Electric Vehicles: A Closer Look

Electric Vehicle Analysis:

Driving Towards a Sustainable Future

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OBJECTIVE :

- Provide insights and findings based on the data analysis.

- Translate raw data into visual formats for easier interpretation.

- Aid stakeholders in making informed decisions.

- Assess various performance indicators related to electric vehicles.

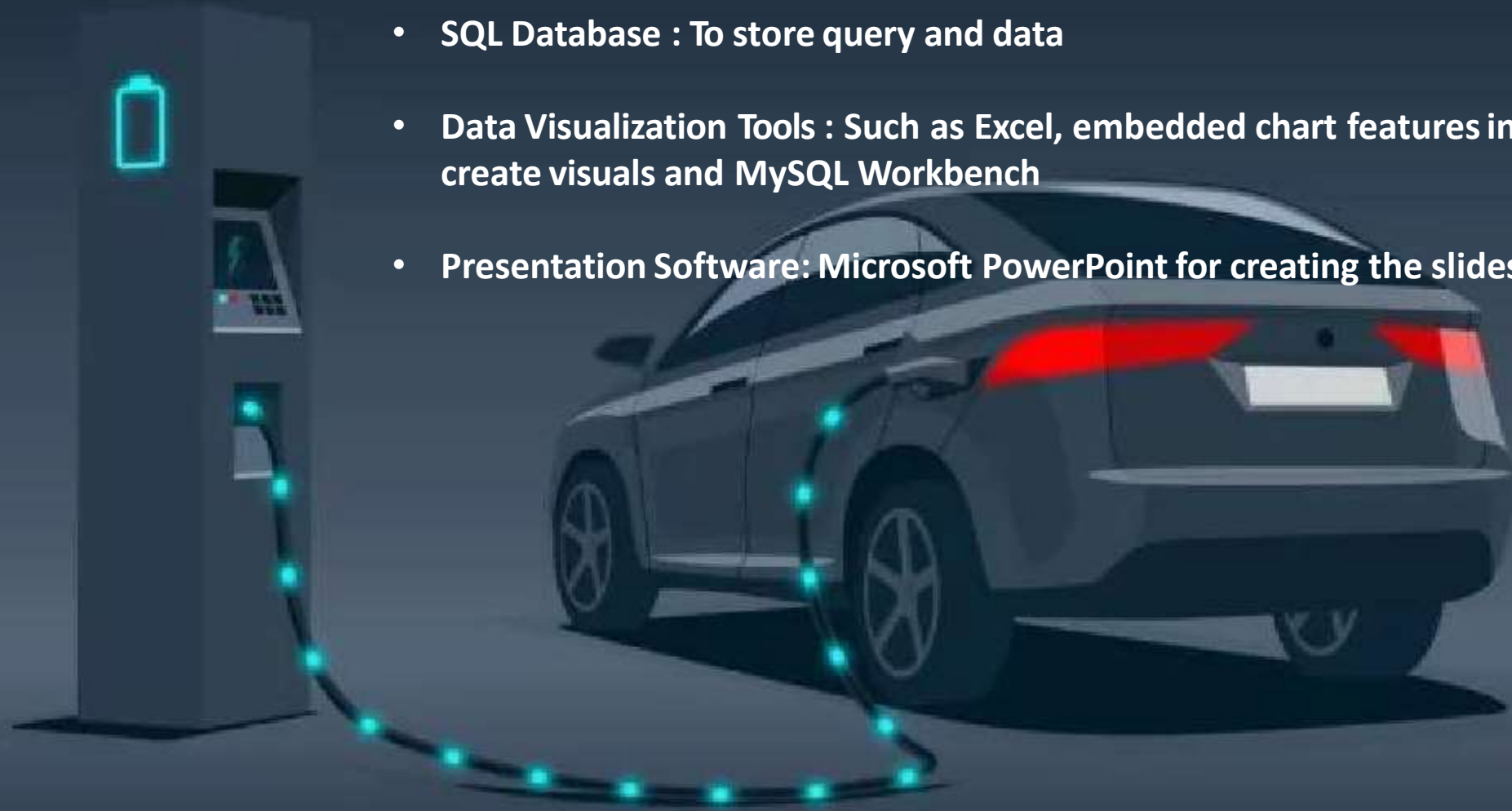- Discuss key findings and insights derived from the data.

SCOPE :

- Provide insights and findings based on the data analysis.

- Translate raw data into visual formats for easier interpretation.

- Aid stakeholders in making informed decisions.

- Assess various performance indicators related to electric vehicles.

- Discuss key findings and insights derived from the data.

