



# 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

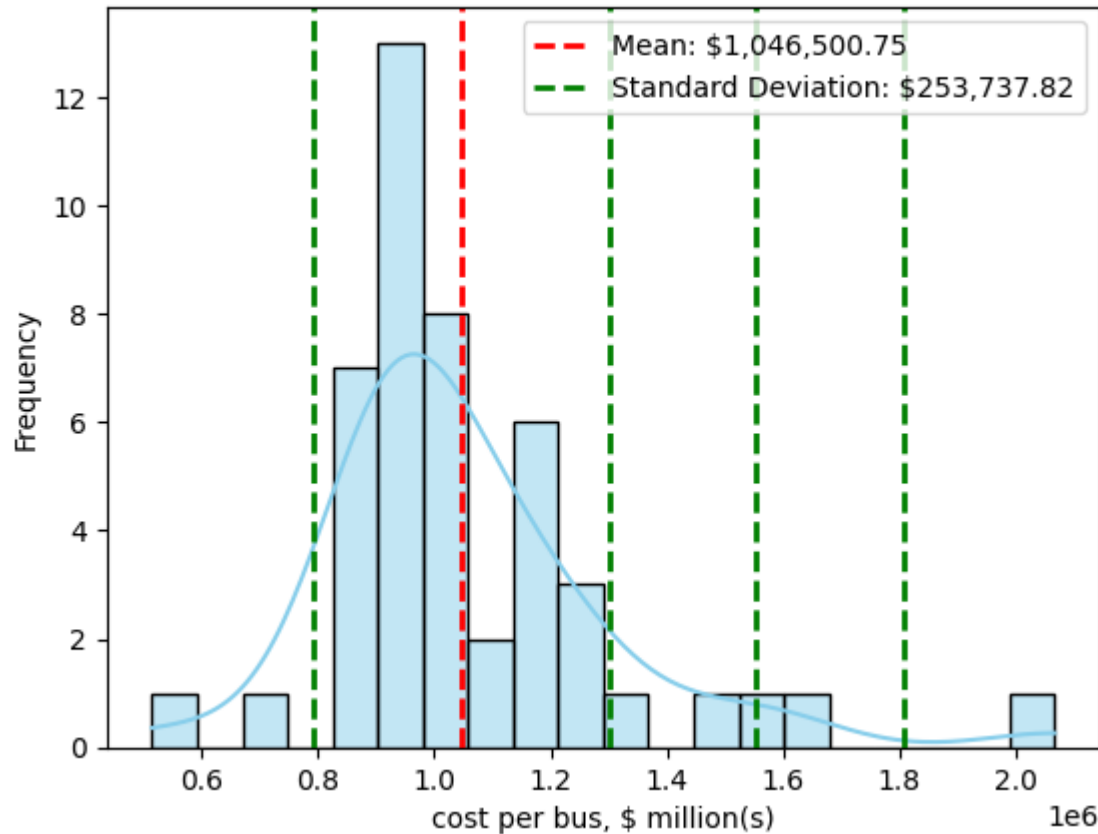
| transit_agency               | prop_type                         | total_cost | bus_count  | cost_per_bus |
|------------------------------|-----------------------------------|------------|------------|--------------|
| City of Los Angeles (LA DOT) | zero-emission bus (not specified) | 102790000  |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

