

EV Population Analysis



www.linkedin.com/in/ankit-rangari.com

Introduction

In this project, I explored a dataset containing detailed information on electric vehicles, including key attributes like VIN, make, model, electric range, and base MSRP. My analysis covered various aspects of electric vehicles, from identifying trends in vehicle manufacturers and models to calculating advanced metrics like the cumulative count of registrations and comparing electric ranges.

The queries I developed aimed to:

- Extract insights about electric vehicle distribution by make, model year, and electric range.
- Leverage advanced SQL techniques, such as subqueries, window functions, and ranking to analyze vehicle characteristics and trends.
- Create categories for electric vehicles based on their electric range, and rank vehicles based on their MSRP within each model year.

Through this analysis, I applied SQL to solve practical data challenges, providing insights on electric vehicle distribution and performance metrics. The findings can inform discussions on electric vehicle adoption, manufacturer trends, and pricing in the automotive industry.

```
6  
7      -- 1) Write a query to list all electric vehicles with their VIN (1-10), Make, and Model.  
8 •   SELECT  VIN, make, model  
9      FROM electric_vehicle_population_data;  
10
```

Result Grid | Filter Rows: Export: Wrap Cell Content: Fetch rows:

	VIN	make	model
▶	WBY8P6C58K	BMW	I3
	5YJSA1DN4D	TESLA	MODEL S
	5YJSA1E26J	TESLA	MODEL S
	WBY2Z2C54E	BMW	I8
	5YJXCDE23J	TESLA	MODEL X
	WBY33AW0XP	BMW	I4
	5YJ3E1EB5L	TESLA	MODEL 3
	1V2GNPE86P	VOLKSWAGEN	ID.4
	WWWPP7AU0G	VOLKSWAGEN	E-GOLF
	3C3CFFGE8D	FIAT	500
	5YJ3E1EB0M	TESLA	MODEL 3
	1N4BZ1CP3K	NISSAN	LEAF
	KL8CK6S00G	CHEVROLET	SPARK
	1N4AZ0CP4E	NISSAN	LEAF
	5YJSA1E29J	TESLA	MODEL S

electric_vehicle_population_dat...

Output

```

16      -- 2. Write a query to display all columns for electric vehicles with a Model Year of 2020 or later.
17 • SELECT *
18   FROM electric_vehicle_population_data
19   WHERE `model year`>=2020 ;
20
21

```

Result Grid | Filter Rows: Export: Wrap Cell Content: Fetch rows:

	VIN	County	City	State	Postal Code	Model Year	Make	Model	Electric Vehicle Type	Clean Alternative Fuel Veh Eligibility
▶	WBY33AW0XP	King	Seattle	WA	98109	2023	BMW	I4	Battery Electric Vehicle (BEV)	Eligibility unknown as batte
	5YJ3E1EB5L	King	Bothell	WA	98011	2020	TESLA	MODEL 3	Battery Electric Vehicle (BEV)	Clean Alternative Fuel Veh
	1V2GNPE86P	King	Sammamish	WA	98075	2023	VOLKSWAGEN	ID.4	Battery Electric Vehicle (BEV)	Eligibility unknown as batte
	5YJ3E1EB0M	Yakima	Yakima	WA	98908	2021	TESLA	MODEL 3	Battery Electric Vehicle (BEV)	Eligibility unknown as batte
	SADHD2S10L	King	Bellevue	WA	98004	2020	JAGUAR	I-PACE	Battery Electric Vehicle (BEV)	Clean Alternative Fuel Veh
	5YJYGAEE8M	Snohomish	Snohomish	WA	98296	2021	TESLA	MODEL Y	Battery Electric Vehicle (BEV)	Eligibility unknown as batte
	5YJ3E1EB6L	King	Redmond	WA	98052	2020	TESLA	MODEL 3	Battery Electric Vehicle (BEV)	Clean Alternative Fuel Veh
	WBA7W4C07L	Snohomish	Lynnwood	WA	98087	2020	BMW	745E	Plug-in Hybrid Electric Vehicle (PHEV)	Not eligible due to low batt
	1C4JJXR69P	Island	Coupeville	WA	98239	2023	JEEP	WRANGLER	Plug-in Hybrid Electric Vehicle (PHEV)	Not eligible due to low batt
	YV4H60DE9P	King	Burien	WA	98168	2023	VOLVO	XC60	Plug-in Hybrid Electric Vehicle (PHEV)	Clean Alternative Fuel Veh
	JTJKKCFZ4R	King	Renton	WA	98056	2024	LEXUS	NX	Plug-in Hybrid Electric Vehicle (PHEV)	Clean Alternative Fuel Veh
	WA1E2AFY5N	King	Issaquah	WA	98027	2022	AUDI	Q5	Plug-in Hybrid Electric Vehicle (PHEV)	Not eligible due to low batt
	KM8JFDA28P	Yakima	Yakima	WA	98901	2023	HYUNDAI	TUCSON	Plug-in Hybrid Electric Vehicle (PHEV)	Clean Alternative Fuel Veh