TOOLS AND TECHNOLOGIES:

- **SQL Database : To store query and data**

- **Data Visualization Tools : Such as Excel, embedded chart features in PowerPoint to create visuals and MySQL Workbench**

- **Presentation Software: Microsoft PowerPoint for creating the slides.**

Electric Vehicle Lineup

1

VIN, Make, Model

List all electric vehicles with their unique identifiers and model details.


```
12  •    SELECT `VIN (1-10)`,Make,Model from ev_data;
13
```

VIN (1-10)	Make	Model
WBY8P6C58K	BMW	I3
5YJSA1DN4D	TESLA	MODEL S
5YJSA1E26J	TESLA	MODEL S
WBY2Z2C54E	BMW	I8
5YJXCDE23J	TESLA	MODEL X

Our comprehensive database includes detailed information on a wide range of electric vehicles, including their unique VIN (1-10), make, and model. This allows us to provide a complete overview of the available EV options for our customers.

Electric Vehicle Lineup

2

2020+ Model Year

Showcase the latest electric vehicle models from the past few years.

To ensure we offer the most up-to-date and advanced electric vehicles, our query focuses on models from 2020 and later. This allows us to showcase the latest technological advancements and features that these cutting-edge EVs have to offer.

```
28 •    SELECT * FROM ev_data WHERE `Model Year` >=2020;
```

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

VIN (1-10)	County	City	State	Postal Code	Model Year
WBY33AW0XP	King	Seattle	WA	98109	2023
5YJ3E1EB5L	King	Bothell	WA	98011	2020
1V2GNPE86P	King	Sammamish	WA	98075	2023
5YJ3E1EB0M	Yakima	Yakima	WA	98908	2021
SADHD2S10L	King	Bellevue	WA	98004	2020

Electric Vehicle Lineup

3   Tesla Vehicles

Highlight the electric vehicles manufactured by the industry leader, Tesla.


```
35 •    SELECT * FROM ev_data WHERE make='tesla';
```

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

VIN (1-10)	County	City	State	Postal Code	Model Year	Make
5YJSA1DN4D	Kitsap	Bremerton	WA	98312	2013	TESLA
5YJSA1E26J	King	Kent	WA	98042	2018	TESLA
5YJXCDE23J	King	Bellevue	WA	98004	2018	TESLA
5YJ3E1EB5L	King	Bothell	WA	98011	2020	TESLA
5YJ3E1EB0M	Yakima	Yakima	WA	98908	2021	TESLA

As a leader in the EV market, we are proud to showcase the electric vehicles manufactured by Tesla. These innovative and high-performance models have set the standard for the industry and continue to captivate drivers with their sleek designs and impressive capabilities.

Electric Vehicle Statistics

4   Total Electric Vehicles Leaf Model's

Display the vehicles of Leaf Model's

For those interested in the Nissan Leaf, our query allows you to easily find all electric vehicles where the model name contains the word "Leaf." This provides a focused search for this popular and eco-friendly EV option.

Electric Vehicle Statistics

5   Total Electric Vehicles Count

Provide the total quantity of vehicles from the dataset

```
50 •    SELECT COUNT(*) as Total_Quantity FROM ev_data;
51
```

Result Grid	Filter Rows:	Export:	Wrap Cell

Total_quantity
186879

To give you a comprehensive understanding of the EV market, we've included a query that counts the total number of electric vehicles in our database. This information can help you gauge the scale and growth of this rapidly evolving industry.

Electric Vehicle Statistics

6 Average Electric Range

Provide the overall count of electric vehicles in the dataset.

Knowing the average electric range of the vehicles in our database is crucial for understanding the capabilities and performance of these eco-friendly cars. Our query provides this valuable data point to help you make informed decisions.

Electric Vehicle Statistics

7　　　Top 5 Highest MSRP

Identify the electric vehicles with the
highest base prices.


```
63
64 ●    SELECT  * FROM ev_data ORDER BY `base msrp` DESC LIMIT 5;
```

Fuel Vehicle (CAFV)	Electric Range	Base MSRP	Legislative District	DOL Vehicle ID
low battery range	12	845000.00	48	100479039
low battery range	14	184400.00	17	183245247
low battery range	14	184400.00	47	475425590
low battery range	14	184400.00	18	107105750
low battery range	14	184400.00	41	113244169

For those seeking the ultimate in luxury and performance, our query showcases the top 5 electric vehicles with the highest base MSRP, sorted in descending order. This allows you to explore the most premium and high-end EV options available.

Matching Electric Vehicles

* **Same Make, Model Year**

Find electric vehicle pairs with identical make and model year.

* **Electric Vehicle Counts by Make**

Analyze the distribution of electric vehicles by manufacturer.

