



Agenda Item No. (4)

To: Transportation Committee / Committee of the Whole
Meeting of May 20, 2021

From: Keith Nunn, Director of Maintenance, Bus Division
Mona Babauta, Deputy General Manager, Bus Division
Denis J. Mulligan, General Manager

Subject: **APPROVE THE DISTRICT'S ZERO-EMISSION BUS (ZEB) ROLLOUT
PLAN AND BOARD RESOLUTION FOR SUBMITTAL TO THE
CALIFORNIA AIR RESOURCES BOARD (CARB)**

Recommendation

The Transportation Committee recommends that the Board of Directors approve the Golden Gate Bridge, Highway and Transportation District's (District) Zero-Emission Bus (ZEB) Rollout Plan and Board Resolution for submittal to and in compliance with the California Air Resources Board (CARB) Innovative Clean Transit (ICT) regulation.

This matter will be presented to the Board of Directors at its May 21, 2021 meeting for appropriate action.

Summary

In December 2018, CARB adopted the ICT regulation, requiring all public transit agencies in the state to transition gradually to an all-ZEB fleet, such as battery-electric or fuel-cell electric, with a goal of full implementation by 2040. The ICT regulation first requires large transit agencies to create a ZEB rollout and implementation plan that outlines how agencies intend to achieve the transition to an all-ZEB fleet. This plan was initially due to CARB by July 1, 2020. As a result of the COVID-19 pandemic, CARB granted large transit agencies an extension on submitting their rollout plans. The District received confirmation from CARB that the ZEB Rollout Plan could be submitted by May 31, 2021.

The main provisions of the ICT Regulation include:

- Transit agencies that operate a fleet larger than 65 buses are required to submit a ZEB Rollout Plan;
- Transit agencies must purchase a minimum number of ZEBs during future procurements according to the following schedule:
 - Starting in 2023, 25 percent of new bus purchases must be ZEB (applies to 40-ft. buses only);

- Starting in 2026, 50 percent of all new bus purchases must be ZEBs (40-foot, 60-foot, and Motor Coaches); and
 - Starting in 2029, 100 percent of all new bus purchases must be ZEBs.
- Transit agencies can earn credits to offset the 2023 and 2026 ZEB purchase requirements by utilizing zero-emission vehicles not covered by the ICT regulation; and,
 - The minimum ZEB purchase requirement may be delisted if a certain number of ZEBs are purchased statewide by the end of 2020 and 2021.

In April 2020, the District retained Stantec Consulting Services Inc. (Stantec) to develop the District's ZEB Rollout and Implementation Plan.

Based on a predictive energy and power modeling exercise and analysis, Stantec has recommended that the District adopt a battery-electric bus fleet for both 40-ft. buses and motor coaches, according to the following purchase schedule.

<u>Timeline (Year)</u>	<u>Total # of Buses to Purchase</u>	<u># of ZEB Purchases</u>	<u>% of Annual ZEB Purchases</u>	<u>ZEB Bus Type(s)</u>	<u>ZEB Fuel Type(s)</u>	<u># of Conv. Bus Purchases</u>	<u>% of Annual Conv. Bus Purchases</u>	<u>Type(s) of Conv. Buses</u>	<u>Fuel Type(s) of Conv. Buses</u>
2021	0	0	N/A	N/A	N/A	0	N/A	N/A	N/A
2022	0	0	0%	N/A	N/A	0	N/A	N/A	N/A
2023	0	0	N/A	N/A	N/A	0	N/A	N/A	N/A
2024	23	0	N/A	N/A	N/A	23	100%	23 motor coach	Diesel
2025	0	0	N/A	N/A	N/A	0	N/A	N/A	N/A
2026	32	16	50%	16 motor coach	BEB	16	50%	16 motor coach	Diesel
2027	0	0	N/A	N/A	N/A	0	N/A	N/A	N/A
2028	0	0	N/A	N/A	N/A	0	N/A	N/A	N/A
2029	25	25	100%	25 motor coach	BEB	0	0%	N/A	N/A
2030	0	0	N/A	N/A	N/A	0	N/A	N/A	N/A
2031	20	20	100%	20 standard	BEB	0	0%	N/A	N/A
2032	47	47	100%	47 standard	BEB	0	0%	N/A	N/A
2033	0	0	N/A	N/A	N/A	0	N/A	N/A	N/A
2034	0	0	N/A	N/A	N/A	0	N/A	N/A	N/A
2035	0	0	N/A	N/A	N/A	0	N/A	N/A	N/A
2036	0	0	N/A	N/A	N/A	0	N/A	N/A	N/A
2037	0	0	N/A	N/A	N/A	0	N/A	N/A	N/A
2038	23	23	100%	23 motor coach	BEB	0	0%	N/A	N/A
2039	0	0	N/A	N/A	N/A	0	N/A	N/A	N/A
2040	32	32	100%	32 motor coach	BEB	0	0%	N/A	N/A

Stantec developed a Rollout Plan to guide the District's conversion to a ZEB fleet. Per the requirements of the ICT regulation, the Rollout Plan includes required information from the following sections:

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

The required information is included in Attachment A, the Zero-Emission Bus Rollout Plan for the District to be submitted to CARB. Additional details and information is included in Attachment B, the Full Zero-Emission Bus Rollout Plan for the District.

The Rollout Plan is a living document intended to guide the agency's conversion to a ZEB fleet and may be updated based on changes in vehicle technology, fleet size, and operating requirements.

Fiscal Impact

There is no fiscal impact for the Board of Directors to approve adoption of the Zero-Emission Bus (ZEB) Rollout Plan. However, there will be a significant fiscal impact as the District implements this plan over the next ten years. Staff have identified projects for ZEB implementation in the District's 10-year plan, and will seek to secure grant funds to support the District's future investments in ZEB infrastructure and vehicle purchases.

Attachments: A. Zero-Emission Bus Rollout Plan for Golden Gate Transit to be submitted to CARB
B. Draft Board Resolution
C. Full Zero-Emission Bus Rollout Plan for Golden Gate Transit Presentation

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Zero-Emission Bus Rollout Plan

Section A: Transit Agency Information

Please provide the following information regarding your agency.

Golden Gate Bridge, Highway and Transportation District (GGT)

1101 Andersen Dr
San Rafael, CA 94901

GGT is part of Bay Area Air Quality Management District (AQMD) and part of the San Francisco Bay Area Air Basin.

Peak Vehicles: 126
Population: 903,524¹

Contact Information:

Nunn, Keith
Director of Maintenance
415-257-4459
KNunn@goldengate.org

GGT is not part of a Joint Zero-Emission Bus Group.

Section B: Rollout Plan General Information

1. *Does your transit agency's Rollout Plan have a goal of full transition to zero-emission technologies by 2040 that avoids early retirement of conventional transit buses? Yes*
2. *The ICT regulation requires 100% ZEB purchases in 2029. Conventional transit buses that are purchased in 2028 could be delivered in or after 2029. Please explain how your transit agency plans to avoid potential early retirement of conventional buses in order to meet the 2040 goal.*
Optional
3. *When did your transit agency's board or governing body approve the Rollout Plan?*
 - a. Approval date (MM/DD/YYYY)
 - b. Resolution number (optional)
 - c. *Is a copy of the board approved resolution attached to the Rollout Plan submitted to CARB? Yes (required)*
4. *Contact information for follow-up on details of the Rollout Plan (Optional)*
 - a. Keith Nunn
 - b. Director of Maintenance
 - c. 415-257-4459
 - d. knunn@goldengate.org
5. *Who created the rollout plan? My transit agency/A consultant (optional)*

¹ Population and peak vehicles from NTD 2019 profile



- a. *If consultant, please identify the company name*
6. *Cost for Rollout Plan creation (Optional)*
7. *How many person-hours did it take to create the Rollout Plan? (Optional)*

Section C: Technology Portfolio

What type(s) of zero-emission bus technologies (e.g. battery electric and fuel cell electric buses) does your transit agency plan to deploy through 2040?

GGT plans to deploy battery electric buses (BEBs).

Section D: Current Bus Fleet Composition and Future Bus Purchases

Please complete Table 2 regarding expected future bus purchases, including the number of buses in total expected to be purchased or leased in the year of purchase. Identify the number and percentage of ZEBs of the total bus purchases each year, as well as bus types and fuel types. Identify the same type of information for purchases of conventional buses. Bus types include standard, articulated, over-the-road, double decker, and cutaway buses. For zero-emission technologies, identify the fuel type as diesel, CNG, LNG, diesel hybrid (dHEB), gasoline hybrid (gHEB), propane, or gasoline.

2. Table 2a represents the anticipated 40' buses that will be purchased in the future and Table 2b represents anticipated motor coach purchase schedule.

Table 2a: Future 40' and Motor Coach Bus Purchases (Required)

<u>Timeline (Year)</u>	<u>Total # of Buses to Purchase</u>	<u># of ZEB Purchases</u>	<u>% of Annual ZEB Purchases</u>	<u>ZEB Bus Type(s)</u>	<u>ZEB Fuel Type(s)</u>	<u># of Conv. Bus Purchases</u>	<u>% of Annual Conv. Bus Purchases</u>	<u>Type(s) of Conv. Buses</u>	<u>Fuel Type(s) of Conv. Buses</u>
2021	0	0	N/A	N/A	N/A	0	N/A	N/A	N/A
2022	0	0	0%	N/A	N/A	0	N/A	N/A	N/A
2023	0	0	N/A	N/A	N/A	0	N/A	N/A	N/A
2024	23	0	N/A	N/A	N/A	23	100%	23 motor coach	Diesel
2025	0	0	N/A	N/A	N/A	0	N/A	N/A	N/A
2026	32	16	50%	16 motor coach	BEB	16	50%	16 motor coach	Diesel
2027	0	0	N/A	N/A	N/A	0	N/A	N/A	N/A
2028	0	0	N/A	N/A	N/A	0	N/A	N/A	N/A
2029	25	25	100%	25 motor coach	BEB	0	0%	N/A	N/A
2030	0	0	N/A	N/A	N/A	0	N/A	N/A	N/A
2031	20	20	100%	20 standard	BEB	0	0%	N/A	N/A
2032	47	47	100%	47 standard	BEB	0	0%	N/A	N/A



<u>Timeline (Year)</u>	<u>Total # of Buses to Purchase</u>	<u># of ZEB Purchases</u>	<u>% of Annual ZEB Purchases</u>	<u>ZEB Bus Type(s)</u>	<u>ZEB Fuel Type(s)</u>	<u># of Conv. Bus Purchases</u>	<u>% of Annual Conv. Bus Purchases</u>	<u>Type(s) of Conv. Buses</u>	<u>Fuel Type(s) of Conv. Buses</u>
2033	0	0	N/A	N/A	N/A	0	N/A	N/A	N/A
2034	0	0	N/A	N/A	N/A	0	N/A	N/A	N/A
2035	0	0	N/A	N/A	N/A	0	N/A	N/A	N/A
2036	0	0	N/A	N/A	N/A	0	N/A	N/A	N/A
2037	0	0	N/A	N/A	N/A	0	N/A	N/A	N/A
2038	23	23	100%	23 motor coach	BEB	0	0%	N/A	N/A
2039	0	0	N/A	N/A	N/A	0	N/A	N/A	N/A
2040	32	32	100%	32 motor coach	BEB	0	0%	N/A	N/A

- GGT is not considering converting some conventional buses to zero-emission buses. GGT will purchase zero-emission vehicles for replacement of buses per the timeline above.

