Emission Zero Program

North Fair Oaks Community Council Meeting

April 27, 2023

Topics: North Base ZEB Transition

- Program Scope
- Battery Electric Buse (BEBs)  vs. Hydrogen Fuel Cell Bus (FCEBs) 
- Recommendation
- Timeline & Progress
- Next Steps

Program Scope

- California Air Resources Board Mandate (ICT Regulation)
- Vehicle Replacement
- New Infrastructure
- Facility Modifications
- Work Force Training

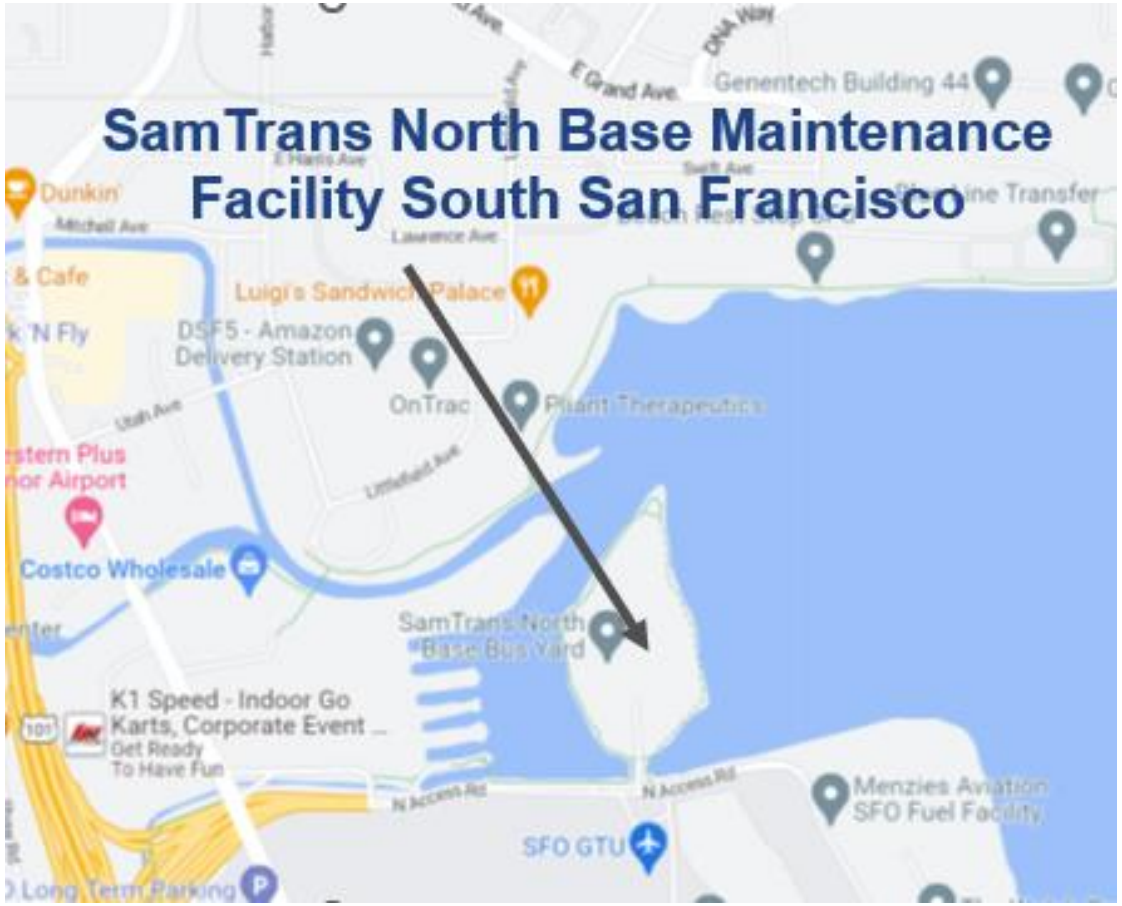
ICT Regulation

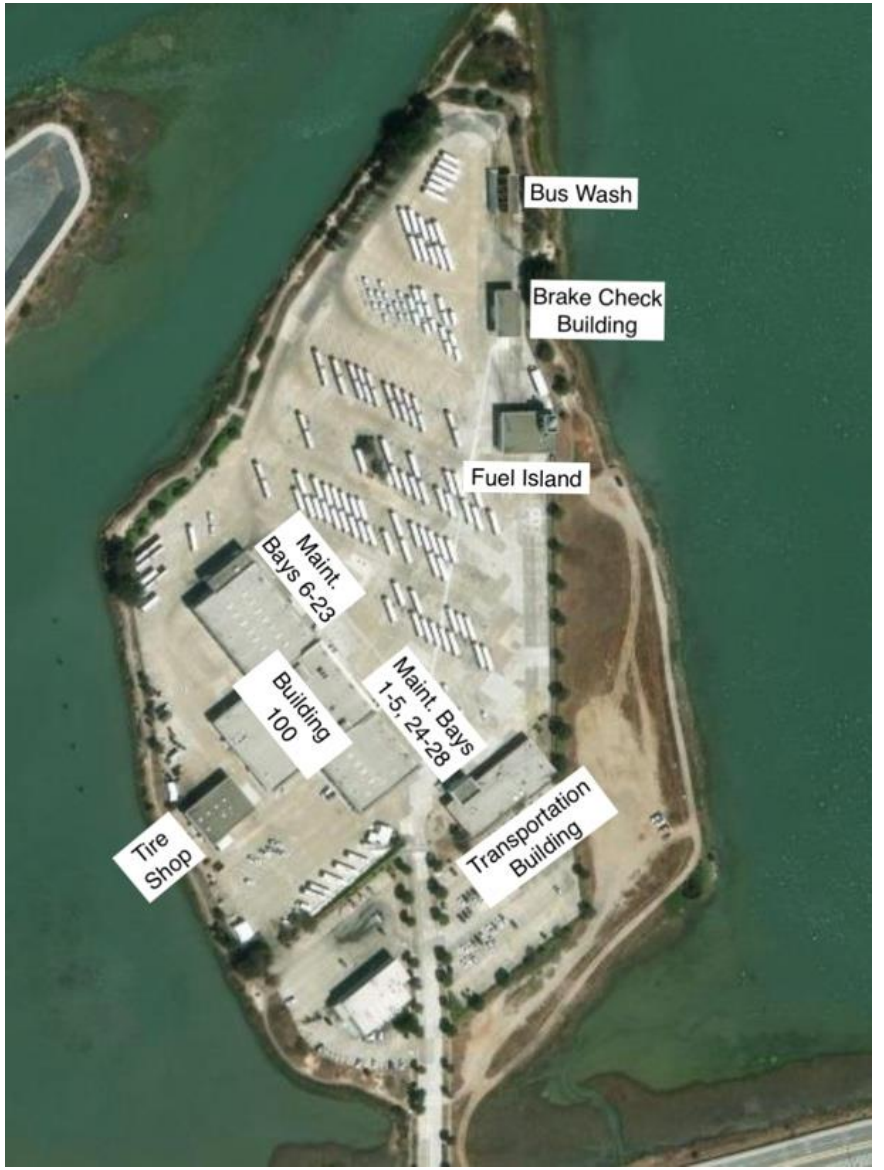
- Instituted by California Air Resources Board (CARB) in 2018
- Requires transit providers to transition their fleets to zero emission technology by 2040
- SamTrans developed ICT Plan to plan; goal to convert fleet by 2034 ahead of mandate

Vehicle Replacement

- **319 Fixed-Route Vehicles**
  - **40’ Buses**
  - **60’ Buses**
- 70 Paratransit Vehicles

