SFMTA

Zero-Emission Bus Fleet Plan

Engineering, Maintenance & Safety Committee Meeting

Citizens' Advisory Council

June 23, 2021

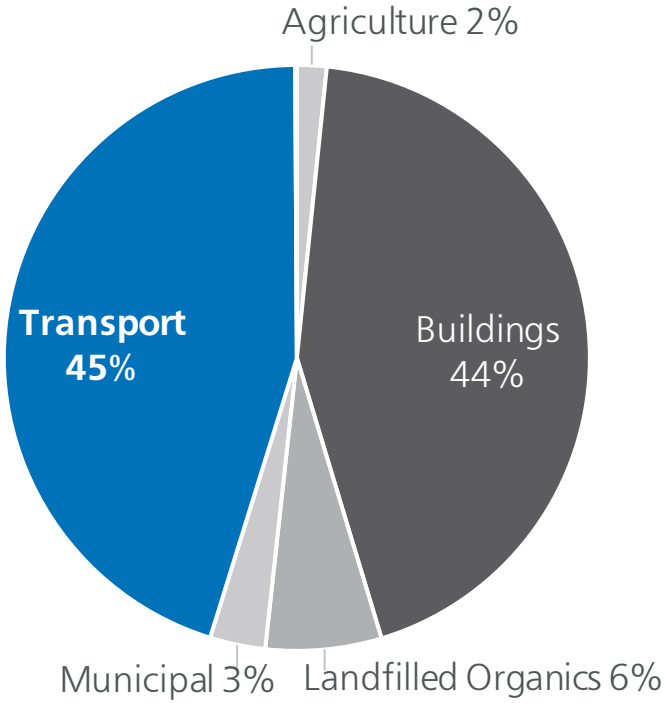
Introduction

- **2018:** SFMTA adopts **Zero-Emission Vehicle Policy**
- **2019:** California Air Resources Board (CARB) implemented the **Innovative Clean Transit (ICT)** regulation
  - Required a board approved ZEB Rollout Plan to be submitted to CARB by March 31, 2021
- **2021:** SFMTA submitted a Board-approved **ZEB Rollout Plan** which included:
  - A schedule for fleet purchase and facilities infrastructure upgrades
  - Identification of potential funding sources
  - Identification of start-up and scaling challenges

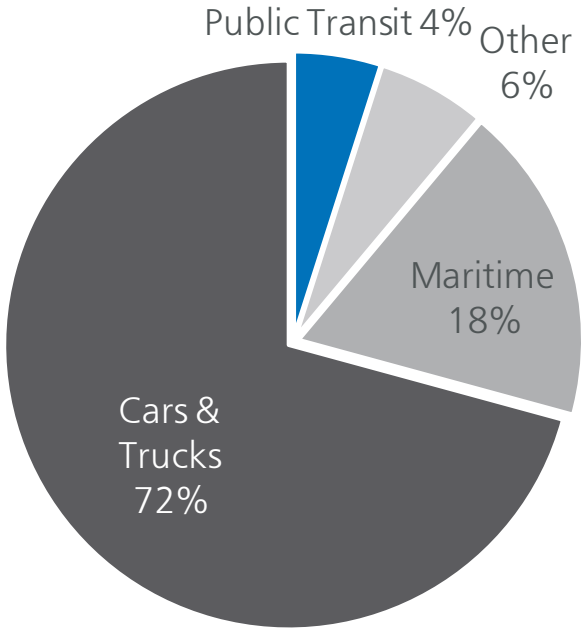
Climate Action at SFMTA

- SFMTA is committed to mitigating the impacts of climate change and addressing transportation sector greenhouse gas (GHG) emissions
- SFMTA is a national leader in reduced or zero emission transit vehicles

San Francisco Greenhouse Gas Emissions (2018)