Section E: Facilities and Infrastructure Modifications

1. Please complete Table 5 with names, locations, and main functions of transit agency divisions or facilities that would be involved in deploying and maintaining zero-emission buses. Please limit the facilities to bus yards and facilities with maintenance, fueling, and charging functions, and exclude other operational functions like training centers, information and trip planning offices, and administrative buildings.

- GGT will have some modifications to its divisions to accommodate the transition to zero-emission. Below is a table of facilities and infrastructure modifications.

Table 5: Facilities Information and Construction Timeline (Required)

<u>Division/ Facility Name</u>	<u>Address</u>	<u>Main Function(s)</u>	<u>Type(s) of Infrastructure</u>	<u>Service Capacity</u>	<u>Needs Upgrade? (Yes/No)</u>	<u>Estimated Construction Timeline</u>
San Rafael (Division 1)	1101 Andersen Drive, San Rafael, CA 94901	Bus operations, maintenance, administration	New transformer and switchboard amp, 1.5 MW generator, minimum 24 150-kW chargers (1:4 charger to dispenser ratio)	90 buses (both 40-ft and motor coaches)	Yes	2031, before first BEBs are deployed in 2032
Novato (Division 2)	801 Golden Gate Place, Novato, CA 94945	Bus operations and maintenance	New transformer and switchboard amp, 1 MW	30 buses (both 40-ft and motor coaches)	Yes	2028, before first BEBs are deployed in 2029



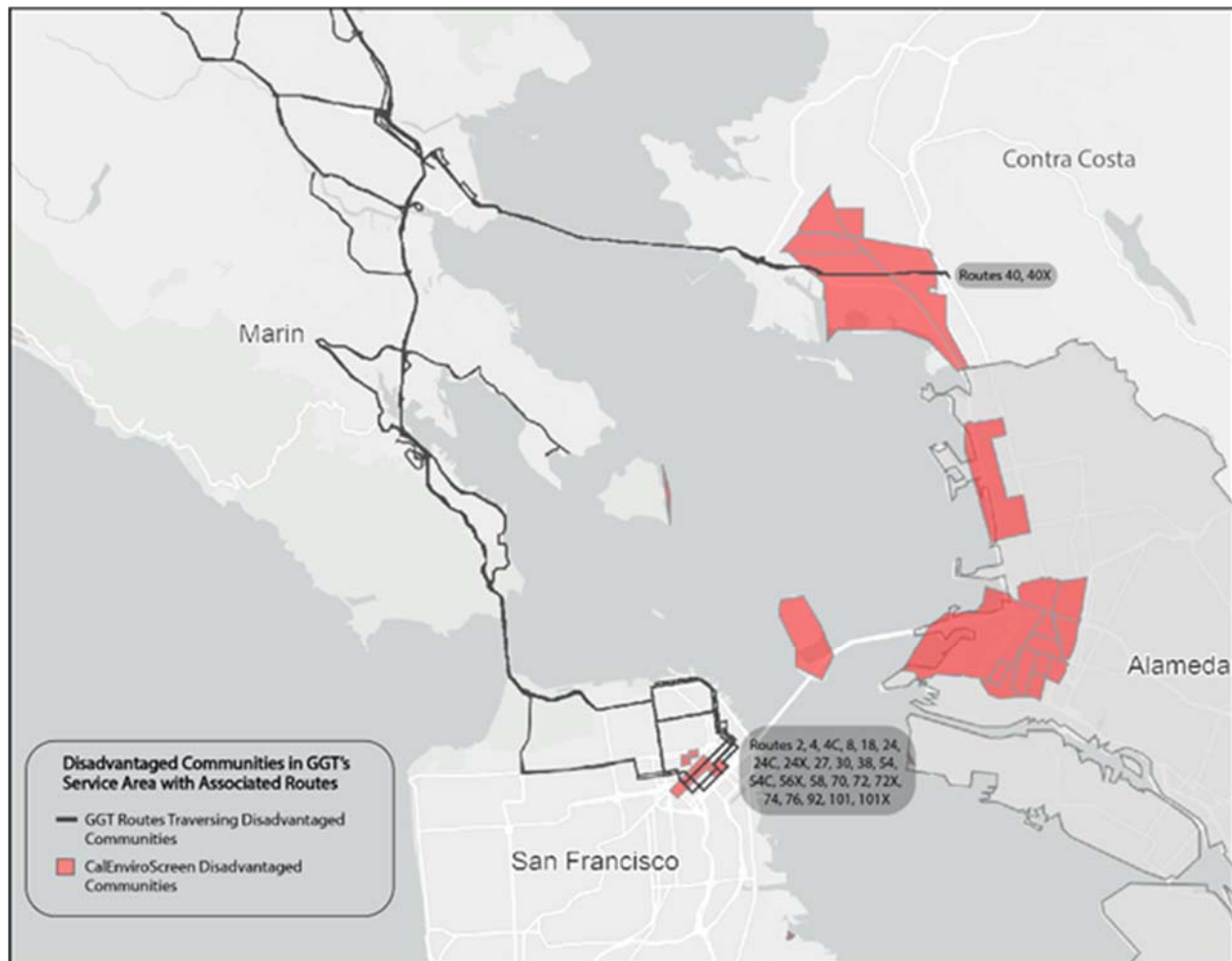
<u>Division/ Facility Name</u>	<u>Address</u>	<u>Main Function(s)</u>	<u>Type(s) of Infrastructure</u>	<u>Service Capacity</u>	<u>Needs Upgrade? (Yes/No)</u>	<u>Estimated Construction Timeline</u>
			generator, minimum 14 150-kW chargers (1:3 charger to dispenser ratio)			
Santa Rosa (Division 3)	3225 Industrial Drive, Santa Rosa, CA 95403	Bus operations and maintenance	New transformer and switchboard amp, 1 MW generator, minimum 17 150-kW chargers (1:2 charger to dispenser ratio)	30 buses (both 40-ft and motor coaches)	Yes	2025, before first BEBs are deployed in 2026
San Francisco (Division 4)	101 Perry Street, San Francisco, CA 94107	Bus layover	New transformer and switchboard amp, 750 kW generator, minimum 12 150-kW chargers (1:1 charger to dispenser ratio)	75 buses (both 40-ft and motor coaches)	Yes	2028, before first BEBs are deployed in 2029 that will require midday charging at Division 4

6. Electric utilities in GGT's service area is Pacific Gas and Electric (PG&E) and Sonoma Clean Power.

Section F: Providing Service in Disadvantaged Communities

1. GGT does serve one or more disadvantaged communities as listed in the latest version of CalEnviroScreen.

While the majority of census tracts in GGT's service area are not categorized as disadvantaged communities, many GGT routes terminate in downtown San Francisco or in Contra Costa where disadvantaged communities are located. As such, all GGT routes (except Route 25) touch at least one disadvantaged community, as seen in the figure below. As a result, no special prioritization of routes is required to meet the ICT regulation other than not to first deploy ZEBs exclusively on Route 25.



Census tracts of disadvantaged communities that intersect with GGT routes are listed in the table below:

Census tract ID	Location	Routes
6075017601	San Francisco	4C, 24C, 30, 54C, 70, 92, 101, 101X
6075017801	San Francisco	2, 4, 4C, 8, 18, 24, 24C, 24X, 27, 38, 54, 54C, 56X, 58, 72, 72X, 74, 76, 92
6013380000	Richmond	40, 40X
6013379000	Richmond	40, 40X
6013382000	Richmond	40, 40X
6013381000	Richmond	40, 40X



Section G: Workforce Training

Describe your transit agency's plan and schedule for the training of bus operators and maintenance and repair staff on zero-emission bus technologies. (Required)

The table below provides a high-level overview of GGT's plan and schedule for the training of bus operators and maintenance and repair staff on ZEB technologies.