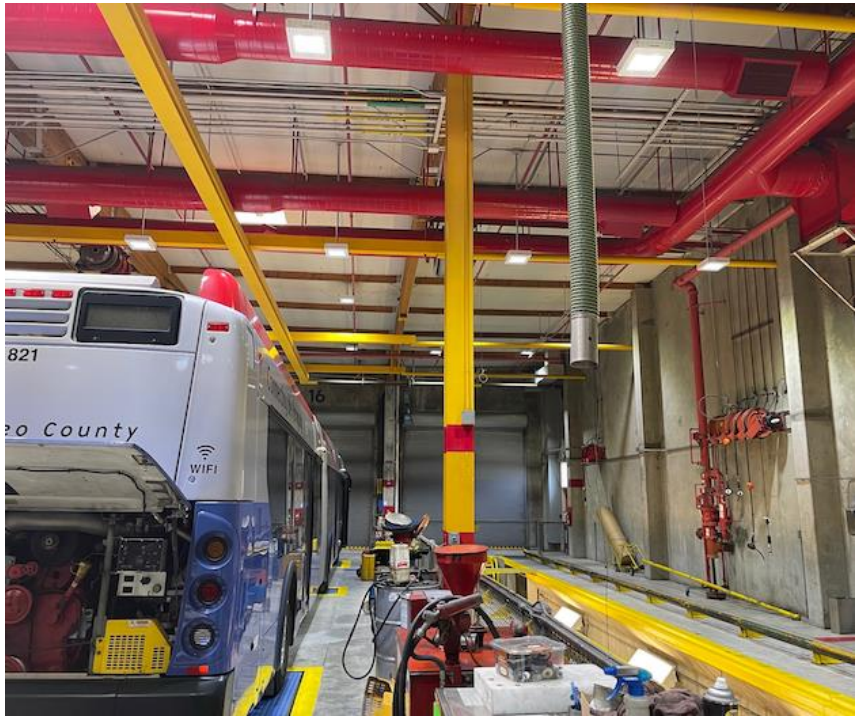
New Infrastructure





Facility Modifications

- Electric System Upgrades
- Maintenance Facility Modifications



Work Force Training

BEBs vs. FCEBs

- Vehicle Performance
- Infrastructure
- Life Cycle Costs
- Emissions
- Resilience

Vehicle Performance

Criteria	BEBs	FCEBs
Range	180 - 200 miles	260 - 300 miles
Charging/Fueling Time	4 to 6 hours	6 to 20 minutes

BEBs: Range Requirements

BEBs 

Range: up to 200 miles

Buses		Number of Miles Traveled per Day	
Type	Number	Less than 200 miles	Greater than 200 miles
40'	114	97 buses	17 Buses
60'	21	15 buses	6 Buses

Options for routes that travel more than 200 miles per day, includes Route ECR (over 20% of SamTrans service):

- Purchase 17 additional 40’ BEBs and 6 additional 60’ BEBs
- Charge buses along the routes

