ZERO-EMISSION BUS
ROLLOUT PLAN

SunLine TRANSIT AGENCY

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SECTION A:
Transit Agency Information

SunLine Transit Agency (SunLine) provides public transit services in California's Coachella Valley. It has pioneered zero-emission bus deployments, particularly for hydrogen fuel cell electric buses (FCEB). In 1993, SunLine's Board adopted a voluntary policy of pursing alternative fuel solutions that provide the lowest possible emissions, which led to SunLine becoming the first transit agency in the state to convert its entire fleet to compressed natural gas (CNG). The current fleet includes 16 FCEBs and 4 battery electric buses (BEB), which comprise 24% of the fixed route fleet. SunLine is committed to transitioning its entire bus fleet to zero-emission in accordance with the Innovative Clean Transit (ICT) Regulation.

SunLine service includes local fixed route buses, a bus circulator loop, commuter/express buses, microtransit, and paratransit buses. Its service area is in the Riverside County Supervisorial District 4 and includes the following cities:

- Cathedral City
- Coachella
- Desert Hot Springs
- Indian Wells
- Indio
- La Quinta
- Palm Desert
- Palm Springs
- Rancho Mirage

SunLine's service also includes several unincorporated territories within Riverside County. In total, the service area covers 1,120 square miles. The bus fleet provides service to 15 local bus routes, one commuter/express bus between Indio and San Bernardino, and paratransit services for people who are unable to use fixed route buses.

SunLine operates out of two facilities. The administrative headquarters and main operating facility is located at 32-505 Harry Oliver Trail in Thousand Palms (Thousand Palms Facility). A smaller operating and maintenance facility is located at 83-255 Highway 111 in Indio (Indio Facility).

SunLine operates within the South Coast Air Quality Management District. The majority of SunLine's service territory is within the Salton Sea Air Basin, but the commuter bus route extends into the South Coast Air Basin. Key information about the agency is summarized below:

Transit Agency's Name	SunLine Transit Agency
Mailing Address (number, street, city, county, zip code)	32-505 Harry Oliver Trail Thousand Palms, CA 92276
Name of Transit Agency's Air District(s)	South Coast Air Quality Management District
Name of Transit Agency's Air Basin(s)	Salton Sea Air Basin, South Coast Air Basin
Total number of buses in Annual Maximum service	59
Population of the urbanized area a transit agency is serving as last published by the Census Bureau before December 31, 2017	375,550
Contact information of the general manager, chief operating officer, or equivalent: A) Contact Name (Last Name, First Name, MI) B) Title C) Phone number D) Email Address	Skiver, Lauren Chief Executive Officer / General Manager 760-343-3456 lskiver@sunline.org

SECTION B:
Rollout Plan General Information

SunLine's Rollout Plan will enable the agency to fully transition its bus fleet to zero-emission by 2035, which is five years ahead of the deadline set in the ICT Regulation. All buses will operate for their expected useful life to avoid early retirement of any vehicle. To achieve this, SunLine will build off past success deploying FCEBs and BEBs, which already make up 24% of the fixed route fleet.

Starting in 2021, all new fixed route vehicle purchases will be zero-emission buses (ZEB). Since each bus will operate for their entire useful life of 12-14 years, the last CNG buses purchased will dictate the year in which the fleet is fully transitioned to zero-emission. Any fixed route CNG bus purchases beyond 2020 will delay the transition. m,

The paratransit cutaway buses will be replaced on-schedule with the ICT regulation. However, the turnover of these vehicles is quicker because they are designed to a shorter lifespan. This will enable the paratransit CNG vehicles to be phased out of the fleet before 2035.

To reduce near-term costs, SunLine will refurbish 12 CNG fixed route buses in 2020, extending their lifetime by approximately six years. Fifty-three of SunLine's fixed route buses (62% of the fleet) were purchased between 2008 and 2009 and are now approaching their useful life. This batch procurement was executed to take advantage of available funding programs at that time. In the absence of these refurbishments, all these buses would need to be replaced around the same time, which would drive a spike in procurement. Extending the lifetime of a portion of these buses through refurbishment will help equalize the number of new purchases from year to year.

SunLine's existing FCEB fueling and BEB charging infrastructure was designed to enable future growth of their fleet. In late 2019, SunLine began operating an electrolyzer capable of producing 900 kg-H_2/day, which is enough to satisfy demand for 32 buses based on the average fuel consumption of FCEBs operating on SunLine's routes. There are currently six AC/DC BEB chargers installed between SunLine's Thousand Palms and Indio facilities serving only four BEBs. The electrical capacity could be used to power additional buses; however, new DC/DC chargers will be required to be compatible with BEBs offered by most bus providers.

This Rollout Plan was approved by SunLine's Board of Directors on June 24, 2021 under resolution number 0780. The board approved resolution is attached as Appendix B.

This Rollout Plan was developed by Zen and the Art of Clean Energy Solutions (Zen) in collaboration with SunLine.

For additional information on the Rollout Plan, please contact:

Tommy Edwards
Chief Performance Officer
(760) 343-3456 x1203
tedwards@sunline.org

SECTION C:
Technology Portfolio

SunLine intends to continue to deploy both FCEBs and BEBs as the fleet is transitioned to 100% zero-emission. The final fleet composition – 67 fixed route FCEBs, 18 fixed route BEBs, and 39 paratransit FCEBs – was determined to maximize performance and minimize cost. Using speed and elevation data from SunLine's current routes/blocks, daily operating energy and peak power requirements for BEBs and FCEBs were modelled to determine which technology was most appropriate for each route. Additional constraints were considered such as infrastructure footprint limitations and available electrical capacity.

Route Analysis

A representative portion of SunLine's routes were analyzed using a proprietary kinetic model developed by Zen, to determine which routes were best suited to BEBs or FCEBs. The model provides an accurate prediction of actual bus range limitations by considering route-specific power demand over time based on speed, elevation change, and idling time. Results were modelled based on vehicle specifications for several currently available BEBs and FCEBs. The model accuracy has been validated through comparison with actual range and fuel consumption on BEBs and FCEBs respectively.

Figure 1 shows an example of a duty cycle for a particular route operated during peak revenue service at SunLine. Figure 2 and Figure 3 show the modelled power demand and fuel consumption for a BEB and FCEB respectively operating on the duty cycle shown in Figure 1.

