Business Analytics
(IS641)

ASSIGNMENT

ELECTRIC VEHICLE DATA ANALYSIS USING POWER BI TOOLS

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ABOUT THE DATASET

The dataset is a detailed compilation of information on electric vehicles (EVs) within a specific region, encompassing various attributes such as geographic, legislative, and economic contexts. Key columns include vehicle details like model year, make, and model, as well as the type of electric vehicle, which helps differentiate between Battery Electric Vehicles (BEVs) and Plug-in Hybrid Electric Vehicles (PHEVs). The 'Electric Range' column provides insights into the efficiency and performance of different models, while geographic data such as city, state, postal code, legislative district, and 2020 census tract enable spatial analysis of EV adoption and regional differences in usage patterns. The 'Electric Utility' column further contextualizes the support infrastructure, highlighting the availability of charging stations and the impact of utility policies.

Economic aspects are also a critical part of the dataset, with the 'Base MSRP' (Manufacturer's Suggested Retail Price) indicating the financial accessibility of various EV models. Additionally, the 'Clean Alternative Fuel Vehicle (CAFV) Eligibility' column shows whether a vehicle qualifies for specific incentives aimed at promoting clean energy, providing a basis for analysing the effectiveness of such policies in encouraging EV adoption.

VIN (1-10)	County	City	State	Postal Code	Model Year	Make	Model	Electric Vehicle Typ	Clean Alternative Fu	Electric Range	Base MSRP	Legislative District	DOL Vehicle ID	Vehicle Location	Electric Utility	2020 Census Tract
KM8K33AGXL	King	Seattle	WA	98103	2020	HYUNDAI	KONA	Battery Electric Vehi	Clean Alternative Fu	258	0	43	249675142	POINT (-122.34301	CITY OF SEATTLE -	53033004800
1C4RJYB61N	King	Bothell	WA	98011	2022	JEEP	GRAND CHEROKEE	Plug-in Hybrid Electri	Not eligible due to lo	25	0	1	233928502	POINT (-122.20578	PUGET SOUND ENE	53033021804
1C4RJYD61P	Yakima	Yakima	WA	98908	2023	JEEP	GRAND CHEROKEE	Plug-in Hybrid Electri	Not eligible due to lo	25	0	14	229675939	POINT (-120.602720	PACIFICORP	53077002900
5YJ3E1EA7J	King	Kirkland	WA	98034	2018	TESLA	MODEL 3	Battery Electric Vehi	Clean Alternative Fu	215	0	45	104714466	POINT (-122.209285	PUGET SOUND ENE	53033021903
WBY7Z8C5XJ	Thurston	Olympia	WA	98501	2018	BMW	I3	Plug-in Hybrid Electri	Clean Alternative Fu	97	0	22	185498386	POINT (-122.89692	PUGET SOUND ENE	53067010700
5YJ3E1EAXL	Snohomish	Marysville	WA	98271	2020	TESLA	MODEL 3	Battery Electric Vehi	Clean Alternative Fu	266	0	38	124595523	POINT (-122.171384	PUGET SOUND ENE	53061940001
2C4RC1N77H	King	Kent	WA	98042	2017	CHRYSLER	PACIFICA	Plug-in Hybrid Electri	Clean Alternative Fu	33	0	47	1815593	POINT (-122.111625	PUGET SOUND ENE	53033031707
5YJYGDEE3L	King	Woodinville	WA	98072	2020	TESLA	MODEL Y	Battery Electric Vehi	Clean Alternative Fu	291	0	45	124760555	POINT (-122.151685	PUGET SOUND ENE	53033021906
5YJ3E1EA1J	Island	Coupeville	WA	98239	2018	TESLA	MODEL 3	Battery Electric Vehi	Clean Alternative Fu	215	0	10	125048003	POINT (-122.688070	PUGET SOUND ENE	53029971000