Citywide



Transportation Sector

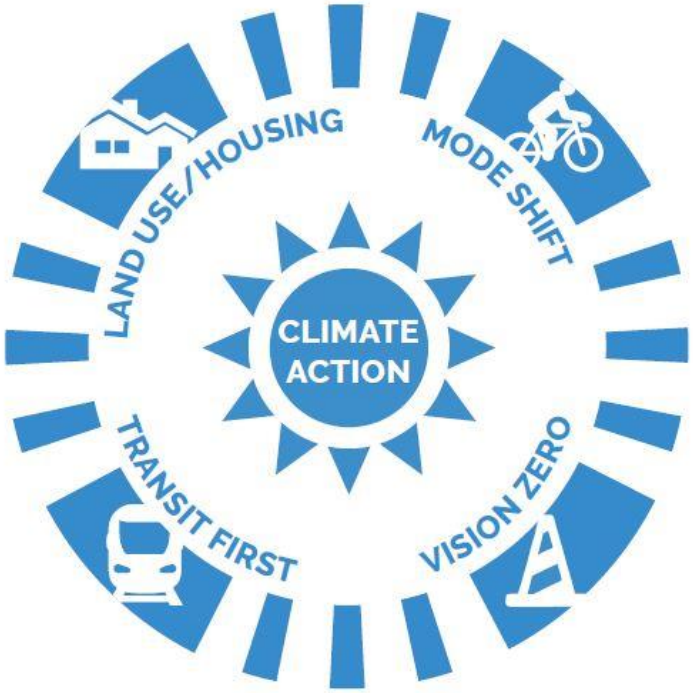
.01% of citywide emissions are attributable to Muni fleet

Climate Action at SFMTA

SFMTA is committed to procurement of Battery Electric Buses as per our Zero Emission Vehicle Policy.

Our approach to mitigating climate impacts and reducing transportation sector emissions must include diverse and holistic multimodal strategies.

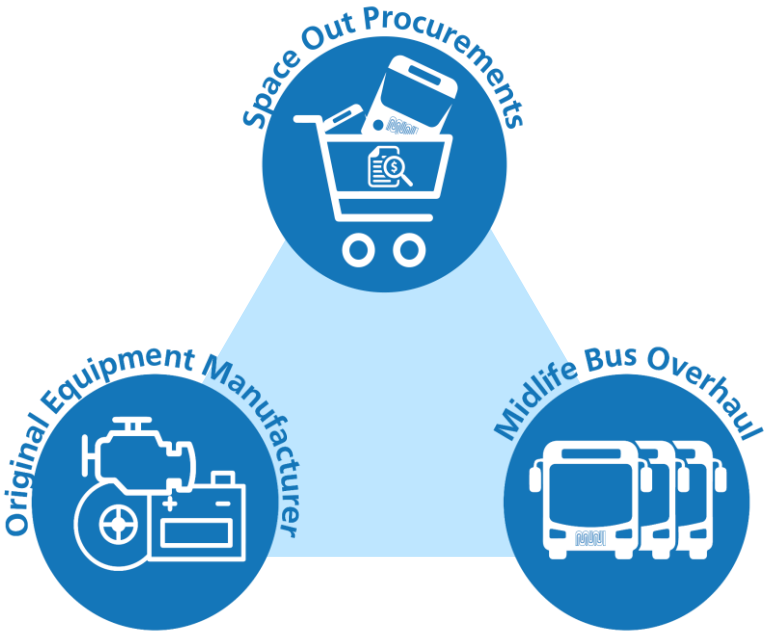
In addition to making progress towards a zero-emission transit system, providing quality and reliable service will be critical for Muni to enable mode shift from private auto use.



SFMTA's Approach to Fleet Management

Guiding Principles

- Maintain consistent average fleet age
- Performance-based procurements
- Develop robust maintenance standards
- Align with City's sustainability goals
- Anticipate and accommodate growth
- Maintain a spare ratio of 20%



Progress Towards Zero-Emission Policy

Recent Accomplishments

- Took delivery of first three buses in 40-ft pilot program to test battery electric buses
- Completed installation on a charging unit at Marin
- Initiated construction of scalable charging infrastructure for the Battery Electric Bus pilot program at Woods Division
- Completed the Design Criteria Document and Request for Qualifications Process for the Potrero Yard Modernization Project, the SFMTA's first purpose-build BEB facility
- Commissioned the Trolley Bus Future Suitability Analysis, which aimed to investigate the future of trolley buses in zero-emission fleets.

Rollout Plan Summary

Proposed Bus Procurement Schedule

- **2021:** 30 x 30’ replacement hybrid electric buses
- **2021 – 2022:** 12 x 40’ battery electric buses
- **2025:** 112 x 40’ replacement hybrid electric buses
  - Facilities for battery electric buses may not be ready by 2025. The SFMTA is evaluating the potential for retrofitting existing facilities for battery bus use.
- **2027 and onward:** 100% zero-emissions buses