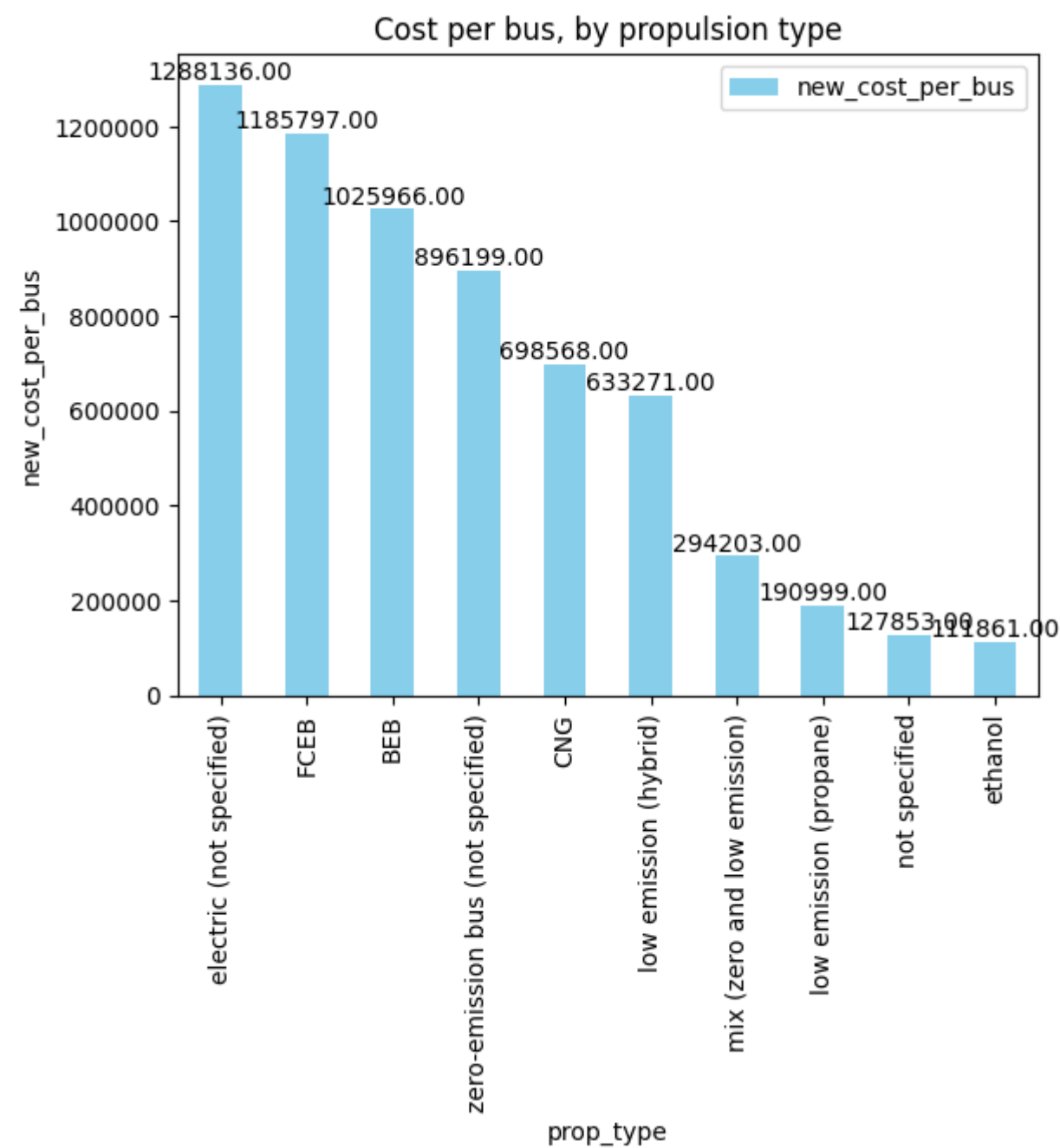
## What is the distribution of ZEB cost?

ZEB cost per bus distribution with Mean and Standard Deviation



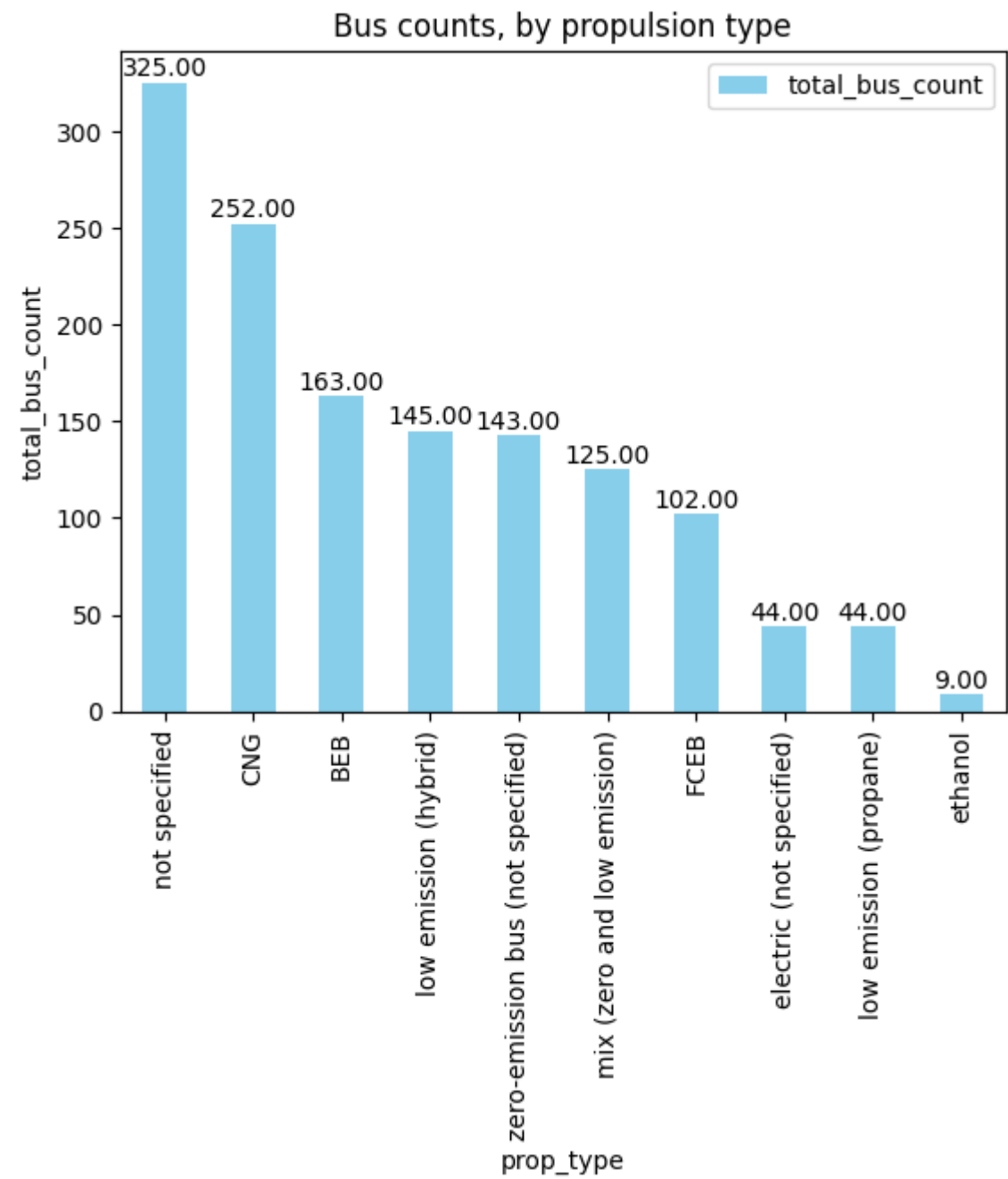
This distribution shows the ZEB cost floating around **~\$1,000,000**, with only a few instances extending past  $\pm 1$  standard deviation. As shown earlier, the lowest cost per ZEB bus was about **~\$500,000**. However, it should be noted that the propulsion type for this instance did not specify 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?



