

Bus Procurement Cost Analysis

Summary

This analysis examines the cost of buses for transit agencies across the county. Specifically, to observe the variation of bus cost for propulsion type with a focus on Zero Emission Buses (ZEB).

Data was compiled from three data sources:

1. FTA Bus and Low- and No-Emission Grant Awards press release (federally funded, nationwide data)
2. TIRCP project data (state-funded, California only data)
3. DGS usage report for all procurements from California agencies purchasing from New Flyer and Portera Inc..

The initial dataset included nearly 300 projects. It was reduced to 88 projects after applying criteria to exclude non-bus related work. Projects involving the construction of new facilities, training programs, or the procurement of non-bus items such as trains and ferries were excluded. The final dataset comprised only projects focused on bus procurement.

These projects were aggregated against propulsion type and bus size type, and categorized by ZEB and non-ZEB.

ZEB projects are categorized into the following propulsion types:

- zero-emission (not specified)
- electric (not specified)
- battery electric (BEB)
- fuel cell electric (FCEB)

Non-ZEB projects include the following propulsion types:

- compressed natural gas (CNG)
- ethanol
- low-emission (hybrid, propane)
- diesel
- gas

Below is a breakdown of each data source showing the total buses and cost for each source:

source	bus_count	total_cost	cost_per_bus
dgs	236.000000	250112853	1059800
fta	883.000000	391257025	443099
tircp	233.000000	187250513	803650
Grand Total	1352.000000	828620391	612884

The following charts and tables display the kinds of variations to bus cost transit agencies have faced.

Charts and Tables

Summary of cost by ZEB propulsion types

	prop_type	bus_count	total_cost	cost_per_bus
	BEB	163.000000	167232489	1025966
	FCEB	102.000000	120951335	1185797
	electric (not specified)	44.000000	56678000	1288136
	zero-emission bus (not specified)	143.000000	128156513	896199
	Grand Total	452.000000	473018337	1046500

Summary of cost by non-ZEB propulsion types *

	prop_type	bus_count	total_cost	cost_per_bus
	CNG	252.000000	176039140	698568
	ethanol	9.000000	1006750	111861
	low emission (hybrid)	145.000000	91824361	633271
	low emission (propane)	44.000000	8403969	190999
	mix (zero and low emission)	125.000000	36775430	294203
	Grand Total	575.000000	314049650	546173

*The remaining buses did not specify a propulsion type

Which agencies had the highest and lowest ZEB cost per bus?

Max cost_per_bus

transit_agency	prop_type	total_cost	bus_count	cost_per_bus
University of California - San Diego	BEB	4134000	2.000000	2067000

Min cost_per_bus

transit_agency	prop_type	total_cost	bus_count	cost_per_bus
City of Wasco	zero-emission bus (not specified)	1543000	3.000000	514333

Which agencies procured the most and least amount of ZEBs?

Max bus_count

transit_agency	prop_type	total_cost	bus_count	cost_per_bus
City of Los Angeles (LA DOT)	zero-emission bus (not specified)	102790000	112.000000	917767

Min bus_count

transit_agency	prop_type	total_cost	bus_count	cost_per_bus
SLO TRANSIT (SAN LUIS OBISPO, CA)	BEB	847214	1.000000	847214
City of San Luis Obispo	BEB	859270	1.000000	859270

Which agencies had the most and least total ZEB cost?

