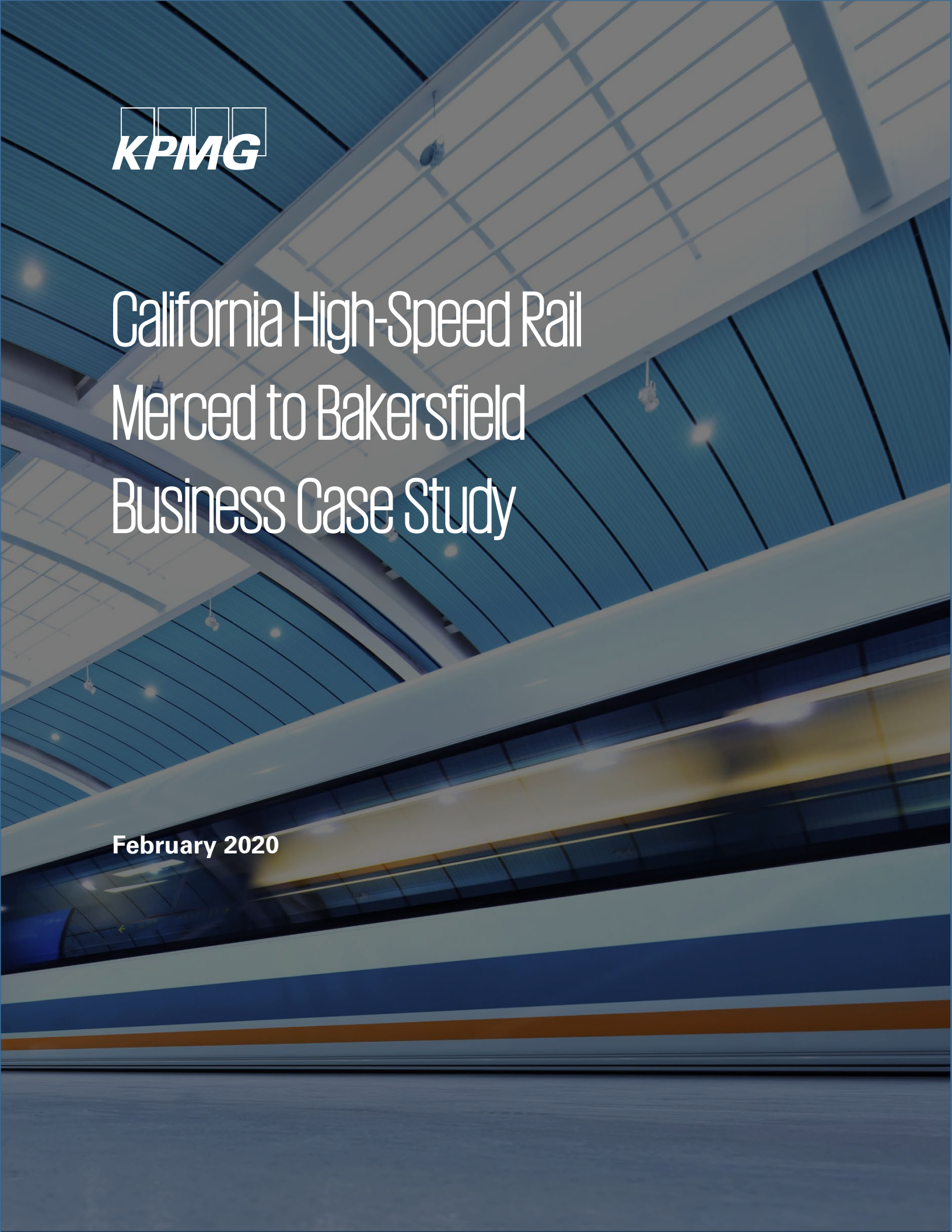


KPMG

California High-Speed Rail Merced to Bakersfield Business Case Study

February 2020

GLOSSARY AND ACRONYMS

Altamont Corridor Express (ACE): The commuter rail service connecting Stockton to San Jose, with a planned extension to Merced and Sacramento. ACE is owned and operated by the San Joaquin Regional Rail Commission.

American Reinvestment and Recovery (ARRA) Grant: Federal funds allotted to California High-Speed Rail as part of federal stimulus funding in 2009.

Bookend/Early Investment Projects: Various transportation improvement projects in Southern California and the Bay Area along the Phase 1 high-speed rail corridor with $1.3 billion in Authority-committed funding.

Business Case: A preliminary assessment of critical issues for consideration and future study, such as this document.

Business Model: The arrangement between stakeholders to define and manage the relationships for Interim Service.

Business Plan: A required financial, implementation and operations document describing planning for the California high-speed rail system.

California High-Speed Rail Authority (Authority): A California State Agency first established in 1996 by SB 1420, and PUC § 185020, to implement high-speed rail service.

California State Transportation Agency (CalSTA): State cabinet-level agency responsible for transportation-related departments within California.

Caltrain: A commuter rail line extending from San Francisco to the Santa Clara Valley with a terminus at Gilroy.

Cap-and-Trade Program: California's program for greenhouse gas emissions reduction and a source of California high-speed rail funding.

Central Valley Segment (CVS): The 119-mile long geographic alignment for the initial construction of the high-speed rail system.

Design-Build (DB) Contractors: The private construction firms responsible for the actual construction of high-speed rail assets. The high-speed rail system is being built through a series of design-build contracts.

Early Train Operator (ETO): The commercial rail partner assisting in the planning, design, and implementation of the high-speed rail program. In 2017, the U.S. arm of Deutsche Bahn AG was selected.

Electrification: The process of adding infrastructure to plain-line rail tracks to support electric-powered trains.

ETO Study: The Central Valley and Peninsula Corridors Operations Financial Plan Study**,** authored by the ETO and dated May 1, 2019, that explores the options for interim high-speed rail service in the Central Valley and Peninsula corridors.

ETO Updated Forecast: Updated ridership, revenue, and operations and maintenance cost forecasts provided by the ETO received in late November 2019.

Federal Rail Administration (FRA): Agency that oversees environmental permitting under federal laws.

FY10 Funds: Federal funding appropriated to California High-Speed Rail in Fiscal Year 2010.

Greenhouse Gas (GHG): A gas that contributes to the greenhouse effect by absorbing infrared radiation.

Heavy Maintenance Facility (HMF): The proposed Central Valley-located facility where high-speed trains would be maintained.

Initial Operating Section (IOS): Initial segment for high-speed rail passenger service that has been proposed in the Authority's Business Plans and subject to the terms of Proposition 1A.

Interim Operator: The Operator responsible for provision of Interim Service.

Interim Service: High-speed passenger rail services before the start of operations on the IOS. The ETO Study proposed Interim Service from Merced to Bakersfield that would facilitate

connections to existing and future rail services in the Central Valley, including ACE and San Joaquins.

Interim Service Business Model: The proposed business model for the provision of Interim Service.

Long-Term Business Model: The proposed business model for the provision of high-speed rail passenger service on the IOS and as set out in the Authority's 2018 Business Plan.

Overhead Catenary System (OCS): The overhead engineering system that provides electric traction power to electric trainsets.

Operator: An independent operating entity responsible for provision of passenger rail services.

Operations and Maintenance (O&M): Operations and regular maintenance of the infrastructure assets.

Pacheco Pass Tunnels: The pair of proposed 13-mile-long tunnels under the Pacheco Pass Range that would connect the Central Valley and San Jose.

Peninsula Corridor Electrification Project: Project to electrify the Caltrain corridor from San Francisco to San Jose, replacing diesel service with electric.

Project Update Report (PUR): The bi-annual report to the California State Legislature on the status of the program.

Proposition 1A: A 2008 initiative that authorized $9.0 billion in bonds to advance a California high-speed rail system in conjunction with private and other public funds.

Right-of-Way (ROW): A right-of-way is a type of easement granted, purchased or reserved over the land for transportation purposes.

Segment: A specified geographic section of high-speed rail track as defined in the Track and Systems Contract.

San Joaquins Intercity Passenger Rail Service (San Joaquins): The passenger rail service operated by Amtrak with major stops at Oakland, Sacramento, Stockton and Bakersfield.

San Joaquin Joint Powers Authority (SJJPA): Authority responsible for the governance and management of the San Joaquins rail service.

San Joaquin Regional Rail Commission (SJRRC): Commission responsible for the governance and management of the ACE rail service.

Study: This business case study conducted by KPMG, undertaken from June to December 2019.

Third Parties – Organizations, agencies or companies that are not affiliated with the Authority.

Track and Systems (T&S): The rail, rail ballast and/or slab, signaling, overhead catenary system, and communications technology for high-speed rail.

Track and Systems Contractor: The contractor responsible for design, build, operation, and maintenance of the Track and Systems on the Authority's civil works.

Train Operating Company (TOC): See Operator.

Trainset or Rolling Stock: A set or a fleet of train cars.

Trainset or Rolling Stock Contractor: The contractor for the Authority's design-build maintain contract for Trainsets.

Valley to Valley (V2V): The geographic alignment between the Central Valley and the Silicon Valley that has been proposed in the 2016 and 2018 Business Plans.

OVERVIEW
Contents

Executive Summary and Recommendations

This Study presents the findings and recommendations on key opportunities, considerations, and risks related to the Business Case for an interim high-speed rail service between Merced and Bakersfield.

Purpose and Scope of the KPMG Business Case Study

This Study analyzes key aspects of the proposed interim high-speed rail service (Interim Service) between Merced and Bakersfield articulated in the Authority 2019 Project Update Report (PUR). Specifically, this Study discusses funding and affordability, capital costs, delivery schedule, operating and maintenance costs, ridership and revenue forecasts, business model, commercial considerations, socio-economic impacts and other benefits such as safety. The purpose of this Study is to present the merits and considerations of proposed Interim Service without consideration of other potential investments or opportunity costs. This Study also identifies key risks and opportunities for consideration which highlight the complexity and interconnected nature of the proposal. The analysis and insights herein may help inform the California High-Speed Rail Authority (Authority) and its Board for the 2020 Business Plan, in future decision-making processes and for contracting and Business Planning activities.

The analysis contained within this document serves as a standalone Study on the investment in interim high-speed rail service between Merced and Bakersfield. The analysis does not compare the Business Case for this investment to any other potential investments that the Authority may choose to make now or in the future.

In the preparation of this Study, KPMG relied upon certain assumptions, data and analysis provided by the Authority or its consultants, including for ridership, revenue and costs. Where possible, KPMG conducted interviews with key stakeholders and sought information from the Authority's staff and consultants. In certain instances, new data and analysis were developed to inform this Study. Where this Study contains new data and analysis that were generated by KPMG, Authority staff or its consultants, this is noted herein.

The work undertaken in this Study:

- Review historical context and justification for Merced to Bakersfield
- Review the Central Valley and Peninsula Corridors Operations Financial Plan Study (the ETO Study), including supporting data, analysis and follow-up analysis
- Analyze capital cost forecasts and Authority's funding status
- Develop a business model for Interim Service
- Solicit input from key stakeholders
- Review implications of Interim Service on the Valley-to-Valley (V2V) Initial Operating Section (IOS), including additional ridership, revenue, and operating cost forecasts
- Review socio-economic benefits and cost benefit analysis
- Identify and analyze risks and opportunities

During the course of this Study, the Early Train Operator (ETO) developed updated ridership, revenue, and business model assumptions as a result of KPMG findings. This resulted in the ETO Updated Forecast provided in late November 2019[1], and subsequently further sensitivity analyses provided in late December 2019. In the relevant sections, this Study notes where the ETO Updated Forecast further informed the initial findings and overall conclusions. The ETO Updated Forecast from November 2019 are the final estimates used in the revised ETO Study which was released in February 2020.

This Study was undertaken by KPMG from June to December 2019. The results and conclusions are presented herein and summarized in this Executive Summary.

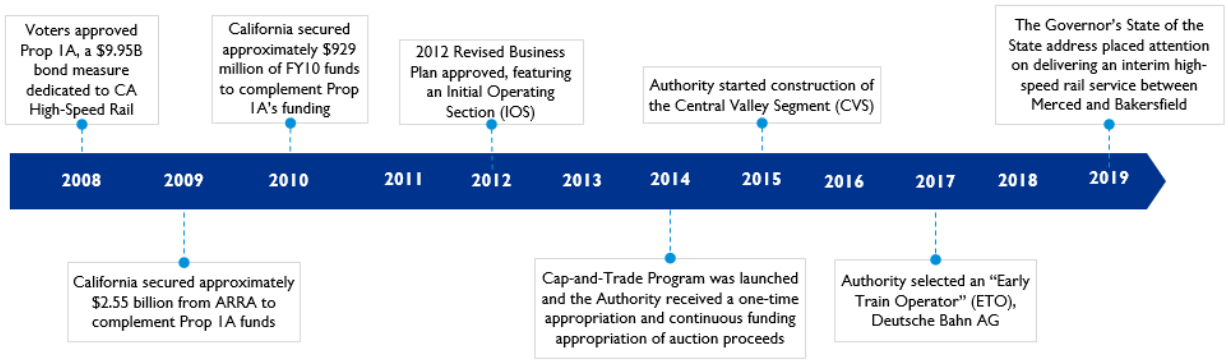
Historical Context

The concept of high-speed rail in the State of California (State) has a long history with initial planning beginning in the late 1990s. The Authority was established in 1996 as the agency responsible for planning, designing, building and operating the high-speed rail system in the State. Planning continued through the early 2000s to determine the preferred corridors and stations for the system.

The California High-Speed Rail Program has advanced considerably over the last decade. Construction has commenced in the Central Valley and planning for the rest of the program continues to move forward. The Authority has also evolved since its inception, transitioning from acting primarily as a planning organization to one that is now also focused on construction and operations (see Figure 1 below).

[1] ETO Updated Forecast will be released in parallel with the Authority's 2020 Business Plan.

Figure 1: California High-Speed Rail Key Events Timeline



In 2008, California voters approved Proposition 1A[2], a $9.95 billion bond measure that created the first dedicated funding mechanism for a U.S. high-speed rail system. As envisioned, Phase 1 of the system would connect San Francisco to the Los Angeles basin through the Central Valley, operate at speeds up to 220 miles per hour, and enable a trip between California's two primary urban areas in under two hours and 40 minutes. Phase 2 would subsequently extend the system to Sacramento and San Diego. Proposition 1A allocated approximately $9.0 billion for the development and construction of Phase 1.[3] In addition, as part of the oversight function, the Authority is required to submit a Business Plan to the State Legislature every two years.[4]

In 2009 and 2010, the State secured approximately $2.55 billion from the American Recovery and Reinvestment Act[5] (ARRA) and $929 million of Fiscal Year 2010 (FY10) funds from the federal government to complement Proposition 1A's funding and began planning and seeking environmental clearances along the corridor.

In 2012, the Authority adopted the 2012 Revised Business Plan[6], which established a vision to implement the high-speed rail system in coordination with other state, regional and local rail investments as part of a broader statewide rail modernization program. In that same year, the State Legislature appropriated $8 billion in federal and State funding for planning, preliminary design, environmental clearance, construction of the first high-speed rail investment in the

[2] "Safe, Reliable High-Speed Passenger Train Bond Act for the 21st Century", http://www.sos.ca.gov/elections/sov/2008_general/sov_complete.pdf

[3] The balance of Proposition 1A bond measure funds have been committed to local connectivity projects.

[4] Public Utilities Code 185033 requires the business plan to include the following elements:

- The type of service the Authority anticipates it can develop;
- The proposed timeline for construction and the expected schedule for completing the environmental review process;
- Alternative financial scenarios based on different levels of service;
- Forecasts of ridership levels, operation and maintenance costs and capital costs;
- Written agreements with public or private entities to fund the system and an estimate of anticipated funding sources;
- And a discussion of foreseeable risks to the project and plans to mitigate those risks

[5] https://www.govinfo.gov/content/pkg/PLAW-111publ5/html/PLAW-111publ5.htm

[6] https://www.hsr.ca.gov/docs/about/business_plans/BPlan_2012_rpt.pdf

Central Valley and 15 bookend and connectivity projects throughout the State. In 2014, the State's Cap-and-Trade emissions program was launched, and the Authority received a one-time appropriation followed by a continuous funding appropriation of the auction proceeds from the program[7].

Since the 2012 Revised Business Plan, the Authority has undertaken construction of the Central Valley Segment (CVS), a 119-mile alignment that will extend from Madera to Poplar Avenue (in Shafter), located north of Bakersfield.

A key feature of the Authority's Business Plans is the development of an IOS, defined as a geographical segment where high-speed rail passenger service would begin. The level of analysis produced to study and confirm the validity of the IOS has been extensive and regularly updated in the Authority's Business Plans. Since the 2012 Revised Business Plan, the Authority has acknowledged that available funding would not be sufficient to complete Phase 1 in its entirety and therefore has defined the IOS as the geographic segment to begin non-subsidized high-speed rail operations. The Authority has recognized the need to define an IOS that meets the goals and objectives of the Proposition 1A[8].

History of IOS Concept

In its 2012 Revised Business Plan, the Authority first developed the concept of an IOS as a subset of the first phase of the high-speed rail network, which will connect San Francisco and Los Angeles. By establishing an IOS, the Authority recognized that there could be potential benefits delivered to the State before Phase 1 could be completed. From the Revised 2012 Business Plan to the 2018 Business Plan, the Authority's IOS strategy has evolved several times, and in the 2018 Business Plan was defined as San Francisco to Bakersfield with a phased extension to Merced.

Introduction of Merced to Bakersfield Interim Service Proposal

The 2018 Business Plan recognized that identified funding was not sufficient to complete the Pacheco Pass Tunnels and extension to Merced, and directed further study of Interim Service in the Central Valley and in the Bay Area. In February 2019 the Governor, in his State of the State address, endorsed the idea of focusing on delivering the commitments to meet the federal requirements and develop a high-speed rail line between Merced and Bakersfield that was affordable within existing funding constraints. The goal to "live within our means" was established and initiated further work to explore options for early operations in the Central Valley.

In May 2019, the Authority released its 2019 Project Update Report. The report outlined a proposal to develop high-speed Interim Service along the IOS, from Merced to Bakersfield that would facilitate connections to existing and future rail services in the Central Valley, including

[7] The California legislature has authorized an extension of the Cap-and-Trade program through 2030. Under Senate Bill 862, the Legislature and Governor approved an annual appropriation of 25% of the annual Cap-and-Trade proceeds on a continuous basis to fund high-speed rail.
[8] Proposition 1A includes numerous requirements for the high-speed rail system. The requirement that is relevant to the definition of the IOS is that it shall not require an operating subsidy.

ACE and San Joaquins. The proposal of Interim Service between Merced and Bakersfield builds off the ETO Study, which estimated that a positive impact to the State could be achieved from implementing the proposed Interim Service. Subsequently, the ETO provided revised ridership, revenue, and operating cost figures based on KPMG's initial findings in November 2019. The ETO Updated Forecast resulted in a range of potential State cost outcomes approximately consistent with the original ETO Study estimate.

The proposal for Interim Service between Merced to Bakersfield would require:

1. Construction of civil works to extend north from the northern terminus of the CVS at Madera to downtown Merced and south from the southern terminus at Poplar Avenue to downtown Bakersfield as already considered in the 2018 Business Plan V2V scope
2. Installation of track, electrification equipment, and communication and signaling systems between the stations of Merced and Bakersfield
3. Purchase of electric high-speed rail rolling stock
4. Certification of the Merced to Bakersfield corridor by 2028 for high-speed rail service.

In June 2019, the Board approved a $15.6 billion budget[9] to deliver the 119-mile CVS from Madera to Poplar Avenue[10], Phase 1 Records of Decision (ROD), and Bookends/Early Investments commitments in Northern and Southern California. The additional construction and development costs for Interim Service as described in the 2019 Project Update Report would require the Board to increase the program budget by an estimated cost of $4.8 billion, bringing the total program budget to an estimated $20.4 billion[11]. This amount includes approximately $1.6 billion[12] of costs that were not included in the 2018 Business Plan as part of the V2V IOS, because a portion of the extension to Merced was retained in future Phase 1 costs and transferred to the V2V costs.

ETO Study: Analysis Central Valley and Peninsula Corridors Interim Service

The scope of the ETO Study included an evaluation of the potential ridership, revenues, and operations of Interim Service between Merced and Bakersfield and between San Francisco's 4th Street/King Street Station and Gilroy. This analysis included estimated impacts on revenue, ridership, and operations on ACE, San Joaquins, and Caltrain, to develop a "corridor-wide view"[13] of passenger rail in the Central Valley and Peninsula.

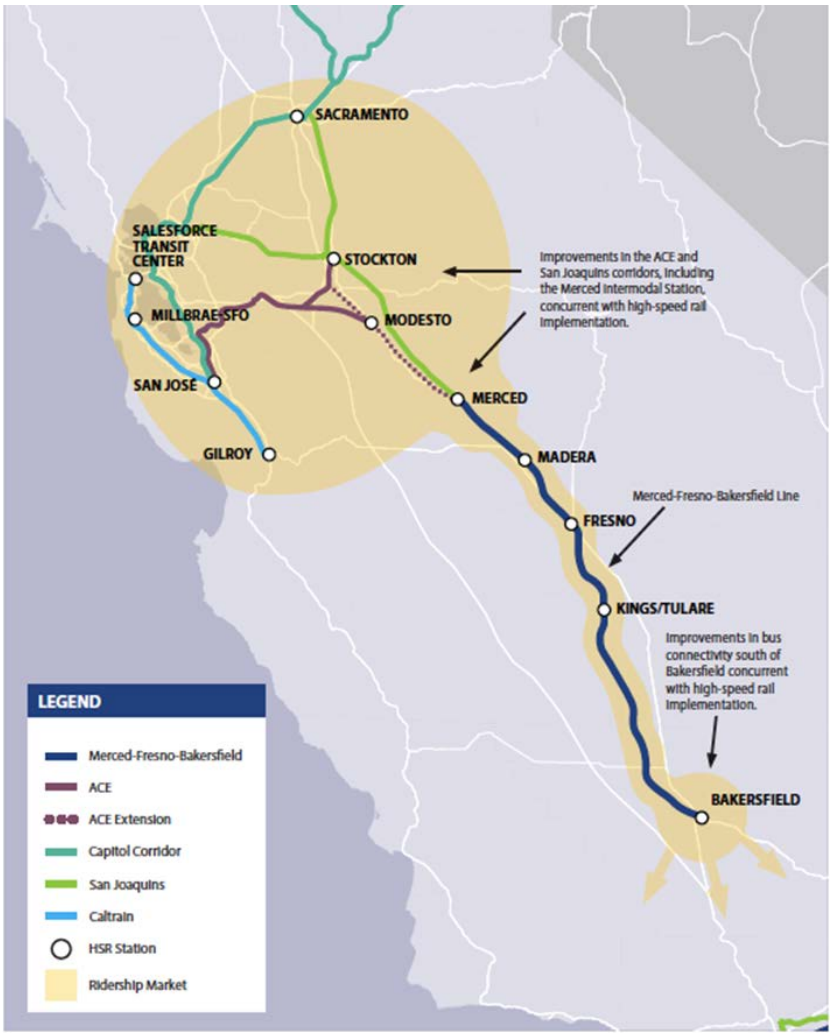
The 2019 Project Update Report only recommended Interim Service on the Merced and Bakersfield alignment and concluded that most of the service improvements in the Peninsula would be captured by the Peninsula Corridor Electrification Project from San Francisco to San Jose, a related project that is being jointly funded by the Authority, Caltrain, local transit agencies and the federal government[14].

[9] https://www.hsr.ca.gov/about/board/resolutions.aspx
[10] This includes Track and Systems.
[11] 2019 Project Update Report cost estimate.
[12] Excludes the provision of additional HSR trainsets.
[13] Page 15, Project Update Report, March 2019.
[14] Page 28, Project Update Report, March 2019.

As such, this Study only focuses its analysis on Interim Service between Merced and Bakersfield.

As presented in the ETO Study, the Merced to Bakersfield Interim Service schedule would be highly coordinated with both the ACE and San Joaquins rail services at Merced Station (see Figure 2: Merced to Bakersfield Interim Service Connectivity). The plan envisions a coordinated cross-platform transfer shared by the high-speed rail, ACE and San Joaquins services to allow for passenger connectivity. ACE would provide service to San Jose and Natomas (Sacramento County) via the Union Pacific (UP) freight railroad alignment, while the San Joaquins would continue to provide service to Oakland and Natomas on the BNSF freight railroad line. The plan also includes a coordinated bus feeder service south of Bakersfield to Southern California.

Figure 2: Merced to Bakersfield Interim Service Connectivity



ETO Study: Key Findings

The ETO Study found "significant value in interim high-speed rail services"[15] based on qualitative and quantitative factors. Key conclusions of the ETO Study included[16]:

- The analysis of ridership, revenue, and operations and maintenance costs estimates indicate that the proposed Interim Service could reduce the forecasted annual State cost to operate ACE and San Joaquins services from $82.8 million in 2026 to $62.6 million (both in 2018 dollars), resulting in an annual savings of $20.2 million (in 2018 dollars) for the State. Under the ETO Updated Forecast, annual savings to the State range from $25.5 million to $41.0 million (both in 2019 dollars)
- Optimal use of State assets could be achieved, along with reduced dependency on current freight railroad infrastructure; the use of the dedicated high-speed rail infrastructure allows for higher frequencies of public transportation services
- Improved connectivity for local communities with increased public transportation frequencies and would allow high-speed rail operations to test service level and become familiar in the Central Valley
- Increased economic development opportunities in the Central Valley
- Lower cost per train mile and reductions in greenhouse gas (GHG) emissions from public transportation in the Central Valley corridor would be possible
- Reduced travel times (by over 90 minutes between Merced and Bakersfield) of public transportation would result in higher ridership and increase the farebox recovery ratio for operations and maintenance costs
- Early high-speed rail operations in the Central Valley could reduce the ramp-up time for V2V service once the infrastructure is completed

The ETO Study stated that it excluded implications related to high-speed rail infrastructure delivery risks, and commercial arrangements. A review of the assumptions supporting the ETO Study is presented in Section B*, Operational Considerations*.

After the concept for high-speed rail service from Merced to Bakersfield was discussed by the Board in May 2019, the Board's Finance and Audit Committee asked KPMG to review and develop a Business Case for the proposed Merced to Bakersfield interim high-speed rail service.

Between June and December 2019, KPMG developed its business case findings. The initial findings included in this Study have been shared with the ETO and included in the development of updated forecasts.

[15] ETO Study, Page 18, https://www.hsr.ca.gov/docs/about/legislative_affairs/Central_Valley_and_Peninsula_Corridors_Operations_Financial_Plan_Study.pdf

[16] ETO Study, Page 18-19.