* **Electric Range Categories**

Classify electric vehicles based on their battery range capabilities.

Matching Electric Vehicles

8

Same Make, Model Year

Find electric vehicle pairs with identical make and model year.


```sql
71 •   SELECT ev1.`VIN (1-10)` as VIN_1,
72             ev2.`VIN (1-10)` as VIN_2,ev1.make,ev1.`model year`
73     FROM ev_data ev1
74     JOIN ev_data ev2
75     ON ev1.make = ev2.make AND ev1.`model year` = ev2.`model year`;
```

VIN_1	VIN_2	make	model year
WBY8P6C5XK	WBY8P6C58K	BMW	2019
WBAJB1C53K	WBY8P6C58K	BMW	2019
WBAJB1C50K	WBY8P6C58K	BMW	2019
WBY8P4C52K	WBY8P6C58K	BMW	2019
WBY8P4C50K	WBY8P6C58K	BMW	2019

Our database also allows you to identify electric vehicles that share the same make and model year. This information can be useful for comparing and contrasting similar EV models, as well as for finding potential matches or alternatives.

Matching Electric Vehicles

9

Electric Vehicle Counts by Make

Analyze the distribution of electric vehicles by manufacturer.


```
81  ●    SELECT Make,count(*) as Vehicle_Count FROM ev_data
82       GROUP BY Make ORDER BY Vehicle_Count;
```

Make	Vehicle_Count
ROLLS ROYCE	2
WHEEGO ELECTRIC CARS	3
BENTLEY	3
GMC	4
TH!NK	5

To provide a deeper understanding of the EV market, our query breaks down the total number of electric vehicles by make. This data can help you identify the most popular and dominant brands in the industry, as well as emerging players.

Matching Electric Vehicles

10

Electric Range Categories

Classify electric vehicles based on their battery range capabilities.

```
92  ● ⊖  SELECT `VIN (1-10)`,Make,`Electric Range`, CASE
93          WHEN `electric range` < 100 THEN 'SHORT_RANGE'
94          WHEN `electric range` BETWEEN 100 AND 200 THEN 'MIDDLE_RANGE'
95          ELSE 'LONG_RANGE'
96          END AS TYPE_
97      FROM ev_data ORDER BY `electric range`;
```

Result Grid | Filter Rows: [   ] | Export: | Wrap Cell Content: ⫶A | Fetch row

VIN (1-10)	Make	Electric Range	TYPE_
WBY7Z4C50J	BMW	97	SHORT_RANGE
WBY1Z8C36H	BMW	97	SHORT_RANGE
1FADP3R47H	FORD	100	MIDDLE_RANGE
1FADP3R44H	FORD	100	MIDDLE_RANGE
1FADP3R43J	FORD	100	MIDDLE_RANGE

Short Range

Electric vehicles with a range less than 100 miles are categorized as "Short Range." These models may be suitable for urban commuters or those with access to frequent charging opportunities.

Medium Range

Electric vehicles with a range between 100 and 200 miles are categorized as "Medium Range." These models offer a balance of practicality and convenience for daily driving needs.

Long Range

Electric vehicles with a range exceeding 200 miles are categorized as "Long Range." These high-performance models provide the freedom and flexibility for longer-distance travel.

Advanced Electric Vehicle Analytics

Model Length

Calculate the length of each electric vehicle model name.

Highest Electric Range

Identify the electric vehicle with the maximum battery range.

High-End Vehicles

View a curated list of electric vehicles with a high base MSRP.

MSRP Ranking

Rank electric vehicles within each model year by base MSRP.

Advanced Electric Vehicle Analytics

11   Model Length

Calculate the length of each electric vehicle model name.


```
103 •      ALTER TABLE ev_data ADD COLUMN `Model Length` INT;
104 •      UPDATE ev_data SET `Model length`=LENGTH(model);
105 •      SELECT model,`Model Length` FROM ev_data;
```

