DRAFT – REVISION 1

To:	Sarkes Khachek, Director of Programming, Programming Division Maya Kulkarni, Transportation Planner I	From:	David Verbich Kelly Watts
	SBCAG		Stantec
File:	CCZEV Strategic Study	Date:	November 7, 2022

Reference: CCZEV Strategic Study – Transit Agency Electrification Efforts

1. INTRODUCTION

The Santa Barbara County Association of Governments (SBCAG), San Luis Obispo Council of Governments (SLOCOG), and Association of Monterey Bay Area Governments (AMBAG) have partnered to develop the Central Coast Zero-Emission Vehicle Strategy (CCZEVS). The CCZEVS will identify electric vehicle (EV) charging infrastructure needs in the Central Coast Counties, including Santa Barbara, San Luis Obispo, Monterey, Santa Cruz, and San Benito counties as well as Ventura County. The goal of the CCZEVS is to identify future charging infrastructure siting and technology needs to accommodate future travel demand specifically for interregional motorists, regional transit services, and freight.

The purpose of this memo is to summarize the interregional services of transit agencies in the CCZEVS study area, survey their current and future electrification efforts, and to identify opportunities and challenges for electrification. This memo provides a snapshot of the existing conditions of electrification, as well as a framework for understanding potential collaboration among the agencies, particularly around the prospect of strategically locating fueling and/or charging infrastructure.

First, the memo provides a brief summary of the policy mandates for transit fleet electrification, followed by an overview of each agency's current regional transit services. Next, current and future electrification efforts are presented as agencies begin to transition their fossil fuel-based fleets to zero-emission bus (ZEB) fleets. Lastly, potential challenges are discussed along with a summary of future electrification needs.

2. FEDERAL AND STATE MANDATES

This section reviews applicable mandates and policies for the electrification of bus transit fleets in California.

FEDERAL MANDATE

At the federal level, there is no mandate to transition away from fossil fuel buses to ZEBs. Nonetheless, the federal government incentivizes the transition to ZEBs as part of its broader environmental and social justice goals.

A prime example of this is the Low- and No-Emission Vehicle Funding (Low-No) from the Federal Transit Administration (FTA). The Low-No grant is part of a broader set of funding under Section 5339, and includes both formula funding and competitive funding. The FTA has dramatically increased the funding available for Low-No grants, as shown below. **Table 1** provides an overview of the authorized funding for the 5339 program[1]

[1] https://www.transit.dot.gov/sites/fta.dot.gov/files/2022-03/FY22-Low-No-Bus-Public-Webinar.pdf

through FY 2026, demonstrating the significant investment from the federal government to support ZEB transitions.

Table 1: Authorized Funding for Section 5339 Program

Program component	FY 2021 Enacted	FY 2022 (in millions)	FY 2023 (in millions)	FY 2024 (in millions)	FY 2025 (in millions)	FY 2026 (in millions)
Formula	$582.61	$603.99	$616.61	$632.71	$645.78	$662.20
Buses and Bus Facilities Competitive	$414.04	$375.70	$383.54	$393.56	$401.69	$411.90
Low or No Emissions Competitive	$180.00	$1,121.56	$1,123.06	$1,124.96	$1,126.51	$1,128.46
5339 Program Total	$1,176.65	$2,101.25	$2,123.21	$2,151.23	$2,173.98	$2,202.56

This historic investment is a clear indication of the federal government's support for adoption of alternative fuels to reduce pollution and help 'green' transit fleets. To access FTA funding through the 5339(c) Low or No Emission Program (Low-No) and the 5339(b) Buses and Bus Facilities Program opportunities, transit agencies will need to comply with FTA's requirements for these competitive funding opportunities, including the development and submission of an FTA-compliant ZE Transition Plan. The FTA ZE Transition Plan contains six elements as required through the *Dear Colleague* letter and the Notice of Funding Opportunity for the Low-No competitive grant program:

1. Demonstrate a long-term fleet management plan with a strategy for how the applicant intends to use the current request for resources and future acquisitions;
2. Address the availability of current and future resources to meet costs for the transition and implementation;
3. Consider policy and legislation impacting relevant technologies;
4. Include an evaluation of existing and future facilities and their relationship to the technology transition;
5. Describe the partnership of the applicant with the utility or alternative fuel provider; and
6. Examine the impact of the transition on the applicant's current workforce by identifying skill gaps, training needs, and retraining needs of the existing workers of the applicant to operate and maintain zero emission vehicles and related infrastructure and avoid the displacement of the existing workforce.

In summary, a ZE transition plan is required if an agency wishes to apply for federal funding.

STATE MANDATE

The California Air Resources Board (CARB) adopted the Innovative Clean Transit (ICT) regulation in December 2018, which requires all public bus transit agencies in the state to gradually transition to a completely ZEB fleet by 2040. This regulation is in accordance with preceding state policies SB 375 and SB 350. SB 375, the Sustainable Communities and Climate Protection Program, creates initiatives for increased development of transit-oriented communities, better-connected transportation, and active transportation. Relatedly, SB 350

supports widespread transportation electrification through collaboration between CARB and the California Public Utilities Commission (CPUC).

ICT also states that transit agencies are required to produce a ZEB rollout plan that describes how the agency is planning to achieve a full transition to a ZE fleet by 2040 as well as outlining reporting and record-keeping requirements. Specific elements required in the rollout plan include:

- A full explanation of how the agency will transition to ZEBs by 2040 without early retirement of conventional internal combustion engine buses
- Identification of the ZEB technology the agency intends to deploy
- How the agency will deploy ZEBs in disadvantaged communities
- Identification of potential funding sources
- A training plan and schedule for ZEB operators and maintenance staff
- Schedules for bus purchase and lease options (including fuel type, number of buses, and bus type)
- Construction of associated facilities and infrastructure (including location, type of infrastructure, and timeline)

CARB defined large transit agencies as operating in "an urbanized area with a population of at least 200,000 as last published by the Bureau of Census before December 31, 2017 and has at least 100 buses in annual maximum service." Agencies that do not meet this definition are categorized as small transit agencies. The agencies in the CCZEVS area, by the CARB definition are considered small transit agencies.

The ICT regulation outlines different ZEB purchase schedules that large and small agencies must adhere to. Beginning in 2021 and continuing annually through 2050, each transit agency will be required to provide a compliance report[2]. The initial report outlined the number of and information on active buses in the agency's fleet as of December 31, 2017. Subsequent reports must include transit agency information, information on each bus purchased, owned, operated, leased, or rented (including make, model, curb weight, engine and propulsion system, bus purchases, and any information on converted buses), ZE mobility option information (if applicable), and information on renewable fuel usage (including date purchased, fuel contract number, and effective date, if applicable).

Table 2 below outlines the ZEB purchase schedule for small transit agencies for heavy-duty transit vehicles—that is, traditional 40-ft buses. Specific vehicle types, such as motor coaches, cutaways, double decker, and 60-ft. vehicles, are exempt from this purchase schedule until 2026 or later (dependent on Altoona testing being completed). Whereas large agencies are required to start purchasing ZEBs in 2023, small agencies are exempt until 2026, when 25% of new bus purchases must be ZE.

[2] https://ww2.arb.ca.gov/sites/default/files/2019-10/ictfro-Clean-Final_0.pdf

Table 2: ZEB purchase schedule (as a percentage of total new bus purchases for small transit agencies) for standard buses[3]

Year	Percentage
2026	25%
2027	25%
2028	25%
2029 and after	100%

ICT also outlines several flexible options to comply with ZEB purchase requirements that transit agencies can take advantage of. These include receiving bonus credits for early ZEB purchases, ZE mobility options to encourage innovation, enhanced first/last mile connections and improved mobility, and the option to form a joint ZEB group, which entails transit agencies working together to collectively comply with ZEB purchase requirements and a joint ZEB rollout plan. Formation of joint ZEB groups is dependent on certain eligibility requirements (agencies must share infrastructure, be in the same air basin, air district, Metropolitan Planning Organization, or Regional Transportation Planning Organization).

