Untitled2

December 19, 2023

0.1 VISUALIZATION

[1]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
```

[2]:
```
df = pd.read_csv('EV_Registration_Dataset.csv')
```

[3]:
```
City_df = pd.DataFrame(df.City[:20].value_counts().sort_index())
City_df
```

[3]:

	City
Bellevue	2
Bellingham	1
Bremerton	1
Buckley	1
Edmonds	2
Gig Harbor	1
Kent	2
Oak Harbor	1
Port Townsend	1
Puyallup	1
Ridgefield	1
Sammamish	2
Seattle	1
Tacoma	2
Vashon	1

[4]:
```
cities_by_Electric_Range=df.City.value_counts()
cities_by_Electric_Range
```

[4]:
```
Seattle       23489
Bellevue       6960
Redmond        4965
Vancouver      4819
Kirkland       4201
              ...
```

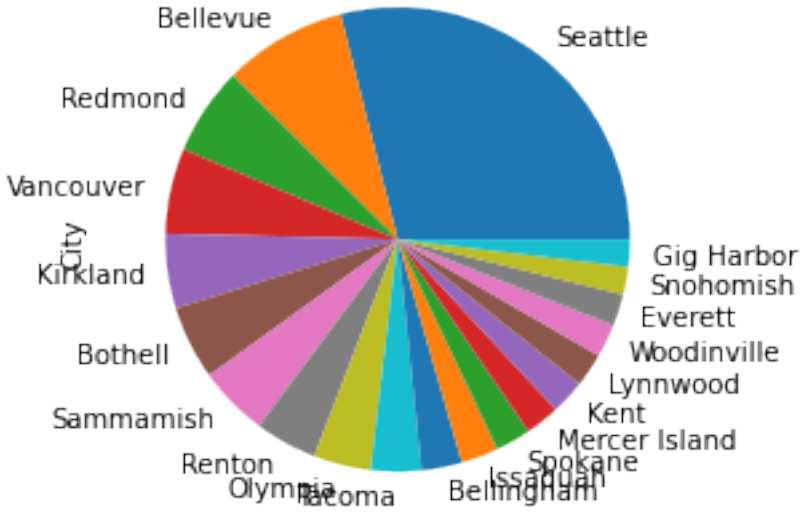
```
Belleville        1
Dallas            1
Prosper           1
Lakeview          1
Pittsburg         1
Name: City, Length: 651, dtype: int64
```

[5]:
```
cities_by_Electric_Range[:20]
```

[5]:
```
Seattle          23489
Bellevue          6960
Redmond           4965
Vancouver         4819
Kirkland          4201
Bothell           4196
Sammamish         3950
Renton            3516
Olympia           3228
Tacoma            2846
Bellingham        2281
Issaquah          2108
Spokane           1999
Mercer Island     1943
Kent              1942
Lynnwood          1895
Woodinville       1873
Everett           1804
Snohomish         1567
Gig Harbor        1525
Name: City, dtype: int64
```

[6]:
```
# To plot the cities by the Electric Range upto range 20
cities_by_Electric_Range[:20].plot(kind='pie')
```