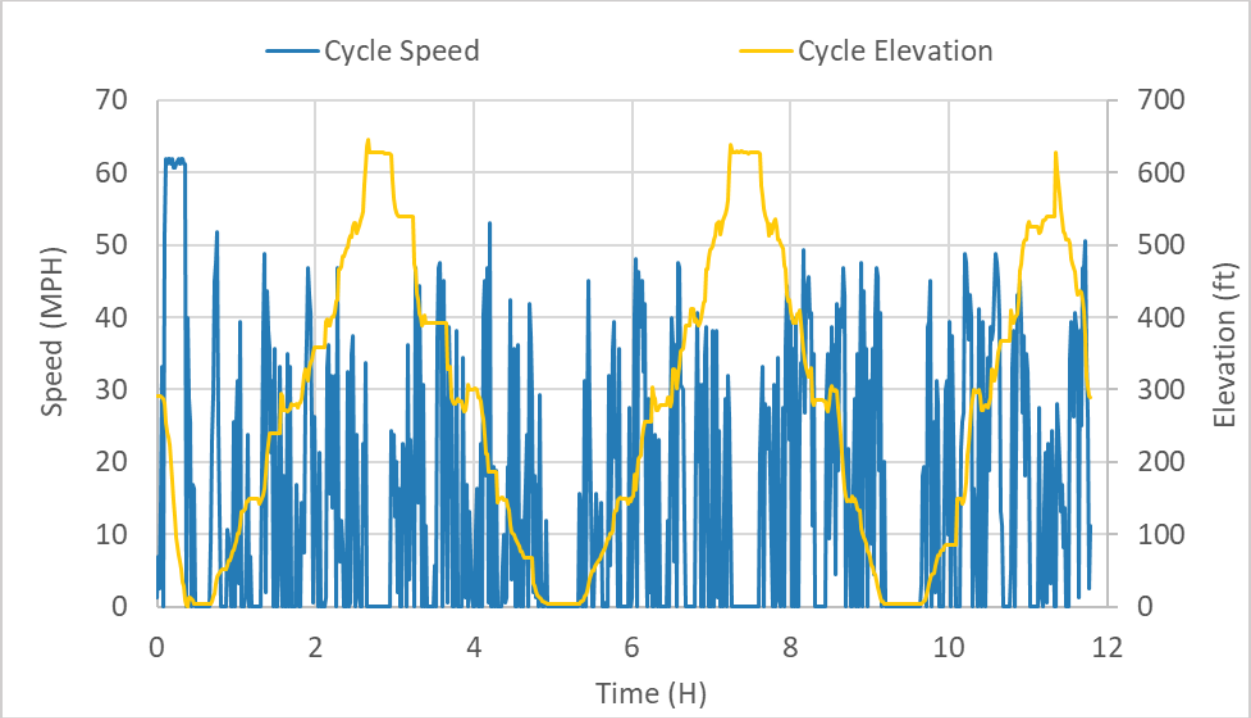


Figure 1. Example Duty Cycle

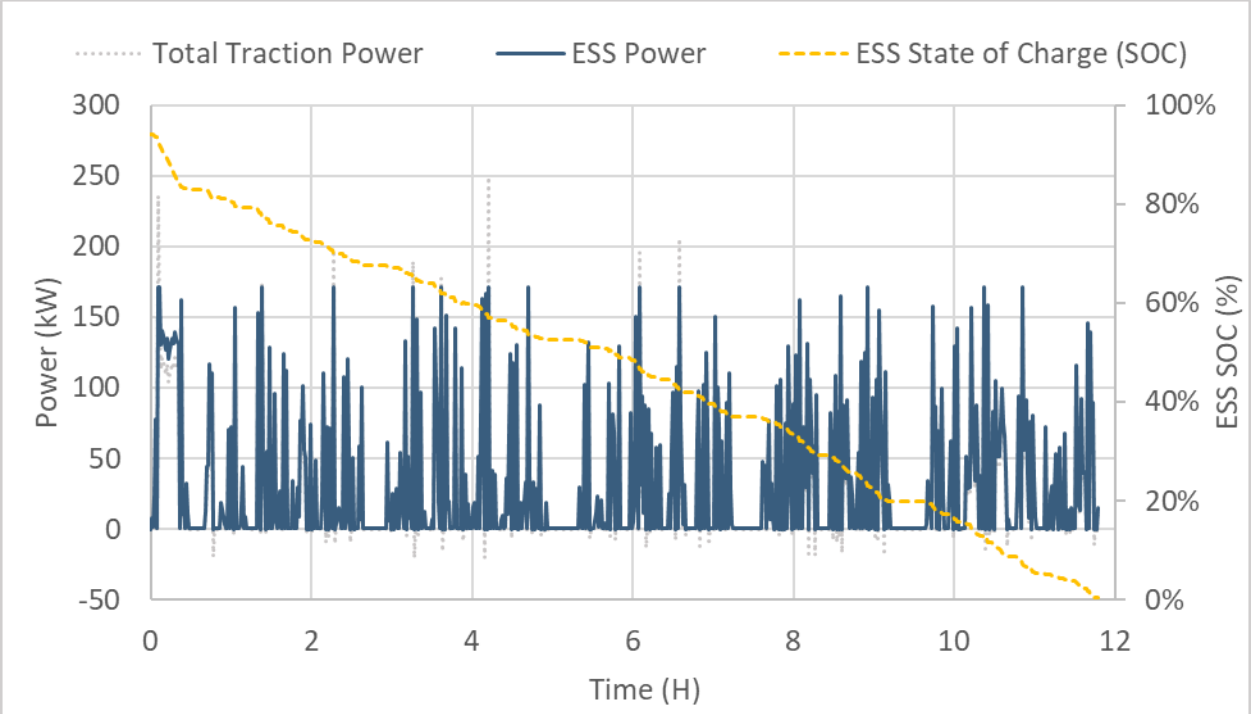


Figure 2. Example BEB Model: Power and Energy System Storage State of Charge

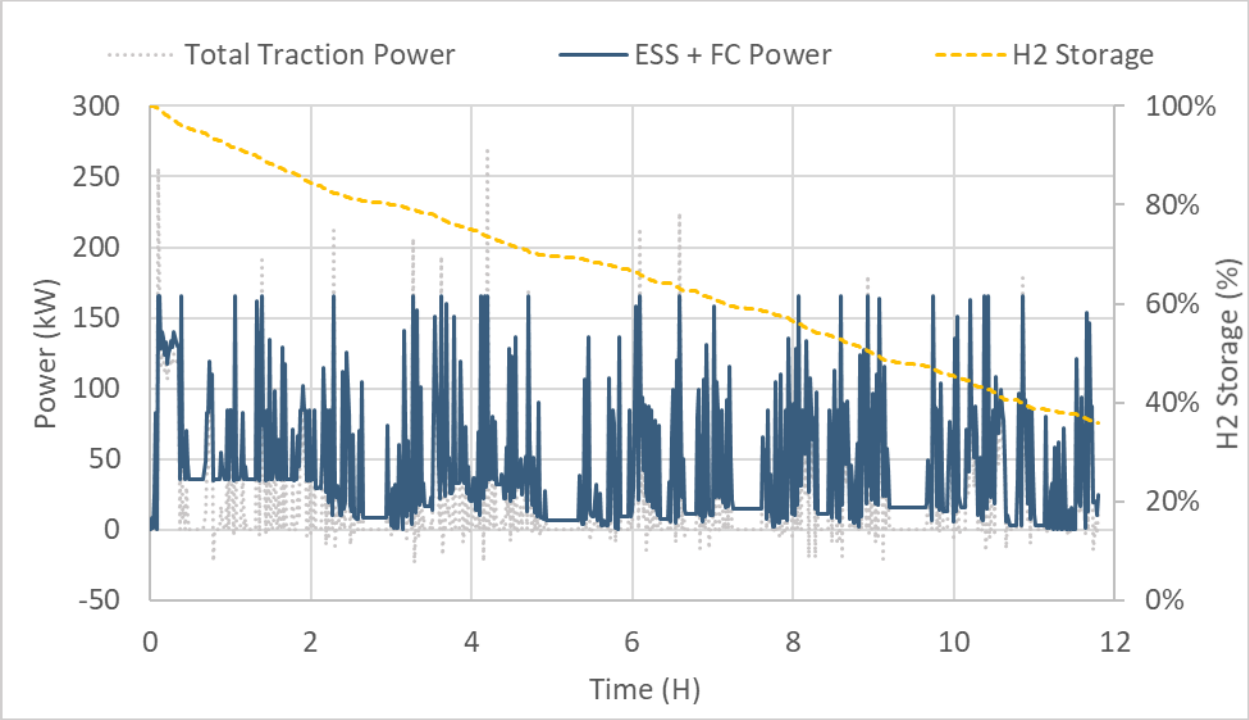


Figure 3. Example FCEB Model: Power and Hydrogen Storage

Based on the route modelling output, SunLine's fleet could contain up to 20-41 BEBs while maintaining the current service level and without requiring more than a 1-1 vehicle replacement. The remainder of the fleet must be FCEBs, due to the longer range capability of these bus types.

Infrastructure Constraints

Two major constraints limiting the deployment of ZEB infrastructure are the availability of space and electrical capacity. New hydrogen fueling or electric charging equipment takes up land area and must be sited to enable vehicle flow and parking. For highly space constrained agencies, this will be a major factor in deciding what type of equipment to install. Both of SunLine's facilities have sufficient space to install hydrogen and battery electric charging equipment without impacting existing operations.

Figure 4 and Figure 5 show overhead views of existing bus fueling/charging equipment as well as the expected location of future equipment at the Thousand Palms and Indio facilities respectively. The location of future equipment shown in these figures is approximate – the exact siting will be determined through engineering analysis as the construction projects are planned.