Timeline (year)	Operator Training	Maintenance/Technician Training	Other Training
FY2026	Drive training-4 sessions-4 hours each (Division 3) Overall vehicle/system orientation-20 sessions-2 hours each (Division 3)	Preventative maintenance training-4 sessions-8 hours each (Division 3) Electrical/electronic training-6 sessions-8 hours each (Division 3) Multiplex training-4 sessions-3x8 days per session (Division 3) HVAC training-4 sessions-4 hours each (Division 3) Brake training-4 sessions-4 sessions (Division 3) ESS, lithium-ion battery and energy management hardware and software training-6 sessions-8 hours each (Division 3) Electric drive/transmission training-6 sessions-8 hours each (Division 3)	Agencywide orientation to new BEB technology Local fire and emergency response department introduction to new technology (Division 3)
FY2027	Annual refreshers (Division 3)	Annual refreshers (Division 3)	No activity
FY2028	Drive training-4 sessions-4 hours each (Division 4) Overall vehicle/system orientation-20 sessions-2 hours each (Division 4) Annual refreshers (Division 3)	Annual refreshers (Division 3)	Local fire and emergency response department introduction to new technology (Divisions 3 and 4)
FY2029	Drive training-4 sessions-4 hours each (Division 2) Overall vehicle/system orientation-20 sessions-2 hours each (Division 2) Annual refreshers (Divisions 3 and 4)	Preventative maintenance training-4 sessions-8 hours each (Division 2) Electrical/electronic training-6 sessions-8 hours each (Division 2) Multiplex training-4 sessions-3x8 days per session (Division 2) HVAC training-4 sessions-4 hours each (Division 2)	Local fire and emergency response department introduction to new technology (Division 2)



Timeline (year)	Operator Training	Maintenance/Technician Training	Other Training
		<p>Brake training-4 sessions-4 sessions (Division 2)</p> <p>ESS, lithium-ion battery and energy management hardware and software training-6 sessions-8 hours each (Division 2)</p> <p>Electric drive/transmission training-6 sessions-8 hours each (Division 3)</p> <p>Annual refreshers (Division 3)</p>	
FY2030	Annual refreshers (Divisions 2, 3, 4)	Annual refreshers (Divisions 2 and 3)	Local fire and emergency response department introduction to new technology (Divisions 3 and 4)
FY2031	Annual refreshers (Divisions 2, 3, 4)	Annual refreshers (Divisions 2 and 3)	Local fire and emergency response department introduction to new technology (Division 2)
FY2032	<p>Drive training-4 sessions-4 hours each (Division 1)</p> <p>Overall vehicle/system orientation-20 sessions-2 hours each (Division 1)</p> <p>Annual refreshers (Divisions 2, 3, 4)</p>	<p>Preventative maintenance training-4 sessions-8 hours each (Division 1)</p> <p>Electrical/electronic training-6 sessions-8 hours each (Division 1)</p> <p>Multiplex training-4 sessions-3x8 days per session (Division 1)</p> <p>HVAC training-4 sessions-4 hours each (Division 1)</p> <p>Brake training-4 sessions-4 sessions (Division 1)</p> <p>ESS, lithium-ion battery and energy management hardware and software training-6 sessions-8 hours each (Division 1)</p> <p>Electric drive/transmission training-6 sessions-8 hours each (Division 1)</p> <p>Annual refreshers (Divisions 2 and 3)</p>	Local fire and emergency response department introduction to new technology (Divisions 1, 3, and 4)
FY2033	Annual refreshers (all divisions)	Annual refreshers (Divisions 1, 2, and 3)	Local fire and emergency response department introduction to new technology (Division 2)
FY2034	Annual refreshers (all divisions)	Annual refreshers (Divisions 1, 2, and 3)	Local fire and emergency response department introduction to new technology (Divisions 1, 3, and 4)
FY2035	Annual refreshers (all divisions)	Annual refreshers (Divisions 1, 2, and 3)	Local fire and emergency response department introduction to new technology (Division 2)
FY2036	Annual refreshers (all divisions)	Annual refreshers (Divisions 1, 2, and 3)	Local fire and emergency response department introduction to new technology (Divisions 1, 3, and 4)



Timeline (year)	Operator Training	Maintenance/Technician Training	Other Training
FY2037	Annual refreshers (all divisions)	Annual refreshers (Divisions 1, 2, and 3)	Local fire and emergency response department introduction to new technology (Division 2)
FY2038	Annual refreshers (all divisions)	Annual refreshers (Divisions 1, 2, and 3)	Local fire and emergency response department introduction to new technology (Divisions 1, 3, and 4)
FY2039	Annual refreshers (all divisions)	Annual refreshers (Divisions 1, 2, and 3)	Local fire and emergency response department introduction to new technology (Division 2)
FY2040	Annual refreshers (all divisions)	Annual refreshers (Divisions 1, 2, and 3)	Local fire and emergency response department introduction to new technology (Divisions 1, 3, and 4)

Section H: Potential Funding Sources

Please identify all potential funding sources your transit agency expects to use to acquire zero-emission technologies (both vehicles and infrastructure).

The table below shows all potential funding sources GGT will explore to use to acquire zero-emission technologies.

Fund/Grant	Level of government	Description	Applicability
Low or No Emission Program (Low-No Program)	Federal/FTA	Low-No provides competitive funding for the procurement of low or no emission vehicles, including the leasing or purchasing of vehicles and related supporting infrastructure. This has been an annual program under the FAST Act since FY2016 and is a subprogram of the Section 5339 Grants for Bus and Bus Facilities. There is a stipulation for a local match.	Based on federal budget adoption of a new transportation appropriations bill, it's likely a similar program will continue. In FY2020, the FTA awarded \$130 million to 41 projects for the Low-No program. \$180 million was announced for FY2021 projects.
Buses and Bus Facilities Program (5339)	Federal/FTA	Grants applicable to rehabbing buses, purchase new buses, and invest and renovate related equipment and facilities for low or no emission vehicles or facilities. For FY20, FTA announced ~\$455 million in competitive grant funding. Requires a 20% local match.	FY2020 5339 funding totaled \$808 million, which is a combination of formula, bus discretionary, and Low-No funding. The JPA in Merced County ("The Bus") was awarded \$2 million for ZEB electric buses and associated charging equipment in FY19.
Urbanized Area Formula Grants (5307)	Federal/FTA	5307 grant funding makes federal resources available to urbanized areas for transit capital and operating assistance. Eligible activities include capital investments in bus and bus-related activities such as replacement, overhaul and rebuilding of buses. The federal share is not to exceed 80%	The Alameda Contra Costa Transit District (AC Transit) has allocated \$979,000 in 5307 funds in the MTC's 2021 Draft TIP to assist in the purchase of 10 ZEBs.



Fund/Grant	Level of government	Description	Applicability
		<p>of the net project cost for capital expenditures. The federal share may be 90% of the cost of vehicle-related equipment attributable to compliance with the Clean Air Act.</p> <p>Typically, the MPO or another lead public agency is the direct recipient of these funds and distributes these to local transit agencies based on TIP allocation.</p>	
Better Utilizing Investments to Leverage Development (BUILD)	Federal/USDOT	<p>Formerly TIGER, BUILD is a discretionary grant program aimed to support investment in infrastructure. BUILD funding supports planning and capital investments in roads, bridges, transit, rail, ports, and intermodal transportation. A local match is required.</p>	FY2020 provided \$1 billion in BUILD grants to 70 projects with a stipulation requiring 50% of funding for projects in rural areas.
Hybrid and Zero-Emission Truck and Bus Voucher Incentive Program (HVIP)	State/CARB	<p>Voucher program aimed at reducing the purchase cost of zero-emission vehicles. A transit agency would decide on a vehicle, contact the vendor directly, and then the vendor would apply for the voucher. HVIP stacking is not available for vehicles funded by the Proposition 1B Goods Movement Emission Reduction Program, the Volkswagen Environmental Mitigation Trust, or for trucks and buses funded by the California Energy Commission.</p>	<p>HVIP anticipates accepting new voucher requests beginning in early 2021, when FY20-21 funding becomes available. The District should apply for this once a vendor has been selected and if funds are available</p>
Carl Moyer and AB 923	State/CARB	<p>Funding to help procure low-emission vehicles and equipment. Transit buses are eligible for up to \$80,000 funding.</p>	The Bay Area AQMD noted more than \$50 million in available funds for the FY2019 funding cycle ²
Caltrans Transportation Planning Grants – Adaptation Planning Grants	State/California Transportation Commission	<p>The overarching goal of this grant program is to support planning actions at local and regional levels that advance climate change adaptation efforts on the transportation system, especially efforts that serve the communities most vulnerable to climate change impacts. The program awarded \$6 million in FY 2019-20 funds in May 2019. There is a grant minimum of \$100,000 and maximum of \$1 million. An 11.47% minimum match is required and may be in the form of an eligible in-kind contribution (e.g., staff time from the primary applicant counts as cash match).</p>	The programs could fund planning that furthers the state goal of reducing GHG emissions

² [https://www.baaqmd.gov/~media/files/strategic-incentives/carl-moyer/msif-cmp-overview-fact-sheet-yr-21-pdf.pdf?la=en](https://www.baaqmd.gov/~/media/files/strategic-incentives/carl-moyer/msif-cmp-overview-fact-sheet-yr-21-pdf.pdf?la=en)



Fund/Grant	Level of government	Description	Applicability
Caltrans Transportation Planning Grants - Strategic Partnership Grants	State/California Transportation Commission	The FY 2020-21 cycle made \$4.5 million available to identify and address statewide, interregional, or regional transportation deficiencies on the State highway system in partnership with Caltrans. The program's transit component funds planning projects that address multimodal transportation deficiencies with a focus on transit.	The programs could fund planning that furthers the state goal of reducing GHG emissions
State Transportation Improvement Program (STIP)	State/Caltrans	The STIP is a program of formula funds adopted by the CTC by April of each even year (i.e., 2020, 2022, 2024).	The ZEB Fleet Replacement project could compete for STIP funding but only for FY 2022 and beyond.
Sustainable Transportation Equity Project (STEP)	State/CARB	A new pilot that takes a community-based approach to overcoming barriers to clean transportation. Two different grant types: Planning and Capacity Building Grants (up to \$1.75 million for multiple grantees) and Implementation Grants (up to \$17.75 million for between one and three grantees). Lead applicant must be a CBO, federally-recognized tribe, or local government representing a public transit agency.	The application window closed as of August 31, 2020. It is unclear whether more funding will be made available in the Low Carbon Transportation Funding Plan for 2020-21.
Low Carbon Transit Operations Program (LCTOP) and Transit and Intercity Rail Capital Program (TIRCP)	State/CARB/Caltrans	5% and 10% of the annual Cap and Trade auction proceeds fund these programs. These programs fund projects that support new or expanded bus and rail services, improve multimodal facilities and can include equipment, fueling, maintenance and other costs. Projects must reduce greenhouse gas emissions. LCTOP is formula funding transit agencies commonly use for operations and TIRCP is a competitive program.	Many agencies are already recipients of these funds and can use these funds to purchase ZEBs and related equipment.
SB1 State of Good Repair	State/Caltrans	SGR funds are formula funds eligible for transit maintenance, rehabs, and capital programs – agencies receive yearly SB1 SGR funding through their MPO, based on population and farebox revenues.	GGT can decide to devote its portion of SB 1 funds to ZEB transition.
SB 350	State/California Energy Commission	The Clean Energy and Pollution Reduction Act will enable transformation of energy production to zero-emission. Primarily provides funding to public utilities to reduce GHG emissions. Also supports transportation electrification by providing rebates of up to 50% of the electric vehicle supply	If GGT proceeds with BEBs, they should apply for SB 350 at the appropriate time to reduce infrastructure costs. Funds are distributed through utility companies. Currently, SCE, PG&E, and SDG&E