The ZE mobility option outlined above specifically refers to a program that provides a ZE service, such as a shared mobility bicycle program or any service operated by the agency that includes ZE transportation, such as microtransit, demand-response service, or autonomous shuttles. The mobility option does not apply to larger buses or fixed-route transit services. Small transit agencies must achieve 180,000 zero-emission passenger miles per year to be eligible for a mobility credit. One mobility credit is the equivalent to having one ZEB in the fleet.

To account for circumstances beyond a transit agency's control that may impact their ability to comply with ICT regulations, the mandate laid out specific provisions for exemptions. Exemptions will be permitted for the following circumstances:

- If the required ZEB type is unavailable
- Daily mileage needs cannot be met
- Gradeability needs cannot be met
- Delays in infrastructure construction
- A financial emergency is declared by the transit agency
- In circumstances where incremental capital or electricity costs for charging cannot be offset after applying for all available funding and incentive opportunities.

Specifically, the ZEB rollout plan required to be submitted to CARB by June 30, 2023 must include the following components, broken down by CARB into nine sections.

[3] Standard buses refer to 35-ft. or 40-ft. unless otherwise stated

- Section A: Transit agency information
- Section B: Rollout plan general information
- Section C: Technology portfolio
- Section D: Current bus fleet composition and future bus purchases
- Section E: Facilities and infrastructure modifications
- Section F: Providing service in disadvantaged communities
- Section G: Workforce training
- Section H: Potential funding sources
- Section I: Start-up and scale-up challenges

The CCZEVS transit agencies are at various stages of developing their ZEB plans and transitioning to ZEB fleets. The section below provides the current status of electrification efforts of these agencies.

3. TRANSIT SERVICES OVERVIEW

This section provides an overview of the interregional transit services within the CCZEVS study area. The list of services was developed together with the CCZEVS stakeholders. It is important to note the list of services is not exhaustive and is focused on routes and services that travel between cities and have the potential to share charging and/or fueling infrastructure.

SANTA MARIA REGIONAL TRANSIT & CITY OF LOMPOC TRANSIT

Regional commuter service between Santa Maria, Los Alamos, Buellton, Solvang, and Lompoc is provided by both The City of Santa Maria and the City of Lompoc. Santa Maria Regional Transit (SMRT) operates the Breeze Bus, and the City of Lompoc Transit (COLT) operates the Wine Country Express. Together, regional commuter service consists of three routes, summarized in **Table 3**. Riders can connect between the SMRT Breeze Bus and the COLT Wine Country Express.

Table 3: City of Santa Maria & City of Lompoc Regional Service

Route	Operator	Service
Breeze Bus Route 100	Santa Maria Regional Transit	Santa Maria, Vandenberg Space Force Base, Vandenberg Village, Lompoc
Breeze Bus Route 200	Santa Maria Regional Transit	Santa Maria, Los Alamos, Buellton, Solvang
Wine Country Express	City of Lompoc Transit	Lompoc, Buellton, Solvang

Reference: **CCZEV Strategic Study – Transit Agency Electrification Efforts**

The Breeze Bus

The Breeze Bus operates Monday through Friday and consists of two routes, Route 100 and Route 200, shown in **Figure 1** and **Figure 2**.

Figure 1: Breeze Route 100 Service

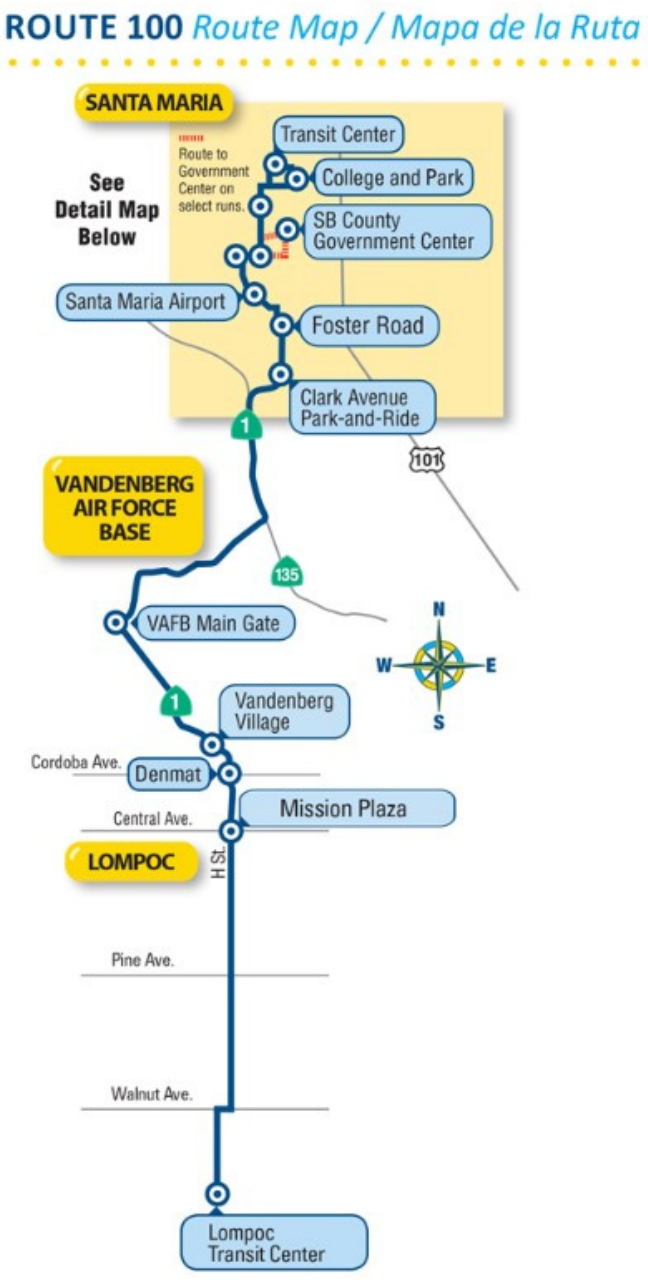
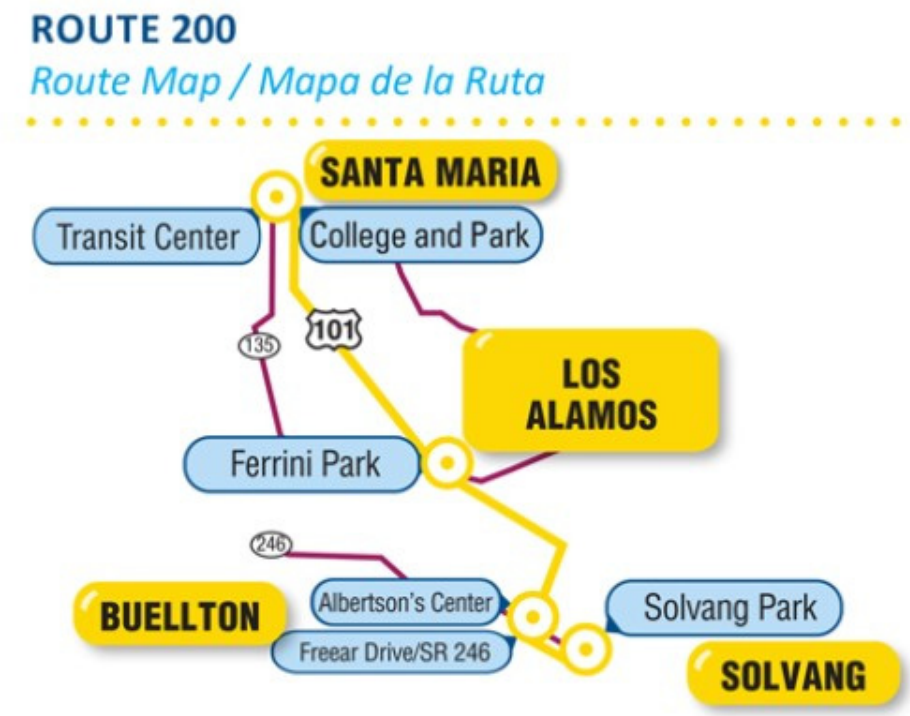


Figure 2: Breeze Route 200 Service



SMRT's current fleet is a mix of 30-ft., 35-ft., and 40-ft. Gillig diesel buses, and two 35-ft. battery electric buses (BEBs). The two BEBs have not been used for revenue service but will enter service in November of 2022. SMRT has another 16 BEBs on order with 10 of those scheduled for delivery by the summer of 2023 and the remaining 6 in early 2024. SMRT anticipates being 100% electric by 2024. However, the two BEBs have not yet been used for revenue service. The agency uses 18 vehicles to operate Santa Maria Regional Service, with an average route daily revenue vehicle mileage of 211 miles.

