



Side-by-Side Study

Quantitative Analysis - Summary of Findings and Conclusions

February 18, 2020

Project Update Report – Released in May 2019

Central Valley: Merced-Bakersfield

- More than **doubles** the Service
- Reduction of up to **90 min** in travel time
- **Reduced Subsidy** for the total corridor
- Connected to ACE and San Joaquin In Merced and Thruway Buses to SoCal in Bakersfield

Peninsula: San Francisco-Gilroy

- **No substantial ridership** from incremental High-Speed Rail service
- High-Speed Rail Operating **Expenses exceed fare revenues**
- Electrification Scenario with increased Caltrain service without High-Speed Rail captures most of the benefits
- HSR service benefits do not materialize until connected to Central Valley via Pacheco Pass

Based on findings, CHSRA made a **policy recommendation** to use **\$4.8 billions** in remaining available funding, to complete the 171-mile line connecting **Merced, Fresno and Bakersfield**.

CHSRA and The Board of Directors requested additional studies to help inform its decision making process These studies included:

- ETO Side-by-Side Study** (NorCal, CV, SoCal) – (OpEx, CapEx, Revenue, Ridership, GHG, Congestion)
- KPMG Business Case Study** (Prop1A, Business Model, Funding, Risks)
- ETO Updated Central Valley Study** (Reviewed connectivity, Infrastructure Gaps & Business Model)

- 1. Focused in 3 standalone corridors:** Output of the models in the Side by Side are different from the Integrated Valley to Valley and Phase 1.
- 2. Scenarios for the purpose of the study:** assumptions were made by the ETO they do not represent a commitment or request by any of the stakeholders in the corridor
- 3. Constraints to limit the number of scenarios:** There are “infinite” possible scenarios depending on the assumed available funds, Prop 1A HSR funds eligibility and available plans used as assumptions.
- 4. The Study focused in the “Change”:** The transformation created by the additional investment compared to the existing situation in each corridor

The Side-By-Side Study focus in answering 3 Main Questions:

■ **Question 1:**

How do Benefits of early HSR Service compare in the three Corridors?

■ **Question 2:**

How do benefits of early HSR Eligible Investment compare in the three Corridors?

■ **Question 3:**

Where to continue with HSR implementation to achieve the highest benefits at the earliest time?: Extension to Merced-Bakersfield, Peninsula or Southern California?

Scenarios to answer the Questions



For this Purpose ETO defined four Scenarios in each Corridor:

■ **Scenario 1:**

Today's operation for purpose of data analysis and as Reference Point

■ **Scenario 2:**

Committed future regional projects using approved non-HSR funds + HSR bookend investments as Baseline for Comparison

■ **Scenario 3:**

Additional regional funds paired with early Eligible HSR infrastructure investment (Provides answer to Question 2: Comparison of the Benefits of early HSR Investment in the three Corridors)

■ **Scenario 4:**

Complete HSR investment to provide full HSR standalone service (Provides Answer to Question 1: Comparison of Benefits of early HSR Service in the three Corridors)