7SAYGDEF0P	King	Bellevue	WA	98004	2023	TESLA	MODEL Y	Battery Electric Vehi	Eligibility unknown a	0	0	48	240416207	POINT (-122.201905	PUGET SOUND ENE	53033023806
5YJ3E1EA7J	King	Kirkland	WA	98033	2018	TESLA	MODEL 3	Battery Electric Vehi	Clean Alternative Fu	215	0	48	231013436	POINT (-122.20264	PUGET SOUND ENE	53033022603
3FA6P0SU8G	Kitsap	Port Orchard	WA	98367	2016	FORD	FUSION	Plug-in Hybrid Electri	Not eligible due to lo	19	0	26	212561716	POINT (-122.685164	PUGET SOUND ENE	53035092902
JTDKARFP9H	Kitsap	Port Orchard	WA	98366	2017	TOYOTA	PRIUS PRIME	Plug-in Hybrid Electri	Not eligible due to lo	25	0	26	229764972	POINT (-122.639265	PUGET SOUND ENE	53035092600
5YJ3E1EB8K	Snohomish	Mukilteo	WA	98275	2019	TESLA	MODEL 3	Battery Electric Vehi	Clean Alternative Fu	220	0	21	179728755	POINT (-122.299965	PUGET SOUND ENE	53061041301
5YJ3E1EA5K	King	Redmond	WA	98052	2019	TESLA	MODEL 3	Battery Electric Vehi	Clean Alternative Fu	220	0	45	120633516	POINT (-122.12302	PUGET SOUND ENE	53033032323
3FA6P0SU0D	Thurston	Rochester	WA	98579	2013	FORD	FUSION	Plug-in Hybrid Electri	Not eligible due to lo	19	0	20	138697212	POINT (-123.09573	PUGET SOUND ENE	53067012730
WA1VABGE4K	King	Seattle	WA	98112	2019	AUDI	E-TRON	Battery Electric Vehi	Clean Alternative Fu	204	0	43	475364046	POINT (-122.306935	CITY OF SEATTLE -	53033006400
1N4AZ0CP6F	King	Seattle	WA	98125	2015	NISSAN	LEAF	Battery Electric Vehi	Clean Alternative Fu	84	0	46	252522896	POINT (-122.296385	CITY OF SEATTLE -	53033000201
KNDCC3LD7K	Kitsap	Bremerton	WA	98311	2019	KIA	NIRO	Plug-in Hybrid Electri	Not eligible due to lo	26	0	23	2148170	POINT (-122.646881	PUGET SOUND ENE	53035091204
1N4AZ0CP1E	Kitsap	Poulsbo	WA	98370	2014	NISSAN	LEAF	Battery Electric Vehi	Clean Alternative Fu	84	0	23	258176922	POINT (-122.64177	PUGET SOUND ENE	53035091100
5UXKT0C51J	King	Kent	WA	98042	2018	BMW	X5	Plug-in Hybrid Electri	Not eligible due to lo	13	0	47	291897987	POINT (-122.111625	PUGET SOUND ENE	53033031708
5YJSA1E22J	Snohomish	Marysville	WA	98271	2018	TESLA	MODEL S	Battery Electric Vehi	Clean Alternative Fu	249	0	39	172808163	POINT (-122.171384	PUGET SOUND ENE	53061052808
1G1RB6E48D	Kitsap	Bremerton	WA	98312	2013	CHEVROLET	VOLT	Plug-in Hybrid Electri	Clean Alternative Fu	38	0	35	138557555	POINT (-122.65223	PUGET SOUND ENE	53035080700
2T3YL4DV5E	King	Seattle	WA	98108	2014	TOYOTA	RAV4	Battery Electric Vehi	Clean Alternative Fu	103	0	11	183567149	POINT (-122.326965	CITY OF SEATTLE -	53033010001
JTDKARFP5H	Snohomish	Lake Stevens	WA	98258	2017	TOYOTA	PRIUS PRIME	Plug-in Hybrid Electri	Not eligible due to lo	25	0	44	160057901	POINT (-122.112265	PUGET SOUND ENE	53061052607
5YJ3E1EB6L	Kitsap	Silverdale	WA	98383	2020	TESLA	MODEL 3	Battery Electric Vehi	Clean Alternative Fu	322	0	23	6335847	POINT (-122.668076	PUGET SOUND ENE	53035091302
5YJ3E1EB3J	King	Kirkland	WA	98033	2018	TESLA	MODEL 3	Battery Electric Vehi	Clean Alternative Fu	215	0	45	205530552	POINT (-122.20264	PUGET SOUND ENE	53033022401
1FADP5CU0G	Kitsap	Kingston	WA	98346	2016	FORD	C-MAX	Plug-in Hybrid Electri	Not eligible due to lo	19	0	23	1465033	POINT (-122.50156	PUGET SOUND ENE	53035090102
WVWKR7AU0K	King	Kirkland	WA	98033	2019	VOLKSWAGEN	E-GOLF	Battery Electric Vehi	Clean Alternative Fu	125	0	45	306865107	POINT (-122.20264	PUGET SOUND ENE	53033022006