Buses are dispatched from the facility at 1303 Fairway Drive, Santa Maria, with layovers occurring at the transit center, Suey Crossing Road, and Bradley at Crossroads, Santa Maria. All vehicles are fueled at the public works yard, located at 810 W Church St., Santa Maria.

Wine Country Express

The Wine Country Express is operated by COLT and is a cooperative service provided by the Cities of Lompoc, Buellton, and Solvang, as well as Santa Barbara County. It operates Monday through Friday, three times a day. Buses depart at 7:25 a.m., 1:00 p.m., and 4:45 p.m., providing roundtrip service between Lompoc, Buellton, and Solvang (**Figure 3**).

Figure 3: Wine Country Express Service

COLT's current fleet is a mix of 28-ft. and 30-ft diesel cutaways and 3 diesel paratransit vans, with a total of 13 vehicles. The average route daily revenue vehicle mileage is 126 miles. Vehicles are dispatched from the corporate yard located at 1300 W. Laurel Ave., Lompoc.

SAN LUIS OBISPO REGIONAL TRANSIT AUTHORITY (RTA)

The San Luis Obispo Regional Transit Authority (RTA) provides regional service to all of San Luis Obispo County and parts of Santa Barbara County. It is a Joint Powers Authority (JPA) that connects cities including Arroyo Grande, Atascadero, Grover Beach, Morro Bay, Paso Robles, Pismo Beach, San Luis Obispo, and more. The RTA also oversees South County Area Transit (SCAT) which operates in Shell Beach, Pismo Beach, Grover Beach, Oceano, and Arroyo Grande.

The RTA's fixed-route service runs along Highways 1 and 101 to North County, the North Coast, and South County. Regional service consists of four fixed routes, summarized in **Table 4**, and shown schematically in the map in **Figure 4**.

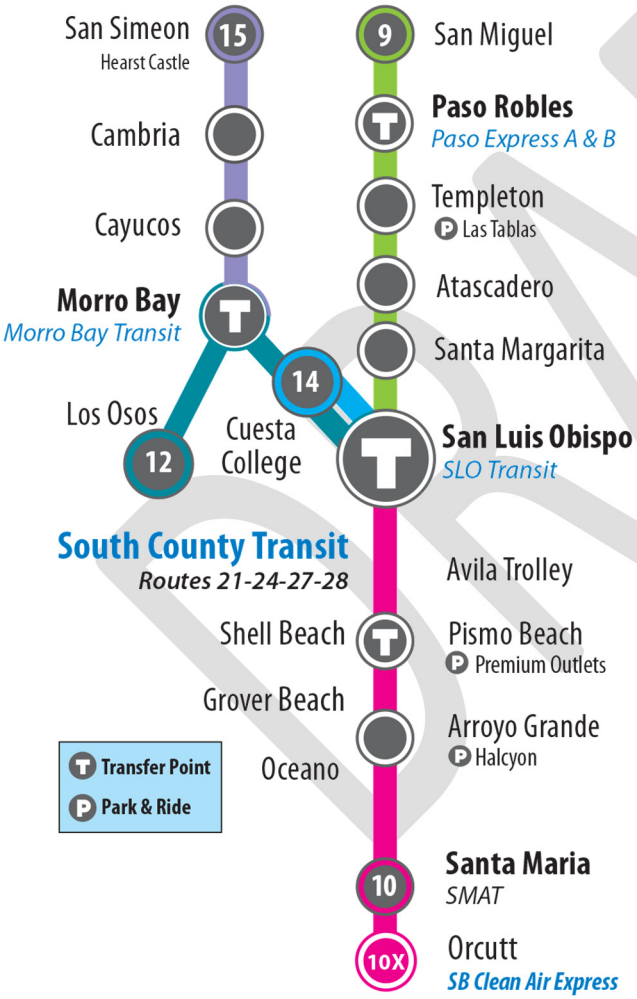
Table 4: RTA Regional Fixed Routes

Route	Service
Route 9	North County hourly, local and express service, plus limited Saturday and Sunday local service. Runs via Highway 101, between San Luis Obispo, Cal Poly (limited), Santa Margarita, Atascadero, Templeton, Paso Robles and San Miguel (limited). Operates seven days a week with less frequency on Saturdays and Sundays.
Route 10	South County weekday local and express service. Runs via Highway 101, between San Luis Obispo, Cal Poly, Shell Beach, Pismo Beach, Grover Beach, Arroyo Grande, Nipomo and Santa Maria. Operates seven days a week with less frequency on Saturdays and Sundays.

Reference: **CCZEV Strategic Study – Transit Agency Electrification Efforts**

Route	Service
Route 12	Service between Los Osos/Baywood Park/Morro Bay and San Luis Obispo. One 12 Cal Poly express trip (12X) operates between Los Osos, Morro Bay and Cal Poly. Operates seven days a week with less frequency on Saturdays and Sundays.
Route 15	North Coast provides service from Morro Bay to Cayucos, Cambria, San Simeon and to Hearst Castle on the weekends. Operates seven days per week.

Figure 4: SLORTA network map



Reference: **CCZEV Strategic Study – Transit Agency Electrification Efforts**

The RTA's current fleet for regional services includes heavy-duty diesel-powered buses, and gasoline-powered cutaways on Route 15. The roundtrip average mileage for 40-ft. buses operating on regional routes is 248 miles.

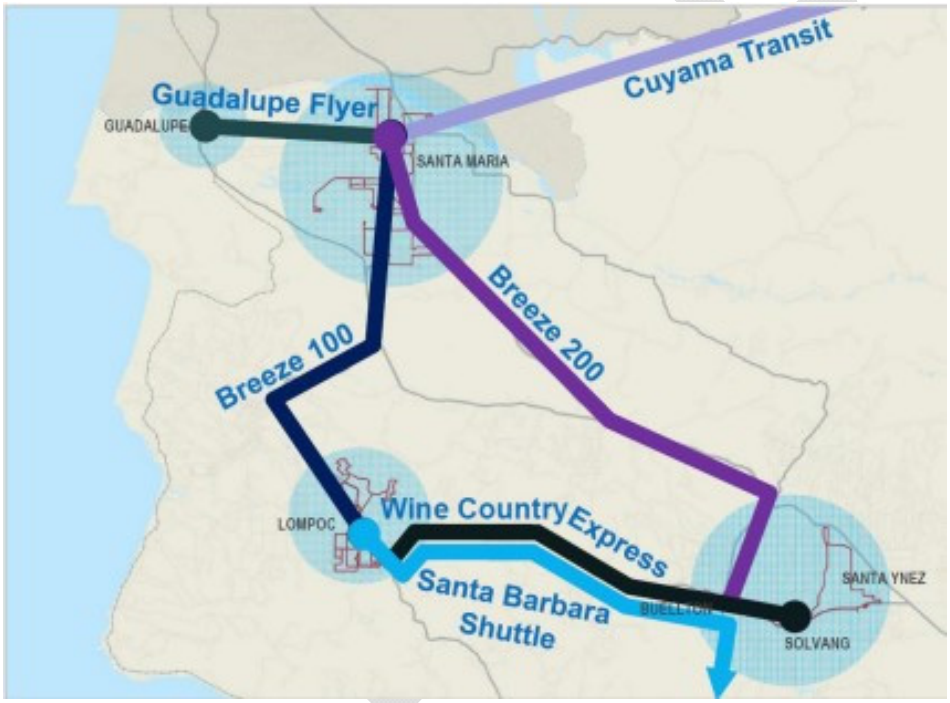
The RTA dispatches all vehicles from a newly built bus maintenance facility located at 253 Elks Lane, San Luis Obispo and utilizes park-outs in Paso Robles and Arroyo Grande.