FCEB: Range Requirements

FCEBs 

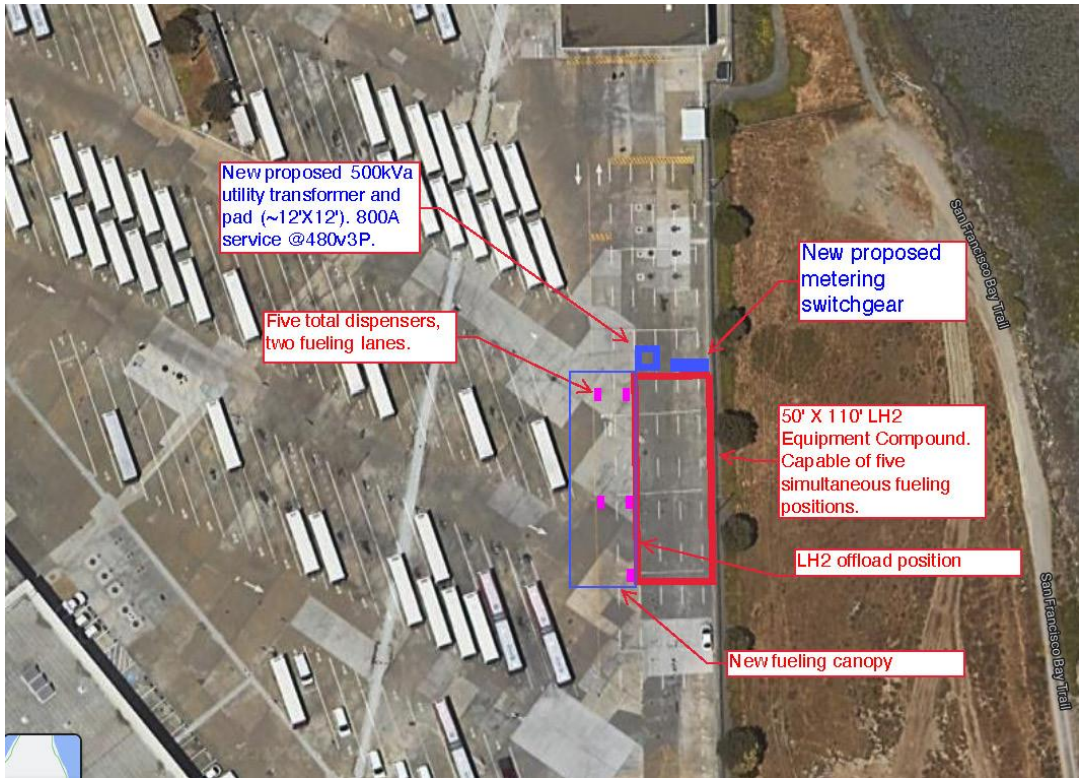
Range: up to 300 miles

Buses		Number of Miles Traveled per Day
Type	Number	Less than 300 miles
40'	114	114 Buses
60'	21	21 Buses

No need to purchase additional buses to maintain the same service level.