Proposed Facility Transition Schedule

	Current Fleet Capacity & Type	Project Timeline	Comments
Potrero	93 – 60ft Trolleys 53 – 40ft Trolleys	2024-2027	Rebuild to 213 capacity
Kirkland	91– 40ft Hybrids	2024-2027	Likely Retrofit (under analysis)
Flynn	119 – 60ft Hybrids	2025-2028	Retrofit
Presidio	132 – 40ft Trolleys	2028-2031	Rebuild to 225 capacity
Islais Creek	105 - 60ft Hybrids 10 - 30ft Hybrid	2030-2033	Retrofit
Woods	221- 40ft Hybrids 20 - 30ft Hybrids	2034-2037	Likely Rebuild (under analysis)

Battery Electric Bus Pilot Program

- In 2020, the SFMTA placed orders for three 40-ft battery electric buses each from New Flyer, BYD, and Proterra to determine the current state of battery electric bus technology.
- These vehicles will be used in regular revenue service on the SFMTA's most demanding routes and will also be compared to existing hybrid and trolleys.
- The first buses from New Flyer, BYD, and Proterra have arrived at San Francisco and are now undergoing testing and commissioning.
- In 2021, the SFMTA added a fourth manufacturer (Nova Bus) to the slate of test buses. These buses will be delivered in 2022.

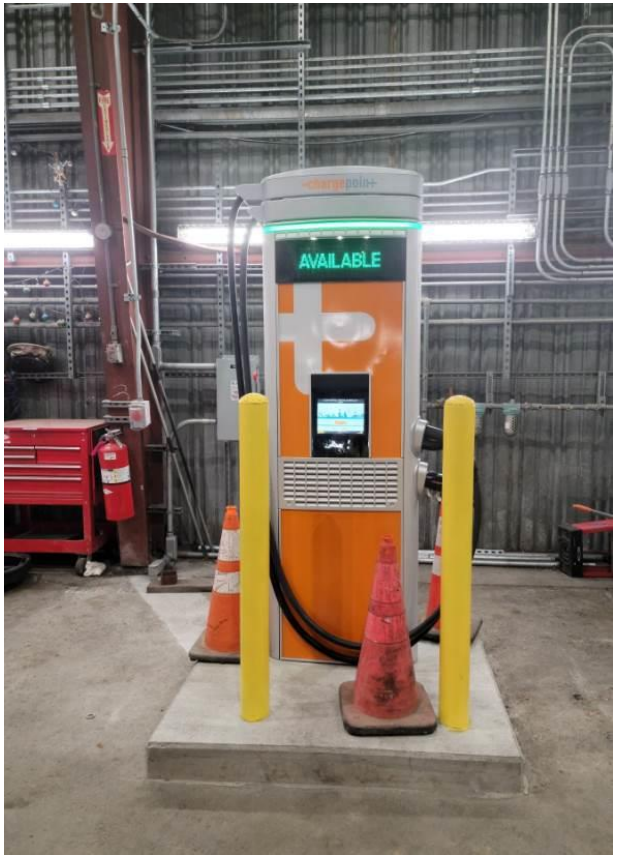
Battery Electric Bus Pilot Program

Battery Electric Bus Pilot Program

- The pilot program will allow the SFMTA to evaluate the bus building ability of each manufacturer to ensure they can provide safe, reliable, and high-performance buses for our riding public.
- The battery buses are expected to perform comparably to our existing electric trolley and diesel hybrid buses in terms of gradeability, speed, acceleration, and clearance on San Francisco streets.
- The SFMTA will perform speed, acceleration, and range testing on the pilot buses on many routes, including the 1, 9, 22, 24, 29, 43, and 44.
- The buses are expected to deliver at least 160 miles per charge with a 52-passenger load.

Charging Infrastructure

- Completed installation on a charging unit at Marin. The pilot buses will be tested, commissioned and go thru the acceptance process at the Marin facility.
- Once the buses are ready to go in the revenue service, the buses will be operated out of Woods Division.

