



City of Glendale

Zero-Emission Bus Rollout Plan



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Section A: Transit Agency Information

The City of Glendale operates the Glendale Beeline fixed route transit service in the Arroyo Verdugo region of Los Angeles County. Glendale Beeline serves Glendale, La Cañada Flintridge, and the unincorporated Los Angeles County communities of La Crescenta and Montrose. The City of Glendale also operates Glendale Dial-A-Ride, a curb-to-curb demand-response transit service for seniors and disabled residents residing in Glendale, La Cañada Flintridge, La Crescenta, and Montrose.

The City of Glendale also manages, operates, and maintains the City of La Cañada Flintridge's LCF Shuttle fixed route service. The LCF Shuttle service buses are owned by the City of La Cañada Flintridge and based at the City of Glendale's Beeline Maintenance Facility.

Transit Agency	City of Glendale (Glendale Beeline)
Mailing Address	1759 Gardena Ave Glendale, CA 91204
Transit Agency's Air District	South Coast Air Quality Management District
Transit Agency's Air Basin	South Coast Air Basin
Total number of buses in Annual Maximum Service	33
Population of the urbanized area a transit agency is serving as last published by the Census Bureau before December 31, 2017	268,780
Contact information of the general manager, chief operating officer, or equivalent	Martha D'Andrea Transit Manager (818) 937-8337 MDAndrea@GlendaleCA.gov
Is your transit agency part of a Joint Group (13 CCR § 2023.1(d)(3))?	No

Section B: Rollout Plan General Information

The California Air Resources Board (CARB) Innovative Clean Transit (ICT) regulation was adopted in 2019 and requires all California transit agencies to transition to a 100-percent zero-emission bus (ZEB) fleet by 2040. The ICT regulation mandates each transit agency to develop a ZEB Rollout Plan, approved by its board, to show how it is planning to achieve a full transition to zero-emission technologies by 2040. The board approved rollout plan must be submitted to CARB by July 1, 2023. The approved resolution is attached in Appendix A.

Glendale also operates, maintains, and administers the City of La Cañada Flintridge's fixed route service and fleet. The La Cañada Flintridge fleet is housed and operated out of the City of Glendale's Beeline Maintenance Facility. Glendale will operate, maintain, and administer La Cañada Flintridge's future zero-emission buses once they are delivered. Glendale's successful facility upgrades of the necessary infrastructure to transition to a zero-emission fleet is crucial for La Cañada Flintridge to procure and deploy their zero-emission fleet.

All buses in the existing fleet will operate their expected useful life to avoid early retirement of any vehicle. Starting in 2023, all new fixed route vehicle purchases will be zero-emission buses (ZEB). Since each bus will operate for their entire useful life of 12 years, the last CNG buses purchased will determine the year in which the fleet is fully transitioned to zero-emission.

For additional information regarding the Rollout Plan, please contact:

Martha D'Andrea
Transit Manager
(818) 937-8337
MDAndrea@GlendaleCA.gov

The Rollout Plan was created by the City of Glendale. The Rollout Plan took approximately 100 hours to create. The Rollout Plan was based on the findings of the Arroyo Verdugo Transit Operators Electrification Feasibility Study conducted by CALSTART in collaboration with the Cities of Glendale, Pasadena, and Burbank. The LCF Shuttle fleet and service was also included in the study to comprehensively assess Glendale's infrastructure needs. The study was funded by the Caltrans Sustainable Transportation Planning grant.

Section C: Technology Portfolio

Per the recommendations from the Arroyo Verdugo Transit Operators Electrification Feasibility Study conducted by CALSTART, the City of Glendale intends to transition to 100% zero-emission fleet by adopting battery-electric technology and deploying battery-electric buses. While the feasibility study assessed battery-electric and hydrogen fuel cell technologies, it recommended battery-electric over hydrogen fuel cell technologies due to the cost and the space constraints at the Beeline Maintenance Facility. Due to the space constraints at the existing facility site, Glendale must build a parking deck to accommodate charging infrastructure and bus fleet parking. Refer to [Section E](#) for more information regarding the facility and infrastructure modification plans.