The RTA does not currently operate any zero-emission buses (ZEBs), but they have issued a purchase order for two 40-ft. BEBs to be used primarily on Route 12, which is relatively flat and provides low-speed local service. In addition, the RTA plans to purchase five more BEBs early in 2023.

GUADALUPE TRANSIT

Guadalupe Transit provides a variety of services, including fixed-route, and paratransit service. The agency offers one regional route, the Guadalupe Flyer Express, which travels between Guadalupe and Santa Maria every hour, and one local route, the Guadalupe Flyer Local which travels within the City of Guadalupe every half-hour (**Figure 5**). The paratransit service operates on demand and provides service to a similar area.

Figure 5: Guadalupe Flyer



Guadalupe Transit's fleet consists of two 29-ft. and two 40-ft. diesel buses, and one gasoline paratransit van. The Guadalupe Flyer Express averages 240 daily revenue miles Monday through Sunday, and 184 revenue miles on a truncated Sunday schedule, and the Guadalupe Flyer Local averages 156 daily revenue miles Monday through Sunday, and 120 revenue miles on a truncated Sunday schedule.

Vehicles are dispatched from SMOOTH offices in Santa Maria at 240 E. Roemer Way, and layovers occur at the same facility. Vehicles are fueled at the City of Santa Maria's fuel depot.

MONTEREY-SALINAS TRANSIT DISTRICT (MST)

Monterey-Salinas Transit District (MST) provides service to the cities of Carmel, Del Rey Oaks, Gonzales, Greenfield, King City, Marina, Monterey, Pacific Grove, Salinas, Sand City, Seaside, Soledad, and the County of Monterey. In addition, MST also provides service to the nearby regions of San Jose, Santa Cruz, Paso Robles, and Templeton.

MST operates 50 local fixed routes and 7 regional commuter routes, with regional route lengths exceeding 120 miles. Regional routes are summarized in **Table 5**, and shown in **Figure 6** below.

Table 5: MST regional routes

Route	Service
20	Salinas to Monterey via Marina
23	Salinas to King City
24	Carmel Valley Grapevine Express
28	Watsonville to Salinas
29	Watsonville to Salinas via Prunedale
61	Salinas to DOD Clinic
64	King City to Paso Robles

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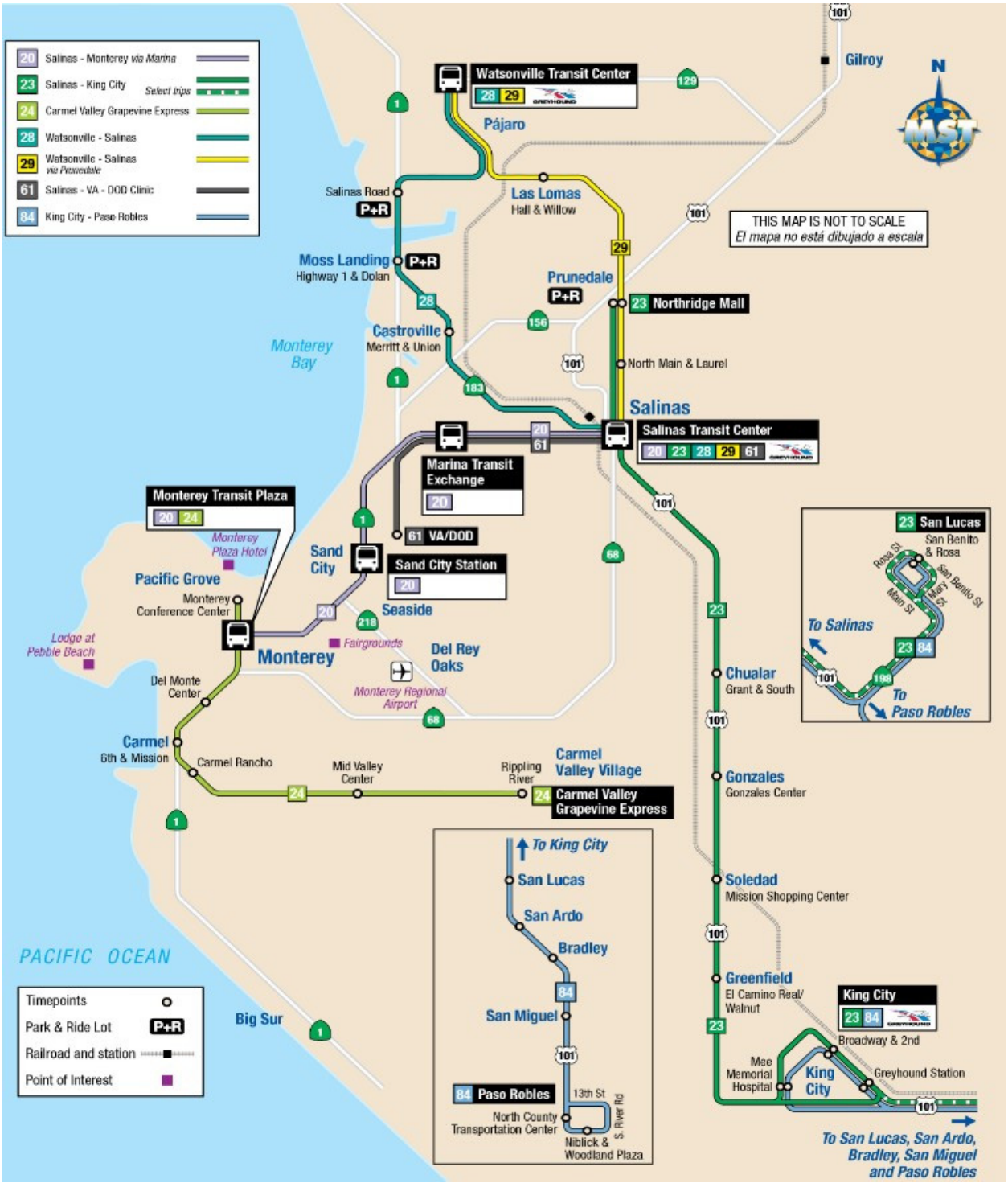
Reference: **CCZEV Strategic Study – Transit Agency Electrification Efforts**

Figure 6: MST regional services map



MST uses over-the-road coaches for high-mileage routes. Currently, MST has two 30-ft BEBs, two 40-ft BEBs, and one electric trolley that is charged on-route through a WAVE inductive charger near 201 Pearl Street, Monterey.

MST has three facilities, located at 1 Ryan Ranch Road, Monterey, 443 Victor Way, Salinas, and 170 East San Antonio Drive, King City. The Monterey, Salinas, and King City facilities are equipped with diesel and gasoline fueling stations. In addition, a privately owned facility at 4512 Joe Lloyd Way, Seaside, and is fully equipped with gasoline fueling stations. A summary of MST's facilities, functions, capacity, and infrastructure plans are summarized in **Figure 7**.