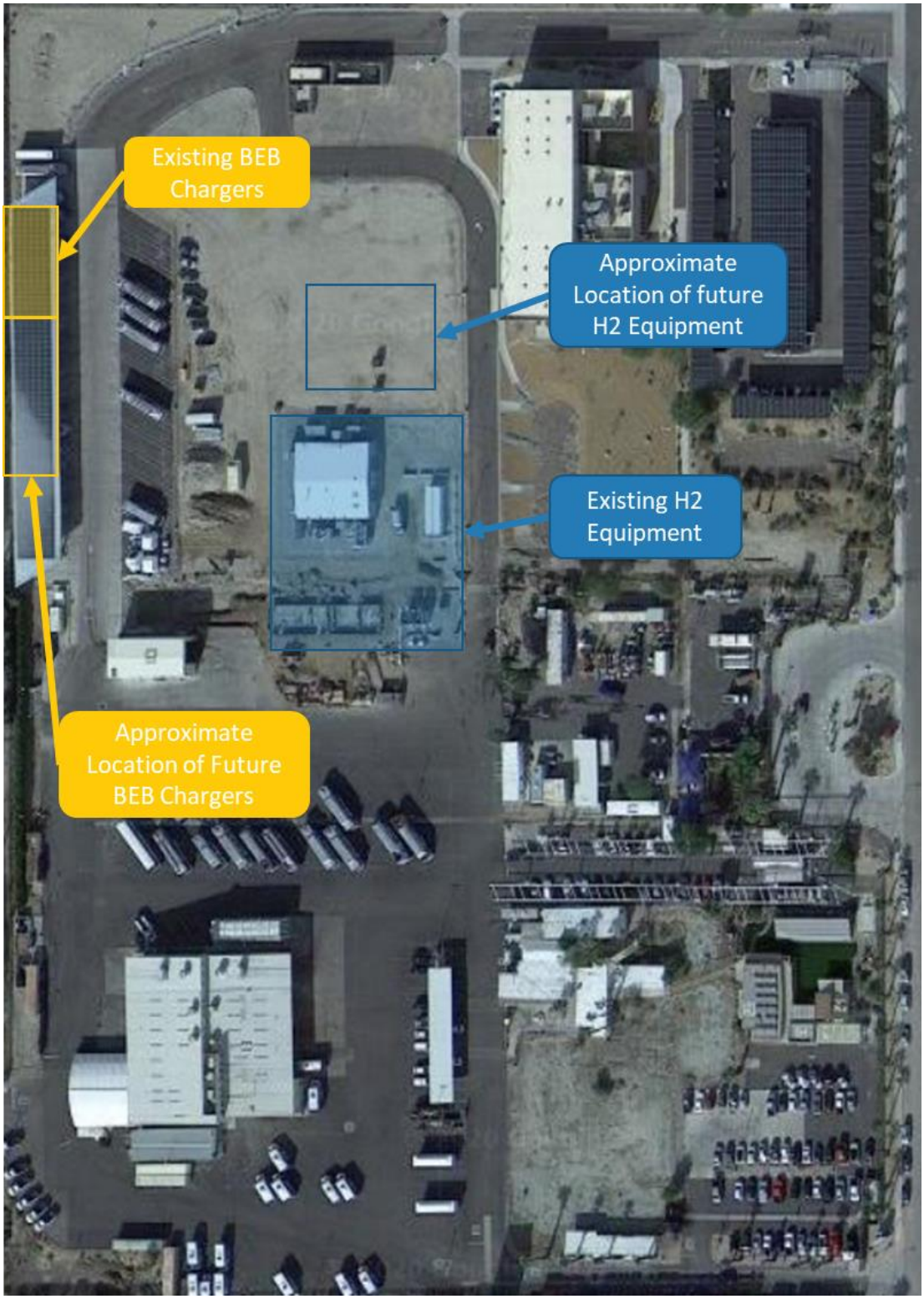


Figure 4. SunLine Thousand Palms Facility Site Overview

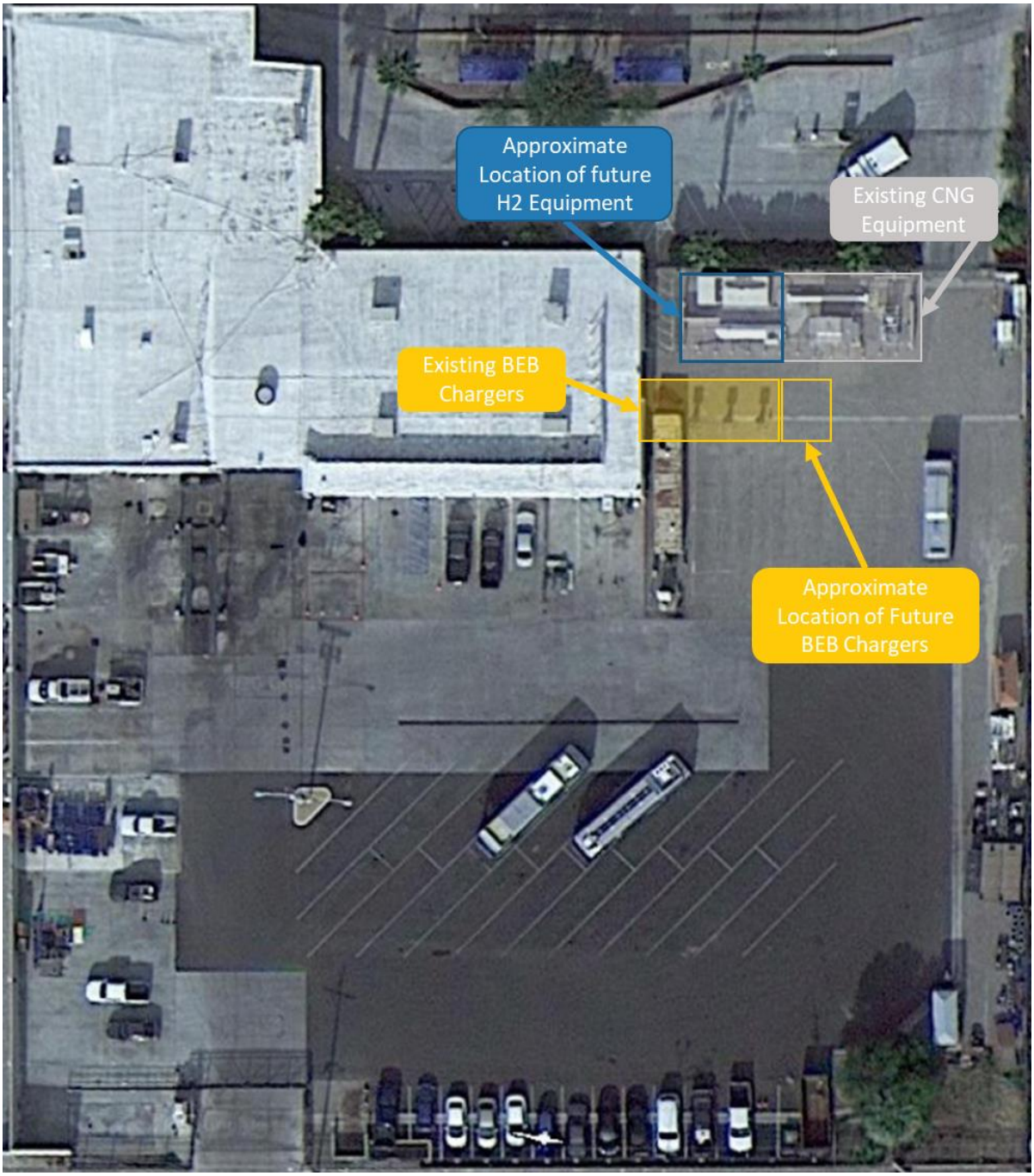


Figure 5. SunLine Indio Facility Site Overview

The available electrical capacity at both the Thousand Palms and Indio facilities was assessed based on the total power supplied to both sites compared to the loads on each meter. Historical billing data was also reviewed to assess current utilization. It was determined that SunLine's fleet could be comprised of 17-24 BEBs without requiring additional electrical capacity to the sites. Going beyond this threshold would necessitate adding a new distribution line and potentially a new substation upstream of the meter which would be prohibitively expensive.

Final Fleet Composition

Figure 6 shows the limits for the number of BEBs in the fleet based on the route analysis and electrical capacity.

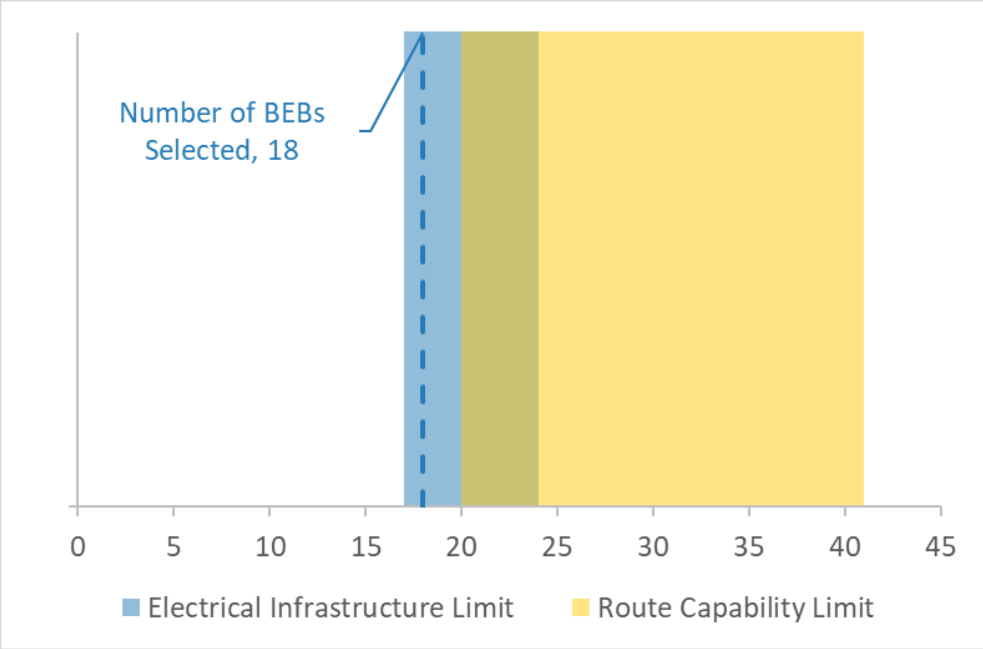


Figure 6. BEB Fleet Size Limit Summary

To be conservative, the final fixed route fleet composition was determined to be 18 BEBs and 67 FCEBs. The plan is for all paratransit vehicles to be FCEBs, in order to utilize the same infrastructure as the fixed route vehicles. This split ensures that SunLine will be able to continue operating at the same service level and minimizes cost by utilizing BEBs to the extent possible without triggering costly electrical transmission upgrades or compromising vehicle range requirements.

SECTION D:

Current Bus Fleet Composition & Future Bus Purchases

SunLine's current fleet of fixed route buses is comprised of 16 FCEBs, 4 BEBs, and 65 CNG vehicles. Four of the CNG buses were added to the fleet in 2020 as expansion vehicles. Two CNG over-the-road buses operate on SunLine's commuter link route between Indio and San Bernardino. SunLine operates five trolley style CNG buses on its BUZZ service - a free local circulator operating in downtown Palm Springs on Thursday, Friday, and Saturday.

Table 1: Individual Bus Information of Current Bus Fleet

Number of Buses	Bus Model Year	Fuel Type	Bus Type
1	2012	Hydrogen	Standard
3	2014	Hydrogen	Standard
1	2017	Hydrogen	Standard
8	2018	Hydrogen	Standard
2	2019	Hydrogen	Standard
1	2016	Hydrogen	Standard
4	2018	Electricity	Standard
1	2005	CNG	Standard
2	2020	CNG	Over-the-Road
37	2008	CNG	Standard
10	2009	CNG	Standard
5	2014	CNG	Trolley Style
6	2016	CNG	Standard
4	2020	CNG	Standard
3	2013	CNG	Cutaway
4	2015	CNG	Cutaway
9	2016	CNG	Cutaway
9	2017	CNG	Cutaway
14	2019	CNG	Cutaway

The replacement schedule was designed so that no bus retires before completing its useful life. Typically, fixed route buses were assumed to operate for 14 years. To avoid a single year with significantly more purchases than usual, the expected retirement age was sometimes staggered to better distribute procurement across years. All fixed route buses were assumed to last at least 12 years and no bus was projected to last more than 15 years.

The paratransit bus replacement schedule was similarly devised assuming the CNG vehicles typically

last 4 years. This is consistent with current operations at SunLine. No CNG paratransit vehicle was forecasted to last longer than 5 years. FCEB paratransit vehicles are not commercially available, so their lifetime is uncertain. However, due to the added expense of fuel cells relative to a CNG engine, it is probable that the vehicles will need to be designed to last longer than conventional CNG vehicles. In this plan, it was assumed that FCEB paratransit vehicles will last 6 years on average. This will need to be revisited as FCEB paratransit vehicles become available and are tested on the road.

Figure 7 and Figure 8 show the number of new bus purchases anticipated each year for fixed route and paratransit operations respectively.