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

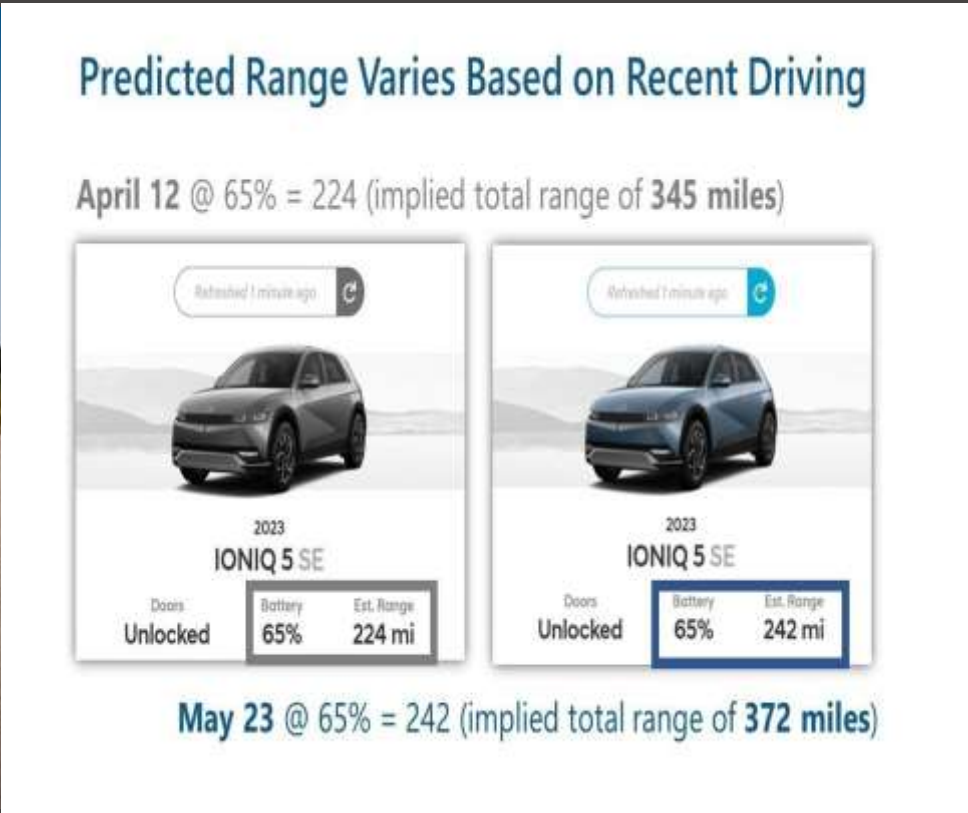| model	Model Length
I3	2
MODEL S	7
MODEL S	7
I8	2
MODEL X	7

Our database now includes a new column, "Model_Length," which calculates the length of each model name. This can be a useful data point for various analyses and comparisons.

Advanced Electric Vehicle Analytics

12

Highest Electric Range

Identify the electric vehicle with
the maximum battery range.

```sql
111  SELECT Model, `Electric Range`
112  FROM (
113          SELECT Model,
114              `Electric Range`,
115              ROW_NUMBER() OVER (ORDER BY `Electric Range` DESC) AS rn FROM ev_data) v
116  WHERE rn=1;
```

Result Grid	Filter Rows:	Export:	Wrap Cell Content:

Model	Electric Range
MODEL S	337

Predicted Range Varies Based on Recent Driving

April 12 @ 65% = 224 (implied total range of **345 miles**)

2023
IONIQ 5 SE

Doors	Battery	Est. Range
Unlocked	65%	224 mi

2023
IONIQ 5 SE

Doors	Battery	Est. Range
Unlocked	65%	242 mi

May 23 @ 65% = 242 (implied total range of **372 miles**)

Using advanced functions, we've identified the electric vehicle with
the highest electric range in our database, providing you with the
ultimate in long-distance driving capabilities.

Advanced Electric Vehicle Analytics

13

High-End Vehicles

View a curated list of electric vehicles with a high base MSRP.

```
122 •    CREATE VIEW HighEndVehicles AS
123      SELECT * FROM ev_data WHERE `base MSRP` >=50000;
124
125 •    SELECT * FROM HighEndVehicles;
```

| Result Grid | Filter Rows: | Export: | Wrap Cell C |
Clean Alternative Fuel Vehicle (CAFV) Eligibility	Electric Range	Base MSRP
Clean Alternative Fuel Vehicle Eligible	208	69900.00
Clean Alternative Fuel Vehicle Eligible	208	69900.00
Clean Alternative Fuel Vehicle Eligible	208	69900.00
Clean Alternative Fuel Vehicle Eligible	208	69900.00
Clean Alternative Fuel Vehicle Eligible	208	69900.00

Our "HighEndVehicles" view showcases electric vehicles with a base MSRP of $50,000 or higher, catering to those seeking the most premium and luxurious EV options.