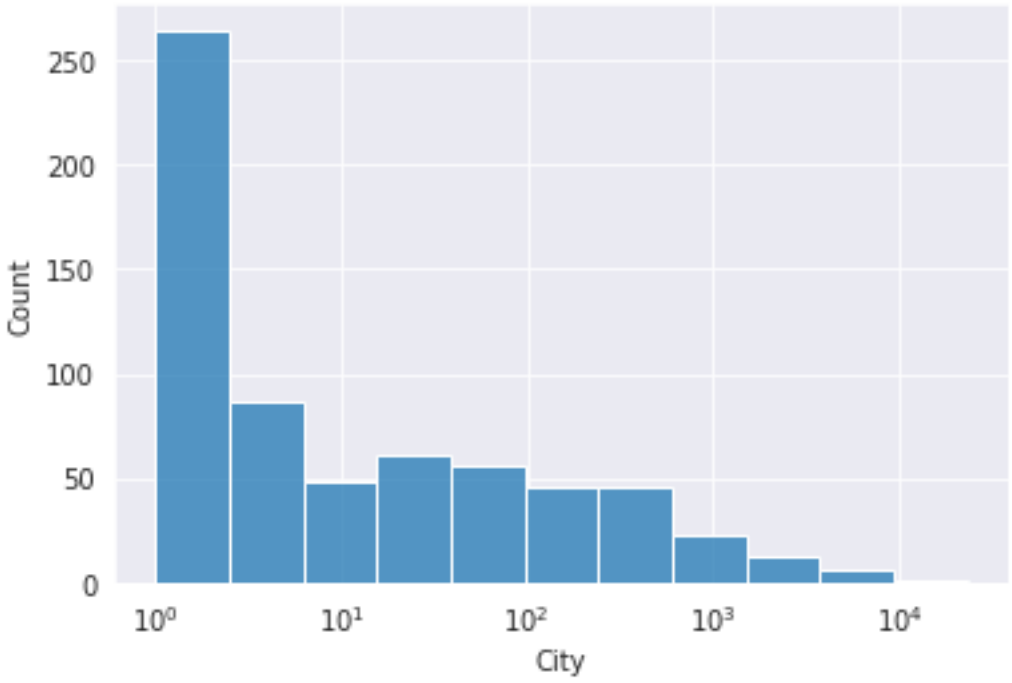
[6]:
```
<AxesSubplot: ylabel='City'>
```



[7]:
```
sns.set_style('darkgrid')
```

[8]:
```
# to plot the cities by Electric Range Using log scale
sns.histplot(cities_by_Electric_Range,log_scale=True)
```

[8]: <AxesSubplot: xlabel='City', ylabel='Count'>



[9]:
```
cities_by_Electric_Range[cities_by_Electric_Range==1]
```

[9]:
```
Fort Lauderdale    1
Bucoda             1
Warner Robins      1
Silver Spring      1
Bridgeport Bar     1
                  ..
Belleville         1
Dallas             1
Prosper            1
Lakeview           1
Pittsburg          1
Name: City, Length: 197, dtype: int64
```

[10]:
```
# to view the top models
top_Model=df.Model.value_counts()
top_Model[:10]
```

[10]:
```
MODEL 3        25837
MODEL Y        23577
LEAF           13020
MODEL S         7473
BOLT EV         5419
VOLT            4881
MODEL X         4874
NIRO            2609
ID.4            2480
PRIUS PRIME     2473
Name: Model, dtype: int64
```

[11]:
```
max_Model=df.groupby('City')['Model Year'].max().sort_values(ascending=False)
max_Model.head(10).index
```

[11]:
```
Index(['Gig Harbor', 'Monroe', 'Vancouver', 'Vashon', 'Puyallup', 'Pullman',
       'Redmond', 'Seabeck', 'Kennewick', 'Lake Forest Park'],
      dtype='object', name='City')
```

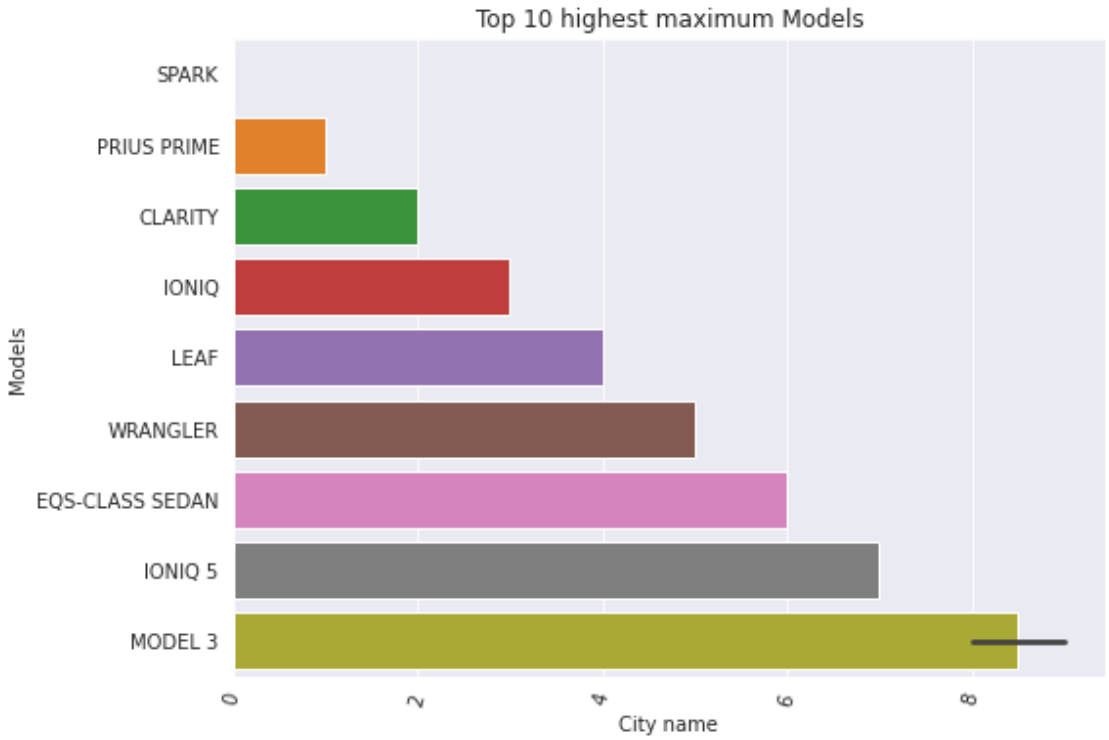
[12]:
```
#  ploting the top models
plt.figure(figsize=(8,6))
plt.xticks(rotation=75)
sns.barplot(y=df.Model.head(10),x=df.Model.head(10).index);
plt.xlabel( "City name")