Fund/Grant	Level of government	Description	Applicability
		equipment (chargers, etc.) for transit fleets.	have received funding for electrification programs.
SB1 Local Partnership Program (LPP)	State/California Transportation Commission	The LPP includes both a formulaic and competitive program to distribute funds to local and regional transportation agencies to further projects that improve transit and rail, aging infrastructure, and more. Funds are distributed to eligible agencies through a 60% formulaic component and 40% competitive component.	SB1 created the LPP and continuously appropriates \$200 million annually to local and regional transportation agencies that are within jurisdictions with voter approved taxes, tolls, or fees which are dedicated solely for transportation improvements.
Solutions for Congested Corridors Program (SCCP)	State/California Transportation Commission	The SCCP includes programs with both formula and competitive funds. Funding is available to projects that make specific performance improvements and are a part of a multimodal comprehensive corridor plan designed to reduce congestion in highly traveled corridors by providing more transportation choices for residents, commuters, and visitors to the area of the corridor while preserving the character of the local community and creating opportunities for neighborhood enhancement projects.	Improvements to transit facilities are eligible projects. Cycle 2 funding of \$500 million covers two years (FY2022 and FY2023). To submit a LPP/SCCP application, you need to know exactly what sources will be funding the project and when the funds will be used, as well as which project phase they will be used for.
Affordable Housing and Sustainable Communities Program (AHSC)	State/Department of Housing and Community Development	The AHSC Program funds land use, housing, and transportation projects to support development that reduces GHG emissions. The program provides both grants and loans that reduce GHG emissions and benefit disadvantaged communities through increasing accessibility via low-carbon transportation. The program distributed \$193 million for transportation projects in FY18-19.	Sustainable transportation infrastructure projects, transportation-related amenities, and program costs (including transit ridership) are eligible activities. Agencies can use program funds for assistance in construction or modification of infrastructure for ZEB conversion as well as new vehicle purchases.
PG&E EV Fleet Program	State/PG&E	Objective is to support the conversion of fleets to electric by lowering the upfront cost of electric charging infrastructure, specifically through installation of level 2 and DC fast chargers at 700+ sites by the end of 2023, supporting 6,500 medium- and heavy-duty vehicles, including transit buses. This program offers incentives and rebates for chargers and associated infrastructure.	PG&E offers two ownership structures: Option 1: customer designs, builds, owns, operates, and maintains BTM infrastructure, where PG&E constructs, owns, and maintains all TTM costs and provides an incentive for BTM costs Option 2: PG&E designs, builds, owns, operates, pays for, and maintains all infrastructure Agency must commit to a ten year term of agreement for operation and maintenance of the chargers.



Fund/Grant	Level of government	Description	Applicability
			Agencies can apply for vehicles that will be operated in the future as long as vehicles are procured within five years of program contract execution.
VW Environmental Mitigation Trust Funding	State	VW's settlement provides nearly \$130 million for zero-emission transit, school, and shuttle bus replacements. Transit may be eligible for up to \$65 million.	Applications are open for transit agencies and funding for transit buses is still available. The grant is a one-time deal. Applications are processed on a first come, first serve basis and will be considered for funding if eligible and while project funds are available.
Transportation Fund for Clean Air (TFCA)	Regional/Bay Area AQMD	Since 1991, the BAAQMD has imposed a \$4 surcharge on cars and trucks registered within the Air District's jurisdiction to provide grant funding for eligible projects that reduce on-road motor vehicle emissions. Eligible projects include vehicle replacements and infrastructure construction (both BEB charging infrastructure and construction of new hydrogen stations) as well as other projects that help reduce emissions (such as active transportation improvements). Requires proof of a 10% local match.	Final rules and evaluation criteria for the 2021 funding cycle have recently been released.
Low Carbon Fuel Standard (LCFS credits)	N/A	LCFS credits are not necessary funding to be applied for; rather, they are offset credits that are traded (through a broker) to reduce operating costs.	Once ZEBs are acquired and operating, agencies can collect LCFS and 'sell' them to reduce operating costs of ZEBs. Both hydrogen and electricity used as fuels are eligible for LCFS credits

Appendix

Exhibit A - Fully Executed Resolution (To be attached once approved)

GOLDEN GATE BRIDGE, HIGHWAY AND TRANSPORTATION DISTRICT

RESOLUTION NO. 2021-0XX

**APPROVE THE DISTRICT'S ZERO-EMISSION BUS (ZEB) ROLLOUT PLAN AND
BOARD RESOLUTION FOR SUBMITTAL TO THE CALIFORNIA AIR RESOURCES
BOARD (CARB)**

May 21, 2021

WHEREAS, in 2018, the California Air Resources Board (CARB) adopted the Innovative Clean Transit (ICT) Regulation, which requires public transit agencies to transition to a 100 percent zero-emission bus (ZEB) fleet, such as battery-electric or fuel-cell electric, by 2040;

WHEREAS, the main provisions of the ICT regulation include:

- Transit agencies which operate a fleet larger than 65 buses are required to submit a ZEB Rollout Plan (Rollout Plan) by July 1, 2020
- Transit agencies must purchase a minimum number of ZEBs during future procurements, according to the following schedule:
 - Starting in 2023, 25 percent of new bus purchases must be ZEBs (applies to 40-foot buses only)
 - Starting in 2026, 50 percent of all new bus purchases must be ZEBs (40-foot, 60-foot, and Motor Coaches)
 - Starting in 2029, 100 percent of all new bus purchases must be ZEBs
- Transit agencies can earn credits to offset the 2023 and 2026 ZEB purchase requirements by providing zero-emission vehicles not covered by the ICT regulation;
- The minimum ZEB purchase requirement may be delayed if a certain number of ZEBs are purchased statewide by the end of 2020 and 2021;

WHEREAS, the ICT regulation requires each agency to submit a Rollout Plan to CARB by July 1, 2020;

WHEREAS, the Rollout Plan is a living document intended to guide the agency's conversion to a ZEB fleet and may be updated based on changes in vehicle technology, fleet size, and operating requirements.

WHEREAS, the Rollout Plan must be approved by the transit agency's governing body through the adoption of a resolution prior to submission to CARB;

WHEREAS, per the requirements of the ICT, the Rollout Plan includes the following components:

- Type(s) of ZEB technologies a transit agency is planning to deploy
- Schedule for all ZEB and conventional bus purchases
- Schedule for infrastructure upgrades and modifications
- Identification of costs and potential funding sources
- Plan to deploy ZEBs in disadvantaged communities
- Training plan for operators and maintenance staff

RESOLUTION NO. 2021-0XX
BOARD OF DIRECTORS MEETING OF MAY 21, 2021
PAGE 2

- Goal of full transition to ZEBs by 2040

WHEREAS, the Transportation Committee at its meeting of May 21, 2021, has so recommended; now, therefore, be it

RESOLVED that the Golden Gate Bridge, Highway and Transportation District Board of Directors hereby adopts the Rollout Plan as a guide for the implementation of ZEB technology and approves it for submission to CARB.

ADOPTED this 21st day of May 2021 by the following vote of the Board of Directors:

AYES ():

NOES ():

ABSENT ():

[Note: On this date, there were four vacancies on the Board of Directors.]

Barbara L. Pahre
President, Board of Directors

ATTEST:

Amorette M. Ko-Wong
Secretary of the District



**Golden Gate Bridge,
Highway and Transportation
District**

Final Zero Emission Bus
Rollout Plan

May 21, 2021





Presentation Overview

1. Project background
2. Existing conditions review
3. Modeling methodology and results
4. Fleet concept development and refinement
5. Fleet procurement schedule and outlook
6. Facility and infrastructure modifications
7. Disadvantaged communities
8. Workforce training and funding sources
9. Financial analysis

Project Background

CARB ICT Regulation

- All transit agencies mandated to gradually transition to total ZEB fleet by **2040**, starting with ZEB purchases in **2023**
- Zero-emission cutaway, motorcoach, and articulated buses exempt until **2026** (if Altoona tested)
- Large transit agencies must submit a rollout plan to CARB by June 1, 2020 (GGT has been given an extension)

Required Components	Section Description
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

What is a Zero-Emission Bus?