5YJSA1E29L	Kitsap	Kingston	WA	98346	2020	TESLA	MODEL S	Battery Electric Vehi	Clean Alternative Fu	330	0	23	110621444	POINT (-122.50156	PUGET SOUND ENE	53035090102
1N4AZ0CP7F	Thurston	Olympia	WA	98506	2015	NISSAN	LEAF	Battery Electric Vehi	Clean Alternative Fu	84	0	22	141547311	POINT (-122.887478	PUGET SOUND ENE	53067010200
WA1LAAGE7M	Yakima	Yakima	WA	98908	2021	AUDI	E-TRON	Battery Electric Vehi	Clean Alternative Fu	222	0	14	144941534	POINT (-120.602720	PACIFICORP	53077002801
KNDCE3LG9K	King	Enumclaw	WA	98022	2019	KIA	NIRO	Battery Electric Vehi	Clean Alternative Fu	239	0	31	117615928	POINT (-121.98953	PUGET SOUND ENE	53033031400
1N4AZ0CP8F	King	Seattle	WA	98109	2015	NISSAN	LEAF	Battery Electric Vehi	Clean Alternative Fu	84	0	43	180279487	POINT (-122.34848	CITY OF SEATTLE -	53033007301
5YJ3E1EA4P	King	Bellevue	WA	98006	2023	TESLA	MODEL 3	Battery Electric Vehi	Eligibility unknown a	0	0	41	241481278	POINT (-122.16937	PUGET SOUND ENE	53033024704
JN1AZ0CP1B	King	Seattle	WA	98133	2011	NISSAN	LEAF	Battery Electric Vehi	Clean Alternative Fu	73	0	32	133592196	POINT (-122.34584	CITY OF SEATTLE -	53033000404
3C3CFFGE4G	King	Auburn	WA	98002	2016	FIAT	500	Battery Electric Vehi	Clean Alternative Fu	84	0	47	225708626	POINT (-122.222855	PUGET SOUND ENE	53033030600
1G1FY6S07L	Yakima	Moxee	WA	98936	2020	CHEVROLET	BOLT EV	Battery Electric Vehi	Clean Alternative Fu	259	0	15	125943058	POINT (-120.379511	PACIFICORP	53077001702
1V2DNPE83P	King	Seattle	WA	98125	2023	VOLKSWAGEN	ID.4	Battery Electric Vehi	Eligibility unknown a	0	0	46	245619664	POINT (-122.296385	CITY OF SEATTLE -	53033009900
1G1FY6S06N	Yakima	Tieton	WA	98947	2022	CHEVROLET	BOLT EV	Battery Electric Vehi	Eligibility unknown a	0	0	14	208932349	POINT (-120.75692	PACIFICORP	53077002900
1N4AZ0CPXD	Kitsap	Silverdale	WA	98383	2013	NISSAN	LEAF	Battery Electric Vehi	Clean Alternative Fu	75	0	23	144485785	POINT (-122.668076	PUGET SOUND ENE	53035091205
3MW39FS02P	Kitsap	Port Orchard	WA	98367	2023	BMW	330E	Plug-in Hybrid Electri	Not eligible due to lo	20	0	35	244137120	POINT (-122.685164	PUGET SOUND ENE	53035092901
1N4BZ1CP2K	King	Renton	WA	98057	2019	NISSAN	LEAF	Battery Electric Vehi	Clean Alternative Fu	150	0	11	4870099	POINT (-122.21024	PUGET SOUND ENE	53033026200
WAUTPBFF2H	King	Bellevue	WA	98008	2017	AUDI	A3	Plug-in Hybrid Electri	Not eligible due to lo	16	0	48	159300466	POINT (-122.11832	PUGET SOUND ENE	53033023300
2C4RC1L73P	King	Tukwila	WA	98188	2023	CHRYSLER	PACIFICA	Plug-in Hybrid Electri	Clean Alternative Fu	32	0	11	236367519	POINT (-122.29179	PUGET SOUND ENE	53033028200
5YJ3E1EA7K	King	Seatac	WA	98188	2019	TESLA	MODEL 3	Battery Electric Vehi	Clean Alternative Fu	220	0	33	216597293	POINT (-122.29179	PUGET SOUND ENE	53033028300
1FADP3R40D	Thurston	Tumwater	WA	98501	2013	FORD	FOCUS	Battery Electric Vehi	Clean Alternative Fu	76	0	35	230763249	POINT (-122.89692	PUGET SOUND ENE	53067011720
2C4RC1N79J	Kitsap	Suquamish	WA	98392	2018	CHRYSLER	PACIFICA	Plug-in Hybrid Electri	Clean Alternative Fu	33	0	23	176286968	POINT (-122.55717	PUGET SOUND ENE	53035940100
KNDRJDLH0N	Yakima	Yakima	WA	98908	2022	KIA	SORENTO	Plug-in Hybrid Electri	Clean Alternative Fu	32	0	14	209591812	POINT (-120.602720	PACIFICORP	53077000800