# Set label for y-axis
```

```
plt.ylabel( "Models" )

# Set title for figure
plt.title( "Top 10 highest maximum Models" )
```

[12]: Text(0.5, 1.0, 'Top 10 highest maximum Models')



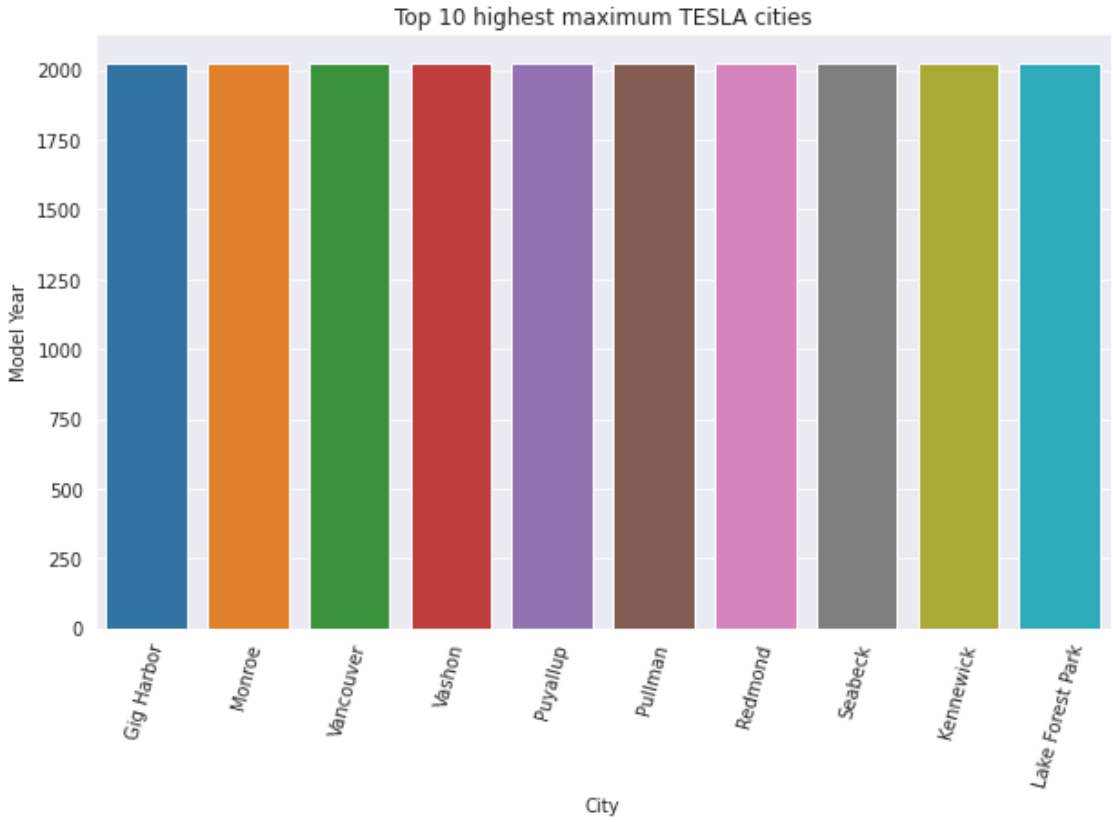
[13]:
```
max_Model_TESLA=df.groupby('City')['Model Year'].max().
  ↪sort_values(ascending=False)
max_Model_TESLA.head(10).index
```

[13]:
```
Index(['Gig Harbor', 'Monroe', 'Vancouver', 'Vashon', 'Puyallup', 'Pullman',
       'Redmond', 'Seabeck', 'Kennewick', 'Lake Forest Park'],
      dtype='object', name='City')
```

[14]:
```
plt.figure(figsize=(10,6))
plt.xticks(rotation=75)
plt.xlabel( "City")
plt.ylabel( "TESLA" )
plt.title( "Top 10 highest maximum TESLA cities" )