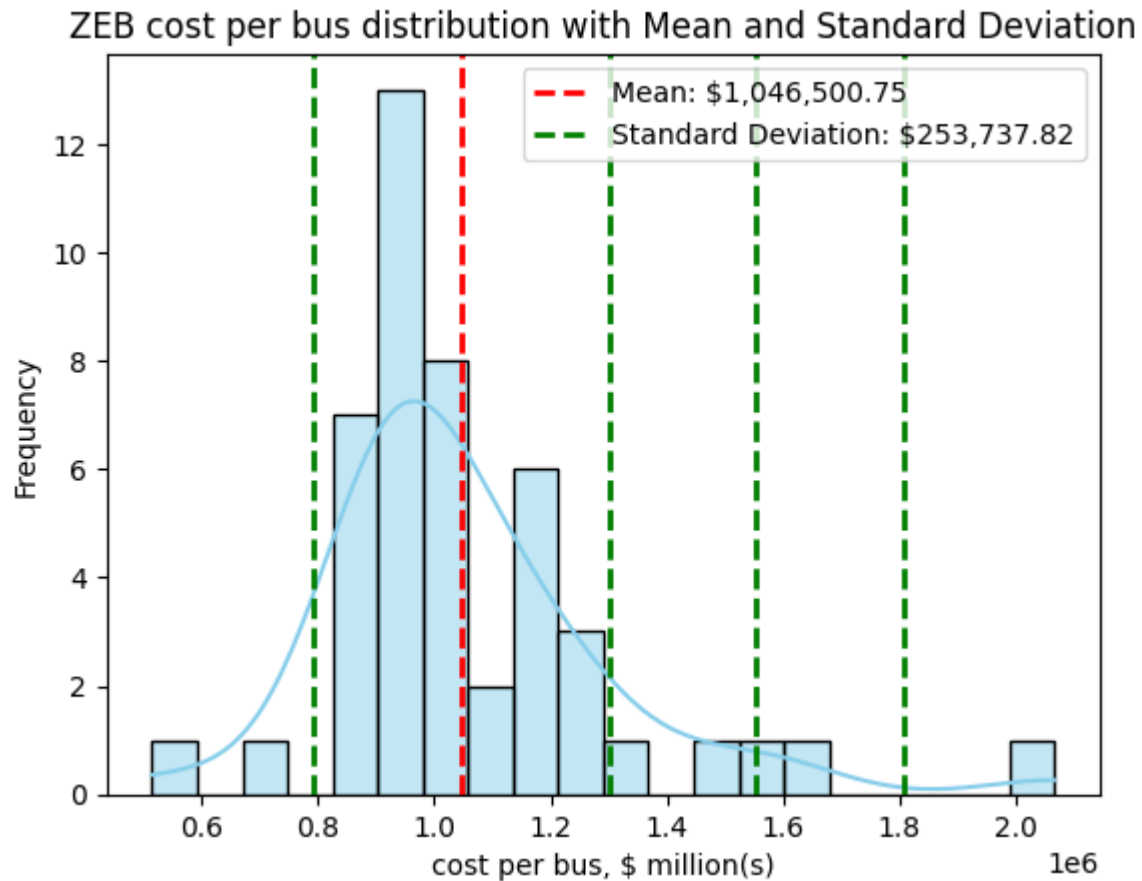
Max total_cost

transit_agency	prop_type	total_cost	bus_count	cost_per_bus
City of Los Angeles (LA DOT)	zero-emission bus (not specified)	102790000	112.000000	917767

