To: Lex Luther, CEO, Janzen Consulting Group

From: Data Analysis Team

Date: September 10, 2024

Re: Analysis of Electric Vehicle Population Data in Washington State Department of Licensing (DOL).

Mr. Luther, we have conducted an analysis of electric vehicle population data that are currently registered through Washington State Department of Licensing (DOL) to inform our consulting strategy for clients in the automotive and energy sectors of our findings. This analysis is crucial for understanding EV adoption trends, which have significant implications for urban planning, energy infrastructure, and environmental policies.

Our analysis mainly focuses on how people from various cities in Washington State (Seattle, Tacoma, Yakima, and Olympia) are adopting electric vehicles depending on various factors. We have examined variables such as Make, Model Year, Electric Range, Electric Vehicle Type and Cities. Our key takeaways are as follows:

- **Tesla** dominates the EV market in Washington, with model year 2023 being the most popular
- There's a significant variation in EV adoption across different cities but **Seattle** has the **highest concentration** of EVs
- Battery Electric Vehicles (BEVs) are more prevalent than plug-in hybrid electric vehicles (PHEVs).

For our analysis we utilized Make, Model Year, Electric Range, Electric Vehicle Type and Cities from the dataset. We created a subset for our city variable focusing in on data from Seattle, Tacoma, Yakima, and Olympia. These cities provided a broader outlook on the dataset provided for the state. For the distribution of manufactures we isolated **8** of the top manufactures to condense our findings. The manufactures utilized are BMW, Chevrolet, Ford, Kia, Nissan, Tesla, Toyota, and Volkswagen.

(*MAKE*) - Tesla accounts for over **48%** of the electric vehicles in the dataset, indicating a **significant** market dominance in the selected cities of Washington State. **(Table 1)**

(CITY) - There's a substantial disparity in electric vehicle adoption among the selected cities, with **Seattle** accounting for **over three-quarters** of the registered electric vehicle types. **(Table 1)**

(*ELECTRIC VEHCILE TYPE)* - Battery Electric Vehicles (**BEV**s) significantly outnumber Plug-in Hybrid Electric Vehicles (PHEVs), suggesting a stronger consumer preference for **fully electric vehicles** in the selected cities of Washington. **(Table 1)**

(*ELECTRIC RANGE)* - The wide range of electric ranges (from 0 to 337 miles) indicates significant variability in vehicle capabilities, which could influence consumer choices based on their driving needs. This variable was **positively skewed** due to **unreported values** (reported as "0" in the dataset) for newer vehicle model year. **(Table 2)**

(*MODEL YEAR)* - The **negative skewness** indicates a higher concentration of **newer model years**, suggesting a recent surge in electric vehicle adoption. **(Table 2)**

Table:1 Categorical Summary

Distribution of EVs by Make

Make	Freq	Percent
Tesla	13934	48.4%
Nissan	3533	12.3%
Chevrolet	3216	11.2%
BMW	1819	6.3%
Ford	1745	6.1%
Kia	1695	5.9%
Volkswagen	1478	5.1%
Toyota	1379	4.7%
Total	28799	100%
EV Type	**Freq**	**Percent**
BEV	24003	83.3%
PHEV	4796	16.7%
Total	28799	100%
City	**Freq**	**Percent**
Seattle	21960	76.2%
Olympia	3386	11.8%
Tacoma	2940	10.2%
Yakima	513	1.8%
Total	28799	100%