sns.barplot(y=max_Model_TESLA.head(10),x=max_Model_TESLA.head(10).index)
```

[14]:
```
<AxesSubplot: title={'center': 'Top 10 highest maximum TESLA cities'},
xlabel='City', ylabel='Model Year'>
```



[15]:
```
min_Model_TESLA=df.groupby('City')['Model Year'].min().
  ↪sort_values(ascending=True)
min_Model_TESLA.head(10).index
```

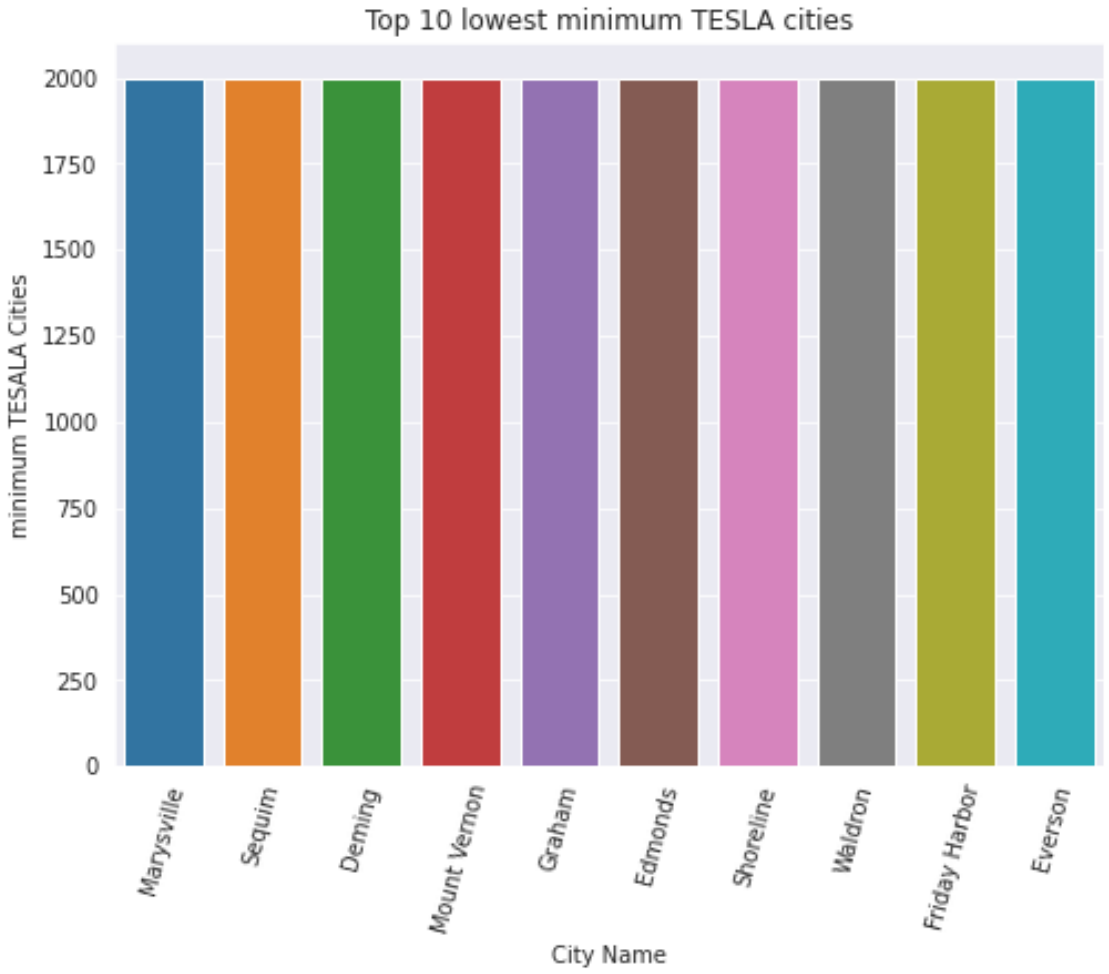
[15]:
```
Index(['Marysville', 'Sequim', 'Deming', 'Mount Vernon', 'Graham', 'Edmonds',
       'Shoreline', 'Waldron', 'Friday Harbor', 'Everson'],
      dtype='object', name='City')
```

[16]:
```
plt.figure(figsize=(8,6))
plt.xticks(rotation=75)
sns.barplot(y=min_Model_TESLA.head(10),x=min_Model_TESLA.head(10).index)
plt.xlabel( "City Name")