These updated ridership, revenue, and O&M cost forecasts, referred to in this Study as the ETO Updated Forecast, were provided to the KPMG team in late November 2019. The ETO Updated Forecast included revisions to the project delivery schedule, assumptions, and service plans. The ETO Updated Forecast is summarized in Table 1. While the ETO provided a number of sensitivities, only the base and downside scenarios are shown in the following table in order to provide a range of potential operating performance along the corridor.

- **Base Scenario:** assumes full build-out of infrastructure and integrated operating plan with ACE, Amtrak San Joaquin, and Thruway Bus services.
- **Downside Scenario:** assumes reduced corridor-wide service and longer transfer times as a result of infrastructure constraints in the Central Valley.

Table 1: Corridor-wide Revenue, and O&M Cost Forecast (in $ millions)

Cashflow Scenario	ETO Study (May 2019)	Updated Forecast (November 2019)
Annual Revenue*		
Base	165.8	195.3
Downside	N/A	179.8
Annual O&M Cost		
Base	228.4	237.1
Downside	N/A	237.1[17]
Annual State Cost		
Base	62.6	41.8
Downside	N/A	57.3

*Note: Revenues include farebox revenues and ancillary revenues. Please note that the ancillary revenues include Low Carbon Fuel Standards (LCFS) credits. Per the ETO, given that this is a system wide analysis, these revenues have been included pending a further discussion among State stakeholders.

For the purpose of assessing a wider range of potential outcomes, the ETO was asked to also develop a Low Case scenario that would examine a downside scenario to inform the Authority of its risk exposure in such a situation.

Items addressed by the ETO in November 2019 and the Low Case scenario are outlined in greater detail in Section B, *Operational Considerations*.

Prop 1A No Subsidy Requirement: Report Assumptions

The Authority's funding plans have historically established that no subsidy will be necessary upon completion of the IOS. Proposition 1A does not provide a specific definition of subsidy other than the generally accepted meaning of the term. In all analyses, the Authority has consistently projected that the IOS would breakeven, meaning the projected operating revenues generated from farebox and ancillary revenues would be sufficient to cover the estimated cost of operations and maintenance.

[17] Sensitivity scenarios assume the same level of train service (ACE, San Joaquin and high-speed rail).

For the purposes of Interim Service, and until further clarification is provided by the legislature, the Study has assumed a conservative position in terms of the Business Model for Interim Services whereby the Authority leases its assets to the SJJPA or another third party (as further described below and in Section A, *Commercial and Business Model).*

As outlined further in the report this Business Model approach has the added advantage of directly addressing short term affordability concerns on long term maintenance and lifecycle payments for high-speed rail assets. Interim Service would create a revenue stream made of passenger farebox and CalSTA funding to cover the 30-year maintenance and lifecycle needs of the Track and Systems and Rolling Stock contracts (as further described in Section A, *Commercial and Business Model).*

KPMG Key Observations and Conclusions

The sections that follow present analysis regarding the commercial and business model; operational considerations; capital cost and schedule; funding and affordability; socio-economic benefits; financial analysis; and risks.

Our conclusions have identified significant benefits to support the operation of Interim Service between Merced-Bakersfield including:

1. Significant socio-economic benefits
2. Enhanced mobility and creation of a hub at Merced
3. Utilization of Authority assets prior to completion of IOS
4. Reduced State cost for the current (San Joaquins and ACE) service but does not break even
5. Affordable capital program based on base case scenario
6. Positive return on investment for the inclusion of Merced in V2V

However, this report has also identified material implementation risks arising from the complex contractual interfaces, relative timing and multiple stakeholders associated with the introduction of Interim Service and a Merced-Bakersfield service:

7. Business model and applicability of Proposition 1A "no-subsidy requirement" on an interim[18] service proposal
8. Interim Service requires additional investments from state and local partners
9. Long-term DBM contracts for Track and Systems and Rolling Stock
10. Capital Program risks and Interim Service risks

In the recommendations section we discuss some proposed mitigation strategies to manage these risks.

[18] Interim until the start of operations on the IOS.

Investments in the Central Valley are expected to Deliver Significant Socio-economic Benefits

Successful implementation of the $20.4 billion Merced to Bakersfield capital program is forecast to bring immediate economic benefit to the State, especially to disadvantaged communities in the Central Valley. The Authority estimates that these investments will generate approximately 203,000 job-years of employment and $37.9 billion in total economic activity and is discussed further in Section E, *Socio-economic Benefits and Financial Analysis*. For comparison, the combined gross domestic product for the Merced, Madera, Fresno and Bakersfield metropolitan areas was $93.6 billion in 2017[19].

These investments will positively impact small and disadvantaged businesses throughout the State in accordance with Authority policies. The Authority estimates that $3.2 billion to $4.5 billion will be allocated to small businesses in California out of the total Merced to Bakersfield capital program. The termini of the Interim Service at Bakersfield and Merced will also likely positively impact the local economies of these cities, especially within the real estate market. While detailed analysis of these impacts has yet to be explored, precedent in transit-oriented development suggests that significant benefits could be delivered, especially close to station areas. The potential impact could increase substantially with other concurrent investments in public services (i.e., state, county, city, and/or higher education facilities).

Investments in the Central Valley are expected to Enhance Mobility and create a Hub at Merced

Beyond the direct impacts of construction, Interim Service is forecast to have a major impact on existing mobility and rail travel between Silicon Valley and the Central Valley through the creation of a Merced mobility hub. The 2019 Project Update Report proposes a service plan with significant improvements in connectivity between the current passenger rail services in the Central Valley, including more convenient transfers to ACE and San Joaquins. The ETO Study estimates that population growth, improved travel times, and improved regional rail and bus connectivity will increase corridor-wide (ACE, San Joaquins, and high-speed rail) ridership significantly from 2017 levels, from 2.6 million passengers currently to 8.8 million passengers in 2029 based on the ETO Updated Forecast from November 2019. Riders will experience a travel time reduction of over 90 minutes between Merced and Bakersfield using the Interim Service compared to the current San Joaquins service, the result of faster speeds and less frequent stops along the corridor. Interim Service would also improve safety, reduce noise, provide congestion relief, and GHG emissions reduction benefits.

Interim Service utilizes Authority's Assets before Completion of the IOS

Without an identified funding stream to complete the IOS, the Authority is faced with how to best utilize the CVS and allocate its remaining funding to meet one of its key objectives: initiating high-speed rail service as soon as possible. Interim Service, if structured appropriately, mitigates the risk of unutilized completed assets. The recommendations section discusses actions to manage the risks.

[19] U.S. Bureau of Economic Analysis. Gross Domestic Product by Metropolitan Area, 2017. See: https://www.bea.gov/system/files/2018-09/gdp_metro0918_0.pdf

Interim Service may also allow an operator to refine and improve its passenger service, ticketing, marketing, and operations and allow for passengers to become accustomed to high-speed rail, which could reduce the forecasted ramp-up period for subsequent segments.

Interim Service is Forecast to Reduce the State Cost for Rail Service in the Central Valley but is Not Anticipated to Break Even

As reported in the ETO Study and in the Authority's May 2019 Project Update Report, Merced to Bakersfield Interim Service is forecasted to enhance the overall financial viability of the combined ACE, San Joaquins, and high-speed rail passenger services. In the ETO Study, annual cost savings to the State are forecasted at $20.2 million in 2026. In the ETO Updated Forecast, the State cost in 2029 is projected to be reduced by approximately $25.5 million to $41.0 million per annum[20]. The materialization of these savings requires the Authority and state and regional partners to be highly coordinated to implement Interim Service in the coming years, including delivery of supporting stakeholder infrastructure such as the ACE Ceres to Merced extension and the Merced intermodal station. As a result, actual financial performance may vary. Section B, *Operational Considerations*, has identified key assumptions and analysis that may impact the ridership, revenue, and O&M cost forecasts presented in the ETO Study.

Notwithstanding this aggregate improvement, Interim Service is not forecasted to fully cover its operating costs with the revenues it generates on a standalone basis.

Construction of Merced to Bakersfield is Currently Affordable Under Base Case Funding Scenario and 2019 PUR Cost Estimates

The Authority's Board has approved a $15.6 billion budget to deliver the CVS, Phase 1 Records of Decision, and Bookend/Early Investment commitments in Northern and Southern California. Proposed incremental investments are set out below:

Table 2: Capital Cost Estimate – Merced to Bakersfield Interim Service

Element	Budget ($YOE)	Status
CVS, Phase 1 RODs, Bookends	**$15.6bn**	**Approved**
Extension to Bakersfield	$1.4bn	Pending
Extension to Merced	$2.5bn	Pending
High-speed trainsets and other	$0.85bn	Pending
Merced-Bakersfield (subtotal)	**$4.8bn**	**Pending**
Total	**$20.4bn**	**Partially Approved**

The Authority currently estimates its available funding ranges from $20.6 billion to $23.4 billion through 2030 as discussed in the 2019 Project Update Report. This estimate includes anticipated funding from the Cap-and-Trade Program, Proposition 1A, and the federal grants (ARRA and FY10).

A significant portion of the Authority's funding is contingent on proceeds from the State's Cap-and-Trade program, which is an auction-based system and subject to fluctuation. Since the

[20] Range of State savings based on net revenues of the ETO Updated Forecast Base and Downside Cases, compared with the No-Build Scenario presented in the ETO Study.

enactment of Chapter 135, Statutes of 2017 (AB398), receipts have stabilized; however, there are components to the structure of the program that could result in future variations.

Access to the remaining $4.2 billion Proposition 1A funds requires the Director of Finance to approve a funding plan, the submission of the funding plan to the Joint Legislative Budget Committee, and appropriation from the State Legislature. Approval of the funding plan and legislative appropriation are contingent upon those bodies reviewing the contents of the funding according to the criteria defined in Streets and Highways Code (S&H Code) section 2704.08, subdivisions (c) and (d).

FY10 funds have been de-obligated by the federal government. The Federal Railroad Administration (FRA) has stated it intends to obligate these funds to another program and that it is exploring options to rescind and recover the ARRA funds. While all ARRA funds have been expended, FY10 funds have not yet been received by the Authority; therefore, the de-obligation coupled with an award of the FY10 funds to another eligible program could potentially reduce the Authority's total funding by $929 million. The Authority has initiated litigation against the federal government in federal court to reverse the de-obligation of the FY10 funds. The outcome of that litigation is pending.

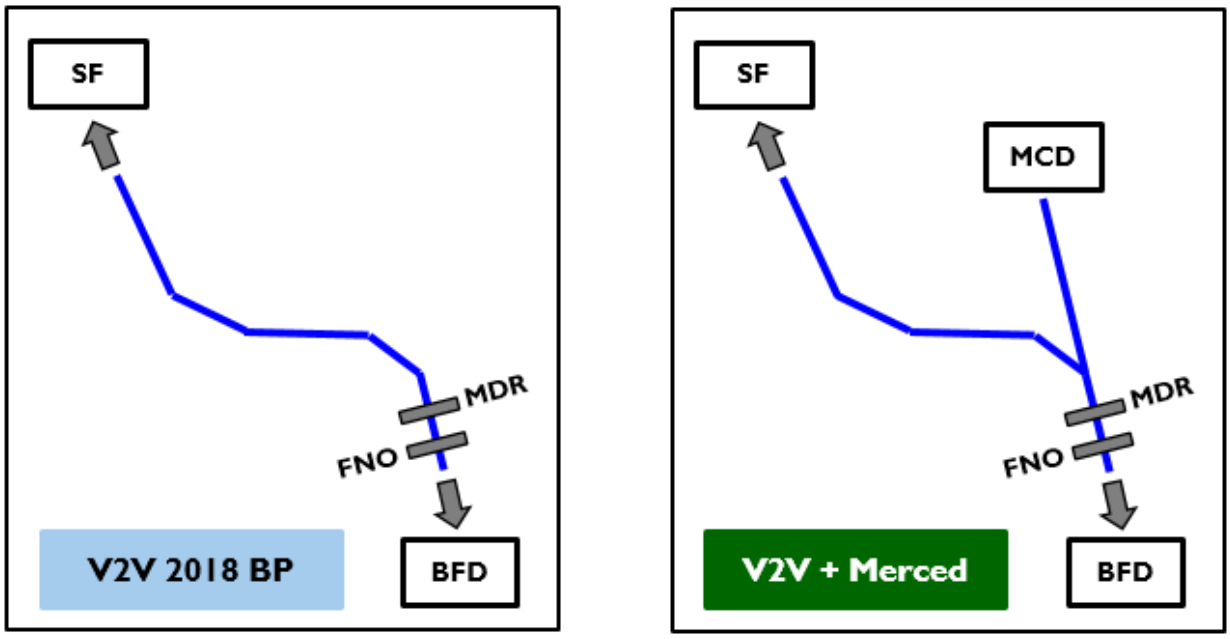
Given the narrow margin between costs and available funding ($20.4 billion versus $20.6 billion to $23.4 billion, respectively), the affordability of the proposed extensions is contingent upon available funding and cost estimates remaining stable.

The critical path of decision making, associated risks, environmental work, design, analysis and negotiations with operating partners that will be necessary to successfully achieve start of Merced to Bakersfield Interim Service by December 2028 are described in Section C, *Capital Cost and Schedule*, Section D, *Funding and Affordability*, and in Section F, *Risks*.

Positive Return on Investment for the Inclusion of Merced in V2V

To evaluate the investment decision for the potential extension to Merced, this Study analyzed the long-term incremental financial impact on a completed IOS. The objective of this analysis is to apply a similar methodology that has been utilized in the Authority's prior Business Plans to confirm that the completed IOS that includes Merced (see Figure 3: Map of Valley to Valley Line in the 2018 Business Plan and Valley to Valley + Merced) would continue to breakeven. In addition, this analysis evaluates whether the incremental net cash flow (revenues less operating expenditures) generated by adding Merced to V2V would, over a defined period, offset the additional capital cost of high-speed rail infrastructure. The analysis considers the long-term impact of Merced as part of a completed V2V system, rather than the short-term impact of Merced as part of Interim Service that was analyzed by the ETO.

Figure 3: Map of Valley to Valley Line in the 2018 Business Plan and Valley to Valley + Merced



New ridership, revenue, and O&M cost estimates were developed from models used for the Authority's 2018 Business Plan to make an "apples to apples" comparison.

The analysis finds that the addition of Merced in V2V demonstrates positive financial return. As presented in the following table, the discounted cash flow analysis estimates that the addition of Merced to V2V generates $2.5 billion to $2.9 billion of additional net cash flows. This reflects additional net cash flows above the estimates for V2V presented in the 2018 Business Plan, discounted to 2033 (the forecast start of IOS)[21]. After taking into account the $1.8 billion incremental capital cost of the Merced Extension, overall return on investment through 2060 could range from $0.7 billion to $1.1 billion.

Table 3: Discounted Cash Flows Analysis for Merced Extension (in $ millions)

Cash Flow	V2V + Merced (2018 BP Models)		
Discount Rate	**Nominal**	**2.24%**	**3.24%**
Incremental Net Cash Flows over V2V (NPV to 2033)	4,014	2,858	2,486
Incremental Capital Cost	1,957	1,957	1,957
Net Cash Flows Less Capital Cost	2,057	901	529

[21] This analysis compared the 2018 Business Plan V2V Scenario (San Francisco to Bakersfield) with the San Francisco / Merced to Bakersfield option, using the 2018 BP models, to enable an apples-to-apples comparison

This analysis illustrates that in the context of the IOS, the incremental cash flows of building the extension to Merced are forecast to generate value relative to the incremental capital cost.

A New Business Model Required for Interim Service

In discussion over the course of this Study, the stakeholders agreed in principle with an Interim Service Business Model that would position the Authority as an infrastructure owner. Under this model, the Authority would lease its high-speed rail infrastructure to SJJPA/SJJRC or another entity in return for payment that is sufficient to cover the operations and maintenance costs for the infrastructure. The cost to operate and maintain the infrastructure will be determined through the long-term contracts that the Authority is planning to enter for Track and Systems and Trainsets. Based on discussions with stakeholders, the Authority and its consultants, the proposed concept of Interim Service in the 2019 Project Update Report has support from the SJJPA and CalSTA, though formal agreements have not yet been developed.

The ETO Study proposes that the SJJPA will operate Interim Service on the Authority's infrastructure. However, the Interim Service Business Model has flexibility to allow other entities, both public and private, to utilize the Authority's infrastructure as long as the total payments to the Authority are sufficient to fully cover the operations and maintenance costs of the infrastructure.

The Business Model and the risks for the Authority to consider are discussed in Section A, *Commercial and Business Model,* and Section F, *Risks.*

Interim Service Plans Require Additional Investments from the State and Regional Partners

Interim Service not only requires the Authority to deliver its infrastructure, but also relies on SJJPA, SJRRC, and CalSTA to make improvements to enhance connectivity to the ACE and San Joaquins services. These investments primarily include the extension of ACE to Merced and the construction of a cross-platform connection between high-speed rail services and San Joaquins in Merced. These estimates are not included in the $20.4 billion Authority capital cost.

To date, SJJPA and SJRRC have secured full funding for the Base Valley Rail project that will extend ACE service from Stockton to Ceres and provide a bus service from Ceres to Merced by 2023[22]. SJJPA and SJRRC are expecting to secure additional grant funds and other state sources such as:

- Transit and Intercity Rail Capital Program (TIRCP),
- Public Transportation Account (PTA),
- Interregional Transportation Improvement Program (ITIP), and
- State Rail Assistance (SRA) funds in the future for the Expanded Valley Rail project that will further extend ACE rail service from Ceres to Merced by 2027 in order to connect with the high-speed rail service, and enable increased ACE and San Joaquins service to Merced[23].

[22] SJRRC received $400.0 million in Senate Bill 132 of 2017 funds to extend ACE service from Stockton to Merced. In addition, SJJPA and SJJRC have secured $590.9 million in state, federal and local funds for the Base Valley Rail project, including $504.3 million in TIRCP grant funds in April 2018.

[23] An additional $226.0 million is required for the Expanded Valley Rail project.

The Valley Rail project scope does not include the provision of a cross-platform connection between the San Joaquins service and high-speed rail service at Merced. However, SJJPA, SJRRC, and CalSTA are currently conducting the Merced Intermodal Track Connection (MITC) project study[24] that will assess the connection necessary for the San Joaquins service to directly connect with high-speed rail at Merced. Further, the Base Valley Rail project scope includes the relocation of the San Joaquins Madera station adjacent to the Madera high-speed rail station.

Without the connectivity assumed in the ETO Study, ridership and revenue levels will likely be significantly impacted and reduce the service improvements envisaged with Interim Service.

Upcoming Long-Term Contracts for Track and Systems and Rolling Stock will have Implications for Interim Service

As discussed in Section F, *Risks,* decision points related to the procurement of Track and Systems and high-speed Trainsets are imminent:

- By the end of calendar year 2020, the Authority plans to execute contracts for Track and Systems and Trainsets to achieve the ARRA grant deadline and complete high-speed rail infrastructure for testing and operations[25]
- The Authority recently issued an RFP for the procurement of Track and Systems for V2V, phased into several segments beginning with the CVS. The procurement is structured as a long-term contract that includes both the construction, fabrication, and installation of high-speed rail Track and Systems (e.g. communications, electrification, signals etc.) and the long-term maintenance and lifecycle of those assets
- The Authority is also planning to begin procurement of high-speed rail Trainsets in early 2020 through a similar long-term contract model that bundles manufacturing, testing, and certification with the long-term maintenance
- The Authority aims to complete these procurements and execute the contracts in 2020

The Track and Systems and Trainset contracts each include long-term and complex provisions on performance levels, service plans, obligations and associated penalties during operations that will be rigorously examined by any operator that utilizes the high-speed rail infrastructure. The Operator of Interim Service will have to conform to the terms of the contracts that the Authority is presently procuring, including service plans and payments. As such, the Authority and stakeholders will need to agree that the terms and conditions of these contracts conform with the requirements of Interim Service.

During stakeholder discussions, the Authority, SJJPA, and CalSTA, acknowledged the need for an arrangement for Interim Service in which terms are "back-to-back" (terms remain consistent between contracts) with the Authority's long-term design-build-maintain (DBM) contracts for Track and Systems and Trainsets. The agreements between the Authority and SJJPA/SJRRC

[24] SJJPA Board Meeting (November 2019) Agenda Item 9 – Valley Rail: Network Integration Planning https://sjjpa.com/wp-content/uploads/SJJPA_Nov_22_2019_Board-Mtg-Final-.pdf

[25] Both Track and System and Trainsets are required for the testing, commission, and certification of high-speed rail infrastructure from the FRA.

should focus on mitigating the risks during operations to minimize the Authority's exposure during Interim Service.

The Track and Systems contract and the risks associated with the execution of it, including the construction phase, are discussed more fully in in Section A, *Commercial and Business Model*, Section C, *Capital Cost and Schedule,* and Section F, *Risks*.

Delineation of Capital Program Delivery and Interim Service Risks

Risks associated with the delivery of the Merced to Bakersfield Interim Service fall into two major categories:

1. **Capital Program Risks** are risks associated with the high-speed rail capital program, including the delivery of high-speed rail infrastructure and assets. The proposed capital program for delivering Merced-Bakersfield, bookend projects, and system-wide planning, are multiple mega-projects that, in aggregate, represent a $20.4 billion, 10-year capital program.
2. **Interim Service Risks** are risks associated with implementing the operational aspects of Interim Service. These can take the form of Authority risks, shared risks or risks owned by other third parties or public sector agencies. Various parties will need to enter into commercial agreements with the Authority for the provision of infrastructure to support Interim Service. In addition, those same or other Third Parties will be responsible for delivering any remaining necessary infrastructure, such as the connections at Merced.

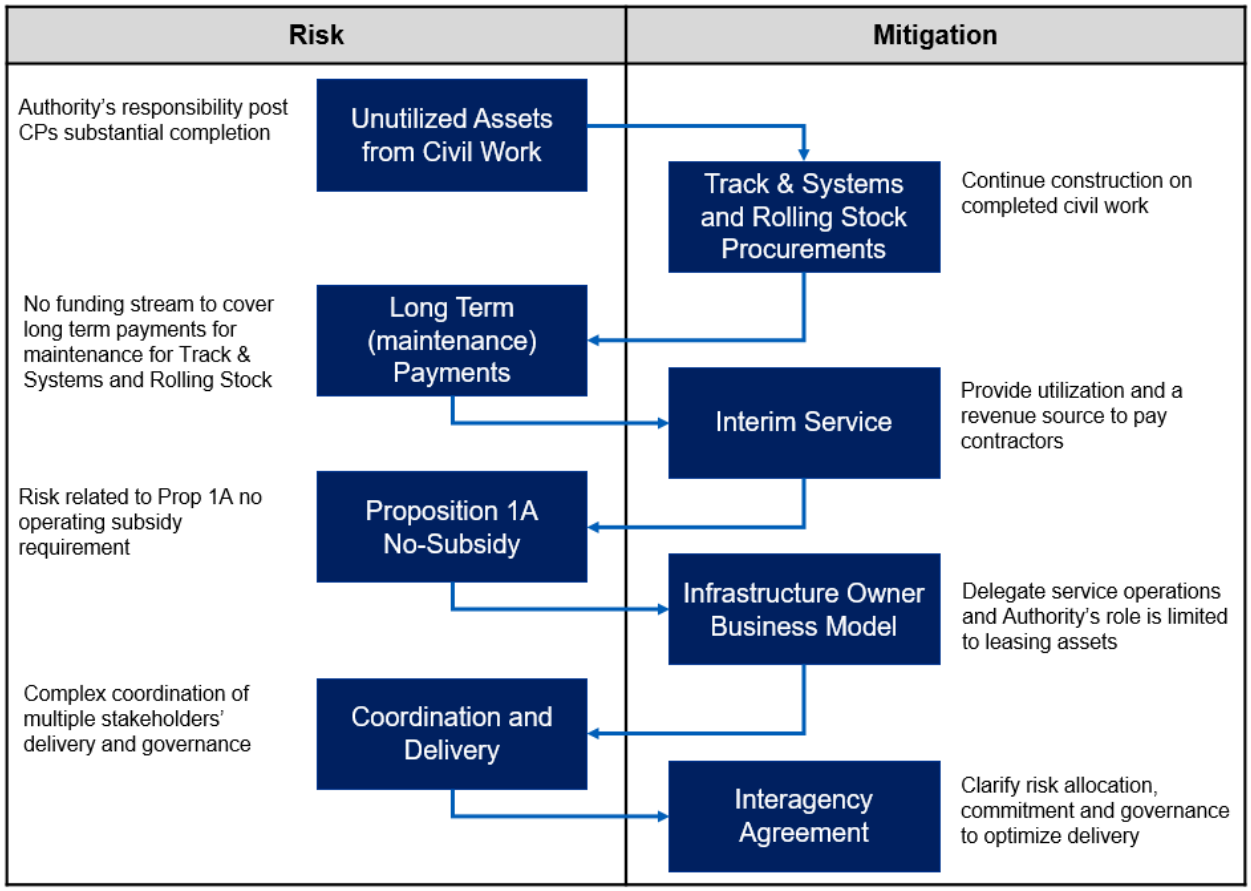
Table 4: Risk Categories for the HSR Capital Program and Interim Service

Category 1 HSR Capital Program Risks	Category 2 Interim Service Risks
Capital Funding	Operations Funding
Cost Escalation and Schedule Delay	Delay in HSR Infrastructure
Environmental Permitting	Ancillary Regional Connectivity Infrastructure
Right-of-Way Acquisition	Interim Operator Procurement
Contract Interfaces and Contract Management	HSR Revenue Risk
Delivery of Civil Infrastructure, Track and Systems	Operating Risk
Trainset Design, Build, Maintenance	Contract Interface

Capital Program Risks exist regardless of whether Interim Service is implemented. However, Interim Service Risks are specifically associated with implementation of Interim Service. Individual risk categories are discussed in more detail in the relevant Study sections, and summarized in Section F, *Risks*.

Figure 4 outlines the interconnected nature of risk and mitigation within the delivery of Interim Service.

Figure 4: Interim Service Risk Mitigation Strategy



As the civil works of the CVS are completed, the Authority will be responsible for the maintenance and security of its newly constructed assets. The Authority's plan to procure Track and Systems and Trainsets contracts is to mitigate the risk of unused civil work assets. Both contracts are intended to be structured as DBM contracts, requiring contractors to maintain these assets for the duration of the 30-year contracts. Interim Service could provide a mechanism to pay for long-term maintenance costs of completed assets. Further, Interim Service could also mitigate the risk of having unused completed assets and provide the State with the socio-economic benefits associated with high-speed rail passenger service.