Benefits of HSR Investment

Key Characteristics of each Corridor



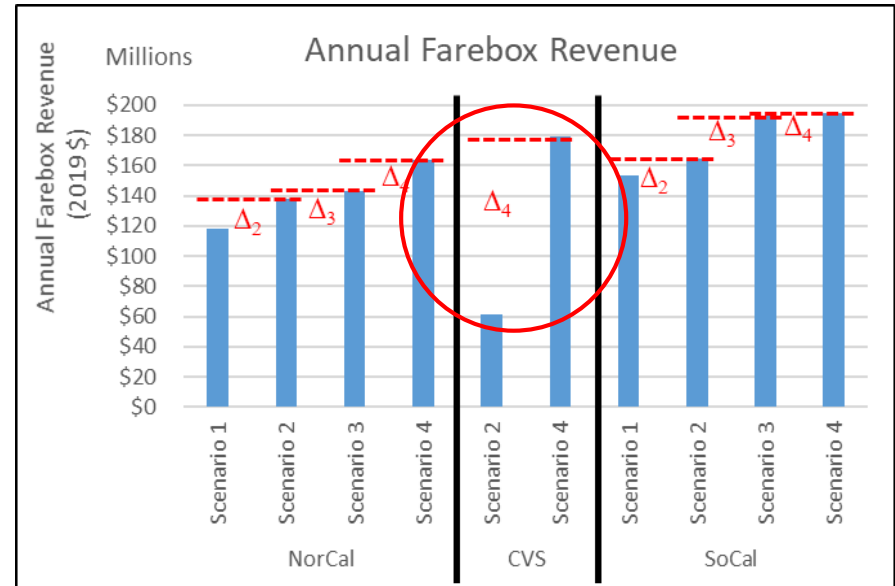
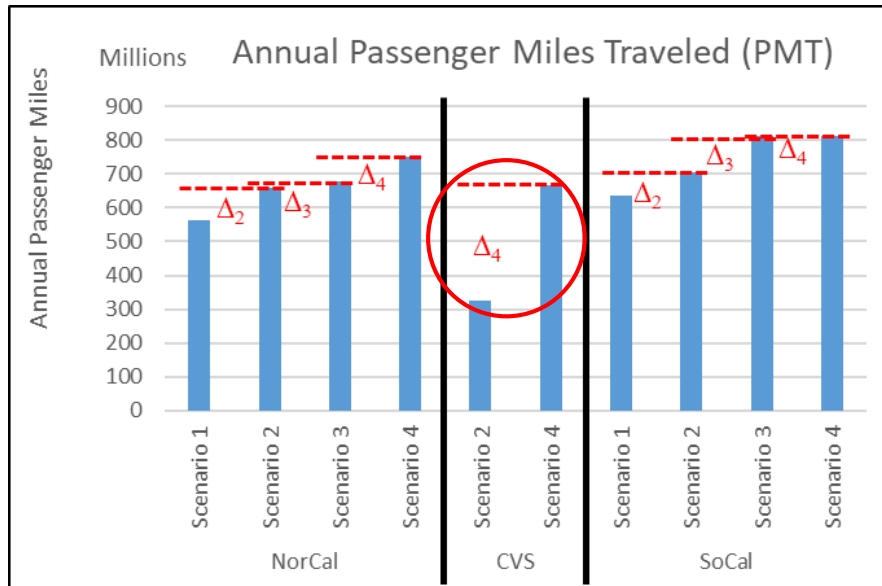
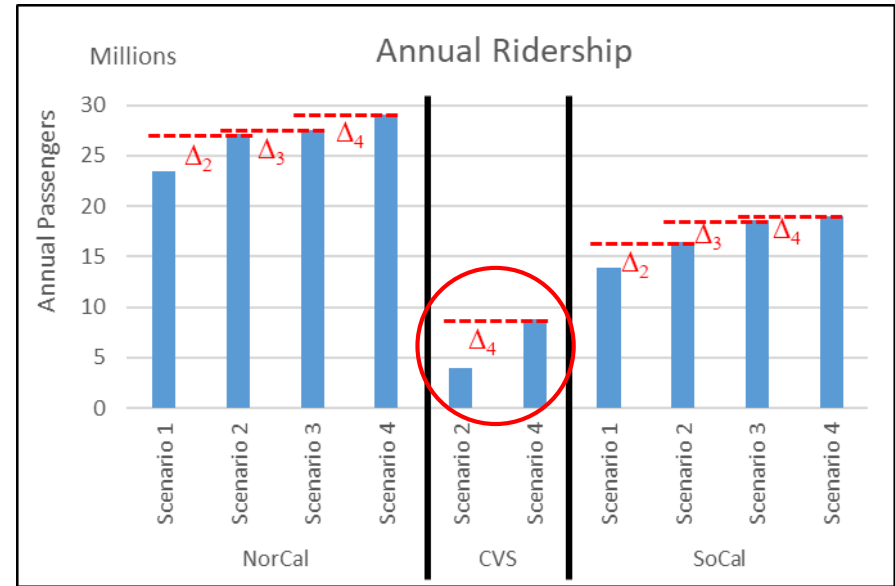
Corridor	Length Miles	Max. Speed after Invest. mph	Service	Investment Main Impact	Scenario 2 Ongoing Funded Projects*		Scenario 3 Additional Investment No HSR Trains service		Scenario 4 Full HSR investment to run HSR Trains	
					Infrastructure	CapEx	Infrastructure	CapEx Vs Sc2	Infrastructure	CapEx Vs Sc2
NorCal San Francisco – Gilroy	77	110 mph	Shared with Regional Service	Capacity Increase	Electrification San Francisco-San Jose + Caltrain Electric Trains	Funded	Electrification & additional Tracks to Gilroy + Grade Separations + Diridon Station + Rail Systems + More Caltrain Electric Trains	20.6B	Additional HSR Maintenance Facilities + HSR Trains + Mod Stations + Curve Straighten	22.4B
CVS Merced – Bakersfield	171	220 mph	Dedicated Full HSR Corridor	Capacity Increase and Travel time improvement	Valley Rail Project with Expansion of Service to Natomas and ACE to Ceres + Madera Poplar HSR (Not Operational)	Funded	Not Applicable	N/A	Extension to Merced + Ext to Bakersfield + HSR Trains + Connectivity Projects	5.3B (4.8B +0.5B)
SoCal Burbank - Anaheim	44	125 mph	Shared with Regional Service	Capacity Increase	Initial SCORE investment + Link US Phase A + Conversion to Zero-Emissions Vehicles & ZEV MF + Regional Trains	Funded + 5.1B ZEV*	Burbank to LAUS 4 Tracks +LAUS to Fullerton 4 Tracks + Link US Phase B +Rail Systems +Regional Trains	6.4B (+ 5.1B ZEV*)	Burbank Airport Station + Anaheim Station +Electrification +Mod Stations + LMF+ HSR Trains	8.8B (+ 5.1B ZEV*)