# Set label for y-axis
plt.ylabel( "minimum TESALA Cities" )

# Set title for figure
plt.title( "Top 10 lowest minimum TESLA cities" )
```

[16]: Text(0.5, 1.0, 'Top 10 lowest minimum TESLA cities')



[18]:
```
# Base MSRP distribution
Base_MSRP = df.sample(n = 10000)
```

[19]:
```
Base_MSRP
```

[19]:

	Identifier	City	Postal Code	Model Year	Make	\
1614	YV4BR00L2L	Seattle	98105.0	2020	VOLVO	
110276	5YJ3E1EBXM	Kirkland	98034.0	2021	TESLA	
62674	5YJYGAEE6M	Seattle	98115.0	2021	TESLA	
109298	4JGDM2EBXP	Kirkland	98033.0	2023	MERCEDES-BENZ	
27807	5YJ3E1EBXL	Yakima	98908.0	2020	TESLA	
…	…	…	…	…	…	
131057	KM8KRDAF1P	Walla Walla	99362.0	2023	HYUNDAI	
94489	7SAYGDEE8P	Kirkland	98033.0	2023	TESLA	
21336	YV4BR00L2N	Redmond	98052.0	2022	VOLVO	

```
50065   2C4RC1N79J     Richland      99352.0        2018       CHRYSLER
63284   5YJ3E1EB6N       Medina      98039.0        2022          TESLA

                Model                    Electric Vehicle Type  \
1614             XC90  Plug-in Hybrid Electric Vehicle (PHEV)
110276        MODEL 3          Battery Electric Vehicle (BEV)
62674         MODEL Y          Battery Electric Vehicle (BEV)
109298  EQS-CLASS SUV          Battery Electric Vehicle (BEV)
27807         MODEL 3          Battery Electric Vehicle (BEV)
…               …                                     …
131057        IONIQ 5          Battery Electric Vehicle (BEV)
94489         MODEL Y          Battery Electric Vehicle (BEV)
21336            XC90  Plug-in Hybrid Electric Vehicle (PHEV)
50065         PACIFICA  Plug-in Hybrid Electric Vehicle (PHEV)
63284         MODEL 3          Battery Electric Vehicle (BEV)