DATA PREPROCESSING

1. Removing Null Values:

- Identified and removed rows with missing values across all columns to ensure data integrity.

2. Removing Rows with Incorrect Values:

- Identified and removed rows containing incorrect or invalid values, such as negative values or outliers.

3. Removing duplicates:

- Checked for and removed any duplicate rows to avoid skewing the analysis.

4. Removing the VIN and County Columns:

- The "VIN" and “County” columns were deemed unnecessary for the analysis or calculations required for the project.
- As a result, the columns were removed from the dataset to simplify further processing.

5. Handling Categorical Variables:

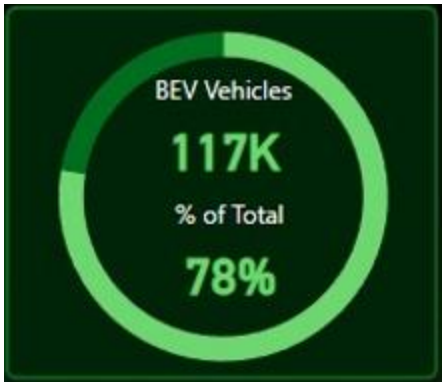
- Identified categorical variables within the dataset, such as "Electric Vehicle Type" or "Clean Alternative Fuel Vehicle (CAFV) Eligibility" and applied appropriate encoding techniques.
- Utilized techniques like one-hot encoding or label encoding to convert categorical variables into numerical format, ensuring compatibility with machine learning algorithms.
- By handling categorical variables effectively, we ensure that all features are represented in a format suitable for analysis and modelling, thereby enhancing the robustness of our predictive models.