Battery Electric Bus (BEB)

- Propulsion occurs from electricity directly stored in batteries
- Fueling occurs by recharging batteries

Hydrogen Fuel Cell Electric Bus (FCEB)

- Propulsion occurs from hydrogen converted by fuel cells into electricity for propulsion
- Fueling occurs by refilling onboard hydrogen tank

Battery Electric Bus Plug-In

- Larger energy storage capacity (466-660 kWh)
- Longer range (than on-route charging BEB)
- Charging time 2-6 hours
- Charging infrastructure
 - Low power depot charger (< 150 kW)
 - High power depot charger (> 300 kW)
- Can be supplemented with on-route charging



Battery Electric Bus On-Route Charging

- Typically smaller battery (200-300 kWh)
- Shorter range (but in theory infinite)
- Charging time 5-10 minutes
- Charging infrastructure
 - Overhead inverted pantograph
 - Non-contact inductive charging

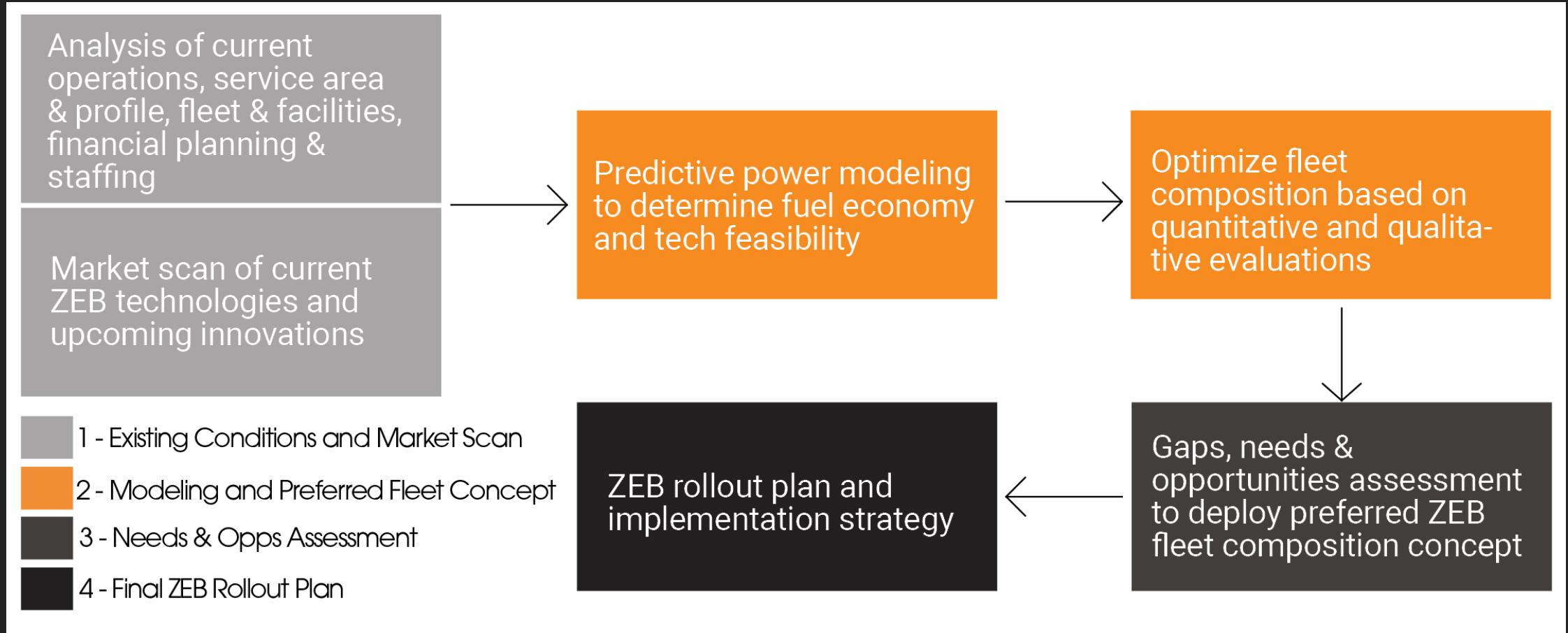


Hydrogen Fuel Cell Electric Bus

- Shorter refueling times (6-12 minutes)
- Refueling similar to diesel or CNG
- Longer range
- High cost of producing hydrogen presently because of supply chain



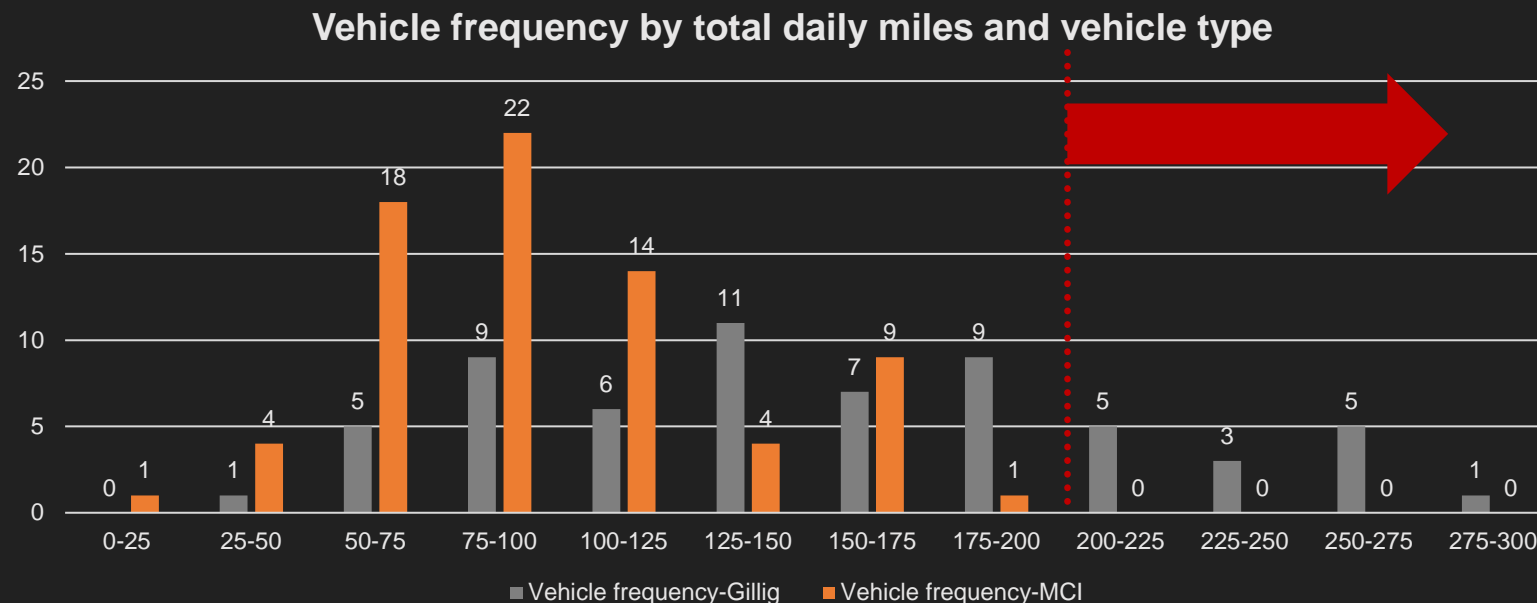
Project Overview and Approach



Overview of Existing Conditions

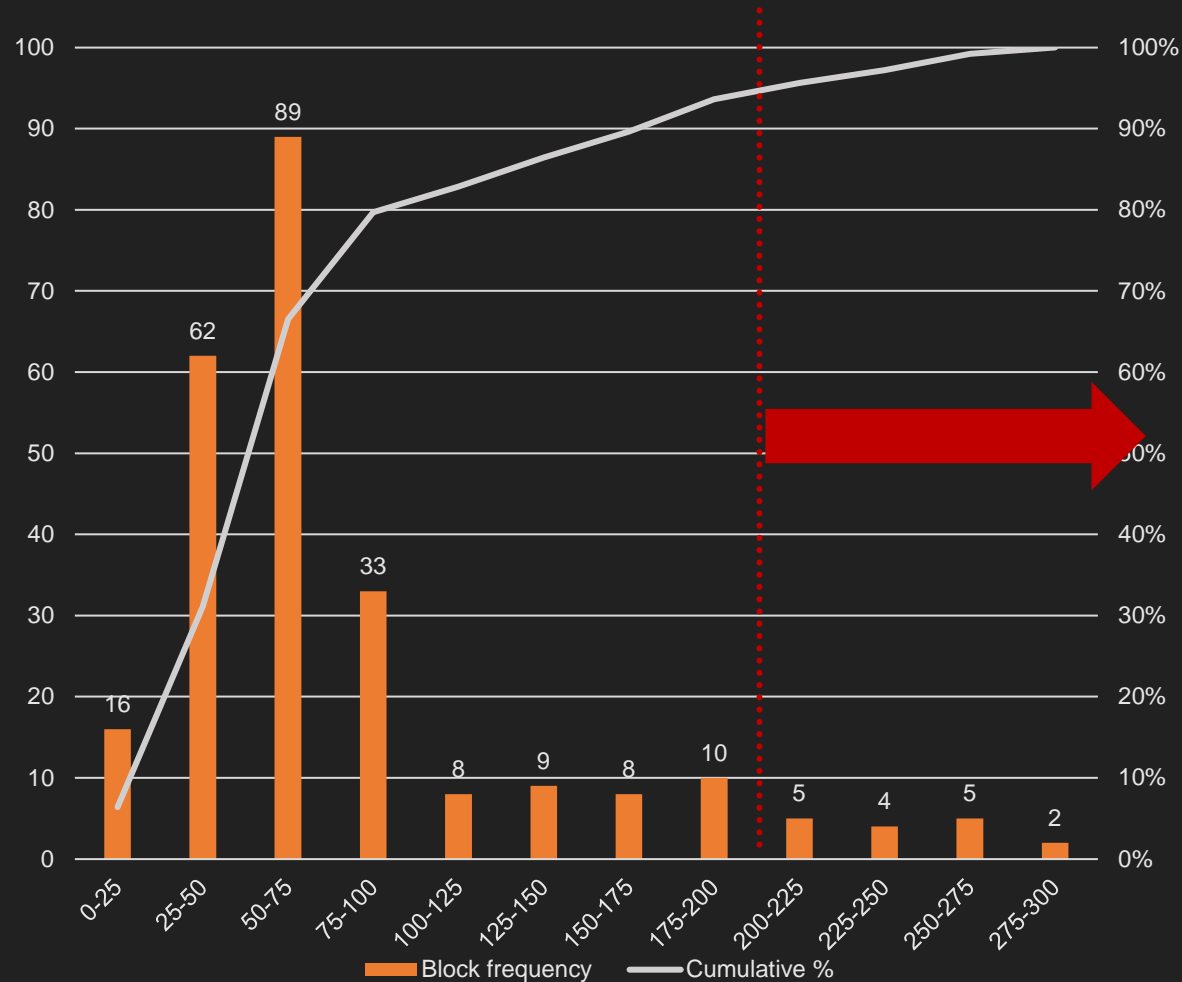
GGT Existing Conditions

- Commuter service, large service area, long routes
- Use of motor coach vehicles, while currently exempt until 2026 or later, current ZE motor coach options are very limited
- Complex daily vehicle patterns, where vehicles do not necessarily return to the same division at the end of their daily service, which results in complications related to charging strategies
- Block lengths up to 285 miles, which exceed current BEB ranges without on-route or opportunity charging