Figure 7: MST facilities

Facility	Address	Main function	Type(s) of infrastructure	Service capacity	Needs upgrade? (yes/no)	Estimated construction timeline
Monterey Garage	1 Ryan Ranch Rd, Monterey, CA 93940	Bus maintenance and storage	Charging Infrastructure, Liquid Hydrogen Infrastructure (if needed)	45 Vehicles	Yes	Completed by 2031
Salinas Garage	443 Victor Way, Salinas, CA 93907			31 Vehicles	Yes	Completed by 2031
Seaside Garage (privately operated)	4512 Joey Lloyd Way, Seaside, CA 93955	Para-transit vehicle maintenance and storage	Charging Infrastructure	81 Vehicles	Yes	Completed by 2031

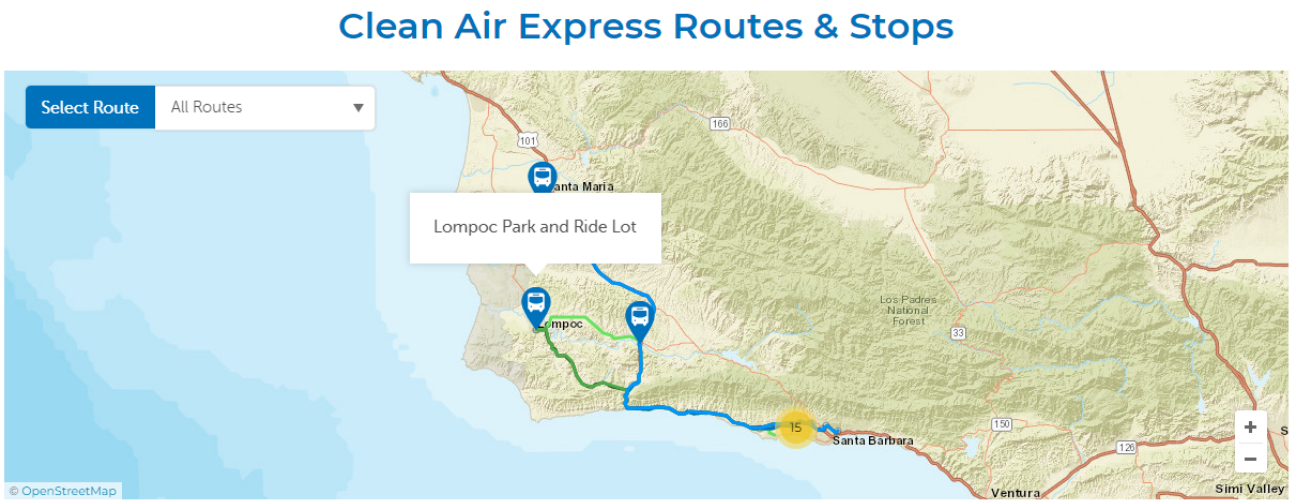
SANTA BARBARA COUNTY ASSOCIATION OF GOVERNMENTS (SBCAG)

SBCAG, in addition to its planning functions, operates a regional commuter service called the Clean Air Express. The Clean Air Express serves residents of Northern Santa Barbara County commuting to their jobs in Goleta and Santa Barbara, providing a fast, convenient, and money-saving way to get to work. The Clean Air Express has two main routes—a Lompoc set of routes operating between Lompoc and Goleta or UCSB or Santa Barbara, and a Santa Maria set of routes operating between Santa Maria and Goleta or Santa Barbara (**Figure 8**).

This service is operated with over-the-road motorcoaches fueled with diesel. The current service is operated with 9 vehicles, but pre-COVID and in the near future with the intent to restore service levels, 14 vehicles will be used. On average, vehicles operate 120 miles and a maximum of 170 miles on a typical day.

Buses are dispatched from Santa Maria and Lompoc early in the morning and run commuter routes to Goleta and Santa Barbara where they layover during the day. They then return to their origin city in the afternoon. Maintenance is performed in Grover Beach and fueling happens at the County fueling location 6416 Hollister Avenue, Goleta.

Figure 8: Clean Air Express Routes



SANTA CRUZ METRO

Santa Cruz METRO (METRO) offers a variety of services throughout Santa Cruz County, including fixed-route, paratransit, microtransit, and on-demand services. It operates one commuter service called the Highway 17 Express (**Figure 9**), between Santa Cruz and the San Jose Diridon Station. In addition, METRO operates 9 inter-city routes, summarized in **Table 6**.

Santa Cruz Metro uses 10 40-foot diesel hybrid buses to operate Route 17 Express, with trips averaging 68 miles round trip. Buses are dispatched from 1200 River St., Santa Cruz, and layovers occur at the Santa Cruz METRO Center, San Jose Diridon Station, and San Jose State University (SJSU).