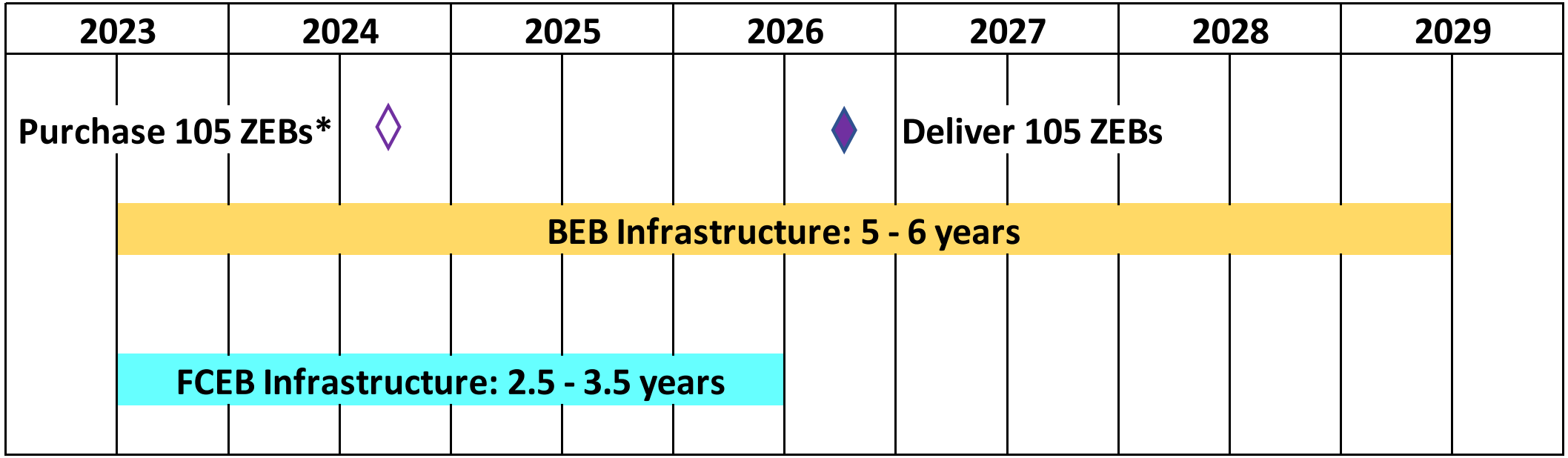
BEB Infrastructure

FCEB Infrastructure



Facility Modifications for FCEBs

Infrastructure Schedule



**105 buses have reached their useful life*

Life Cycle Costs: Assumptions

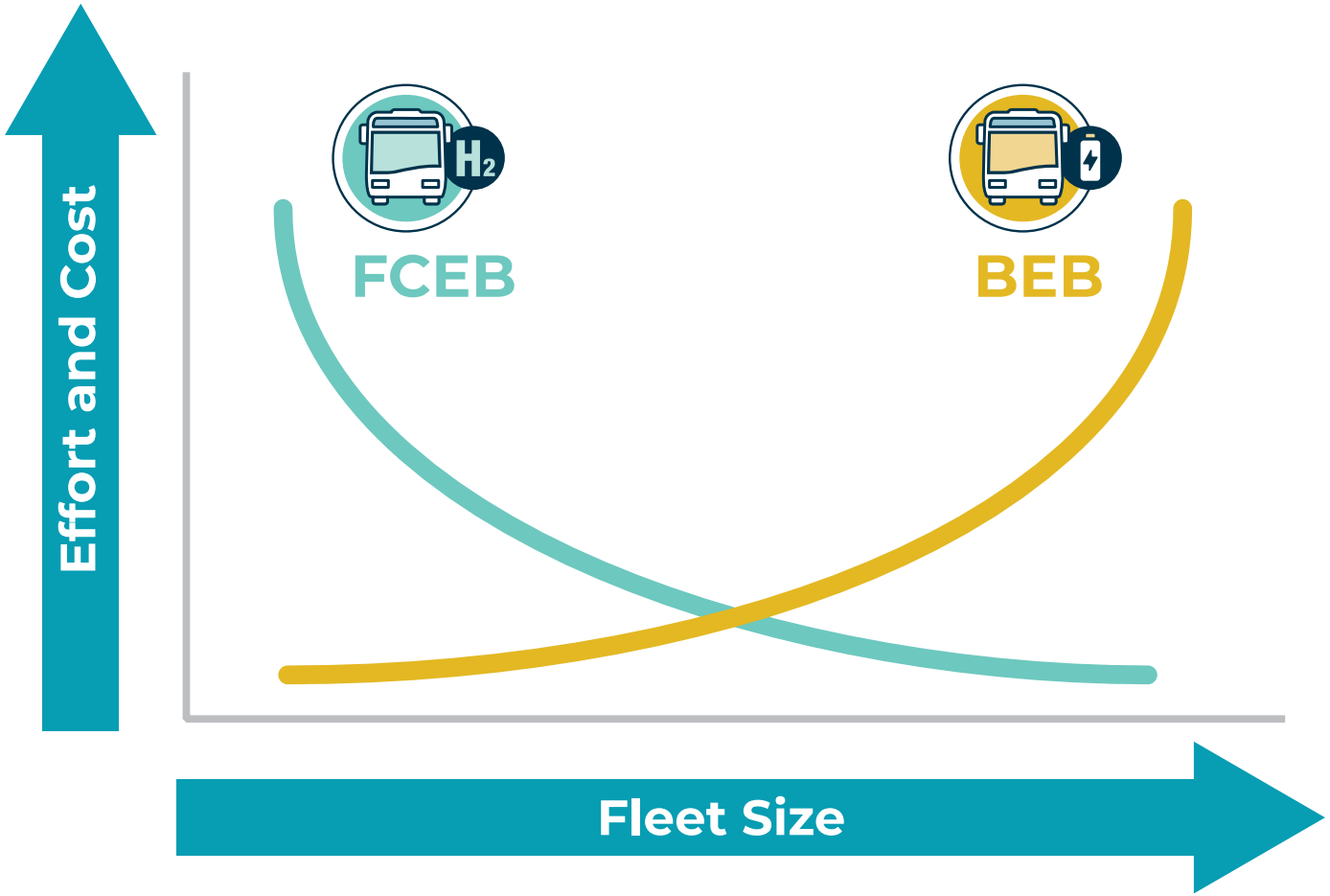
- Revenue Fleet at North Base (NB)
- 12 Year Life Cycle
- Reimagine SamTrans Service Level
- Costs in Year of Expenditure Dollars