The Authority should limit its role to only being an infrastructure provider, leasing its rail assets and delegating Interim Service passenger service operations to the San Joaquins or another third-party.

The execution of this Business Model requires coordination of multiple stakeholders for delivery and governance. A detailed interagency agreement will likely be needed to clarify risk allocation, commitment and governance to optimize delivery of Track and Systems and Trainset contracts.

Recommendations

The Authority is at an important juncture in the development of the program and has a number of critical decisions to make. Many upcoming decisions will have implications on the future

development and operation of the wider system, both in the short and long-term. As such it is important that decisions and actions be considered in a holistic manner.

In order to address some of the risks identified in the previous section we have developed some recommendations for the Authority to consider prior to implementation of Merced-Bakersfield Interim Service.

Implement Interim Service to Unlock Mobility Benefits and Fund Infrastructure Maintenance

The Authority should implement an Interim Service on its completed infrastructure assets to realize early benefits to the State and also mitigate the risk of having underutilized infrastructure. Certain risks can be mitigated by adopting the Interim Service Risk Mitigation strategy outlined in Figure 4 in the previous section.

Interim Service on each completed segment reduces the risk of having unutilized civil works and rail assets. It also allows the State to unlock the significant mobility benefits associated with high-speed rail passenger service (including travel time savings, improved connectivity, congestion relief, etc.) prior to the completion of the IOS. Planning for Interim Service on a relatively short segment, such as Merced-Bakersfield, also mitigates some of the risks associated with delivering and commencing service on the entire V2V segment which is still the long term goal.

Once the high-speed rail infrastructure is complete, the Authority will be responsible for long-term maintenance of completed assets. The Authority may not have sufficient long-term funding or revenue to cover maintenance of the assets prior to the commencement of IOS operations. Interim Service could provide an additional source of funding for maintenance and lifecycle costs.

Pursue an Interagency Agreement with Other Agencies

The Authority and the Board should secure a sufficient level of commitment from SJJPA/SJRRC, CalSTA, and/or other regional partners in the form of a memorandum of understanding before making any major long-term commitments and operating decisions with regards to Interim Service. Elements of this agreement should at least include:

- Commitments to invest and develop the regional rail connectivity infrastructure up to and around Merced station
- Agreement on the operational and performance requirements and associated payment terms of the Track and Systems and Trainset contracts including commitment to utilize and pay for assets as they become available on a segment by segment basis for Interim Service

Secure Funding Streams to Complete Capital Program

The Authority needs to secure the remaining Proposition 1A construction funds to complete the capital program for Interim Service.

The Authority should consider taking steps to secure the remaining Proposition 1A funding at the appropriate time (current estimates indicate FY 21/22) in order to reduce uncertainty on the

affordability of its capital program. The agreement with SJJPA and CalSTA, as discussed above, may strengthen the Authority's position in meeting the funding plan requirements of Proposition 1A and securing the appropriation from the Legislature. The Authority should work closely with key stakeholders and partner agencies including, the Department of Finance and the Legislature to gain stakeholder consensus to increase the certainty of securing the funding.

Preparatory Work Required before Executing Track and Systems and Trainsets Contracts

Prior to signature of the Track and Systems and Trainsets contracts, the Authority should:

- Ensure stakeholders, including SJJPA/SJRRC, CalSTA, and/or other regional partners are formally committed to Interim Service prior to the execution of additional major contracts as mentioned above
- Include flexibility in the first NTP to allow the Authority to comply with the minimum scope of the federal grant requirements (i.e. plain-line track and deadline) by setting specific delivery milestones and other control points to mitigate the Authority's financial exposure
- Ensure the design-build civil works contracts are fully aligned with the Track and Systems contract, including any necessary renegotiation and amendment of existing design-build contracts to allow for the delivery and acceptance of 5-mile sections of the civil works and the associated delivery schedule. The coordination between these contracts will be critical to maintain costs, meet the schedule required under the federal grant agreements, and begin a coordinated service with ACE and the San Joaquins
- Complete the acquisition of all ROW for the 119-mile test track

Advance Extensions to Downtown Bakersfield and Merced Incrementally by Segment

Extensions of the CVS via Bakersfield and Merced Segments could be undertaken in due course as soon as the following milestones and risks for the relevant Segment have been either achieved, mitigated, clarified and/or quantified or otherwise addressed:

- Achievement of ROD (Bakersfield has ROD, Wye section is scheduled for 9/2020) and the subsequent purchase of ROW;
- Affordability of Track and Systems contract for each segment based on schedule of values from successful Track and Systems Proposer;
- Securing access to relevant funding sources; and
- Risk surrounding the FY10 grant agreement.

Extending the CVS to Bakersfield is consistent with 2018 Business Plan (as the segment is included in the V2V IOS), extends to a southern terminus with a larger population center, and is consistent with the construction of the V2V IOS. The Authority received the Record of Decision from the FRA for the Locally Generated Alternative in Bakersfield in November 2019 and will have the opportunity to start work on ROW acquisition and utilities relocation as per the 2019 Project Update Report. This would provide an opportunity to the Authority to demonstrate how it would apply the lessons learned from experience and build confidence in its delivery

capability. This approach would permit to advance early work (design, ROW acquisition, utility relocation and geotechnical work) prior to the execution of large construction contracts.

Section A
Commercial and Business Model

The Business Model and scope for California High-Speed Rail needs to evolve to deliver Interim Service

Background and Approach

This section describes the Authority's planned delivery model to construct, operate, and maintain its assets and discusses potential business models that decision-makers might consider for the operation of Interim Service between Merced and Bakersfield.

The delivery model describes the Authority's procurement and contracting strategy for the high-speed rail infrastructure. The long-term business model for the provision of high-speed rail passenger service on the IOS was proposed in the Authority's 2018 Business Plan and defines the roles and responsibilities of various entities for high-speed rail passenger operations (Long-Term Business Model).

In the context of Interim Service, this Study recommends the Authority adopt a new business model for Interim Service (Interim Service Business Model) so that it would meet a conservative interpretation of the no subsidy requirement of Proposition 1A.

Prop 1A No Subsidy Requirement: Report Assumptions

The Authority's funding plans have historically established that no subsidy will be necessary upon completion of the IOS. Proposition 1A does not provide a specific definition of subsidy other than the generally accepted meaning of the term. In all analyses, the Authority has consistently projected that the IOS would breakeven, meaning the projected operating revenues generated from farebox and ancillary revenues would be sufficient to cover the estimated cost of maintenance and operations.

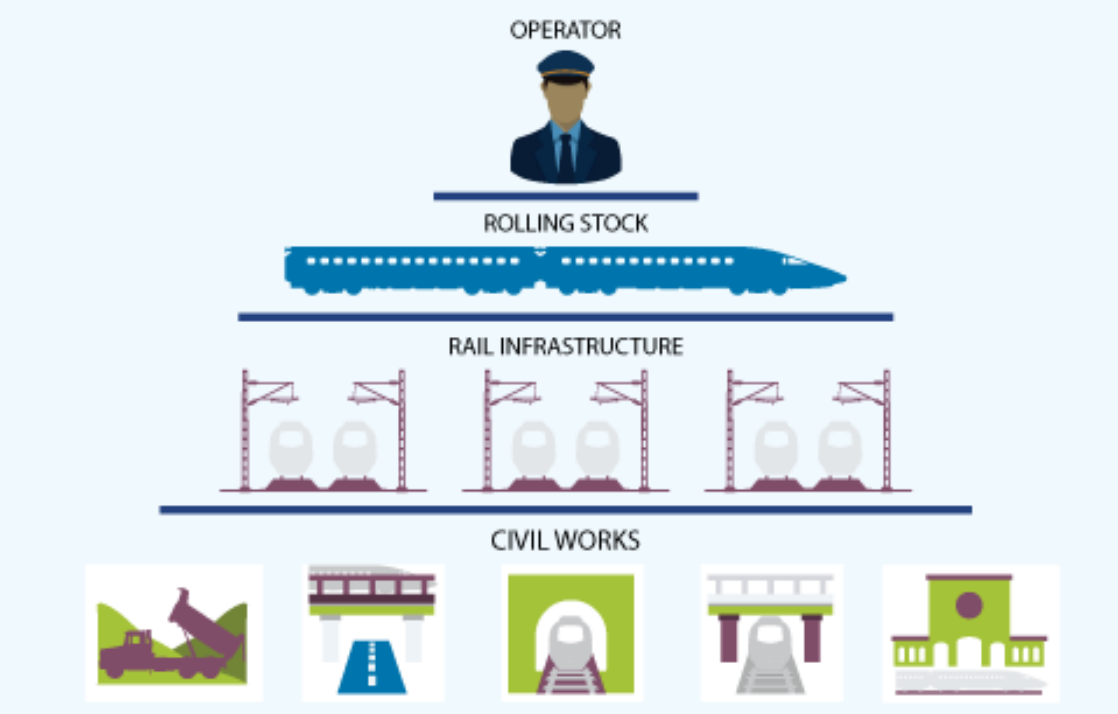
For the purposes of Interim Service, and until further clarification is provided by the legislature, the Study has assumed a conservative position in terms of the Business Model for Interim Services whereby the Authority leases its assets to the SJJPA or another third party (as further described below and in Section A, *Commercial and Business Model).*

As outlined further below this Business Model approach has the added advantage of directly addressing short term affordability concerns on long term maintenance and lifecycle payments for high-speed rail assets. This matter is further discussed in the California High-Speed Rail Peer Review Group letter to the Legislature dated August 23, 2019.

Delivery Model

The Authority's delivery model has not significantly changed since the 2012 Revised Business Plan. An overview of the V2V delivery model for the completion of the HSR infrastructure is illustrated in the following diagram.

Figure 5: V2V Delivery Model



Civil Works Construction

Civil works include significant engineering activities such as mass grading, the construction of bridges, overpasses and other critical initial steps in a large construction project. The civil works for this project are being delivered through design-build contracts and do not include a maintenance component.

The Authority currently has three active design-build contracts for the CVS. Further civil work contracts are anticipated for segments beyond CVS are subject to Board approval, environmental permits, right-of-way acquisition, and the availability of funding. The extension to Merced and to Bakersfield would likely require at least two additional and separate contracts—one south to Bakersfield, and one north to Merced. Subject to the availability of funding, civil contracts would need to be procured for the remaining segments comprising the V2V alignment.

Rail Infrastructure (Track, Systems, and Power)

In parallel to the civil works contracts already under way in the Central Valley, the Authority intends to seek bids for a long-term performance-based DBM contract for Track and Systems. Track and Systems includes the actual rail, rail ballast and/or slab, signaling, overhead catenary system, and communications technology for the project.

The Request for Qualifications (RFQ) for this procurement was approved by the Board in June 2019 and the RFQ was released in July 2019 followed by a RFP in December 2019. The selected contractor will be responsible for the construction, installation, and integration of the high-speed rail equipment and systems and for the long-term maintenance of the equipment, track and underlying civil works.

The scope of this contract includes the entire alignment of V2V and will be developed in segments when the Authority issues a notice to proceed (NTP) to begin work. In other words, the Track and Systems contractor will be responsible for the availability of the defined V2V high-speed rail system in its entirety (excluding only the high-speed rail Trainsets) over a period of 30 years after construction completion.

Under this contract, the availability of the high-speed rail system will be subject to a performance regime that incentivizes (and penalizes) the selected contractor to make the system available to the high-speed rail Operator. **The Track and Systems contract is therefore central in the long-term delivery model of the State's high-speed rail system and is expected to be the largest and longest single contract (in terms of dollar value and contract term) for the Authority.**

Track and Systems will be delivered in segments subject to individual NTPs as set out below:

Table 5: Track and Systems Segment Locations and Distances

Segment	Location	Distance/miles
Segment 1	Central Valley Segment: Madera to Poplar Avenue	119
Segment 2	Poplar Avenue to Bakersfield	20
Segment 3	Madera to Merced	30
Segment 4	Gilroy to Central Valley Wye	96
Segment 5	San Jose to Gilroy	30

Segment 1 will include the CVS from Madera to Poplar Avenue and is intended to be the "test track" for achieve certification from the FRA for the high-speed rail system. Segment 1 includes the plain line track for the purpose of meeting the requirements of the ARRA grant with a dedicated milestone and a liquidated damages regime to meet the requirements. The Authority will accept Segment 1 from the contractor once Track and Systems and high-speed Trainsets have been certified by the FRA. Subsequent segments will have similar acceptance procedures. The contractor will also build a maintenance of way facility and be responsible for delivering the operational control center. The Track and Systems contractor will have additional responsibility for running the operational control center from which it will dispatch trains on the network.

High-Speed Rail Trainsets/Rolling Stock

High-speed Trainsets are trains capable of speeds that achieve compliance with Proposition 1A. The Trainset contract is also planned to be a long-term performance-based, DBM contract with a term of 30 years after delivery and certification of the Trainsets and heavy maintenance facility (HMF), including responsibility for maintenance and lifecycle of the trainsets and HMF over the term of the contract.

The Authority currently anticipates it will order six high-speed Trainsets for the operation of Interim Service between Merced and Bakersfield and will order additional Trainsets as operations are extended beyond Merced to Bakersfield Interim Service. It is critical in the context of Interim Service that the initial order of Trainsets is agreed with CalSTA, likely through a memorandum of understanding or similar agreement.

The delivery of high-speed Trainsets is an important component of the critical path, because they are integral in the testing and certification of the Track and Systems. As a result, the procurement of the Trainsets is required to be closely choreographed with that of the Track and Systems. Procurement for the trainsets is expected to start in early 2020.

Maintenance and lifecycle payments associated with the use of the Trainsets will commence after passenger revenue service commences.

Train Operating Company

The last component of the business model is the TOC of the system. In the 2018 Business Plan, it was intended that the Operator of the V2V system transition the IOS through initial start-up operations (ramp-up) into its positive net revenue long-term state. Under the ETO contract, the Authority appointed Deutsche Bahn in a role intended to transition from an operator consultant to the first Operator of the V2V system under a financial plan to be agreed covering the ramp-up period.

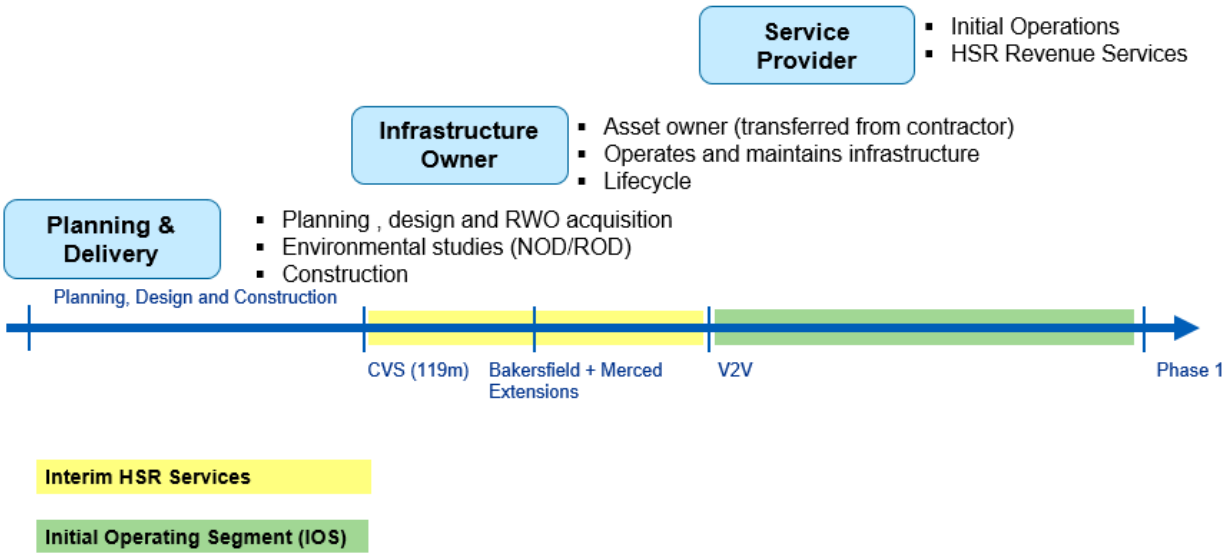
After testing and commissioning of Trainsets and Track and Systems and, subject to agreement with the Authority on a financial plan, it is intended that the ETO will establish a TOC. The ETO's contract requires ETO to recruit and train staff for the TOC and start a 12-month period of trial running without fare-paying passengers. Once the IOS is mature enterprise, which is anticipated after the ramp-up period of passenger service, it could be monetized through a sale or through a series of short to medium-term franchises.

Long-Term Business Model

By statute, the Authority is responsible for planning, designing, building, and operating the first high-speed rail system in the nation. This means its roles and its responsibilities will evolve progressively over time. Since 2013, when the CP1 contract was executed, the Authority has been in the process of transitioning from a planning organization to a delivery organization as reflected in the 2018 Program Management Plan. There will continue to be some overlap in roles as more planning is required to deliver Phase 1.

Since the 2012 Business Plan, the Authority envisioned a Long-Term Business Model that would allow a private concessionaire or franchise to take over operations for the IOS after substantial completion and a ramp-up period. Over time (after ramp-up of revenue service), the IOS is expected to be self-sustaining and generate net positive cash flow, which would have considerable enterprise value. At that time, this value could be monetized through franchising or a sale of the high-speed rail services to a private operator. The proceeds of the monetization could be used to construct other sections of Phase 1. This approach was developed to be compliant with Proposition 1A. Figure 6 below illustrates the transition of the Authority's role over different phases of the program.

Figure 6: Evolution of the Authority



The Authority will sequentially assume at least three main roles before reaching the end goal of statewide operational high-speed rail services as envisioned in Proposition 1A:

1. **Planning and Delivery Organization**: The Authority is advancing planning, design, and right-of-way acquisition on many segments, environmentally clearing each segment of the entire system, and has construction work underway in the Central Valley. Progressively, the Authority will focus more on delivery as planning and design is completed.
2. **Infrastructure Owner**: As the first segment is delivered (or reaches substantial completion) and is transferred to the Authority from the contractor, it will be a significant asset of the State that the Authority needs to manage and maintain. The Authority will have the responsibility to decide how it wants to utilize and maintain this asset.
3. **Service Provider**: The Authority will be able to manage and oversee an IOS when revenue projections (farebox and ancillary revenues) are equal to or greater than the costs of operating and maintaining the segment (as per Proposition 1A requirements). At this point, the Authority could transition into a Service Provider that utilizes its own assets and could contract with a TOC to operate high-speed rail revenue services directly on its assets.

This Study reviews the possible strategies and related decisions that the Authority is facing today in its emerging role as an Infrastructure Owner. In this Section A, *Commercial and Business Model*, consideration is given to how the potential organization and governance could be structured to utilize the Authority's infrastructure assets and generate benefits to the State and the taxpayers of California.

Analysis and Findings

Interim Service Business Model

The Authority needs to develop a business model to meet the needs of the Interim Service, recognizing that those requirements are different from the IOS. The Authority should consider implementing an Infrastructure Owner model for Interim Service, in which it leases its infrastructure to the SJJPA/SJJRC to operate a high-speed rail service. This Interim Service Business Model is analogous to the current arrangement that the ACE and San Joaquins have with Union Pacific and Burlington Northern Santa Fe (BNSF) railroads that allow for passenger service on their infrastructure.

Revenue Risk and Revenue Sharing

Amtrak is currently contracted to provide San Joaquins passenger service between Sacramento, Stockton, Oakland, and Bakersfield. The Amtrak contract is an annual cost reimbursement-based contract where SJJPA reimburses Amtrak's incurred net costs of farebox receipts, Amtrak does not take revenue risk under the contract, hence the payments made by SJJPA represent the State operating cost required to provide this existing service. Rolling stock for the San Joaquins is provided by the State through CalSTA. In FY 2018-19, the State cost for the San Joaquins service totaled $45.4 million.

This analysis assumes that SJJPA will continue to assume revenue risk for Interim Service as proposed in the ETO Study. Based upon the analysis provided in the ETO Study, the aggregate provision of rail services in the Central Valley of ACE and San Joaquins, including Interim Service between Merced and Bakersfield, will continue to require funding from the State. From the Authority's perspective, payments from the SJJPA/SJRRC to its Operator(s) will need to cover the costs of operations and maintenance under the terms of its Track and System and high-speed Trainsets contracts.

Interim Service Governance Structure Between the Authority, SJJPA, and CalSTA

The establishment of an Infrastructure Owner model for Interim Service requires an effective governance structure. While the development of governance model options was not within the scope of this Study and requires further development, one potential option could be to develop a similar structure to the San Joaquins corridor as defined under AB 1779 (2012). The Authority would provide access to its infrastructure, similar to BNSF and Union Pacific railroads under AB 1779, and the access and use of its assets for high-speed service would be governed by interagency agreements between the Authority and SJJPA/SJRRC. CalSTA would continue to have responsibility to fund San Joaquins operations to the extent costs exceed revenues per AB 1779; and SJJPA/SJRRC would have the responsibility for the administration, management, and expansion of the services, including the procurement of Operator(s) for the Interim Service.

To the extent that the Authority moves forward with the proposed Interim Service, the Authority should further analyze governance options and consider memorializing governance principles among the parties through a memorandum of understanding or similar agreement prior to execution of the Track and Systems and high-speed trainset contracts.

Business Model Options

This section describes the basic commercial structure of Interim Service Business Models that have been discussed with stakeholders. The Interim Service Business Model has been developed to be consistent with both the assumptions of the ETO Study and the key assumptions described above.

The key issues that arose in discussions with stakeholders on Interim Business Models are considered below.

Authority as Infrastructure Owner

The Authority will be the owner of the infrastructure assets it constructs between Merced and Bakersfield (similar to how BNSF owns the railroad currently utilized by San Joaquins). The Authority's Track and Systems contractor will maintain the high-speed rail system for the Operator. Under this approach, the high-speed rail assets would be made available to the Operator under a track access agreement and trainset rental agreement with the Authority that would mirror the terms of the Authority's long-term contracts for Track and Systems and Trainsets. This means that the performance regime of these contracts will apply to the Operator.

Operator

The SJJPA or another entity would have to procure an Operator for the Interim Service. The contract for the Operator would need a period of time to enable the Operator to stand up, train and certify a high-speed rail TOC, trial-run the service for a certain period (the ETO Study assumes up to a year), and then earn a certain level of profit or return through operations.

The agreement between SJJPA/SJRRC and the Operator would have a similar reimbursement principle that the SJJPA/SJRRC currently has with Amtrak. SJJPA/SJJRC would agree on the service specification and annual funding for Interim Service. Payment from SJJPA/SJRRC combined with the farebox proceeds or a specified revenue share of the combined San Joaquins service would be formulated to meet the costs of providing the service. Service costs would include the maintenance costs associated with the high-speed Trainsets and Track and Systems contracts.

When considering this structure, a key issue is the cost of establishing and certifying a high-speed rail TOC. Operators of any new rail service that utilizes new technology on a greenfield asset typically will require a trial running period. The Authority has made a provision for some pre-operations costs associated with the testing and commissioning of the new HSR equipment, (see Section C, *Capital Cost and Schedule)* and its schedule includes periods of trial running. The agreements between the SJJPA/SJRRC and the Authority would need to include this period of trial running and budget for the contract would need to include the associated costs.

The Authority may need to confirm that a third-party public agency can provide high-speed revenue service within the State above a certain threshold speed of 125 mph. This Study does not examine this question.

Number of Operators

While the San Joaquin service currently has a single operator, the introduction of high-speed rail services on the Merced-Bakersfield segment raises the question of whether multiple operators would be more efficient for the provision of the full San Joaquin service.

One alternative that was discussed with stakeholders is that SJPPA could be responsible for managing two passenger rail service Operators within specified geographical regions. This would require a north-south interface at the Merced station with a cross-platform interchange between the two TOCs:

- San Joaquins services north of Merced (similar or same to those currently provided by Amtrak) operated exclusively by one TOC.
- San Joaquins services south of Merced provided using high-speed rail assets and operated exclusively by another (high-speed) TOC.

Another alternate business model is based on two TOCs with the provision of regional services on the BNSF rail infrastructure that is parallel to the Authority's infrastructure between Merced and Bakersfield. This means that both regional and high-speed services may operate along the same corridor south of Merced:

- Regional services both north and south of Merced continuing on BNSF infrastructure provided by one TOC.
- Intercity high-speed services south of Merced using the high-speed rail assets provided by another high-speed TOC.

Cost and ridership estimates for this variant were not available for this Study, as this business model was not analyzed in the ETO Study. While further analysis of costs would be necessary, this option may have some benefits in terms of connectivity and ridership, because the San Joaquins service would continue to provide service at stations along the current San Joaquins service.

Stakeholders' preferred model is for a single TOC, and this is discussed further in the section below on Preferred Business Model.

Preferred Business Model – Single Train Operating Company with Integrated Services

Stakeholder's preferred approach considers a business model that would be based on a single Operator for both regional and high-speed San Joaquins services north and south of Merced. ACE would continue to operate its own service.

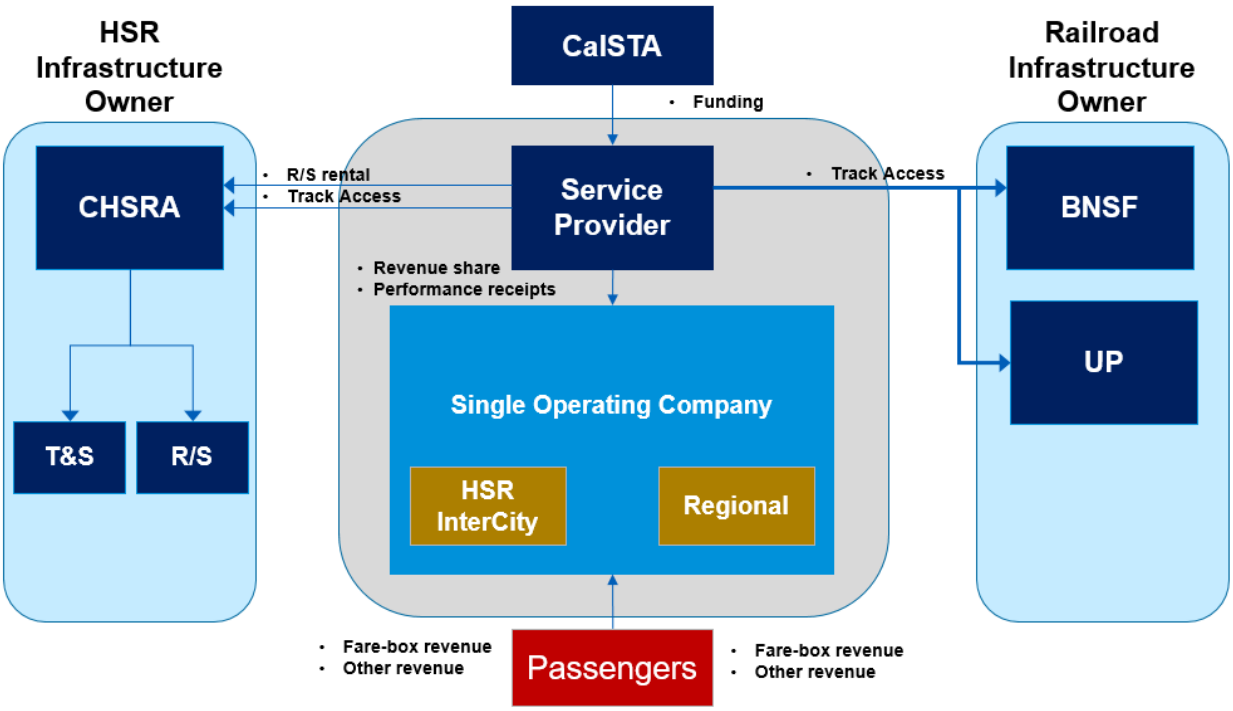
This model potentially allows some cost efficiencies compared with multiple operators, because it would eliminate duplicative management and overhead costs for one of the two TOCs. This model envisions a single Operator capable of running both intercity (high-speed) and regional (slower diesel) services. This model is being considered in the ETO Updated Forecast, which sees potential administrative cost efficiencies of up to 30% per the SJJPA and SJRRC.