electric_vehicle_population_dat... ①

Output

```

24    -- 3. Write a query to list electric vehicles manufactured by Tesla.
25 • SELECT *
26   FROM electric_vehicle_population_data
27 WHERE make="tesla" ;
28
29

```

result Grid | Filter Rows: Export: Wrap Cell Content: Fetch rows:

VIN	County	City	State	Postal Code	Model Year	Make	Model	Electric Vehicle Type	Clean Alternative Fuel Vehicle (CAFV) Eligibility
5YJSA1DN4D	Kitsap	Bremerton	WA	98312	2013	TESLA	MODEL S	Battery Electric Vehicle (BEV)	Clean Alternative Fuel Vehicle Eligible
5YJSA1E26J	King	Kent	WA	98042	2018	TESLA	MODEL S	Battery Electric Vehicle (BEV)	Clean Alternative Fuel Vehicle Eligible
5YJXCDE23J	King	Bellevue	WA	98004	2018	TESLA	MODEL X	Battery Electric Vehicle (BEV)	Clean Alternative Fuel Vehicle Eligible
5YJ3E1EB5L	King	Bothell	WA	98011	2020	TESLA	MODEL 3	Battery Electric Vehicle (BEV)	Clean Alternative Fuel Vehicle Eligible
5YJ3E1EB0M	Yakima	Yakima	WA	98908	2021	TESLA	MODEL 3	Battery Electric Vehicle (BEV)	Eligibility unknown as battery range has not
5YJSA1E29J	Kitsap	Poulsbo	WA	98370	2018	TESLA	MODEL S	Battery Electric Vehicle (BEV)	Clean Alternative Fuel Vehicle Eligible
5YJ3E1EBXJ	Thurston	Rainier	WA	98576	2018	TESLA	MODEL 3	Battery Electric Vehicle (BEV)	Clean Alternative Fuel Vehicle Eligible
5YJXCBE25H	King	Bellevue	WA	98004	2017	TESLA	MODEL X	Battery Electric Vehicle (BEV)	Clean Alternative Fuel Vehicle Eligible
5YJ3E1EB9K	King	Seattle	WA	98177	2019	TESLA	MODEL 3	Battery Electric Vehicle (BEV)	Clean Alternative Fuel Vehicle Eligible
5YJYGAEE8M	Snohomish	Snohomish	WA	98296	2021	TESLA	MODEL Y	Battery Electric Vehicle (BEV)	Eligibility unknown as battery range has not
5YJSA1V24F	Yakima	Selah	WA	98942	2015	TESLA	MODEL S	Battery Electric Vehicle (BEV)	Clean Alternative Fuel Vehicle Eligible
5YJ3E1EB6L	King	Redmond	WA	98052	2020	TESLA	MODEL 3	Battery Electric Vehicle (BEV)	Clean Alternative Fuel Vehicle Eligible
5YJYGDEE3M	Snohomish	Everett	WA	98208	2021	TESLA	MODEL Y	Battery Electric Vehicle (BEV)	Eligibility unknown as battery range has not

electric_vehicle_population_dat...

```

32      -- 4. Write a query to find all electric vehicles where the Model contains the word Leaf.
33 •  SELECT *
34    FROM electric_vehicle_population_data
35   WHERE Model LIKE '%Leaf%' ;
36