Life Cycle Costs: Total Cost of Buses (NB)

	BEB		FCEB		Variance
	Number*	Cost	Number	Cost	
40’ Bus	148	$169,542,050	131	$175,120,390	
60’ Bus	37	$82,851,107	31	$71,887,784	
Total	**185**	**$252,393,157**	**162**	**$247,008,174**	**$5,384,983**

** Additional BEBs are required for routes that exceed the 200 mile range of BEBs*

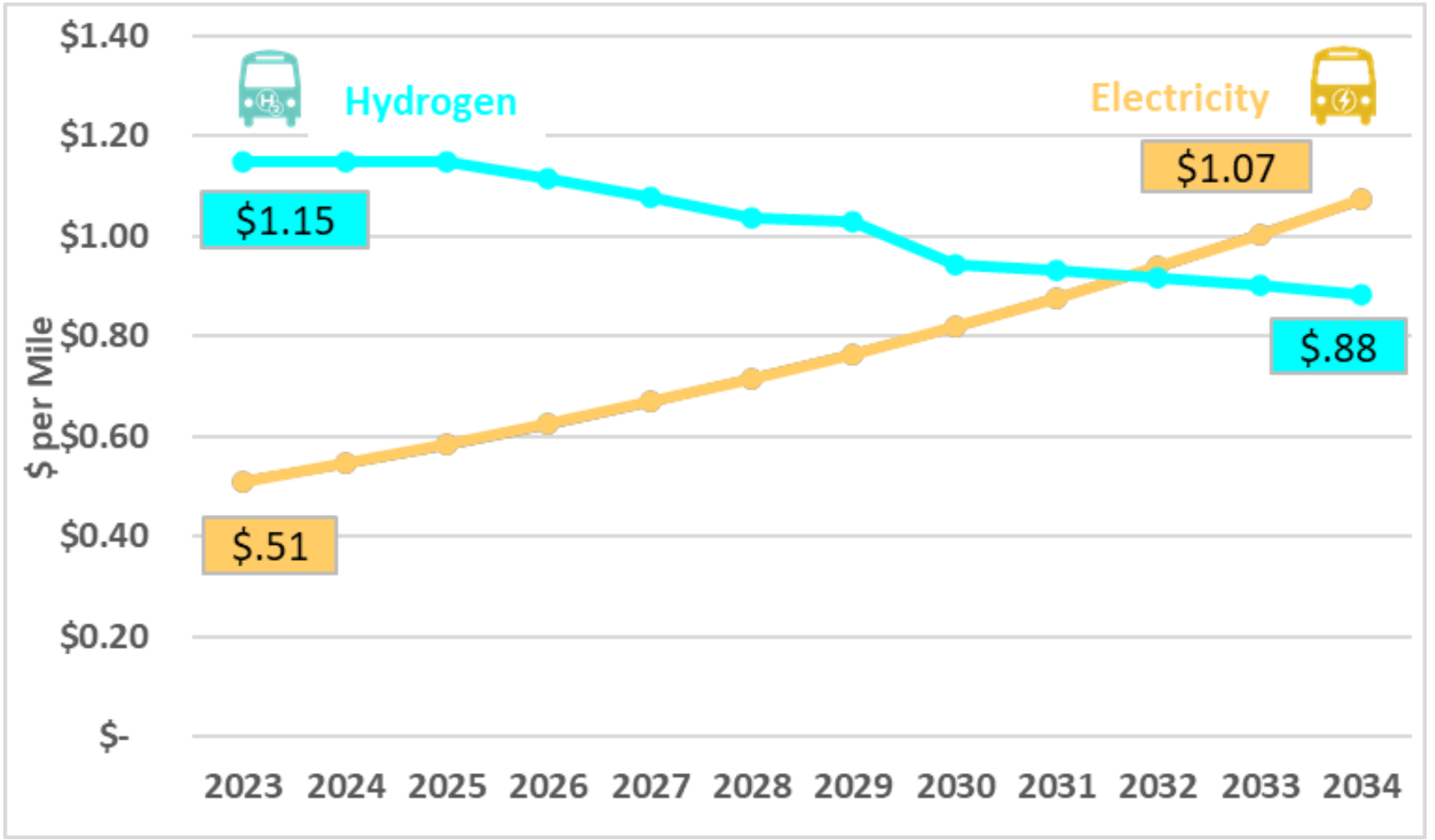
Infrastructure Costs: BEB vs. FCEB



Life Cycle Costs: 12-Year Total (NB)

	BEB	FCEB	Variance
Buses	$252,393,157	$247,008,174	$5,384,983
Infrastructure	$144,950,000	$36,150,000	$108,800,000
Vehicle Maintenance	$36,592,886	$42,106,882	($5,513,996)
Infrastructure Maintenance	$3,900,000	$8,580,000	($4,680,000)
Total	**$437,836,043**	**$333,845,057**	**$103,990,987**

Energy Costs: Electricity vs. Hydrogen



Life Cycle Costs: 12-Year Total + Energy (NB)

	BEB	FCEB	Variance
Buses	$252,393,157	$247,008,174	$5,384,983
Infrastructure	$144,950,000	$36,150,000	$108,800,000
Vehicle Maintenance	$36,592,886	$42,106,882	($5,513,996)
Infrastructure Maintenance	$3,900,000	$8,580,000	($4,680,000)
Total	**$437,836,043**	**$333,845,057**	**$103,990,987**