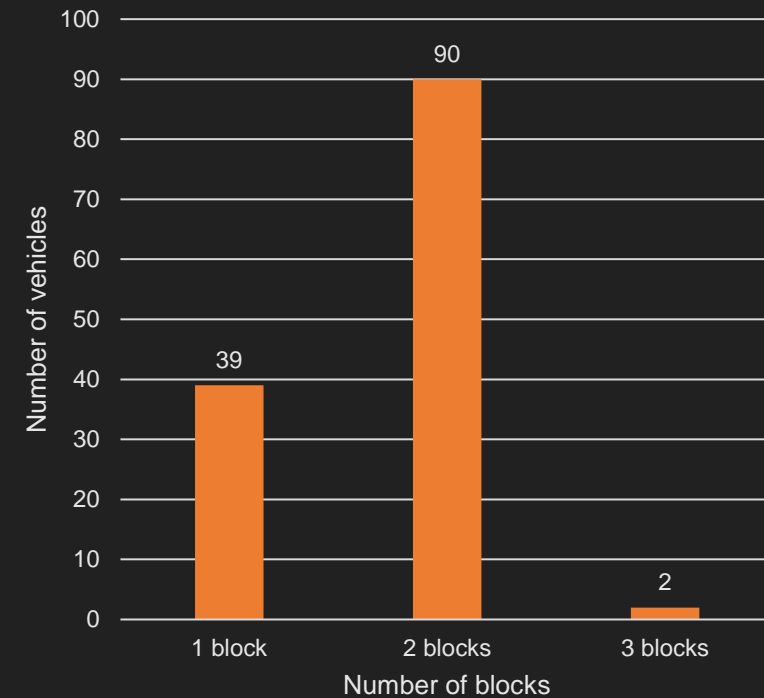


GGT Existing Conditions Block Analysis

Frequency of blocks by total daily miles (weekday)

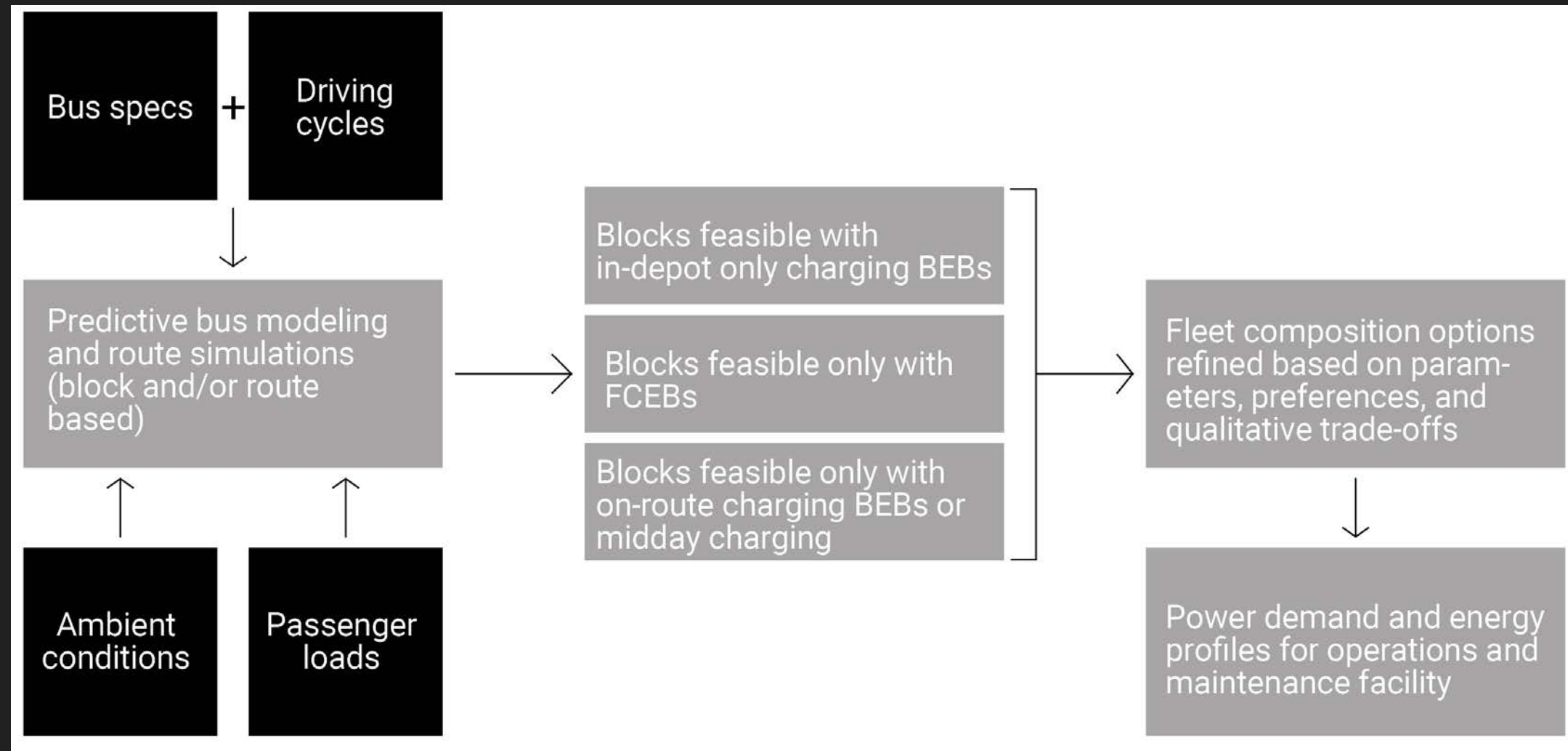


Frequency of vehicles by number of blocks completed (weekday)



Bus Modeling and Route Simulation

ZEBDecide Process and Fleet Composition Refinement



Block-Level Modeling Results

BEBs		40-ft. Bus	Motor Coach
Number of successful blocks	Blocks	80 (83%)	129 (100%)
Total energy consumption	kWh/day	23,000	20,000
Average energy efficiency	kWh/mi	2.39	3.02

FCEBs		40-ft. Bus	Motor Coach
Number of successful blocks	Blocks	88 (92%)	N/A
Total energy consumption	kg/day	1,550	N/A
Average energy efficiency	mi/kg	6.28	N/A

Fleet Concept Development and Refinement

Preliminary Fleet Compositions

	Alternative A Mixed Fleet	Alternative B All BEB Fleet	Alternative C Mainly FCEB Fleet
Fleet details	<ul style="list-style-type: none"> 40-ft. buses: 75% BEB, 25% FCEB Motor coaches: 100% BEB 	<ul style="list-style-type: none"> 40-ft. buses: 100% BEB Motor coaches: 100% BEB 	<ul style="list-style-type: none"> 40-ft. buses: 100% FCEB Motor coaches: 100% BEB
Scheduling and planning	<ul style="list-style-type: none"> Scheduling for midday charging Two ZEB configurations FCEBs are limited to garages with fueling capabilities 	<ul style="list-style-type: none"> Scheduling for midday charging One ZEB configuration Longer blocks may need modification 	<ul style="list-style-type: none"> Scheduling for midday charging and midday refueling Two ZEB configurations Two FCEB tank sizes
Operations and dispatching	<ul style="list-style-type: none"> Dispatch to consider and manage two technologies with different ranges 	<ul style="list-style-type: none"> Greater dispatching flexibility due to homogenous fleet 	<ul style="list-style-type: none"> Dispatch to consider and manage two technologies with different ranges
Training	<ul style="list-style-type: none"> Requires training for BEBs and FCEBs 	<ul style="list-style-type: none"> Requires training for BEBs only 	<ul style="list-style-type: none"> Requires training for BEBs and FCEBs
Technology/ OEM/ procurement	<ul style="list-style-type: none"> More BEB OEMs Fewer FCEB OEMs at present Contracts and spare parts for three different vehicle types 	<ul style="list-style-type: none"> More BEB OEMs Contracts and spare parts for two different vehicle types 	<ul style="list-style-type: none"> More BEB OEMs Fewer FCEB OEMs at present Contracts and spare parts for two different vehicle types
Depot infrastructure	<ul style="list-style-type: none"> Major electrical upgrades in three garages and new hydrogen fueling in at least one garage Changes to maintenance bays and tooling for two technologies 	<ul style="list-style-type: none"> Major electrical upgrades in three garages Changes to maintenance bays and tooling for one technology 	<ul style="list-style-type: none"> Major electrical upgrades in three garages New hydrogen fueling in at least two garages Changes to maintenance bays and tooling for two technologies
Other infrastructure	<ul style="list-style-type: none"> Coordination with utility company and grid connection upgrade 	<ul style="list-style-type: none"> Coordination with utility company and grid connection upgrade 	<ul style="list-style-type: none"> Coordination with utility company and grid connection upgrade
Cost of ownership	<ul style="list-style-type: none"> \$2.66/mile over 14-year lifetime 	<ul style="list-style-type: none"> \$2.87/mile over 14-year lifetime 	<ul style="list-style-type: none"> \$2.79/mile over 14-year lifetime
Other	<ul style="list-style-type: none"> Energy systems required for resiliency Diesel or CNG generator for FCEB resiliency Requires midday and overnight charging for BEBs 	<ul style="list-style-type: none"> Requires midday and overnight charging Energy systems required for BEB resiliency 	<ul style="list-style-type: none"> Diesel or CNG generator for FCEB resiliency Energy systems required for BEB resiliency Requires midday charging
Overall fit	★★★	★★★★	★★★