Section D: Current Bus Fleet Composition and Future Bus Purchases

The City of Glendale owns the fleets for the Beeline and Dial-A-Ride service. At the time of this report, the operations and maintenance of the Glendale Beeline and Glendale Dial-A-Ride services are contracted out to MV Transportation.

For fixed route service, the Glendale fleet consists of 41 CNG buses and La Cañada Flintridge's fleet consists of three (3) CNG buses. The Glendale Dial-A-Ride fleet consists of 10 gasoline-powered vehicles: three (3) cutaway buses, two (2) raised top vans, and five (5) minivans. While the vans are not required for inclusion in the rollout plan, they have been described for context.

Table 1 shows the Glendale and La Cañada Flintridge fleets.

Table 1: Individual Bus Information of Current Bus Fleet

No. of Buses	Engine Model Year	Bus Model Year	Fuel Type	Bus Type	City
2	2005	2005	CNG	Standard	Glendale
9	2009	2009	CNG	Standard	Glendale
4	2012	2012	CNG	Standard	Glendale
10	2013	2013	CNG	Standard	Glendale
9	2016	2016	CNG	Standard	Glendale
2	2019	2019	CNG	Standard	Glendale
5	2019	2020	CNG	Standard	Glendale
1	2016	2016	Gasoline	Cutaway	Glendale
2	2017	2017	Gasoline	Cutaway	Glendale
1	2009	2009	CNG	Standard	La Cañada Flintridge
1	2001	2001	CNG	Standard	La Cañada Flintridge
1	2016	2016	CNG	Standard	La Cañada Flintridge

Table 2 shows the projected schedule for Glendale and La Cañada Flintridge's future bus purchases. To comply with the ICT ruling, Glendale and La Cañada Flintridge intends to purchase battery-electric buses moving forward. Due to the decline in Dial-A-Ride service demand, the City plans to replace the three (3) cutaway buses used for Dial-A-Ride with vans, which are not subject to the ICT regulation. Unless otherwise stated, the bus purchases are for the City of Glendale.

Table 2: Future Bus Purchases

Timeline (Year)	Total No. of Buses to Purchase	No. of ZEB Purchases	Percentage of Annual ZEB Purchases	ZEB Bus Type(s)	ZEB Fuel Type(s)	No. of Conv. Bus Purchases	Percentage of Annual Conv. Bus Purchases	Type(s) of Conv. Buses	Fuel Type(s) of Conv. Buses
2023	5	5	100%	Standard	Electric	N/A	N/A	N/A	N/A
2024	8	8	100%	Standard	Electric	N/A	N/A	N/A	N/A
2025	10	10	100%	Standard	Electric	N/A	N/A	N/A	N/A
2026	2*	2	100%	Standard	Electric	N/A	N/A	N/A	N/A
2027	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2028	1*	1	100%	Standard	Electric	N/A	N/A	N/A	N/A
2029	9	9	100%	Standard	Electric	N/A	N/A	N/A	N/A
2030	0	0	100%	N/A	N/A	N/A	N/A	N/A	N/A
2031	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2032	9	9	100%	Standard	Electric	N/A	N/A	N/A	N/A
2033	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2034	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2035	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A

* City of La Cañada Flintridge ZEB purchase

Table 3 shows the required battery-electric bus range and estimated costs of future bus purchases. The unit of measurement for the required battery-electric bus range is the amount of energy consumed by a battery-electric bus in kilowatt-hour (kWh).