Energy (electricity & H2)	$41,096,703	$51,129,786	($10,033,083)
Total + Energy	**$478,932,746**	**$384,974,842**	**$93,957,904**

Emissions (Tail Pipe)

	BEBs	FCEBs
Tail Pipe Emissions	Zero	Zero

Green House Gas (GHG) Reduction

Diesel	BEBs	FCEBs
0%	77% - 100%*	60-100%*

** Depends on fuel source*

Battery Usage

	BEBs (185)	FCEBs (162)
Battery Packs	1,110	162

FCEBs generate much less battery waste than BEBs.

FCEBs require one battery pack per vehicle while BEBs require six.

Resilience

	BEBs	FCEBs
Energy Source	Single Source – Electric Grid	Multiple Sources
Infrastructure	Fixed	Can be relocated

Criteria	BEBs	FCEBs
Range		✓
Fueling Time		✓
Infrastructure		✓
Maintenance	✓	
Energy Costs	✓	
GHG Reduction	✓	
Resilience		✓

Other Transit Agencies in CA

- Bay Area Transit Agencies
  - BEBs: SF MTA
  - BEBs & FCEBs/FCEB Plans: AC Transit, VTA, Golden Gate
- At least 19 Agencies have FCEBs/ FCEB Plans
  - AC Transit: 70% FCEBs – 30% BEBs
  - Foothill Transit: 1 Facility for FCEBs, 1 Facility for BEBs
  - FCEBs: 157 by 2023; 1500 by 2031
  - H2 Stations: 12 by 2023; 34 by 2031