Note: (*) Scenario 2 in SoCal includes the ZEV investment currently unfunded in order to make it comparable to the other 2 corridors.

Impact of the Investment (Focus in the Change)



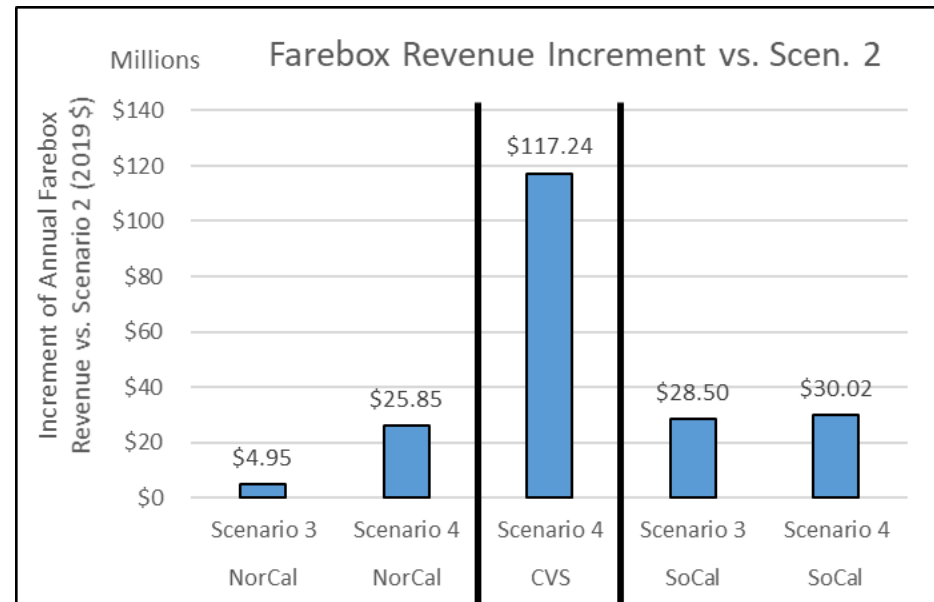
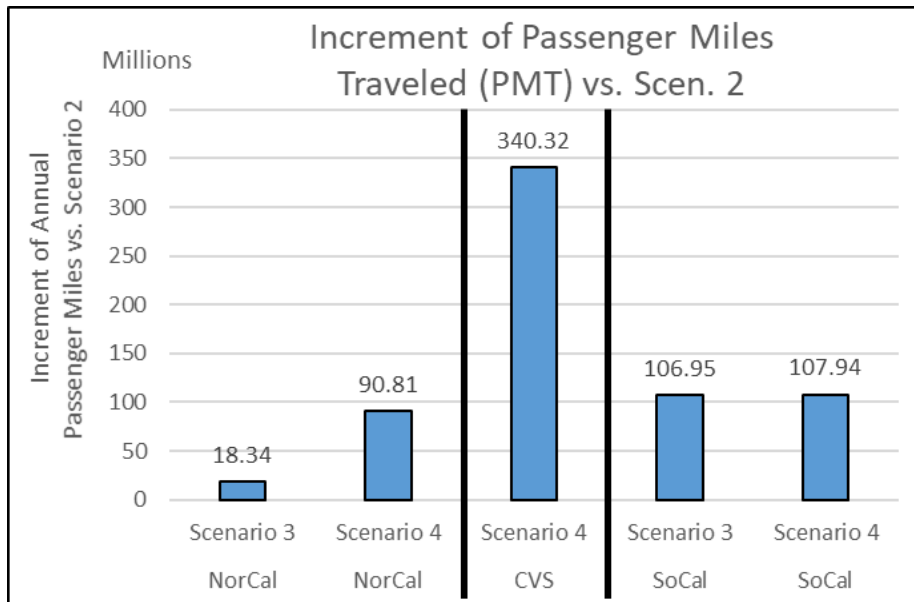
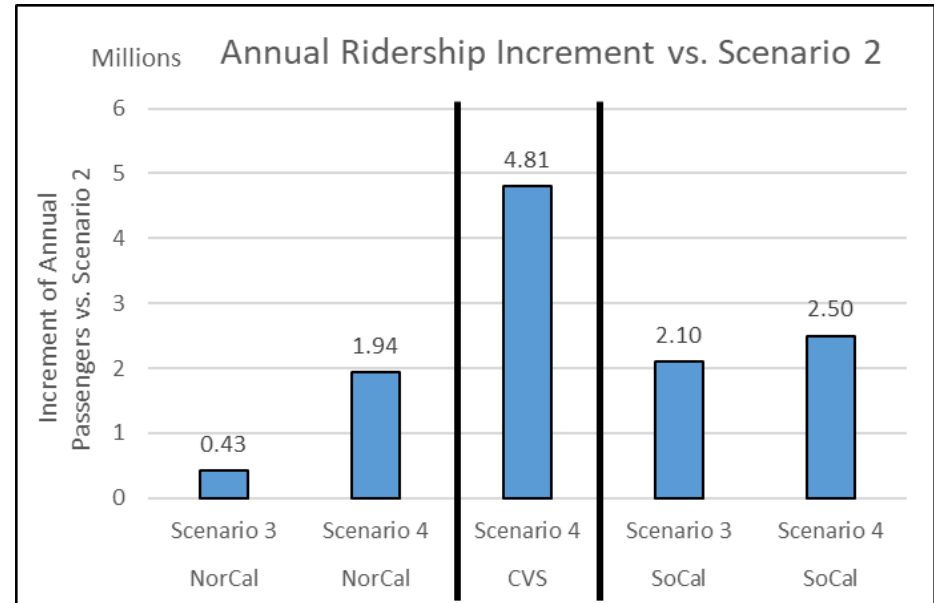
- Existing ridership is highest in NorCal
- But the **Difference** between the Scenarios Δ reflects the impact of:
 - Completion of Regional Investment(Scenario 2)
 - Additional HSR Investments and additional Regional Investment (Scenario 3)
 - Full HSR Investments + HSR Service (Scenario 4)