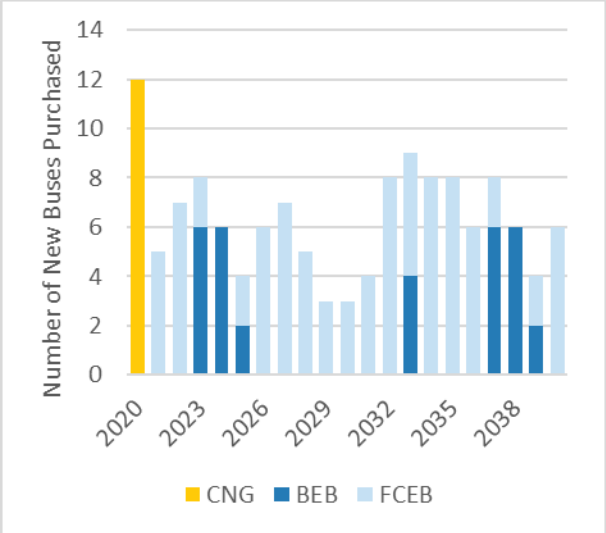


Figure 7. Fixed Route Bus Purchases by Year

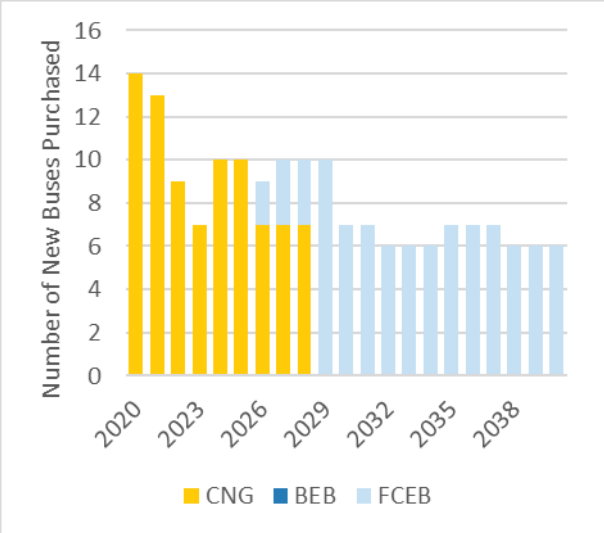


Figure 8. Paratransit Bus Purchases by Year

Figure 9 and Figure 10 show the composition of SunLine's fixed route and paratransit fleets between 2020 and 2040. Figure 9 identifies 12 "CNG Rehab" buses. A large portion of SunLine's fixed route bus fleet needs to be replaced between 2020 and 2021 due to a large batch procurement of buses in 2008 and 2009. To limit the number of new purchases in these two years, 12 CNG buses will be refurbished and have Cummins near-zero engines installed to extend their lifetime by approximately 6 years. This will delay these purchases to distribute capital expenditure more evenly across years.

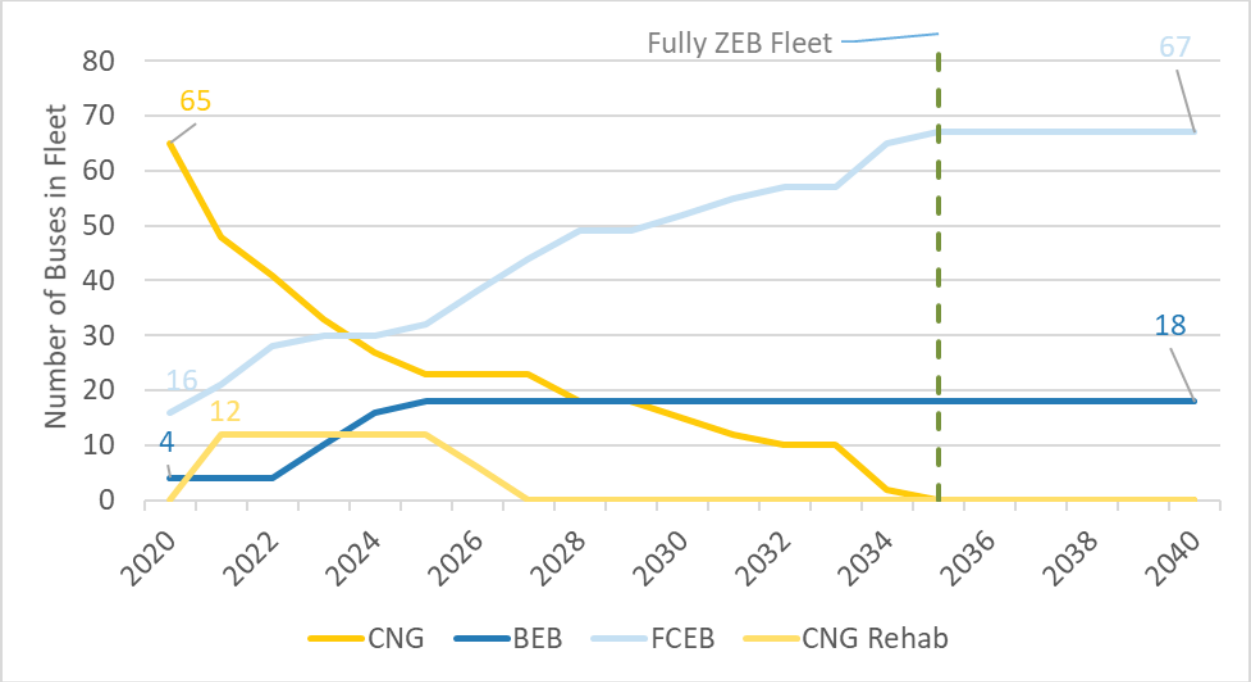


Figure 9. Fixed Route Bus Fleet Composition by Year

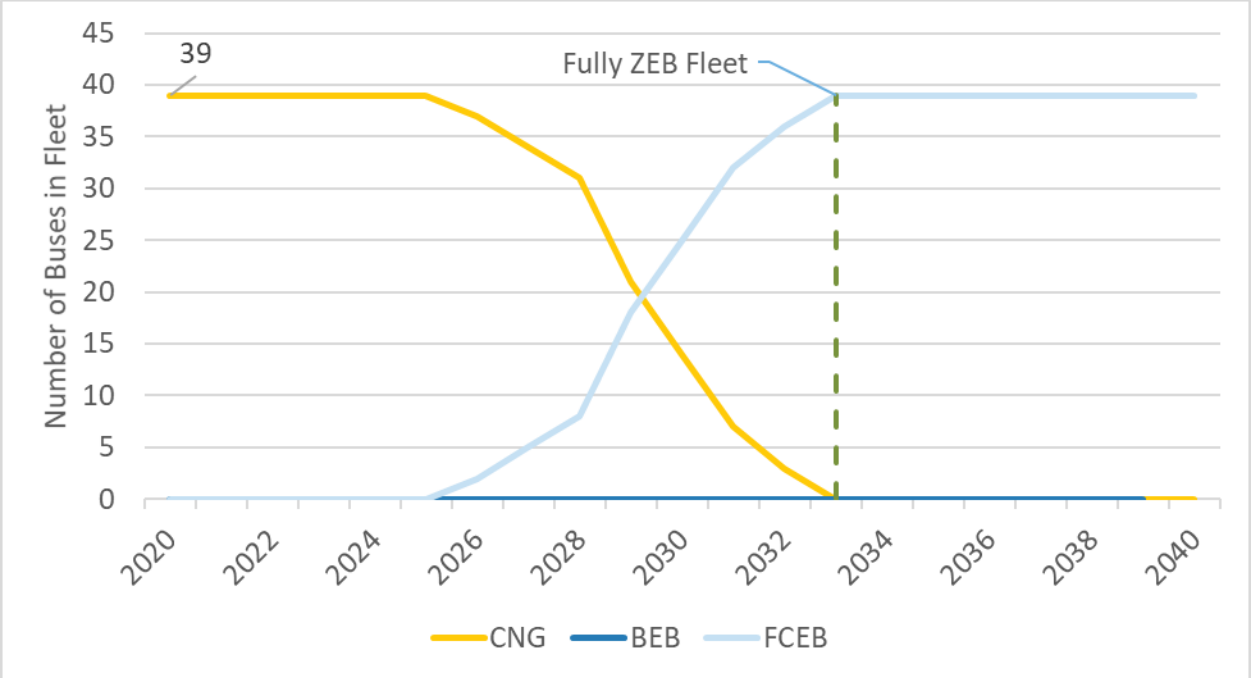


Figure 10. Paratransit Bus Fleet Composition by Year

Table 2 shows all future bus purchases by year, type, and technology.

Table 2: Future Bus Purchases

Timeline (year)	Total No. Buses Purchased	ZEB Purchases				Conventional Bus Purchases			
		No.	% of ZEB	Bus Type	Fuel Type	No.	% of Conv.	Bus Type	Fuel Type
2020	26	0	0%			26	100%	•10 Standard •2 Over-the-Road •14 Cutaway	•26 CNG
2021	18	5	28%	•5 Standard	•5 Hydrogen	13	72%	•13 Cutaway	•13 CNG
2022	16	7	44%	•7 Standard	•7 Hydrogen	9	56%	•9 Cutaway	•9 CNG
2023	15	8	53%	•8 Standard	•2 Hydrogen •6 Electricity (Depot)	7	47%	•7 Cutaway	•7 CNG
2024	16	6	38%	•6 Standard	•6 Electricity (Depot)	10	63%	•10 Cutaway	•10 CNG
2025	14	4	29%	•4 Standard	•2 Hydrogen •2 Electricity (Depot)	10	71%	•10 Cutaway	•10 CNG
2026	15	8	53%	•6 Standard •2 Cutaway	•8 Hydrogen	7	47%	•7 Cutaway	•7 CNG
2027	17	10	59%	•7 Standard •3 Cutaway	•10 Hydrogen	7	41%	•7 Cutaway	•7 CNG
2028	15	8	53%	•5 Trolley Style •3 Cutaway	•8 Hydrogen	7	47%	•7 Cutaway	•7 CNG
2029	13	13	100%	•3 Standard •10 Cutaway	•13 Hydrogen	0	0%		
2030	10	10	100%	•3 Standard •7 Cutaway	•10 Hydrogen	0	0%		
2031	11	11	100%	•4 Standard •7 Cutaway	•11 Hydrogen	0	0%		

Timeline (year)	Total No. Buses Purchased	ZEB Purchases				Conventional Bus Purchases			
		No.	% of ZEB	Bus Type	Fuel Type	No.	% of Conv.	Bus Type	Fuel Type
2032	14	14	100%	•6 Standard •2 Over-the-Road •6 Cutaway	•14 Hydrogen	0	0%		
2033	15	15	100%	•9 Standard •6 Cutaway	•11 Hydrogen •4 Electricity (Depot)	0	0%		
2034	14	14	100%	•8 Standard •6 Cutaway	•14 Hydrogen	0	0%		
2035	15	15	100%	•8 Standard •7 Cutaway	•15 Hydrogen	0	0%		
2036	13	13	100%	•6 Standard •7 Cutaway	•13 Hydrogen	0	0%		
2037	15	15	100%	•8 Standard •7 Cutaway	•9 Hydrogen •6 Electricity (Depot)	0	0%		
2038	12	12	100%	•6 Standard •6 Cutaway	•6 Hydrogen •6 Electricity (Depot)	0	0%		
2039	10	10	100%	•4 Standard •6 Cutaway	•8 Hydrogen •2 Electricity (Depot)	0	0%		
2040	12	12	100%	•6 Standard •6 Cutaway	•12 Hydrogen	0	0%		

The cost of each new bus purchase was forecasted based on the most recent quotes for procuring buses received by SunLine and future cost trends projected by the California Air Resources Board (CARB).[1] Figure 11 and Figure 12 show the estimated annual cost for fixed route and paratransit vehicles based on the adoption schedule in this rollout plan.