Table 3: Range and Estimated Costs of Future ZEB Purchases

Timeline (Year)	Number of ZEBs	Bus Type(s)	Required BEB Range (kWh)	Estimated Cost of Each Bus
2023	5	5 Standard Electric	350	\$1,105,000
2024	8	8 Standard Electric	350	\$1,105,000
2025	10	10 Standard Electric	350	\$1,105,000
2026	2*	2 Standard Electric	350	\$1,105,000
2027	0	N/A	N/A	N/A
2028	1*	1 Standard Electric	350	\$1,105,000
2029	9	9 Standard Electric	350	\$1,105,000
2030	0	N/A	N/A	N/A
2031	0	N/A	N/A	N/A
2032	9	9 Standard Electric	350	\$1,105,000
2033	0	N/A	N/A	N/A
2034	0	N/A	N/A	N/A
2035	0	N/A	N/A	N/A

* City of La Cañada Flintridge ZEB purchase

Glendale and La Cañada Flintridge are not considering the conversion of conventional buses to zero-emission buses, so the plan is based on bus replacement only. Table 4a below is not applicable.

Table 4a: Schedule of Converting Conventional Buses to Zero-Emission Buses

Timeline (Year)	Number of Buses	Bus Type(s)	Removed Propulsion System	New Propulsion System
N/A	N/A	N/A	N/A	N/A

Section E: Facilities and Infrastructure Modifications

The Beeline Maintenance Facility was designed and constructed to accommodate an on-site CNG fueling station on a space-constrained site. The construction of the facility was well underway when the ICT ruling was passed in 2019. With the passing of the ICT ruling, the City of Glendale will need additional infrastructure modifications at the facility to deploy battery-electric buses. Table 5 provides facility information and the construction timeline for infrastructure modifications.

Table 5: 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
Beeline Maintenance Facility	1759 Gardena Av, Glendale, CA 91204	CNG; Battery Electric Bus Charging; Maintenance	Construction for parking deck and utility upgrades to accommodate charging infrastructure (transformer, switch gear cabinets, etc.) installation, and installing chargers	60 buses	Yes	2023-2024: complete parking deck design 2024-2025: construct parking deck; install charging infrastructure

Charging infrastructure has a large physical footprint. Currently, the on-site facility bus parking capacity can accommodate 60 CNG buses. Installing charging infrastructure will reduce the parking to 38 buses. There are 44 buses between the Glendale and La Cañada Flintridge fleets. In the future, Glendale and La Cañada Flintridge may expand service, so more vehicles may be added to the fleet. To accommodate all current and potential vehicles, Glendale will need to construct a parking deck. The proposed project site of the parking deck is shown in Figure 1 below. The proposed project site in red is where the current bus fleet parks.



Figure 1. Proposed Project Site (in red) at the Beeline Maintenance Facility

The proposed parking deck will introduce an additional level on-site. In addition to accommodating bus parking, the parking deck will accommodate electrical infrastructure, charging infrastructure, photovoltaic canopy, service contractor nonrevenue vehicles, city vehicles, and employee parking. Glendale anticipates the installation of 14 chargers. Glendale intends to charge its fleet on-site at the maintenance facility during the midday and after service hours.

Charging battery-electric buses is significantly power-intensive. There are currently two feeders that serve the facility; however, the amount of power distributed by these feeders is insufficient to power the entire fleet. Currently, there is enough power available to charge 9 buses at the Beeline Maintenance Facility at 150 kW. Glendale Water and Power (GWP), the city's utility company, is in the process of a city-wide modernization and upgrade of utility infrastructure, which includes upgrading their current and aging 4 kV distribution system to a 12 kV distribution system. This upgrade will allow the power lines to carry more electricity to its customers. GWP is also working on upgrading their substations from a 34 kV system to a 69 kV system. Currently, there is no funding available to prioritize the substation upgrades that serve the Beeline Maintenance Facility. The successful transition and deployment of battery-electric buses is contingent upon these utility upgrades, so Glendale is exploring methods to finance utility upgrades, such as seeking grant funding and leveraging Low Carbon Fuel Standard (LCFS) credits, to accelerate the substation upgrades.