System Total Annual Ridership and Revenue Increment vs. Scenario 2 (Baseline) by Corridor



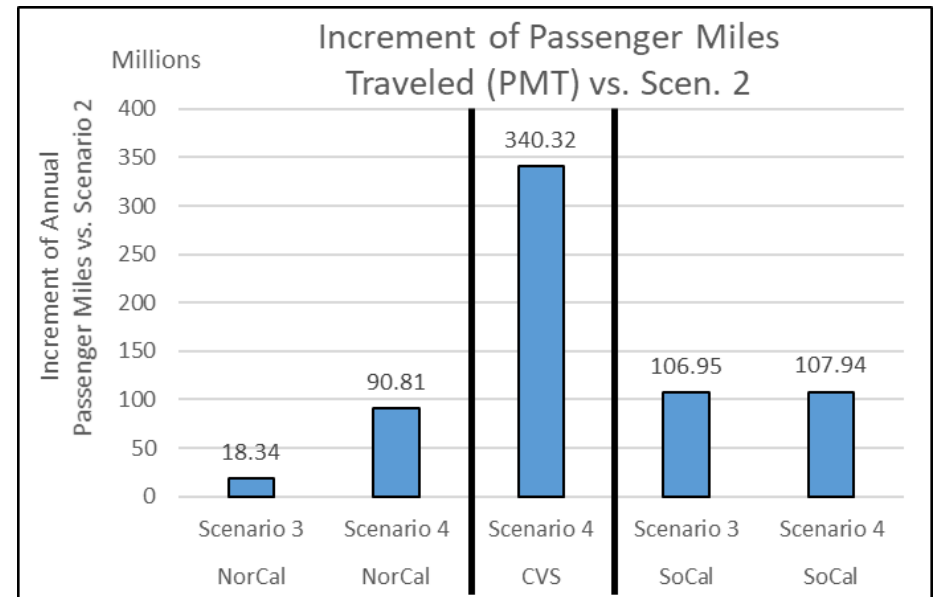
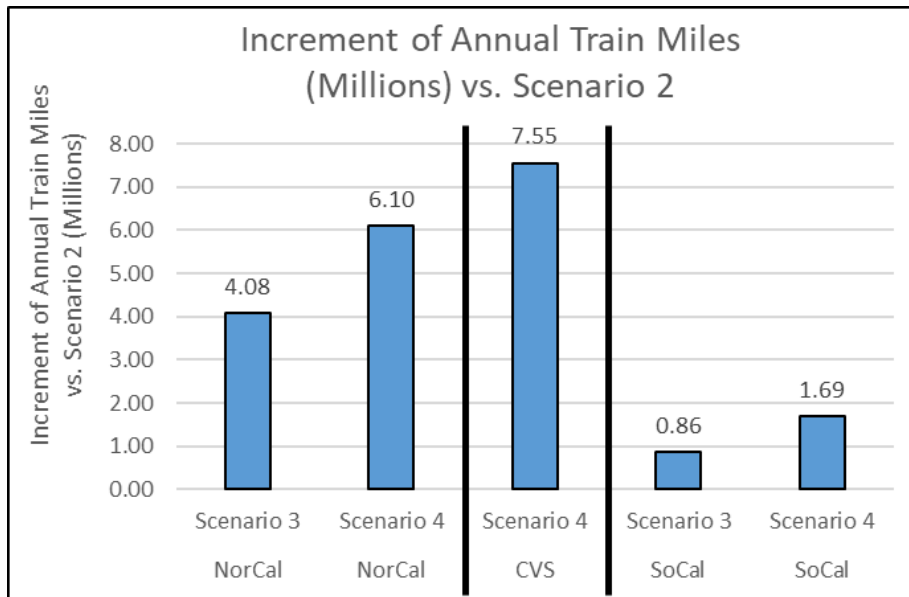
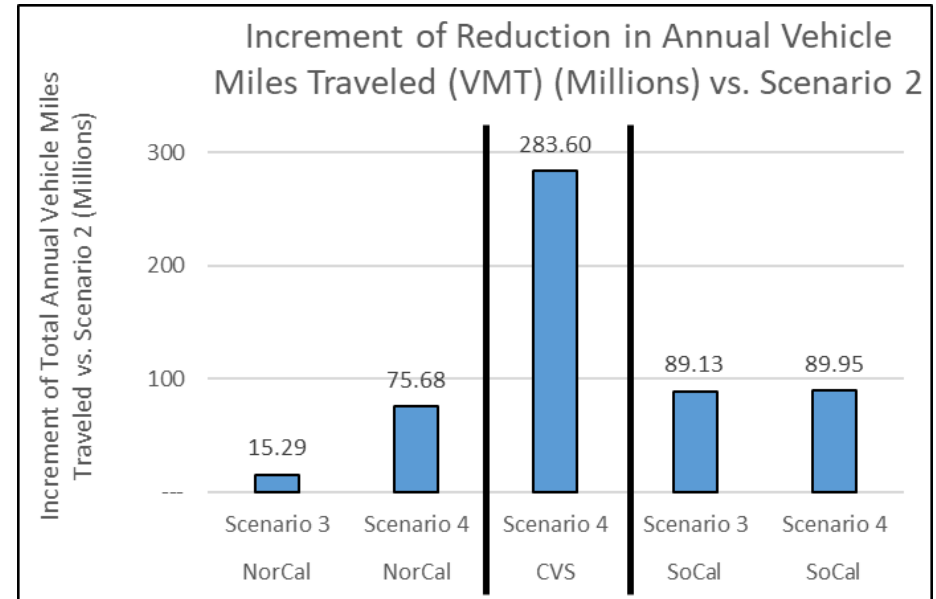
- CVS provides the highest increase in both Percentage and Net Value of Ridership and Revenue benefits.
- Value of Passenger Miles is an indicator of the transportation performance which combines the number of passengers and the distance traveled.