```

Result Grid									
VIN	County	City	State	Postal Code	Model Year	Make	Model	Electric Vehicle Type	Clean Alternative Fuel Vehicle (CAF) Eligibility
1N4BZ1CP3K	Kitsap	Bainbridge Island	WA	98110	2019	NISSAN	LEAF	Battery Electric Vehicle (BEV)	Clean Alternative Fuel Vehicle Eligible
1N4AZ0CP4E	King	Redmond	WA	98052	2014	NISSAN	LEAF	Battery Electric Vehicle (BEV)	Clean Alternative Fuel Vehicle Eligible
1N4AZ0CP2D	King	Bellevue	WA	98004	2013	NISSAN	LEAF	Battery Electric Vehicle (BEV)	Clean Alternative Fuel Vehicle Eligible
1N4AZ0CP6G	King	Seattle	WA	98125	2016	NISSAN	LEAF	Battery Electric Vehicle (BEV)	Clean Alternative Fuel Vehicle Eligible
JN1AZ0CP7B	Kitsap	Kingston	WA	98346	2011	NISSAN	LEAF	Battery Electric Vehicle (BEV)	Clean Alternative Fuel Vehicle Eligible
1N4BZ0CP9G	Kitsap	Port Orchard	WA	98366	2016	NISSAN	LEAF	Battery Electric Vehicle (BEV)	Clean Alternative Fuel Vehicle Eligible
1N4AZ0CP1G	King	Kirkland	WA	98034	2016	NISSAN	LEAF	Battery Electric Vehicle (BEV)	Clean Alternative Fuel Vehicle Eligible
1N4AZ0CP6F	King	Bellevue	WA	98007	2015	NISSAN	LEAF	Battery Electric Vehicle (BEV)	Clean Alternative Fuel Vehicle Eligible
1N4AZ0CP5F	King	Kirkland	WA	98034	2015	NISSAN	LEAF	Battery Electric Vehicle (BEV)	Clean Alternative Fuel Vehicle Eligible
JN1AZ0CP4B	Kitsap	Bainbridge Island	WA	98110	2011	NISSAN	LEAF	Battery Electric Vehicle (BEV)	Clean Alternative Fuel Vehicle Eligible
1N4AZ0CP8E	Thurston	Olympia	WA	98506	2014	NISSAN	LEAF	Battery Electric Vehicle (BEV)	Clean Alternative Fuel Vehicle Eligible
1N4AZ1CP8J	Snoho...	Lynnwood	WA	98087	2018	NISSAN	LEAF	Battery Electric Vehicle (BEV)	Clean Alternative Fuel Vehicle Eligible
1N4BZ0CP7H	Kitsap	Poulsbo	WA	98370	2017	NISSAN	LEAF	Battery Electric Vehicle (BEV)	Clean Alternative Fuel Vehicle Eligible

```
39      -- 5. Write a query to count the total number of electric vehicles in the dataset.  
40 •   SELECT COUNT(DISTINCT VIN) AS total_vehicle_count  
41     FROM electric_vehicle_population_data;
```

		Result Grid	Filter Rows:	Export:	Wrap Cell Content:	
	total_vehicle_count					
▶	11237					

```
47      -- 6. Write a query to find the average Electric Range of all electric vehicles.  
48 •   SELECT AVG(`electric Range`)  
49     FROM electric_vehicle_population_data;  
50
```