Min total_cost

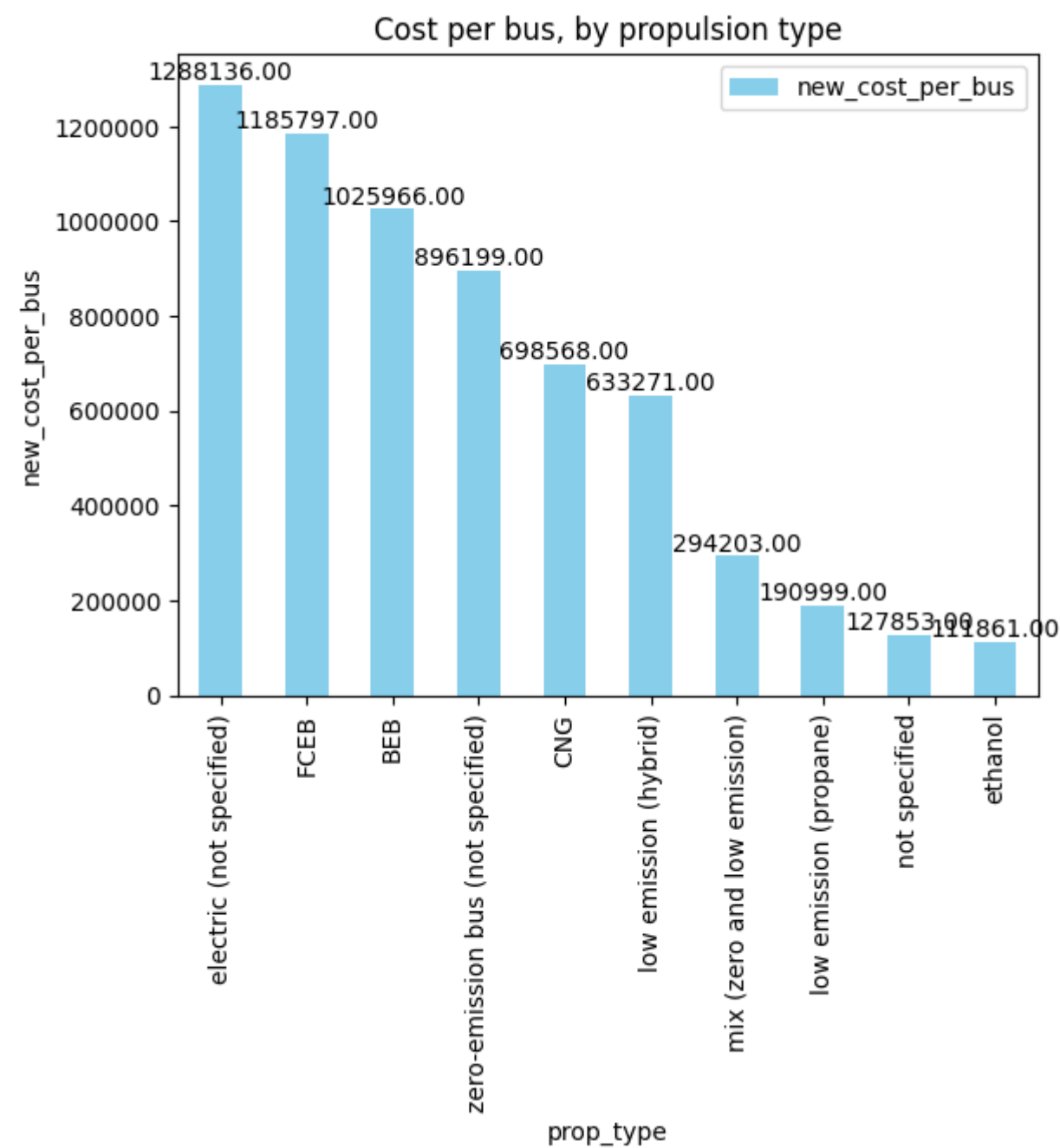
transit_agency	prop_type	total_cost	bus_count	cost_per_bus
SLO TRANSIT (SAN LUIS OBISPO, CA)	BEB	847214	1.000000	847214

What is the distribution of ZEB cost?