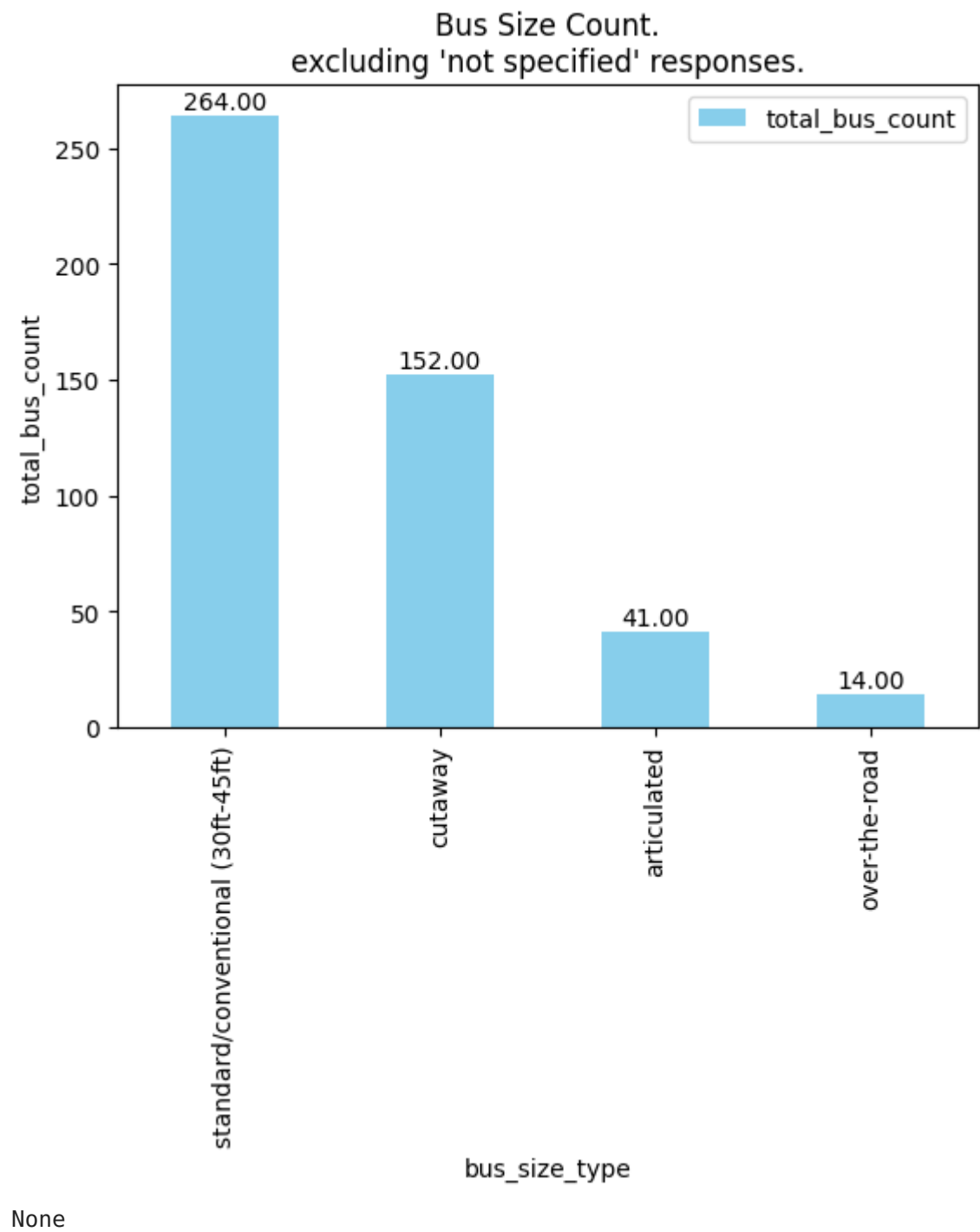
None

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.