		Result Grid	Filter Rows:	Export:	Wrap Cell Content:	
	AVG(`electric Range`)					
▶	56.6831					

```
51    -- 7. Write a query to list the top 5 electric vehicles with the highest Base MSRP, sorted in
52 •     SELECT VIN, `model year` , make, `base MSRP`
53     FROM electric_vehicle_population_data
54     ORDER BY `base msrp` DESC LIMIT 5;
55
56
```

Result Grid | Filter Rows: Export: Wrap Cell Content: Fetch rows:

VIN	model year	make	base MSRP
WP0CA2A13F	2015	PORSCHE	845000
WP0CH2A76J	2018	PORSCHE	184400
WP0AH2A77J	2018	PORSCHE	184400
WP0CH2A75J	2018	PORSCHE	184400
WP0AH2A71J	2018	PORSCHE	184400

```
57    -- 8. Write a query to list all pairs of electric vehicles that have the same Make and Model Year.  
58    -- Include columns for VIN_1, VIN_2, Make, and Model Year.  
59  
60 •   SELECT e1.vin AS vin1, e2.vin AS vin2 , e1.make, e1.`model year`  
61     FROM electric_vehicle_population_data AS e1  
62     JOIN electric_vehicle_population_data AS e2  
63     ON e1.make=e2.make  
64         and e1.`model year`=e2.`model year`  
65         and e1.vin<e2.vin;
```

Result Grid | Filter Rows: Export: Wrap Cell Content: Fetch rows:

	vin1	vin2	make	model year
▶	WBAJB1C53K	WBY8P6C58K	BMW	2019
	WBAJB1C50K	WBY8P6C58K	BMW	2019
	WBY8P4C52K	WBY8P6C58K	BMW	2019
	WBY8P4C50K	WBY8P6C58K	BMW	2019
	WBAJB1C58K	WBY8P6C58K	BMW	2019
	WBAJA9C51K	WBY8P6C58K	BMW	2019
	WBAJA9C57K	WBY8P6C58K	BMW	2019
	WBY8P4C51K	WBY8P6C58K	BMW	2019
	WBY8P4C55K	WBY8P6C58K	BMW	2019

```
67    -- 9. Write a query to find the total number of electric vehicles for each Make.  
68    -- Display Make and the count of vehicles.  
69 • SELECT make, count(*) AS vehicle_count  
70     FROM electric_vehicle_population_data  
71     GROUP BY make  
72     ORDER BY vehicle_count DESC;  
73
```

	make	vehicle_count
▶	TESLA	83149
	NISSAN	14168
	CHEVROLET	14046
	FORD	9812
	KIA	7875
	BMW	7843
	TOYOTA	6735
	VOLKSWAGEN	5286
	JEEP	4915
	LINCOLN	4772

```

76      -- 10. Write a query using a CASE statement to categorize electric vehicles into three categories based on their Electric
77      -- Range: Short Range for ranges less than 100 miles, Medium Range for ranges between 100 and 200 miles,
78      -- and Long Range for ranges more than 200 miles.
79
80 •   SELECT make, `electric range`,
81     CASE
82       WHEN `electric range` < 100 THEN 'Short range'
83       WHEN `electric range` BETWEEN 100 AND 200 THEN 'Medium range'
84       ELSE 'Long range'
85     END AS Range_category
86   FROM electric_vehicle_population_data;
87

```

Result Grid | Filter Rows: Export: Wrap Cell Content: Fetch rows:

	make	electric range	Range_category
▶	BMW	153	Medium range
	TESLA	208	Long range
	TESLA	249	Long range
	BMW	14	Short range
	TESLA	238	Long range
	BMW	0	Short range
	TESLA	322	Long range
	VOLKSWAGEN	0	Short range
	VOLKSWAGEN	83	Short range
	FIAT	87	Short range

```
88      -- 11. Write a query to add a new column Model_Length to the electric vehicles table that  
89      -- calculates the length of each Model name.  
90  
91 • ALTER TABLE electric_vehicle_population_data ADD COLUMN `Model Length` INT;  
92 • SET SQL_SAFE_UPDATES = 0;  
93 • UPDATE electric_vehicle_population_data SET `Model length`=LENGTH(model);  
94 • SELECT model, `model length` FROM electric_vehicle_population_data;  
95  
96
```