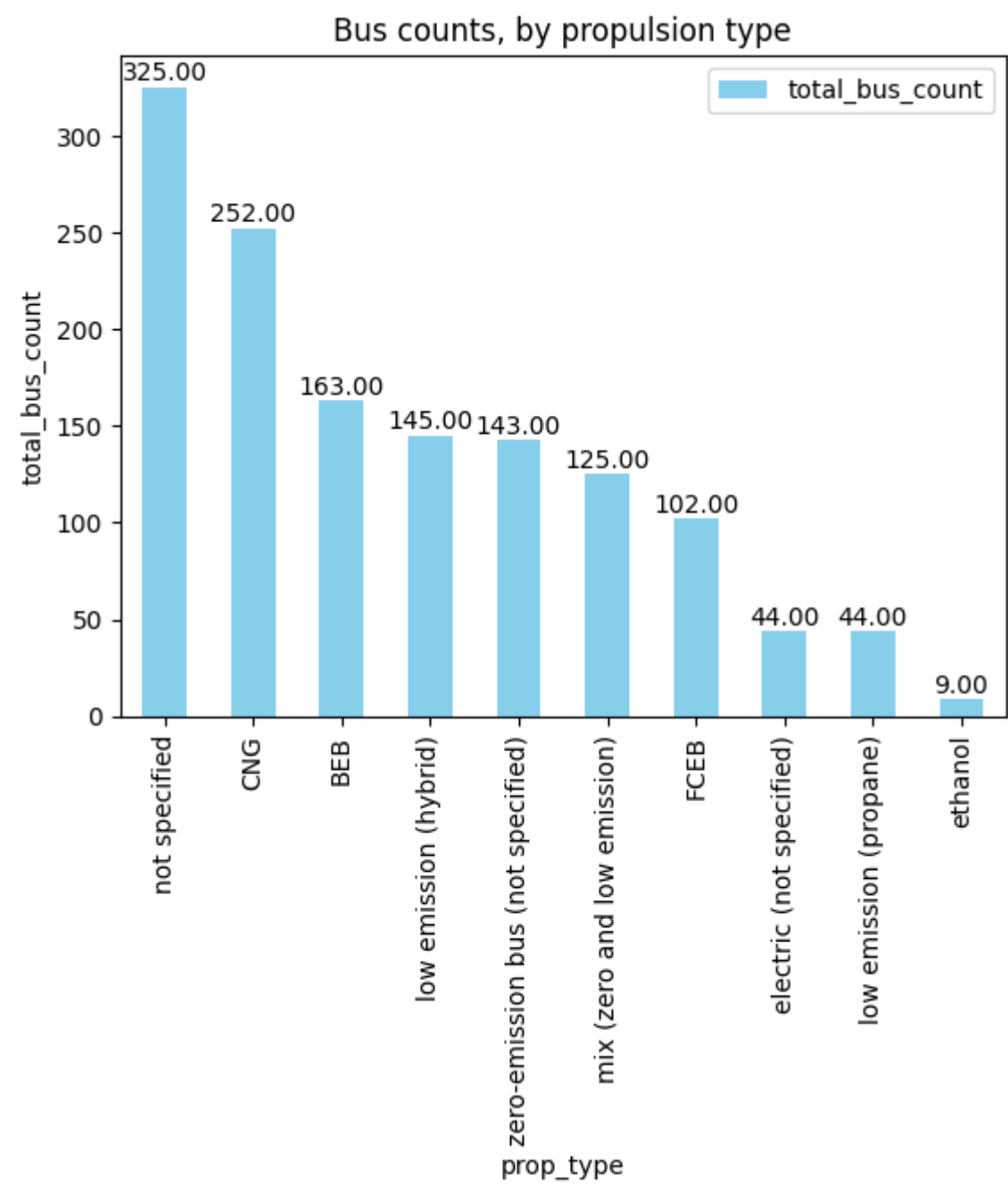
This distribution show the ZEB cost floating around **~\$1,000,000** , with only a few instances extending past +/- 1 standard deviation. As shown earlier, the lowest cost per ZEB bus was about **~\$500,000** . However it should be noted that the propulsion type for this instance did not specify exactly which type of ZEB was procured (BEB, FCEB, or otherwise). The highest cost per ZEB was about **~\$2,000,000** for BEB.

What is the cost per bus compared against all propulsion types?



