CALIFORNIA High-Speed Rail Authority

California High-Speed Rail
BRIEFING: May 11, 2023 Board Meeting Agenda Item #3

TO: Brian Kelly, Chief Executive Officer

FROM: Brian Annis, Chief Financial Officer

DATE: May 11, 2023

RE: High-Speed Rail Benefit-Cost Analysis

Background

The Authority has completed the benefit-cost analysis (BCA) conducted for the Phase 1 System from San Francisco to Los Angeles/Anaheim. The BCA estimates the societal benefits and costs tied to the Phase I high-speed rail system, from construction through 30 years of operations. This differs from the Economic Impact Analysis Report presentation to the Board in March 2023, which considered the effects of project expenditures on the local economy during construction in terms of jobs, labor income, and economic output.

This BCA was prepared to support the Authority's grant application for the Federal-State Partnership for Intercity Passenger Rail Grant (FSP-National) Program. The analysis was conducted in accordance with the benefit-cost methodology outlined by the U.S. Department of Transportation (USDOT) in the *Benefit-Cost Analysis Guidance for Discretionary Grant Applications* released in January 2023[1]. The BCA estimates the societal benefits and costs tied to the high-speed rail system including through operations. The estimates include the entire project costs.

The 2023 BCA report reflects the Authority's most recent ridership projections and the latest construction cost estimates. The projected future expenditures and demand data are based on the *2023 Project Update Report*.

The overall conclusion of the BCA is that the benefits of the Phase I System are substantial and far exceed costs.

Methodology

The BCA captures the net welfare change created by a project, including cost savings and increases in welfare (benefits), as well as disbenefits where costs can be identified (e.g., project capital costs).

The BCA involves defining a Base Case or "No Build" Case, which is compared to the "Build" Case. The BCA assesses the incremental difference between the Base Case and the No Build Case, which represents the net change in welfare. BCA's are forward-looking exercises which seek to assess the incremental change in welfare over a project life cycle. The importance of future welfare changes is determined through discounting, which is meant to reflect both the opportunity cost of capital as well as the societal preference for the present.

This methodology includes the following analytical assumptions:

- Defining existing and future conditions under a Base Case as well as under the Build Case;

[1] U.S. Department of Transportation, Benefit-Cost Analysis Guidance for Discretionary Grant Applications, January 2023. https://www.transportation.gov/mission/office-secretary/office-policy/transportation-policy/benefit-cost-analysis-guidance. Accessed April 2, 2023.

- Estimating benefits and costs during project construction and operation, including 30 years of operations beyond the Project completion when benefits accrue;
- Using USDOT recommended monetized values for reduced fatalities, injuries, property damage, travel time savings, and emissions, while relying on best practices for monetization of other benefits;
- Presenting dollar values in real 2021 dollars. In instances where cost estimates and benefits valuations are expressed in historical or future dollar years, using an appropriate inflation factor to adjust the values;
- Discounting future benefits and costs with a real discount rate of 7 percent,[2] consistent with USDOT January 2023 guidance;
- Operations & Maintenance and Repair & Rehabilitation are disbenefits (rather than a cost); and
- Benefit and cost estimates should reflect real resource use. Transfers such as fare revenues or indirect taxes do not change real resources, so they are not included in our BCA.

Discussion

The Analysis presents the Benefit and Costs in categories as follow:

Benefits can be positive or negative (disbenefits). In the table below, total benefits are presented in nominal dollars, or undiscounted Year of Benefit (YOB) dollars, in billions.

Benefit Category	
High-Speed Rail User Benefits	$278.7
Safety and Environmental Benefits	$175.4
Wider Economic Benefits to Workers and Firms	$213.0
At-Grad Rail Crossing Removals	$67.7
Residual Value	$177.1
Freight and Passenger Rail Efficiency Gains	$18.4
Operations & Maintenance and Repair & Rehabilitation (disbenefit)	-$82.1
Total	**$848.3**

The benefit quantification above is based on specific outcomes in a Build versus a No Build scenario and the many advantages of high-speed rail over other travel modes. These include:

- **Travel and Transfer Time Savings:** 1 billion total hours of time savings for riders resulting in $141 billion in total benefits
- **Reliability Relative to Other Modes:** HSR arrives on time more than other modes, resulting in $59 billion in total benefits
- **Stations and Train Amenities:** Improvements relative to current trains and stations for all users of those facilities result in $51 billion in total benefits
- **Induced Ridership:** These benefits accrue to those that would not have traveled but for fast, safe and convenient high-speed rail, resulting in $27 billion in total benefits
- **Automobile Cost Savings:** Due to a 96-billion-mile total reduction in vehicle miles traveled (VMT), automobile costs of operation and maintenance will have savings that result in $98 billion in total benefits
- **Highway Traffic Crash Reduction:** Due to reduced VMT, 1,346 fatal crashes, 23,985 injury crashes, and 41,011 property damage crashes will be avoided, resulting in $56 billion in total benefits

[2] With the one exception to this being for carbon dioxide (CO2) emissions, which are discounted at 3 percent per US DOT Guidance.