Result Grid | Filter Rows: _____ | Export: Wrap Cell Content: Fetch rows:

	model	model length
▶	I3	2
	MODEL S	7
	MODEL S	7
	I8	2
	MODEL X	7
	I4	2
	MODEL 3	7

```
99
100    -- 12. Write a query using an advanced function to find the electric vehicle with the highest Electric Range.
101
102 • WITH RankedVehicles AS (
103     SELECT make, model,
104           `electric range`,
105           Row_number() OVER (ORDER BY `electric range` DESC) AS Range_rank
106     FROM electric_vehicle_population_data
107 )
108     SELECT make, model, `electric range`
109     FROM RankedVehicles
110     WHERE Range_rank = 1;
111
```

Result Grid | Filter Rows: | Export: Wrap Cell Content:

	make	model	electric range
▶	TESLA	MODEL S	337

```

112
113      -- 13. Create a view named HighEndVehicles that includes electric vehicles with a Base MSRP of $50,000 or higher.
114
115 • CREATE VIEW HighEndVehicles AS
116   ( SELECT DISTINCT VIN, make, model, `electric vehicle type`, `Base MSRP`
117     FROM electric_vehicle_population_data
118     WHERE `Base MSRP` > 50000);
119 • SELECT * FROM HighEndVehicles;
120

```

Result Grid | Filter Rows: Export: Wrap Cell Content:

	VIN	make	model	electric vehicle type	Base MSRP
▶	5YJSA1DN4D	TESLA	MODEL S	Battery Electric Vehicle (BEV)	69900
	5YJSA1H19E	TESLA	MODEL S	Battery Electric Vehicle (BEV)	69900
	5YJSA1CN8D	TESLA	MODEL S	Battery Electric Vehicle (BEV)	69900
	5YJSA1H11E	TESLA	MODEL S	Battery Electric Vehicle (BEV)	69900
	5YJSA1DN8C	TESLA	MODEL S	Battery Electric Vehicle (BEV)	59900
	LYVBR0DM7K	VOLVO	XC60	Plug-in Hybrid Electric Vehicle (PHEV)	52900
	5YJSA1DN1D	TESLA	MODEL S	Battery Electric Vehicle (BEV)	69900
	5YJSA1CGXD	TESLA	MODEL S	Battery Electric Vehicle (BEV)	69900

HighEndVehicles 22 ×

Output

```
107  
108      -- 14. Write a query using a window function to rank electric vehicles based on their Base MSRP within each Model Year.  
109  
110 •  SELECT DISTINCT VIN, make, model, `model year`, `Base MSRP`,  
111      RANK() OVER (Partition by `model year` ORDER BY `Base MSRP` DESC) AS ranking  
112      FROM electric_vehicle_population_data;  
113  
...
```

Result Grid | Filter Rows: _____ | Export: Wrap Cell Content:

	VIN	make	model	model year	Base MSRP	ranking
▶	1GCDE14HXV	CHEVROLET	S-10 PICKUP	1997	0	1
	1FTZR1078W	FORD	RANGER	1998	0	1
	1FTZR0819X	FORD	RANGER	1999	0	1
	1FTZR0812X	FORD	RANGER	1999	0	1
	1FTZR0813X	FORD	RANGER	1999	0	1
	1FTZR0818X	FORD	RANGER	1999	0	1
	1FTZR0870Y	FORD	RANGER	2000	0	1
	1FTZR0813Y	FORD	RANGER	2000	0	1
	1FTZR0819Y	FORD	RANGER	2000	0	1
	1FTZR0816Y	FORD	RANGER	2000	0	1
	1FTZR0817Y	FORD	RANGER	2000	0	1
	1FTZR0879Y	FORD	RANGER	2000	0	1
	TT3CS10W07	TOYOTA	RAV4	2002	0	1