Congestion Benefits - Reduction in Vehicle Miles vs. Scenario 2 by Corridor



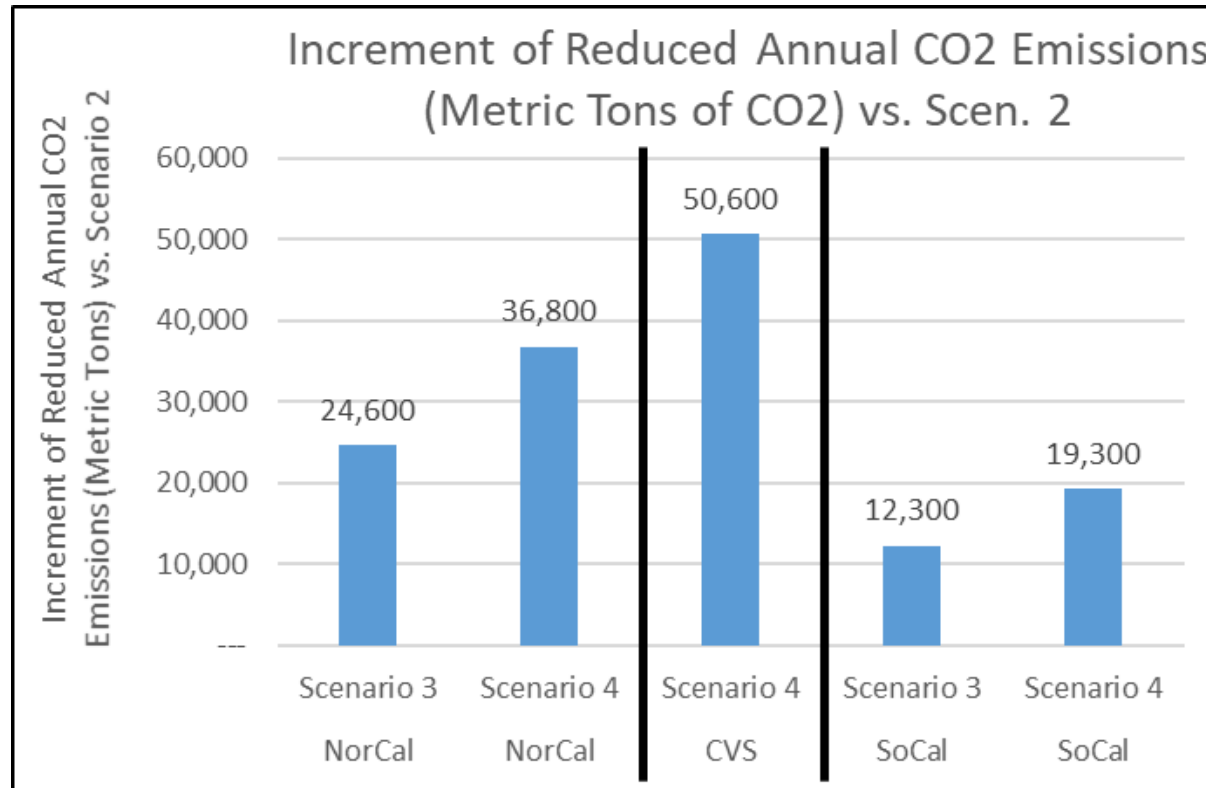
- CVS provides the highest systemwide increase in train miles. (Service offered)
- CVS provides the highest increment in passenger miles (Demand)
- PMT is linked to VMT that represents the congestion relief (VMT reduction).
- Highest efficiency between additional offer and additional demand in CVS