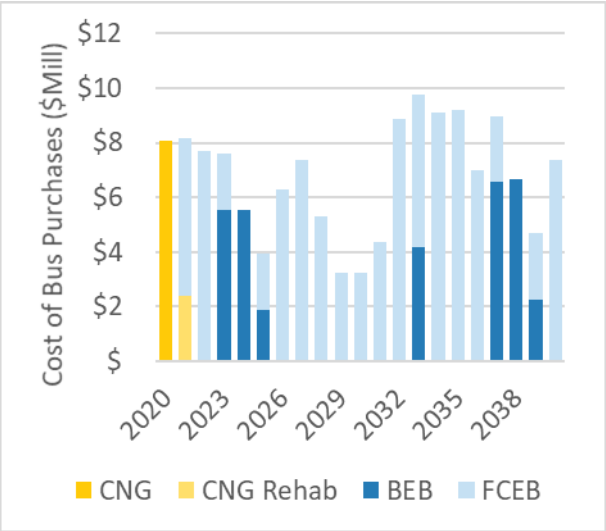


Figure 11. Cost of Fixed Route Bus Purchases

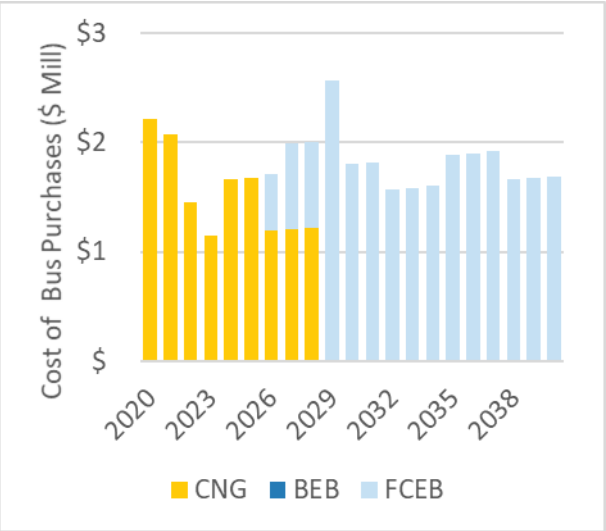


Figure 12. Cost of Paratransit Bus Purchases

Table 3 shows the estimated range and cost of each ZEB purchase outlined in the plan.

Table 3. Range and Estimated Cost of Future ZEB Purchases

Timeline (year)	Number of ZEBs	Bus Type(s)	Estimated Cost of Each Bus
2021	5	•5 Standard FCEB	•$1,150,000
2022	7	•7 Standard FCEB	•$1,100,000
2023	8	•2 Standard FCEB •6 Standard BEB	•$1,050,000 •$920,000
2024	6	•6 Standard BEB	•$920,000
2025	4	•2 Standard FCEB •2 Standard BEB	•$1,040,000 •$930,000
2026	8	•6 Standard FCEB •2 Cutaway FCEB	•$1,050,000 •$260,000

[1] State of California Air Resources Board. (2018). Staff Report: Initial Statement of Reasons - Public Hearing to Consider the Proposed Innovative Clean Transit Regulation A Replacement of the Fleet Rule for Transit Agencies: Appendix K. Retrieved from https://www.arb.ca.gov/regact/2018/ict2018/appk-statewidecostanalysis.xlsx?_ga=2.48303334.1749999270.1571069223-138148794.1501775822

Timeline (year)	Number of ZEBs	Bus Type(s)	Estimated Cost of Each Bus
2027	10	•7 Standard FCEB •3 Cutaway FCEB	•$1,060,000 •$260,000
2028	8	•5 Trolley Style FCEB •3 Cutaway FCEB	•$1,060,000 •$260,000
2029	13	•3 Standard FCEB •10 Cutaway FCEB	•$1,070,000 •$260,000
2030	10	•3 Standard FCEB •7 Cutaway FCEB	•$1,080,000 •$260,000
2031	11	•4 Standard FCEB •7 Cutaway FCEB	•$1,090,000 •$260,000
2032	14	•6 Standard FCEB •2 Over-the-Road FCEB •6 Cutaway FCEB	•$1,110,000 •$1,110,000 •$260,000
2033	15	•5 Standard FCEB •4 Standard BEB •6 Cutaway FCEB	•$1,120,000 •$1,040,000 •$260,000
2034	14	•8 Standard FCEB •6 Cutaway FCEB	•$1,140,000 •$270,000
2035	15	•8 Standard FCEB •7 Cutaway FCEB	•$1,150,000 •$270,000
2036	13	•6 Standard FCEB •7 Cutaway FCEB	•$1,170,000 •$270,000
2037	15	•2 Standard FCEB •6 Standard BEB •7 Cutaway FCEB	•$1,180,000 •$1,100,000 •$270,000
2038	12	•6 Standard FCEB •6 Cutaway FCEB	•$1,200,000 •$280,000
2039	10	•2 Standard FCEB •2 Standard BEB •6 Cutaway FCEB	•$1,210,000 •$1,130,000 •$280,000
2040	12	•6 Standard FCEB •6 Cutaway FCEB	•$1,230,000 •$280,000

SunLine is not considering converting any conventional buses to zero-emission vehicles, the plan is based on replacement buses only.

SECTION E:

Facilities and Infrastructure Modifications

SunLine has infrastructure in place to support the FCEBs and BEBs already in its bus fleet and to enable expansion. In late 2019, a 900 kg/day hydrogen electrolysis station became operational at SunLine's Thousand Palms Facility. This station includes hydrogen production, compression, storage, and dispensing. It is capable of supporting a fleet of approximately 32 FCEBs based on the fuel consumption of FCEBs currently deployed at SunLine. This station replaced SunLine's previous hydrogen production facility which generated hydrogen through the reformation of natural gas, which was decommissioned in 2020.

The Thousand Palms and Indio facilities each have three 80 kW AC/DC BEB chargers that power the four BYD BEBs currently in the fleet. These chargers could serve additional BEBs, but for the purposes of planning it was assumed that new chargers would need to be installed as BEBs join the fleet because most BEB models require DC/DC chargers. The critical difference is that the buses currently deployed at SunLine include onboard equipment to convert the AC power to DC, so the chargers deliver AC power to the bus. Most BEBs require DC power from the charger, so the AC to DC conversion takes place in the charger itself.

As the fleet grows, additional fueling and charging infrastructure will be required. The adoption schedule was designed so that SunLine quickly builds the FCEB fleet until demand matches the capacity of the existing 900 kg/day station so that it is fully utilized. Once this threshold is met, SunLine will replace retiring buses with BEBs and add chargers to delay the expansion of the hydrogen refueling station. When the target number of BEBs are in the fleet, SunLine will again purchase FCEBs and will expand the hydrogen refueling station at the Thousand Palms Facility to increase its capacity to service the entire fleet. At that time, SunLine will

consider available options such as installing additional electrolyzers to increase onsite production capacity or entering a contract with a supplier to provide delivered liquid hydrogen to supplement the existing capacity. It is anticipated that a delivered liquid station will be the preferred option because it will enable a redundant supply of hydrogen to increase resiliency. Having two independent sources of hydrogen – delivered liquid and on-site generated – will ensure fuel is available if the supply is interrupted from either source. For example, a prolonged power outage would stop the on-site electrolyzer from producing hydrogen and a shutdown at a centralized hydrogen production facility could disrupt the supply chain for delivered hydrogen. Eventually, a satellite hydrogen station will also be installed at the Indio Facility to service the portion of the bus fleet that operates from this location. This station will need to serve approximately 10 buses.

Figure 13 shows the estimated daily fleet hydrogen demand compared to on-site station capacity over time as the fleet of FCEBs grows and fueling infrastructure is added.

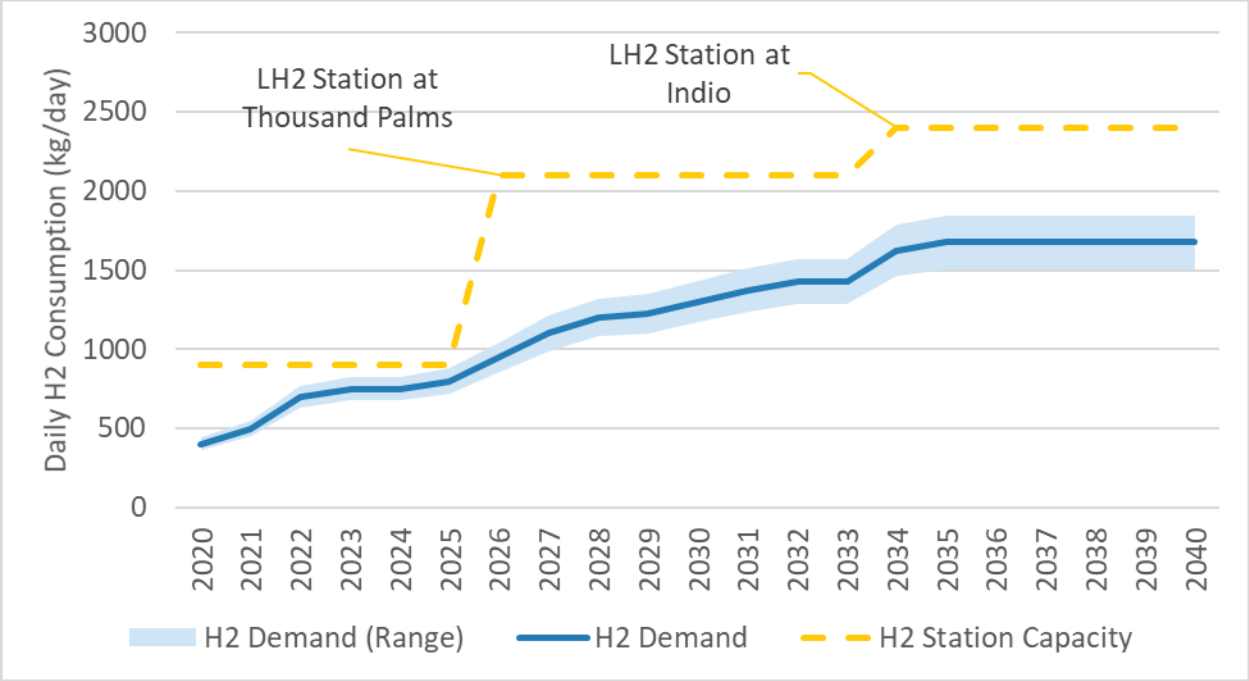


Figure 13. Estimated Daily Hydrogen Demand and Station Capacity

Figure 14 shows the estimated cost to install the necessary hydrogen refueling and battery charging infrastructure. The costs were estimated based on budgetary estimates from potential suppliers. It was assumed that delivered liquid hydrogen stations are deployed at the Thousand Palms and Indio hydrogen fueling stations as opposed to expansion of on-site generation.