The maintenance facility will also need to undergo modifications to step down the voltage from the distribution system so the bus chargers can use the power. GWP offers two options for stepping down the power. The first option is for GWP to provide power at a secondary voltage

and then step down with its own utility transformers on-site at the facility. Constructing an on-site transformer would require space for the transformer, vault room, and switchgear. Battery-electric bus charging consumes a large load of power, so multiple vault rooms and switchgears would be needed. This takes up a large physical footprint since vault rooms need to be spaced apart for ventilation purposes. For this option, GWP would be responsible for obtaining funding, approval, and installing the transformers and vault rooms, which can delay the fleet transition process.

The second option is for GWP to deliver primary voltage at 12 kV and have the City to procure its own transformer to step down the voltage and manage the power. The City will need to hire a third-party contractor to install the transformer. This option would allow the City to avoid the need for multiple vault rooms and switchgears, thus have a smaller physical footprint than the first option. The City is having ongoing discussions with GWP to determine which option is most feasible to move forward with.

Table 6 provides a summary of the types of bus propulsion systems deployed at each of the transit agency's facilities. Since the battery-electric bus transition process is based on the existing fleet's replacement schedule, Glendale and La Cañada Flintridge will continue to operate both CNG and battery-electric buses until the transition process is complete. The Beeline Maintenance Facility is not located in a NOx-exempt area.

Table 6: NOx-Exempt Area and Electric Utilities' Territories

Division's Name	Type(s) of Bus Propulsion System	Located in NOx Exempt Area? (Yes/No)	Electrical Utility
Beeline Maintenance Facility	CNG; Battery Electric	No	Glendale Water and Power

Section F: Providing Service in Disadvantaged Communities

Glendale Beeline is committed to providing service to disadvantaged communities. Beeline operates 7 days a week, serving major destinations in the region such as Glendale Galleria, the Americana, Glendale College, and the Jet Propulsion Laboratory. All Beeline routes serve disadvantaged communities, as seen in Figure 2 below. Beeline also completes the regional transit network by serving as a connection to major regional transit services such as Metrolink, Amtrak, and LA Metro. Beeline also connects to neighboring community transit services such as Pasadena Transit, BurbankBus, and LADOT.