Table 2: Quantitaive Summary

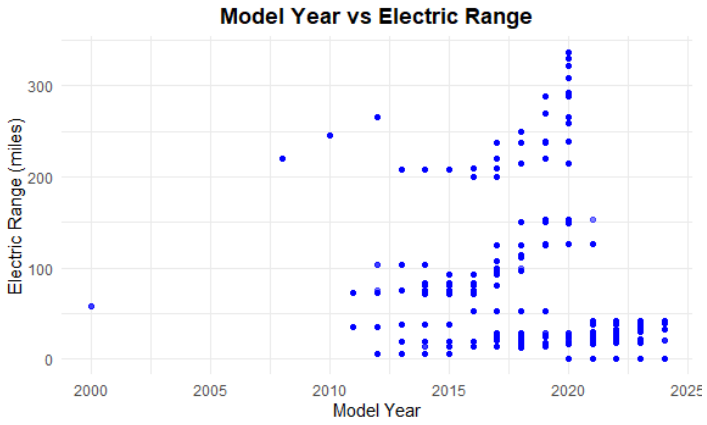
Summary Statistics for Model Year

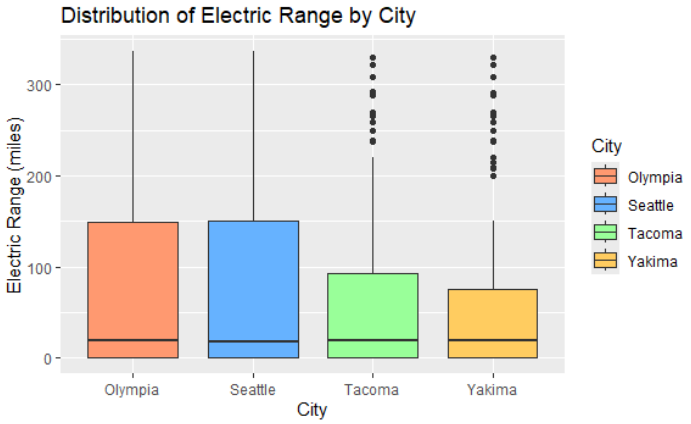
N	Minimum	1st Quartile	Median	Mean	3rd Quartile	Maximum	SD	Skewness
166800	2000	2018	2021	2020	2023	2024	3.1	-0.9

Summary Statistics for Electric Range

N	Minimum	1st Quartile	Median	Mean	3rd Quartile	Maximum	SD	Skewness
166800	0	0	19	74.2	150	337	99.7	1.1

The scatter plot shows a non-linear trend in the improvement of electric vehicle range over the years. This is due to the reported electric range of newer vehicles (2020+) being recorded in the dataset as “0”. There's a noticeable acceleration in range improvements starting around 2018, coinciding with advancements in battery technology and increased competition in the EV market. In recent years EV development for electrical vehicle range has increased potentially due to technological breakthroughs and increased investment.



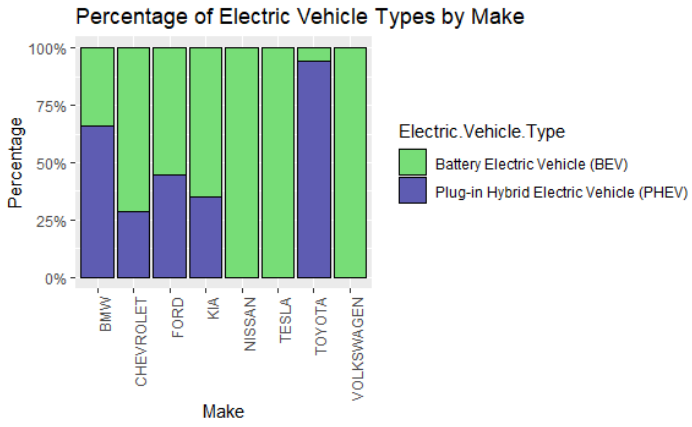


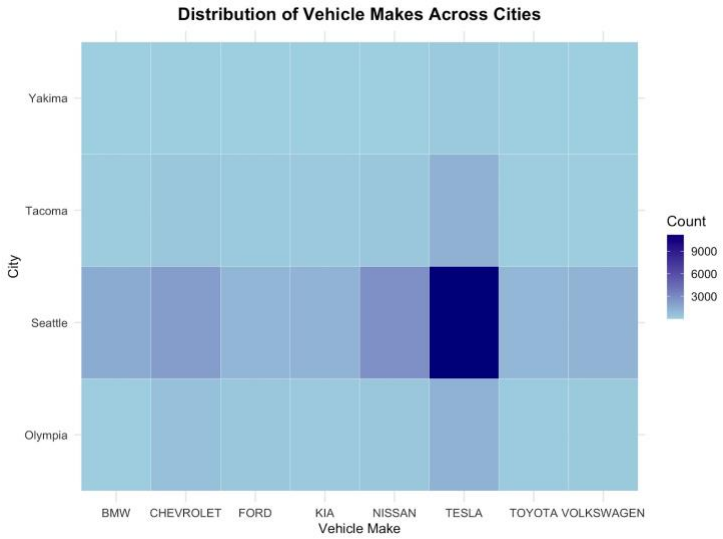
Seattle has a higher median and mean electric range compared to other cities. This suggests that Seattle residents tend to own electric vehicles with longer ranges, possibly due to different driving needs or socioeconomic factors.

