

Appendix G: Zero Emission Fleet Replacement Plan

Marin Transit's first Battery Electric Bus went into revenue service at the end of February, and staff is collecting information on range, fueling costs, and capabilities. Based on initial results, the range will not be sufficient for the majority of service blocks (the distance a bus drives in one day) without additional charging. Given the rapid pace of technological change and new electric buses in the pipeline, staff expects that the range for the next generation of zero-emission buses will increase.

For purposes of the Fleet Replacement Plan, staff assumed the following availability for all-electric vehicles:

- An FTA-approved cutaway bus will be available in 2025;
- An FTA-approved narrow body bus will be available in 2030;
- The range of in-depot charged buses will increase from about 125 miles to 300 miles by 2027; and
- Over the next five years, there will not be a significant infusion of capital funding for Marin Transit to construct infrastructure improvements that support in-route vehicle charging or hydrogen fueling stations.

To plan for technological uncertainty, Marin Transit staff has developed the following recommendations:

- 1) Develop a base plan that assumes the zero-emission technology is available to meet the minimum ICT requirements, without significant changes to routing or requiring in-route charging infrastructure;
- 2) Identify decision points that will allow time for developing route changes or infrastructure projects, if required; and
- 3) Identify decision points purchasing additional zero-emission vehicles if technology exceeds expectations and/or there is significant additional capital to pursue in-route charging or other mitigations to deploy zero-emission buses.

To meet the replacement plan goals, Marin Transit first anticipates the feasibility of converting the standard bus fleet to electric buses. The narrow-bodied vehicles needed for rural and recreational services have vehicle work blocks of over 300 miles on steep, hilly terrain. This makes them the most challenging to convert. Marin Transit plans to start to replace those vehicles with zero-emission technology in FY 2031 to allow more time for the technology to improve. Marin Transit will be able to modify the procurements planned for FY 2024 and FY 2027 should a suitable zero emission vehicle type become available earlier.

In addition to the draft replacement plan in Table G-1 below, staff have provided a more detailed chart of the plan in Table G-2.

Table G-1: Marin Transit Draft Fixed Route Vehicle Replacement Plan

Fiscal Year	Zero Emission Fleet Percentage	New Vehicle Purchases - Fixed Route Fleet		
		Standard Size Buses	Cutaways	XHFs - Heavy Duty, Narrow Body
FY 2020	3%	11 - 40ft Hybrid Buses		4 - 29ft XHFs
FY 2021	3%	4 - 40ft Electric Buses	9 - Cutaways	2 - 35ft XHFs
FY 2022	8%			
FY 2023	8%	7 - 35ft Hybrid Buses	1 - Cutaway	2 - 29ft XHFs
FY 2024	8%			
FY 2025	8%			8 - 35ft XHFs
FY 2026	9%		1 - Cutaway 1 - Electric Cutaway	
FY 2027	14%	4 - 30ft Hybrid Buses 7 - 40ft Electric Buses		
FY 2028	17%		7 - Cutaways 2 - Electric Cutaways	1 - 35ft XHF 2 - 29ft XHFs
FY 2029	29%	10 - 40ft Electric Buses		
FY 2030	31%		1 - Electric Cutaway	
FY 2031	33%	2 - 35ft Electric Buses		2 - 35ft Electric Narrow Body
FY 2032	41%			2 - 35ft Electric Narrow Body 4 - 30ft Electric Narrow Body
FY 2033	56%	15 - 40ft Electric Buses	2 - Electric Cutaways	
FY 2034	68%	7 - 35 ft Zero Emission Buses		2 - 30ft Electric Narrow Body
FY 2035	77%		9 - Electric Cutaways	
FY 2036	77%			
FY 2037	87%		1 - Electric Cutaway	8 - 35 ft Electric Narrow Body
FY 2038	87%			
FY 2039	97%	7 - 40ft Electric Buses 4 - 30ft Electric Buses		1 - 35 ft Electric Narrow Body
FY 2040	100%		2 - Electric Cutaways	2 - 30ft Electric Narrow Body

Decision Points and Next Steps

Staff have identified points in the next ten years when Marin Transit will decide whether to make increase its investments in Zero Emission Buses earlier or make other decisions regarding the future of the zero-emission fleet.