Reference: **CCZEV Strategic Study – Transit Agency Electrification Efforts**

Figure 9: Santa Cruz METRO Route 17 Express

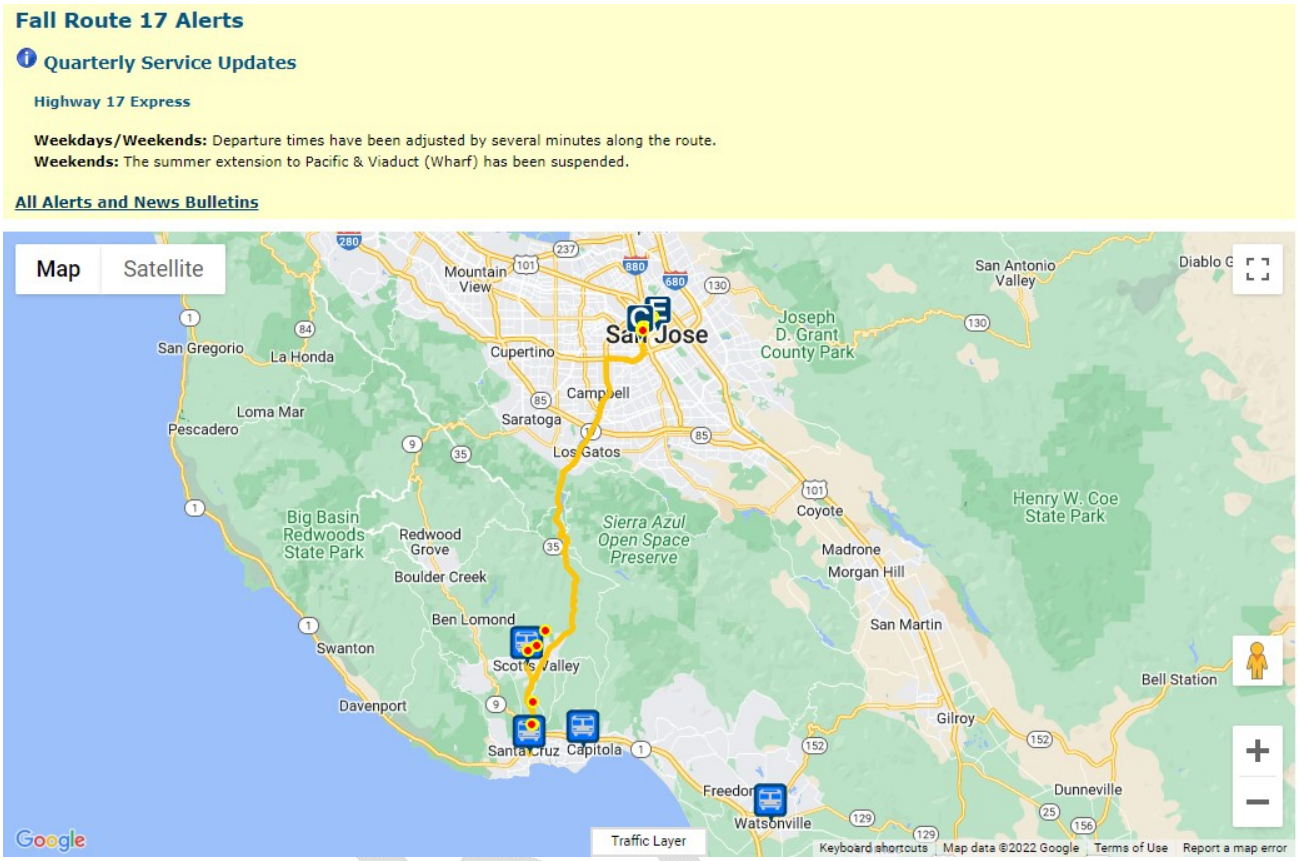


Table 6: Santa Cruz METRO Intercity Routes

Route	Service Description
35E	Service between Santa Cruz, Scotts Valley, and Redwood Grove. Operates on weekdays and weekends.
35	Service between Santa Cruz, Scotts Valley, and San Lorenzo Park. Operates on weekdays and weekends.
40	Service between Santa Cruz and Davenport. Operates on weekdays only.
41	Service between Santa Cruz and Bonny Doon. Operates on weekdays only.
42	Service between Santa Cruz, Davenport, and Bonny Doon. Operates on weekdays and weekends.
69W	Service between Santa Cruz and Watsonville. Operates on weekdays and weekends.
69A	Service between Santa Cruz and Capitola. Operates weekdays and weekends.
71	Service between Santa Cruz and Watsonville. Operates weekdays and weekends.
91X	Express service between Santa Cruz and Watsonville via Cabrillo Highway. Operates weekdays only.

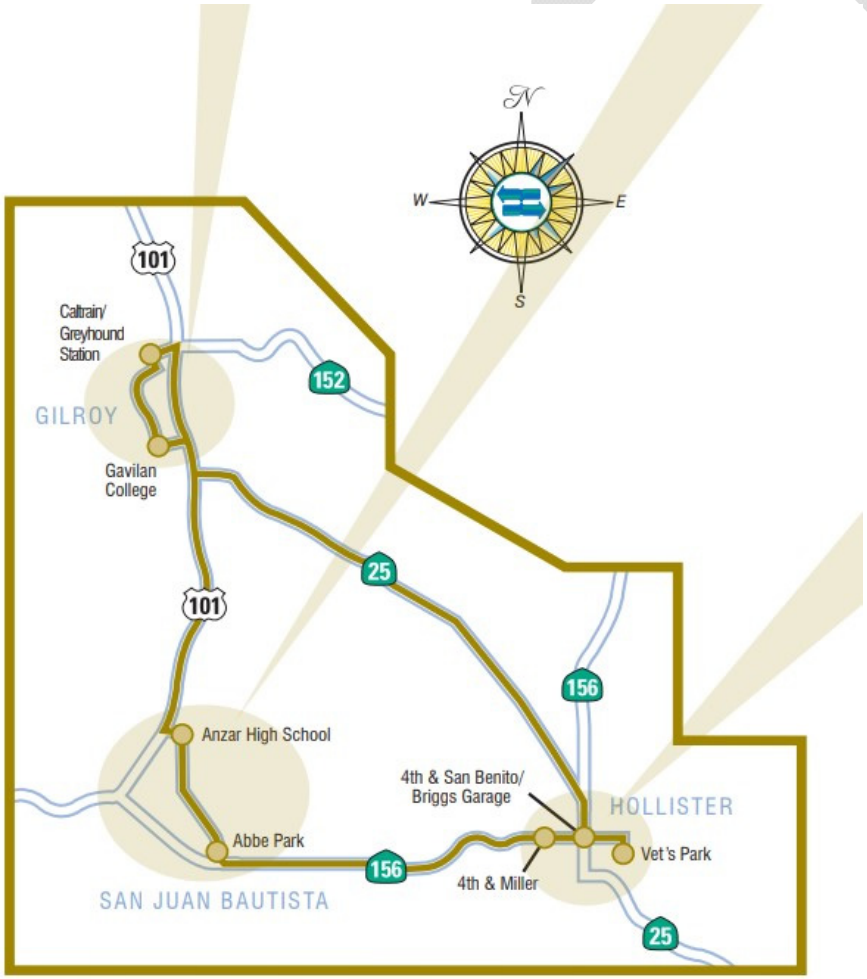
Reference: **CCZEV Strategic Study – Transit Agency Electrification Efforts**

SAN BENITO COUNTY LTA

The San Benito County Local Transportation Authority (LTA) operates the San Benito County Express, providing service to the communities of Hollister, San Juan Bautista, and Gilroy. The agency provides intercounty service to Gilroy's Caltrain and Greyhound Stations and Gavilan College with connecting service to the Santa Clara VTA bus system. County Express provides service along three routes, shown in Figure 10.

- Gavilan College: service to Gavilan College between Hollister, San Juan Bautista, and Gilroy
- Caltrain: express bus service to the Caltrain commuter rail station in Gilroy
- Gilroy Greyhound: weekend service to the Greyhound Bus Terminal in Gilroy

Figure 10: San Benito County LTA intercounty service



Reference: CCZEV Strategic Study – Transit Agency Electrification Efforts

County Express also provides an on-demand service throughout Hollister, San Juan Bautista, and Tres Pinos, as well as ADA paratransit service. Paratransit service is available in any area within ¾ miles of the County Express fixed route service.

LTA currently uses cutaways, specialized transportation cutaways, and minivans to operate its intercounty and specialized transportation services. County Express utilizes 5 diesel vehicles, with 4 gasoline vehicles being used for specialized transportation. The average mileage for a round trip is 50 miles and 60 miles for intercounty and specialized transportation services respectively.

County Express is dispatched and fueled from LTA's yard in Hollister, and layovers occur at Gavilan College and Gilroy Transit Center. Specialized transportation is dispatched from the Hollister Community Center and is fueled at the yard in Hollister. Cutaway layovers occur at the dialysis centers in Gilroy and Morgan Hill, and minivan layovers occur at various medical facilities in the area.

SANTA BARBARA MTD

Santa Barbara MTD operates public transit services throughout the South Coast region of Santa Barbara County, including the City of Santa Barbara, Goleta, Isla Vista, and Carpinteria. MTD's services are mainly local, and are not regional in nature. However, Line 20 between downtown Santa Barbara and Carpinteria—a distance of about 11 miles one-way—could be considered 'interregional' and is the service considered in the scope of this memo. Line 20 operates every day for most of the day, with headways on the order of 20-minutes during peaks, and 30-60 minutes during off-peaks. This service is operated with heavy-duty 40-ft diesel-powered transit buses (**Figure 11**).

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Reference: **CCZEV Strategic Study – Transit Agency Electrification Efforts**

Figure 11: MTD Line 20 between Santa Barbara and Carpinteria

MTD's fleet is mainly composed of 30-ft and 40-ft buses powered by diesel fuel, including diesel-electric hybrids. Currently, MTD operates 13 BEBs on one of its lines within the City of Santa Barbara and is in the process of acquiring 9 additional BEBs for deployment in early 2023.

MTD's main operating and maintenance facility (Terminal 1) is located at 550 Olive St in downtown Santa Barbara and MTD is in the process of installing bus chargers in the yard. Furthermore, MTD owns another transit facility, Terminal 2, in Goleta at 5353 Overpass Rd; this facility will be reactivated in the next few years to relieve limited space pressures at Terminal 1. Terminal 2 will be developed to accommodate a diesel fleet initially, and eventually a BEB fleet.

Reference: **CCZEV Strategic Study – Transit Agency Electrification Efforts**

VENTURA COUNTY TRANSPORTATION COMMISSION (VCTC)

Ventura County Transportation Commission (VCTC) is the transportation planning body for the County of Ventura. Apart from its planning functions, VCTC also plans and operates transit services, including commuter type services between cities within the county and between Ventura County and Santa County, as well as local services in the northeastern portions of the county called the Valley Express. The service of interest for the CCZEV study is the Intercity Express service called the Coastal Express between Camarillo, Ventura, and Goleta in Santa Barbara County (**Figure 12**).