Recommended Fleet Composition

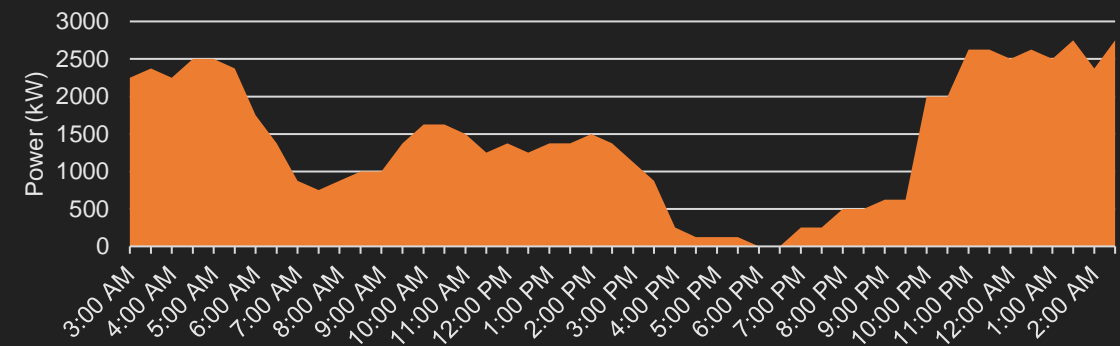
- Fleet Alternative B, All-BEB Fleet

Energy requirements under recommended fleet composition

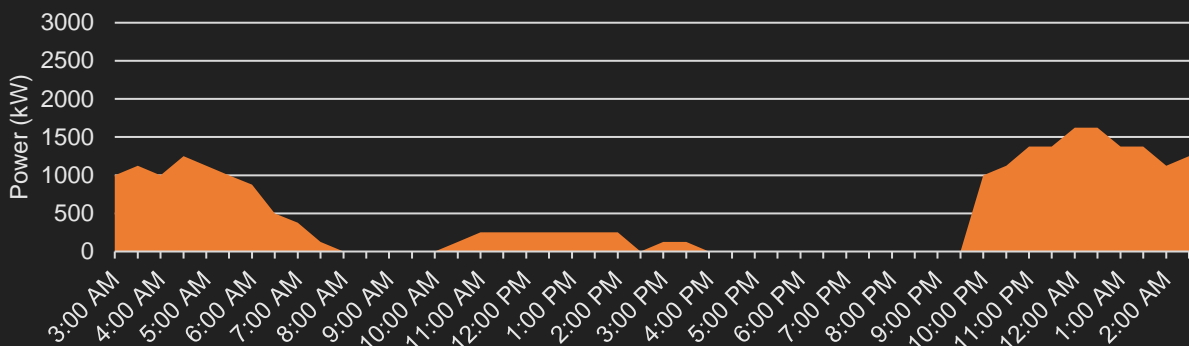
BEBs		40-ft. Bus	Motor Coach
Number of vehicles	Units	60	71
Total energy consumption	kWh/day	23,000	20,000
Average energy efficiency	kWh/mi	2.39	3.02

Power Demand Model and Charging Profiles

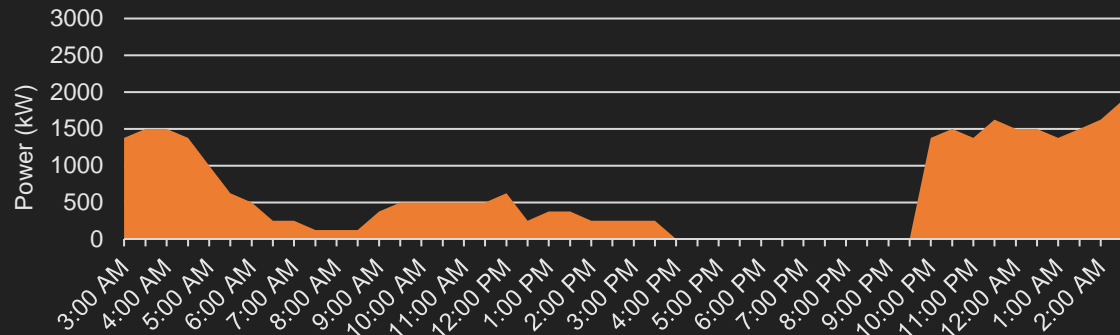
San Rafael division charging schedule



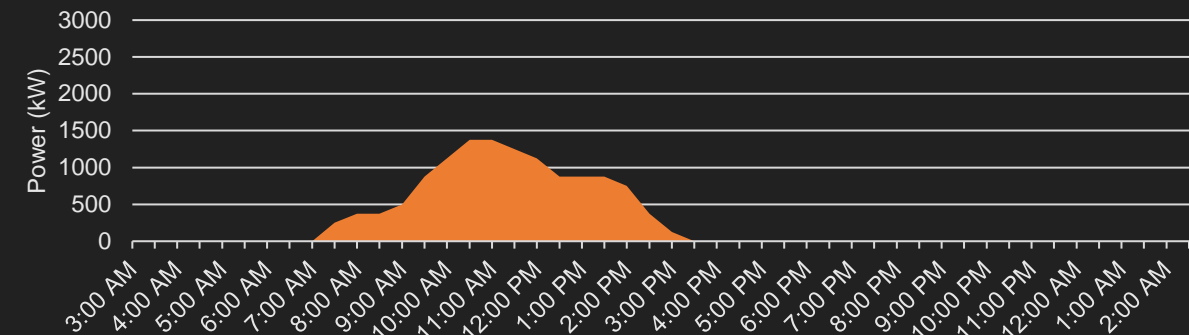
Novato division charging schedule



Santa Rosa division charging schedule



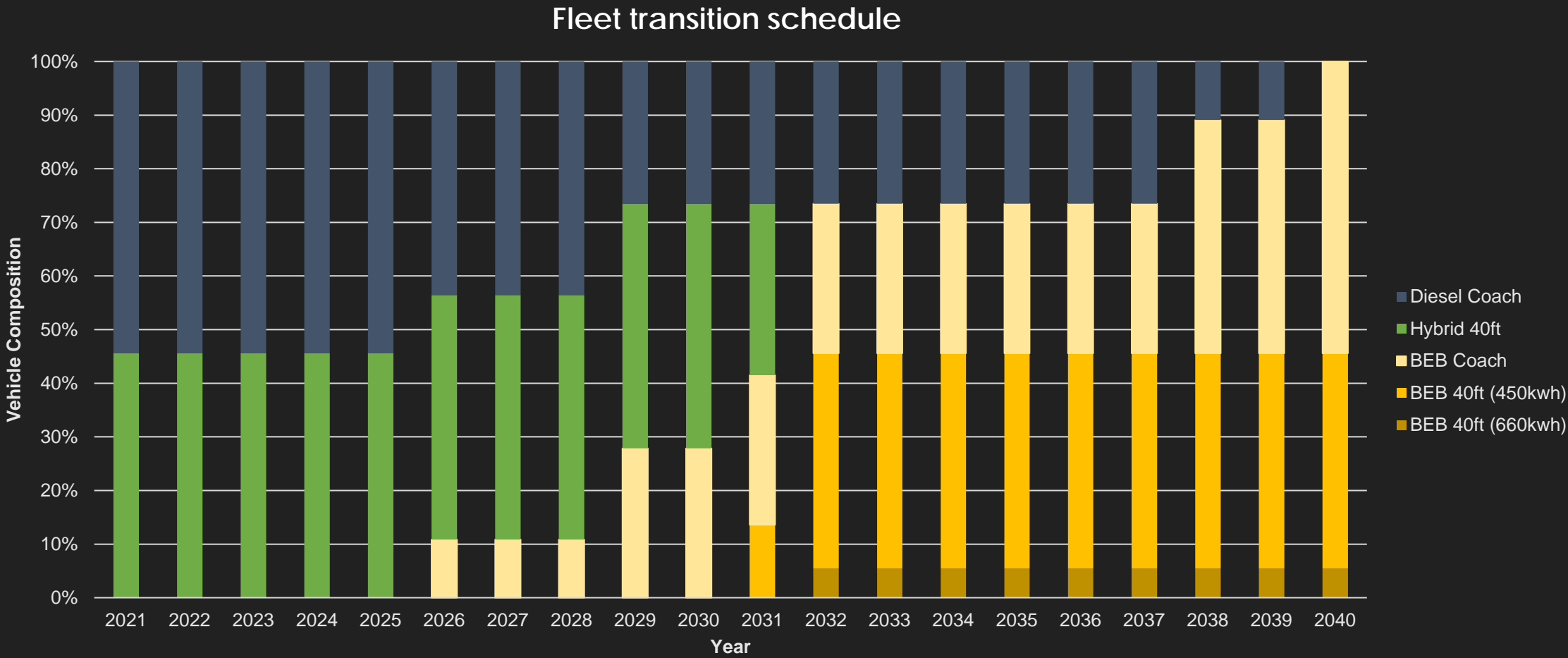
San Francisco division charging schedule



Division	Total daily energy requirement	Max power demand	# of required chargers (125 kW each)	Charger : Dispenser Ratio	Total Dispensers
Division 1 – San Rafael	24,345 kWh	2,750 kW at 1:30AM	24	1:4	96
Division 2 – Novato	8,550 kWh	1,625 kW at 12:00AM	14	1:3	42
Division 3 – Santa Rosa	10,620 kWh	1,875 kW at 2:30AM	17	1:2	34
Division 4 – San Francisco	4,500 kWh	1,375 kW at 11:00AM	12	1:1	12