City	State	Postal Code	Model Year	Make	Model	Electric Vehicle Type	Clean Alternative Fuel Vehicle (CAFV) Eligibility	Electric Range	Base MSRP	Legislative
Bellevue	WA	98006	2023	TESLA	MODEL Y	Battery Electric Vehicle (BEV)	Eligibility unknown as battery range has not been researched	0	0	
Bellevue	WA	98006	2023	TESLA	MODEL Y	Battery Electric Vehicle (BEV)	Eligibility unknown as battery range has not been researched	0	0	
Bellevue	WA	98006	2023	TESLA	MODEL Y	Battery Electric Vehicle (BEV)	Eligibility unknown as battery range has not been researched	0	0	
Bellevue	WA	98006	2023	TESLA	MODEL Y	Battery Electric Vehicle (BEV)	Eligibility unknown as battery range has not been researched	0	0	
Bellevue	WA	98006	2023	TESLA	MODEL Y	Battery Electric Vehicle (BEV)	Eligibility unknown as battery range has not been researched	0	0	
Bellevue	WA	98006	2023	TESLA	MODEL Y	Battery Electric Vehicle (BEV)	Eligibility unknown as battery range has not been researched	0	0	
Bellevue	WA	98006	2023	TESLA	MODEL Y	Battery Electric Vehicle (BEV)	Eligibility unknown as battery range has not been researched	0	0	
Bellevue	WA	98006	2023	TESLA	MODEL Y	Battery Electric Vehicle (BEV)	Eligibility unknown as battery range has not been researched	0	0	
Bellevue	WA	98006	2023	TESLA	MODEL Y	Battery Electric Vehicle (BEV)	Eligibility unknown as battery range has not been researched	0	0	
Bellevue	WA	98006	2023	TESLA	MODEL Y	Battery Electric Vehicle (BEV)	Eligibility unknown as battery range has not been researched	0	0	
Bellevue	WA	98006	2023	TESLA	MODEL Y	Battery Electric Vehicle (BEV)	Eligibility unknown as battery range has not been researched	0	0	
Bellevue	WA	98006	2023	TESLA	MODEL Y	Battery Electric Vehicle (BEV)	Eligibility unknown as battery range has not been researched	0	0	
Bellevue	WA	98006	2023	TESLA	MODEL Y	Battery Electric Vehicle (BEV)	Eligibility unknown as battery range has not been researched	0	0	
Bellevue	WA	98006	2023	TESLA	MODEL Y	Battery Electric Vehicle (BEV)	Eligibility unknown as battery range has not been researched	0	0	
Bellevue	WA	98006	2023	TESLA	MODEL Y	Battery Electric Vehicle (BEV)	Eligibility unknown as battery range has not been researched	0	0	
Bellevue	WA	98006	2023	TESLA	MODEL Y	Battery Electric Vehicle (BEV)	Eligibility unknown as battery range has not been researched	0	0	
Bellevue	WA	98006	2023	TESLA	MODEL Y	Battery Electric Vehicle (BEV)	Eligibility unknown as battery range has not been researched	0	0	
Bellevue	WA	98006	2023	TESLA	MODEL Y	Battery Electric Vehicle (BEV)	Eligibility unknown as battery range has not been researched	0	0	
Bellevue	WA	98006	2023	TESLA	MODEL Y	Battery Electric Vehicle (BEV)	Eligibility unknown as battery range has not been researched	0	0	
Bellevue	WA	98006	2023	TESLA	MODEL Y	Battery Electric Vehicle (BEV)	Eligibility unknown as battery range has not been researched	0	0	

DATA VISUALIZATIONS

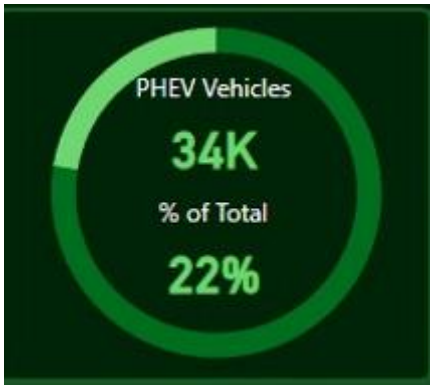
1. Donut Graph: BEV Vehicles and % of them

- Identifying and analyzing the total number of Battery Electric Vehicles (BEVs) in the dataset.
- Calculating the percentage of BEVs relative to the total number of electric vehicles, providing insights into the dominance of fully electric models.



2. Donut Graph: PHEV Vehicles and % of them

- Identifying and analyzing the total number of Plug-in Hybrid Electric Vehicles (PHEVs)) in the dataset.
- Calculating the percentage of PHEVs relative to the total number of electric vehicles, providing insights into the dominance of fully electric models.