        Clean Alternative Fuel Vehicle (CAFV) Eligibility  Electric Range  \
1614                 Not eligible due to low battery range            18.0
110276  Eligibility unknown as battery range has not b…               0.0
62674   Eligibility unknown as battery range has not b…               0.0
109298  Eligibility unknown as battery range has not b…               0.0
27807              Clean Alternative Fuel Vehicle Eligible           322.0
…                                                    …              …
131057  Eligibility unknown as battery range has not b…               0.0
94489   Eligibility unknown as battery range has not b…               0.0
21336                Not eligible due to low battery range            18.0
50065              Clean Alternative Fuel Vehicle Eligible            33.0
63284   Eligibility unknown as battery range has not b…               0.0

        Base MSRP  Legislative District  Vehicle ID  \
1614          0.0                  43.0   100478227
110276        0.0                  45.0   137140041
62674         0.0                  43.0   171465521
109298        0.0                  48.0   229659874
27807         0.0                  14.0   110302293
…           …                    …          …
131057        0.0                  16.0   230998582
94489         0.0                  48.0   237793041
21336         0.0                  45.0   187432493
50065         0.0                   8.0   476442235
63284         0.0                  48.0   219374151

                                    Vehicle Location  \
1614    POINT (-122.31911499999995 47.661320000000046)
110276   POINT (-122.20928499999997 47.71124000000003)
62674   POINT (-122.31849999999997 47.679490000000044)
109298   POINT (-122.20263999999997 47.67850000000004)
```

```
27807    POINT (-120.60272019999996 46.59656250000006)
…                                                    …
131057   POINT (-118.34331999999995 46.06398500000006)
94489    POINT (-122.20263999999997 47.67850000000004)
21336    POINT (-122.12301999999994 47.67668000000003)
50065    POINT (-119.29441499999996 46.27187500000008)
63284   POINT (-122.22802499999995 47.615980000000036)

                                        Electric Utility  2020 Census Tract
1614          CITY OF SEATTLE - (WA)|CITY OF TACOMA - (WA)       5.303300e+10
110276      PUGET SOUND ENERGY INC||CITY OF TACOMA - (WA)       5.303302e+10
62674         CITY OF SEATTLE - (WA)|CITY OF TACOMA - (WA)       5.303300e+10
109298      PUGET SOUND ENERGY INC||CITY OF TACOMA - (WA)       5.303302e+10
27807                                          PACIFICORP       5.307700e+10
…                                                     …                 …
131057                                         PACIFICORP       5.307192e+10
94489       PUGET SOUND ENERGY INC||CITY OF TACOMA - (WA)       5.303302e+10
21336       PUGET SOUND ENERGY INC||CITY OF TACOMA - (WA)       5.303303e+10
50065   BONNEVILLE POWER ADMINISTRATION||CITY OF RICHL…       5.300501e+10
63284         CITY OF SEATTLE - (WA)|CITY OF TACOMA - (WA)       5.303302e+10

[10000 rows x 15 columns]
```

[21]:
```
# to view the Electric Utility
Electric_Utility = df.sample(n = 10000)
```

[22]:
```
Electric_Utility
```

[22]:
```
        Identifier            City  Postal Code  Model Year      Make  \
32308   2C4RC1S73M         Redmond      98052.0        2021  CHRYSLER
80915   WBY73AW04N        Kirkland      98033.0        2022       BMW
11881   1N4BZ0CP1H         Seattle      98125.0        2017    NISSAN
9660    KNDC4DLC1P          Burien      98166.0        2023       KIA
63525   5YJ3E1EC9L         Seattle      98126.0        2020     TESLA
…              …               …            …           …         …
23352   5YJSA1H14E  Spokane Valley      99216.0        2014     TESLA
76299   WBY1Z4C52G         Seattle      98107.0        2016       BMW
89585   5YJ3E1EB1L      North Bend      98045.0        2020     TESLA
117404  5YJYGAEEXM    Maple Valley      98038.0        2021     TESLA
45025   7SAYGDEF1N      Marysville      98271.0        2022     TESLA