Result 19

Output

```
128    -- 15. Write a query to calculate the cumulative count of electric vehicles registered each year sorted by Model Year.  
129  
130 • SELECT `Model Year`,  
131      COUNT(*) AS Vehicles_Registered_That_Year,  
132      SUM(COUNT(*)) OVER (ORDER BY `Model Year`) AS Cumulative_Vehicles_Registered  
133  FROM electric_vehicle_population_data  
134  GROUP BY `Model Year`  
135  ORDER BY `Model Year`;  
136
```

Result Grid | Filter Rows: Export: Wrap Cell Content:

	Model Year	Vehicles_Registered_That_Year	Cumulative_Vehicles_Registered
▶	1997	1	1
	1998	1	2
	1999	5	7
	2000	7	14
	2002	2	16
	2003	1	17
	2008	20	37
	2010	24	61
	2011	757	818
	2012	1589	2407

Result 23

```
---  
156      -- 17. Write a query to find the county with the highest average Base MSRP for electric vehicles.  
157      -- Use subqueries and aggregate functions to achieve this.  
158  
159 •   SELECT County, AVG_MSRP  
160     FROM (  
161         SELECT County, AVG(`Base MSRP`) AS AVG_MSRP  
162             FROM electric_vehicle_population_data  
163                 GROUP BY County  
164     ) AS CountyAvgMSRP  
165     ORDER BY AVG_MSRP DESC  
166     LIMIT 1;  
167
```

The screenshot shows a database query results interface. At the top, there are several buttons: 'Result Grid' (selected), 'Filter Rows:', 'Export:', 'Wrap Cell Content:', and 'Fetch rows:'. Below these buttons is a table with two columns: 'County' and 'AVG_MSRP'. A single row is displayed, showing 'Columbia' in the County column and '4992.8571' in the AVG_MSRP column. There is also a small arrow icon next to the County value.

	County	AVG_MSRP
▶	Columbia	4992.8571

```
168 -- 18. Write a query to find pairs of electric vehicles from the same City where one vehicle has a longer Electric Range
169 -- than the other. Display columns for VIN_1, Range_1, VIN_2, and Range_2.
170
171 • SELECT ev1.VIN AS VIN_1,
172     ev1.`Electric Range` AS Range_1, ev2.VIN AS VIN_2,
173     ev2.`Electric Range` AS Range_2
174     FROM electric_vehicle_population_data ev1
175     JOIN electric_vehicle_population_data ev2
176     ON ev1.City = ev2.City
177     AND ev1.`Electric Range` > ev2.`Electric Range`
178     AND ev1.VIN <> ev2.VIN;
179
180
```

Result Grid | Filter Rows: Export: Wrap Cell Content: Fetch rows:

	VIN_1	Range_1	VIN_2	Range_2
▶	5YJSA1DP2D	208	WBY8P6C58K	153
	5YJXCAE27J	238	WBY8P6C58K	153
	1G1FZ6S07L	259	WBY8P6C58K	153
	5YJSA1H23F	208	WBY8P6C58K	153
	5YJXCBE27H	200	WBY8P6C58K	153
	5YJSA1H13F	208	WBY8P6C58K	153
	5YJXCDE28J	238	WBY8P6C58K	153
	5YJSA1E27L	330	WBY8P6C58K	153
	5YJSA1E2XH	210	WBY8P6C58K	153

Conclusion:

This analysis highlighted key trends in the electric vehicle market, showing the growing dominance of newer models and brands like Tesla. By categorizing vehicles based on electric range, we showcased advancements in technology, with most vehicles offering medium to long-range capabilities. Geographic insights revealed higher-priced electric vehicles in specific counties, and top-performing models in terms of range and MSRP were identified. Overall, this project offers valuable insights into the evolving electric vehicle landscape and future market trends.