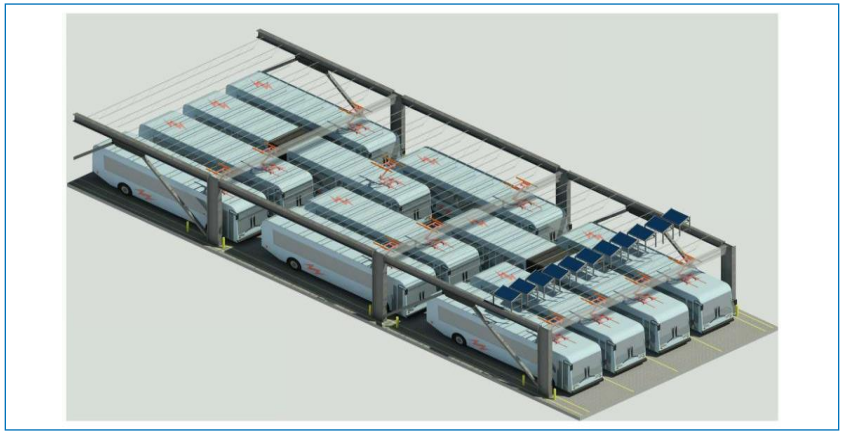


Charging Infrastructure

- Construction of scalable charging infrastructure for the Battery Electric Bus pilot program at Woods Division is underway with the estimated completion date of Sept 2021.

BEB Transition Plan

- On-boarded a Consultant for an in-depth facility and fleet assessment to support the SFMTA's facility and operational transition to a zero-emission battery electric bus (BEB) fleet.
- Potrero Yard is scheduled to be completed in 2027 and will be our first BEB ready bus yard.
- SFMTA has opted to install overhead charging infrastructure with Pantographs at our facilities.



Challenges with ZEB Transition

Ongoing Fiscal Uncertainty

Timing

Complexity

COVID 19 Impacts and Future Resiliency

Challenges with ZEB Transition

Ongoing Fiscal Uncertainty

- Initial cost estimate for vehicles is $1.4B and for facilities upgrades/rebuild is in the range of $2 - 3B (rebuild + conversion)
- The Facilities and Fleet Plan (currently in development) will provide comprehensive cost estimates, including:
  - facility retrofits, code compliance upgrades (SGR)
  - utility work required by PG&E, or
  - facilities already programmed for full rebuild with e-bus as a component
- The SFMTA's budget crisis means we have a funding gap for a ZE transition starting in 2025

Challenges with ZEB Transition

Timing of Facility Upgrades

- Charging infrastructure must be in place in advance of procuring BEBs
- Facility capital projects have long lead times – 3-5 years for retrofit, and 6-10 years for full rebuild projects
- Potrero will be the first purpose-built BEB facility and is planned to be completed in 2026; planning phase began in 2017
- Transitioning of all facilities is a complex process that relies on delivery efficiency and related project phasing

Challenges with ZEB Transition

Complexity

- BEBs require extensive power above existing power capacity at our facilities.
- Provision of new electrical service and any associated grid improvements are beyond the SFMTA's control. This is dependent on PG&E's commitment to deliver the required power upgrades in a timely manner.
- Significant coordination and collaboration with PG&E.
- Facility rebuilds requires significant logistical planning to ensure transition minimizes disruption to service.

Challenges with ZEB Transition

COVID 19 Impacts and Future Resiliency

- The pilot program has been delayed, minimizing our experience to date with the BEBs.
- Covid-19 has highlighted the importance of fleet and facility resiliency and has emphasized the need to be prepared for uncertainty and the ability to act nimbly.
- The ZEV Policy and the ICT regulation does not address emergency/contingency fleet needs.
- The industry needs more time to evaluate the performance of BEBs in emergency response roles.

Trolley Feasibility Study

- The SFMTA commissioned Jacobs Engineering to perform a trolley feasibility study to help determine what role trolleys will play in SFMTA's future zero emission fleet.
- Finding: market demand for trolley buses is waning and there is a risk for the future of trolley bus production.

Trolley Feasibility Study

Advantages	Disadvantages
Zero-emissions/nearly silent	Expanding infrastructure can be costly
Infrastructure already in place	Cannot easily reroute/cannot detour due to road work (unless using dual mode vehicles)
Routes are already planned out/stable	Requires specialized maintenance staff
Funding available	Capital costs generally higher than other vehicles
Perform well on both hills and flat stretches of road	Majority of OEMs have ceased manufacturing trolley buses, while parts/subsystem providers have significantly reduced their trolley bus offerings
Longer lifecycles when compared to other vehicle types	Long lead times for parts
Can share electrical systems, such as substations, with other transit systems	Shortage in future suppliers of parts

Next Steps

- SFMTA staff will lead a policy discussion on the path to future of zero-emissions bus fleet
  - Carry on pilot program to evaluate battery buses in SF
  - Conduct 60’ battery electric bus pilot program
  - Evaluate potential to accelerate facility retrofit
  - Continue to engage with PG&E and SFPUC to ensure needed power is available
  - Continue pursuing funding strategies
  - Update ZEB Rollout Plan in 2022 to reflect our findings and further refine our path forward


Thank you
SFMTA