set of documents on viability analysis processes, which formed the basis for this report.

EXHIBIT B. MAJOR CONTRIBUTORS TO THIS REPORT

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U.S. Department of Transportation

Memorandum

Federal Railroad Administration

Date: March 14, 2012 Reply to Attn of:

Subject: FRA Response to Office of Inspector General (OIG) Draft Report on Guidance for High-Speed Rail Project Viability Assessments

From: Joseph C. Szabo
Administrator
Federal Railroad Administration

To: Mitch Behm
Assistant Inspector General for Rail, Maritime, and Economic Analysis

The American Recovery and Reinvestment Act of 2009 (Recovery Act) rapidly transformed the Federal Railroad Administration (FRA) from an organization nearly entirely devoted to safety and safety oversight, to one with a significant grant making component. This required FRA to build the necessary grant making capabilities, including guidance, operations, and oversight with the unprecedented speed mandated by the Recovery Act. The massive extent of this undertaking combined with the short time frames of the Recovery Act required extraordinary action by FRA. We are proud to say that FRA met this challenge and fulfilled the statutory requirements necessary to get America's High-Speed and Intercity Passenger Rail (HSIPR) program moving.

With regard to the specific technical areas touched upon in this report, FRA provided guidance to grant applicants that was sufficient to meet applicable statutory requirements within the timeframe afforded by the Recovery Act and the fiscal year (FY) 2010 appropriation. The Recovery Act and FY 2010 appropriations act accelerated the time frames of the Passenger Rail Improvement and Investment Act (PRIIA) and called for funds to be made available *on the basis of interim guidance rather than a final rule*.[1] FRA issued Interim Guidance in June 2009, with updates provided in July 2010 and March 2011. This guidance provided direction to applicants on cost estimation, ridership and revenue forecasts, service development planning, public benefits assessment, engineering documentation, and other proposal elements. Given the newness of the Federal role in funding intercity passenger rail projects, and consistent with the early stage of the program's development and the Congressionally-mandated time frames, the Interim Guidance allowed some flexibility in the methodologies used by applicants to develop their proposals, but required a specific set of basic information needed for FRA to make sound selection decisions.

[1] *See* PRIIA, Pub. L. No. 110-432, § 301, 122 Stat. 4936 (2008); ARRA, Pub. L. No. 111-5, 123 Stat. 208 (2009); Consolidated Appropriations Act of 2010, Pub. L. No. 111-117, 123 Stat. 3056-57 (2009).

FRA recognizes that as additional HSIPR funds become available in the future, it will be important to provide further guidance in the areas of ridership/revenue projections, public benefits assessments, and operating and maintenance cost estimates. The OIG report will provide useful input for that process. Even as we implement the Recovery Act and FY 2010-funded program, FRA has been working to refine its guidance related to benefits and costs to provide clear and consistent criteria for our stakeholders and future applicants. However, it is important to recognize that the primary beneficiary of this additional guidance is future applicants competing for any additional funding that may become available in the future. Because the vast majority of current grantees have projects that are fully-funded through the final design and construction phase, this guidance is not necessary for the successful delivery of these currently-funded HSIPR projects. Except for the 3 percent of funds supporting only planning and engineering/environmental activities, current grantees will not need to "justify additional funding needs" in order to enter final design/construction or to complete their projects.

Recommendations and Responses

OIG Recommendation 1: Develop specific, detailed guidance for the preparation of HSIPR ridership and revenue forecasts, public benefits valuations, and operating cost estimates that reflects the key considerations identified in this report.

FRA Response: We concur. Our initial guidance document will focus on assessing project costs and benefits. FRA will circulate this guidance for vetting by stakeholders and appropriate technical experts by March 2013.

OIG Recommendation 2: Establish specific requirements for ridership and revenue forecasts, public benefits valuations, and operating cost estimates for each level of project development provided by HSIPR grant applicants.

FRA Response: We concur. As additional funding is made available for the HSIPR program, FRA will ensure that the guidance described above is reflected in the application preparation, review, and selection processes described in future Notices of Funding Availability.

Appendix. Agency Comments