Figure 12: VCTC Intercity map (top) and Coastal Express map (bottom)

The Coastal Express service currently operates with over-the-road diesel powered motorcoaches (20 buses are used throughout the day on this service). The scheduled service is mainly geared to commuters and operates during rush hours, with limited midday service. Service on the weekends is limited to five round trips. While the alignment between the two terminals is over 50 miles, VCTC operates variants of the Coastal Express service so that not all stops are served on all trips, resulting in different 'routes'.

VCTC, through an agreement with SBCAG, has recently procured BYD BEB motorcoaches for deployment on the Coastal Express service. Five BEBs are slated to begin operation sometime in 2023 with charging planned to occur at SBCAG's facility in Goleta. Currently, there are no immediate plans to charge buses at VCTC's Intercity facility (not owned by VCTC) at 240 South Glenn Drive in Camarillo. While VCTC owns its fleet, operations and maintenance of the fleet and services is through a third-party contractor, who also provides an operations and maintenance facility, i.e., VCTC does not operate its fleet directly nor does it directly own an operations and maintenance facility.

4. CURRENT & FUTURE ELECTRIFICATION STATUS

This section summarizes the current electrification efforts of the transit agencies in the CCZEVS study area for their interregional routes. Notably, a few agencies have deployed BEBs and some are in the process of procuring BEBs, but most are not operating ZEBs. Several are in the process of developing state-compliant ZEB Rollout Plans and are at various stages.

SANTA MARIA REGIONAL TRANSIT & CITY OF LOMPOC TRANSIT

Santa Maria Regional Transit has recently received 2 Proterra BEBs (Model ZX5+) but have yet to deploy them; SMRT is waiting for the delivery and installation of their bus chargers. SMRT's CARB-compliant plan is nearly 95% complete and will focus on deploying battery-electric technology. Potential charger types and locations are currently in development.

The City of Lompoc Transit does not have any ZEBs in operation and is currently developing a CARB-compliant plan. The preferred technology and charging method is being examined to inform the rollout plan.

SAN LUIS OBISPO RTA

The RTA has issued a purchase order for two 40-ft. BEBs to be used primarily on Route 12, which is relatively flat and mostly provides low-speed local service. In addition, the RTA plans to purchase five more BEBs early in 2023. At the end of 2022, four fast-charging dispensers should be installed and operational in RTA's new bus maintenance facility.

The RTA is on track to complete its ZEB Rollout Plan soon and is looking to deploy BEBs. However, the RTA recognizes that several of its operating profiles may be too strenuous for the operating ranges of BEBs (due to duty cycles, terrain, mileages, etc.) recognizing the need to have layover charging its bus park outs in Paso Robles and in Arroyo Grande, as well as other layover locations in San Luis Obispo, Morro Bay, and Santa Maria.

GUADALUPE TRANSIT

The Guadalupe Transit does not currently operate ZEBs and has not developed its ZEB Rollout Plan. However, the City of Guadalupe is planning to transition its fleet to BEBs and charge in-depot at its corporation yard at 240 E. Roemer Way, Santa Maria.

MONTEREY-SALINAS TRANSIT

MST currently operates 5 BEBs on local services. For interregional services, MST's CARB-compliant ZEB Rollout Plan tentatively indicates that it will explore not only BEBs, but likely hydrogen fuel cell-electric bus (FCEB) technology since these vehicles are able to travel longer distances[4]. In the shorter term, BEBs will be procured and beyond 2027, FCEBs are planned to replace fossil fuel buses on the longest operating routes, particularly intercity routes. MST's fleet transition schedule is summarized in **Figure 13**.

Figure 13: MST fleet transition schedule

ICT Requirement	Year	ZEB				Conventional				Total Purchased
		Qty.	% of Total	Bus Length	Technology	Qty	% of Total	Bus Length	Fuel	
0%	2022					7	100%	40′	Diesel	7
	2023	4	100%	35′ Bus	Battery - Depot					7
		3		40′ Bus	Battery - Depot					
	2024	2	100%	35′ Bus	Battery - Depot					9
		7		40′ Bus	Battery - Depot					
	2025									
25%	2026									
	2027	11	100%	35′ Bus	FCEB*					18
		7		40′ Bus	FCEB*					
	2028									
100%	2029									
	2030	20	100%	40′ Bus	FCEB*					31
		11		35′ Bus	FCEB*					
	2031									
	2032									
	2033									
	2034	7	100%	40′ Bus	FCEB*					7

SBCAG

SBCAG has procured one BYD BEB over-the-road coach (model C10). The proprietary BYD charger (which is not interoperable with other bus manufacturers) is located SBCAG's Regional Transit Facility at 6416 Hollister Ave in Goleta. Currently, the power output is limited to 25 kW (but has a 200 kW rated output) due to power

[4] https://mst.org/wp-content/media/MST-ICT-Final-Adopted-20211213.pdf

availability from the utility (SCE) at the site. SBCAG hopes to deploy the BEB shortly on the Clean Air Express service.

SBCAG has not yet developed its CARB-compliant ZEB Rollout Plan. SBCAG is likely looking to pursue a battery-electric fleet in the future and is currently working closely with SCE to install Level 2 chargers and Level 3 chargers at the Regional Transit Facility. SBCAG is exploring opportunities to partner with VCTC for charging at that facility.

SANTA CRUZ METRO

Santa Cruz METRO is actively developing its ZEB rollout plan. Although they are not currently operating ZEBs, they have 4 Proterra BEBs on order. METRO received a Low-No grant in 2016 and has encountered numerous challenges finding vehicles that provide adequate range to cross the steep grades and long distances along the Highway 17 Express route. The agency will be utilizing in-depot charging.

SAN BENITO COUNTY LTA

San Benito County LTA is not currently operating ZEBs and plans to apply for funding to develop their ZEB transition plan. In the LTA Short Range Transit Plan (SRTP), the agency discusses the transition to BEBs, including the installation of electric charging infrastructure. The first round of public outreach yielded positive public sentiment and overall support of the purchase of ZEBs, and the SRTP recommends early adoption of ZEBs. The SRTP outlines a redesign of the maintenance and storage yard to include EV charging capabilities in 2023-2024. In addition, the report provides a general timeline for procuring BEBs in 2022-2023, 2024-2025, and 2026-2027 (**Figure 14**).[5]

Figure 14: San Benito County 2022-2027 Estimated Vehicle Capital Costs

Vehicle Estimated Capital Expenditures	Cost Estimate
2022-23	
2 - 27'-32' Transit bus (battery electric)	$ 1,500,000
2 - Gasoline Vans	$ 110,000
2023-24	
None	
2024-25	
2 - Gasoline 16 Pass+2 Wheelchair Cutaways	$ 140,000
1 27'-32' Transit bus (battery Electric)	$ 750,000
2025-26	
None	
2026-27	
Option A: 4 -16 pass + 2 WC Cutways (Battery Electric)	$ 1,480,000
Option A: 2 - 27'-32' Transit Bus (Battery electric)	$ 2,250,000
Option B: 6 - 27'-32' Transit Bus EV (Battery electric)	$ 5,250,000
Total Option A	$ 6,230,000
Total Option B	$ 7,750,000

[5] San Benito Short Range Transit Plan, May 2022 http://sanbenitocog.org/wp-content/uploads/2022/06/Final-Draft-SRTP-Report-For-June-Board-Release_June-12-2022.pdf

SANTA BARBARA MTD

Santa Barbara MTD currently operates 14 BEB BYDs equipped for in-depot charging. However, no BEBs operate on Line 20 route currently.