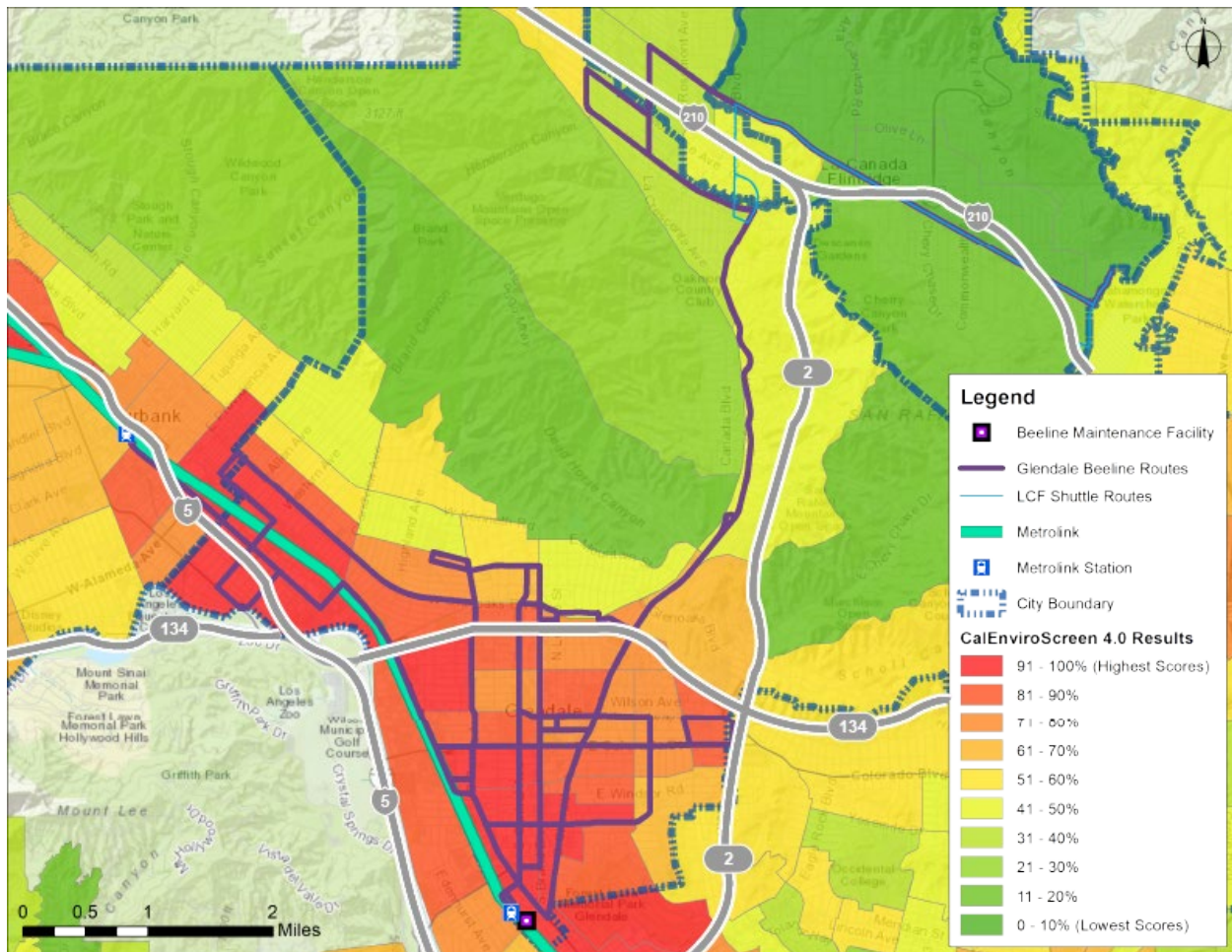


Figure 2. CalEnviroScreen 4.0 results for Glendale Beeline and LCF Shuttle

The Glendale city center is surrounded by three major freeways, I-5, SR-2, and SR-134, that exacerbate pollution in the area where the greatest concentration of disadvantaged communities in the service area resides. Additionally, Glendale is impacted by emissions from commercial fleets, industrial discharge, container trucks, and highway traffic as are many surrounding communities. Switching to battery electric buses would help improve air quality. Glendale City Council has made transitioning its municipal fleet to zero-emission a priority.

Section G: Workforce Training

Glendale intends to have its service contractor retrain and reskill the current workforce on how to operate and maintain zero-emission vehicles and related infrastructure as new equipment is deployed to avoid displacement of the existing workforce. Glendale will also require the service contractor to retrain and reskill the current workforce to support deploying La Cañada Flintridge's transit services as they transition to a zero-emission fleet.

Glendale's transit service contractor, MV Transportation, has implemented various training programs for its bus operators and mechanics. Various trainings and refresher courses are conducted throughout the year to ensure that operations staff are up to date. Additionally, manufacturers of ZEB equipment such as bus, charge management software, and charging equipment offer training courses that can be purchased during the bus and equipment procurement process.

Glendale intends to continue to leverage training offered by vehicle OEMs and infrastructure providers wherever possible to support the vehicles that Glendale and La Cañada Flintridge will purchase. In addition, Glendale plans to provide additional training where necessary, with courses offered by other transit agencies and outside programs, such as the West Coast Center of Excellence in Zero Emission Technology (CoEZET) hosted by SunLine Transit Agency. Funded by the FTA, this center serves to bring education to transit agencies looking to establish or increase their zero-emission fleets and technologies. Instruction will cover topics that address in-service management of zero-emissions technologies, which includes fueling systems and fleet operations. The Center has also been funded for a dedicated zero emissions maintenance facility which will be used to demonstrate many of the diagnostic tools necessary to maintain zero-emission fleets. Glendale is committed to investing in the development of the current workforce to support the zero-emission fleet conversion.