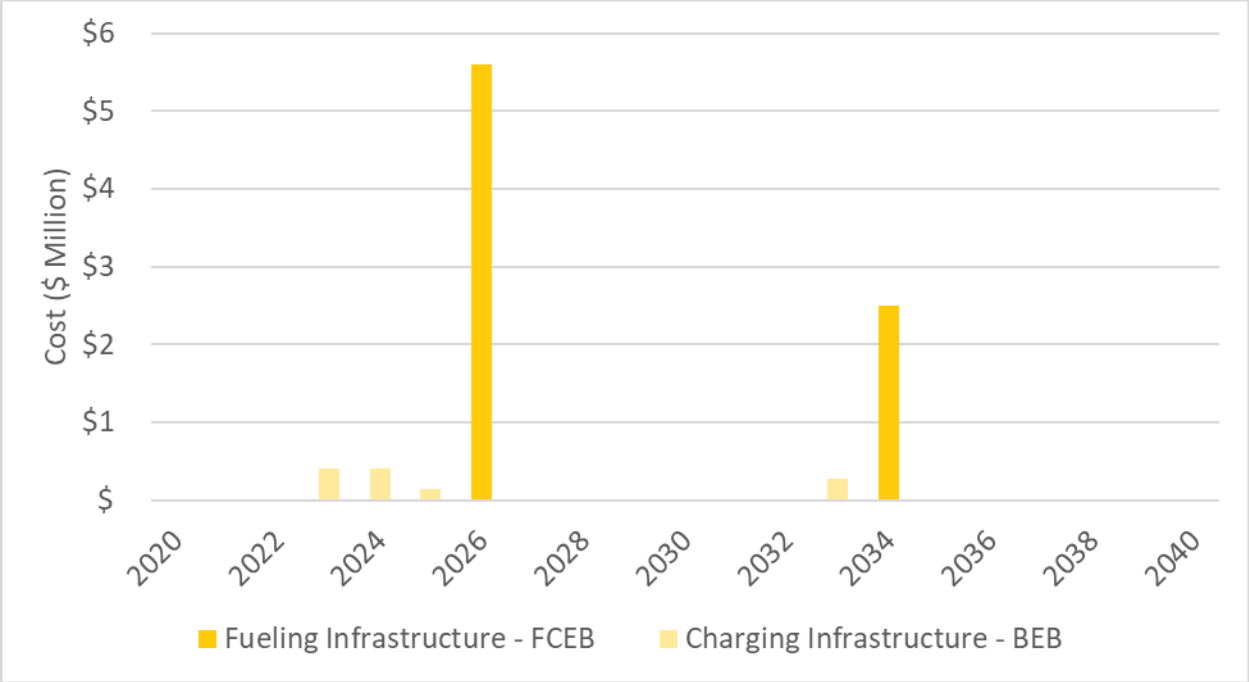


Figure 14. Infrastructure Costs

SunLine's existing maintenance facility at the Thousand Palms location is fully equipped for work on FCEBs and BEBs. It has already undergone safety upgrades to conduct maintenance on hydrogen and high voltage systems, so no further upgrades are required. Minor upgrades will be required at the Indio Facility to install hydrogen sensors to be linked to the safety systems already in place for CNG. No modifications are expected to the bus parking arrangements as a result of the transition, since the plan calls for a 1:1 replacement of buses.

Table 4 summarizes the new facilities and upgrades that will be required relating to the transition of the bus fleet to 100% zero-emission.

Table 4: Facilities Information and Construction Timeline

Division / Facility Name	Address	Main Function(s)	Type(s) of Infrastructure	Service Capacity	Needs Upgrade? (Yes/No)	Estimated Construction Timeline
Thousand Palms	32-505 Harry Oliver Trail Thousand Palms, CA 92276	Hydrogen Fueling Infrastructure	900 kg/day electrolyzer	900 kg-H_2/day	No	2019
			2 Hydrogen dispensers	360 kg-H_2 / 8-hours each	No	2019/2020
			Delivered liquid hydrogen compression, storage, and dispensing station	50 buses	No	2026
		Battery Electric Bus Charging	3 AC/DC BEB chargers	80 kW each	No	Existing
			2 DC/DC BEB chargers	120-150 kW each	No	2023
			3 DC/DC BEB chargers	120-150 kW each	No	2024
			2 DC/DC BEB chargers	120-150 kW each	No	2025
Indio	83-255 Highway 111 Indio, CA 92201	Hydrogen Fueling Infrastructure	Delivered liquid hydrogen compression, storage, and dispensing station	10 buses	n/a	2034
		Battery Electric Bus Charging	3 AC/DC BEB chargers	80 kW each	n/a	Existing
			2 DC/DC BEB chargers	120-150 kW each	No	2033
		Maintenance	Hydrogen detection and safety sensors installed	n/a	Yes	2034

Table 5 shows the types of buses to be deployed at each facility and the electrical utility serving each location. SunLine does not operate in any NOx-exempt areas.

Table 5: NOx-Exempt Area and Electric Utilities' Territories

Division's Name (Same as in Table 5)	Type(s) of Bus Propulsion System	Located in NOx-Exempt Area? (Yes/No)	Electrical Utility
Thousand Palms	•CNG (Until 2033) •Hydrogen •Battery Electric	No	Imperial Irrigation District
Indio	•CNG (Until 2035) •Hydrogen •Battery Electric	No	Imperial Irrigation District

SECTION F:

Providing Service in Disadvantaged Communities

Figure 15 shows the disadvantaged communities within SunLine's service territory as defined by the latest version of CalEnviroScreen.[2]

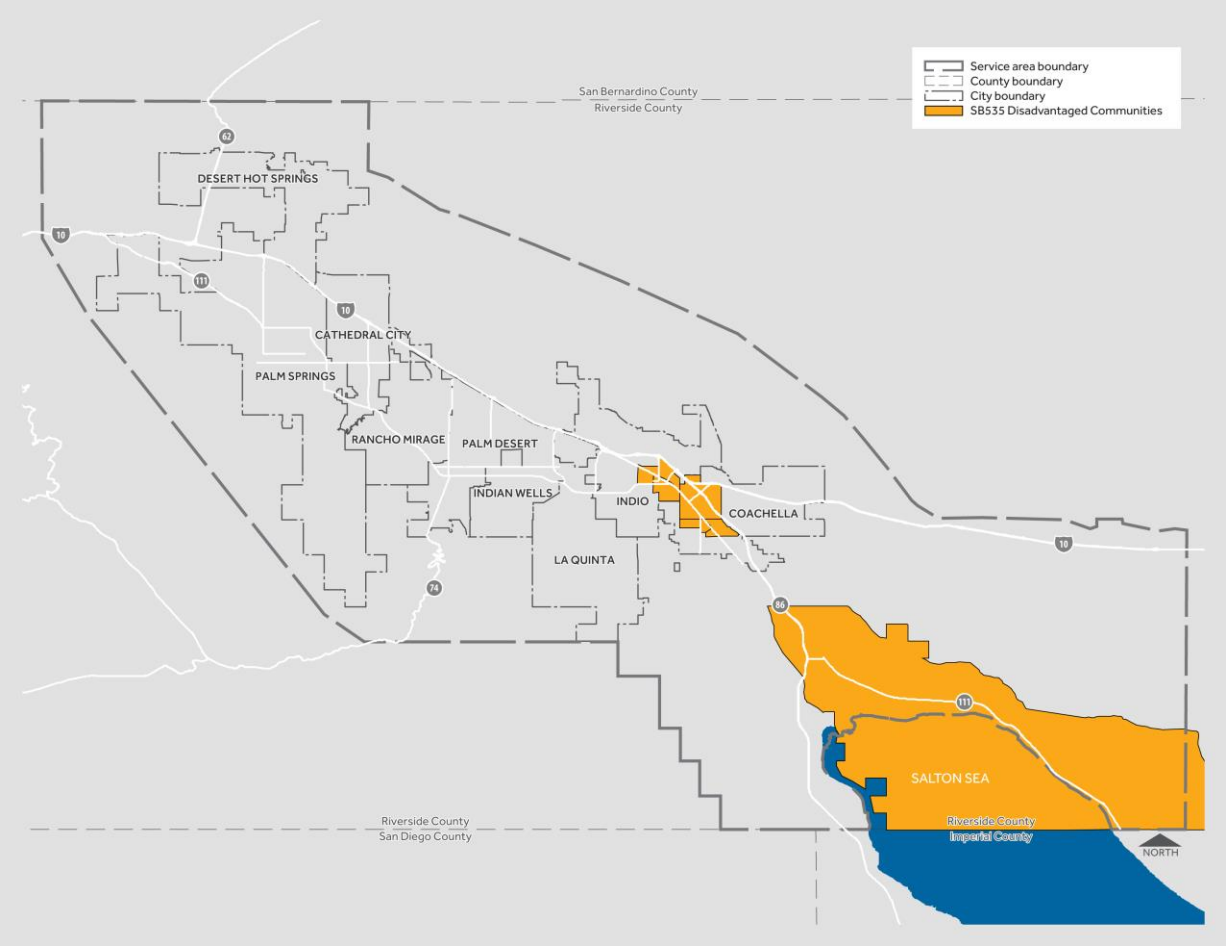


Figure 15. Disadvantaged Communities within SunLine Service Territory

The Census Tracts located within SunLine's service territory are:

- 6065045303
- 6065045502
- 6065045604
- 6065045706
- 6065045707
- 6065049500
- 6065940400

[2] CalEnviroScreen 3.0. (June 2018). SB535 Map of Disadvantaged Communities. Retrieved from http://oehha.maps.arcgis.com/apps/View/index.html?appid=c3e4e4e1d115468390cf61d9db83efc4

Many of SunLine's fixed route and paratransit buses pass through these disadvantaged areas daily. This service is critical as it is relied upon by these communities for essential travel including to workplaces, medical appointments, government agencies, etc. As buses are transitioned from CNG to zero-emission, it will eliminate critical criteria pollutant emissions of nitrogen oxides (NOx), carbon monoxide (CO) and volatile organic compounds (VOCs), along with particulate matter (PM2.5) and greenhouse gases (GHGs). This improvement in air quality will benefit the citizens of the local community, including those living in designated disadvantaged communities that SunLine services.