Advanced Electric Vehicle Analytics

14

MSRP Ranking

Rank electric vehicles within each model year by base MSRP.


```
131 ●    Select `VIN (1-10)`,Make,Model,`model year`,`Base MSRP`,
132 ○        RANK() OVER ( Partition by `model year`
133                       order by `Base MSRP` DESC) as Rank
134      FROM ev_data;
```

VIN (1-10)	Make	Model	model year	Base MSRP	Ranking
1GCDE14HXV	CHEVROLET	S-10 PICKUP	1997	0.00	1
1FTZR1078W	FORD	RANGER	1998	0.00	1
1FTZR0819X	FORD	RANGER	1999	0.00	1
1FTZR0812X	FORD	RANGER	1999	0.00	1

Using window functions, we can now rank electric vehicles based on their base MSRP within each model year, providing a more nuanced understanding of pricing trends and market positioning.

Electric Vehicle Trends

Yearly Registrations

Analyze the cumulative growth of electric vehicle registrations over time.

MSRP Updates

Implement a process to update the base MSRP for individual vehicles.

Regional Pricing

Identify the county with the highest average electric vehicle pricing.

Electric Vehicle Trends

15　　📅　　Yearly Registrations

Analyze the cumulative growth of electric vehicle registrations over time.

Our query tracks the cumulative count of electric vehicles registered each year, sorted by model year, giving you a comprehensive view of the industry's growth and adoption over time.

```
141 •    SELECT `Model Year`,count(*) as year_count,
142          SUM(COUNT(*)) OVER (order by `model year`) as cumulative_count
143      FROM ev_data
144      group by `model year`;
```

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

Model Year	year_count	cumulative_count
1997	1	1
1998	1	2
1999	5	7
2000	7	14

Electric Vehicle Trends

16   **$**   MSRP Updates

Implement a process to update the base MSRP for individual vehicles.

```
149      DELIMITER //
150  ●   CREATE PROCEDURE Update_msrp(IN a text, IN b INT)
151  ⊖   BEGIN
152          UPDATE ev_data SET `base msrp`=b WHERE `VIN (1-10)`=a;
153      END //
154      DELIMITER ;
155
156  ●   CALL update_msrp('WBY8P6C58K',5000);
157  ●   SELECT `VIN (1-10)`,`base msrp`  FROM ev_data;
```

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

VIN (1-10)	base msrp
WBY8P6C58K	5000.00

With our stored procedure, you can easily update the base MSRP of any electric vehicle in our database by providing the VIN (1-10) and the new MSRP value, ensuring your data remains up-to-date and accurate.

Electric Vehicle Trends

17   ◎   Regional Pricing

Identify the county with the
highest average electric vehicle
pricing.

```
165  ●    SELECT COUNTY,AVG_
166  ⊖    FROM (
167           SELECT county,AVG(`base msrp`) as AVG_
168           FROM ev_data
169           GROUP BY county
170       ) AS t
171   ORDER BY AVG_ DESC
172   LIMIT 1;
```

| Result Grid | ▦ | ↻ | Filter Rows: | | Export: | 🖫 | Wrap Cell Co |

	COUNTY	AVG_
▶	Charles	102000.000000

Our advanced query
using subqueries and
aggregate functions has
identified the county
with the highest
average base MSRP for
electric vehicles,
providing valuable
insights into regional
pricing trends and
market dynamics.

Exploring Electric Vehicle Differences

EV Pairs's by City

```sql
SELECT ev1.city as city_,
        ev1.`VIN (1-10)` as VIN_1, ev1.`electric range` as Range_1,
        ev2.`VIN (1-10)` as VIN_2, ev2.`electric range` as Range_2
FROM ev_data ev1
JOIN ev_data ev2
ON ev1.city=ev2.city AND ev1.`electric range` > ev2.`electric range`;
```

sult Grid | Filter Rows: | Export: | Wrap Cell Content: IA | Fetch rows:

city_	VIN_1	Range_1	VIN_2	Range_2
Seattle	5YJSA1E45J	249	WBY8P6C58K	153
Seattle	5YJYGDEE0L	291	WBY8P6C58K	153
Seattle	5YJSA1DP2D	208	WBY8P6C58K	153
Seattle	5YJXCAE27J	238	WBY8P6C58K	153
Seattle	1G1FZ6S07L	259	WBY8P6C58K	153

We've also identified pairs of electric vehicles from the same city where one vehicle has a longer electric range than the other, offering a unique perspective on the diversity of EV options within local markets.

The Future of Electric Vehicles

Advancing Technology	Expanding Charging Infrastructure	Evolving Regulations
Improved battery performance	Increased public charging stations	Incentives and policies
Autonomous driving features	Faster charging times	Environmental impact standards

CONCLUSION AND FUTURE WORK

- **Key Findings :**
  - Sales Trends
  - Customer Demographic

- **Recommendations :**
  - Should Expand Charging Network
  - Data Monitoring

- **Impact on Decision Making**
  - Strategic Planning
  - Customer Experience Should Be Added