With the additional electrical components in battery-electric buses, Glendale intends to have its service contractor receive electrical safety training as well. Glendale is requiring its service contractor maintenance staff to obtain the National Fire Protection Association (NFPA) 70E: Standards for Electrical Safety in the Workplace and High Voltage Occupational Safety and Health Administration (OSHA) 1910.269 Electric Power Generation, Transmission, and Distribution certifications. The City will continue to look for any new training and certification opportunities related to battery-electric bus deployment that arise in the upcoming years and have its service contractor staff participate in them.

Section H: Potential Funding Sources

The City of Glendale will need a financing strategy to transition to a zero-emission fleet. Since Glendale already has a transit maintenance facility, the city can focus its attention on procuring funding for charging infrastructure, facility modifications, bus procurement, and utility upgrades.

Glendale's transit service is solely funded by local sales tax measures. Glendale does not receive state funding such as State Transit Assistance (STA), Transportation Development Act (TDA), SB-1, and State of Good Repair (SGR). Glendale also does not receive a federal allocation of the Federal Transit Administration's (FTA) 5307 capital and operating funds.

To comply with the ICT ruling, Glendale actively seeks various grant funding opportunities for battery-electric buses and infrastructure improvements. The Federal Transit Administration (FTA) offers Bus and Bus Facilities and the Low or No Emission grant programs. The State also offers a few funding programs such as the Transit Intercity Rail Capital Program (TIRCP), Low Carbon Transit Operations Program (LCTOP), Carl Moyer Program, Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project (HVIP), and Energize Jump Start Funding Lane Program. Regional funding opportunities include LA Metro's Call for Projects.

Most of the funding opportunities available are for one-time capital projects. There are limited funding opportunities for ongoing operating and maintenance costs. Operating and maintenance costs associated with the deployment of battery-electric bus technologies will be higher than using conventional buses due to how much power will be consumed to charge the vehicles. Regardless, Glendale anticipates that new funding opportunities will be created to accelerate the deployment of zero-emission technologies.

Section I: Start-up and Scale-up Challenges

The City of Glendale faces various start-up and scale-up challenges for battery-electric bus deployment. The costs associated with battery-electric bus deployment is the greatest challenge. As stated in the previous section, Glendale is solely funded by local sales tax measures. For large capital projects such as bus procurement and facility modifications, Glendale relies on grant funding to supplement the costs. Grants can cover one-time capital costs, e.g., buses and charging equipment; however, the operational and maintenance costs associated with the adoption of battery-electric technologies, such as cost of utilities and dedicated battery-electric bus maintenance equipment, are new ongoing costs that the City will have to consider.

Deploying battery-electric buses is immensely power-intensive. The current amount of power supplied by the two feeders that serve the maintenance facility is insufficient for future needs. Currently, there is only enough power to charge 9 buses at 150 kW. Glendale Water and Power (GWP), the City of Glendale's municipal utility company, has plans for substation upgrades throughout the city; however, the substations serving the maintenance facility do not have dedicated funding yet. The substation upgrades timeline does not align with the City's fleet replacement plan. This will delay Glendale's transition to a zero-emission bus fleet.

Small municipal utility companies like GWP are limited in resources compared to large neighboring utility providers like Southern California Edison. To further the state's commitment to accelerate zero-emission vehicle deployment, the City recommends that CARB advocate for state funding for utility upgrades, especially substation upgrades and feeder lines, for small municipal utility companies.

CARB's assistance with capital and operating funding opportunities would greatly help alleviate the financial burden for small local transit agencies like Glendale, that are solely funded by local sales tax measures, to successfully deploy zero-emission buses. Establishing ongoing funding dedicated to zero-emission bus deployment is crucial to ensure that the state meets its zero-emission goals.

Appendix A: Approved Board Resolution

Glendale City Council resolution to be attached after approval.