

Gold Coast Transit District ZEB Transition and Rollout Plan

November 2, 2022



Presentation Overview

- 1. Project purpose and CARB requirements
- 2. Preferred fleet concept
- 3. Facility and infrastructure modifications
- 4. Financial evaluation
- 5. Workforce training
- 6. Disadvantaged communities
- 7. GHG impacts
- 8. Other considerations

Project Purpose

- 1. To develop a CARB-compliant plan for submission in response to the ICT Regulation
- 2. To develop a transition plan and strategy for GCTD's goal of 100% ZEB by 2040

CARB:

- Requires that small transit agencies begin purchasing ZEBs in 2026, with 100% transition by 2040
- 2. Requires that small transit agencies submit a Boardapproved plan by July 1, 2023
- 3. Exempts cutaways, motorcoaches and artics until 2026 (and later if no Altoona tested vehicles are available)
- 4. Provides exemptions for agencies based on lack of feasible vehicle alternatives, challenging terrain, operating profiles that aren't feasible with ZE alternatives, and other challenges



Required Components	Section Description
Section A	Transit agency information
Section B	Rollout plan general information
Section C	Technology portfolio
Section D	Current bus fleet composition and future bus purchases
Section E	Facilities and infrastructure modifications
Section F	Providing service in disadvantaged communities
Section G	Workforce training
Section H	Potential funding sources
Section I	Start-up and scale-up challenges

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Preferred fleet concept

- Analysis, fleet modeling, multicriteria analysis, and stakeholder engagement shaped potential fleet alternatives
- Board decision in February 2022 to pursue hydrogen fuel cell technology
- Hydrogen fuel cell technology is optimal fit for GCTD's operations, service, and needs
- GCTD was recently awarded \$12.1M Low-No Grant to start transition

Fleet Recommendations (by 2040)

Vehicle type	Tank size	Quantity (by 2040)	Notes
35-ft. buses	35 kg	8	All blocks and vehicle assignments successful under the modeling conditions.
40-ft buses	37.5 kg	61	All blocks and vehicle assignments were successful under the modeling conditions.
Demand Response Vehicles (cutaways/vans)	13 kg	32	Around 90% of the daily service assigned to vans can be converted to FCEVs Vehicles need to refuel at the main facility with the fixed-route vehicles. For the purposes of the ZEB Plan, cutaways are assumed to be replaced with passenger vans.

2023-2040 Fleet Forecast

			2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
	CNG	Replace			-	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-
	CNG	Expansion	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	CNG	Retire		-	(3)	(6)	(8)			-		-	-		-	-	-	-	(6)	-
35_ft	Total 35-ft (CNG	17	17	14	8	6	6	6	6	6	6	6	6	6	6	6	6	-	-
55-it	ZEB	Replace		-	-	-	2	-	-	-	-	-	-		-	-	-	-	8	-
	ZEB	Expansion	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	ZEB	Retire	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	(2)	-
	Total 35-ft 2	ZEB	-	-	-	-	2	2	2	2	2	2	2	2	2	2	2	2	8	8
			-																	
	CNG	Replace	4	4	3	4	-	6	-	-	-	-	-	-	-	-	-	-	-	-
	CNG	Expansion	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	CNG	Retire	(10)	(4)	-	-		(8)	(5)		(5)		(3)	(7)	(6)	(4)	(3)	(4)	-	(6)
40-ft	Total 35-ft (CNG	38	38	41	45	45	43	38	38	33	33	30	23	17	13	10	6	6	-
40 10	ZEB	Replace	5	-	-	2	-	2	5	-	5	-	3	7	6	6	6	4	-	8
	ZEB	Expansion	-	-	-	-	-	-	-	2	-	4	1	-	-	-	-	2	-	-
	ZEB	Retire	-	-	-	-	-	-	-	-	-	-	-	-	-	(2)	(3)	-	-	(2)
	Total 40-ft 2	ZEB	5	5	5	7	7	9	14	16	21	25	29	36	42	46	49	55	55	61
	Total Elect	Sizo	60	60	60	60	60	60	60	62	62	66	67	67	67	67	67	69	69	69

2030 2031 2032 2033 2034 2035 2036 2037 2038 2039 2040 2023 2024 2025 2026 2027 2028 2029 CNG/Gas Replace CNG/Gas Expansion -CNG/Gas (6) (7) (8) (5) (1) Retire ------Total CNG/Gas Demand-21 14 14 6 6 1 1 -Response ΖE Replace 6 7 8 5 7 7 2 8 5 10 7 2 8 _ -ZE Expansion 2 3 --ZE Retire (8) (10) (8) (6) (7) (2) (5) (7) (2) --------Total ZE Demand-28 32 6 13 15 23 23 28 32 32 32 32 32 32 32 32 32 32 Response 32 32 32 32 32 32 32 32 32 **Total Fleet Size** 27 27 29 29 29 29 29 32 32

35-ft. and 40-ft. vehicles

Demand response vehicles

Fleet Procurement Schedule & Outlook



GCTD fleet composition through 2040 by vehicle type and technology

Hydrogen Demand

Agency	Item Description	40-ft and 35-ft Buses	Cutaways and Vans	
	Total vehicles in fleet	64	27	
	No. of active vehicles	60 (4 contingency)	26	
GCTD A	Average H2 demand per vehicles (kg/day/vehicle)	15.5	8.5	
	H2 demand for all active vehicles (kg/day/fleet)	885	180	
	Total GCTD Fleet Hydrogen Demand (kg/day)	1,065		
VCTC	Total VCTC Fleet Hydrogen Demand (kg/day)	1,335		
Total Estima	ted Fleet Hydrogen Demand (kg/day)	2,400		
Monthly Est	imated Hydrogen Demand (kg/month)	72,000		