Increment of GHG Benefits vs. Scenario 2 by Corridor



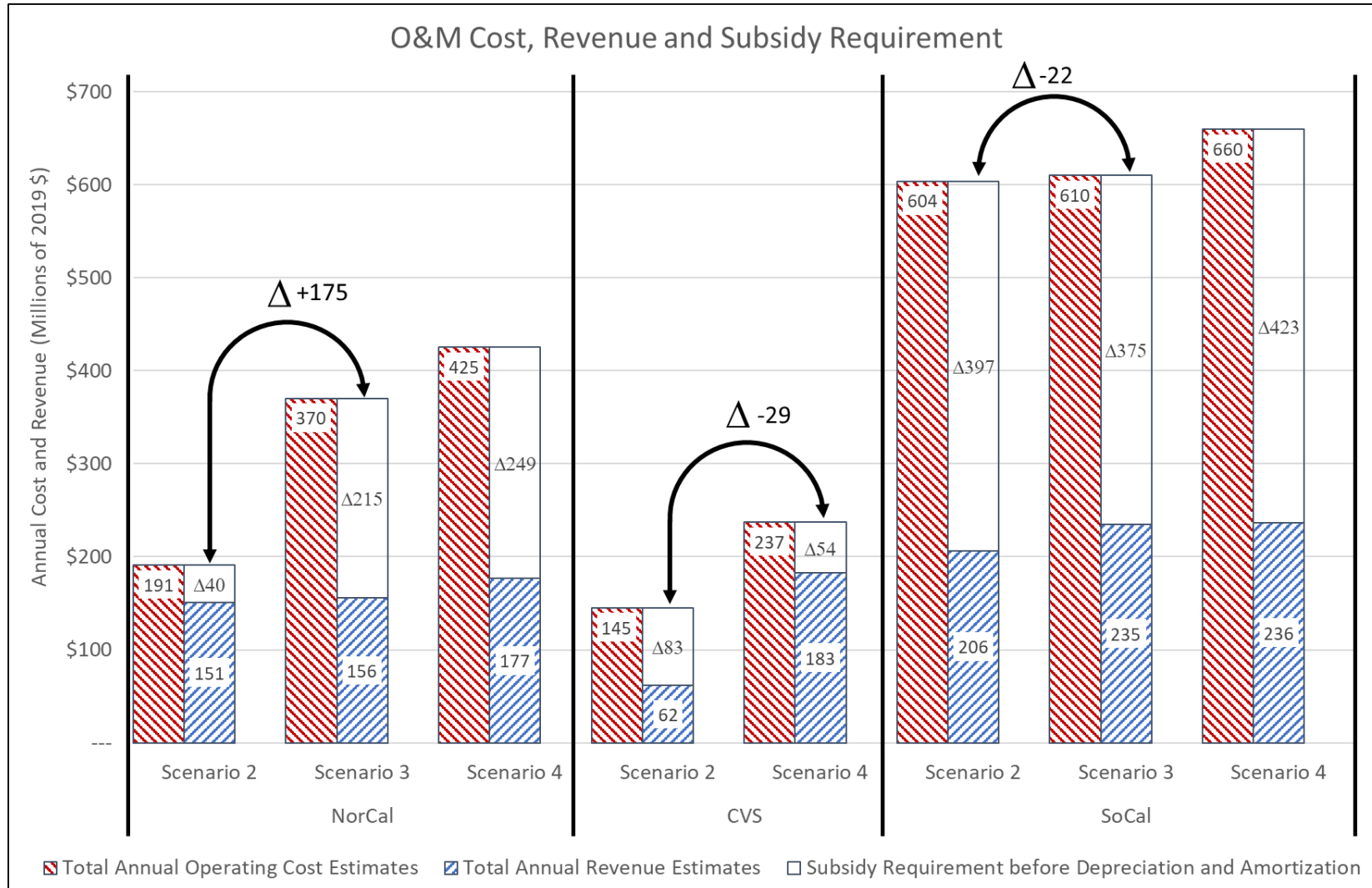
- CVS Scenario 4 provides the highest systemwide reduction in GHG benefits due to highest VMT reduction