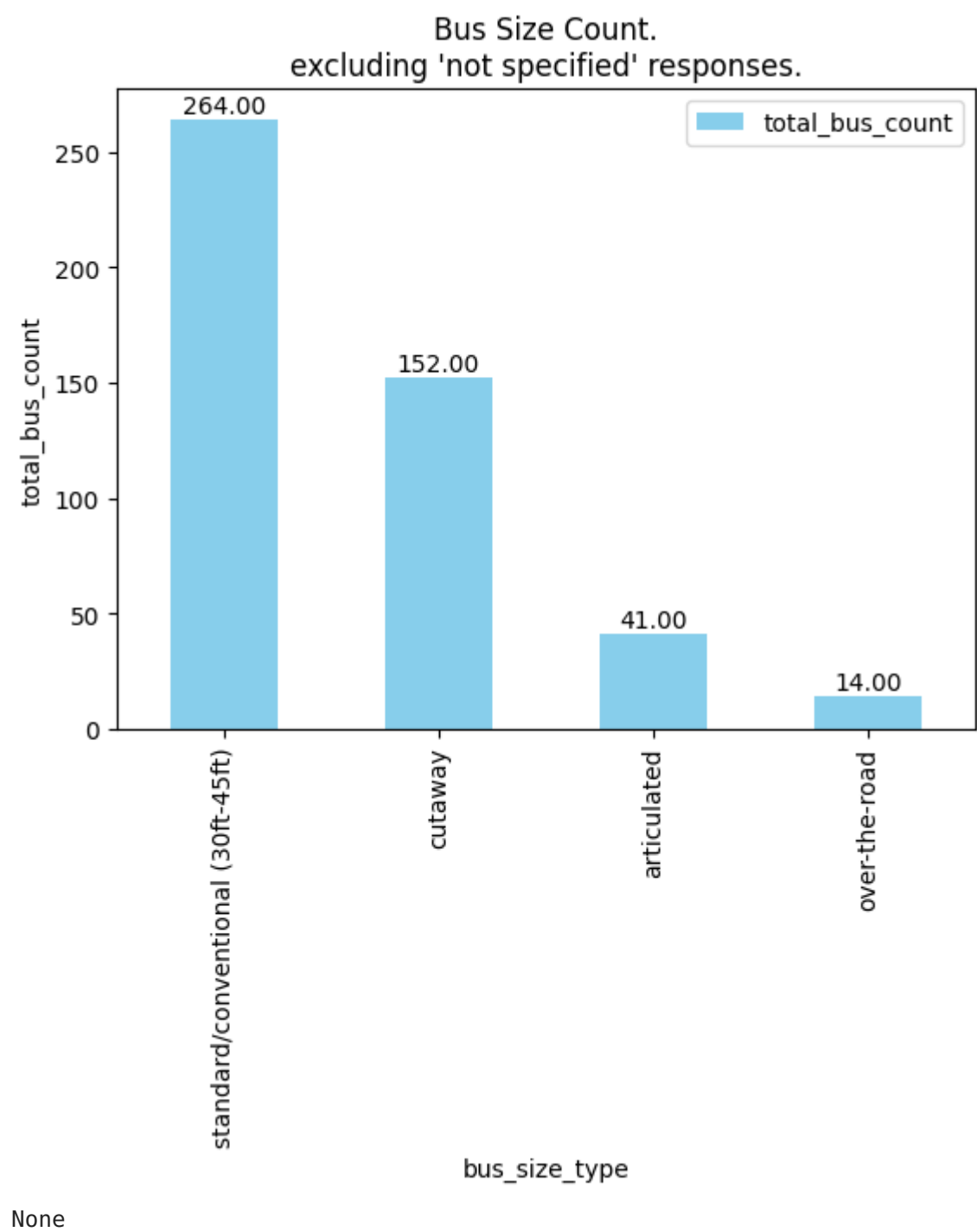
None

What is the total bus counts compared to each propulsion type?



None

What is the total bus counts compared to each bus size category?



What is the breakdown of ZEB Propulsion Type and Bus Size Category?

		bus_count	total_cost	cost_per_bus
prop_type	bus_size_type			
BEB	articulated	12.0	18759576	1563298
	standard/conventional (30ft-45ft)	151.0	148472913	983264
FCEB	not specified	29.0	38070971	1312792
	standard/conventional (30ft-45ft)	73.0	82880364	1135347
electric (not specified)	articulated	29.0	39478000	1361310
	not specified	15.0	17200000	1146666
zero-emission bus (not specified)	not specified	143.0	128156513	896199

Conclusion

Based on these findings, The average cost of a ZEB, throughout the US, is ~\$1,000,000 , roughly twice the price of a conventional, non-ZEB. The variance in cost depends mainly on the options the Transit Agencies chooses. Highly optioned/customized buses contribute to high cost. Unfortunately, analyzing the cost of configurable options is outside the scope of data provided.