Pollution and noise resulting from bus operation are a concern for citizens living adjacent to bus transit routes. Buses also drive in stop and go traffic where they spend considerable time idling, wasting additional fuel and creating even more pollutant emissions. FCEBs and BEBs produce no emissions when idling, use far less fuel and offer virtually silent operation. SunLine will operate the zero-emission buses on routes providing service within disadvantaged communities providing cleaner, quieter service to the local ridership.

Assembly Bill 617 (AB 617), established in 2017, is focused on improving public health in communities that experience disproportionate burdens from exposure to air pollutants. Eastern Coachella has been selected as an AB 617 community. To implement AB 617, CARB requires community-focused action to reduce air pollution and improve public health in these communities. A series of community outreach efforts were conducted, during which residents communicated that their primary concern was related to mobile source emissions. Deploying zero-emission buses not only supports the South Coast Air Quality Management District in implementing the AB 617, but also provides vehicle emission reductions that residents have requested.

SECTION G:
Workforce Training

SunLine has extensive experience operating and maintaining FCEBs and BEBs as well as accompanying fueling/charging infrastructure. An FCEB was first piloted at SunLine in 2000. Since then, many generations of FCEBs have been tested and deployed at SunLine. Currently, there are 16 FCEBs in the fleet, the oldest of which has logged over 180,000 miles. In 2016 the first BEBs joined SunLine's fleet.

As a leader in alternative fuels technologies in the transit industry, SunLine leads the West Coast Center of Excellence in Zero-Emission Technology and Renewable Energy (CoEZET). The goal of CoEZET is to share knowledge about the commercialization of zero-emission technologies as well as exploring economic investments in the workforce. Through this center, SunLine provides instruction to internal staff as well as other agencies covering in-service management of zero-emission technologies including fueling systems and fleet operation. SunLine is working to develop an industry certification for this training. Courses currently offered by CoEZET include:

- Leadership and Employee Relations
    - Federal Transit Administration guidelines for ZEBs
    - American Public Transportation Association White Book: Zero-Emission Technical Standards
    - Contract Options for ZEBs
- Zero-Emission Bus Overview
    - Introduction to ZEB technology
    - Differences between ZEBs and incumbent technologies
    - ZEB demonstrations globally
    - Introduction to ZEB fueling
    - ZEB and fueling vendors
    - Industry standards developed and in development
- Zero-Emission Bus Operations
    - Introduction to zero-emission bus technology
    - Differences between ZEBs and incumbent technologies
    - Dashboard familiarization
    - ZEB fueling training
    - Preventing roadcalls
- Zero-Emission Bus Maintenance
    - Introduction to ZEB technology
    - Differences between ZEBs and incumbent technologies
    - Preventative maintenance practices for ZEBs
    - Unscheduled maintenance practices for ZEBs
    - General and high-voltage safety training
    - Basic diagnostics and troubleshooting
- Fiscal Management
    - ZEB grant management

    - ZEB total cost of ownership
    - Funding opportunities
    - ZEB budget development
- Zero-Emission Bus Procurement
    - Federal Transit Administration guidelines for ZEBs
    - American Public Transportation Association White Book: Zero-Emission Technical Standards
    - Contract Options for ZEBs
- Zero-Emission Bus Policies and Regulations
    - Federal Transit Administration guidelines for ZEBs
    - American Public Transportation Association White Book: Zero-Emission Technical Standards
    - Contract Options for ZEBs
- Planning for ZEB Operation
    - Federal Transit Administration guidelines for ZEBs
    - American Public Transportation Association White Book: Zero-Emission Technical Standards
    - Contract Options for ZEBs

As new FCEBs and BEBs join the fleet, SunLine will receive training from the bus manufacturers on operating and maintenance procedures specific to the vehicles. Similarly, training will be provided by equipment suppliers providing hydrogen fueling and battery charging infrastructure. Depending on the specific equipment, training may occur in a “train-the-trainer” format where key staff are trained thoroughly on equipment who pass on basic knowledge to other personnel, or batch training where all or most of the related staff receive instruction from the equipment manufacturer.

SECTION H:
Potential Funding Sources

Execution of this transition plan will require significant capital expenditure. Figure 16 shows the estimated annual capital cost for vehicle and fueling/charging infrastructure procurement.

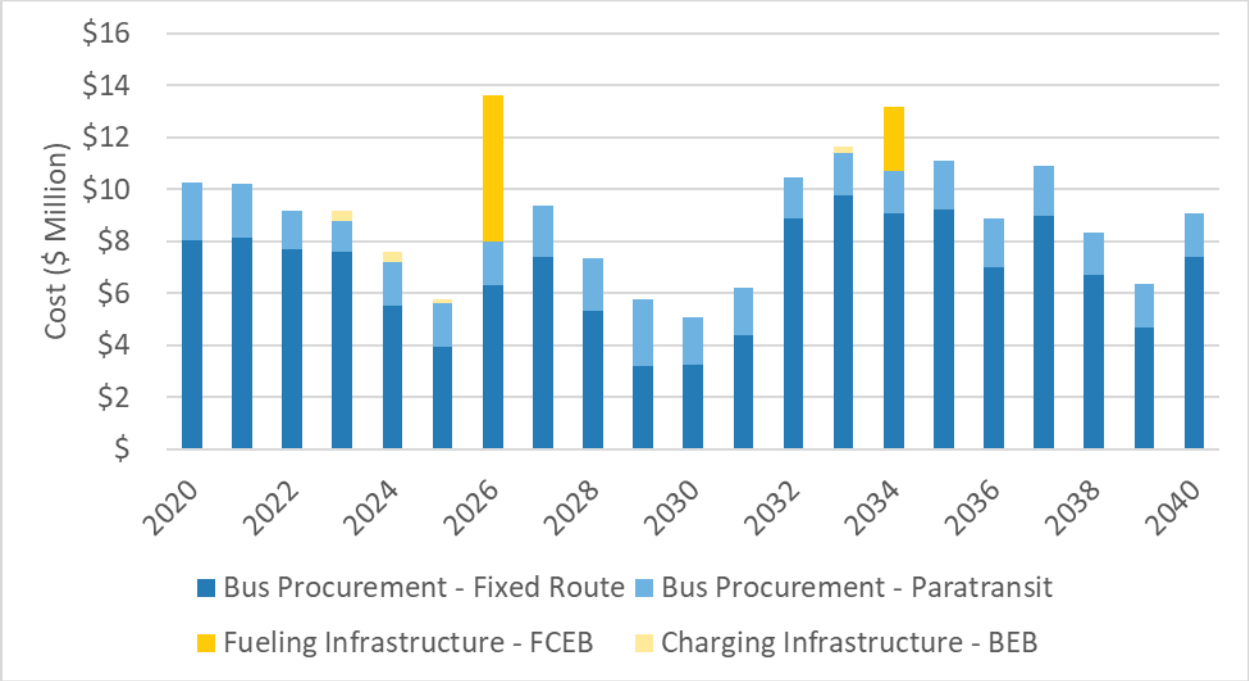


Figure 16. Vehicle Procurement and Infrastructure Capital Costs

Between 2020 and 2040 it is estimated that SunLine will require $173.4 million to pay for all the bus replacements and accompanying charging/fueling infrastructure. To achieve this level of funding, capital must be combined from multiple sources including formula funds as well as special grant funding opportunities.

Formula funds are expected to come from the federal and state governments. The major sources of federal funds are Federal Transit Administration (FTA) Urbanized Area Formula Grants (5307) and Bus and Bus Facilities Program (5339). State formula funds are expected to come from the State Transit Assistance (STA) Program.

Future formula funding from these three sources was estimated based on the level of funding previously received and the percent allocation of these funding sources historically to capital purchases. It was assumed that the funding would increase annually at a rate of 1.5%, which is consistent with historical trends.

Table 6. Formula Funding Summary

Funding Source	Estimated 2021 Funding	Estimated 2021-2040 Funding
FTA 5307	$1,570,000	$36,410,000
FTA 5339	$630,000	$14,520,000
STA	$2,400,000	$55,540,000
Total	**$4,600,000**	**$106,470,000**

Special grant funding will come from a variety of sources, but it is difficult to predict what programs will be available in the future. SunLine expects to apply for a combination of competitive grants and voucher programs to directly fund procurement of ZEBs and accompanying infrastructure.

Table 7 outlines potential special funding sources. SunLine has applied to these programs in the past and is likely to again depending on program specifications.

Table 7. Potential Special Funding Sources Summary

Type	Name	Purpose	Offering	Funds Available
Competitive	FTA 5339 (b) Bus & Bus Facilities	Bus procurement and related facilities	80% of capital costs	$457 million (FY2020)
	FTA 5339 (c) Low or No Emission Vehicle	ZEB procurement and fueling / charging infrastructure	85-90% of capital costs	$130 million (FY2020)
	EPA Targeted Airshed Grant Program	Reduce air pollution in selected nonattainment areas	Up to 100% of capital costs	$107 million (FY2019/20)
Voucher	VW Mitigation	ZEB procurement	$400,000/FCEB; $180,000/BEB	$130 million (until exhausted)
	HVIP	ZEB procurement	$300,000/FCEB; $175,000/BEB	$142 million (FY2019 - currently exhausted)

SECTION I:
Start-up and Scale-up Challenges

The most significant challenge facing transit agencies through the start-up and scale-up phases of the zero-emission transition is the financial requirements. ZEBs are more expensive to procure and new infrastructure is required to operate and maintain the vehicles. Financial support from the federal, state, and local governments will be necessary to achieve the targets in the ICT regulation. The price gap between ZEBs and CNG buses is expected to reduce over time as manufacturing scales up and technology improves, so financial incentives are particularly important in the near- to mid-term.