Fleet Procurement Schedule

Fleet Procurement Schedule



Division Phasing Schedule



Colors represent years

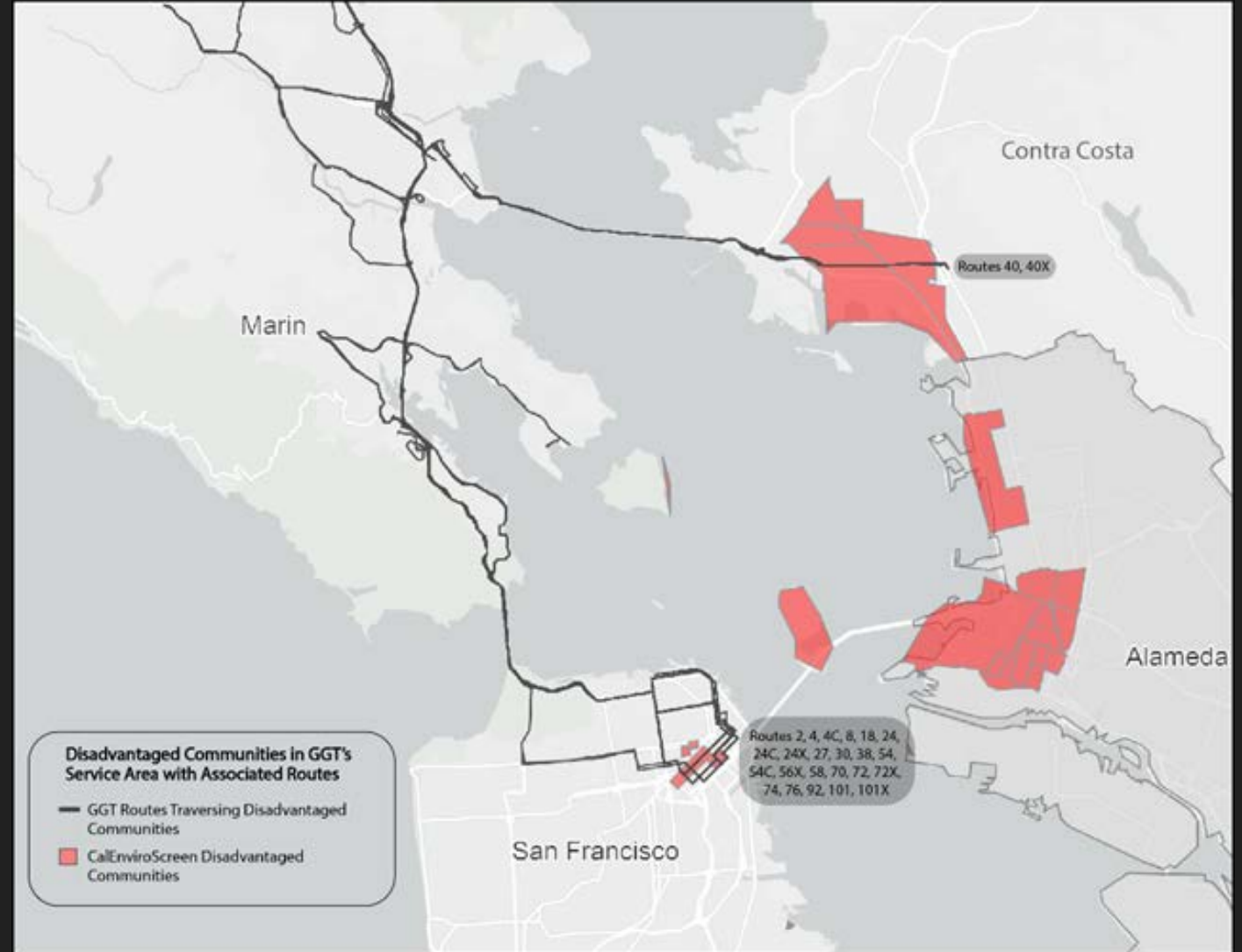
Facility and Infrastructure Modifications

Facilities Information and Construction Timeline

Division Name	Address	Main Function(s)	Type(s) of Infrastructure	Service Capacity	Needs Upgrade (Yes/No)	Estimated construction timeline
San Rafael (Division 1)	1011 Andersen Drive, San Rafael, CA 94901	Bus Admin, Operations, Maintenance, Training; additional storage and admin for other District departments	New BEB charging equipment, additional electrical utility service and associated site improvements.	90 buses (both 40-ft and motor coaches)	Yes	2031
Novato (Division 2)	801 Golden Gate Place, Novato, CA 94945	Bus Operations (Dispatch) & Maintenance	New BEB charging equipment, additional electrical utility service and associated site improvements.	30 buses (both 40-ft and motor coaches)	Yes	2028
Santa Rosa (Division 3)	3225 Industrial Ave, Santa Rosa, CA 95403	Bus Operations (Dispatch) & Maintenance	New BEB charging equipment, additional electrical utility service and associated site improvements.	30 buses (both 40-ft and motor coaches)	Yes	2025
San Francisco (Division 4)	101 Perry Street, San Francisco, CA 94107	Bus Operations	New BEB charging equipment and additional electrical utility service	75 buses (both 40-ft and motor coaches)	Yes	2027

Disadvantaged Communities

Disadvantaged Communities



Training and Funding Highlights

Training

- Operator drive training (four sessions, four hours each)
- Operator vehicle/system orientation (20 sessions, two hours each)
- Preventative maintenance training (four sessions, eight hours each)
- Electrical/electronic training (six sessions, eight hours each)
- Multiplex training (four sessions, three x eight days per session)
- HVAC training (four sessions, four hours each)
- Brake training (four sessions, four hours each)
- Energy Storage System (ESS), lithium-ion battery and energy management hardware and software training (six sessions, eight hours each)
- Electric drive/transmission training (six sessions, eight hours each)

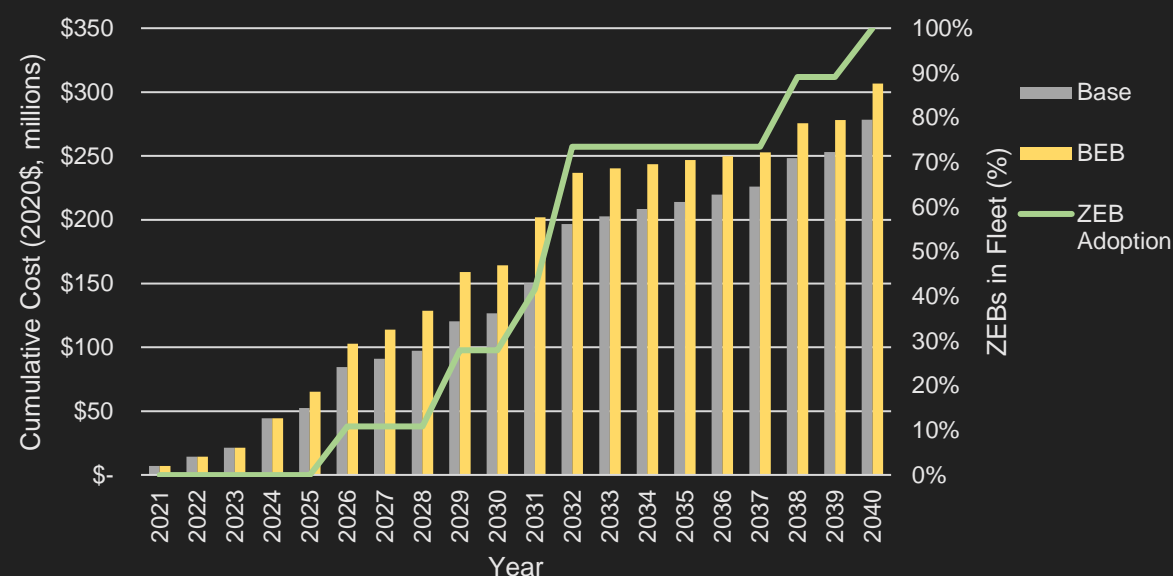
Funding

- **Federal**
 - Low-No
 - Bus and Bus Facilities 5339
 - BUILD
- **State/Local**
 - HVIP
 - LCTOP
 - TIRCP
 - TDA/STA
 - VW Mitigation Fund
- **Other**
 - PG&E EV Fleet Program

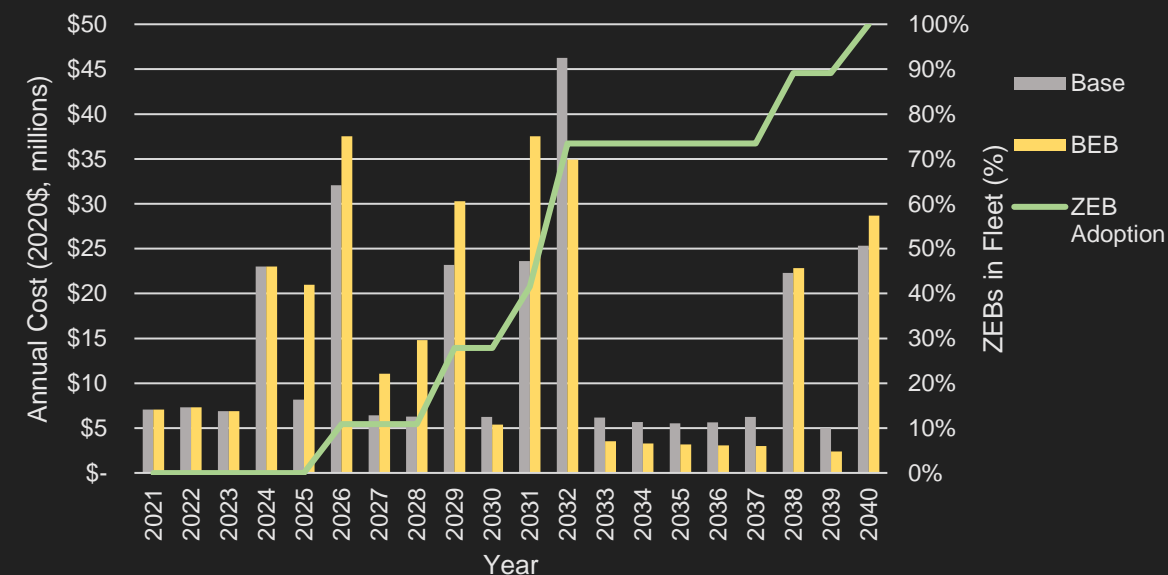
Financial Analysis

Total Cost Comparisons

- Base case: continued business as usual
- ZEB case: transition to 100% ZEB operations by 2040



Cumulative Total Cost Comparison 2021-2040



Annual Total Cost Comparison 2021-2040

Case (2021-2040); all in millions				
Category		Base	BEB	Savings
Capital	Fleet Acquisition	\$148.374	\$160.767	\$(12.393)
Capital	Fleet Refurbishment/Battery Replacement	\$9.056	\$5.402	\$3.654
Operating	Fleet Maintenance	\$57.540	\$46.893	\$10.647
Operating	Fuel/Electricity	\$63.525	\$47.717	\$15.808
Capital	Infrastructure	--	\$45.979	\$(45.979)
Total		\$278.495	\$306.758	\$(28.263)

Thank you

Questions and Discussion

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