- The estimated daily hydrogen demand includes VCTC demand
- Trucking in the liquified hydrogen is recommended to start
- Gas detection investment is minimal



Hydrogen Supply

Short-term, GCTD will likely receive its hydrogen (trucked-in) produced via steam methane reforming (SMR) and with a mixed biogas to account for 33% renewable green hydrogen

Mid-term, GCTD will explore the clean hydrogen hubs in development in So Cal to further maximize environmental benefit

Long-term, the ZEB Rollout Strategy provides analysis and guidance about on-site hydrogen electrolysis to provide redundancy

Site Plan



Hydrogen Storage and Fueling Equipment



Hydrogen Equipment at OCTA







Conceptual Plan for Hydrogen Electrolysis



Financial Impacts





- Biggest expense fleet procurement and hydrogen fueling
- Biggest savings maintenance

Financial Impacts

	Base Case	ZEB Case	Cost difference (ZEB – Base)
Fleet Acquisition	\$45,200,000	\$65,425,000	\$20,225,000
Fleet Refurbishment	\$—	\$457,000	\$457,000
Hydrogen Infrastructure	\$—	\$8,380,000	\$8,380,000
Fleet Maintenance	\$49,098,000	\$48,829,000	\$(269,000)
Fuel/Hydrogen	\$10,996,000	\$11,872,000	\$876,000
Total	\$105,294,000	\$134,963,000	\$29,669,000

GCTD was awarded \$12.1M in Low-No funding for buses and facility infrastructure

Potential Funding Sources



• Low-No

- Bus and Bus Facilities 5339
- RAISE
- CMAQ
- Urbanized Area Formula Grants

State/Local

- HVIP
- LCTOP
- TIRCP
- TDA/STA
- VW Mitigation Fund

Training Methods

Tier	Course
Tier 1	Fuel cell 101
	Fuel cell system basics
	Hydrogen safety
	Servicing basics and schedule
	Preventative maintenance
Tier 3	Introduction to system schematics
	Corrective maintenance
	Diagnostics
	Basic and advanced troubleshooting
	Integration basics
	Remote data analysis

Plan	Description
Train-the-trainer	Small numbers of staff are trained, and subsequently train colleagues. This maintains institutional knowledge while reducing the need for external training.
Vendor training from New Flyer and fueling vendor	OEM training provides critical, equipment-specific operations and maintenance information. Prior to implementing ZEB technology, GCTD staff will work with the OEMs to ensure all employees complete necessary training.
Retraining & refresher training	Entry level, intermediate, and advanced continuous learning opportunities will be offered to all GCTD staff.
ZEB training from other transit agencies	GCTD plans to leverage the experience of agencies who were early ZEB adopters, such as the ZEB University program offered by AC Transit.
National Transit Institute (NTI) training	NTI offers zero-emissions courses such as ZEB management and benchmarking and performance.
Local partnerships and collaborations	GCTD works with local schools to showcase potential careers in bus and facilities management to students.
Professional associations	Associations such as the Zero Emission Bus Resource Alliance offer opportunities for sharing and lessons learned across transit agencies.

OEM tier 1 & tier 3 training

Potential training methods

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Disadvantaged Communities (CalEnviroScreen)



Census Tract ID	Community	Route(s)
6111004902	Oxnard	2, 4A, 4B, 15, 17, 19
6111009100	Oxnard	2, 4A, 4B, 8, 17, 19
6111004400	Port Hueneme	1A, 1B, 23
6111003900	Oxnard	3, 7, 8
6111002300	Ventura	6, 16
6111002400	Ventura	6, 16
6111005003	El Rio	15, 17
6111004715	Oxnard	7

Estimated GHG reductions

	Zero En	nissions	CNG/Gasoline				
	Fixed Route Fleet	Demand Response Fleet	Fixed Route Fleet	CNG Demand Response Fleet	Gasoline Demand Response Fleet		
Fleet tailpipe emissions (ton CO ₂ /year)	-	-	5,627	394	284		
Upstream emissions (ton CO ₂ /year)	4,960	732	3,510	246	1,044		
Total Ton CO₂/year	4,960	732	9,137	640	1,329		
Total Ton CO ₂ /year	5,6	692		11,105			

	Fleet Emissions (Ton CO ₂ /year)
FCEB fleet	5,692
CNG/Gasoline Fleet	11,105
Difference	5,414
Difference	49%

Replacing the CNG fleet with FCEBs is equivalent to:



- Removing 1,167 passenger vehicles per year on our roads, or
- Reducing emissions of the equivalent of 682 households per year, or
- Recycling 1,873 tons of waste rather than landfilling
- Reducing the need for 89,521 trees to capture carbon emissions

Source: https://www.epa.gov/energy/greenhouse-gasequivalencies-calculator

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Other Considerations

Partnerships

- Joint ZEB group
- Regional hydrogen fueling infrastructure / strategy
- Aligns with regional plans, like TIES study

Change management

- An agencywide approach to deployment need a champion and program manager
- A steering committee or task force should be formed
- Engagement with union, operators, and maintenance staff

Fleet Procurement Schedule & Outlook

GCTD fleet composition through 2040 by vehicle type and technology



End