Electric Range vs City

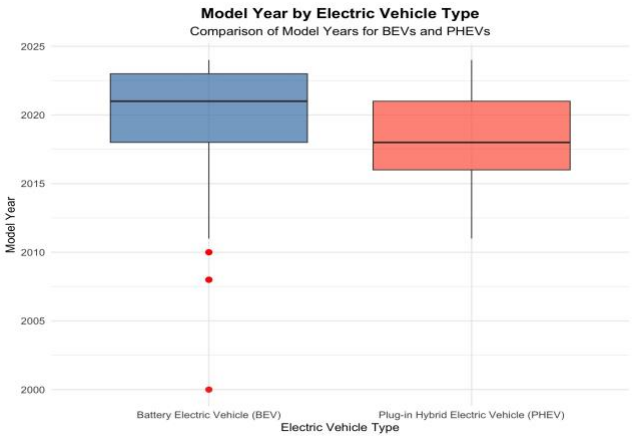
City	N	Mean	Median	Minimum	Maximum	SD
Seattle	21960	75.9	18	0	337	101
Olympia	3386	71.3	19	0	337	97.9
Tacoma	2940	66.9	19	0	330	94
Yakima	513	66	19	0	330	96.3

There's a clear specialization among manufacturers. Tesla, Nissan and Volkswagen exclusively produce BEVs in this dataset, while Toyota heavily favors PHEVs. This indicates different strategic approaches to electric vehicle technology among manufacturers.





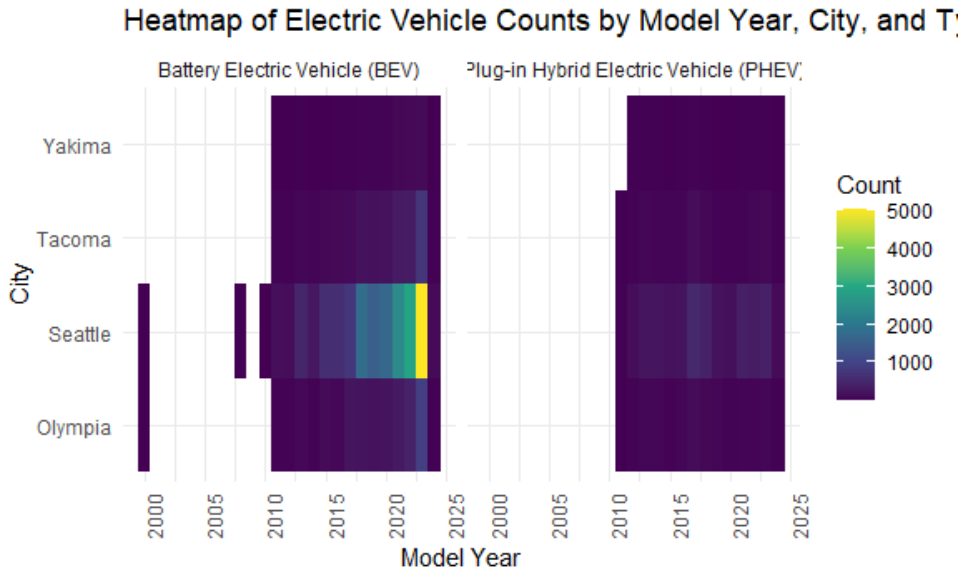
When looking at how EV manufactures are distributed throughout the various cities, there is a clear cluster of Tesla vehicles in Seattle.



Electric Range vs. Electric Vehicle Type							
EVT	N	Mean	Median	Minimum	Maximum	SD	Skewness
(BEV)	24003	82.1	0	0	337	107	0.8
(PHEV)	4796	34.9	30	6	153	21.2	2

Model Year vs. Electric Vehicle Type							
EVT	N	Mean	Median	Minimum	Maximum	SD	Skewness
(BEV)	24003	2020	2021	2000	2024	2.91	-1.1
(PHEV)	4796	2018	2018	2011	2024	3.41	-0.1

BEVs show a higher electrical range (miles) when compared to PHEVs. Washington state EV consumers show preference for both EVTs and newer vehicles (2018+) throughout our findings.



There's a clear shift in adoption patterns over time. Battery Electric Vehicles (BEVs) show a more rapid increase in recent years compared to Plug-in Hybrid Electric Vehicles (PHEVs), suggesting a growing preference for fully electric vehicles as the technology matures. Seattle stands out with significantly higher adoption rates for both BEVs and PHEVs compared to other cities, indicating it's likely a hub for electric vehicle usage. This could be due to factors like urban density, environmental policies, or tech-savvy population. The adoption of electric vehicles appears to have started earlier and grown more rapidly in Seattle compared to other cities. Olympia and Tacoma show more recent growth, while Yakima has the lowest adoption rates across all years, suggesting possible urban-rural divides in EV adoption.

Although no apparent trends proceeded from this dataset, we can see a clear domination from a few EV manufactures (especially Tesla) and higher EV adoption in Seattle. There is a clear preference for BEV overall. In conclusion, we would recommend the client to wait until the dataset is updated to obtain more accurate information about electric vehicle range for newer models. This would provide a clearer view of which cities prefer long-range electrical vehicles. These findings are critical for future EV infrastructure planning for the various cities of Washington state.

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