           Model                    Electric Vehicle Type  \
32308   PACIFICA  Plug-in Hybrid Electric Vehicle (PHEV)
80915         I4          Battery Electric Vehicle (BEV)
11881       LEAF          Battery Electric Vehicle (BEV)
9660         EV6          Battery Electric Vehicle (BEV)
63525    MODEL 3          Battery Electric Vehicle (BEV)
```

```
…          …                                    …
23352    MODEL S          Battery Electric Vehicle (BEV)
76299         I3  Plug-in Hybrid Electric Vehicle (PHEV)
89585    MODEL 3          Battery Electric Vehicle (BEV)
117404   MODEL Y          Battery Electric Vehicle (BEV)
45025    MODEL Y          Battery Electric Vehicle (BEV)

        Clean Alternative Fuel Vehicle (CAFV) Eligibility  Electric Range  \
32308             Clean Alternative Fuel Vehicle Eligible            32.0
80915   Eligibility unknown as battery range has not b…              0.0
11881             Clean Alternative Fuel Vehicle Eligible           107.0
9660    Eligibility unknown as battery range has not b…              0.0
63525             Clean Alternative Fuel Vehicle Eligible           308.0
…                                                    …              …
23352             Clean Alternative Fuel Vehicle Eligible           208.0
76299             Clean Alternative Fuel Vehicle Eligible            72.0
89585             Clean Alternative Fuel Vehicle Eligible           322.0
117404  Eligibility unknown as battery range has not b…              0.0
45025   Eligibility unknown as battery range has not b…              0.0

        Base MSRP  Legislative District  Vehicle ID  \
32308         0.0                  48.0   185439782
80915         0.0                  48.0   209941889
11881         0.0                  46.0   205748980
9660          0.0                  34.0   224552303
63525         0.0                  34.0   109780478
…           …                    …          …
23352     69900.0                   4.0   192886179
76299         0.0                  43.0   205514774
89585         0.0                   5.0   112453890
117404        0.0                   5.0   170379093
45025         0.0                  38.0   205600979

                                      Vehicle Location  \
32308    POINT (-122.12301999999994 47.67668000000003)
80915    POINT (-122.20263999999997 47.67850000000004)
11881   POINT (-122.29638499999999 47.715580000000045)
9660     POINT (-122.34101999999996 47.46593000000007)
63525    POINT (-122.37410499999999 47.54468000000003)
…                                                    …
23352    POINT (-117.21263999999996 47.65877540000008)
76299   POINT (-122.37814999999995 47.668660000000045)
89585    POINT (-121.78140119999995 47.49353160000004)
117404   POINT (-122.05190999999996 47.35798500000004)
45025    POINT (-122.17138469999998 48.10433000000006)

                                   Electric Utility  2020 Census Tract
```

```
32308       PUGET SOUND ENERGY INC||CITY OF TACOMA - (WA)       5.303303e+10
80915       PUGET SOUND ENERGY INC||CITY OF TACOMA - (WA)       5.303302e+10
11881        CITY OF SEATTLE - (WA)|CITY OF TACOMA - (WA)       5.303300e+10
9660        PUGET SOUND ENERGY INC||CITY OF TACOMA - (WA)       5.303303e+10
63525        CITY OF SEATTLE - (WA)|CITY OF TACOMA - (WA)       5.303301e+10
…                                                    …              …
23352   BONNEVILLE POWER ADMINISTRATION||AVISTA CORP||…      5.306301e+10
76299        CITY OF SEATTLE - (WA)|CITY OF TACOMA - (WA)       5.303300e+10
89585       PUGET SOUND ENERGY INC||CITY OF TACOMA - (WA)       5.303303e+10
117404      PUGET SOUND ENERGY INC||CITY OF TACOMA - (WA)       5.303303e+10
45025                              PUGET SOUND ENERGY INC       5.306105e+10

[10000 rows x 15 columns]
```

[24]:
```
import matplotlib
```

[25]:
```
sample_df=df.sample(500)
```

[ ]:
```

```