Annual Operations & Maintenance Cost



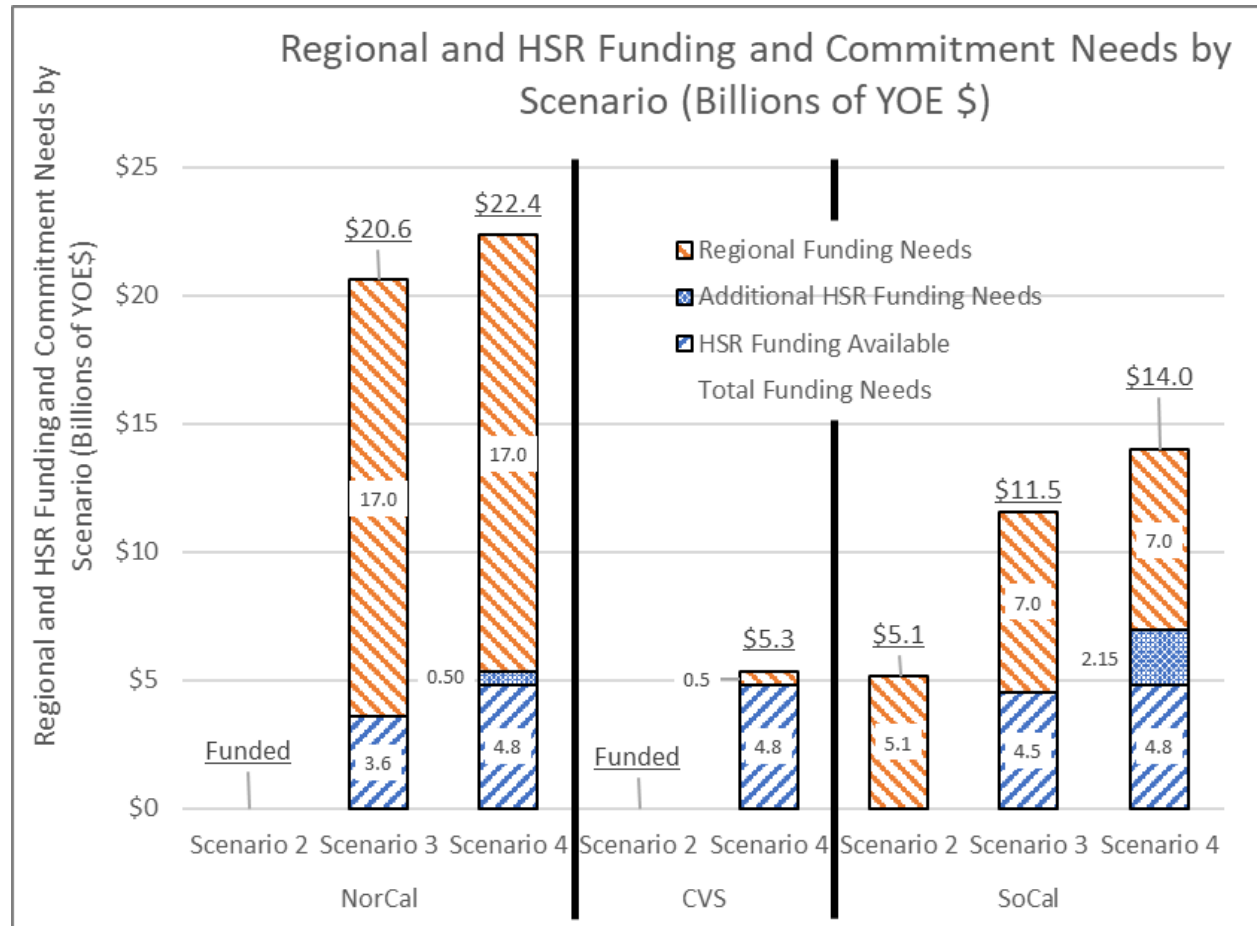
- CVS provides the highest reduction in subsidy requirements – \$28.76 million without consideration of LCFS credits of \$12.7 million



Funded Versus Unfunded Investment



- SoCal Scenario 2 requires \$5.14 billion for ZEV conversion and fleet expansion (\$5.14 billion currently unfunded), NorCal Scenario 2 and CVS Scenario 2 are fully funded
- CVS Scenario 4 has lowest total funding and commitment needs to fully achieve benefits of HSR investment (4.8 billion USD HSR Funding and up to 0.5 billion USD Regional Investment)



Side-by-Side Summary Table



Aspects Compared	Northern California Peninsula Corridor	Central Valley Segment	Southern California Burbank to Anaheim Corridor
Length of Corridor (in miles)	77	171	44
Speed Attainable	110	220	110 to 125
Ridership Increase (in millions)	1.9	4.8	2.5
Greenhouse Gas Emissions Reductions (in thousand metric tons of CO2)	36.8	50.6	19.3
Annual Vehicle Miles Traveled Reduction (in million of miles)	75.7	283.6	90.0
Total Funding Required (\$YOE billions)	24.7	5.3	15.8
HSR Operational Within 10 Years	Possible	Yes	Unlikely

Summary of Findings from the Side-by-Side Study

The ETO's Side-by-Side Study **concluded that the Merced - Bakersfield line (CVS Scenario 4) yields the greatest benefits** compared to the other two corridors related to the following criteria:

- (1) **Ridership Performance:** Measured by the highest increase in Annual Passenger Miles Traveled (PMT);
- (2) **Congestion Relief:** Measured by the greatest reduction in Vehicle Miles Traveled (VMT);
- (3) **Green House Gas Reduction:** Measured by the greatest reduction in metric tons of CO₂;
- (4) **Operational expenses:** Measured in terms of the highest reduction of required subsidies for operation and maintenance;
and
- (5) **Capital Investment:** Measured in terms of the lowest additional investment required.
- (6) **From HSR Program View:** Only CVS Scenario 4 provides high-speed rail operation, Benefits of HSR in NorCal and SoCal will materialize only when interconnected to Central Valley
- (7) **From Funding Availability:** HSR additional investment in CVS provides the highest benefits, with less additional CAPEX while reducing the operating subsidies