Notwithstanding potential cost advantages, this may add challenged for management over the long-term once high-speed passenger rail services are extended beyond Interim Services. For example, the Authority may want to terminate rental agreements for infrastructure following

completion of the number of operational high-speed rail segments beyond the Merced-Bakersfield alignment in order to transition to the Long-Term Business Model for the full IOS.

The commercial structure is illustrated below.

Figure 7: Preferred Business Model – Single TOC with Integrated Services



Timing and Duration of Interim Service

The start of Interim Service is dependent on many factors including, but not limited to, the completion date of the relevant high-speed segments, the testing and commissioning of high-speed rail infrastructure and equipment, the establishment and certification of a TOC, and successful trial running. The 2019 Project Update Report set out a schedule for the completion of the Merced to Bakersfield segment, which anticipated that Interim Service would commence in December 2028.

As incremental segments of the IOS are added through a modular approach for civil works and Track and Systems, it may be possible to expand Interim Service along the additional segments. At this time, any such collection of segments is not currently expected to be net revenue positive until the full IOS is complete. Until the IOS is complete, Interim Service will likely continue to require an additional revenue stream over and above farebox. Hence, the amount of funding necessary to support this strategy will be a function of the amount of time between the commencement of Interim Service and the completion of the IOS.

The 2018 Business Plan assumed that the IOS would be completed by 2029. This assumption did not assume delays in the funding necessary to complete the capital program for the IOS and did not include the proposed extension to Merced. In order to factor in the financially

constrained environment, these assumptions will require adjustment in the 2020 Business Plan.

Finally, following the completion of the IOS, a question remains as to whether the San Joaquins service would continue in the same form and frequency as it would be provided under the Interim Service. Changes to high-speed rail service for the IOS may not meet the demand for local services historically provided by San Joaquins, hence additional service adjustments may be necessary to make its connections.

Conclusions

The Authority's delivery model for the program, is based on a building block (segment by segment) approach, leads to a practical need to utilize each constructed segment of the high-speed system as it is completed. The contracts that the Authority is planning to procure imminently (Track and Systems and Trainsets) also require long-term payments for maintenance and lifecycle as soon as any revenue service commences.

The sequential delivery of high-speed rail segments implies that the Authority will first be an Infrastructure Owner for the CVS with potential future extensions to Bakersfield, Merced, and then build out to V2V as funding sources permit. This is a logical progression for the Authority and one that has been under consideration since the establishment of the ARRA grant agreement, where intermediate operations are contemplated as a rational potential strategy to utilize the completed assets. This means that the Authority and its Board face decisions about Interim Service before the completion of the Merced to Bakersfield segment is delivered. While the CVS segment may essentially be used to test and commission high-speed infrastructure, Interim Service on the CVS may be required even as the extension to Bakersfield and Merced are under construction.

Potential Interim Service Business Models rely on the Authority in an Infrastructure Owner role, which also has the advantage that other third-party entities are operating the contemplated high-speed services as part of the San Joaquins service. While stakeholders broadly agree on the type of services which could enhance the existing San Joaquins service, the service specification and commitment to use high-speed rail assets needs to be formally agreed, along with how the transition to the Long-Term Business Model will be implemented.

The Authority will continue to advance planning, design, and construction on other segments and implement its Infrastructure Owner responsibilities. Consequently, the Authority and the Board need to allow its organizational structure to evolve and support both roles: one side of the organization focusing on the planning and delivery (current organization) and a second side on transition and evolution to its Infrastructure Owner responsibilities.

Section B
Operational Considerations

Commencing Interim Service in the Central Valley can have positive impacts by increasing rail ridership and enhancing corridor-wide revenue performance.

Context and Approach

As part of this Business Case, KPMG conducted a detailed review of ridership, revenue, O&M cost, and State cost forecasts and assumptions provided by the ETO for the proposed Interim Service between Merced and Bakersfield.

This operational review was conducted over three distinct steps, beginning with our initial feedback to the ETO on the May 2019 ETO Study, and culminating with additional analyses conducted by the ETO in December 2019 based on KPMG comments and findings:

- **Step 1 – ETO Base Case Forecast:** Between June and September 2019, KPMG reviewed the Base Case Forecast from the May 2019 ETO Study. As part of this review, we provided detailed observations to the ETO on their supporting models, inputs, and documentation (see Table 6 and Table 7).
- **Step 2 – ETO Updated Forecast:** In November 2019, we reviewed the ETO Updated Forecast (see Table 8), which are the final estimates contained in the revised ETO Study published in February 2020. These revised ETO forecasts incorporated KPMG, Authority, and stakeholder comments from Step 1, and included both updated Base Case estimates as well as a new Downside Case sensitivity with higher transfer penalty assumptions and modified HSR connectivity. As part of our Step 2 review, we requested additional sensitivity analyses be conducted by the ETO in Step 3 in order to provide a higher confidence interval around forecasts.
- **Step 3 – ETO Low Case and Supporting Analyses:** In December 2019, we reviewed scenario sensitivities and other supporting analyses developed by the ETO (as requested in Step 2). These additional analyses included a new Low Case Scenario with delayed infrastructure delivery assumptions, a market share analysis, fare sensitivity testing, load factors, induced traffic & tourist trips, and long-distance trips.

This Section evaluates the various results and assumptions provided by the ETO, and highlights key considerations for the Authority to manage as it advances operating arrangements for Interim Service.

Key elements of our review methodology include:

- **Consistency and Verification Check of Source Data:** The ETO Study, supporting models, documentation, and ETO updated analyses were reviewed in the context of current plans, funding agreements, and strategies published by the Authority, ACE, and the San Joaquins, including the Authority's 2018 Business Plan, the 2019 Project Update Report, and the SJJPA 2019 Business Plan Update.
- **Interviews and Stakeholder Discussions:** Relevant staff from both the Authority and its consultants (including the ETO), as well as those from other supporting stakeholders were interviewed on the proposed operating concept and underlying assumptions. This enabled the clarification of assumptions presented in the ETO Study and ETO Updated Forecast, as well as the assessment and evaluation of rationale for the inclusion of specific operating plan components.
- **Comparison of Operational Assumptions with Capital Plans:** ETO service plans were compared with Authority and stakeholder capital plans in order to assess the consistency of the proposed operating plans with the infrastructure planned for the Central Valley.
- **Refinement of Forecasts with the ETO:** Where we observed inconsistencies or risks, we provided this feedback to the ETO and collaboratively worked with them to enhance the reasonableness and robustness of forecasts through additional quantitative analyses and modelling.

Analysis and Findings

Step 1 KPMG Preliminary Review

Between June and September 2019, KPMG reviewed the original ETO Study, examined supporting models and documentation, and met with the ETO and stakeholders such as CalSTA, SJJPA, and SJRRC on the capital investment and operating requirements needed to achieve Interim Service.

Table 6 summarizes our key observations from our Step 1 review of ridership and revenue estimates, while Table 7 summarizes our key observations on the O&M cost forecasts. The ETO addressed the majority of our feedback on the original ETO Study forecasts (May 2019) by incorporating revised assumptions in the ETO Updated Forecast in November 2019. A summary of how the ETO addressed KPMG observations is included in the Appendix.

Table 6: KPMG Ridership and Revenue Observations

Item	Ridership & Revenue Observations	Potential Impact on Estimates
1	No ramp-up period for passenger familiarization with the HSR mode	Early year ridership performance may be overstated, as typically there is a period of time at the start of operations for the market to adjust to new modes of transport
2	Ridership model assumes that all transit trips between Merced, Madera, Fresno, Hanford, and Bakersfield use HSR.	In actuality, there are other connectivity options in the Central Valley including local bus service. Ridership model may overstate short-distance trips
3	High-speed rail fares are set at current San Joaquin fare levels with no differentiation for HSR	Globally, there is typically a fare premium for HSR services. The ridership model may be understating potential revenues from the system
4	Transfers are assumed to be optimized in Merced (cross-platform transfer with no physical barriers)	The planned intermodal station in Merced is only partially funded, and the realization of this infrastructure investment (as well as the ACE Ceres to Merced project) is needed to achieve ridership forecasts
5	Connecting train, bus, and HSR services are assumed to be 100% reliable	In practice, current San Joaquin reliability is 75.7%. If this performance continues, it could damper passenger demand for rail services in the corridor (perception among travelers that the train is unreliable)
6	Low transfer penalty from one mode to another	Passenger demand could be overstated as demand is typically sensitive to the number of transfers that need to be made
7	No traveler preference constant for HSR	HSR is typically seen as a distinct mode when compared with conventional rail. Ridership forecasts could be understated

Table 7: KPMG Operations & Maintenance Cost Observations

Item	O&M Cost Estimate Observations	Potential Impact on Estimates
1	Opportunity for administrative cost savings under a single TOC model	This could result in significant operating cost savings
2	A 10% TOC profit margin assumed. Costs are calculated without any added margins for subcontractors	The profit margin could vary depending on the type of entity and scope of services procured
3	Thruway bus costs appear to be undercounted in the supporting cost model	Potential undercounting of O&M costs. SoCal bus connections were only costed at 1 frequency per route per day
4	Warranties were assumed to cover all defects for the first four years	Potential undercounting of O&M costs. In practice, warranties may not cover every incident and there is generally a lag between claims and claims pay-out
5	10% contingency margin was applied despite a range of 15% to 35% assumed in the 2018 BP	Potential undercounting of contingency costs for O&M events
6	Amortization, depreciation, interest, and taxes are not included in forecasts.	These are additional costs that the Authority may incur when the system opens.
7	Fewer insurance coverages were assumed in the modelling (when compared to those policies assumed in the 2018 BP)	Potential undercounting of O&M costs
8	Assumed a flat $150,000 per county for policing costs	Potential undercounting of O&M costs. In practice, counties have been trending towards true cost recovery for law enforcement contract services in the preceding five years
9	Rolling stock maintenance parts / materials are assumed to be included in the rolling stock contract	Potential undercounting of O&M costs. There does not appear to be provision for rolling stock maintenance materials in either the latest capital cost estimate or the O&M estimate.
10	The ACE ridership forecast assumed an annualization factor of 323.6 days while the ACE O&M forecast assumed an annualization of 253 days.	ACE O&M cost estimates reflect only a 253 day year, despite service on 323.6 days per year. Potential undercounting of O&M costs.

Step 2 ETO Updated Forecast

In response to our initial Step 1 observations, the ETO developed two updated forecast series with revised assumptions in November 2019. The ETO Updated Forecast are the final estimates used in the revised ETO Study, which was published in February 2020:

1. **Revised Base Case Forecasts:** an update of the No-Build and Build estimates presented in the May 2019 ETO Study, but with a 2029 modelling horizon to account for revised infrastructure delivery needs. These revised forecasts incorporate an updated commercial model (aligning with the options we presented in Section A of this report), service plan enhancements, and operational tweaks in order to address KPMG preliminary findings in Step 1.
2. **New Downside Case Scenario:** a new Build scenario intended to address KPMG's observations regarding planned regional interfaces for the Interim Service at Merced. When compared with the Revised Base Case Forecast, this scenario includes higher transfer penalties and more limited regional connectivity in order to account for potential downside events in ridership realization.

Across the revised Base Case and new Downside Case Build scenarios, it is clear that Interim Service will continue to require State funding (with cost recovery ratios from 72% to 83%) and that the key to the achievement of forecasts is the materialization of capital infrastructure investments from the Authority, CalSTA, SJJPA, SJRRC, and other relevant stakeholders. These projects include the ACE Ceres to Merced Extension and the Merced intermodal station.

Table 8 illustrates the ETO Updated Forecasts (Current Actuals, No-Build Base, Build Base, Downside Case), while Figures 8, 9 and 10 depict the revenue, O&M cost, State cost, and farebox recovery estimates for the revised scenarios.

Table 8: Interim Service Ridership by Scenario (in thousands of unlinked trips for each mode; in thousands of linked trips for total)

Scenario	Current Corridor 2017 Actuals	ETO Study May 2019 No-Build 2026 Horizon	ETO Study May 2019 Base Case - Build 2026 Horizon	ETO Updated Forecast Nov 2019 No-Build 2029 Horizon	ETO Updated Forecast Nov 2019 Base Case - Build 2029 Horizon	ETO Updated Forecast Nov 2019 Downside Case - Build 2029 Horizon
HSR	-	-	1,671	-	2,049	1,656
San Joaquin	1,102	1,689	3,327	1,778	3,111	2,983
ACE	1,503	1,865	4,306	2,191	4,572	4,394
Thruway Buses	375	324	570	341	668	594
Other Thruway	-	561	912	587	1,441	1,395
Total *	**Rail: 2,605 Bus: 375**	**3,555**	**8,426**	**3,969**	**8,776**	**8,283**

*Current Corridor Performance data from the ETO Study (May 2019) - note that linked trips are not available for 2017 actuals.

Note: *the individual ridership totals for each mode presented (i.e. HSR, ACE, San Joaquins, etc.) may not be additive to a system-wide ridership total. This is because the individual modal totals are reported on an unlinked trips basis (not factoring transfers to other modes), whereas the system-wide ridership totals are reported on a linked trips basis (accounting for passengers who transfer between modes)*

Figure 8: ETO Study (May 2019) Build Scenario Base Case Revenue and O&M Results (in 2018 $ millions)

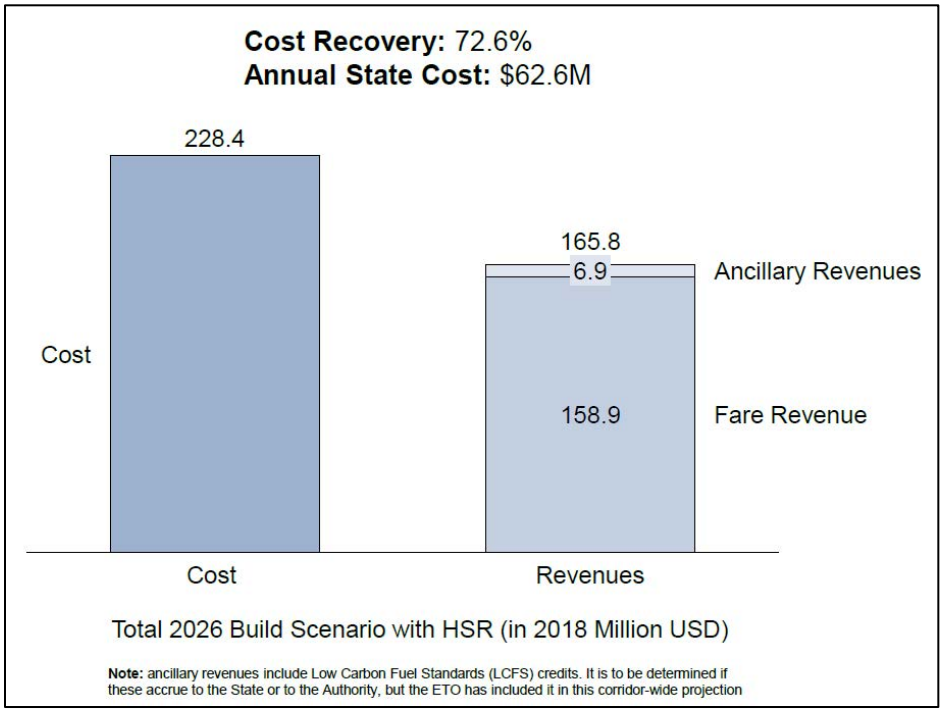


Figure 9: ETO Updated Forecast (Nov 2019) Build Scenario Base Case Revenue and O&M Results (in 2019 $ millions)

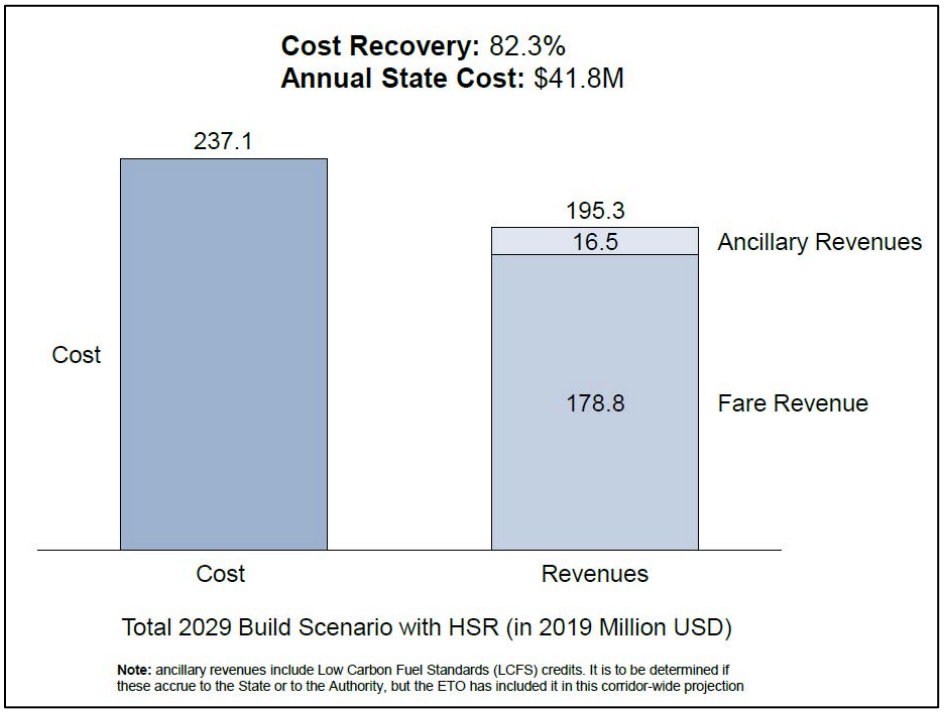
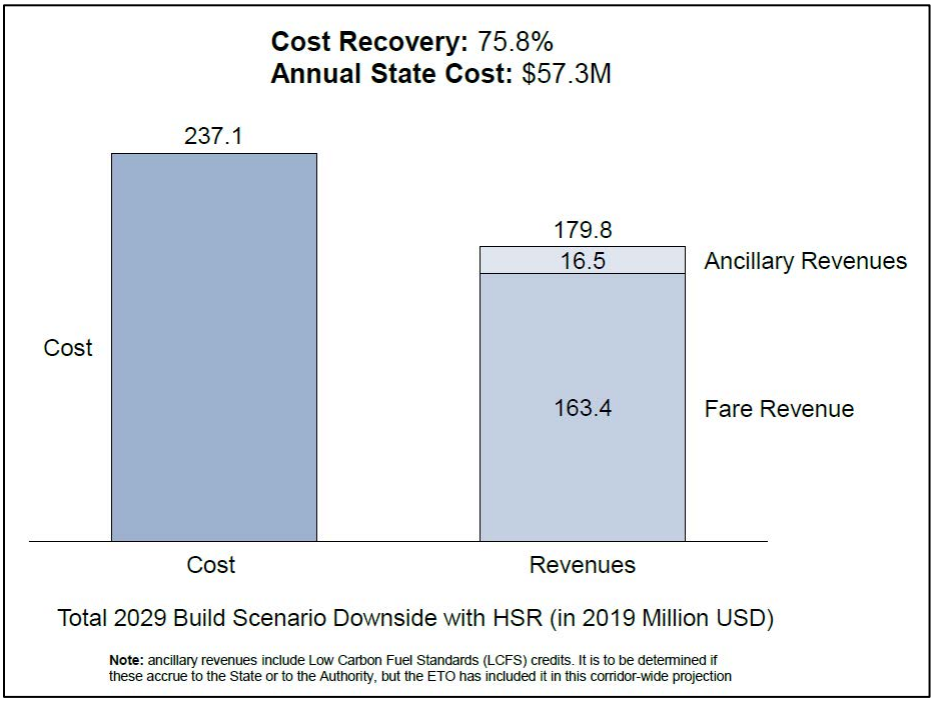


Figure 10: ETO Updated Forecast (Nov 2019) Build Scenario Downside Case Revenue and O&M Results (in 2019 $ millions)



Step 3 ETO Additional Analyses and Sensitivity Testing

Low Case Scenario

To inform the Authority of its absolute risk exposure profile, the ETO was requested to run a Low Case Scenario to account for downturn events and the delay of supporting stakeholder infrastructure investments. The result is the following Step 3 Low Case Scenario analysis, which the ETO conducted using a model post-processor. For the Low Case Scenario, the ETO assumed the following inputs:

- Hourly HSR service (matching the Build Scenario Downside Case in Section B)
- No-Build ACE service levels (no Ceres to Merced connection)
- No-Build San Joaquin service levels (non-intermodal terminal in Merced)
- Feeder buses matching the existing San Joaquin Thruway Connections schedule

Ridership, revenue, and O&M estimates were derived through extrapolation and the scaling of estimates by metrics such as train miles, bus miles, and variable costs. The ETO believes that by using this top-down approach, estimates will be within range of a more comprehensive ridership and O&M model run.

In summary, the Low Case Scenario will see the cost recovery ratio decrease to 51.4% with an annual State cost of $93.0M. This represents a $10 million increase in State cost from the 2026 No-Build (current state) scenario presented in the ETO Study (May 2019).

Under the Low Case Scenario, without connecting infrastructure investments from partners such as CalSTA, SJJPA, and SJRRC, the State savings will not materialize, reducing the benefit from the inclusion of high-speed rail in the integrated Central Valley system.

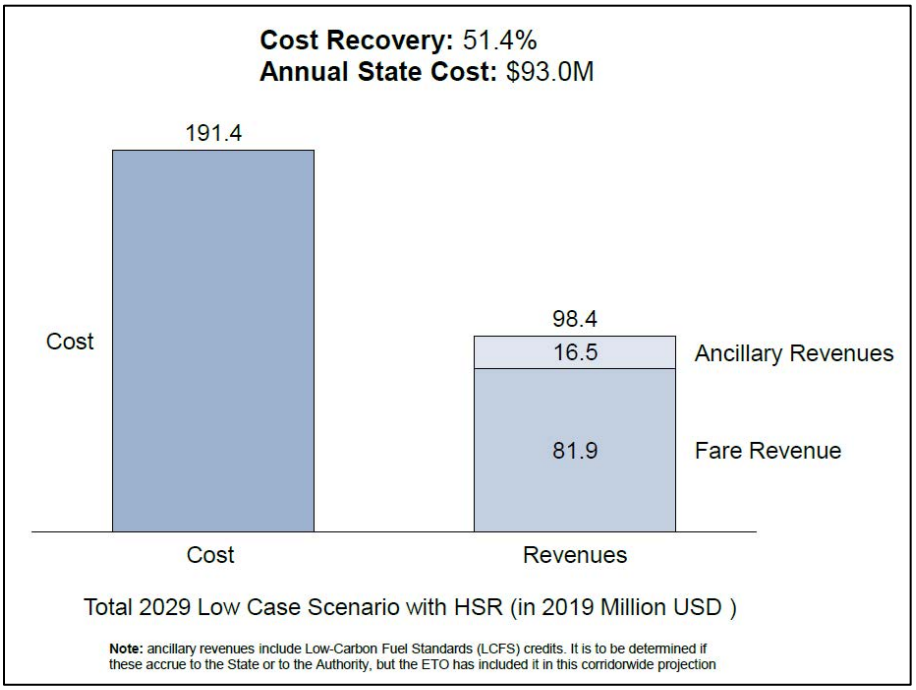
Table 9 summarizes the ridership by mode under the Low Case Scenario. Figure 11 depicts the corresponding revenue, O&M cost, and State cost performance.

Table 9: ETO Low Case Build Scenario Ridership by Mode (in thousands of unlinked trips)

Scenario	Current Corridor 2017 Actuals	ETO Updated Forecast Base Case (Build) 2029 Horizon	ETO Updated Forecast Downside Case (Build) 2029 Horizon	Low Case Scenario (Build) 2029 Horizon
HSR	N/A	2,049	1,656	1,656
San Joaquin	1,102	3,111	2,983	1,170
ACE	1,503	4,572	4,394	2,516
Thruway Buses	375	668	594	341
Other Thruway	N/A	1,441	1,395	587

Note: the ridership figures presented in Table 9 are on an unlinked trips basis and cannot be added together to derive total trips (as this would double-count passengers traveling between modes).

Figure 11: ETO Low Case Build Scenario Revenue and O&M Results (in 2019 $ millions)



Market Share Analysis

In order to better understand the relative increase in ridership between the Build and No-Build Base Case Scenarios summarized in Table 10, the ETO provided a market share analysis. To

conduct this analysis, the ETO compared HSR ridership market share with average annual daily traffic (AADT) along the SR 99, SR 145, SR 33, and I-5 highway corridors. Currently, Amtrak San Joaquin service represents 1.08% of overall Central Valley traffic. HSR alone in 2029 is expected to garner a 2.29% market share in the ETO Updated Forecast – Build Base Case Scenario.

Per the ETO, changes between the 2017 No-Build and the 2029 No-Build and Build scenarios are due to:

- Increases in population
- Greater congestion on roadways
- Travel time savings
- Improved rail service options in both the No-Build and Build scenarios.

We believe that the HSR share of overall trips is reasonable in light of the total road traffic in the Central Valley. Table 10 illustrates the ETO market share study results, looking specifically at rail service south of Merced.