- **2020 – Procurement and In-service Plan for FY 2021 Electric Vehicles** - By the end of 2019, Marin Transit needs a procurement and in-service plan for the four electric vehicles to be purchased in FY 2021. This plan will include vehicle selection, an operations plan, associated operations contractor agreements, and a plan for infrastructure and power delivery.
- **2024 – Initial Infrastructure Plan** - Marin Transit will complete an initial infrastructure plan that will allow three years for implementation and construction before delivery of seven electric vehicles in FY 2027 and ten electric vehicles in FY 2029. The District is currently working to purchase a facility that would accommodate electric vehicle infrastructure. If the District has not yet purchased a facility, the plan will include alternatives. These may include hydrogen fuel cell buses, if the fueling is available, or consolidating electric vehicles with contractors that are able to install electrical infrastructure on their properties.
- **2025 – Confirm Vehicle Types for FY 2027 Procurement** – Marin Transit will evaluate the battery range of available zero-emission vehicles. The District will also evaluate the status of its infrastructure and power delivery capabilities to determine whether it is possible increase the percentage of zero-emission buses in the FY 2027 procurement. At this time, the FY 2027 procurement is planned to consist of seven 40-foot electric and four 30-foot hybrid buses.
- **2025 – Determine if a zero-emission cutaway bus is available** – Marin Transit’s first planned replacement of a cutaway (shuttle) with zero-emission technology is planned for FY 2026 to provide additional time for testing and development of a federally-approved vehicle. In addition, a price of the technology needs to go down for purchase of these vehicles to be cost effective over the shorter vehicle life (seven years). If no federally approved vehicle is available, CARB will exempt agencies from the requirement. Until a zero-emission alternative is available, the District will evaluate replacement of its shuttles with a standard size battery electric buses or replacing with standard gasoline vehicles
- **2027 – Confirm Vehicle Types for FY 2029 Procurement** - Determine whether battery range has improved enough to deliver the District’s existing service profile. If not, the FY 2029 procurement allows time for Marin Transit to evaluate purchasing additional vehicles, cutting or re-designing service to match vehicle constraints, and/or negotiating with jurisdictions to install opportunity charging at strategic locations throughout the county.
- **2028 – Confirm Vehicle Types for FY 2031 Procurement of Narrow-Bodied Vehicles** - Decide whether there is a zero-emission bus capable of operating on the West Marin Stage and Muir Woods Shuttle services. If not, Marin Transit will have to consider cutting these programs. If a narrow-bodied vehicle is available and the range is the only concern, the District will evaluate purchasing additional vehicles to provide the service and/or whether installing opportunity charging along the routes is feasible,

- **2029 – Update Initial Infrastructure Plan** – Based on the current fleet status and the state of zero-emissions bus technology, Marin Transit will update the infrastructure plan in advance of the FY 2032 procurements that will bring the District’s fleet to over 50 percent electric.

Electric bus technology is evolving rapidly. Marin Transit values the benefits of zero-emission buses. The District will recommend investments that take advantage of proven technologies while closely monitoring new developments. Marin Transit needs to be flexible as it develops the quickest, most reliable path toward a sustainable and completely zero-emission fleet. Staff will explore technology options as each of decision points nears and will evaluate the best investments that will move the District toward a battery electric fleet at a faster pace than the current vehicle replacement plan.