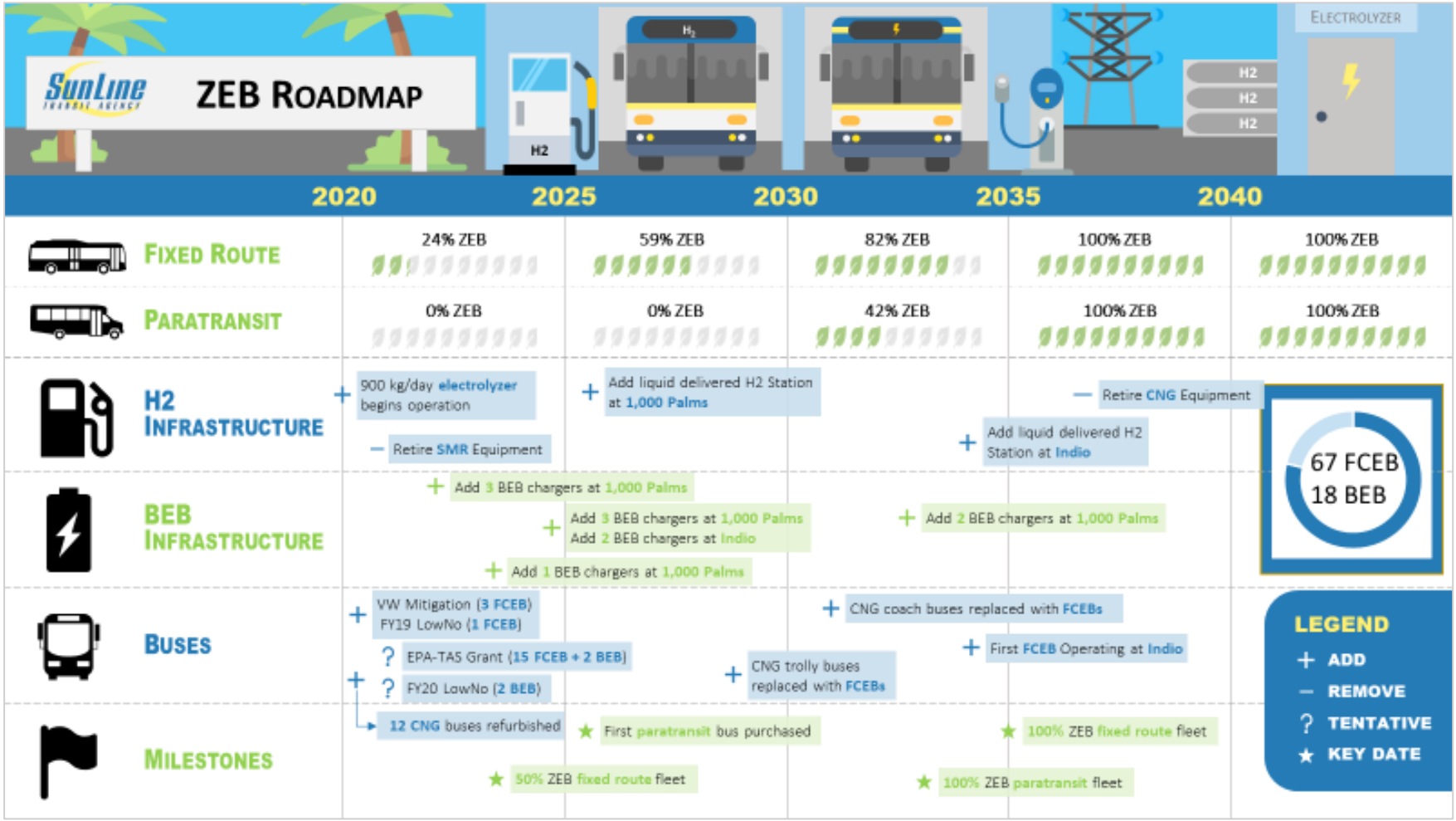
The per vehicle cost of buses is impacted by procurement volumes. With each agency placing orders individually over the next few years, this continues to pressure costs. It may be possible to reduce the per vehicle cost through a state-led bulk procurement of BEBs and/or FCEBs that could incorporate demand from many agencies.

Funding should also be made available for workforce training. To ensure a successful transition, agencies must prepare staff for correct operation and maintenance of ZEBs. While ZEBs require less maintenance than conventional buses because they include fewer moving parts, they require new protocols and procedures to ensure safe and successful operation. The use of regenerative braking also alters ideal driving characteristics. Drivers must be adequately trained to ensure vehicles are operating at optimal performance. Organizations providing training like the West Coast Center of Excellence in Zero-Emission Technology will be an invaluable resource to agencies as they transition to zero-emission.

A challenge facing long-term transition planning is the uncertainty around performance and availability of zero-emission paratransit and over-the-road vehicles. At present, zero-emission paratransit and over-the-road vehicles are not commercially available in North America. Little data is available to forecast vehicle performance or cost. Pilot scale deployment of FCEBs and BEBs in these transit applications would benefit the industry by providing key insights into vehicle operation.

It is imperative that the CARB provide funding to transit agencies across the state to support the transition to zero-emission vehicles. As fleets are transitioned, agency capital and operating budgets will increase, and funding will be required to maintain the level of service provided to residents. In addition to funding support for bus and infrastructure purchases, CARB should support training/educational programs as well as deployment of new bus platforms like paratransit and over-the-road vehicles.

APPENDIX I:
SunLine Roadmap



APPENDIX II:
Board Resolution

SUNLINE TRANSIT AGENCY

RESOLUTION NO. 0780

RESOLUTION APPROVING THE SUNLINE TRANSIT AGENCY ZERO-EMISSION BUS (ZEB) ROLLOUT PLAN AND AUTHORIZING THE CEO/GENERAL MANAGER TO SUBMIT THE ZEB ROLLOUT PLAN TO THE CALIFORNIA AIR RESOURCES BOARD IN ACCORDANCE WITH THE INNOVATIVE CLEAN TRANSIT REGULATIONS

WHEREAS, SunLine Transit Agency is a Joint Powers Authority located at 32-505 Harry Oliver Trail, Thousand Palms, CA, 92276 and its Board of Directors is comprised of one elected official from each member agency, which includes Desert Hot Springs, Palm Springs, Cathedral City, Rancho Mirage, Palm Desert, Indian Wells, La Quinta, Indio, Coachella and the County of Riverside; and

WHEREAS, the Innovative Clean Transit (ICT) regulations were adopted by the California Air Resources Board (CARB) in December 2018 and became effective on October 1, 2019;

WHEREAS, Title 13 of the California Code of Regulations § 2023 (13 CCR § 2023.1 through 2023.11) requires all public transit agencies to gradually transition their bus fleet to zero-emission technologies;

WHEREAS, each transit agency must adopt and submit to CARB a ZEB Rollout Plan describing how the agency will transition to a zero-emission fleet;

WHEREAS, SunLine's ZEB Rollout Plan must be submitted to CARB by July 1, 2023;

WHEREAS, SunLine's goal is to fully transition to zero-emission technologies by 2035, that avoids early retirement of compressed natural gas (CNG) buses, and can be achieved with available funds; and

WHEREAS, the Board of Directors has approved a Strategic Plan as a foundation to guide the implementation of ZEBs and compliance with California Code of Regulations § 2023.2.

NOW THEREFORE, BE IT FURTHER RESOLVED that the Board of Directors of Sunline Transit Agency adopts the SunLine Transit Agency's ZEB Rollout Plan, attached hereto as Exhibit A, which achieves the following pursuant to the ICT Regulations:

1. A goal to transition its bus fleet to zero-emission by 2035 with careful planning that avoids early retirement of CNG buses;

2. Identifies types of ZEB technologies that the Agency intends to continue to deploy, including battery electric and hydrogen fuel cell electric buses;

3. Sets forth a schedule for construction of facilities and infrastructure modifications or upgrades required to deploy and maintain the ZEBs;

4. Sets forth a schedule for ZEB purchases;

5. Describes how the Agency plans to deploy ZEBs in disadvantaged communities as listed in the latest version of "CalEnviroScreen";

6. Sets forth a training plan and schedule to train operators and maintenance and repair staff;

7. Describes how the Agency will share knowledge about the commercialization of zero-emission technologies as well as exploring economic investments in the workforce by leading the West Coast Center of Excellence in Zero-Emission technology and Renewable Energy;

8. Identifies potential funding sources; and

9. Identifies start-up and scale-up challenges.

NOW THEREFORE, BE IT RESOLVED that the CEO/General Manager is authorized to submit the SunLine Transit Agency's ZEB Rollout Plan, and any other documents or instruments required by CARB for the submittal and adoption of the ZEB Rollout Plan, in accordance with the ICT Regulations.

ADOPTED this 24th day of June, 2020

ATTEST:

Brittney B. Sowell
Clerk of the Board
SunLine Transit Agency

Kathleen Kelly
Chairperson of the Board
SunLine Transit Agency

APPROVED AS TO FORM:

Deputy General Counsel

STATE OF CALIFORNIA)
) ss.
COUNTY OF RIVERSIDE)

I, BRITTNEY B. SOWELL, Clerk of the Board of Directors of the SunLine Transit Agency, do hereby certify that Resolution No. 0780 was adopted at a regular meeting of the Board of Directors held on the 24th day of June, 2020, by the following vote:

AYES: 10

NOES: Ø

ABSENT: Ø

ABSTAIN: Ø

IN WITNESS WHEREOF, I have hereunto set my hand this 24th day of June, 2020.

Brittney B. Sowell
Clerk of the Board
SunLine Transit Agency