Table 10: ETO Market Share Study Results

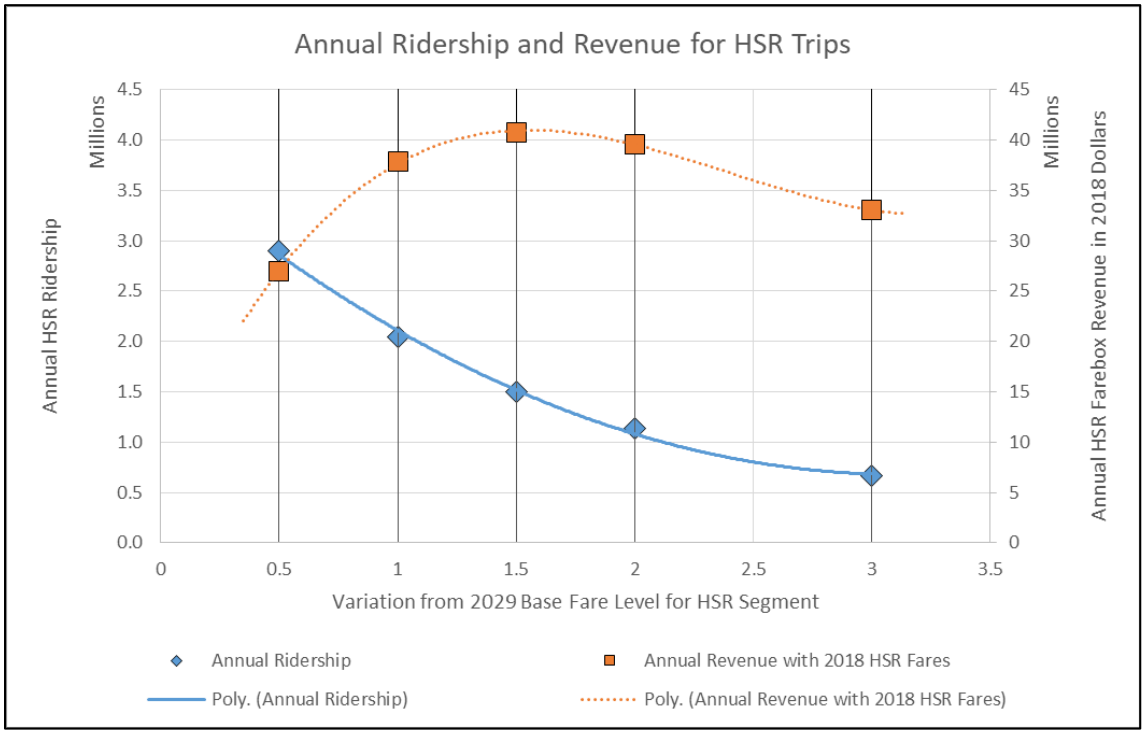
Service	Year	Market Share
SJ Service	2017 No-Build	1.08%
SJ Service	2029 No-Build	1.59%
HSR Service	2029 Build – Base Case	2.29%

Fare Sensitivity Testing

The ETO also conducted a fare study to measure sensitivity on ridership and revenue performance if higher HSR fares were to be used. Figure 12 illustrates ridership and revenue outcomes at each fare level for the ETO Updated Forecast – Build Base Case Scenario. Currently, HSR fares are set at 100%, resulting between $35 million and $40 million in HSR farebox revenue. Revenues appear to be maximized at 150% of base fares, and there is high revenue generation potential even if tickets are set at 200% of base fares.

The fare structure used in the ETO analysis (which reflects the current Amtrak San Joaquin fare structure) is under-optimal from a revenue maximization standpoint. As presented in Figure 12, ridership is decreasing with higher fares, which also implies that variable O&M costs may also decrease. The current fare structure provides a conservative position in terms of revenue and O&M cost performance.

Figure 12: ETO Fare Sensitivity Test Outputs



Load Factor Analysis

The ETO looked at load factors for the Base Case Scenario with the objective to assess potential crowding in trainsets. As shown in Table 11, load factors range from 50% to 83% during the peak periods of service (6am to 6pm). During other hours (5am-6am, 6pm to 11pm) the load factors range from 15% to 48%. We believe this data indicates that there is significant high-speed rail demand during peak periods, and an opportunity for the future operator to optimize services during off-peak periods.

As the ETO states in Table 11, this load factor analysis was conducted on the assumption that only 4 out of 8 train cars per trainset would be open to service (225 seats), and that the other four cars would be left empty (though with the flexible option to be placed into revenue service during peak periods of passenger demand). For traction power purposes, it would be difficult to decouple unused train cars due to motor unit needs for high-speed rail operations. It must be noted that with a full 8-car trainset configuration, load factors would be halved.

Table 11: ETO Hourly Load Factor Analysis – 2029 Build Scenario Base Case

Hour	Share Cars Highway Northbound	Share Cars Highway Southbound	Normalized Share Northbound for Operating Hours	Normalized Share Southbound for Operating Hours	Estimated Hourly Rail Demand Northbound	Estimated Hourly Rail Demand Southbound	Estimated Northbound Load Factor per Train	Estimated Southbound Load Factor per Train
0	1.7%	1.0%						
1	1.3%	0.8%						
2	1.2%	0.8%						
3	1.4%	1.1%						
4	2.0%	1.8%						
5	3.3%	3.5%	3.6%	3.7%	80	83	35.7%	36.8%
6	5.3%	5.6%	5.7%	6.0%	128	134	57.1%	59.4%
7	6.4%	7.4%	6.9%	7.9%	155	176	68.8%	78.3%
8	4.8%	5.1%	5.2%	5.4%	117	121	52.0%	53.7%
9	4.7%	4.8%	5.1%	5.1%	115	115	51.0%	51.1%
10	4.8%	4.7%	5.1%	5.0%	115	112	51.2%	49.8%
11	4.9%	4.9%	5.3%	5.1%	119	115	52.7%	51.1%
12	4.7%	5.2%	5.1%	5.5%	113	124	50.4%	55.0%
13	5.1%	5.8%	5.6%	6.2%	125	138	55.3%	61.2%
14	5.3%	6.3%	5.7%	6.7%	128	150	57.1%	66.7%
15	6.1%	7.0%	6.6%	7.4%	147	167	65.4%	74.0%
16	7.3%	7.6%	7.9%	8.0%	178	179	78.9%	79.7%
17	7.6%	7.5%	8.3%	7.9%	185	177	82.2%	78.7%
18	5.7%	5.4%	6.2%	5.7%	139	128	61.8%	56.8%
19	4.5%	3.9%	4.8%	4.1%	108	93	48.0%	41.2%
20	3.7%	3.2%	4.0%	3.3%	89	75	39.7%	33.2%
21	3.2%	2.7%	3.5%	2.9%	78	65	34.6%	28.8%
22	2.7%	2.2%	2.9%	2.3%	66	51	29.2%	22.7%
23	2.2%	1.6%	2.4%	1.6%	53	37	23.7%	16.4%
Daily	100%	100%	100%	100%	2238	2238	55.3%	55.3%

Note:
Data analysis based on Caltrans PemS Data for SR 99 from 10/01/2017 through 12/30/2017 for weekdays less holidays.
Assumes 450 seat capacity with 4 out of 8 cars open to service (225 seats available) and hourly HSR service.

Induced Traffic and Tourist Trips

The ETO Study and the ETO Updated Forecast do not include out-of-state, induced, or tourist trips consistent with the Authority's 2018 Business Plan modelling approach. Rather the ridership model focuses on regional and local trips within California. We believe this is a conservative and reasonable assumption as tourist and out-of-state travel demand is generally more seasonal, and revenue performance more volatile on a year-on-year basis. The ETO is planning on developing additional ridership runs to assess the upside impact for induced, tourist, and out-of-state traffic.

Long Distance Trips

Finally, in order to assess the ridership model behavior with respect to long distance trips, the ETO provided two analyses on the distribution of region to region passenger trips, and average trip length. In Tables 12 and 13, the 2029 No-Build Scenario is compared with the 2029 Build Scenario Base Case from the ETO Updated Forecast. As a result of the greater connectivity with Interim Service, trips solely within the North of Merced area are expected to increase twofold due to greater ACE / San Joaquin investments in the north and enhanced feeder bus schedules.

Intra-Central Valley and Central Valley to North of Merced / South of Bakersfield trips are also expected to increase substantially due to reduced travel times (per the ETO, up to two hours in

some origin-destination pairs). Figures reported in Tables 12 and 13 are on a region-to-region basis, and this analysis reflects those passengers who may transfer between modes such as HSR, ACE, San Joaquins, and feeder buses.

In addition, the ETO conducted an average trip length analysis for the ETO Updated Forecast – Build Base Case Scenario. As depicted in Figure 13, which shows cumulative frequency of trips by miles travelled, 60% of Interim Service trips are 80 miles or less, while 20% of trips only exceed 200 miles. These results indicate that rational travel demand preferences were used in the ridership modelling.

We believe these region-to-region and long distance trips estimates to be sensible in light of the significant investments expected in the Interim Service corridor.

Table 12: ETO Bi-Directional Linked Trips Analysis – 2029 No-Build Scenario

Travel Between	North of Merced	Central Valley	South of Bakersfield
North of Merced	2,936,000	529,000	(*)
Central Valley	529,000	163,000	341,000
South of Bakersfield	(*)	341,000	N/A

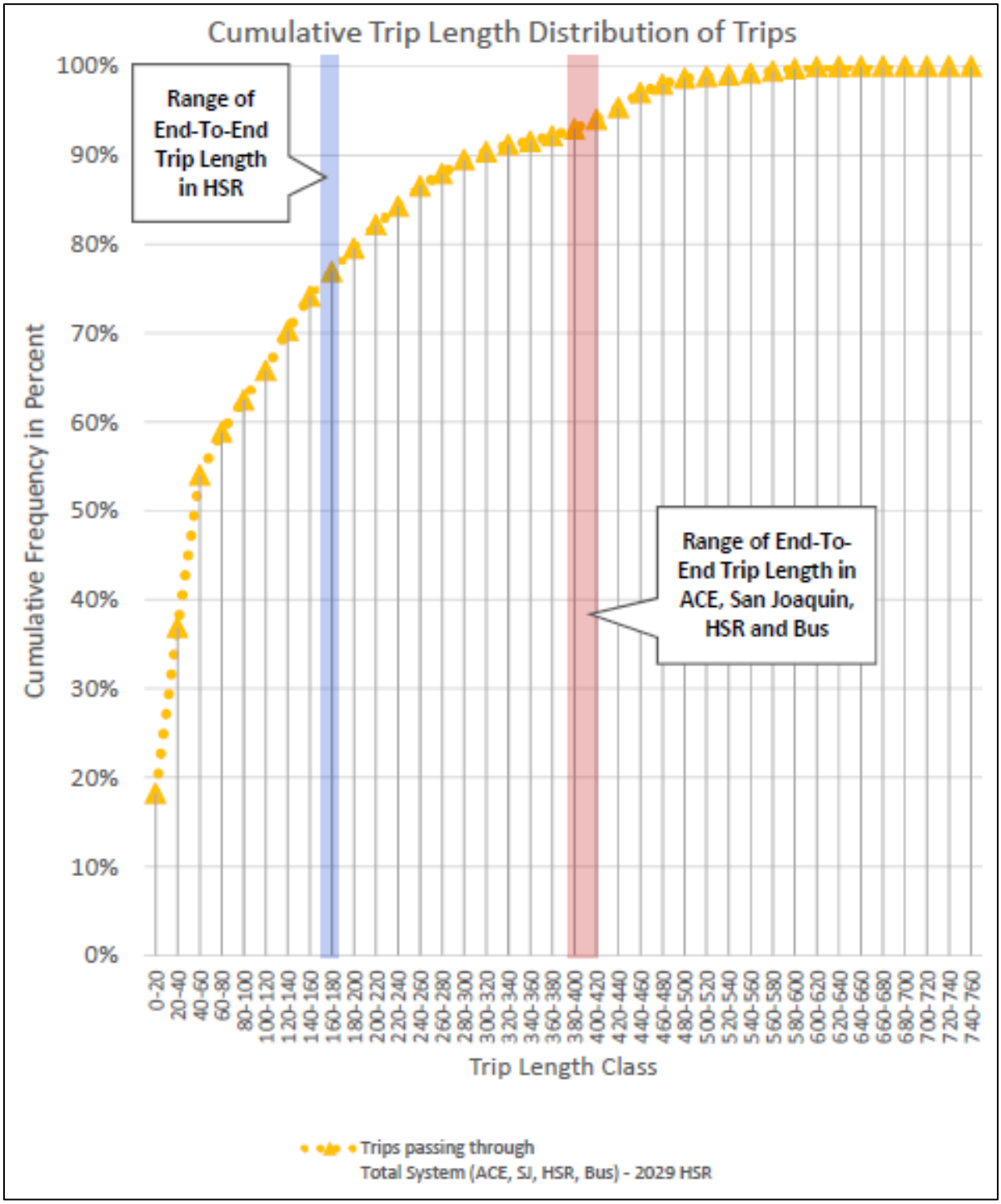
Note: (*) Data included in trips total from Central Valley to LA Basin. Intra-LA Basin trips not shown as the open bus concept is to be finalized. Trips shown are on a bi-directional basis.

Table 13: ETO Bi-Directional Linked Trips Share Analysis – 2029 Build Scenario Base Case

Travel Between	North of Merced	Central Valley	South of Bakersfield
North of Merced	6,727,000	956,000	(*)
Central Valley	956,000	425,000	668,000
South of Bakersfield	(*)	668,000	N/A

Note: (*) Data included in trips total from Central Valley to LA Basin. Intra-LA Basin trips not shown as the open bus concept is to be finalized. Trips shown are on a bi-directional basis.

Figure 13: ETO Cumulative Frequency of Trips by Distance – 2029 Build Scenario Base Case



Conclusions

Based on a comprehensive review of ETO outputs (including both the initial May 2019 ETO Study and subsequent revisions), ridership and O&M cost models, and supporting documentation, we believe that the ETO ridership, revenue, and O&M methodology and forecasts are well-developed and reasonable, with assumptions consistent with the current level of system planning and design. Below are our conclusions from our review of the ETO operating plan:

- **Interim Service would significantly improve passenger rail services in the Central Valley** by reducing travel times and providing increased service and flexibility to passengers, through improved connectivity with regional rail services. The ETO Study and ETO Updated Forecast indicate that ridership will increase significantly over current levels and would increase the farebox recovery ratio for both ACE and the San Joaquins. In addition, Interim Service would reduce the State's reliance on private freight rail infrastructure, improving reliability of service.

- **Incorporating a fare pricing strategy and the streamlining of functions of the Operator may enhance the financial viability of the Merced to Bakersfield Interim Service.** High-speed rail services typically command a fare premium over conventional passenger rail services because the service level on high-speed rail is higher. ETO fare analyses (as depicted in Figure 12) shows a significant opportunity for revenue maximization. Also, based on discussions with SJJPA and SJRRC, there is an opportunity to reduce operating costs by sharing services and functions with San Joaquins or ACE, as is assumed in the ETO Updated Forecast.

- **The estimated reduction of the annual cost to the State is contingent on the delivery of stakeholder capital infrastructure investments**. The ETO Study and ETO Updated Forecast identify infrastructure requirements crucial to the Merced to Bakersfield Interim Service operating plan, including the ACE Ceres to Merced Extension and the intermodal station at Merced. As shown in the ETO Low Case Scenario in Figure 11, delays in the delivery of partner agency assets could significantly impact the return on investment from Interim Service. As the Authority advances planning for the Interim Service, it is important that it reach agreements with stakeholders such as CalSTA, the SJJPA, and SJRRC for the delivery of critical path projects.

Section C
Capital Cost and Schedule

Interim Service requires additional investments by the Authority and coordinated investments from regional rail partners, SJJPA and SJRRC.

Background and Approach

In May 2018, the Board, in conjunction with the approval of the 2018 Business Plan adopted the 2018 Baseline capital costs, establishing an updated scope, schedule, costs and budget for the Silicon Valley to Central Valley line, Bookends/Early Investment projects, and Phase 1 environmental work. For the first time, the capital program costs were presented in ranges based on the level of design and variations of the scope elements for the project segments. The capital cost ranges included risk contingency amounts based upon each project segment's level of design maturity. The 2018 Baseline also established a structured change management and review process moving forward.

As committed in the 2018 Business Plan, the Authority conducted additional cost review estimate and risk analysis. The 2019 Project Update Report presented an updated capital cost estimate and schedule on program costs for completing the CVS, other commitments currently underway, and the estimated incremental capital costs for delivering Merced to Bakersfield Interim Service. The updated capital cost estimate was a result of an estimate-at-completion review and a Monte Carlo[26] risk analysis, which increased project contingency amounts.

Analysis and Findings

Current Commitments

In June 2019, the Board approved a $15.6 billion budget[27] to deliver the CVS[28], Phase 1 RODs, and Bookends/Early Investments commitments in Northern and Southern California. Based upon current capital cost estimated, this budget provides the funding necessary for the Authority to fulfill its commitments under the ARRA/FY10 grants and Proposition 1A funding plans. The following Table 14 shows a summary of the 2019 Baseline Update and incremental capital cost to implement Merced to Bakersfield Interim Service.

[26] Monte Carlo simulations are used to model the probability of different outcomes in a process that cannot easily be predicted due to the intervention of random variables. It is a technique used in a variety of disciplines to understand the impact of risk and uncertainty in prediction and forecasting models.
[27] https://www.hsr.ca.gov/about/board/resolutions.aspx
[28] This includes Track and Systems.

Table 14: Capital Cost Estimate – May 2019 Baseline Update (in millions of $)

SCOPE CATEGORY	COST
Central Valley Segment (CVS)	12,367
CP1 (including SR-99)	*4,380*
CP2-3	*3,194*
CP4	*1,104*
CVS Track	*940*
CVS Systems, Stations and HMF	*1,359*
Planning & Program-wide Support	*1,390*
Outside Central Valley Segment	3,246
Phase 1 RODs	*759*
Bookends / Early Investments	*1,298*
Other Funded Scope	*1,189*
TOTAL – MAY 2019 BASELINE UPDATE	**15,613**

Incremental Scope for Merced to Bakersfield Interim Service

Interim Service as described in the 2019 Project Update Report would require the Board to increase the capital program budget by $4.8 billion for the additional scope requirements. This would bring the capital program budget to $20.4 billion[29]. Table 15 shows a summary of the incremental capital cost to implement Merced to Bakersfield Interim Service.

Table 15: Capital Cost Estimate – Merced to Bakersfield Interim Service (in millions of $)

SCOPE CATEGORY	COST
Subtotal – May 2019 Baseline Update	**15,613**
Bakersfield Extension	1,408
Merced Extension	2,536
Six High-Speed Trainsets	676
Program Support Costs	175
Subtotal – MCD to BFD Incremental Cost	**4,794**
TOTAL – MCD-BFD INTERIM SERVICE	**20,407**

The Bakersfield extension and procurement of high-speed Trainsets are both consistent with the 2018 Business Plan and V2V scope, while the Merced extension scope would represent an addition to the V2V scope.

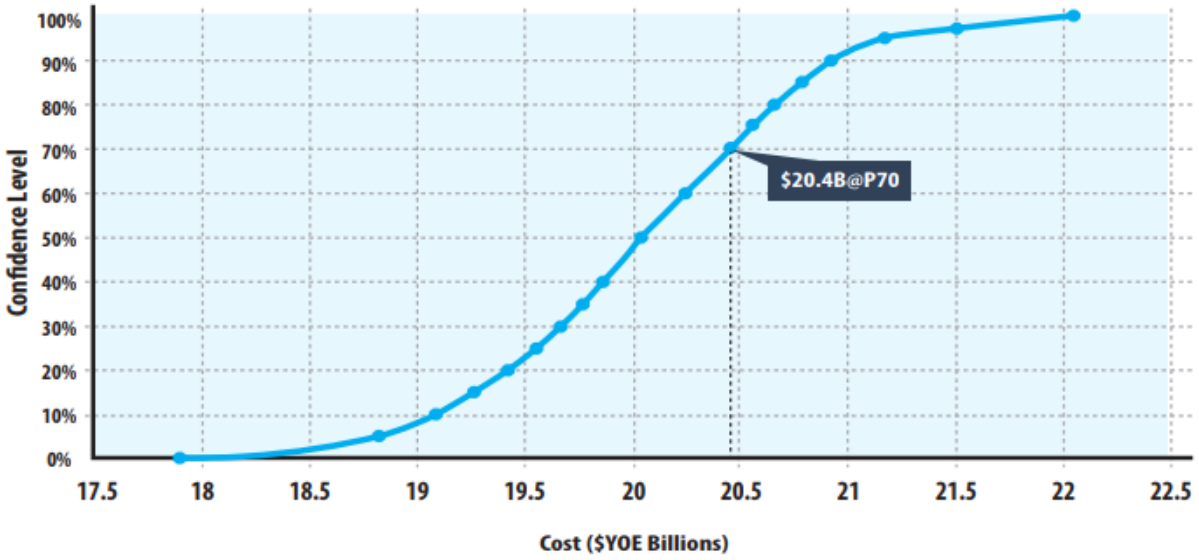
[29] 2019 Project Update Report cost estimate.

Merced to Bakersfield Interim Service Cost Range – Monte Carlo Risk Analysis

The Authority conducted a Monte Carlo risk analysis for the Merced to Bakersfield Interim Service in order to analyze the capital cost range of the project at different probability levels. The baseline cost estimates presented in the 2019 Project Update Report for Merced to Bakersfield Interim Service is based on P70 levels. This means that current Authority forecasts reflect a 70% probability of the actual capital cost being at or below the estimate.

Conversely, the Authority currently forecasts a 30% probability that this estimate will be exceeded. Figure 14 below shows the current capital cost estimates at different probability levels. The P70 estimate for the Merced to Bakersfield Interim Service is $20.4 billion, while the P90 and P100 estimates are $20.9 billion and $22.1 billion, respectively.

Figure 14: Merced to Bakersfield Interim Service Cost Range[30]



Capital Cost Estimate Scope vis-à-vis Operating Assumptions

The Authority has refined its capital cost estimate for the development of the 2020 Business Plan. The following list of observations in Table 16 were included in the capital cost estimate update to reflect the ridership, revenue, and O&M assumptions of the Merced to Bakersfield Interim Service assumed in the ETO Study.

[30] 2019 Project Update Report, Page 38.

Table 16: Authority Capital Cost Estimate Scope vis-à-vis Operations Assumptions

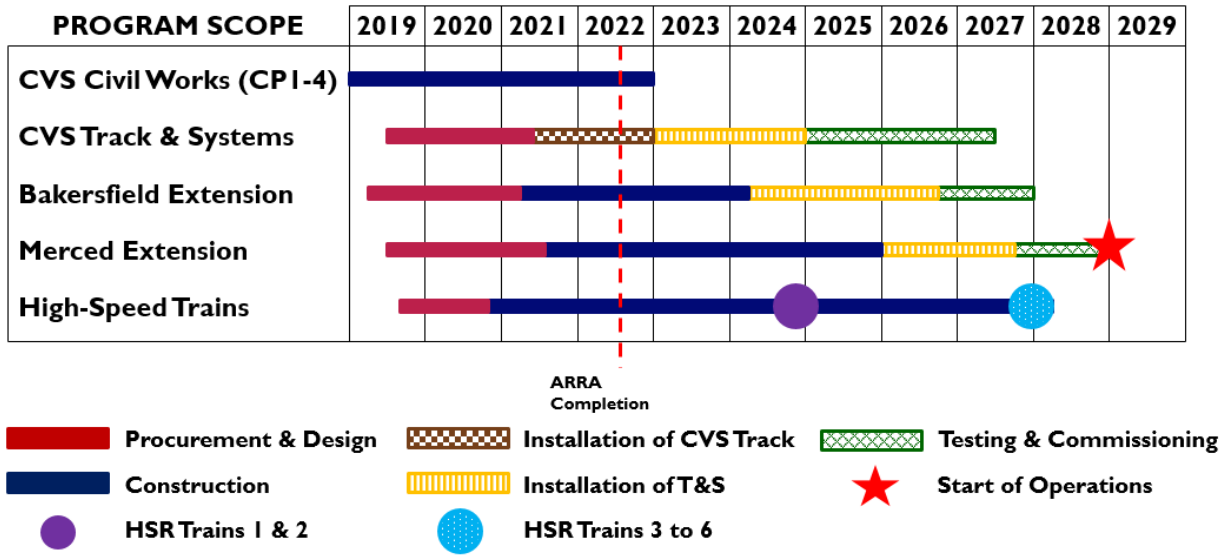
Scope	ETO Study Assumption	Actions
Track & Systems	The following items are capitalized and included in the track and systems contract: • Specialized O&M tools • O&M material and spares required in first five years of operations • Non-rail vehicles for O&M	The capitalization of tools, materials and spares, and non-rail vehicles for track and systems O&M have been incorporated in the capital cost estimate.
High-Speed Rail Trainsets	95% of material in planned maintenance (excluding consumables) are capitalized and included in the high-speed rail trainsets contract	Capitalization of material in planned maintenance is not currently assumed in the capital cost estimate. Five-year contract-warranty cover initial planned maintenance materials costs.
Heavy Maintenance Facility (HMF)	The HMF will be designed and built in three stages. The final phase will become operational in time for the first required overhaul of high-speed rail trainsets.	Capital cost estimate only includes first stage of HMF. Funds may need to be encumbered to construct the second and third stages of the HMF.
Start-up Cost	Passenger operations start-up costs is capitalized in the capital cost estimate.	2018 Baseline (Baseline Rev0) passenger operations startup cost budget was $106 million for the Silicon Valley to Central Valley Line. Merced to Bakersfield service startup cost budget is currently estimated at $40 million.

The ETO Forecast Update does not change any of the findings in the table above.

Schedule Considerations

The 2019 Project Update Report provided the estimated timeline for the completion of the ARRA/FY10 grants scope of work and the future scope of works necessary to meet the scheduled start for Interim Service. The Authority is currently working on refining the program delivery schedule of the Merced to Bakersfield Interim Service. The following Figure 15 shows the Merced to Bakersfield Interim Service delivery timeline as shown in the 2019 Project Update Report.

Figure 15: Merced to Bakersfield Interim Service Projected Timeline



The Authority expects to meet the ARRA/FY10 grants deadline of December 2022 for the attainment of Phase 1 RODs, and completion of the civil works construction packages and installation of tracks on the CVS.