- **Auto and Air Emission Reduction:** Due to reduced VMT, reduced congestion, and reduced flights, harmful emissions will be reduced resulting in $8.0 billion in total benefits
- **Wider Economic Benefits that produce:**
    - **Worker Wage Uplift:** Due to improved collaboration opportunities with other workers and firms, workers will be more productive and see wage gains that result in $197 billion in total benefits
    - **Firm Productivity Uplift:** Due to improved access to workers and improved collaboration opportunities with other firms, commercial real estate near high-speed rail stations will appreciate faster, resulting in $16 billion in total benefits
- **Elimination of Current At-Grade Rail Crossings:** New grade separated crossings reduce delays for ambulance and fire service, and avoid fatal and injury crashes at crossings, resulting in $68 billion in total benefits
- **Freight and Passenger Rail Efficiency Gains:** High-speed rail on dedicated tracks reduces demand on existing freight tracks, resulting in $18 billion in total benefits
- **Residual Value:** While the FRA guidance limits benefits from operations to 30 years, some high-speed rail assets have 100-year design life if properly maintained, resulting in $177 billion in total benefits
- **Operations & Maintenance and Repair & Rehabilitation Cost:** These costs are counted as negative benefits (disbenefits) of $82 billion

Costs of building the Phase I System are shown in the below table in nominal dollars, or undiscounted Year of Expenditure (YOE) dollars in billions. The cost table below is from the *2023 Project Update Report*.

The table below converts costs and benefits to 2021 dollars with a 7% annual discounting of future benefits and costs.

Scope Element	Low	Base	High
	Phase I Program		
Merced to Bakersfield	29,833	31,497	32,976
Northern California	21,180	27,865	35,514
Southern California	31,908	40,650	52,807
Program Wide	5,624	6,151	6,636
Total:	**88,545**	**106,163**	**127,933**

Category	Value (YOE$, Billions), No Discount	Value (2021$, Billions), No Discount	Value (2021$, Billions), 4% Discount Rate	Value (2021$, Billions), 7% Discount Rate
Total Benefits	$848.3	$364.2	$133.5	$70.6
Total Capital Costs [(1)]	$106.2	$76.9	$62.2	$53.7
Net Benefits	**$742.1**	**$287.3**	**$71.3**	**$16.9**

[(1)] *Capital Costs net of indirect taxes for all by YOE$*

The results of this BCA are very favorable. A project is considered cost-effective when the Net Present Value (or Net Benefits) is positive and when the Benefit Cost Ratio (BCR) is 1.0 or greater. The project has strong net benefits at various levels of discounting. With the 7 percent discount rate directed by the federal government, the Net Present Value is $16.9 billion with a Benefit Cost Ratio of 1.32.

Summary

- The Phase I HSR System is transforming California and our nation's transportation infrastructure.
- The benefits of the High-Speed Rail project far exceed the costs of building it and offer increased access to opportunity to disadvantaged areas.
- The societal benefits generated by the project are estimated to be $70.6 billion in discounted 2021 dollars over the lifetime of the system. The total capital costs *net of indirect taxes* are calculated to be $53.7 billion in discounted 2021 dollars. The difference in the discounted benefits and costs equals a net present value of $16.9 billion in discounted 2021 dollars, resulting in a benefit-cost ratio (BCR) of 1.32.
- Over half of the project's investment occurs in designated disadvantaged communities where improving access to jobs and opportunities is a priority for the State.

Legal Approval

The Legal Office has reviewed this item and it is in compliance with Authority policy.

Budget and Fiscal Impact

This is an informational item on the 2023 Benefit-Cost Analysis, and by itself, does not have a budget or fiscal impact.

REVIEWER INFORMATION	SIGNATURE
Reviewer Name and Title: **Brian Annis** **Chief Financial Officer**	Signature verifying budget analysis:
Reviewer Name and Title: **Alicia Fowler** **Chief Legal Counsel**	Signature verifying legal analysis:

Recommendations

This item is informational only; there are no recommended actions at this time.