Table G-2: Marin Transit Detailed Fixed Route Vehicle Replacement Plan

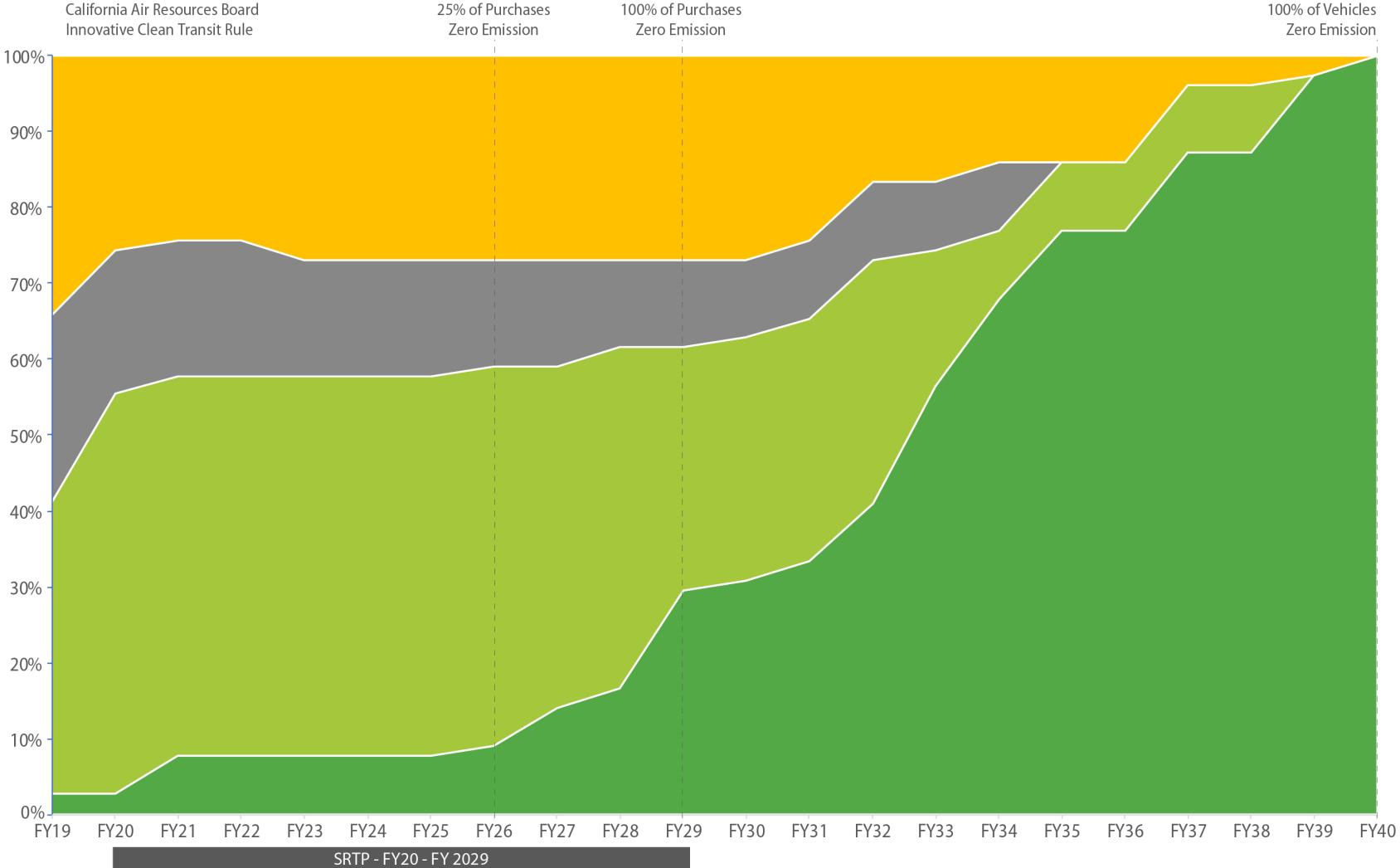
					SRTP Years - FY20-FY29																				
					Replacements (In-service year)																				
Contractor	Vehicle Type	Life Cycle (yrs)	Current Vehicles	Final Vehicle	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026 ⁽⁴⁾	FY 2027	FY 2028	FY 2029 ⁽⁵⁾	FY 2030	FY 2031	FY 2032	FY 2033	FY 2034	FY 2035	FY 2036	FY 2037	FY 2038	FY 2039	FY 2040
Golden Gate Transit	60 ft Artic	12	10	0																					
	35ft Hybrid	12	7	0				7																	
	35ft Electric	12	2	9											2				7						
	40ft Hybrid	12	10	0	11																				
	40ft Electric	12	0	25		4 ⁽¹⁾								10				15 ⁽²⁾							
Marin Airporter	Shuttle	7	13	0		9		1			1		7												
	Electric Cutaway	7	0	12							1		2		1		2	1		9					
	40ft Hybrid	12	7	0								7													
	40ft Electric	12	0	7																				3	
	30ft Hybrid	12	4	0																					
	30ft Electric	12	0	4									4											5	
MV Transportation	Stage Cutaway	7	6	0																					
	29ft XHF	12	3	0	4			2					2												
	30ft Electric	12	0	9													4		2						
	35ft XHF	12	10	0	2	2					8 ⁽³⁾		1												
	35ft Electric	12	0	12												2	2						8	1	2

= Electric Fleet = Fleet No Longer Exists

Notes:

- (1) Purchase of 4 Electric Buses in FY 2021 (and replacement in 2033) going on GGT contract is contingent upon service levels and GGT ability/willingness to operate vehicle type
- (2) Replacement of 11 - 40ft Hybrids and 4 - 40ft Electric Vehicles combined in FY 2033
- (3) Purchase of 5 35ft XHFs and 3- 35ft XHFs combined in FY 2025
- (4) 25% of purchases are Required to be Zero-Emission under CARB's Innovative Clean Transit Rule
- (5) 100% of purchases are required to be Zero-Emission under CARB's Innovative Clean Transit Rule

Figure G-1: Marin Transit Fixed Route Fleet Composition Over Time



- Percentage Zero Emission

- Percentage Hybrid

- Percentage Gasoline

- Percentage Diesel