The 2019 Project Update Report critical path schedule for the ARRA/FY10 grants scope is as follows:

- Removal of contractual obstacles and increasing pace of construction of CP1, CP2-3 and CP4 civil works contracts to have substantial completion by late-2021
- Issuance of notice-to-proceed for installation of CVS tracks by mid-2020
- Initiation of procurement and change order activities for the construction of civil works in the CVS (e.g. emergency egress elements, sound walls, trench pump stations, etc.) not currently included in CP1, CP2-3 and CP4 design-build contracts.

Commencement of Merced to Bakersfield Interim Service

Merced to Bakersfield Interim Service is scheduled to commence on December 2028. Separate capital projects to build the Bakersfield and Merced extensions and to deliver high-speed Trainsets need to progress concurrently and as scheduled. The 2019 Project Update Report critical path schedule for the Merced to Bakersfield Interim Service scope is as follows (the Authority is currently updating the program schedule and dates below may change):

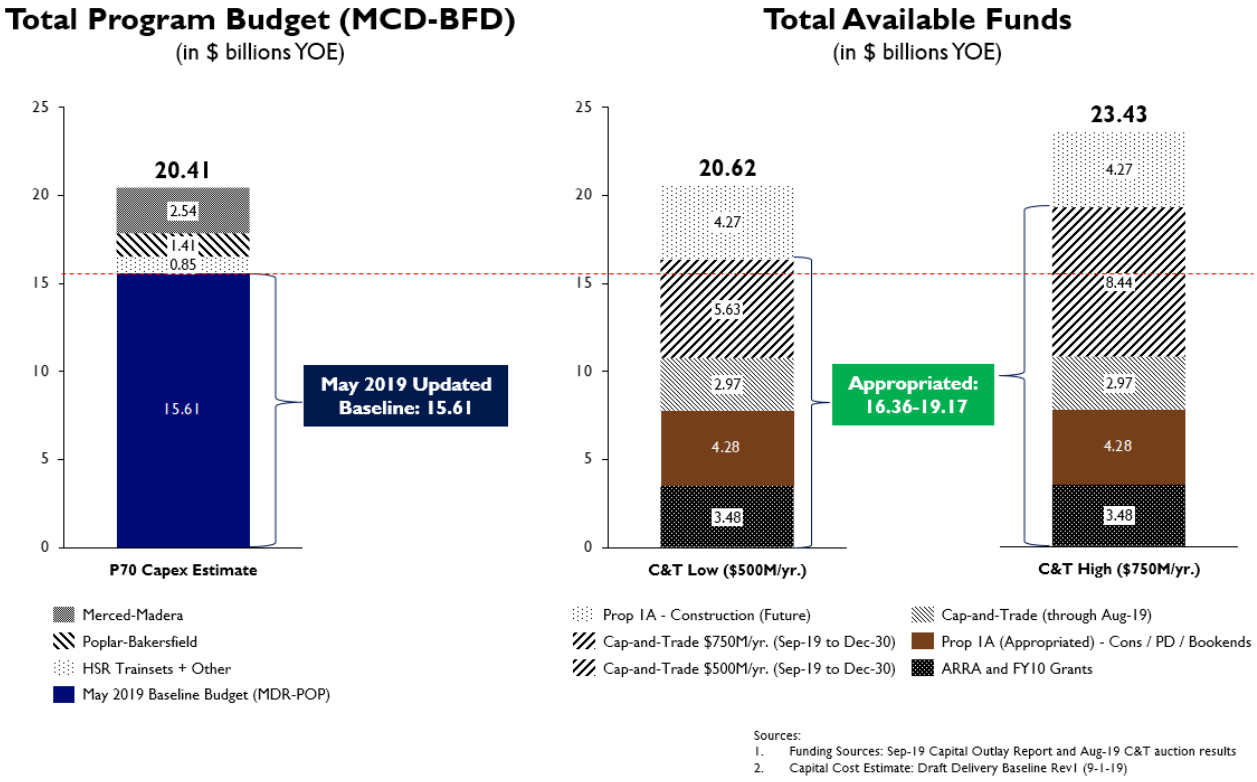
- Completion of ARRA/FY10 grants scope by December 2022
- Initiation of procurement activities for high-speed Trainsets by late-2019
- Initiation of procurement activities for Bakersfield and Merced extensions design-build contract by mid-2020
- Pre-construction activities (e.g. ROW acquisition, third-party agreements, preliminary engineering for procurement, etc.).

Procurement activities for Track and Systems and high-speed Trainsets are scheduled to commence in late 2019, while procurement activities for the Bakersfield and Merced extensions

are scheduled to commence in 2020. These are significant steps for the Authority, with major management and organizational implications, especially given the organizational focus on construction delivery of the ARRA/FY10 grants scope in the CVS. The Authority should assess its institutional capacity to manage these additional significant capital projects.

In addition, the concurrent launch of the above-referenced contracts also has budget and funding implications. The May 2019 Baseline Update Budget of $15.6 billion is fully funded by current appropriated funds of $16.4 billion to $19.2 billion. Depending on the actual Cap-and-Trade revenue, the Authority may require the appropriation of the balance of Proposition 1A funds ($4.2 billion) in order to launch the procurements outside of the May 2019 Baseline Update Budget. See Figure 16 below for more details.

Figure 16: Merced to Bakersfield Interim Service Budget vs. Total Available Funds



Coordinated Rail Services Investments with Regional Partners

As presented in the ETO Study, the Merced to Bakersfield Interim Service schedule will be highly coordinated with both the ACE and San Joaquins rail services. To enable the planned rail connectivity between the three rail services, SJRRC and SJJPA need to extend ACE service to Merced and provide a cross-platform connection between high-speed rail services and San Joaquins service in Merced, respectively.

To date, SJJPA and SJRRC have secured full funding for the Base Valley Rail Project that will extend ACE service from Stockton to Ceres and provide a bus service from Ceres to Merced by

2023[31]. SJJPA and SJRRC are expecting to secure additional Transit and Intercity Rail Capital Program (TIRCP) grant funds and other state sources such as the Public Transportation Account (PTA), Interregional Transportation Improvement Program (ITIP), and State Rail Assistance (SRA) funds in the future for the Expanded Valley Rail Project that will further extend ACE rail service from Ceres to Merced by 2027 in order to connect with the high-speed rail service, and enable increased ACE and San Joaquins service to Merced[32].

The Valley Rail Project scope does not currently include the provision of a cross-platform connection between the San Joaquins service and high-speed rail service at Merced. However, SJJPA, SJRRC, and CalSTA are currently conducting the Merced Intermodal Track Connection (MITC) project study[33] that will provide the connection necessary for the San Joaquins service to directly connect with high-speed rail at Merced. Further, the Base Valley Rail project scope includes the relocation of the San Joaquins Madera station adjacent to the Madera high-speed rail station.

Figure 17: Proposed SJJPA/SJRRC Valley Rail Project

These ancillary capital investments are not included in the Authority's Merced to Bakersfield Interim Service capital cost estimate of $20.4 billion.

[31] SJRRC received $400.0 million in Senate Bill 132 of 2017 funds to extend ACE service from Stockton to Merced. In addition, SJJPA and SJJRC have secured $590.9 million in state, federal and local funds for the Base Valley Rail project, including $504.3 million in TIRCP grant funds in April 2018.

[32] An additional $226.0 million is required for the Expanded Valley Rail project.

[33] SJJPA Board Meeting (November 2019) Agenda Item 9 – Valley Rail: Network Integration Planning https://sjjpa.com/wp-content/uploads/SJJPA_Nov_22_2019_Board-Mtg-Final-.pdf

Conclusions

The Authority's current capital program budget of $15.6 billion budget would require $4.8 billion of incremental scope for the proposed Merced to Bakersfield Interim Service. This includes the purchase six high-speed rail trainsets and the extensions to Bakersfield and Merced.

The Authority has experienced increases to its capital cost estimates in the CVS. Since the design and alignment has not been completed for the extensions to Bakersfield and Merced, there is a risk that the capital cost estimates could rise further. The current P70 estimate for the Merced to Bakersfield Interim Service is $20.4 billion, while the current P90 and P100 estimates are $20.9 billion and $22.1 billion, respectively.

The Authority expects to meet the ARRA/FY10 grants deadline of December 2022 and start Merced to Bakersfield Interim Service by December 2028. By July 2021, the Authority plans to execute contracts for Track and Systems, Trainsets, the Bakersfield extension, and the Merced extension.

The execution of the Track and Systems and Trainsets contracts depend on the completion of and access to the civil works that are under construction in the CVS. To comply with the completion schedule requirements in the grant agreement with FRA on ARRA/FY10 funding, the Authority plans to make non-contiguous segments along the CVS available to the Track and Systems contractor on an agreed-upon schedule. However, at the time of this Study, it is understood that the Authority has not yet negotiated the schedule with the civil contractors.

The launch of the above-referenced contracts also has budget and funding implications. The May 2019 Baseline Budget of $15.6 billion is fully funded with current appropriated funds of $16.3 billion to $19.2 billion. Depending on actual Cap-and-Trade revenues, the Authority may require the appropriation of the balance of Proposition 1A funds ($4.2 billion) in order to launch these additional procurements.

Section D
Funding and Affordability

Based on current estimates, Authority funding sources are sufficient to cover the required capital investments to begin Interim Service. However, the Authority should consider the timing of cash receipts and risks to funding sources.

Background and Approach

The 2019 Project Update Report presented the Authority's total available funding authorized under current law and various grant agreements.

This section discusses each source of funding in detail below. It is important to note that a major component of the funding available to the Authority under current authorization will depend upon the amount of revenue the State generates through the Cap-and-Trade program through its current legislative sunset in 2030. The amount of funding estimated to be available to the Authority is subject to a number of risks, which are further discussed below and in Section F, *Risks*.

Table 17: Program Funding Summary (in millions of $)

Program Funding Summary	Estimated Funding Under Current Authorizations	Total Appropriations Through FY 2018
Federal Funds		
ARRA	2,547	2,547
FY10*	929	929
State Funds		
Proposition 1A	8,550	4,284
Cap-and-Trade (through Dec-2030)**	8,595 to 11,407	8,595 to 11,407
Grand Total	**20,621 to 23,434**	**16,355 to 19,167**

*FY10 funds are included here but pending resolution of a lawsuit challenging the FRA's decision to terminate the FY10 grant agreement.

**Assumes a low of $500 million to a high of $750 million per year.

ARRA and FY10 Grants

The Authority has received approximately $3.48 billion in federal funding commitments to complete environmental review for the 520-mile Phase 1 system and to construct the CVS. The $2.55 billion in ARRA funding is fully expended, and the Authority is currently matching the ARRA funds with state funds. Per the terms of the grant agreement, $929 million of FY10 funds along with $360 million of State matching funds, are scheduled to be the last funding required to complete scope of work subject to the federal grant.

On May 16, 2019, the FRA terminated the FY10 Grant Agreement. In response, the State filed a lawsuit challenging the FRA's decision. In addition, the FRA has stated that it is exploring remedies to reclaim previous ARRA expenditures and to terminate the ARRA grant. A more detailed discussion of this funding risk and the Authority's management and mitigation plan is at the end of this section.

Proposition 1A

The passage of Proposition 1A in 2008 provided $9.0 billion of funds for the California High-Speed Rail Program. Since then, the Authority has secured $4.3 billion of Proposition 1A funding through appropriations for CVS construction, Phase 1 and Phase 2 project development, and bookend investments.

The remaining Proposition 1A funds yet to be appropriated include $4.2 billion for construction. To access the remaining Proposition 1A construction funds, the Authority is required to prepare funding plans and comply fully with the specifications set out in Streets and Highways Code 2704.08(c) and 2704.08(d).

Cap-and-Trade

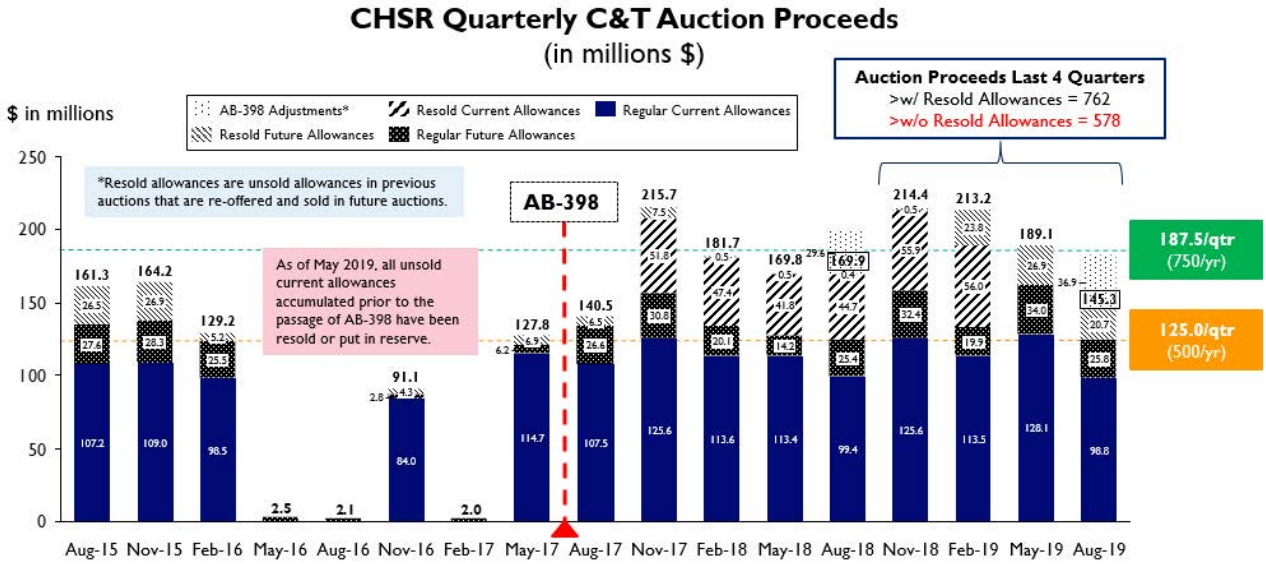
In 2014, the Authority received a pair of one-time allocations of Cap-and-Trade funding totaling $650 million. In addition, the State Legislature provided a continuous appropriation of 25% of annual Cap-and-Trade funds for the high-speed rail program. As of September 2019, the Authority has received $2.97 billion in Cap-and-Trade funds, which includes the initial $650 million appropriation and quarterly funds since August 2015.

For the purposes of capital planning, the Authority estimated a range of potential future Cap-and-Trade revenues. The low end of the range assumes that the Authority would receive $500 million per year and the high end of the range assumes $750 million per year. Since the enactment Chapter 135 of the Statutes of 2017 (AB398), which extended duration of the Cap-and-Trade program to December 2030, Cap-and-Trade revenue has averaged $729 million per year. The last four quarterly auctions have yielded a total of $762 million in proceeds for high-speed rail.

Notwithstanding this higher-than-estimated result, there is expected future volatility in the revenues. Cap-and-Trade auction results in the previous two years include proceeds from the resale of previously unsold allowances preceding the passage of AB398. The amount of unsold allowances will decrease over time because less unsold allowances can be recycled. On the other hand, California's more aggressive 2030 GHG emissions target[34] will result in steeper declines in annual GHG emissions cap starting in 2020, potentially driving up the price of allowances. The Energy Institute at Haas[35] and The Brattle Group[36] base case forecasts of allowance price in 2030 are both above the $50 level. At this price level, the Authority's annual revenues could rise to approximately $1 billion.

As shown in Figure 18 below, the Authority's revenue from the last four quarterly auctions was $762 million and $578 million without the revenue from resold allowances.

Figure 18: Authority Quarterly Cap-and-Trade Auction Proceeds (August 2015 to August 2019)



*AB-398 (California Global Warming Solutions Act of 2006) mandated the suspension of the Fire Prevention Fee and Sales and Use Tax Manufacturing through Dec-30 and Jun-30, respectively. Foregone tax revenues from the suspensions are calculated and deducted from the Greenhouse Gas Reduction Fund (GGRF) at start of every fiscal year.

Future Funding

Currently, there are no other sources of funds available to the Authority. At this time, it appears unlikely that any private financing would be available without significant State-level, or equivalent, guarantees. Any use of private financing at this time would likely include significant and burdensome risk premium placed on the project by investors. This feedback has been provided consistently over time to the Authority by a range of private sector entities and investors. Furthermore, the potential to leverage revenues from Interim Service for funding of this project at this time is likely not because there is not forecast to be a net positive cash flow during this period. The monetization analysis presented in prior business plans assumes that future cash flows are financed once segment (V2V and Phase 1) revenues have been

[34] AB-32 Target: Reduce CA GHG emissions to 1990 levels by 2020; SB-32 Target: Reduce CA GHG emissions to 40% below 1990 levels by 2030.
[35] Borenstein, Severin et al. *California's Cap-and-Trade Market through 2030: A Preliminary Supply/Demand Analysis*. Energy Institute at Haas, 2017.
[36] Yang, Yingxia et al. *The Future of Cap-and-Trade Program in California: Will Low GHG Prices Last Forever?* The Brattle Group, 2017.

demonstrated. Therefore they cannot be applied towards construction of those segments and will not be accessible during the construction phase of the program.

The Authority may wish to explore further State or local level funding sources to bolster its current profile. With the passage of SB1 and large regional measures, there has been a demonstrated appetite within the California tax base to invest in long-term transportation infrastructure. Federal funding may also become available in the future.

As assumed in the 2016 and 2018 Business Plans, the Authority may be able to finance its future Cap-and-Trade revenue in order to accelerate future funding. In the 2016 Business Plan, the Authority estimated that Cap-and-Trade financing could yield a potential range of $3.9 to $11.1 billion in financing, contingent upon enacting the supporting legislation to make the financing investment grade. The three critical elements that the Authority has identified to achieve financing are:

- Non-impairment of appropriations to the Authority
- Extension of the Cap-and-Trade program through 2050
- Minimum guarantee (floor) of Authority Cap-and-Trade annual revenues.

Analysis and Findings

Funding Scenarios

Four funding scenarios were considered in the funding analysis of the Merced to Bakersfield Interim Service. Given the uncertainty around certain funding sources, such as FY10 grant funds, as well as the variability in the amount of Cap-and-Trade revenues, a range of potential outcomes were constructed to illustrate the impact of different levels of funding.

Table 18 shows the different funding sources and level of Cap-and-Trade revenue for these four funding scenarios. In each of these four cases, the Authority is assumed to receive the remaining authorized Proposition 1A funds in a timely manner.

Table 18: Program Funding Scenarios (in millions of $)

FUNDING SCENARIOS	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Case	Base Case at $500M C&T	Base Case at $750M C&T	No FY10 at $500M C&T	No FY10 at $750M C&T
Federal Funds				
ARRA	2,547	2,547	2,547	2,547
FY10	929	929	-	-
State Funds				
Prop 1A	8,550	8,550	8,550	8,550
Cap-and-Trade (through Dec-2030)*	8,595	11,407	8,595	11,407
Grand Total	**20,621**	**23,434**	**19,692**	**22,505**

The Base Case scenarios reflect the same assumptions used in the May 2019 Project Update Report, updated to reflect the total amount of Cap-and-Trade revenues received through July 2019. The other two scenarios present the level of funding if FY10 funds are successfully de-

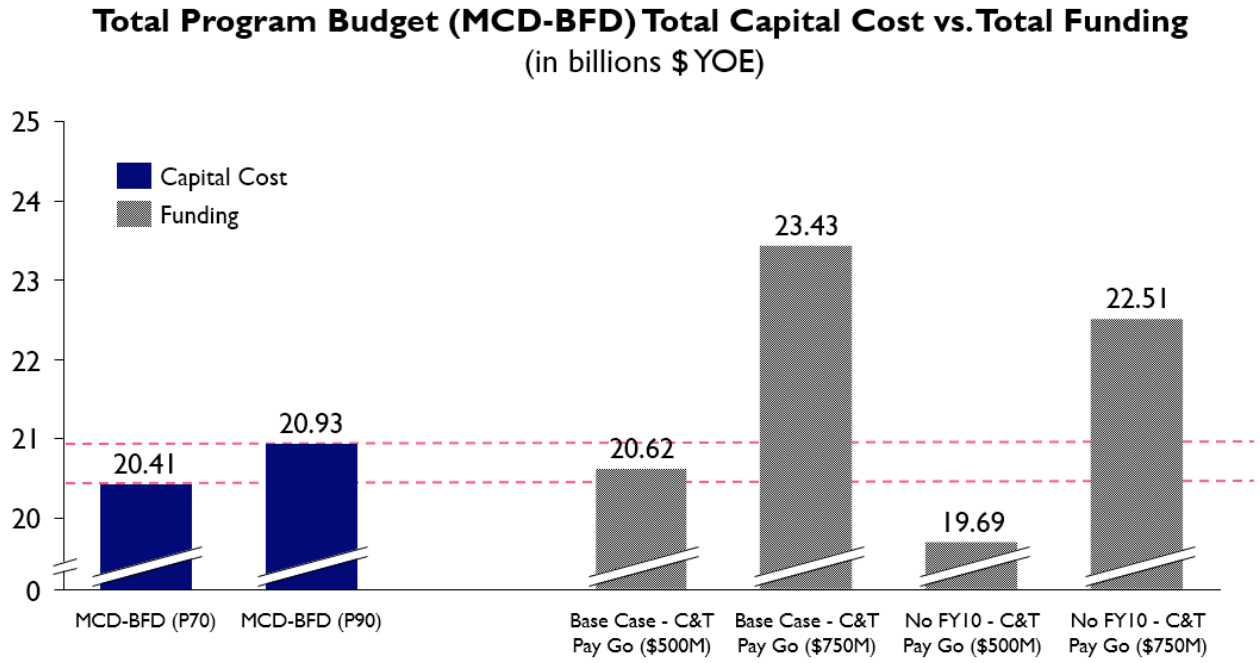
obligated by the FRA. This results in a range of estimated total funding potential outcomes for these four scenarios from $19.7 billion to $23.4 billion.

Affordability Analysis

The current P70 capital cost estimate of Merced to Bakersfield is fully funded in three of the four funding scenarios (Scenario 1, Scenario 2 and Scenario 4). In the event the FY10 grant is no longer available to the Authority, it must receive $564 million of annual Cap-and-Trade revenues from September 2019 to December 2030 for the current capital cost estimates to be affordable.

The current P90 capital cost estimate can only be funded in two of the four funding scenarios (Scenario 2 and Scenario 4). If the Authority retains the FY10 grant funds, the Authority must receive at least $527 million of annual Cap-and-Trade revenues from September 2019 to December 2030 to fund current P90 estimated capital costs. If the FY10 funds are not available, the amount of annual Cap-and-Trade revenue would need to increase to at least $610 million from September 2019 to December 2030 to fund the current capital costs at P90 levels. Figure 19 summarizes the results of the analysis.

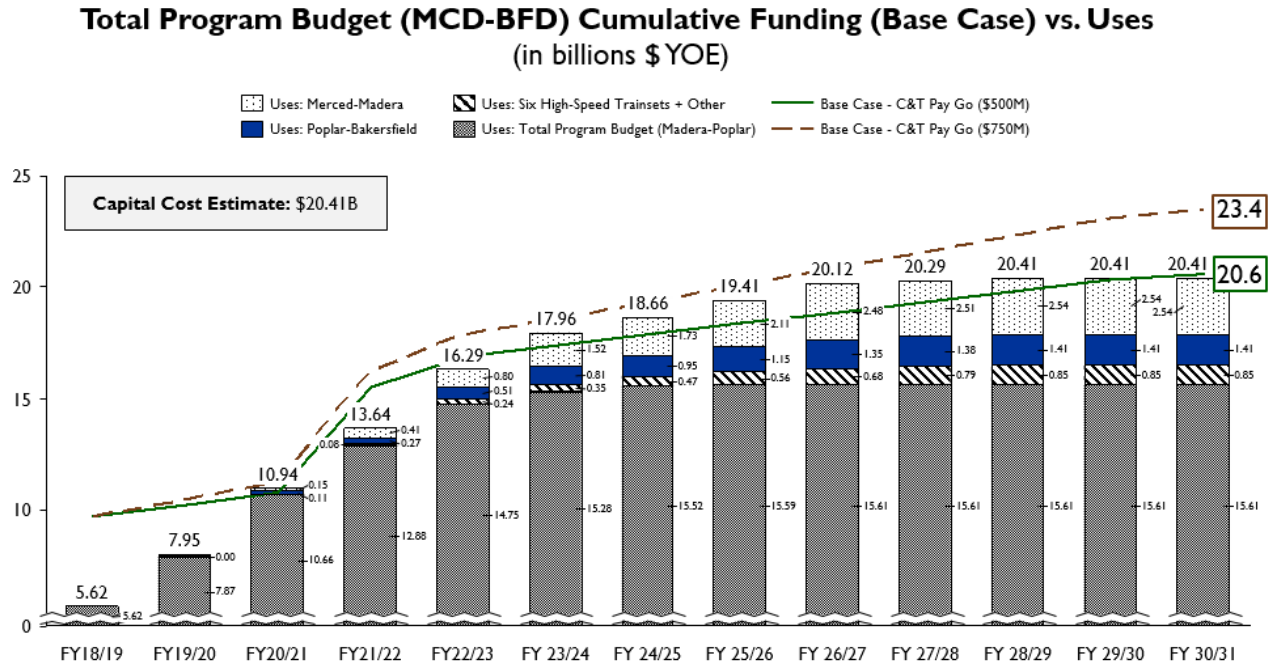
Figure 19: Merced to Bakersfield Capital Cost Range and Funding Scenarios



An affordability analysis was also conducted on an annualized basis to compare the total estimated annual capital costs with the estimated annual funding sources. The purpose of this analysis is to determine, based on the assumptions of each scenario, whether funding deficits are anticipated on a year-to-year basis.

The following Figure 20 compares the current P70 capital cost estimate against Scenarios 1 and 2. This analysis illustrates that while both funding scenarios are sufficient to cover the current estimated capital cost, Scenario 1 is forecast to experience cash flow deficits starting in FY 2023-24 through December 2030.