MTD is actively developing its ZEB rollout plan and is exploring all technologies and feasible options. At the moment, the analysis is trending towards a fleet of BEBs that charge in-depot only. On-route charging is unlikely needed due to the route lengths being within the operating limits of BEBs. Moreover, due to zoning and community preferences, it is unlikely that MTD will be able to install on-route chargers on public property. Nonetheless, there may be interest at a later time for deploying chargers (either low power or high power) in Carpinteria, potentially to recharge smaller microtransit electric vans planned for deployment on MTD's microtransit service in the next few years.

VCTC

VCTC is currently planning to deploy 5 BYD BEB motorcoaches on the Coastal Express in 2023 and plans to recharge buses in Goleta at SBCAG's facility at 6416 Hollister Ave in Goleta; as described under the SBCAG section, this facility has one AC BYD proprietary charger rated at 200 kW, but currently limited to 25 kW. SBCAG is working with SCE to install 2 Level 2 chargers and 2 Level 3 fast chargers at the SBCAG Regional Transit Center.

Apart from these electrification plans, VCTC is currently developing its ZEB rollout plan and is in the process of route modeling to understand the feasibility of different technologies and their implications for operations. Apart from BE coaches, VCTC is also exploring the potential use of hydrogen FCE over-the-road coaches for a few reasons. First, FCEVs have longer operating ranges than BEBs, using hydrogen fuel stored in onboard tanks to power a battery to propel the vehicle. Second, the local transit agency in Oxnard, Gold Coast Transit District (GCTD), is planning to deploy FCEBs and build a hydrogen fueling station capable of supplying hydrogen to VCTC in the near future. Thus, VCTC could reduce capital expenses and leverage local infrastructure to fuel possible FCEBs. Nonetheless, one key challenge is the current lack of readily available hydrogen-powered over-the-road coaches.

Based on this assessment, for its regional service, in the short-term, VCTC will take advantage of the chargers at the SBCAG Regional Transit Center for charging and will also likely need chargers in the Camarillo area. In the longer-term, if VCTC continues to pursue a BEB fleet for the Coastal Express, these charging needs would remain, and if the fleet alternative is an FCEB fleet, then VCTC will no longer need charging for the Coastal Express and would leverage fueling at GCTD's yard in Oxnard.

5. CHALLENGES RELATED TO TRANSIT FLEET ELECTRIFICATION

There are several key challenges and risks to the regional electrification efforts of the CCZEVS transit agencies.

First is the challenge of operating range for long, intercity journeys. BEBs and to a lesser extent, FCEBs, have shorter operating ranges than fossil fuel equivalents. This means it will be harder to convert these routes to ZEBs without significant impacts to bus operations, such as midday charging/fueling, deploying more vehicles to provide the same level of service, and so on. Moreover, the range challenge is compounded by gradients and topographical challenges that worsen fuel economy and thus operating range. For example, the Cuesta Grade in San Luis Obispo is a challenging terrain along the 101-Fwy between San Luis Obispo and Paso Robles, as well as along the 101-Fwy between Santa Maria and Isla Vista, and steep terrain along the 1-Fwy between Las Cruces and Lompoc.

Second are vehicle related challenges. While full size 40-ft ZEBs are beginning to approach the ranges of fossil fuel equivalents, the nature of intercity operations is such that motorcoaches are generally deployed on these routes to provide enhanced customer comfort. ZE motorcoach models are rather limited, and have much shorter ranges (100-150 miles) than fossil fuel motorcoaches (300+ miles). In addition, several of the agencies considered in this memo operate cutaway buses or smaller vans that carry small batteries and thus small ranges. Nonetheless, manufacturers continue to improve upon their technologies and the maturation of the market may minimize many of these challenges in the coming years.

A third challenge is charging. While some of the services described above have downtime (known in the industry as 'recovery' or 'layover' time) between runs that can be used for recharging, the agency must consider the trade-offs between operational downtime to charge, ensuring enough vehicles are available for service, and that enough time is available to charge. This last consideration will depend on the power output of the charger, as well as the state of charge of the battery. High power chargers (150 kW+) are generally more expensive and will more quickly recharge a vehicle, but not all vehicle types may be able to accept high power charging without specific modifications, particularly smaller cutaways vehicles, limiting the ability to 'fast charge'.

A lack of financial resources is a challenge that many transit agencies face. There are several state and federal funding opportunities available, but a full fleet transition is a costly endeavor to cover the cost of new buses, potential facility renovations, and charging infrastructure. In addition, the operation of zero-emission regional services also poses several logistical challenges. Agencies will need to develop plans for and agree upon how to handle maintenance, operating, and electricity costs for shared fueling.

Lastly, adopting ZEB technology will require extensive operation and maintenance training. This can pose several challenges due to staffing shortages and lack of training resources, especially for rural agencies with small staff and limited capabilities.

6. FUTURE ELECTRIFICATION NEEDS

The service providers outlined in this memo are at various stages of their electrification efforts. While some have fully developed ZEB rollout plans that are being implemented, many are just starting to develop their plans and are at the beginning stages of navigating their fleet transitions. **Table 7** summarizes each provider's electrification planning status, the fuel type(s) in consideration, and the preferred method of charging.

Table 7: Regional transit provider electrification status and needs

Provider	ZEB planning status	ZEB Technology	Fueling/Charging
Santa Maria Regional Transit (SMRT)	• Currently operating BEBs • ZEB rollout plan 95% complete	BEB	Charger types and locations are in development
City of Lompoc Transit (COLT)	ZEB rollout plan is in development	In development	In development
San Luis Obispo Regional Transit Authority (RTA)	• ZEB rollout plan is in development • Goal to present draft January 2023	BEB	• Primarily depot charging • Possible on-route charging
Guadalupe Transit	ZEB rollout plan in development	BEB	Depot charging
Monterey-Salinas Transit District (MST)	ZEB rollout plan complete	• BEBs identified as the preferred technology • FCEBs will be used on long-distance routes that cannot be served by BEBs	• Depot charging for BEBs • Hydrogen infrastructure is in development
Santa Barbara County Association of Governments (SBCAG)	ZEB rollout plan in development	BEB	Depot
Santa Cruz METRO	ZEB rollout plan in development	BEB	Depot charging
San Benito County	Plan to apply for funding to develop ZEB rollout plan	In development	In development
Santa Barbara MTD	ZEB rollout plan is in development	BEB	Depot
Ventura County Transportation Commission (VCTC)	ZEB rollout plan is in development	• BEB • Hydrogen	• Depot • On-route • Hydrogen fueling

Similarly, each provider has a unique fleet with varying levels of ZEB penetration. A summary of the providers' current fleet status is provided in **Table 8**.

Table 8: Regional transit provider fleet status

Provider	Fleet providing regional service	Number of ZEBs in fleet	Number of ZEBs providing regional service
Santa Maria Regional Transit (SMRT)	18 diesel buses	2 35-ft. BEBs to be in service soon	None
City of Lompoc Transit (COLT)	• 10 cutaways • 3 vans	None	None
San Luis Obispo Regional Transit Authority (RTA)	• Vehicles are mixed between the local and regional services • 40-ft. diesel buses, cutaways, minivans	None	None
Guadalupe Transit	• 4 diesel buses • 1 van	None	None
Monterey-Salinas Transit District (MST)	• 4 over-the-road coaches	• 1 battery electric trolley • 2 30-ft. BEBs • 2 40-ft. BEBs	None
Santa Barbara County Association of Governments (SBCAG)	• 9 diesel over the road coaches • 4 spares	1 BYD C10 2022 will be in service soon	None
Santa Cruz METRO	• 10 40-ft. diesel hybrid buses	None	None
San Benito County Express	• 5 cutaways • 4 specialized transportation	None	None
Santa Barbara MTD	7 diesel buses	14 BEBs	None
Ventura County Transportation Commission (VCTC)	20 diesel buses	5 BYD BEBs will be in operation in 2023	None

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