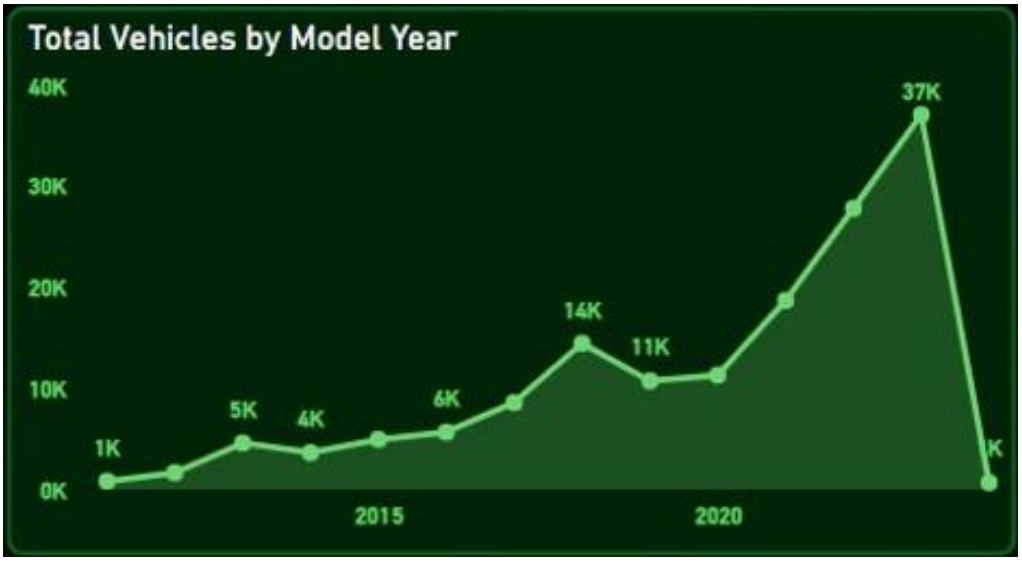


3. Filled Map: Total Vehicles by State

This chart showcases the geographical distribution of electric vehicles across different states, allowing for the identification of regions with higher adoption rates.

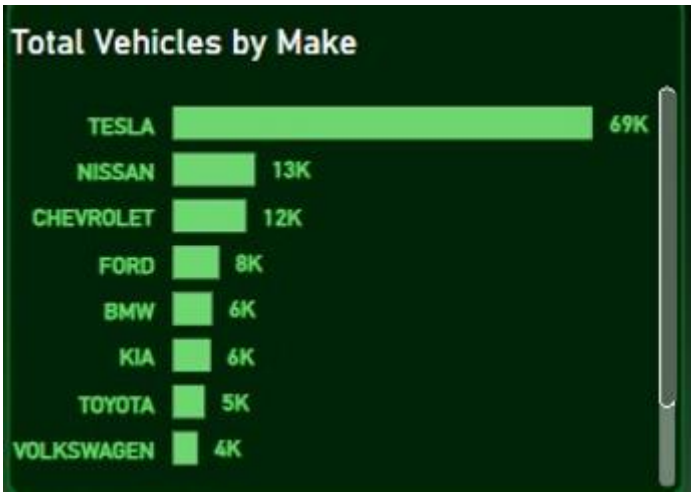
4. Area Chart: Total Vehicles by Model Year

This chart illustrates the distribution of electric vehicles over the years, starting from 2010, providing insights into the growth pattern and adoption trends..



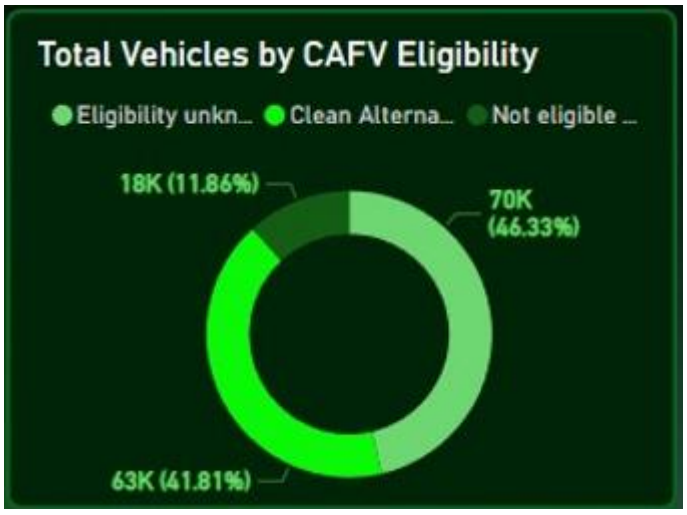
5. Bar Chart: Top 10 Total Vehicles by Make

This highlights the top 10 electric vehicle manufacturers based on the total number of vehicles, providing insights into the market dominance of specific brands.



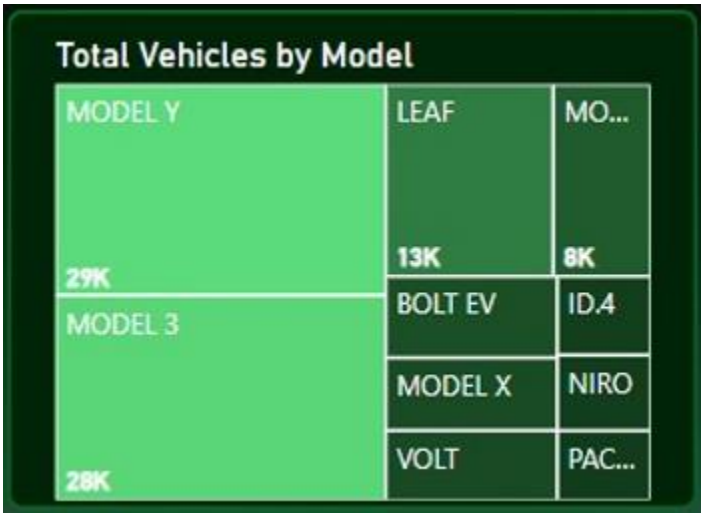
6. Donut Chart: Total Vehicles by CAFV Eligibility