Figure 20: Merced to Bakersfield Annual Cumulative Funding and Capital Cost – Scenarios 1 and 2



Notes:

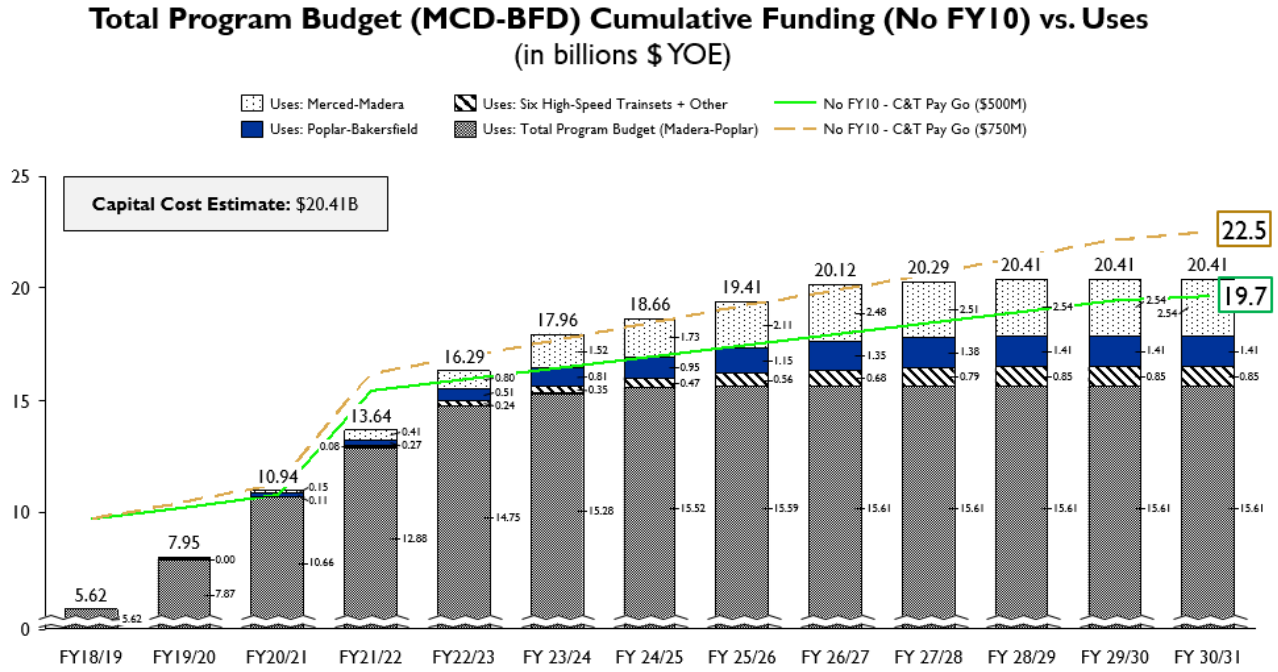
1. Total Program Budget (MCD-BFD) scope includes all ARRA Grant and CVS Funding Plan commitments, Poplar to Bakersfield and Merced to Madera construction and six high-speed trainsets.
2. Assumes Future Proposition 1A funds [FY20-21 ($4.2 billion)].

Sources:

1. Funding Sources: Jul-19 Capital Outlay Report and Jul-19 C&T auction results
2. Capital Cost Estimate: Draft Delivery Baseline Rev1 (6-10-19)

The following Figure 21 compares the current P70 capital cost estimate against the No FY10 funding scenarios. This analysis illustrates that while the Scenario 4 can cover the current estimated capital cost, it is forecasted to have cash flow deficits starting in FY 2023-24 through FY 2026-27. Scenario 3 is forecast to experience funding shortfalls in FY 2022-23 and is not forecast to recover those deficits into the future.

Figure 21: Merced to Bakersfield Annual Cumulative Funding and Capital Cost – Scenarios 3 and 4



Notes:

1. Total Program Budget (MCD-BFD) scope includes all ARRA Grant and CVS Funding Plan commitments, Poplar to Bakersfield and Merced to Madera construction and six high-speed trainsets.
2. Assumes Future Proposition 1A funds [FY20-21 ($4.2 billion)].

Sources:

1. Funding Sources: Jul-19 Capital Outlay Report and Jul-19 C&T auction results
2. Capital Cost Estimate: Draft Delivery Baseline Rev1 (6-10-19)

Summary

From an annual cumulative funding and capital cost point-of-view, only Scenario 2 has sufficient annual funding to cover the current P70 capital cost and schedule without an annual cash flow deficit. The other funding scenarios require funds to be advanced to cover capital cost requirements in certain periods. It should be noted that the Authority has engaged in discussions with Department of Finance and is about to secure solutions for covering short-term cash shortfalls. Table 19 below summarizes the results of the analysis.

Table 19: Merced to Bakersfield Affordability Analysis Summary

Funding Scenario	Scenario 1 [Base Case at $500M/yr. C&T]	Scenario 2 [Base Case at $750M/yr. C&T]	Scenario 3 [No FY10 at $500M/yr. C&T]	Scenario 4 [No FY10 at $750M/yr. C&T]
Fully Funds Estimated P70 Capital Cost	Yes	Yes	No	Yes
Fully Funds Estimated P70 Capital Cost in each Period	No	Yes	No	No
Overall Estimated Affordability	No	Yes	No	No

Conclusions

The capital cost to extend the CVS to Merced and Bakersfield is fully funded under the base case scenario based on current estimated future capital costs.

The southern extension to Bakersfield is currently estimated to cost $1.4 billion. The extension to Merced has a current estimated cost of $2.5 billion. The purchase of six high-speed rail trainsets and additional program management cost is currently estimated to be $900 million. As such, the estimated total capital costs for high-speed service between Merced and Bakersfield are $20.4 billion[37]. The Authority currently estimates its available funding range to be $20.6 billion to $23.4 billion through 2030 as discussed in the 2019 Project Update Report.

[37] All figures are YOE dollars.

Section E
Socio-economic Benefits and Financial Analysis

Interim Service is forecast to bring immediate positive benefits to the State through job creation, additional economic impacts, improved travel times and connectivity for passengers in the Central Valley and Northern California.

Background and Approach

There are projected short-term and long-term socio-economic benefits from the proposed Merced to Bakersfield Interim Service. In the short term, capital expenditures to build the project generate additional employment, labor income and economic output. In the long term, the enhanced passenger rail service provides travel time, safety, road congestion relief, and GHG emissions reductions benefits. Furthermore, there is also potential financial benefit from the anticipated additional cash flow from operations induced by the incremental capital investment from the addition of Merced to the planned V2V IOS presented in the Authority's 2018 Business Plan.

Benefits from Capital Cost Investment Expenditures

The Authority conducted quantitative and qualitative analysis of the short-term benefits of the Merced to Bakersfield Interim Service. The Authority's analysis measured the forecast amount of additional employment, labor income and economic output that will be generated by the proposed project investments. Furthermore, the Authority also provided a range of the estimated program investments that will be paid to small businesses. Lastly, the analysis explored the relative economic impact of capital cost expenditures in the different regions of California based on the proportion of disadvantaged communities and total size of the regional economy.

The methodology used for this analysis is similar to previous economic impact analyses produced by the Authority. In the past, the methodology has been validated by a number of industry experts both within and outside of government and the November 2018 California State Auditor Report found the Authority's methodology to be consistent with industry standards.

Benefits from Enhanced Passenger Rail Operations

To supplement the economic impact analysis conducted by the Authority on the Merced to Bakersfield Interim Service, KPMG also analyzed potential long-term benefits and impacts

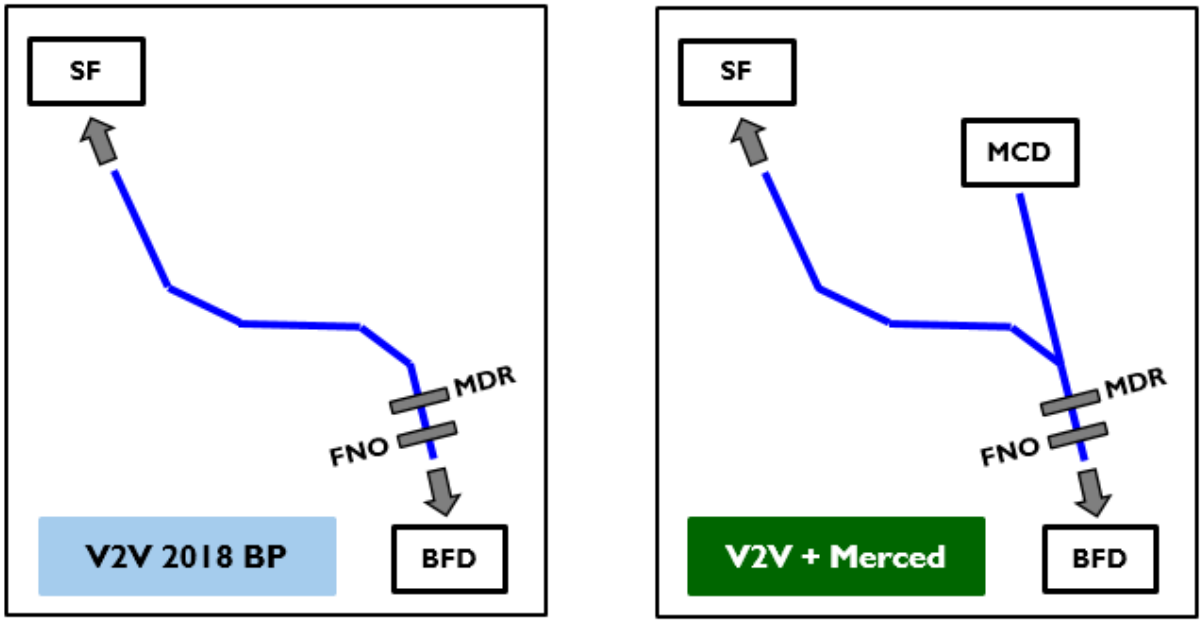
associated with future high-speed rail operations, such as travel time savings and increased safety benefits. The study also identifies road congestion relief and GHG emissions reduction as potential benefits and provides a recommendation on possible future economic impact studies the Authority can conduct.

Benefits from Incremental Cash Flow from Operations of the IOS including Merced

In addition, this Study conducted a return on investment analysis on the incremental value of adding the Merced extension to the existing V2V IOS scenario presented in the Authority's 2018 Business Plan. This analysis considered whether the anticipated net (revenues less operating expenditures) cash flow from the V2V with Merced system would over a defined period offset the capital expenditures needed to deliver the incremental high-speed rail infrastructure. This newly developed financial analysis did not consider the Merced Extension as a standalone interim operating segment, but rather as an extension to the Authority's IOS presented in the 2018 Business Plan.

In conducting the analysis, a discounted cash flow methodology was employed. Discounted cash flow is a valuation method used to estimate the value of future net revenues, enabling a comparison with the overall investment cost needed to deliver the required infrastructure.

Figure 22: Map of Valley to Valley Line in the 2018 Business Plan and Valley to Valley + Merced



Data for this new financial analysis was provided by the ETO using the Authority's Business Plan ridership and O&M cost models. As planning for the 2020 Business Plan is currently in progress, the last Authority-approved assumptions from the 2018 Business Plan assumptions were used for the analysis (see Table 20: Ridership and O&M Cost Model Assumptions).

Table 20: Ridership and O&M Cost Model Assumptions

Key Feature	2018 BP Valley to Valley	V2V + Merced (2018 BP Models)
Monetization Start Year	2033	2033
HSR Fares	See Authority's 2018 Business Plan Ridership Model Memo	Matches 2018 BP
Ancillary Revenues	4.00% of Farebox Revenues	Matches 2018 BP
Stations	San Francisco, San Jose, Gilroy, Madera, Fresno, Kings/Tulare, and Bakersfield	San Francisco, San Jose, Gilroy, Merced, Madera, Fresno, Kings/Tulare, and Bakersfield
Wye Leg Buildout	None	Partial Wye Alignment
HSR Service Patterns	San Francisco to Bakersfield	San Francisco to Bakersfield
		Merced to Bakersfield
Trains per Day	44 One-Way Runs per Day across one service pattern	74 One-Way Runs per Day across two service patterns
Feeder Bus Routes	Sacramento and Los Angeles routes. Sacramento bus connection at Madera	Matches 2018 BP. Difference: Sacramento bus connection at Merced
Bus / Train Transfer Time	15 minutes	Matches 2018 BP
Fleet Size	16	19
Maintenance Facilities	1 Heavy Maintenance Facility	1 Heavy Maintenance Facility
	1 Light Maintenance Facility	1 Light Maintenance Facility
	2 Maintenance of Way Facilities	2 Maintenance of Way Facilities

Analysis and Findings

Benefits from Capital Cost Investment Expenditures

Per the Authority's economic impact study, in the short term, capital expenditures to build the project generate additional employment, labor income and economic output. A significant portion of these benefits are accrued by small businesses and disadvantaged communities in California.

Employment, Labor Income and Economic Output

The Authority's May 2019 Baseline Update Budget commits $15.6 billion to deliver the CVS, Phase 1 ROD, and Bookends/Early Investments commitments in Northern and Southern California. Upon completion, these investments are estimated to result in a total of almost 160,000 job-years of employment[38] and generate $28.7 billion in total economic activity. See Table 21 for detail.

Table 21: May 2019 Baseline Update Economic Impacts[39]

Impact Area	Employment	Labor Income (in millions of $)	Economic Output (in millions of $)
Direct	**76,800**	**5,700**	**14,200**
Indirect	**35,600**	**2,500**	**7,100**
Induced	**45,400**	**2,500**	**7,400**
Sub-Total – May 2019 Baseline	**157,800**	**10,700**	**28,700**

In order to deliver Merced to Bakersfield Interim Service, the Authority needs to commit $4.8 billion of additional budget for six high-speed trainsets, the Merced extension, and the Bakersfield extension. These incremental investments are estimated to support an additional 45,000 job-years of employment and generate $9.2 billion in total economic activity. See Table 22 for further detail.

[38] A job-year is a measure of standardized labor usage. For example, five job-years equates to one full-time employee working for five years, five full-time employees working for one year or ten half-time employees working for one year.

[39] Note: totals may not sum due to rounding.

Table 22: Incremental Merced to Bakersfield Interim Service Economic Impacts[40]

Impact Area	Employment	Labor Income (in millions of $)	Economic Output (in millions of $)
Direct	**21,900**	**1,500**	**4,600**
Indirect	**10,800**	**800**	**2,400**
Induced	**12,700**	**700**	**2,100**
Sub-Total – Incremental	**45,400**	**3,000**	**9,200**
Total (May 2019 Baseline + M-B Incremental)	**203,000**	**13,700**	**37,900**

Small Business Participation

The Authority has committed that small businesses will play a major role in building high-speed rail. Through December 2018, more than 20% of expended dollars have gone to Certified Small Businesses, Disadvantaged Business Enterprises, Disabled Veteran Business Enterprises, and Minority-Owned Businesses in California.

Going forward, contractors have a target allocation to small businesses of 30%. Based on the forecast expenditure described above, and the proportion of that expenditure that will likely be spent on contracts with small business requirements, an estimated $2.4 billion to $3.4 billion will go to small businesses in California under the May 2019 Baseline Update Budget, and $800 million to $1.1 billion from the additional expenditure to deliver the full Merced to Bakersfield Interim Service. In total, an estimated $3.2 billion to $4.5 billion of project expenditure will be allocated to California small businesses.

[40] Note: totals may not sum due to rounding.

Table 23: Range of Estimated Program Investment Paid to Small Businesses by Certification[41] (in millions of $)

Key Area	Small Business	Disadvantaged Business Enterprise	Disabled Veteran Business Enterprise	Minority-owned Business	Total
May 2019 Baseline Update Budget	**440 to 620**	**1,140 to 1,610**	**450 to 640**	**370 to 530**	**2,400 to 3,400**
Incremental Merced to Bakersfield Interim Service	**150 to 200**	**380 to 520**	**150 to 210**	**120 to 170**	**800 to 1,100**
Total	**590 to 820**	**1,520 to 2,130**	**600 to 850**	**490 to 700**	**3,200 to 4,500**

The ranges and allocations across small business certification types reflected in the table above are based on demonstrated historical small business expenditure patterns. The low end of the range reflects the historical small business expenditure percentage of 21% and the high end of the range is based on the current contract target of 30%. These percentages are applied to the likely net amount of forecast expenditure on eligible contracts, which excludes spending on categories such as right-of-way acquisition, third-party agreements, payments related to third-party agreements, Trainset acquisitions, and others.

Investments in Disadvantaged Communities

While over half of the Central Valley's population resides in a Disadvantaged Community Census Tract[42], only 29% of the Southern California population and just 6% of the Bay Area population live in Disadvantaged Communities. As such, investment in the Central Valley is far more likely to benefit California's Disadvantaged Communities relative to investments in other regions.

Further, given the size of the Central Valley economy relative to the economies of the Bay Area and Southern California, an investment in the Central Valley region has almost three times as much relative impact than an investment in the Bay Area region, and approximately six times the impact relative to the Southern California region.

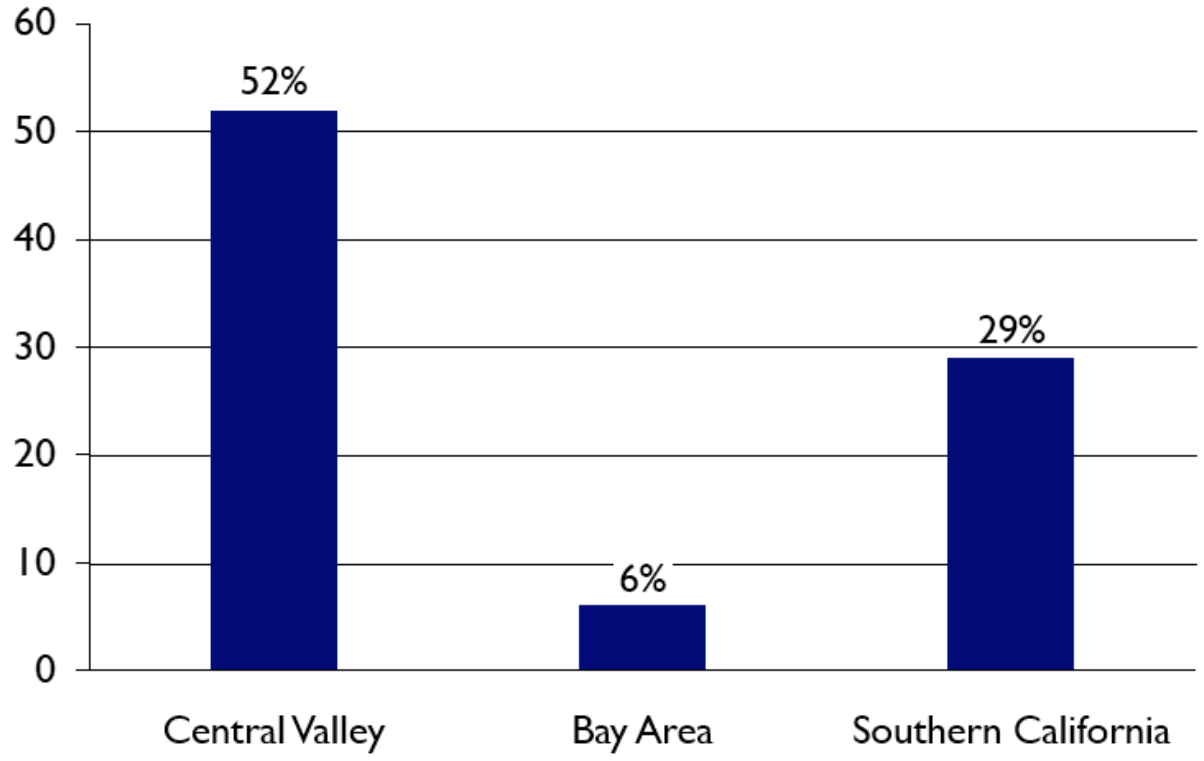
The Authority's decision to build the program's first construction segment in the Central Valley included a consideration of positive economic impact in the region. Committing additional funding for the incremental investments required to extend the first construction segment north to Merced and South to Bakersfield further emphasizes the Authority's commitment to

[41] Note: totals may not sum due to rounding.

[42] "Disadvantaged communities" are defined as the top 25% scoring areas from CalEPA's CalEnviroScreen 3.0 screening tool which is used to help identify communities disproportionally burdened by multiple sources of pollution and with population characteristics that make them more sensitive to pollution. https://oehha.ca.gov/calenviroscreen/sb535

invest in the region with the highest percentage of its population in Disadvantaged Communities.

Figure 23: Percentage of Populations in Disadvantaged Communities (DAC)



Benefits from Enhanced Passenger Rail Operations

The Authority's economic benefits discussed above reflect those resulting strictly from historical and forecast capital investment expenditure. This discussion below analyzes the potential long-term benefits and impacts associated with future high-speed rail operations, such as travel time savings and increased safety benefits. It briefly discusses road congestion relief and GHG reduction benefits and provides a recommendation on possible future economic impact studies the Authority can conduct.

Regional Connectivity in the Central Valley

The high-speed rail program in California is envisioned to be the key link of passenger rail services in the State. As construction comes to a completion in the Central Valley, the Authority has an opportunity to bring intermediate benefits to the State by allowing regional services on its alignment. Beginning Interim Service would alleviate the State's reliance on infrastructure of freight railroads by providing a 171-mile segment dedicated to passenger rail service. As discussed in Section B, *Operational Considerations*, the ETO Study estimates that ridership on passenger rail services in the Central Valley will grow significantly in 2026 from 2017 levels.

First High-Speed Rail System in the Nation

Interim Service will also allow the testing, commissioning, and operations of the first Tier III high-speed rail system in the country. The Authority identified the CVS as its "test track" since

the 2012 Revision Business, in which it would utilize the completed CVS for testing and commissioning. This plan, and associated costs, are part of the Authority's Business Plans for the IOS. Interim Service would allow the Authority to undertake the testing and commissioning process now to reduce the cost and time required for subsequent segments of the system.

The demonstration impact is another potential benefit of Interim Service. It is not easily quantifiable but is largely recognized by transportation experts. In the Authority's Business Plans since 2012, the Authority had forecasted a four-year time horizon required for ramp-up of service. The ramp-up period factors in the time required for passengers to shift from one mode (cars) to passenger rail and also for economic activity resulting from the enhanced connectivity to develop along the corridor. Interim Service may accelerate the mode shift and economic activity along the corridor, allow the operator to develop experience in high-speed rail operations in California, and ultimately reduce the ramp-up period when the IOS is complete and operational.

Travel Time Savings Benefit

The Authority is scheduled to start providing high-speed rail passenger service between Merced and Bakersfield in December 2028. Apart from the terminal stations in Merced and Bakersfield, there will be additional stations on the line located at Madera, Fresno and Kings/Tulare. These cities have completed or are in the process of developing station area plans to create vibrant, livable districts around the future high-speed rail stations. The Authority envisions that improved inter-city connections, faster travel times, and higher service frequency will foster economic revitalization, affordable housing and workforce development in the Central Valley.

The implementation of the Merced to Bakersfield Interim Service will reduce travel times in comparison to the existing conventional passenger rail service in the Central Valley. Currently, rail passengers travelling from Merced to Bakersfield using the San Joaquins service experience a scheduled trip of, 3 hours and 9 minutes, subject to on-time service. In comparison, a passenger travelling from Merced to Bakersfield using high-speed rail will be anticipated to cut travel time in half, with a scheduled trip of 1 hour and 21 minutes. See Table 24 for detail.

Table 24: Merced to Bakersfield Indicative Travel Times – HSR vs. San Joaquins (in minutes)[43]

Station	San Joaquins	High-speed rail	Variance
Merced	0	0	**0**
Madera	28	17	**-11**
Fresno	32	15	**-17**
Kings/Tulare	35	17	**-18**
Bakersfield	94	32	**-62**
Total	**189**	**81**	**-108**

The reduction in travel time between Merced and Bakersfield, in conjunction with the planned enhancements in rail connectivity with ACE and San Joaquins service north of Merced to San Jose, Oakland, and Sacramento, is anticipated to provide Central Valley residents with greater access to additional job markets and economic opportunities in Northern California.

However, it should also be noted that the travel time savings presented above are indicative. High-speed rail stations in the Central Valley will not be in identical locations with the current San Joaquins stations. While San Joaquins currently has three stations between Fresno and Bakersfield (Hanford, Corcoran, and Wasco), high-speed rail will only have one station between Fresno and Bakersfield located in Hanford. Further, for trips going north of Merced towards San Jose, Oakland, or Sacramento, additional travel time should be incorporated to take into account the required transfer from high-speed rail train to an ACE/San Joaquins train at the Merced station.

Safety Benefits

Passenger rail is considered to be one of the safest transportation modes available with only 800 related deaths in 2015 compared to 35,000 deaths on U.S. highways according to the United States Department of Transportation. By implementing advanced safety technology, the Authority anticipates creating a system that significantly decreases safety risks. In addition, high-speed rail anticipates avoiding most rail related deaths due to trespassing and collisions at grade-crossings through various mitigation efforts, including Positive Train Control (PTC), grade separations, intrusion protection barriers and quad gates.

PTC is a high-speed rail system safety mechanism that will prevent train-to-train collisions and over-speed derailments. PTC is capable of taking over and preventing the train from running red signaling lights or moving at unsafe speeds in cases where the train engineer doesn't respond to motion detection or speed warnings. An Early Earthquake Detection System is also being adopted by the Authority in order to detect the initial wave from seismic events and instantly cut power to operating trains to mitigate safety risks.

[43] Central Valley HSR Ridership and Revenue Estimates – Additional Scenarios and Summaries, Steer, November 16, 2018.

Through partnership with local municipalities, the Authority plans to implement grade separation projects throughout the entire high-speed rail alignment. A grade separation is a roadway that is re-aligned over or under a railway to eliminate hazards. Benefits of grade separations include:

- Improved safety
- Reduced noise (no train horns)
- Decrease in traffic congestion
- Reduction in GHG emissions from idling vehicles
- Improved train operations reliability

In the Central Valley, where trains will be capable of running at speeds in excess of 200 miles per hour, the high-speed rail system is being built fully grade separated. As part of this effort, 55 existing grade crossings with existing freight service will be eliminated. Within the first three construction packages, stretching approximately 119 miles from Madera to Poplar Avenue (north of Bakersfield), there will be 39 BNSF Railway at-grade crossings eliminated and 16 existing Union Pacific Railroad crossings eliminated. The Amtrak San Joaquins service runs on the BNSF railroad and is not fully grade separated. The California Public Utilities Commission's (CPUC) FY 2015-16 Grade Separation Priority List established priorities for the allocation of state funds to crossing projects that most need grade separation in order to reduce hazard. This list includes six grade separation projects along the BNSF railroad between Merced and Bakersfield. As shown in the table below, these at-grade crossing locations have resulted in 27 total accidents.

Table 25: Grade Crossings in CPUC FY15-16 Priority List in BNSF Merced–Bakersfield Alignment

Priority #	Agency	Crossing Location	Accident History
18	Madera County Road Department	Avenue 12	6
28	City of Shafter	Lerdo Highway	3
34	City of Bakersfield	Kratzmeyer Road	9
38	City of Bakersfield	Baker St-E. Truxtun Ave.	3
50	County of Kern	Reina Road Renfro Road Jenkins Road	6
52	Madera County Road Department	Avenue 9	0
Total			**27**

With the Authority working on construction of a fully grade separated passenger rail corridor, it is anticipated that accidents will be reduced, and existing freight rail operations will improve. This will cause major improvements to both urban and rural areas in the Central Valley. For example, this may result in additional access to adjacent communities and significantly improve safety along the alignment. As cars will no longer idle at rail crossings, local air quality is anticipated to improve and GHG emissions would be reduced.