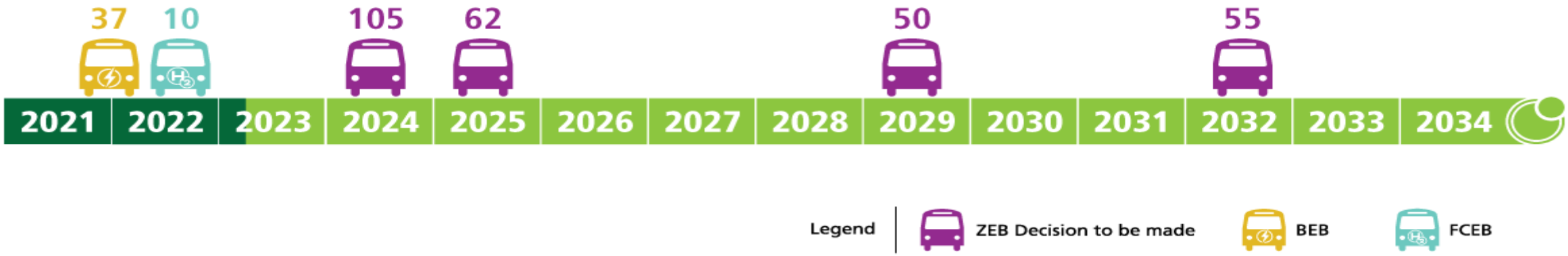
Recommendation: North Base

- Replace North Base Diesel Fleet with FCEBs
  - Operational Flexibility: Range & Fueling Time
  - Infrastructure Cost & Schedule
  - Resilience
  - Experience of other transit agencies

Recommendation: South Base

- Decide in 2024 on type of zero emission bus for the rest of the South Base Fleet based on the following:
  - Actual experience with BEBs and FCEBs
  - Actual Costs of Electricity and Hydrogen
  - Actual Infrastructure Costs & Schedule
  - Additional Experience of Other Transit Agencies

Vehicle Procurement Timeline



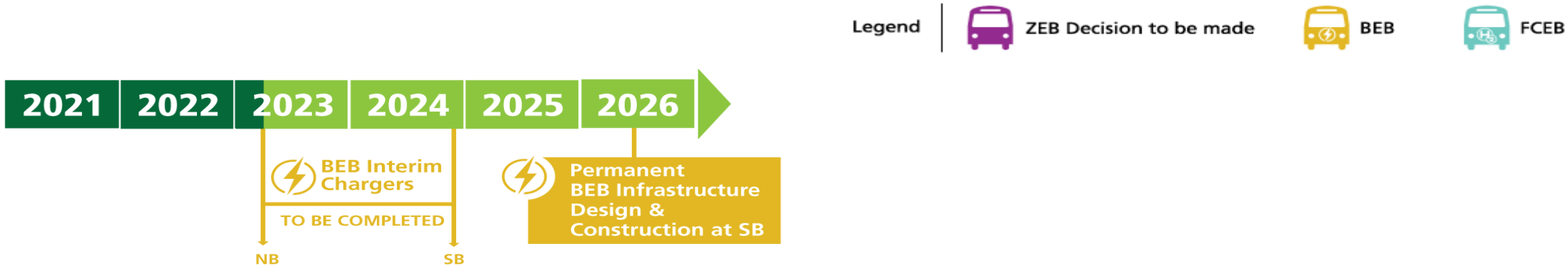
Vehicle Procurement Timeline

Legend | ZEB Decision to be made | BEB | FCEB

FCEB Infrastructure Timeline

Vehicle Procurement Timeline

BEB Infrastructure Timeline



Next Steps Review

- Seek outside funding for zero emission vehicles & infrastructure
- Procure 105 FCEBs for North Base (NB)
- Design & Construct Permanent Hydrogen Fueling Station at NB
- Design & Construct Facility Modifications at NB
- Decide in 2024 on ZEB for Rest of SB Fleet

Request: Support for Funding Applications

SamTrans is requesting support from the North Fair Oaks Community Council for its Emission Zero plan to use when applying to multiple funding sources:

- FTA Low-No Emission & Bus & Bus Facilities
- Department of Energy's Federal Hydrogen Hub
- CTC Local Partnership Program (LPP)
- Others as they arise

Questions?