Illustrates the proportion of electric vehicles that are eligible for Clean Alternative Fuel Vehicle (CAFV) incentives, aiding in understanding the impact of incentives on vehicle adoption.

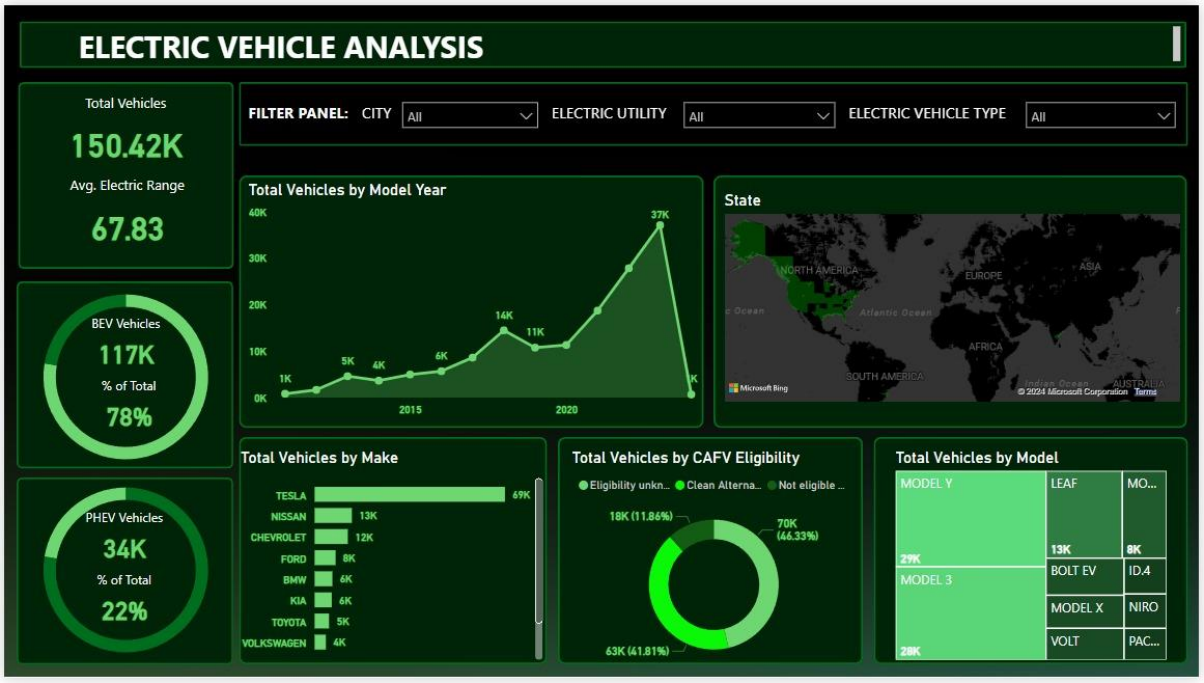


7. Tree Map: Top 10 Total Vehicles by Model

Highlights the top 10 electric vehicle models based on the total number of vehicles, offering insights into consumer preferences and popular models in the market.


Total Vehicles by Model
MODEL Y
29K
MODEL 3
28K
LEAF
13K
MO...
8K
BOLT EV
ID.4
MODEL X
NIRO
VOLT
PAC...

THE DASHBOARD



In conclusion, the dashboard effectively utilizes a combination of data visualization techniques to present key metrics and insights in a user-friendly format. By incorporating visual elements such as charts, graphs, and cards, users can easily interpret and analyse complex data related to electric vehicles. From tracking different electric vehicles to understanding geographical distribution and model types and years distribution, the dashboard offers a comprehensive overview of critical performance indicators. By providing actionable insights and facilitating data-driven decision-making, the dashboard serves as a valuable tool for stakeholders to monitor performance, identify trends, and drive strategic initiatives for growth and success in the vehicle market.