Road Congestion Relief and GHG Emissions Reduction

In addition to travel time savings and safety benefits, the implementation of the Merced to Bakersfield interim service will likely result in road congestion relief and GHG emissions reduction benefits. Both benefits are a function of the amount of people that will be induced to switch from their current mode of transportation (e.g. automobile and conventional rail) to high-speed rail.

This Study scope does not include the analysis of these benefits. This analysis will be incorporated into the ETO Side by Side Analysis (focused on comparing the Southern California, Central Valley, and Northern California corridors) for the quantification analysis of road congestion relief and GHG emissions reduction benefits of the Merced to Bakersfield Interim Service.

Benefits from Incremental Cash Flow from Operations of IOS including Merced

From a financial and return on investment perspective, when considered as a part of the V2V system, the Merced Extension is projected to result in positive incremental monetization.

Similar to the methodology employed in the Authority's prior business plans, this financial analysis considered the value of incremental future net cash flows generated during operations relative to overall investment/capital cost needed to deliver the required infrastructure. These cash flows run from 2033 to an end date of 2060. The analysis assumed that cash flows are discounted at the current 30-year State of California General Obligation Bond interest rate[44] of 2.24% (Base) and 3.24% (Base + 100bps) as a sensitivity. The values illustrate the State's prevailing cost of capital (discount rate).

The incremental capital cost of the inclusion of Merced in V2V is $1,957 million (YOE $). Table 26 (Merced Extension Incremental Capital Cost Over Valley to Valley) show the incremental capital cost breakdown.

Table 26: Merced Extension Incremental Capital Cost Over Valley to Valley (in millions of $)

Segment	V2V + Merced
Merced Extension	1,667[45]
Additional Three High-Speed Rail Trains to Enable Merced Service	290
TOTAL	**1,957**

As presented in the following table, the discounted cash flow analysis estimates that the addition of Merced to V2V generates $2.5 billion to $2.9 billion of additional net cash flows. This reflects additional net cash flows above the estimates for V2V presented in the 2018 Business Plan, discounted to 2033 (assumed cash flow monetization start year). After taking into account the $2.0 billion incremental capital cost of the Merced Extension, overall return on investment through 2060 could range from $0.5 billion to $0.9 billion.

[44] As of August 31, 2019. Thomson Reuters Municipal Market Monitor.
[45] Draft Baseline Revision 1

Table 27: Discounted Cash Flows Analysis for Merced Extension (in $ millions)

Cash Flow	V2V + Merced (2018 BP Models)		
Discount Rate	**Nominal**	**2.24%**	**3.24%**
Incremental Net Cash Flows over V2V (NPV to 2033)	4,014	2,858	2,486
Incremental Capital Cost	1,957	1,957	1,957
Net Cash Flows Less Capital Cost	2,057	901	529

It is important to note that these results are contingent on the Authority's prevailing cost of capital (discount rate). In addition, this analysis does not take into account the potential opportunity cost of foregone cash flows by extending the system to Merced prior to the completion of the V2V system. Such a decision could impact the delivery schedule and funding available for other planned segments of the high-speed rail system.

Furthermore, the Authority has not stated in the past that operational costs would be sufficient to repay the capital investments that they depend on. The timeline to see a positive return on capital investments for high-speed rail infrastructure is much longer than typical commercial investments. This analysis simply illustrates that the incremental cash flows are forecast to generate value for the incremental capital cost of building the extension to downtown Merced.

Conclusions

Successful implementation of Merced to Bakersfield as part of the IOS is expected to have a substantial positive effect on the California economy, especially in disadvantaged communities in the Central Valley. In the short term, nearly 205,000 job-years of employment and $37.9 billion in total economic activity is projected to be generated, of which a significant portion will potentially be allocated to California small businesses.

Completion and certification of the high-speed rail infrastructure in the Central Valley will be the first of its kind in the nation and create the initial segment for future high-speed rail operations. The experience of certification will likely allow the Authority to reduce the time and cost required to test and certify new segments of the system. Interim Service could also reduce the time for ramp-up for operations on the Authority's IOS.

In the long run, once high-speed rail passenger service commences, commuters can expect travel time from Merced to Bakersfield to be cut in half. The reduction in travel time between Merced and Bakersfield, in conjunction with the planned enhancements in rail connectivity with ACE and San Joaquins service north of Merced to San Jose, Oakland, and Sacramento, is anticipated to provide Central Valley residents with greater access to additional job markets and economic opportunities in Northern California. The Merced to Bakersfield Interim Service will

also improve safety, reduce noise, mitigate road congestion, and provide GHG emissions reduction benefits.

Further, the analysis suggests there may be potential for a moderately positive incremental financial value (through 2060) to the proposed downtown Merced Extension to the existing V2V IOS scenario presented in the Authority's 2018 Business Plan. The anticipated cash flows from the V2V with Merced system (revenues less operating expenditures) would potentially offset the capital expenditures needed to deliver the incremental high-speed rail infrastructure. Given the provisional nature of the associated ridership analysis and sensitivity to discount rate, we conclude at this stage that the strictly financial case for including Merced in the IOS, albeit ignoring the other socio-economic factors discussed here, is broadly neutral.

Possible Future Economic Impact Studies

The most recent socio-economic benefit-cost analysis (BCA) of the high-speed rail system was in the 2012 Business Plan. In order to develop a more comprehensive, quantitative analysis of the Program's return on investment of Merced to Bakersfield Interim Service, the Silicon Valley to Central Valley Line and Phase 1 Service, the Authority could conduct an updated BCA. The BCA framework is designed to identify and quantify the monetary value of the various benefits of an infrastructure investment and compare the value of these benefits over time to total project capital costs and ongoing operating and maintenance costs. The economic benefits that were analyzed in the 2012 Business Plan BCA included the following:

- Travel Time Savings;
- Reliability Benefits;
- Reductions in Vehicle Operating Costs;
- Reductions in the Economic Cost of Oil Imports;
- Productivity Benefits;
- Reduction in Parking Infrastructure Needs;
- Airline Operator Savings;
- Airline Fuel Savings;
- Reductions in Air Passenger Delay;
- Accident Cost Savings;
- Reductions in Auto, Truck and Aviation GHG Emissions; and
- Reductions in Auto Noise Pollution.

An update to the previous BCA would result in several additional objective and quantitative metrics to demonstrate the value of investment in high-speed rail, including the net present value (NPV), benefit-cost ratio (BCR), return on investment, payback period, and internal rate of return.

Section F
Risks

Interim Service includes risks associated with delivery of the high-speed rail infrastructure and third-party risk associated with operations.

Overview

The early identification of risk and its management are the keys to building mitigation strategies into the process of delivery. Each section of this study details the risks that are pertinent to that specific area. In this section, those discussions are synthesized to gain a project-wide perspective. This section focuses on risks that are presented in this Study for the Authority and Board to consider as various decision points arise.

Risks

Risks associated with the delivery of the Merced to Bakersfield alignment fall into two major categories:

1. **Capital Program Risks** are risks associated with the high-speed rail capital program, including the delivery of high-speed rail infrastructure and assets. This is comprised of Merced-Bakersfield, bookend projects, and system-wide planning that represent a $20.4 billion capital program.
2. **Interim Service Risks** are risks associated with implementing the operational aspects of Interim Service. These can take the form of Authority risks, shared risks or risks owned by other third parties or other public sector agencies. Various parties will need to enter into commercial agreements with the Authority for the provision of infrastructure to support Interim Service. In addition, those Third Parties will be responsible for delivering any remaining infrastructure to meet the operating plan, such as the Valley Rail Project.

Capital Program Risks exist regardless of whether Interim Service is implemented. Interim Service Risks are specifically associated with implementation of Interim Service replacing existing San Joaquin service between Bakersfield and Merced.

Capital Program Risks

Overall, the risks of achieving completing the capital program to start Interim Service (i.e. delivering a $20 billion mega-project on time and on budget over an almost 10-year time period) outweigh the commercial risks associated with operating Interim Service. Mega-projects often suffer from cost overruns and delays, and this program has already experienced significant impacts (see Section C*, Capital Cost and Schedule*). The primary mitigation against such cost overruns would be to proactively manage interfaces (particularly on timing), delay future segments, secure additional funding and includes de-scoping.

As contemplated, the Merced to Bakersfield project introduces some new project challenges beyond the existing civil work on the first segment. These challenges include new civil works contracts (both north and south of the CVS), which must aim to avoid the issues encountered

in previous contracts, which must aim to avoid the issues encountered on the CVS, and secondly the introduction of incremental layers of interface risk among the eventual Track and System contractor, Trainset contractor, the Operator, the Authority and existing and future civil works contractors.

Track and Systems

The Track and Systems contractor is envisioned to be the key long-term contractor of the Authority over a period of 40 or more years and will be responsible for ensuring the entire high-speed rail system (excluding Trainsets) is available to the operator. As a result, it will be the most important contract to the Authority and includes a significant amount of risk transfer, including interface risk with other contractors and additional scope of future segments. Capital costs associated with it may amount to as much as $3.7 billion for V2V depending on the number of segments completed and associated price inflation.

The execution of this contract will also represent a significant overall change in program risk and will increase the Authority's challenge in managing the interfaces between its parallel major contracts because all three layers of contracts—civil works, Track and Systems, and Trainsets—will need to be very tightly managed and coordinated[46]. The contract is described in more detail in Section A, *Commercial and Business Model.*

The fundamental risk associated with the delivery of the Track and Systems contract is the layer of contractual interface risk with other contractors. One example of this is the requirement—driven in part by the constraint to meet the ARRA grant deadline—to start Track and Systems work before the civil contractors have achieved substantial completion on the CVS. The Authority plans to renegotiate the existing design-build contracts to allow for early handover and shared access of completed work in non-contiguous five-mile segments. The potential for cost escalation associated with these interfaces both on the Track and Systems contract and the existing design-build contracts needs to be considered carefully and is discussed more fully in the Executive Summary (recommendations).

As currently structured, the Track and Systems contract also requires maintenance and lifecycle payments once revenue service commences. This payment would be required regardless of the level of service that is implemented for Interim Service. Maintenance of the high-speed rail infrastructure almost necessitates Interim Service once the contract is completed, or there is a risk of an unutilized asset. If not, the Track and Systems contractor will have termination rights under the contract if either revenue service does not start or payment for maintenance is not made. The termination could represent a significant cost to the program and ultimately to the State. Therefore prior to the execution of the Track and Systems contract, it is important to secure memorandum of understanding with CalSTA, SJJPA and other relevant stakeholders on the use of high-speed rail assets until the completion of V2V.

Trainsets

The high-speed Trainsets may add another layer of interface and challenges as there is an interdependency between the Track and Systems contract to test and certify the infrastructure for high-speed rail (trainsets also require certification by the FRA as Tier III) and be compliant with Buy America requirements. Additionally, the Authority should consider the

[46] The scale and complexity of the Track and Systems contract and the associated challenges are also referenced in the Peer Review Group letter to the legislature dated August 23, 2019.

Trainset specifications to achieve the speeds required for the Phase 1 operations. Trainsets represents a significant investment, and one that will likely only show its full value upon the completion of a high-speed operating segment. While the requirement to test Track and Systems using high-speed Trainsets is a key factor, the risk of investing early in a highly specified technology with associated maintenance and service requirements that does not have a short-term revenue generating use is also an important consideration.

Capital Cost and Schedule

As the project continues to advance, risks need to be re-evaluated and re-quantified, and contingency allowances adjusted according to actual costs and any changes in the risk exposure. Critical capital cost risk exposure factors include progress on environmental clearance, right-of-way acquisition, third-party agreements/final design, contractual interface risk, and pace of design-build construction. Table 16 (Authority Capital Cost Estimate Scope vis-à-vis Operations Assumptions Gaps) in Section C, *Capital Cost and Schedule* demonstrates in detail the key capital cost and schedule exposure factors that may need to be revisited as the project advances.

Schedule risk on the Authority's program is complex and linked to the securing of environmental and other permits and ROW for the civil works associated with Bakersfield and Merced extensions, none of which have currently been acquired or obtained. The 2019 Project Update Report schedule shows that Merced-Bakersfield would be available for Interim Service in December 2028. Applying the lessons learned for CP1-4, the Authority may consider accelerating relevant ROW acquisition and utility relocation work in advance of execution of the construction contracts for Bakersfield and Merced extensions.

The Authority's relationship with FRA and the federal government is also a key factor to the risk of achieving the current schedule. While there are positive signs of collaboration[47], the risk of FRA not being cooperative could delay the schedule.

Schedule risks for existing design-build projects include known delays and potential delays resulting from additional scope, third parties, completing design, and acquiring right-of-way parcels. For future projects, such as the Track and Systems contract, high-speed Trainset contract, and Merced and Bakersfield extensions, schedule risks also include potential procurement delays due to lack of environmental clearance and/or funding.

Schedule risk is interlinked with cost risk because delay will tend to drive both inflation of cost and additional program overhead costs, as well as increase the risk of delay claims from contractors, as has been experienced on the design-build contracts in the Central Valley where the delay in acquisition of right-of-way has driven claims for time impacts on contractors.

In turn, this potentially affects the sufficiency, or insufficiency, of funding for the program. The Track and Systems contract has a mechanism for determining the capital cost of all segments after the first segment, which includes a basket of indexation factors relating to inflation for

[47] The Governor of California and FRA Administrator have signed a MOU that assigns to the Authority FRA's responsibilities as lead agency under the National Environmental Policy Act (NEPA). This is expected to yield significant time savings in the environmental permitting process.

labor and materials. This could incentivize the Authority to take additional risk by issuing a notice-to-proceed prematurely in order to secure a lower price.

The main mitigation against this combined risk, should it materialize, would be to find additional funding or de-scope the project. However, with the interrelated nature of the capital works de-scoping may prove challenging if contracts have already been awarded and work is underway. In the absence of additional funding, the most direct mitigation for the Track and Systems contract would be to delay NTPs on additional segments of the project. However, the first NTP includes the $1.63 billion track, signals and electrification for the 119 mile CVS, whereas the second and third NTPs are estimated to cost only $0.7 billion.

One of the key lessons learned from the CVS contracts was the risk associated with entering into contracts too early without having secured environmental clearances and acquired right-of-way and completed the necessary preparation for utility relocations. The unavailability of right-of-way led to cost escalation on the design-build contracts arising from delay claims by contractors. More generally change orders reflecting change in design or decisions made by the Authority to alter or add scope also drove cost increases.

The Authority's capital program costs factor in the program schedule to determine the estimated expenditures in the corresponding fiscal year. Schedule risk events may shift planned expenditure to later dates. As a result, these costs may increase due to inflation of construction inputs.

Table 28: Key Capital Cost and Schedule Risk Exposure Factors

Key Feature	2019 Project Update Report Capex Estimate and Schedule	Observations
Environmental Clearance	FRA grants NEPA assignment by May 1, 2019	NEPA assignment approved on July 23, 2019
Right-of-Way	**CP1**: 100% of parcels acquired by June 2019 (except two parcels)	101 parcels remaining[49]. Number of required parcels increasing due to redesigns third party assets and utility relocations
	CP2-3: 100% of parcels acquired by December 2019	291 parcels remaining[50]. Number of required parcels increasing due to redesigns third party assets and utility relocations
	CP4: 100% of parcels acquired by August 2019	57 parcels remaining[51]. Number of required parcels increasing due to redesigns third party assets and utility relocations
	Bakersfield and Merced Extensions: 2.6 years (31 months) total duration for ROW acquisition	Duration may be insufficient to allow acquisition of majority of parcels prior to the commencement of design-build contracts as recommended by the November 2018 California State Auditor Report
Third-Party Agreements & Final Design	CVS final design work including those needed for utility relocations completed by mid-2020	21 unexecuted third-party agreements still remaining in the CVS; only 2 executed third-party agreements from March 2019 to June 2019[52]
Track & Systems	Assumes installation of ballast track and access to 119 miles of contiguous ROW in the CVS	To meet ARRA schedule requirements, contractors may need to install slab track and work on non-contiguous segments along the CVS alignment
	Included P70 slab track risk contingency allowance in the CVS of $425 million.	CP1, CP2-3 and CP4 design-build contractors may need to accelerate handover of completed segments to the Track and Systems contractor. Negotiations of the handover schedule of completed segments not yet finalized
CVS Pace of Construction	May 2019 Baseline Update FY19-20 Construction Budget – $1.736 billion	FY18-19 actual construction expenditure is less than half ($786 million) of FY19-20 budget[53]
Future Prop 1A Access	No funding schedule constraint	Appropriation of Proposition 1A – Construction funds balance ($4.2 billion) may be required to launch procurements as scheduled

[49] Operations Report – November 2019 (data as of September 30, 2019)
[50] Ibid.
[51] Ibid.

Funding

Funding risks for the high-speed rail program are two-fold in nature:

- **Binary risk**, such as in the availability of FY10 or Proposition 1A monies; and
- **Accretive risk,** such as in a potential cumulative shortfall of Cap-and-Trade auction proceeds.

The binary risks may require the Authority and Board to consider fallback (or default) strategies for reducing future scope and/or costs e.g. by reducing, or deferring, construction of additional segments or elements of current or future contracts and commitments. Other mitigation strategies may involve finding additional revenue sources, or termination of certain civil works contracts in order to achieve a reduction in the number of live Segments.

The potential accretive risk of shortfalls in Cap-and-Trade funds is more nuanced because of the volatility and uncertainty of future income levels, even when prevailing receipts may be above target. One obvious mitigation is for the Authority to secure a floor on Cap-and Trade-receipts, as has been discussed more extensively in the 2016 Business Plan. This could result in more flexibility with capital planning.

Given the narrow window between estimated costs and available funding, the affordability of the extensions is contingent upon both the funding streams as well as the cost estimates remaining stable. Four primary funding risks include:

- The Authority's Cap-and-Trade funding source is variable and although recent historical receipts have trended within the parameters of the Authority's estimates, there is still potential for volatility in the future. The Authority has previously discussed approaches to securing a base level of receipts. Such strategies, if achieved, would likely bolster and stabilize this revenue stream.
- The FRA and federal government have taken steps to rescind $929 million in FY10 funds and are also considering how to reclaim already expended ARRA funding. Without the federal funds, which are subject to ongoing litigation, the Authority could face a significant funding gap to enable extensions to both cities. If the Authority loses access to the FY10 funds, this could be mitigated with higher Cap-and-Trade auction proceeds. However, the loss of all the federal funds could cause major funding gaps.
- The Authority still needs to secure the remaining appropriation of $4.2 billion of Proposition 1A funding, which requires funding plans outlined in Proposition 1A and appropriation by the Legislature. This funding has specific requirements, significantly, the demonstration that an operational subsidy will not be required.
- Funding for associated infrastructure of ACE and the San Joaquins for Interim Service has not been identified. This responsibility will likely fall to CalSTA, working in collaboration with the Authority and regional partners.

[51] Ibid.
[52] Capital Outlay Report – August 2019

Legal

There continues to be a material risk associated with funding under Proposition 1A associated with any use of a subsidy for high-speed rail services. However, as the Authority has encountered litigation in the past, it could be assumed that litigation would likely result from any new plans to access Proposition 1A funds. In this event, the Authority should plan for any delays in funding that might result.

Additionally, federal funding is also subject to legal proceedings. The outcome of this process is not directly under the control of the Authority so mitigating actions are limited. However, by continuing to comply with the terms of the grants the Authority can demonstrate that it is intent on applying the funds as they were intended to be used.

Organizational Capacity

The Authority also faces risks associated with its internal delivery organization. As it increases its right-of-way acquisition and subsequent contracts are executed, the Authority will need to expand its delivery capacity to ensure that sufficient resources are provided to manage all aspects of the process in a timely and effective manner.

For example, the Track and Systems contract discussed above represents one of the largest contracts that the Authority will enter. It is a complex contract with multiple phases and interfaces that will bridge multiple decades. The counterparty to this agreement is likely to be sophisticated and highly familiar with its own risk profile and resulting negotiating position. It is therefore critical that the Authority provide the internal resources to adequately negotiate and manage the contract for its entire life.

Interim Service Risks

Due to the interdependency of high-speed service with other rail services, risks associated with the operation and delivery of the Merced to Bakersfield Interim Service are intended to primarily lie with SJJPA/SJRRC and CalSTA. While there is a significant almost 10-year period in which to prepare for Interim Service, the Authority is about to make long-term commitments and should ensure that it has the requisite formal agreements in place with the other relevant stakeholders as to the potential use and management of the high-speed infrastructure and associated costs prior to signing the Track and Systems and Trainsets contracts.

Connectivity Infrastructure

In parallel with the high-speed rail capital program, the State and regional partners, acting through CalSTA and SJJPA/SJRRC, must deliver the remaining infrastructure for the connectivity with ACE and Amtrak San Joaquins services. While these works are less significant in scale than the high-speed infrastructure but still require adequate planning and funding. These infrastructure requirements outside of the high-speed alignment provide the assumed level of connectivity with Amtrak San Joaquins and ACE services envisioned by the ETO Study.

These include:

- ACE connection to a high-speed station in Merced;
- Cross-platform connection between San Joaquins and high-speed rail at Merced; and
- The establishment of a station and/or platform and canopy in Madera.

We understand that responsibility for the funding and implementation of these improvements will ultimately likely lie with CalSTA and other regional stakeholders. However, without these investments, Interim Service will not achieve the expected level of benefit to the State, so it will be critical that firm commitments for funding are received and a comprehensive agreement for both construction and operations is completed prior to full commitment. This could be in the form of a memorandum of understanding, or similar agreement that includes the Authority, CalSTA, SJJPA and SJRRC.

Business Model

The primary operating risk to the Authority would be to ensure that the operating and maintenance costs of its infrastructure are fully covered by the track access charges to a third-party operator. While there is some degree of verbal agreement at the staff level among stakeholder entities, a formal agreement between the parties does not yet exist. Ultimately, a formal agreement of Interim Service and the allocation of responsibilities and risk between the various parties will be necessary to implement Interim Service.

The SJJPA and other stakeholders may need to agree on the risks associated with delivery of the Merced to Bakersfield high-speed rail infrastructure that the Authority is currently constructing. Based on the current schedule, this infrastructure will take more than eight years to reach completion. Given the long timeline and associated risks of the capital program, schedule, and funding, the start date of operations may be delayed. It will be essential that the Authority manage risks and costs to ensure timely completion of the full Merced to Bakersfield segment with the amount of funds currently available.

In the event of a stress case scenario, the Authority will require assurances that SJJPA will still operate Interim Service if the delivery of the infrastructure is delayed and on a shorter segment if the Authority is not able to complete the infrastructure for Merced to Bakersfield as planned.

The Interim Service Business Model outlined in Section A*, Commercial and Business Model,* proposes SJJPA/SJRRC procures operator(s) for the enhanced San Joaquins service. Under this model, the Authority would become an Infrastructure Owner that will make its assets available through a lease or a track access agreement with the Operator(s). All operating risks, excluding Track and Systems and Trainsets, would then rest with the operator(s) and SJJPA. The process and risk of certifying the operator for high-speed rail operations would lie with SJJPA. Risks associated with FRA certification of Track and Systems and Trainsets would lie with the Authority. The Authority should further clarify its ability to delegate its responsibility for the operation of high-speed rail services to a third party.

Appendix

KPMG Ridership & Revenue Observations and ETO Action and Response

Item	KPMG Ridership & Revenue Observation	ETO Action and Response
1	No ramp-up period for passenger familiarization with the HSR mode	No action; estimates assume a six-month testing / familiarization period prior to the start of service. In addition, Interim Service will run over a brownfield service area and will be a continuation of an already established offering in the Central Valley
2	Ridership model assumes that all transit trips between Merced, Madera, Fresno, Hanford, and Bakersfield use HSR.	No action as the impact of these other options would be minimal on HSR forecasts (passengers who use local services are typically traveling locally as opposed to regionally on rail)
3	High-speed rail fares are set at current San Joaquin fare levels with no differentiation for HSR	Addressed as part of the additional analyses ETO conducted in Step 3 (see Exhibit E). As a conservative assumption, potential additional revenues were not included in the ETO Updated Forecast (Nov 2019) Base Case pending stakeholder discussions on fare structure
4	Transfers are assumed to be optimized in Merced (cross-platform transfer with no physical barriers)	Addressed as part of the Step 2 Downside Case and the Step 3 Low Case, where transfer times were increased to account for delays in the delivery of stakeholder infrastructure
5	Connecting train, bus, and HSR services are assumed to be 100% reliable	Addressed; perception factor was adjusted to account for the reliability of connecting services
6	Low transfer penalty from one mode to another	Addressed as part of the Step 2 Downside Case and the Step 3 Low Case. Base Case includes a lower transfer penalty due to the assumption of full stakeholder infrastructure.
7	No traveler preference constant for HSR	No action. As a conservative assumption, it was assumed that HSR would be treated the same as conventional rail service

KPMG O&M Cost Observations and ETO Action and Response

#	KPMG O&M Cost Observation	ETO Action and Response
1	Opportunity for administrative cost savings under a single TOC model	Addressed; a 30% efficiency factor was applied to administrative costs
2	A 10% TOC profit margin assumed. Costs are calculated without any added margins for subcontractors	No action. 10% is generally the profit range expected for regional rail services similar to the proposed Interim Service
3	Thruway bus costs appear to be undercounted in the supporting cost model	Addressed; all bus connections were reviewed and optimized
4	Warranties were assumed to cover all defects for the first four years	No action. This is the planned contracting model for these types of services
5	10% contingency margin was applied despite a range of 15% to 35% assumed in the 2018 BP	Addressed through the incorporation of an updated commercial model for operations (i.e. these costs are assumed to be passed on to the operator)
6	Amortization, depreciation, interest, and taxes are not included in forecasts.	No action. The assumption is these costs may be included in lifecycle projections
7	Fewer insurance coverages were assumed in the modelling (when compared to those policies assumed in the 2018 BP)	Addressed through the incorporation of an updated business and commercial model for operations
8	Assumed a flat $150,000 per county for policing costs	Addressed through the incorporation of an updated business and commercial model for operations
9	Rolling stock maintenance parts / materials are assumed to be included in the rolling stock contract	No action. This is the planned contracting model for these types of services
10	The ACE ridership forecast assumed an annualization factor of 323.6 days while the ACE O&M forecast assumed an annualization of 253 days.	Addressed – annualization was reconciled between the ACE models